B.1 General Requirements

It is the intent of the NIH to advance the capability of the Research Laboratory, Vivarium, and Clinical Center facilities. This will be accomplished through the use of design that addresses the needs of all users of the facility. The facilities should enhance the lives of these users. The facilities should also lend themselves to further the goals and objectives of the NIH into the next century. All designs should comply with the current standards of the Research Laboratory, the Vivarium, and health care as a minimum. Additional considerations for design follow.

B.1.1 Building Design

Design Modules: The facility shall be designed using a functional modular building concept. The building module used shall consider the fire protection requirements which require that each level be subdivided into smoke zones as per the requirements of National Fire Protection Association (NFPA) Standards 101. The design module concept must consider the optimum module for providing research, vivarium, hospital, and other facilities, and research and vivarium functions.

Functional Design: Floor plan shapes should be simple and functional so as not to restrict flexibility. Narrow or irregular floor shapes should be avoided. Permanent plan elements, such as mechanical shafts, stairways, and reinforced concrete vaults, should be located to minimize their impact on functional use areas or future expansion of critical areas.

Circulation Design: Adequate circulation space should be provided at points of traffic congestion, and architectural features shall emphasize overall circulation patterns and major entrances to departments.

Circulation should be made more efficient by:

Avoiding confusing hallway systems and extension of through corridors from department to department

Avoiding horseshoe shapes in major corridor systems that require excessive walking distances

Avoiding dead-end departmental corridors

Minimizing the use of single-loaded corridors

Eliminating major corridors through elevator lobbies or through other areas which tend to concentrate circulating personnel

Locating vertical transportation element(s) so that they are visible from major entrances

Special attention should be paid to code requirements for lobbies and vestibules in front of elevators. Main circulation corridors in health care occupancies should be at least 2,500 mm wide, exclusive of lobbies and elevator vestibules unless otherwise directed.

B.1.2 Massing Design

Consideration should be given to the visual impact of any new structure, especially to a new addition on an existing building, and to the massing effect on surrounding views.

B.1.3 Integrated Building Systems Design

The use of integrated building systems, interstitial space should be considered when the facility is large enough to warrant this approach.

B.1.4 Floor-to-Floor Height Design

Determination of finished-floor to finished-floor heights in research, vivarium, hospital, and other facilities is a multidisciplinary task. Elements requiring special ceiling heights should be grouped on the fewest floors consistent with proper functional design.

B.1.5 Future Considerations

Expansion of expensive existing departments can often be coupled with relocation of lower-cost functions. Placing departments on

outside walls with adjacent site space available for expansion also adds future flexibility. Corridor patterns can enhance circulation and flexibility. Adequate access to general circulation is needed for each department to facilitate visitor, patient, staff, and material traffic. Open plans, where feasible, allow easy departmental change. Floor plans that encircle a department with permanent corridors, stairs, mechanical rooms, or other building elements difficult to relocate should be avoided.

Functional elements should be grouped in accordance with the following objectives. (Where difficulties arise in the mutual accommodation of all of the following objectives, the objective stated in the first paragraph below shall be given priority.)

Elements should be combined on the basis of functional adjacency requirements to facilitate better functional flow and reduced operating and staff costs.

Elements with similar electrical, mechanical, and structural requirements should be combined to facilitate savings in construction costs.

Consistent with proper functional adjacency planning, soft-functional areas (areas having minimal plumbing, special finishes, special mechanical features, and special power demands) should be placed between hard-functional areas (areas having appreciable plumbing, special finishes, special mechanical features, and special power demands) to permit in-place future growth of the hard-functional areas by relocation of the less costly soft-functional areas.

Column-free functional areas should be ensured where possible while minimizing the use of transfer beams.

Electrical, mechanical, plumbing, and other support systems should be designed to permit modifications in support of medical functional changes with the least first cost and least disruption to the overall operations.

B.1.6 Handicapped Accessibility

All NIH facilities are required to be accessible to disabled persons and shall be designed and constructed or retrofitted in accordance with the latest requirements of the Uniform Federal Accessibility Standards.

