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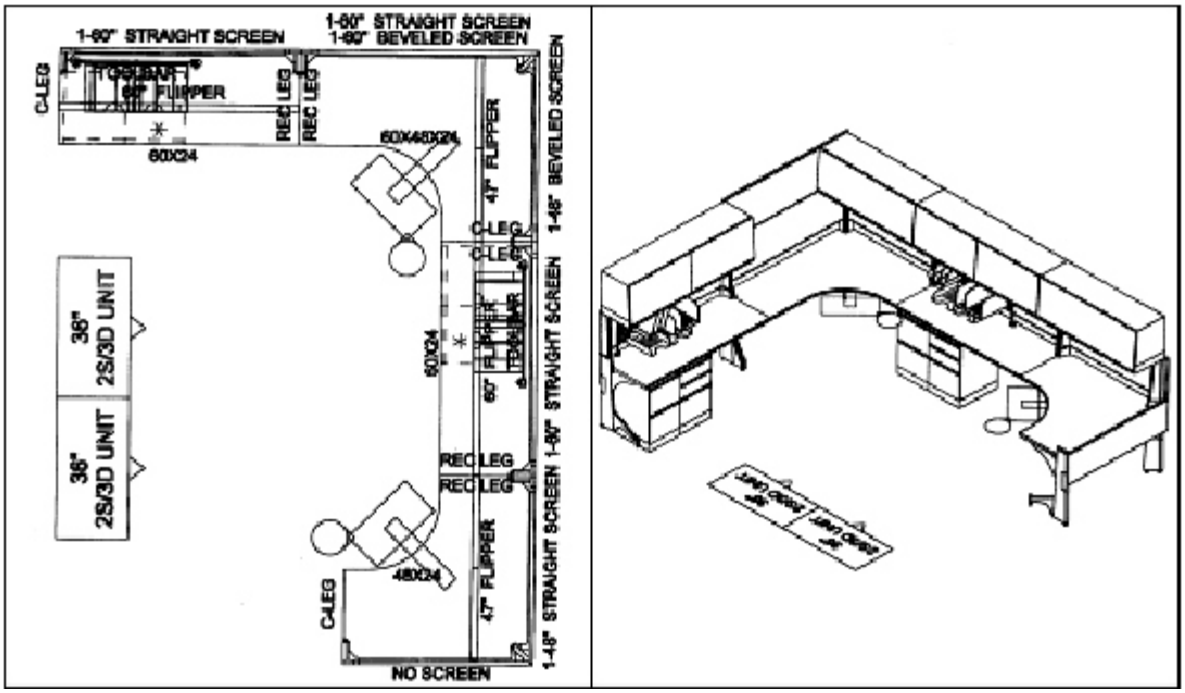
EPA FACILITIES MANUAL, VOLUME 1

Space Acquisition and Planning Guidelines



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Foreword

The *EPA Facilities Manual* is comprised of four distinct, yet complementary resources for planning and managing Environmental Protection Agency (EPA) facilities. These four volumes are meant to be used simultaneously to determine design intent, requirements, and the ongoing evaluation of all EPA facilities. The use of one volume without reference to the other three would result in an incomplete understanding of the requirements for EPA facilities.

Volume 1: The *Space Acquisition and Planning Guidelines* contain information on space planning, space estimation, environment, materials, furniture, process, and maintenance. EPA's Office of Administration and Resources Management developed this document to help EPA facilities managers, space managers, and line personnel plan and use their space.

Volume 2: The *Architecture and Engineering Guidelines* (referred to as the *A&E Guidelines*) provide guidance for facilities management, engineering, planning, and architecture professionals in the design and construction of new EPA facilities and the evaluation of existing facilities.

Volume 3: The *Safety, Health, and Environmental Management Manual: Safety and Health Requirements* outlines safety and health considerations for owned or leased EPA facilities. The Manual's goal is to maintain a safe and healthful workplace that protects against injury, illness, and loss of life.

Volume 4: The *Safety, Health, and Environmental Management Manual*: *Environmental Management Guidelines*, establishes environmental specifications to be addressed by designers and managers of EPA facilities and related building systems.

Space Acquisition and Planning Guidelines

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Chapter 1 - Introduction

1.1 Statement of Purpose

The *EPA Facilities Manual,* in four volumes, is intended to set forth and codify the agency's various recommended standards for its nation-wide office and laboratory facilities. Since its inception in 1970, the EPA has acquired office space and laboratories of various kinds in support of its mission to monitor and to advance the nation's environmental well-being. As the agency's mission has grown, so has its staff and the requirement for office space, and as scientific knowledge has expanded, the need for improved laboratory facilities has increased. To keep pace with growth and change, implement throughout the agency the lessons learned through experience and practice, promote an equitable allocation of space for all employees, and ensure continuing safe and healthy operations of its facilities, the agency has developed this four-part manual for use by EPA administrators, laboratory directors, facilities managers, design professionals, and anyone involved with the acquisition, design, operations, and maintenance of EPA facilities.

1.2 Background

Over the course of its over 30 years of operation, the EPA has developed standards and guidelines for the acquisition, design, and operations of its office space and its laboratory facilities. These standards had been previously published by the agency as three separate manuals: *Space Guidelines* (Volumes 1 & 2), directed primarily at the acquisition and planning of office space; *Architecture, Engineering and Planning Guidelines;* and *the Facility Safety, Health, and Environmental Management Manual*. The revised, integrated *EPA Facilities Manual* updates and reorganizes these documents as explained below.

1.3 Organization of the EPA Facilities Manual

The updated *EPA Facilities Manual* has been divided into four volumes, each volume directed at a specific audience:

- Volume 1, *Space Acquisition and Planning Guidelines,* is intended for the office director/administrator and the facilities manager whose job it is to acquire space. It helps such persons to estimate how much space will be needed, how the space could be planned in an efficient and cost-effective way, and what constraints must be considered: budget, code requirements, environmental aspects, and similar factors that will affect the workplace. Only an overview of the technical considerations is provided here: the volume that follows describes such technical factors in greater detail.

- Volume 2, *Architecture and Engineering Guidelines* is meant for those who will have responsibility for the design and construction of the space, whether newly acquired or scheduled for alteration. This volume addresses building systems (HVAC, lighting, power and telecommunications, plumbing), building codes, fire safety, security, and building materials and finishes. This volume also discusses green building considerations for building design. Because of EPA's mission, it is especially important that the agency take the lead in demonstrating the most current thinking with respect to environmentally

effective design and operation in its facilities, and, whenever possible, provide an example to the public and private sectors.

- Volume 3, *Safety, Health*, *and Environmental Manual: Safety and Health Requirements* sets forth EPA's standards and recommendations for the operations of its facilities, both owned and leased. These standards relate primarily to the safety and health of building occupants, and address concerns such as fire and life safety, indoor air quality, and the safe handling of chemicals and hazardous material in the laboratory environment.

- Volume 4, *Safety, Health*, *and Environmental Manual*: *Environmental Management Guidelines*, provides a detailed program of the environmental factors to be considered in the operations and maintenance of EPA space. This volume also considers some environmental factors as they affect building design and, therefore, many items are cross-referenced in Volumes 2 and 3.

Although each volume of the manual is focused on a specific aspect of facilities planning, facilities management, or both, some material has applicability to all aspects, and cross-references from one volume to another are included where appropriate. For example, the discussion of egress is relevant to both the space planning of the facility and the technical code requirements addressed in Volumes 2 and 3. Similarly, the selection of environmentally appropriate materials is a topic germane to both Volumes 2 and 4. Where appropriate, and to avoid unnecessary duplication of material, cross-references have been provided between volumes.

Chapter 2 - How Space is Acquired

2.1 EPA's Role

Initiating the Process: There are a number of reasons that would lead to a perceived need for new space. Examples of such reasons might include the expiration of a lease, the need to consolidate and upgrade existing fragmented spaces, the creation of new mission assignments necessitating new or expanded office and laboratory facilities, or the need to replace outdated or deteriorated space. In the great majority of instances, the space to be acquired will be leased space, and the process described herein is appropriate to such acquisition. In the few cases where EPA is to own the space, a somewhat different process is followed.

Whatever the reason for the need to acquire space, the first task will be to determine the amount and type of space to be sought. The creation of a planning team that can develop a preliminary program for the space to be requested is an appropriate way to start. The EPA planning team will be required to coordinate its work with EPA Headquarters, with the General Services Administration (GSA), with the end users of the space, and with specialists (both in-house and consultants) who can bring expertise in disciplines such as laboratory design, telecommunications, computer networking, furniture procurement, security, and food service, as may be required. The planning team is typically drawn from the EPA group needing the new space (Regional office or Headquarters component), is augmented with outside consultants when necessary and appropriate, and is monitored and advised by the EPA Facilities Management Services Division. For most large projects, the retention of an outside architectural/planning firm that has experience with EPA's requirements is warranted.

The planning team, once selected, can proceed with the work necessary to determine the space needs. Typically, this process would consist of interviews with key personnel to establish present and projected staffing, inventorying of equipment to be located in the new space, and an analysis of what special spaces might be included in the new facility. There may be a need to provide services such as a children's day care center, a conference/training facility, a fitness facility, and extensive provision for storage/warehousing.

In developing its program of requirements, the planning team must make appropriate allowances for support space, such as conference and meeting rooms, reception areas, filing space, and circulation. This volume of the *EPA Facilities Manual* provides some guidelines to assist the planning team in arriving at reasonable allowances for such support areas, in addition to areas needed for offices and workstations. It is important to note that the rent charged to the agency will be based on rentable area, and that space exceeding GSA's standards may not be allowed.

When the planning team has completed its work and reached an in-house consensus on its space program, the next step is to submit its request to the GSA. Typically, the summary of space requirements is submitted in a memo request, the format for which is mutually agreeable to GSA and the agency. Information in the request should include location, square footage required, construction requirements, and duration of the space need.

In some circumstances, such as a laboratory procurement, the EPA is granted the authority to conduct its own procurement process.

2.2 GSA's Role: The SFO and the POR

GSA has the mission assignment to locate appropriate space for the various agencies of the federal government, and upon receipt of the request for space, it will investigate ways in which the request can be filled; looking first to find vacant space in an existing federal building. If such space is not available, GSA will then solicit offers from the private sector to lease space in an existing structure or in a new "build-to-suit" facility. The request for space, if more than 10,000 usable square feet, is published by GSA in a Solicitation for Offers (SFO), which describes the terms of the lease, the type and amount of space required, and details of its operation and maintenance. To supplement the SFO, a Program of Requirements (POR) is attached, a document that provides the specific details of the space and serves as a guide for the preparation of tenant fit-out drawings and specifications.

The SFO is prepared by GSA with input from the agency. It provides technical and performance characteristics that should result in first-class space. It generally follows the same format for each project, and covers the following points:

- Amount and type of space
- Area of consideration (location of space)
- Lease terms (length of lease; renewal options)
- Proposal submission guidelines
- Evaluation criteria for offers and award of lease
- Project schedule
- Base building requirements (e.g., appearance, quality, code compliance, building systems)
- Tenant fit-out requirements (e.g., partitions, doors, finishes)
- Building services, utilities, maintenance
- Miscellaneous provisions (e.g., parking, landscaping, security).

The POR accompanies the SFO and is intended to describe the agency's specific needs and to provide the basis for the development of tenant space layouts. The POR tailors the generic space described by the SFO to make the space more suited to the agency's specific needs. Its preparation typically requires the assistance of outside professional services. Chapter 3 discusses preparation of the POR in greater detail. Topics addressed in the POR include:

- Enumeration of the amount and type of space required to house the agency: offices, workstations, laboratories, and support spaces
- Listing of the required special spaces: conference/training space, hazardous materials storage, food service, and fitness center
- Descriptions of building systems as they relate to the interior fit-out: lighting, power and telecommunications requirements, heating, ventilation and air-conditioning (HVAC) requirements, and acoustics
- For special spaces such as laboratories, all of the technical requirements for the facility including detailed room data sheets for each laboratory room
- Requirements for facility security systems

- Interior finishes and details, including "above standard" finishes
- Proposed furniture: systems furniture, loose furniture, and laboratory casework.

2.3 Budgeting

2.3.1 GENERAL

The cost of space is clearly a prime consideration in the development of the SFO and the POR. The GSA PBS has documented its policies for computing rents and for determining tenant improvement costs in its *Pricing Desk Guide*. The Guide explains in detail the PBS policies with respect to types of space, key pricing elements, forced moves, customer agency rights and options, and similar factors that determine the rents and fees that will be charged to the agency.

In addition to the rent, the agency must also consider items such as costs of swing space, move costs, furniture and equipment costs, security costs, and telecommunications costs.

In the initial stages of project planning, cost estimating is necessarily somewhat rough, and first estimates are "order-of-magnitude" based on experience with similar types of space. It is helpful to seek outside assistance in arriving at budget numbers for construction costs. Such help can be provided by a local architecture and engineering (A-E) firm with experience in the type of project contemplated, or by a contractor who has recently worked on projects similar in size and scope to the proposed facility. Also, estimating aids such as the R.H. Means *Building Construction Cost Data*, which is updated annually, can offer useful information. Some factors to consider in the early planning stages:

- Before detailed drawings and specifications have been prepared, estimates are typically developed on a square foot basis. As the project proceeds and more information becomes available, estimating can also become more detailed and accurate.

- Because of the extent and complexity of mechanical and electrical services required in laboratories, as well as the costs of case work and fume hoods, the square foot costs of such laboratories will be substantially higher than that of standard office space.

- If the project is a renovation of an existing structure, costs are greater than for new construction. If the building is considered to be of historic interest, and subject to requirements that historic elements are to be preserved and/or restored, costs are significantly higher, and the construction schedule is considerably lengthened.

- If the project includes a need to remediate hazardous materials, such as existing asbestos-containing materials or contaminated earth at the site, the cost for such remediation, as well as its impact on the time schedule, must be considered.

- In developing the project estimate, an escalation factor to account for inflation should be included. A tentative construction schedule should be prepared, and costs escalated to the mid-point of the construction period.

- Construction costs can vary considerably from one city to another. Comparative cost indexes are available that provide factors to adjust construction costs for various urban locations.

- Budget estimates need to include fees for professional services: A-E design fees, project supervision, and specialized consultants (if any).

- If the program requires that the organization relocate temporarily to swing space while the permanent quarters are undergoing renovation, it may be necessary to consult local real estate brokers to determine the availability and cost of the temporary space. It may also be possible to undertake the renovation project in stages such that part of the building can serve as swing space as construction proceeds in the unoccupied portion. The use of swing space can greatly increase the overall cost of the program and cannot be overlooked because such costs, when added to the other costs of construction, furniture and equipment, may make the entire project economically unfeasible. The cost of swing space may include, in addition to lease costs of the space (at short-term rates), two moves of personnel, possible minimal rehabilitation of the swing space, and the possible need to lease or make other provision for furniture in the swing space.

- To the other budget costs noted above (e.g., construction, professional fees, escalation for inflation) must be added costs for furniture, equipment, move costs, security systems and monitoring, and telecommunications. These are usually estimated on a per person or per workstation basis. Depending on the funds available, it may be decided that leasing of the furniture may be preferable to outright purchase.

- The pre-construction cost estimate is only an approximation, until such time as contractors submit firm bids for the build-out of the leased space. It is therefore customary to include a contingency factor to cover the unanticipated costs that may potentially appear during construction. This factor may range from 10% to 20%, depending on the level of information on which the preliminary cost estimate is based. Where construction is to be renovation of an existing structure, as opposed to new construction, a higher contingency factor should be applied, as conditions requiring additional expense may not appear until demolition of existing finishes takes place.

2.3.2 TENANT IMPROVEMENTS (TI)

GSA provides guidance to client agencies in its *Pricing Desk Guide.* This document sets forth GSA's policies for determining what construction items are to be considered as "base building" (and therefore the responsibility of the landlord) and what portions of the build-out of building interiors are to be included in the tenant improvement (TI) allowance. The following summarizes GSA's "Key Pricing Elements" from the *Pricing Desk Guide.*

When an agency procures space through GSA, it is provided with an allowance to finance the build-out of the interiors. While this allowance is prorated into the rent, the process makes funds available up front to facilitate occupancy. The allowance has two components: the general component and the customization component.

The general component is a dollar amount per square foot to cover the cost of partitions, doors, carpeting, and such standard work-letter items. The allowance is intended to take the space from a "building shell" to a "vanilla" office space. This allowance is set nationally, adjusted annually, and indexed to local construction costs.

The customization component is also a dollar amount per square foot but is tailored to individual agencies and bureaus. This component is intended to cover special items and finishes that are not typical to all office space but are necessary to customize the space for a particular agency. Examples include millwork, laboratory countertops and fume hoods, private restrooms, raised access flooring, slab-to-slab walls, and built-in equipment. Customization tiers, each equal to a tenth of the value of the general allowance, have been created. Based on historical data, each agency or bureau has been assigned a tier. At present (2003), EPA has been placed in Tier 3, meaning that a 30% customization allowance is provided for build-out in addition to the general component dollars.

Collectively, the general and customization components constitute the TI allowance. In any instance, should build-out costs exceed the TI allowance, the tenant agency (EPA) is responsible for the excess amount.

GSA has also clearly identified the interior elements that are to be covered by the TI allowance. Funds for the base building (even when residual funds exist) are not transferable for TI use. Budgets for the base building and TI are separate and are not to be commingled. The only exception would be the use of TI funds for base-building in a prospectus level project where a cost overrun has occurred in the purchase of the site or on construction of the shell, and then only with the tenant agency's consent.

In the tables that follow, Table 2.3.3 identifies the items for base-building and tenant areas that constitute the building shell, and Table 2.3.4 lists the elements that typically constitute the TI.

Table 2.3.3. Base Building and Tenant Area Items Included in the Building Shell

Base Building	Tenant Areas
Base structure and building enclosure components (windows with exterior finishes) are complete.	Broom clean concrete floor slab, with level floor not varying more than 1/4 inch (6 mm) over ten (10) foot (3,048 mm) horizontal run in accordance with American Concrete Institute (ACI) Standards.
Base building electrical and mechanical systems (e.g., central fire alarm, chiller plant, cooling tower) are complete and functional.	Gypsum wallboard, spackled and prime painted, on exterior perimeter walls and interior core walls are installed.
All common areas, such as lobbies, elevators, fire egress corridors and stairwells, garages, and service areas are complete. Circulation corridors are provided as part of the base building only on multi-tenanted floors where the corridor is common to more than one tenant. On single tenant floors, only the fire egress corridor necessary to meet code is provided as part of the shell.	Fully installed 2 X 2 foot (610 x 610 mm) suspended acoustical ceiling with 2 X 2 parabolic fluorescent (or other building standard such as 2'.0" X 4'.0" (610 x 1,220 mm) fixtures) installed in the ceiling grid for an open office plan at the rate of one fixture per 80 BOMA usable square feet (7.43 sm) or 100 rentable square feet (9.29 sm).
Building common restrooms are complete and operational.	Common corridor stud walls, without gypsum board on demised tenants' premise side and without suite entry door, are installed.
Building cores on each floor with leaseable space contain the following: Tappable domestic water riser, service sanitary drain, sanitary vent, ready for extension to tenant demised area(s). Electrical power distribution panels and circuit breakers available in an electrical closet, with capacity at 277/480 volt and 120/208 volt, 3 phases, 4 wiring providing 7 watts per BOMA usable (5 watts per rentable) square foot. Designated connection point to the central fire alarm system for extension to tenant demised area(s). Distribution backboard within a wire closet for connection to tenant's telephone lines. Vertical conduit (empty sleeve) through building core, available for tenant wiring/cabling.	Central heating, ventilation and air conditioning systems are installed and operational, including, as appropriate, main and branch lines, VAV boxes, dampers, flex ducts and diffusers, for open office layout. Conditioned air through medium pressure ductwork at a rate of 0.75cfm/square foot of BOMA usable area is provided.
	Sprinkler mains and distribution piping in a protection layout (open plan) with heads turned down, concealed with an escutcheon or trim plate, are installed.

Table 2.3.4 Typical Tenant Improvements

Electrical and telephone outlets and wiring from the tenant demised premises to the building core
Carpeting or other floor covering; raised access flooring
Plumbing fixtures within the demised premises and connection to the building core
Partitioning and wall finishes
Doors (including suite entry), sidelights and frames, and hardware
Millwork
Fire alarm wiring from building core to tenant space and within tenant space; pull stations; strobes; annunciators; and exit signage within the demised premises
Thermostats
Window treatments
Supplemental power, cooling or heating (above the open office plan layout capacities provided in base building) higher rates of air exchanges (if it entails additional or upgraded air handling equipment); pathogen control systems; and all other special HVAC components required by specific tenant needs
Adjustment or repositioning of sprinkler heads so as not to conflict with tenant's particular office partition layout; additional sprinklers required by local code to meet tenant's layout, or ceiling grid adjustments and consequent repositioning of sprinkler heads to the center of ceiling tiles
Tenant signage in the common corridor and within the tenant's demised area. (An overall tenant directory in the building lobby is part of building shell.)
Changes (moves) or additions to the open plan lighting pattern, or to the open plan HVAC distribution network (e.g., additional ductwork and ceiling diffusers to accommodate individual office layout)
Upgrades or changes to building standard items, such as plaster or vaulted ceilings, specialty lighting, and upgraded ceiling tile
Structural enhancements to base building to support non-conventional floor loads, such as a library. (The cost for structurally changed space is no longer borne by the tenant through a continuing premium rent charge.)
Private bathrooms, private elevators, or staircases within tenant space
Laboratory casework
Security systems and features within tenant space are part of tenant improvements; specialty security systems and features for the entire building requested by tenants (usually through the building security committee) are neither building shell nor tenant improvements. They are a separate capital investment in the property and charged to agencies as part of the building specific security charge.

Chapter 3 - Determining Space Needs

3.1 Programming: Providing for Growth and Change

To determine how much space will be required, the agency must first establish the number of persons it intends to house in that space, as well as any special spaces it expects to include. Most EPA facilities consist of office and office support space, laboratories and laboratory support space, or a combination of these two types. Larger EPA installations may also include special spaces such as fitness centers, child care, or food service.

An analysis of the existing organization, including its structure, operations, current staffing, and current use of space, will provide much information to guide development of the program. Interviews with key persons within the organization will help to determine the way it functions, how improvements can be made, and what current shortcomings should be addressed in the new space. Besides current staffing, including vacancies, on-site contractor personnel, interns, "stay-in-schools," and senior environmental employees (SEEs), the programmer must allow for anticipated growth and make reasonable projections of what the organization could look like five years in the future. (The word "reasonable" is emphasized; unrealistic projections of future growth may be rejected.)

Having developed an understanding of the organization and the way it works, the programmer can direct his efforts to the offices and workstations needed. To the extent that the number of different office and workstation sizes can be minimized, the better the program will be in terms of flexibility and adaptability to organizational change. The EPA has established guidelines (shown in Table 3.2.3.2) for the recommended size of office and workstation according to the occupant's grade and position in the organization. The use of a single "universal" size of workstation, suited to the majority of employees, results in an efficient and equitable use of space, and readily accommodates changes in organization. In the same way, minimizing the number of sizes of enclosed offices provides for maximum flexibility. Another way in which the desired flexibility may be enhanced is to size small meeting or "teaming" rooms similar to, and interchangeable with, small offices typically provided for mid-level supervisory personnel.

GSA classifies space as General Use, Warehouse, Parking, and Unique. The General Use space classification includes all support spaces, e.g. meeting rooms, conference and training facilities, automated data processing, laboratories, libraries, high-density filing, as well as laboratories. A flat rent rate is assessed for the entire rentable space. The methodology of separate categorization of support and special spaces for purposes of determining differential rent is not applied anymore. Further information can be found in the *Pricing Desk Guide* previously mentioned.

Because many factors can affect the efficient use of space, such as floor plates with unusual configurations that lead to awkward and unusable corners, or small column bays that dictate less than optimal layouts of workstations, EPA has learned from experience that an allowance of about 225 usable square feet (20.9 sm) per person, which provides for some conference and filing space as well as the office space, is a useful guide for initial planning purposes.

3.2 Developing the Program of Requirements

3.2.1 GENERAL

Defining the Goals: In order to develop a comprehensive and workable program, it is helpful to first define what is intended to be accomplished by the proposed new facility. Depending on the specific purposes of the project, some objectives might include:

- To consolidate existing fragmented organizational components
- To respond to increased or newly assigned mission responsibilities, or to provide for increased staff
- To improve operational efficiencies and to reduce operation and maintenance costs
- To correct or to mitigate existing code and/or accessibility deficiencies
- To enhance employees' safety and environmental conditions
- To replace existing facilities that are outdated or deteriorated, or that are no longer available to the agency because of lease expiration or similar cause

A clearly defined statement of objectives, and the criteria to be observed in achieving them, is the first step in creating a well-organized program of requirements.

3.2.2 SECURITY

Security of occupants in government occupied facilities, both owned and leased, is of great concern in light of terrorist events and threats in recent years. Some guidelines for making federal facilities more secure have been developed while others are in the process. These documents address the placement of new buildings on a site, access control, design and construction, and monitoring. Key reference documents include:

- US Department of Justice, *Recommended Minimum Standards and Applications to Security Level of Federal Facilities.*
- General Services Administration, *PBS P-100 Facilities Standards for the Public Buildings Service, Chapter 8 - Security.*
- Department of Health and Human Services, *Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks*

The latest edition of these documents should be consulted. Other guidance documents may also be available in the future.

3.2.3 SITE SELECTION

The general location of the proposed new facility will be defined in the SFO, which typically establishes an area (perhaps within a given radius from some relevant point, such as an existing related EPA facility) within which the facility is expected to be built. In some instances, the site location may be predetermined, as when the proposed project is the construction of an addition to an existing facility, or when an existing building is to be renovated and altered to accommodate the program requirements. Or, GSA may have space available in an existing building that is suitably located and of a size that will accommodate the agency's program.

In the event the agency's planning team has a participatory role in site selection, selection criteria will include some of the following points. It will be important to have professional assistance, particularly with respect to engineering aspects of the project.