B. 2 Exterior Design Criteria

B.2.1 Exterior Materials

Building Exteriors: Exteriors (elevations) are to be compatible with the styles of previously constructed permanent facilities of the campus and/or are to be compatible with the elements proposed in the NIH Master Plan. To ensure compatibility, the physical features of the site and the character and style of any surrounding building(s) should be observed and documented. Elevations should be developed based on interior departmental functional relationships and requirements and, where possible, should take advantage of existing and developed site assets.

Exterior Building Materials: Cladding is to meet engineering standards with respect to the environment, energy use, materials, and methods of construction. In selecting building materials, careful consideration shall be given to all technical criteria.

Exterior Elements:Mechanical, electrical, transportation, and equipment items which are to be located on the exterior of the facility shall be integrated elements of the design. These elements include air intake/exhaust vents, exterior lights, utility connections, plumbing vents, fuel tank vents, liquid oxygen tanks, transformers, trash compactors, containers, and loading docks.

Thickness: Placement of the wall in relation to the structure impacts the construction cost, fenestration shading, exterior materials, and method of assembly.

Design Characteristics:The design characteristics of wall schemes should be evaluated for aesthetics, functionality, and cost effectiveness as their characteristics relate to the following:

Exterior wall termination at the roof or the top of parapet walls (including penthouses)

Construction and control joint locations, considering their impact on sterile areas, construction sequence, and building movement due to expansion and contraction

Corner conditions, especially material relationships at the intersections of vertical planes and the continuity of wall supports and flashings

Load transfer of the wall to the structure, including consideration of structural frame exposure and lateral wall supports

Weathertight design, including sealant profiles, material adjacencies, and flashing configuration

Window placement relative to the wall, secondary connection requirements, material adjacencies, window washing, glass type and thickness, and life safety hardware

Thermal Resistance: The thermal characteristics of single materials or wall assemblies shall be obtained from the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) *Handbook of Fundamentals* or from manufacturers? certified technical information. Thermal resistance (R) values shall be identified for each element in the building shell. "U" factor calculations shall be prepared following recommended procedures as documented in the ASHRAE *Handbook of Fundamentals*.

Moisture Transport: Dewpoint calculations shall be prepared following recommended design procedures in the ASHRAE *Handbook of Fundamentals* (Reference 4c). Dewpoint consideration will determine where condensation will occur within the wall assembly and what problems will be generated by its presence at specific points during freeze-thaw cycles. A vapor drive analysis is to be provided.

B.2.2 Building Exterior Compositions

Exterior wall compositions shall be based on durability, thermal performance, vapor barrier requirements, aesthetic requirements as they relate to the campus environment or in some cases historic considerations, and cost.

Masonry: Design and construction shall be based on standards, specifications, and publications including those by the American Society for Testing and Materials (ASTM), American Concrete

Institute, Building Stone Institute, Facing Tile Institute, Indiana Limestone Institute, Marble Institute of America, National Building Granite Quarries Association, National Concrete Masonry Association, National Limestone Association, National Limestone Institute, Brick Institute of America, and Portland Cement Association.

Curtainwall: Design and construction shall be based on standards, specifications, and publications including those by the ASTM, American National Standards Institute (ANSI), Aluminum Association, Architectural Aluminum Manufacturing Association, American Concrete Institute, Metal Lath/Steel Framing Association, National Association of Architectural Metal Manufacturers, National Concrete Masonry Association, National Precast Concrete Association, Portland Cement Association, Precast Concrete Institute, Facing Tile Institute, and Brick Institute of America.

Brick Selection Committee: The NIH has a review committee called the Brick Selection Committee, which reviews project brick panels for their match to existing brickwork. The Project Officer is responsible for seeing that the requirements in the Brick Selection Committee Guidelines are incorporated into the project drawings and specifications.

Windows: Fenestration shall be designed considering NFPA codes; heating, ventilation, and air-conditioning requirements; aesthetic appearance; and the comfort of patients and personnel. Where glazing is used (fixed or operable sash), the need for window-cleaning must be recognized and, where need be, provision must be made to accomplish it.