- Minimum required site area, based on the size of building, along with associated site support requirements such as parking.
- Site zoning appropriate to the intended use and density.
- Community acceptance of the proposed facility. In some instances, it may be desirable to invite community participation in the site selection process. It may also be necessary to demonstrate to the community that there will be no negative environmental effects on the neighborhood, such as increased traffic or the possibility of objectionable noise or undesirable emissions.
- Historic or archaeological aspects of the site that may impose constraints on new construction.
- Site area sufficient to support future expansion of the facility, if such expansion is anticipated.
- Presence of adverse environmental conditions that may affect the use of site, such as site contaminants requiring remediation; also, presence of wetlands, potential for flooding.
- A location that provides desired amenities; for example, convenience to public transportation and to neighborhood retail shops and eating places.
- Site capability to include ancillary support structures if required, such as a separate storage building for hazardous waste, or a child care facility separate from the offices and/or laboratories. A separate hazardous waste building may require setbacks from nearby buildings and property lines (refer to Volume 2).
- Technical characteristics of the site: foundation conditions, possible seismic activity, available utilities, accessibility for service vehicles and automobiles.
- Requirements for open space to provide setbacks for security (if required) or to allow landscaping that will enhance the facility's appearance and image.

It is EPA's policy, and also a requirement of law and executive orders, to lend its support to community efforts to maintain and restore buildings of historic worth, and to promote urban redevelopment where appropriate. In the selection of a site or of an existing building for a proposed facility, the agency's planning team should consider the feasibility of adapting an existing historic structure to the proposed uses. Where no existing building is available suitable to the proposed use, consideration should be given to developing a building that will fit into the fabric of an urban redevelopment area. Factors to be addressed include:

- If an existing historic structure is to be altered and rehabilitated, GSA typically provides guidance in the form of a *Building Preservation Plan*, which identifies areas of architectural significance and defines the standards to be employed in the construction. For some buildings, a *Historic Structures Report* may be available.

- The Secretary of the Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings* offers additional guidance for preservation projects.

- The design of an alteration and rehabilitation project will require review and approval by historic preservation authorities; typically a State Historic Preservation Office (SHPO) as

well as GSA preservation specialists. The design approach will depend on the specific building being restored and on the desired program to be achieved, so that each project will be different. Where alterations and/or additions are extensive, it is often more desirable to separate visually the new construction from the existing work, rather than trying to replicate the original construction.

- Because older structures will typically include antiquated mechanical, electrical, and plumbing systems, the alteration and rehabilitation will require care and ingenuity on the part of the A-E to integrate modern building systems into the structure in a manner sympathetic to the historic spaces and finishes.

- Similarly, older structures will also include many conditions that violate current codes and accessibility standards, and bringing them into compliance with current codes may necessitate in some instances design solutions that provide performance meeting the intent of the codes rather than literal and complete compliance.

- As previously noted, rehabilitation of an historic structure is an expensive undertaking and one which requires an extended time frame for both design and construction.

The programmatic needs for the proposed facility will include one or more of several types of space: office space (along with support), laboratory space (and lab support), special spaces such as food service, child care, data processing, conference/training, fitness/wellness, and storage. A discussion of these types of space follows.

3.2.4 OFFICE AND OFFICE SUPPORT SPACE

3.2.4.1 OFFICES AND WORKSTATIONS

Having determined the number of persons to be accommodated in the space, their job functions, and their organizational hierarchy, the next step is to establish how much space will be required to house them. The goal is to create offices and workstations that provide a pleasant and efficient working environment for their occupants, but without waste of space. Based on past experience and practice, the EPA has developed planning guidelines that suggest appropriate ranges of size for various categories of agency personnel. A thoughtful application of these guidelines, which are listed in Table 3.2.3 will result in an equitable facility, consistent with similar facilities in the agency, and one that falls within GSA's general space limits.

In developing the POR, the planning team must be aware of the need for flexibility since organizational needs will inevitably change, and a program that provides adaptability to change will age well. The use of one or two universally-sized workstations (rather than rigid adherence to a hierarchy of workstation sizes), suited to most employees except for senior management, will permit future changes with little need for reconfiguration of workstations. The "universal" workstation (mentioned above in 3.1), which is typically from 75 to 80 net square feet (6.97 to 7.43 sm), is found to be workable for the majority of professionals and senior clerical staff and permit the future reassignment of personnel with minimal disruption to the existing layout. Exhibits 1A and 1B, which follow, illustrate

typical office and workstation layouts that can be adapted to suit the specific requirements of the particular facility.

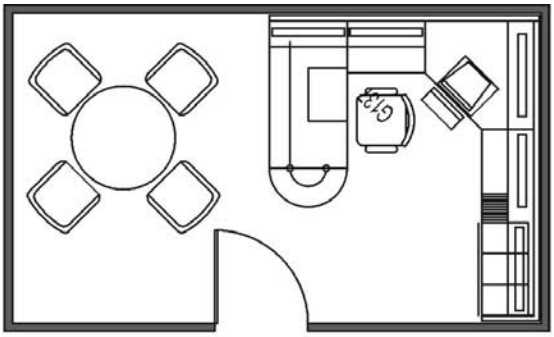
Care should be taken to limit the height of workstation panels to typically no more than 65" to maximize penetration of natural light to the interior zones. Selective use of translucent glass panels will further help with distribution of light and create a bright and pleasing ambiance.

Table 3.2.4.2: Office and Workstation Area Guidelines

TYPE DESIGNATION	TITLE OR ASSIGNMENT	KEY SPACE ATTRIBUTES	SIZE (Approx.)
A	Regional Administrator	Enclosed Office with several visitor chairs & conference table (6-8) Furniture: standard or systems type	350 to 375 Sq.Ft. (32.5 to 34.8 sq. m.)
B	Deputy Regional Administrator	Enclosed office, with several visitor chairs & conference table (4-6) Furniture: standard or systems type	275 to 300 (25.5 to 27.9)
C	Assoc. Reg. Administrator Division Director General Counsel	Enclosed office, with either conf. table (4) or informal seating, plus pull-up chairs Furniture: standard or systems type	225 to 250 (20.9 to 23.2)
D	Deputy Division Director Branch Chief	Enclosed office, with small table or pull-up chairs for conference (3 to 4) Furniture: standard or systems type	170 to 180 (15.8 to 16.7)
E	Section Chief Senior Legal	Enclosed office or semi-enclosed work-station. 2 visitor chairs Furniture: systems type	100 to 120 (9.3 to 11.1)
F	Universal Workstation	Semi-enclosed work-station with 0-2 visitor chairs. Variations in equipment and storage needs. Furniture: systems type	75 to 80 (7.0 to 7.4)

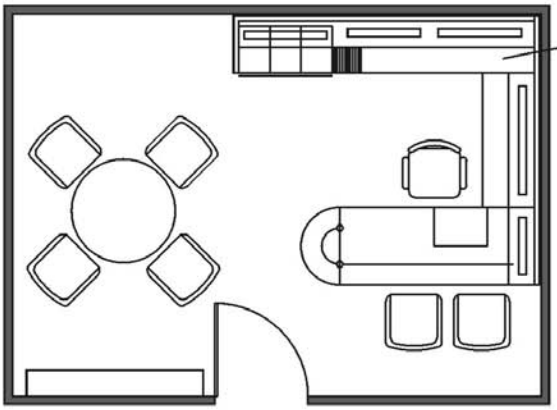
Office C:
225-250 Square feet
(20.90 - 23.22 sm)

Assignment:
Associate Regional Administrator
Division Director
General Counsel



BASIC FEATURES OF TYPE D PLUS:

CONFERENCE TABLE FOR 4



Office A:
350-375 Square feet
(32.52 - 34.84 sm)

Assignment:
Regional Administrator

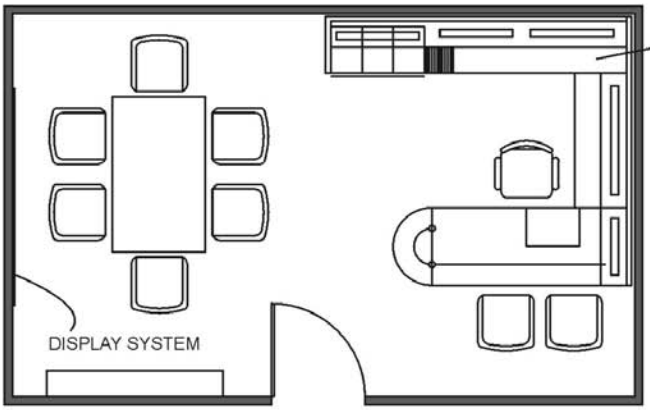
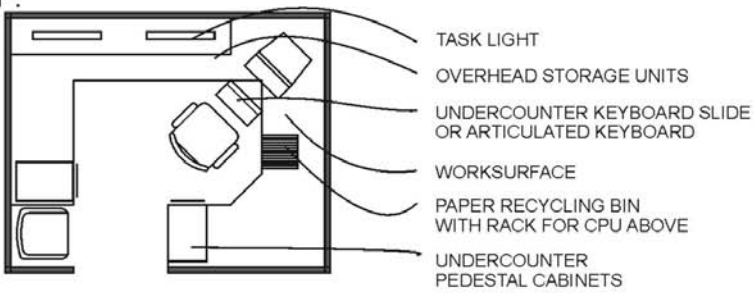


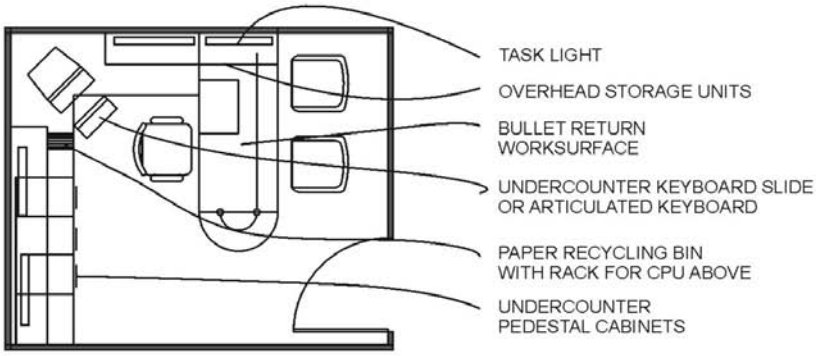
EXHIBIT 1 A

Typical Universal Workstation F:
75-80 Square feet
(6.97 - 7.43 sm)



Office E:
100-120 Square feet
(9.29 - 11.15 sm)

Assignment:
Section Chief
Senior Legal



Office D:
170-180 Square feet
(15.79 - 16.72 sm)

Assignment:
Deputy Division Director
Branch Chief

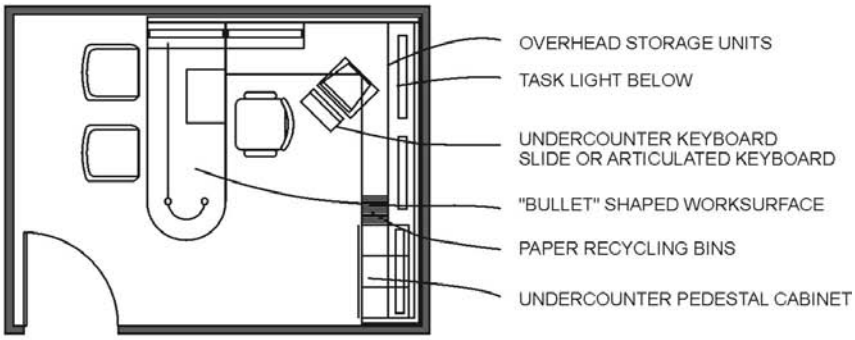


EXHIBIT 1 B

3.2.4.2 OFFICE SUPPORT SPACE

Office support space includes those ancillary functions typically associated with office use, for example, meeting rooms, filing space, copying, printing and faxing, and storage of office supplies. For most organizational units, such as Sections or Branches, there will also be a need for a reception area with guest seating, as well as a small employee coffee/beverage station. In order for the planning team to allow adequate floor area for such support functions, the agency, based on experience, has developed support space guidelines to be applied on a per employee basis. These rules-of-thumb areas are useful for estimating and may be modified as needed where the organization has an unusual and atypical mission-specific requirement, for example, when filing needs are greater than usual, or where there is a proven requirement for additional space for group meetings. Guidelines for estimating office support space areas are given in Table 3.2.3.3: *Office Support Space Area Guidelines.*

Table 3.2.4.3: Office Support Space Area Guidelines

SUPPORT SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
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 *(27,87 sm)*	1 per facility
Departmental	Reception/waiting for senior administrators, e.g., R.A., D.D. Seating for 2-4	100 sf for D.D. *(9,29 sm)*	1 per facility
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	1 per facility
Meeting Room	Standard room for meetings of 6-20 people (also see Special Spaces: Conference Room)	150 sf to 400 sf *(13,93-37,16 sm)*	Varies
Library/ Reference	Reference area for employees, typically for a specific Division Shelving and seats	200 sf *(18,58 sm)* maximum; see Special Space: Library	Varies

SUPPORT SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
Central Evidence	Secure evidence storage room May contain security files, safe If increased floor loading is required, this is Special Space	100-200 sf per facility *(9,29 - 18,58 sm)*	(O.I.G or C.I.D. only)
Copy Center			
Main/Satellite	See Special Space table for Main and Satellite copy areas		
Convenience	Distributed networked copy/printer for a cluster of workstations and offices. Can be located in an open easily accessible space	*40 sf* *(3,71 sm)*	One per 12 - 20 employees
Filling - General	Filling cabinets distributed in open plan office area	9 sf per cabinet *(0.84 sm)* 14 sf in file rm. *(1,3 sm)*	Varies
Equipment Station	Shared station for computer, microfiche reader, typewriter, or other equipment Space for work surface and chair	20 sf *(1,86 sm)*	As needed
Closets	Closets or hanging pace for employees' and visitors' coats	0.5 sf *(0,05 sm)* per employee	Distributed
Coffee Station	Amenity within office area Counter with sink and storage (proximate to wet stack)	30-35 sf *(2,79-3,25 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 room 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 *(11.15 sm)*	1 room per 500 ± employees
Recreation A. Credit Union Office	Office space devoted to these employee amenities	120 sf per office *(11,15 sm)*	

SUPPORT SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
Other desirable areas that fall under GSA "Office" space limits			
Child Care Center **Fitness Center**	These areas are desirable but considered office-type space by the GSA. Because it is difficult for a Region to include them and still maintain 152.5 sf/person (Office), the best option is to share them with other agencies if possible.		

3.2.5 LABORATORIES

The design of laboratories is a special area of expertise that requires the extensive input of the scientists and technicians that will use them, as well as the assistance of qualified design professionals experienced in this field. This volume is not intended to replace such design expertise, but instead to provide an overview of the general requirements that will lead to a reasonably accurate estimate of the amount of space that will be needed. Volume 2 discusses in greater detail many of the aspects of laboratory design, while Volume 3, *Safety, Health, and Environmental Management Manual: Safety and Health Requirements* addresses the health and safety aspects of laboratory operations. Because of the specialized nature of laboratory operations, and because of their typically heavy demands on a facility's mechanical and electrical systems, laboratories are most often constructed to meet requirements unique to that operation, and it would be unusual to find a building that is readily adaptable to the specialized program.

With respect to space acquisition and space planning, the following points should be noted:

- The EPA recommends that laboratories be constructed to a standardized module that can be repeated and which because of its modularity can be adapted to changing mission assignments. EPA prefers a module that is at least 11' (3,353 mm) wide (center to center of demising partitions), and from 26' to 33' (7,925 to 10,058 mm) deep, and finds that a module of that size accommodates the laboratory casework on both sides, leaving aisle space between the countertops of at least 5' (1,524 mm). Depending on the number of people that are expected to work in that laboratory, and the extent of equipment and casework that they require, the room may be designed to occupy two or three lab modules, rather than a single module. It is important that the modular scheme be maintained, as this will allow the flexibility to convert labs of two or more modules to single labs, or to combine single-module labs into larger labs as program needs change. In some instances, where the flow of work is such that two laboratories need to be located side-by-side (for example, where materials to be tested require laboratory preparation work prior to analysis in a second laboratory) the two labs can be connected by a swinging or sliding door to avoid the need to move the samples or chemicals through the primary corridor.

- Each lab module must have direct access to shared utilities such as gases and compressed air. The space containing the facilities must be easily and fully accessible to service personnel without disturbing persons working in the labs. This separation of traffic can be achieved by providing a utility corridor behind the lab modules, or an interstitial space above the modules. All valves and dampers in service lines should be located over either the service or access corridor to allow access by service personnel.

- Laboratories are usually designed for a specific purpose that is defined by the program. However, most laboratories fall into one or the other of two categories: wet, that is, utilizing chemicals and processes that require plumbing and piping, as well as fume hoods; and dry, which are typically electronic.

- Laboratories may also be categorized as research laboratories or testing laboratories: the former intended to investigate new processes and materials, and the latter designed to test samples brought from the field to determine composition, toxicity and other properties. Research laboratories are specific to the targeted investigation and could take many forms depending on the equipment employed, while test laboratories are likely to be somewhat more standardized in layout since testing procedures (in most instances) are likely to be repetitions of previously established routines.

- Specialized laboratory space may be required for certain types of testing and research. Such specialized spaces may require other than standardized modular spaces. Examples include laboratories that work with animals, or with fish, or with flora. In such cases, the scientists and technicians will determine the details of the lab spaces appropriate to their specialized needs.

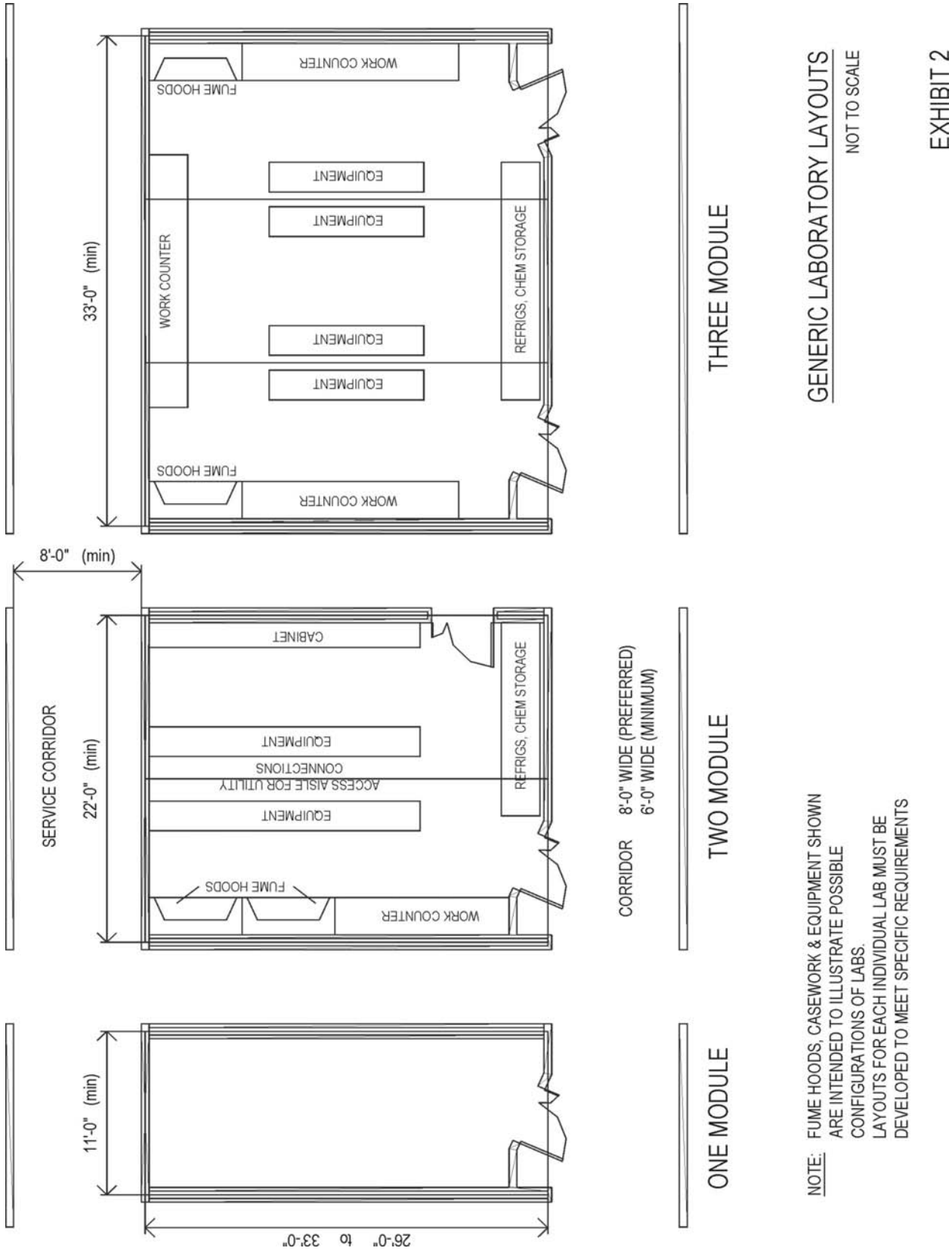
- The space planning team will need to determine the flow of work through the laboratory facility. An example of such a work flow (not necessarily the same for all lab facilities) might be: collection of samples in the field, delivery of samples to the lab building, holding of samples (perhaps in a refrigerated holding room) prior to testing, preliminary preparation of the samples in a preparation laboratory, carting of prepared samples to final testing laboratory (or laboratories), and finally removal of tested material to a hazardous waste storage facility for final disposal.

- Circulation throughout the laboratory facility must be carefully considered. Because of the hazardous nature of most laboratory chemicals and gases, access to the laboratory areas should be limited to authorized persons, and code-mandated fire separations must be strictly observed. Personnel corridors serving the entrances to the lab modules should be a minimum of 6' (1829 mm) wide, and the planners should be aware of the fact that these corridors are used for carting of samples and chemicals. The delivery of piped gases and chemicals to the individual laboratories is best accomplished through the use of a service passageway, access to which is restricted to technical employees, or through an overhead (interstitial) service space. Because the EPA prefers that its laboratory facilities be placed in one-story structures, vertical circulation (stairs and elevators) should not, in most cases, be necessary. Exhibit 2 provides a diagram of typical laboratory-type modules. Note, however, that some very specialized laboratories may vary because of the nature of the mission and the equipment required, and the laboratory installation must be tailored to the specific agency needs.

Because of the specialized nature of laboratories, the POR should include extensive information about the requirements of each laboratory, including the engineering details. The information is conveyed through the use of Room Data Sheets, which are to be provided for each laboratory. The Room Data Sheet should indicate location, size, and type of fume hoods, laboratory

casework and countertops, room finishes, plumbing requirements (e.g., sinks, emergency showers, eyewash stations), power and signal connections, locations of required laboratory gas connections, and similar details. Appendix C of Volume 2 shows examples of Room Data Sheets for laboratories of various modular sizes.

Exhibit 2 *Generic Laboratory Layouts,* which follows, illustrates laboratories of one, two, and three modules.



GENERIC LABORATORY LAYOUTS
NOT TO SCALE

EXHIBIT 2

NOTE: FUME HOODS, CASEWORK & EQUIPMENT SHOWN ARE INTENDED TO ILLUSTRATE POSSIBLE CONFIGURATIONS OF LABS. LAYOUTS FOR EACH INDIVIDUAL LAB MUST BE DEVELOPED TO MEET SPECIFIC REQUIREMENTS

3.2.6 LABORATORY SUPPORT SPACES

Laboratory support space includes those rooms and spaces required to support the laboratories themselves, and will vary according to the specific mission of the facility. Typically, such support spaces might include:

- Technical library
- Storage for chemicals
- Storage for hazardous waste
- Glass washing facilities
- Support spaces for specialized labs, such as for animal or fish research.

Room Data Sheets, similar to those provided for the laboratories themselves, should also be included in the POR to delineate the support space requirements.

3.2.7 SPECIAL SPACES

Special spaces are defined as those that require modifications to the base building architectural and/or mechanical systems in order to accommodate the space uses proposed. Examples include spaces requiring reinforced floor loading capacity (libraries, high density file rooms), augmented HVAC systems (large meeting/training rooms with high occupancy rates), spaces with special electrical service requirements (computer rooms), and spaces with additional plumbing systems such as food service facilities.

Table 3.2.8: *Special Space Area Guidelines,* which follows, describes the approximate size and frequency of Special Spaces that are typically found in EPA facilities.

TABLE 3.2.8: Table of Special Space Area Guidelines

SPECIAL SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
Common Special Spaces			
Conference Room	Meeting room with audio-visual capabilities Specialized lighting, power, HVAC	Varies 400 to 800 sf *(37,16 - 74,32 sm)*	Minimum 1 per facility, preferably 1 per floor or 1 per 150 employees
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 *(69,68 sm)*	1 per facility

SPECIAL SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
Satellite	Centralized room for routine office copying 1-2 copiers, table, storage, recycling bins Specialized HVAC, power, acoustics	225 sf *(20,90 sm)*	1 per floor or 1 per 150 employees
Common Special Spaces			
Public Information	Enclosed space for laser printers serving PCs, LANs Counter, paper storage For IAQ, recommended over providing printers in open work areas; special exhaust	70 sf for 1-3 printer *(6,5 sm)*	Walking distance maximum 75'
Computer Room	Specialized room for mainframe or LAN equipment and related workstations Specialized HVAC, power, telecommunications Equipment support for networked computer services	Varies with equipment	
LAN Room / Telecom Room	Specialized room for voice and data communications equipment. Includes racks, table/counter for monitor and file servers Locate centrally; stack floors Requires HVAC and uninterruptible power supply. Primary telecommunications wiring to run from provider point of entry to this space for distribution to the floor. Locate such that cable run to the furthest PC on the floor does not exceed 295 feet. Provide for a vertical bank of conduits (or sleeves thru floors), including spares for future use, to connect each vertically stacked room with the primary service. Building design should also consider the use of raised floor throughout the occupied space to facilitate cable and/or air distribution.	Varies with equipment (min size: 80-100 sf) *(7,43-9,29 sm)*	Minimum 1 per floor
Support Spaces			
Library	Reference area for EPA employees and public Reading area, stacks, cataloguing, storage Specialized floor loading, humidity control, lighting	Varies w/ size of region + specialization	1 per facility May be separate law library

SPECIAL SPACES	DESCRIPTION	APPROXIMATE SIZE *net square feet*	FREQUENCY GUIDE
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 Lectriever *(7,43 sm)*	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) *(23,22 sm)*	1 per ± 200 employees or 1 per floor
Support Spaces			
Record Management	On-site storage for records Shelving, min. interior finishes Specialized floor loading, climate control	500-600 sf *(46,45-55,74 sm)*	1 per facility
Desirable areas if budget permits			
Training/ Conference Center	Sophisticated, flexible multipurpose 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 person at tables or 40 in rows) *(69,68 sm)*	1 per facility (may share with another Agency)
Video Conferencing	Facility to allow multi-party meeting 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) *(55,74 sm)*	1 per facility

Chapter 4 - Technical Aspects of Space Planning

4.1 General

Volume 2 of the *EPA Facilities Manual* (*Architecture and Engineering Guidelines*) addresses the many technical considerations that must be taken into account when developing space layouts that will, eventually, evolve into construction documents for the building. Although these technical considerations are properly the concern of the professional team of architects, engineers, and interior designers associated with the project, the agency's space planning team should have a general understanding of them. They include:

- Code compliance with respect to fire and life safety
- Egress requirements (a sub-set of fire and life safety)
- Accessibility for the handicapped (UFAS and ADA compliance)
- Environmental policies and practices (as promulgated by GSA and EPA).