Window design and construction shall be based on the standards, guidelines, and publications of the ASTM, ANSI, Aluminum Association, Architectural Aluminum Manufacturing Association, National Institute of Testing and Standards, and the Steel Window Institute.

The use of operable windows shall be evaluated based on functionality, ventilation, quality of life, and code-related issues.

Patient Bedroom Windows: Every patient sleeping room must have an outside window in accordance with NFPA Standards101.

Window and Curtainwall Glazing: Glazing for windows and curtainwalls shall meet the requirements for energy conservation called for in these Guidelines. All glazing designs shall be evaluated for aesthetics, shading characteristics, light transmittance, thermal characteristics, and reflectance.

Glazing for Impact Safety: Due to the size and shape of glazing in some locations, glass panels may be mistaken for a means of entrance or exit and may be subject to human impact. The requirements of ANSI Standards Z97.1 and NFPA Standards 101 shall be complied with in these circumstances. Sill heights less than 760 mm above the finished floor must have an intermediate horizontal mullion included in the fenestration at that height. Examples of these conditions are framed or frameless glass doors, borrowed lights, sliding glass doors, fixed glass panels, and shower or tub enclosures.

Safety Glazing: All windows in mental health patient care units (PCUs), alcohol dependency treatment PCUs, drug abuse treatment PCUs, and medical, surgical, and nursing security bedrooms shall be glazed with laminated glass. Laminated glass shall be 11 mm thick in locked patient units and security rooms, and 8 mm thick elsewhere. Large expanses of glass may require thicker glass. Glass manufacturers should be consulted if this circumstance exists.

If laminated glass is required for double-glazed windows, it shall be provided for interior panes only, except in mental health and behavioral nursing units with sill/stools less than 2,000 mm above the ground and windows facing a courtyard. Where this occurs, a laminated-glass interior pane and tempered-glass exterior pane are required.

Exterior Finishes of Historic Buildings: While designing to meet the project goals, projects affecting windows of historic buildings shall be guided by the Secretary of the Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings.*

Roofing: Roofing systems are to be compatible with construction materials used, readily repairable, and designed to provide a complete, waterproof roof. The system is to be durable, require minimal maintenance, and provide the fire ratings and classifications required. Warranties shall be provided based on specific NIH guidelines.

Roofing systems shall be designed in accordance with the recommendations of National Roofing and Contractors Association, *Roofing and Waterproofing Manual*, Factory Mutual Guidelines; and ASTM Specifications and Tests and Methods; National Bureau of Standards; National Technical Information Service; and Underwriters Laboratories.

On new construction, the roofing system shall be designed for resistance to wind uplift forces.

The use of roof penetrations shall me minimized to the greatest extent possible. Penetrations shall not be installed in valleys or near drains or scuppers.

When roof-mounted equipment is used, the equipment shall provide the lowest profiles for the application used. The supports shall be designed for the equipment size and weight, for ease of a complete reroofing process without disturbing the equipment, and for construction in a manner so as not to violate the waterproof integrity of the roofing materials.

All roofs shall be designed with a positive slope to roof drains or gutters.

Consideration for future vertical expansion shall be incorporated in the roofing design on a project-by-project basis.

All roofs shall provide for emergency overflow through the use of scuppers.

B.3 Structural Considerations

B.3.1 Exterior Walls Faced With Brick

Wall Backup: If a building will have areas faced with brick or concrete masonry facing units, the backup across the cavity shall be concrete masonry units (CMUs). The use of metal studs to provide stability for exterior brick facing is prohibited.

Expansion Joints: Horizontal and vertical expansion joints and relieving angles for cavity wall face brick shall be located, sized, and detailed in accordance with the recommendations of the Brick Institute of America, 11490 Commerce Park Drive, Reston, VA 22091.

In addition to the Brick Institute recommendations, buildings constructed of steel or concrete framing must have a horizontal relieving angle at each floor. Bearing-wall buildings three stories or shorter may not require horizontal relieving angles depending on total building height. If relieving angles are required, one shall be provided at each floor.