4.2 Overview of Technical Considerations

4.2.1 CODE COMPLIANCE

The federal government, as a sovereign entity, is theoretically exempt from the need to meet the requirements of local codes and ordinances in its owned facilities. Nevertheless, its policy and practice, for both owned and leased space, is to comply with such codes because they provide reasonable and appropriate protection for the safety and health of occupants and visitors as well as protection of the premises against damage or loss.

Volume 2 provides a comprehensive listing of codes and standards that may be applicable to a given project, depending on its location. Some codes are national in scope, while others may be specific to a particular jurisdiction. In most cases, a state or municipality will adopt one or another model code, sometimes with small modifications to address conditions peculiar to that locality. Codes most likely to be used by the space planning team and its designers include:

- Local building code: most often, a national model code adopted by the state, or the local jurisdiction, such as the BOCA Code or the Southern Building Code.
- Life Safety Code of the National Fire Protection Association (NFPA 101)
- National Electrical Code
- National Plumbing Code.

Foremost among the concerns addressed by the codes are the life safety provisions. These include measures intended to prevent the spread of fire and to make certain that, should fire break out, occupants can exit the building quickly and safely.

Egress Requirements: The need to provide simple and direct means, of sufficient capacity to handle all occupants to exit space in the event of fire or other calamity is a criterion that is

paramount in the development of space layouts. The applicable codes give design guidance with respect to building population, travel distance to exits, exit capacities, fire stair criteria, and "dead end" conditions. Typically, codes require that for most populations, there should be two means of egress (enclosed fire stairs and/or passages that lead to the outside). Also, occupied spaces, such as offices, workstations, laboratories and meeting rooms cannot be located in a dead end area, that is, an area more than a given distance (20' [6,100 mm] in most codes) beyond an exit corridor.

Other code provisions that will affect the space layouts include the need to provide systems to alert occupants and to suppress fire: a fire alarm system, sprinkler system, fire stand pipes and hose cabinets, and fire extinguishers.

4.2.2 HANDICAPPED ACCESSIBILITY

Volume 2 discusses in greater detail the requirements for meeting the accessibility requirements mandated by the Uniform Federal Accessibility Standards (UFAS), and the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These two documents are equivalent in most respects but in those areas where they differ the more stringent requirements should be applied. In developing the space layouts, the designers need to provide aisle widths and maneuvering space adequate for persons in wheelchairs, and to allow proper clearances at door openings so that such openings can be easily negotiated by the handicapped. Changes in floor level will require ramps to permit the wheelchair-bound to move freely from one level to another, unless the difference in level is sufficient to justify a wheelchair lift.

Those areas of an EPA facility that are open to the public must be designed to be fully accessible. Those areas not normally open to the public, such as laboratories, must be accessible or must be easily adaptable to accommodate any employee who is or may become handicapped.

Refer to Volume 2 for additional requirements for the handicapped.

4.2.3 GSA FACILITIES STANDARDS PBS-P100

GSA, as the landlord for most governmental organizations, has set forth its requirements and recommendations for federal facilities in a comprehensive document titled *Facilities Standards for the Public Buildings Service.* This document is intended to establish general design standards and criteria for new construction and for alterations (including alterations to historic structures) and is applicable to leased space as well as to facilities owned by the government.

PBS-P100 covers many of the same concerns that are addressed in this four-volume EPA Facilities Manual and should be used in conjunction with the Manual. The Standards are general criteria only and must be tailored to suit the detailed requirements of a specific project. *PBS-P100* is not meant to substitute for the services of a qualified design or construction professional.

4.2.4 BUILDING SYSTEMS

The design of the various building systems, including HVAC systems, electrical systems (power and lighting), security systems, telecommunications systems (telephone and data), and fire alarm systems, is properly the responsibility of the A-E design team because of the technical expertise involved. Recommended standards and practices for the design of such systems are given in the *Architecture and Engineering Guidelines* (Volume 2) and in the *GSA Facilities Standards for the*

Public Buildings Service PBS-P100 (November 2000). These documents provide general design criteria that are to be applied by competent design and construction professionals. The EPA space planning team, in the development of estimates of space required, must allow for space adequate to support the necessary mechanical, electrical and telecommunications equipment that will serve the occupiable space.

Of particular concern in the design of HVAC systems is the air quality of the spaces to be occupied by EPA employees and contract employees, and the need to minimize energy use.

4.3 Overview of Environmental Considerations

In view of EPA's special mission and responsibilities, it is of paramount importance that its facilities exemplify sound environmental practices, including:

- Conservation of energy
- Conservation of resources
- Satisfactory indoor air quality
- Pollution prevention.

These goals can be achieved through thoughtful design and selection of building materials and building systems. Refer to Volumes 2 and 4 of the *EPA Facilities Manual* for a more detailed discussion.

In order to promote sound environmental design practices, and to measure effectively the degree of success in attaining satisfactory environmental performance, the U.S. Green Building Council has developed a rating system called *Leadership in Energy and Environmental Design (LEED) Green Building Rating System*. More detailed information on the green building certification program may be found at http://www.usgbc.org/programs/leed.htm. All EPA buildings should be designed to achieve the highest level of LEED certification attainable.

The EPA space planning team, as it develops its program for the proposed facility (whether a new building or the renovation and alteration of an existing structure), should emphasize the environmental aspects of the project. For example, the team can:

- Seek a site that minimizes adverse environmental conditions, such as proximity of heavy traffic or discharge of pollutants from neighboring occupancies. The site should also be chosen so as to minimize the impact that the new EPA facility will have on the environment.
- Require use of building materials and furnishings that are low in volatile organic compounds (VOCs)
- Encourage the use of building materials and products made from recycled materials and post-consumer waste, where such use is economically feasible
- Shun the use of toxic or hazardous materials, as well as those that deplete the ozone layer
- Avoid the use of materials and products from non-renewable sources
- Select energy-efficient building systems and require the use of automated control systems that support energy conservation

- Utilize energy-efficient lighting systems, and provide switching controlled by occupancy sensors and/or daylight sensors
- Encourage space planning layouts that maximize use of natural light, as an energy conservation measure as well as a means to contribute to the well-being of the employees.

Chapter 5 - Principles of Space Planning

5.1 Professional Design and Planning Assistance

The assistance of qualified professional services early in the planning and design process is important to a successfully managed project. The scope and size of the job will suggest the extent of services required. For larger projects, the work may require a team comprised of architects and engineers, interior designers, and perhaps specialty consultants such as acoustical engineers, food service consultants, telecommunications engineers, audio-visual engineers, and landscape architects.

There are several ways in which such services can be provided:

- The agency may have available in-house, or may have available the resources to acquire, part-time or full-time technical staff to manage the project with minimal outside help. A project of limited scope and complexity is assumed if it is to be undertaken by in-house personnel.

- The professional services may be provided through the auspices of GSA, which sometimes has available pre-selected A-E firms under a term contract, against which specific design projects may be developed and paid for. Such an arrangement is particularly useful in situations where a tight time schedule makes impractical the conventional means of procuring outside design services, as for example, when a projected lease expiration requires the agency to vacate existing premises and move into newly acquired space.

- Typically, where leased space is to be acquired in a privately owned facility, the lessor will provide professional design services through his or her own A-E firm. Depending on the terms of the lease, the development of design intent drawings (DIDs), which describe the agency's detailed space program and requirements, may be the responsibility of the lessor's A-E firm; or the agency may, with the consent of GSA, engage its own A-E firm to prepare the DIDs. Upon acceptance by the agency of the DIDs, the lessor's A-E then prepares construction documents (CDs) which are used for bidding, permitting, and construction. The cost of the lessor-provided design services is included in the agency's rent payments.

- The agency may procure professional services itself to develop the program and to prepare the DIDs. There are advantages to this procedure: when EPA hires its own consultants it is assured that its own best interests (as opposed to those of the lessor) are represented, and if the consultants are familiar with EPA's organization, policies and practices from prior experience, the agency can expect services that are well-suited to its needs.

In the event that EPA acquires its own A-E services, it is nevertheless likely that the lessor's A-E team would develop the construction documents from the DIDs provided by EPA's consultants,

because the lessor's A-E has a detailed knowledge of the building, local code requirements, and similar aspects of the project not necessarily available to the agency's team.

5.2 Area Measurement; Efficiency

5.2.1 GENERAL

The discussion of space acquisition and space planning employs a vocabulary of area measurement terms that are used in the real estate industry. These are defined below, so that all parties can agree on what is meant by terms such as "usable area," "rentable area," and "building common area." Since GSA uses these definitions when it determines the rental rate for the space occupied by the tenant agency, it is important for the space planning team to know and understand the methodology used for the calculation of rent.

5.2.2 AREA DEFINITIONS

GSA follows the standards that have been developed by the Building Owners and Managers Association (BOMA), approved by the American National Standards Institute (ANSI), and published as the *Standard Method for Measuring Floor Area in Office Buildings,* ANSI/BOMA Z65.1 (current edition). The full standard may be obtained from BOMA International, and GSA's *Facilities Standards PBS-P100* sets forth in substantial detail GSA's application of Z65.1 in the calculation of rent for federal agencies. Also, the GSA *Pricing Desk Guide* provides examples of rent calculations based on the area standards as defined. The *Standard Method* is applicable to both multi-tenant and single tenant buildings and allows for pro rata allocation of building common areas to the various tenants, as will be seen in the definitions that follow. In brief, the *Standard Method* includes these definitions of area measurement:

- Gross Measured Area: The total horizontal area within the building, less the thickness of the exterior wall

- Usable Area: The area available to the tenant for his use. It is measured from the dominant portion of the exterior wall (inside face of glass where the exterior window area makes up more than one-half of the exterior wall) to the outside face of major vertical penetrations (e.g., stairs, elevator shafts) and includes columns and vertical penetrations that are built for the private use of the specific tenant.

- Common Area: Usable area that provides services to building tenants, but which is not included within the tenant space. There are two categories: <u>Building</u> Common Area, which includes space available for use (or which serves) all tenants, such as entry lobbies, daycare facilities, central mechanical or equipment rooms, and food service facilities; and <u>Floor</u> Common Area, which consists of toilet rooms, elevator lobbies, public corridors, and similar spaces that serve the several tenants on a floor. Where a tenant occupies an entire floor, that tenant is charged for all of that floor including the common area; where there are several tenants on the floor the floor common area is apportioned to each according to its proportionate share of that floor's usable area. Similarly, the building common area is distributed among all of the building tenants on a pro rata basis.

- Rentable Area: This is the area that consists of the sum of the Gross Measured Areas of each floor less the vertical penetrations such as stairs, elevator shafts, and mechanical shafts, and is the area for which the building owner expects to receive rent. It is also equal to the sum of the Usable Area plus the Common Area. In a building with multiple tenants, the distributed portions of Common Area allotted to each tenant plus their usable areas should equal the total rentable area.

Given the above definitions, it can be seen that because the tenant is expected to pay rent on space that he cannot physically occupy (his distributed share of the common area), it is to his advantage to lease space where the ratio of usable area to rentable area is maximized. This is a measure of the efficiency of the building and is called the R/U ratio: Rentable Area divided by Usable Area. In a typical multi-story office building, a calculation of the Floor R/U Ratio, that is, the Floor Rentable Area divided by the Floor Usable Area, a ratio that approaches 1.0 indicates a floor plate that has been designed to achieve maximum efficiency: floor R/U ratios typically range from 1.25 (less efficient) to 1.1 (more efficient). A similar calculation for the Building R/U Ratio, which incorporates the building common area (rather than only the floor common area), will generate a ratio necessarily higher than that for the typical office floor.

5.3 Plan Organization

The development of a well-organized plan design is the key first step in achieving a successful space plan. It assumes that the space planner is working from a program that lists the required number and approximate sizes of offices and workstations, as well as the support spaces associated with them. The program will also include special spaces specific to the project, such as laboratories (if required), conference and training facilities, food service, child care centers, and fitness and health facilities. If the building to be occupied is known, the planner will develop the space layouts according to the building's characteristics. These will include:

- Size of floor plate. For occupancies requiring multiple floors, a floor of at least 20,000 usable square feet (1858 usable sm) minimum is preferred by EPA, although buildings offering smaller floor areas have been used in some instances.

- A simple plan of circulation that repeats on each floor provides for an efficient use of the space and makes occupant orientation easier. It also helps if groups of workstations are provided with a "service center" containing elements used by all, such as printer, fax, paper storage, and beverage station. Such service centers can be used to break up large clusters of workstations, while providing necessary support functions shared by a group of employees.

- Floor shape. Irregular floor configurations tend to generate less efficient space plans because they often lead to awkward circulation patterns and to corners that are difficult to use; for this reason, a simple floor plan is preferable

.

- Bay size. The spacing of columns produces the typical bay size (such as 20' by 20' or 30' x 30' [6,096 x 6,096 mm or 9,144 x 9,144 mm]) and influences the spacing of workstations and circulation aisles. A larger bay size will lead to a more efficient space

layout because it will allow greater flexibility in the location of workstations. However, many older office buildings can be found where 20' x 20' (6,096 x 6,096 mm) bay sizes were used.

- Core to window depth. A building's core is the central grouping of service elements, and includes elevators, fire stairs, toilet rooms, and utility closets. Because natural light is desired by the building occupants, a core-to-window depth of from 40' to 50' (12,192 to 15,240 mm) is recommended. This will permit locating the primary circulation at the core, and whatever enclosed rooms are required by the program at the interior space; in this way, maximum daylight is available to the floor occupants.

- Floor live load capacity. The allowable load on a floor that the structure permits is called the live load capacity. Such loads include the weight of furniture, partitions, and people. Most codes require that office floors be capable of carrying 100 lbs/sq.ft. or 1,600 kg/sm (allowing for 80 psf (1,280 kg/sm) for people and furniture, plus 20 psf (320 kg/sm) for the weight of partitions. This capacity is not sufficient to accommodate unusually heavy loads, such as high-density files or library book stacks. Where such loads are anticipated, a live load capacity of 150 to 175 psf (2,400 to 2,800 kg/sm) should be provided, preferably near the core, as spaces requiring additional capacity do not ordinarily require access to natural light. EPA typically asks that 10 to 15% of the occupiable floor space be reinforced to carry additional loads. Although the initial program may not envision full use of the requested reinforced floor area, the flexibility to be able to meet possible future needs justifies providing an adequate area for increased live load.

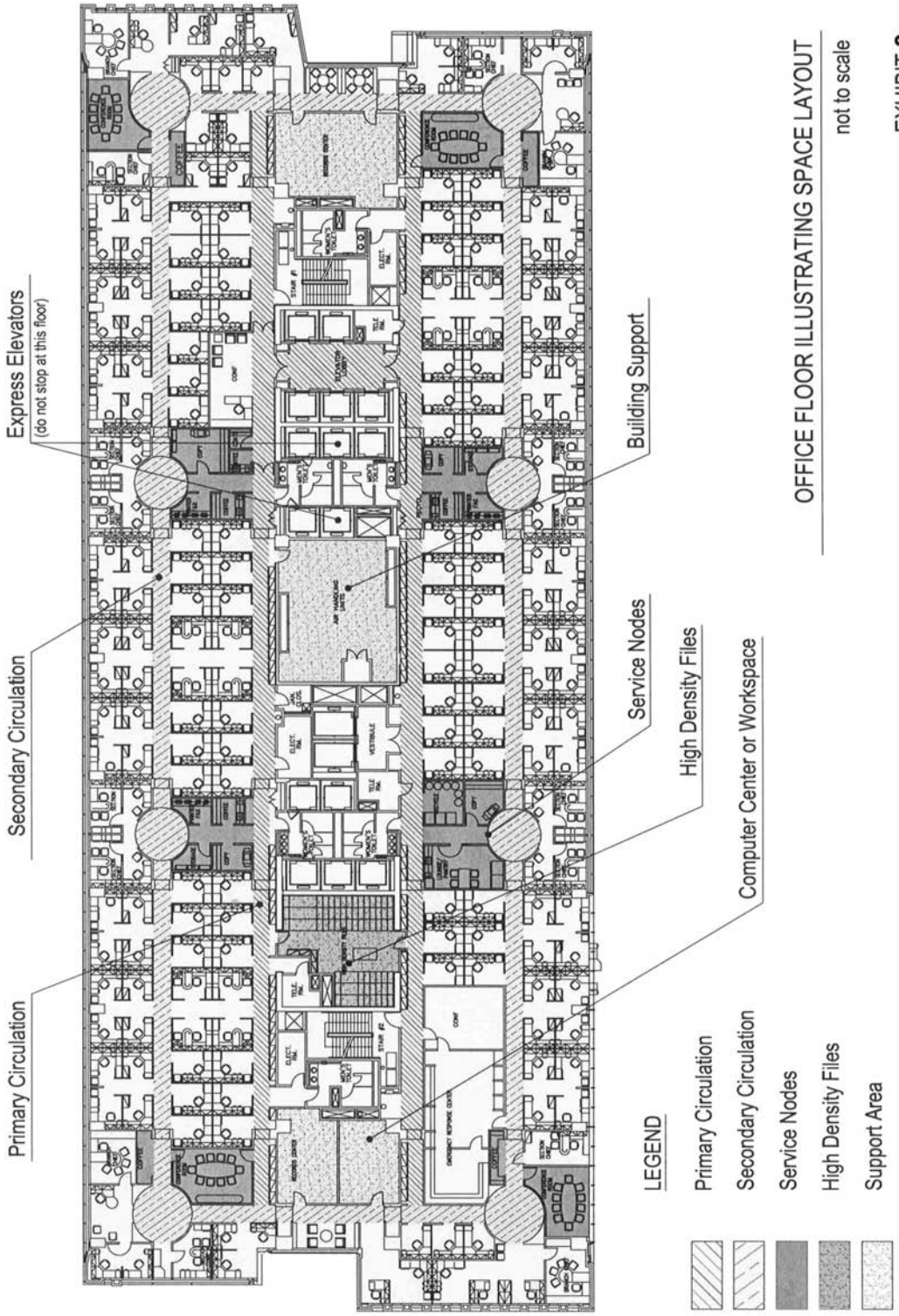
A key consideration in the development of a good space layout is to build in the flexibility that will allow the layout to remain workable several years into the future with a minimal need for change. To this end, as previously mentioned, the use of a limited number of office and workstation sizes is strongly encouraged. Another way in which the space layout can provide the desired flexibility is to create service "nodes" that provide small areas of service space (for example, print-fax-copy machines, perhaps combined with a beverage station and paper/supplies storage). Such nodes can be placed to break up long expanses of aisle and can also serve as a landmark to identify an organizational unit.

As noted before, small team meeting rooms of appropriate size that can be interchangeable with typical offices will add to the desired flexibility. Such team rooms, if provided, should anticipate the possibility of changed use in the future and should, therefore, allow for such change by providing blocking in the walls as needed to carry future furniture workstations or wall-mounted equipment.

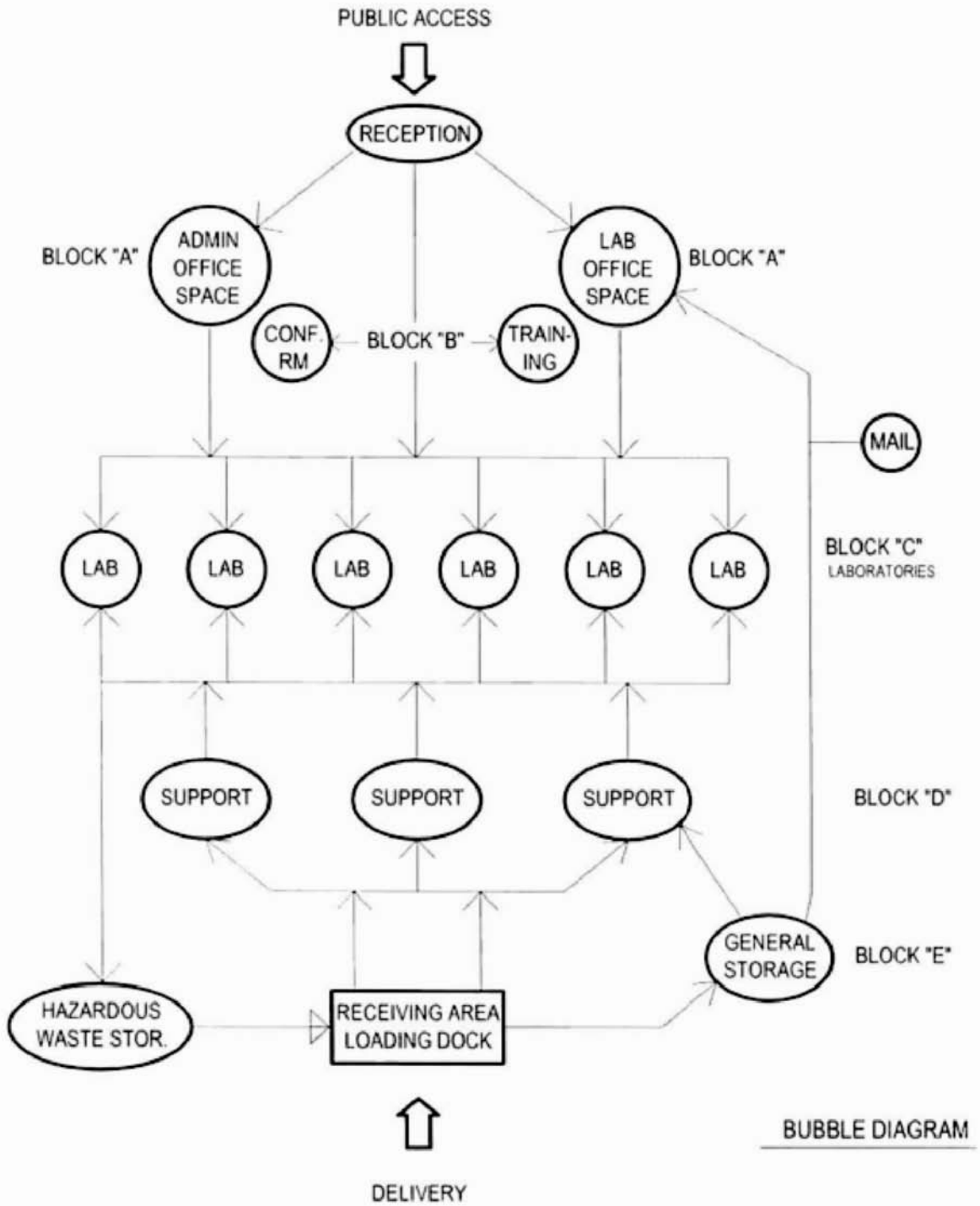
Exhibit 3 shows a typical office floor of an EPA facility illustrating the circulation, use of service nodes, and reinforced areas to receive increased live loads.

The planning team will need to take into consideration the functional relationships or adjacencies that should exist between organizational components. In many cases, the work flow does not require a circulation connection from one organizational group to another, and whatever need for communication between groups can be efficiently handled by in-house networks. In other

situations, the optimal work pattern will suggest the need for one group to be located close to another (or perhaps close to several other groups). Such adjacencies are best determined by those persons in senior management who are most familiar with organization's operations and procedures, and these functional relationships should be described in the POR. A "bubble diagram" showing the desired relationships is a useful way to communicate graphically the appropriate adjacencies. An example of such a bubble diagram is given in Exhibit 4.



OFFICE FLOOR ILLUSTRATING SPACE LAYOUT
not to scale
EXHIBIT **3**



BUBBLE DIAGRAM

EXHIBIT 4

5.4 Blocking and Stacking

When a building (or group of buildings) has been selected in response to the agency's space request and the POR, the first step in developing a well-organized plan is to create a blocking and stacking diagram. The purpose of this diagram is to identify the blocks of space to be assigned to each organizational group. This will require determining the approximate area to be assigned to each group, based on the POR area need for that group, as well as its appropriate location according to the recommended adjacencies.

5.4.1 BLOCK DESIGNATIONS

For its facilities housing both laboratories and administrative functions, the EPA has adopted a convention of assigning block designations for the major components of the facility. This practice provides a readily identifiable way to organize the various functions and more easily see the functional relationships among the different space uses. Block designations for such facilities include:

- *Block A:* General Office Space
- *Block B*: Administrative Support Space
- *Block C*: Laboratory Space
- *Block D*: Laboratory Support Space
- *Block E*: General Support Space

Because of the different uses of the space, the need to provide separate and usually more complex mechanical systems to serve the laboratories, and the possibility of additional hazards present in the laboratory areas, it is often necessary (i.e., required by code) or at least desirable to separate the laboratory and lab support blocks from the other blocks with fire-rated construction.

Where the proposed facility consists only of office and office support space, the use of block designations is less useful and is therefore omitted.

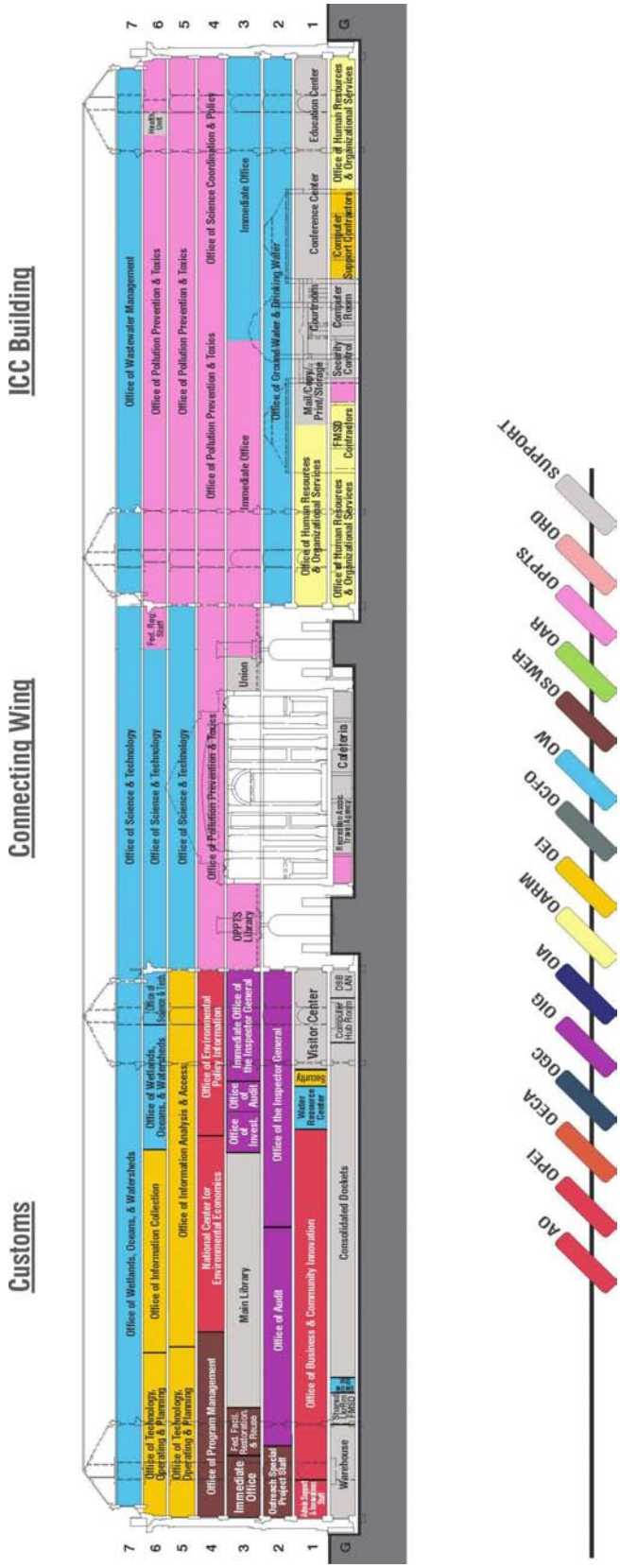
5.4.2 STACKING

For facilities of more than one story, the stacking aspect of the diagram refers to the placement of organizations by floor. For example, if the facility under consideration has spaces and functions that serve the public, such as libraries and training rooms, the blocking and stacking diagram would, in all likelihood, locate such spaces on the ground floor, while spaces seldom visited by many employees or by the public might best be placed on upper floors. The disposition of the vertical circulation elements—passenger elevators and lobbies, service elevators, stairs and escalators—becomes an important part of the stacking diagram.

It is readily apparent that, depending on the size of the organization to be housed, a blocking and stacking diagram can become rather complex because many varying factors must be considered: building size, number of floors, bay sizes, organization sizes, functional relationships, locations of entry points and service delivery points. A program of such complexity would clearly benefit from the services of an experienced professional space planner.

Exhibit 5 is a stacking diagram of part of EPA's Headquarters facility, illustrating the placement of various organizational components within the office building structures.

EXHIBIT 5


Customs
Connecting Wing
ICC Building
Office of Wetlands, Oceans, & Watersheds
Office of Information Collection
Office of Technology, Operating & Planning
Office of Information Analysis & Access
Office of Program Management
Immediate Office
Fed. Facil. Restoration & Reuse
Outreach Special Project Staff
Office of Business & Community Innovation
Office of Audit
Main Library
National Center for Environmental Economics
Office of Environmental Policy Information
Immediate Office of the Inspector General
Office of the Inspector General
Office of Invest.
Office of Audit
Water Resource Center
Agencies
Visitor Center
Warehouse
Consolidated Dockets
Office of Science & Technology
Office of Pollution Prevention & Toxics
Office of Science Coordination & Policy
Office of Wastewater Management
Office of Ground Water & Drinking Water
Immediate Office
Union
OPPTS Library
Cafeteria
Office of Human Resources & Organizational Services
Conference Center
Education Center
Computer Support Contractors
Computer Room
Courtroom
Security Control
Mail Copy Print Storage
FMSD Contractors
Health Unit
AO
OPEI
OECA
OGC
OIG
OIA
OARM
OEI
OCFO
OW
OSWER
OAR
OPPTS
ORD
SUPPORT

5.5 Circulation and Egress

In developing the space plan, the first consideration is to create a simple pattern of circulation to enable occupants and visitors to easily identify the path to the desired location, whether it be a specific workstation or meeting room, or a service element such as elevator lobby, fire stair, or toilet room. Circulation is usually identified as "primary," meaning the main corridors (even if not enclosed) that lead to lobbies, fire egress stairs, and other fixed plan elements; and "secondary" circulation, which refers to the aisles that branch off from the primary corridors and provide access to the individual offices, workstations, and other plan components.

Egress refers to the circulation scheme employed to make certain that occupants can readily find a pathway out of the building in the event of fire or other calamity. A detailed discussion of code-mandated fire egress is contained in Volume 3 of this Manual and will not be repeated here. In typical office buildings, the code will require at least two widely separated fire stairs, enclosed in fire-rated walls or partitions, that lead to the outside of the building. In most instances, the space planning team will be working with a building in which the pattern of egress will have already been determined, and the job of the planning team will be to make certain that their layout conforms to egress requirements by maintaining a clear path to the points of egress. Often, the space layout will contain dead-end aisles or corridors (a dead-end is a space that has only one exit path, rather than two), which are prohibited by most codes (although the allowable length of the dead-end can vary according to the jurisdiction).

The widths of circulation corridors and aisles can vary, depending on location. In a typical office building with occupiable space surrounding a fixed central core containing service elements (stairs, toilet rooms, elevators), there is often a fixed primary corridor around the core. This corridor should be at least 5' (1524 mm) wide, although a more generous width provides a more gracious feeling and allows easier passage of groups of people, carts, and people in wheelchairs. Similarly, secondary circulation aisles between workstations should be at least 3'-8" (1115 mm), but if a greater width can be attained, the space will be more comfortable and there will be less damage to the workstations.

In the laboratory environment, as previously mentioned, a service corridor behind the labs to run piping (or an interstitial space above the labs) should be at least 8' (2438 mm) wide by 8' (2438 mm) high. The corridor at the entrance to the labs is usually the location for service carts delivering chemicals, gases, and supplies, and must be 6' (1830 mm) or greater in width.

5.6 Circulation Factor

In arriving at a reasonable estimate of the amount of space required to house the offices and laboratories (if any) in the program, an allowance for circulation space must be included. Because the amount of circulation space necessary varies, depending on the floor plate of the building under consideration, as well as the proposed mix of offices and workstations, no one factor is suitable for all conditions. For preliminary planning purposes, a circulation factor (for secondary circulation) of 40% can be applied to the net area of office space to be included in Block A, and the administrative support space, Block B. For large special spaces such as conference/training centers, cafeterias, and warehouses, a smaller allowance for circulation can

be assumed. No factor is suggested here; the space planning team should examine the net area of the large special space and develop a rough hypothetical arrangement to arrive at a reasonable circulation pattern and an estimate of space required for circulation.

Similarly, the Laboratory, Lab Support, and General Storage blocks are comprised of large elements that can be connected by primary corridors the areas of which can usually be estimated if the size of the proposed floor plate can be determined, so a smaller factor (10% to 15%) can be assumed at the outset of the planning process. Note that it will also be necessary to include an allowance for service passageways to serve the laboratories, as discussed above.

5.7 Summary of Program Space Requirements

When the space planning team has determined what its space requirements are, including personnel numbers, types and sizes of laboratories required (if any), special spaces (food service, child care, fitness center), and applied appropriate factors to provide for circulation, it will be helpful to summarize these requirements in tabular format to assist the designers in developing workable space plans. An example of such a table, created for a hypothetical EPA component requiring office space as well as laboratories, is provided in Table 5.8: Example of Typical Summary of Program Space Requirements. A summary table such as this should be included in the POR.

Table 5.8: Example of Typical Summary of Program Space Requirements

Key to Block Designations

A	General Office (and Workstation) Space (with Circulation @ 40%)
B	Administrative Support Space (with Circulation @ 40%)
C	Laboratory Space (with Circulation @ 10%)
D	Laboratory Support Space (with Circulation @ 10%)
E	General Warehouse and Storage Space (no allowance for Circulation)

Unnamed EPA Office/Laboratory Organization

						Block Designations					
Immediate Office	*****	**Pers-ons**	**No. Items**	**Area**	**Circ.**	**A**	**B**	**C**	**D**	**E**	**Totals**
Director's Office	C	1		250	100	350					350
Deputy Director's Office	D	1		180	72	252					252
Assoc. Director's Office	D	1		170	68	238					238
Sr. Professional Offices	F	9		720	288	1008					1,008
Clerical Workstations	G	3		192	77	269					269
Files	--		10	90	77	167					167
Copier	--		1	30	12	42					42
Equipment Station	--		1	20	8	28					28
Beverage Station	--		1	20	8	28					28
Director's Conf. Room	--		1	240	96	336					336
Totals:		**15**		**1912**	**806**	**2718**					**2,718**

Branch I	*	Pers-ons	No. Items	Area	Circ.	A	B	C	D	E	Totals
Branch Chief Office	D	1		180	72	252					252
Sr. Professional Offices	F	6		720	288	1008					1,008
Professional Offices	F	20		1600	640	2240					2,240
Clerical Workstations	G	3		192	77	269					269
Meeting Room	--		1	300	120	420					420
Files	--		20	180	72	252					252
Copier	--		1	30	12	42					42
Equipment Station	--		1	20	8	28					28
Beverage Station	--		1	20	8	28					28
Totals:		**30**		**3242**	**1297**	**4539**					**4,539**

Branch II											
Branch Chief Office	D	1		180	72	252					252
Sr. Professional Offices	F	4		480	192	672					672
Professional Offices	F	24		1920	768	2688					2,688
Clerical Workstations	G	5		320	128	448					448
Meeting Room	--		2	300	120	420					420
Files	--		15	135	54	189					189
Copier	--		1	30	12	42					42
Equipment Station	--		1	20	8	28					28
Beverage Station	--		1	20	8	28					28
Totals:		**34**		**3405**	**1362**	**4767**					**4,767**

Branch III											
Branch Chief Office	G	1		180	72	252					252
Sr. Professional Offices	F	--		--	--	--					--
Professional Offices	F	10		800	320	1120					1,120
Clerical Workstations	G	5		320	128	448					448
Meeting Room	--		1	150	60	210					210
Files	--		12	108	43	151					151
Copier	--		1	30	12	42					42
Equipment Station	--		1	20	8	28					28
Beverage Station	--		1	20	8	28					28
Totals:		**16**		**1628**	**651**	**2279**					**2,279**

Laboratory Branch	*	Pers-ons	No. Items	Area	Circ.	A	B	C	D	E	Totals
Branch Chief Office	D	1		180	72	252					252
Sr. Professional Offices	F	4		480	192	672					672
Professional Offices	F	32		2560	1024	3584					3,584
Clerical Workstations	G	4		256	102	358					358
Meeting Room	--		1	200	80	280					280
Files	--		15	135	54	189					189
Copier	--		1	30	12	42					42
Equipment Station	--		1	20	8	28					28
Beverage Station	--		1	20	8	28					28
Laboratories:											
Organic Preparation	--		1	792	79			871			871
Gas Chromatograph	--		1	264	26			290			290
Hazardous Waste Prep.	--		2	792	79			871			871
Inorg. Prep. Trace Level	--		1	264	26			290			290
Inorg, Prep. High Conc.	--		1	528	53			581			581
Inorg. Instr. Met. Analysis	--		2	528	53			581			581
Inorg. Instr Non-Met. Anal.	--		1	528	53			581			581
Inorg. Instr. Radiation	--		1	264	26			290			290
Asbestos Testing	--		1	264	26			290			290
Dishwashing	--		1	792	79			871			871
Laboratory Support											
Hazardous Receiving	--		1	1056	106				1162		1,162
Environmental Receiving	--		1	792	79				871		871
Solvent Storage	--		1	264	26				290		290
Inorg. Standards Stor.	--		1	264	26				290		290
Organic Standards Stor.	--		1	264	26				290		290
Gas Storage	(to be located outside of building; enclosed by fence)								--		--
Technical Library	--		1	528	53				581		581
Terminal/Meeting Room	--		1	528	53				581		581
Totals:		**41**		**12,593**	**2421**				**15,014**		**15,014**

Administrative Support	*	Pers-ons	No. Items	Area	Circ.	A	B	C	D	E	Totals
Main Reception Area	--		1	850	340		1190				1,190
Mail Room	--		1	180	72		252				252
Video Conference Room	--		1	350	140		490				490
General Training Room	--		1	280	112		392				392
Break Room	--		1	180	72		252				252
Central Files (high density)			1	180	72		252				252
Totals:				**2,020**	**808**		**2,020**				**2,020**

General Warehousing

Shipping & Receiving			1	1,200	--					1,200	1,200
Central Storage			1	2,800	--					2,800	2,800
Totals:				**4,000**	--					**4,000**	4,000

TOTALS:

Persons			Circ.	Block A	Block B	Block C	Block D	Block E	TOTAL
136			**7,345**	**19,736**	**2,020**	**5,516**	**15,014**	**4,000**	**46,286**

Based on above summary, a facility with approximately 46,500 usable sq.ft. (4320 sq. m.) is required.

Notes: All areas are in square feet.
Laboratory areas based on assumed module of 11' x 24' = 264 sq.ft.
No allowance has been included for toilet rooms or for mechanical equipment rooms, telephone/data closets and electrical closets (including UPS rooms).
In addition to areas summarized above, most laboratory installations will require a hazardous materials storage facility (HMSF, designated Block F) which should be located in a building separated from the main structure.
Size of the HMSF: from 1,200 to 1,800 sq.ft. (111 to 167 sq. m.)

Chapter 6 - Furniture and Equipment

6.1 Systems Furniture and Loose Furniture

The development of a space plan that provides an efficient, flexible, and pleasant workplace requires careful attention to the selection of furnishings. In some instances, it may be cost-effective to retain existing furniture and to refurbish and relocate it to the newly acquired space, although there can be substantial expense involved. In most cases, however, it will be necessary to procure new furniture, either through outright purchase or through a leasing arrangement with the furniture vendors. The choice of purchase or lease will most likely depend on the project's budget.

The use of systems furniture (cubicles) for most workstations permits an environment that minimizes the extent of permanent partitions required and provides for an efficient and flexible use of the available floor space. For this reason, the agency has promoted the use of open-plan space planning in its offices. Loose furniture, such as desks, conference tables, and credenzas, is employed only in the enclosed offices for senior management positions. Of course, special spaces, such as food service facilities, libraries, conference/training centers, and similar rooms will require loose furniture appropriate to the space function.

Systems furniture provides for flexibility in space planning and also permits flexibility in function; that is, individual workstations can be configured to suit the particular functional needs of the occupant. For example, one employee may require a workstation suitable for meeting one-on-one with other employees or visitors, while another employee may need an arrangement that supports a second computer monitor, and a third employee may have job responsibilities that require space to lay out and review large format drawings and blueprints.

Having arrived at a space layout that incorporates open-plan workstations and a limited number of enclosed managerial offices, the space planning team is then faced with the task of selecting the proper furniture. The choices available among systems furniture manufacturers are many. In addition to cost, other considerations in making an appropriate selection include:

- Wire Management. Systems furniture is designed to provide concealed raceways to organize and hide power and telecommunications cabling. The means employed to manage wires and cables vary from one manufacturer to another, and the planning team should make certain that the system chosen is designed to bring the connections to the desired locations and to have sufficient capacity to handle anticipated future needs as well as current requirements. Convenient accessibility to the wiring raceway to allow future modifications is also a consideration

- Appearance. The furniture must "look good." Most manufacturers offer an extensive choice of finish materials, such as woods, fabrics, metals, and glass vision panels. The team will want to choose furniture that matches or complements other finishes that will be used in the space such as carpet and paint colors, as well as chairs and other loose furniture.

- Acoustics. The use of sound-absorbing materials for systems furniture panels will contribute to a reduction in ambient noise levels within the space. The planning team should make certain that the system chosen is acoustically acceptable and should compare sound-absorbing performance data among the various suppliers.

- Lighting. Most manufacturers offer lighting units that mount to the underside of overhead cabinets. Such lighting reduces the need for convenience outlets at the desk top for movable task lights.

- Environmental Adequacy. Because the furniture's materials and fabrics could affect the indoor air quality, the planning team should verify that environmental criteria are met. See Chapter 5 of the *Safety and Health Manual* (Volume 3 of the *EPA Facilities Manual*) for discussion of indoor air quality considerations.

- Environmental Control. In recent years, designers and engineers have developed integrated systems that permit the occupant of a systems-type workstation to control at his desk the delivery of tempered air to his space and the level of lighting. Such integrated systems typically require a raised-access floor as part of the air-delivery scheme. The planning team may want to consider the use of such a system, as it provides the state of the art in environmental control of the workstation.

- Delivery and Installation. The project schedule establishes dates for occupancy of the facility, and the furniture supplier will have to be ready to ship and to install his product in the time period specified.

The choice of a particular furniture system is also dependent on federal procurement regulations, which require that the procurement process be open and competitive such that all competent manufacturers have the opportunity to submit an offer. For this reason, it is important for the agency (and its design consultants) to prepare detailed specifications providing the performance criteria for the furniture, including (where appropriate) the requirement to test a representative workstation in an environmental chamber to verify that the product will not off-gas an unacceptable level of VOCs.

The furniture industry also continues to evolve in response to technological change. Depending upon the size of procurement, it behooves the project managers to undertake comparative evaluation of available systems, components, and case goods, to identify products that best meet their needs for flexibility, systems integration, ergonomics, and durability. The agency should also be aware that most furniture vendors provide substantial discounts from "book" prices for large volume purchases by federal agencies, and a comparison of final, discounted prices should be made prior to making a final commitment to a particular vendor.

A wide variety of systems furniture is available today. There is also much variation in construction, ergonomics, durability, flexibility, and adaptability among the models offered. The sustainable environment characteristics of these systems, of concern to EPA's mission, also varies significantly. In the process of interior build-out and furnishing, careful attention should be given to the above characteristics. Since furniture is a large up-front cost and will be in use for several years, a thorough analysis of the available systems should be undertaken to ensure that the selected model (or combinations) best serve the specific user-group requirements.

Available furniture systems may be categorized into three primary types:

- Freestanding and non-panel systems: The former utilizes legs or other base support for work surfaces and stanchions for overhead storage units, and the latter may use wall-mounted tracks for supporting work surfaces and overhead storage. These systems do not require additional reinforcement in the wall.

- Panel based systems: Consist of stacking panels or tiles in a variety of finishes including glazed tiles. They are optionally available as powered or non-powered systems. Work surfaces and overhead storage are attached to the panels.

- Spine or service wall based systems: A modified panel system that is self-supporting, stackable, integrates with other systems, allows off-modularity, and has substantial handling capability for data and power cables.

Programmatic requirements of the user-groups will be instrumental in identifying criteria for comparative analysis of available systems. The selection team may, in addition, visit existing installations of the systems being considered and obtain feed-back from managers of those facilities. Among others, criteria may include:

- Panels:
  - Stacking capability
  - Thickness
  - Width options
  - Acoustic ratings (NRC and STC)
- Desk-Mounted Screens:
  - Stacking capability
  - Thickness
  - Acoustic ratings (NRC and STC)
- Off-Modularity:
  - of panel connection
  - of overhead storage unit location
- Interchangeability:
  - of work surfaces between various systems with change of brackets
  - of overhead storage units between various systems
- Power / Data:
  - Provision of outlets at desk height
  - Access to wall outlets in private offices
  - Concealed wire management and adequate cable carrying capacity
  - Adequate separation between power and data cables
  - Number of circuits accommodated
  - Length of base feed
  - Fiber-optic capability
- Furniture Components:
  - One-touch counterbalanced overhead storage unit
  - User-adjustable work surface height
  - Stackable lateral file units
  - Adequate variety of work surface shapes and sizes

Variety and quality of work surface finishes

- Miscellaneous:
  Sliding panels for privacy or securing the workstation

From an operations perspective, it is beneficial to select systems furniture with components that are interchangeable for optional configurations or between various applications (for example, enclosed offices and workstations). This allows for optimal inventory size and relative ease of modification for different user types.

6.2 Laboratory Casework and Fume Hoods

The design and selection of casework for laboratories is a task for the scientists and technicians who will be using the labs and the A-E professionals. Typically, each laboratory will require a design specifically tailored to the tasks to be accomplished in that room, so that no one layout is appropriate for all, or even most, laboratories. The sample Room Data Sheets that accompany Volume 2 illustrate representative laboratories and show the type and extent of information typically included in a POR attachment to an SFO. Although development of a POR for a proposed laboratory will require the preparation of a Room Data Sheet for each laboratory, many lab installations will be found to include the following components, organized to facilitate the work flow:

- Base and wall cabinets along both walls, with island base cabinets in laboratories more than one module in width. Countertops are of a impervious material, often alberene stone, stainless steel, or a composite synthetic material resistant to the corrosive acids and chemicals used.

- One or more fume hoods. These represent a significant portion of the cost of outfitting the laboratories. They are manufactured in various sizes and have different features so they must be selected according to the specific tasks anticipated. Moreover, they must be engineered with the HVAC system, as they draw a considerable volume of air from the room. The hoods are also connected to certain utilities, typically water and gases. Volume 2 discusses fume hoods in substantial detail.

- One or more sinks, for cleaning laboratory glassware, and similar housekeeping functions.

- Storage cabinets for chemicals.

- A desk and computer (located outside of the laboratory itself) where the staff can handle data entry and paperwork associated with the laboratory. Most laboratory facilities will have an internal network (Laboratory Information Management System, or LIMS) that maintains data pertinent to that facility.

- Emergency safety equipment, including emergency showers and eyewash devices. Refer to Volume 2 for the criteria for these items, including their preferred location.

6.3 Telecommunications

The planning of office and laboratory space for the EPA requires that close attention be given to provisions for telecommunications and for networking of computer systems. Such provisions should include adequate outlets to serve the voice and data needs for each office and workstation. These considerations are discussed in substantial technical detail in Section 16 of Volume 2 *Architecture and Engineering Guidelines* and will not be repeated here. The space planning team needs to address the following points as it develops the program for the proposed facility:

- What provision must be made to bring telephone service to the building, and what space will be require to house the service entrance equipment. Where security is a prime consideration, and the need to maintain operations in the event of a disaster is very important, provision for redundant service may be considered as a requirement.

- Vertical distribution of telephone and data cabling is typically accomplished through vertical conduit serving stacked closets on each floor. Empty sleeves for future conduit allows for future expansion. Where EPA shares space in a multi-tenant building, care should be taken to isolate EPA's distribution system from that of the other tenants for security reasons.

- How will telephone service be distributed to the various offices and workstations? Typically, closets at each floor of the building are provided, from which horizontal cables will distribute service to each outlet. The size of such closets is determined by standards established by the Electronics Industries Association (EIA) and by the requirements of the *EPA Structured Wiring/Telecommunications Guidelines.* Closets shall also be sized to allow for an increase of capacity of up to 25%.

- Horizontal distribution at each floor can be accomplished in several ways. The use of raised access flooring for both power and electrical cabling provides the greatest flexibility, as it permits the ready relocation of outlets. Raised access flooring is recommended by GSA for new structures. In existing structures without such flooring, or where its use is precluded because of cost, horizontal distribution by means of cable trays located above a suspended ceiling or by conduit beneath the floor slab feeding "poke-through" floor fittings is suggested. EPA recommends that the use of power poles be avoided, as they are considered unsightly.

- The space planning team must also consider its requirements for computer networking. In larger facilities, one or more central computer rooms may be required, serving LAN closets adjacent to, or sharing space with, the telecommunications closets. Distribution of cabling from the LAN closets utilizes the same system as the telephone system: raised flooring, cable tray, or poke-throughs.

- Consideration must also be given by the planning team to other possible communications needs. Will the EPA facility need rooftop antennae for satellite reception? Will video-teleconferencing be part of the program? What about closed-circuit television for security monitoring? Should there be outlets for broadcast and/or cable TV?

- Note that EPA typically designs and provides its own telecommunications system, and that the building landlord is expected to furnish only the infrastructure ready to receive the cable distribution system that will be installed by EPA and its contractor. However, it is important that the space planning team and its professional designers make complete provision for this work.

- The number of telephone outlets and computer outlets to be provided in offices, workstations and laboratories is given in Section 16.12 of Volume 2, *Communication Systems*, on a per unit basis. Quantities thus determined are useful for preliminary planning purposes, and can be refined when design drawings are developed.

6.4 Special and Miscellaneous Equipment

The program for the proposed new facility is likely to require spaces in addition to the office and lab spaces (and their support spaces). Special spaces such as child care centers, food service facilities, conference/training centers, and fitness centers, will not be addressed in this volume, as these are space types not encountered in every EPA facility, and the need for and capacity of such spaces will be specific to the particular facility. However, most agency facilities will require additional support areas beyond those discussed under office support and laboratory support. These include:

- High density filing space
- Libraries
- High-speed copy centers
- Recycling space
- Emergency power and uninterrupted power supply (UPS).

Note that many EPA facilities require the support of emergency power, beyond that provided for base building life safety systems (e.g., emergency lighting, fire pumps): for example, computer systems where “mission-critical,” and laboratory equipment that must remain functional in the event of a power outage. A UPS system that provides continuity of service until stand-by power kicks in will serve to prevent loss of important computer data. The design of such electrical systems is the province of the building’s A-E design team, but the agency’s planning team will be responsible for providing the design criteria (that is, which items of equipment require back-up power and/or UPS support) to the A-E team.

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