Rabbeted brick made with a lip to conceal the horizontal leg of the relieving angle or lintel angle shall be used in all buildings.

B.3.2 Drywall Interior Partitions

Where metal-stud and drywall partitions are acceptable for use for laboratories and offices, studs of at least 0.91 mm metal gauge, 90 mm in depth, and spaced at 400 mm on-center shall receive first consideration for use.

Where NFPA standards and construction drawings permit stopping partitions at the ceiling suspension system, lateral bracing shall be provided for the top of the partition. The top track of the stud system shall be fastened to the ceiling suspension components at 600 mm on-center with #12 self-cutting screws. In addition, lateral bracing shall be provided at a 45^0 to 60^0 angle above the ceiling at a maximum spacing of 1,800 mm. For a brace length of up to 1,800 mm, a 30 mm x 30 mm x 3 mm steel angle, or the equivalent shall be provided. Bracing locations must be coordinated, prior to

installation, with all other items and services located above the ceiling.

Flexibility must be built into the partition system to accommodate wall-hung book shelves, future shelving and cabinet installation. To provide a surface for fastening, 100 mm wide, 1.33 mm sheet-metal strips shall be placed horizontally on both sides of the studs for the full length of the partition. The strips shall be anchored to each stud with two #12 screws. The top edges of these metal strips shall be installed at the following heights:

- 150 mm and 300 mm above the floor to provide a fastening opportunity for vertical-support standards in the utility ledge space

- 1,000 mm above the floor to provide a fastening opportunity to anchor the steel angle at the back edge of the countertops

- 1,200 mm above the floor to provide a fastening opportunity to anchor the wiremold

- 1,700 mm above the floor to provide a fastening opportunity for the bottom angle that supports wall cabinets. This assumes that the bottom of the 800 mm tall wall cabinets will be located 1,725 mm above the floor, and the cabinets will be supported as described in the Anchorage of Lab and Office Shelving and Wall Cabinets section below. This location also allows shelf-bracket vertical-support standards to be anchored when it is not possible to anchor them to metal studs.

- 2,500 mm above the floor to provide a fastening opportunity to anchor the steel angle at the top of the 800 mm tall wall cabinets. This location also allows shelf-bracket vertical-support standards to be anchored when it is not possible to anchor them to metal studs.

The Designer must check whether the above assumptions agree with program requirements.

Because fastening to wire studs is very difficult, they shall not be used.

B.3.3 Anchorage of Lab and Office Shelving and Wall Cabinets

Anchorage of Lab and Office Shelving: Anchorage of vertical standards carrying shelving brackets shall be capable of safely carrying a fully loaded wall of shelving. A fully loaded wall of shelving consists of a top shelf no higher than 2,300 mm above the floor with shelves spaced 300 mm apart below the top shelf all the way to the floor. Each shelf must support a minimum design load of 7.5 kg per 100 mm, and a fully loaded wall assumes all shelves are loaded to capacity.

Anchorage for shelving carrying equipment exceeding the 7.5 kg per 100 mm loading, or exceeding the 300 mm spacing, must be designed for the specific application.

Anchorage of Cabinets: The Designer must indicate how the wall cabinets shall be attached to the partitions. Standard NIH #34 and #35 wall cabinets have backs with a hidden 20 mm recess. A satisfactory mounting is to use solid or slotted 1.9 mm, 40 mm x 65mm horizontal steel angles. The angles are installed with the long legs vertical, with the short leg projecting from the wall to support the cabinet.

The bottom angle is installed with the long leg directed up (to be hidden behind the cabinet) and is anchored to every metal wall stud with washers and two #12 metal-cutting screws, such as Hilti Metal-to-Metal #4 Point #12-24x2 HWH #4 STLG screws having 40 mm of thread length.

The top angle, with the long leg directed down, is placed at the level of the top of the wall cabinet, and the vertical leg is anchored to the studs in the same manner.

The cabinet is slipped between the two angles, and #12 screws at 300 mm on-center are screwed downward 300 mm from the back of the cabinet into the hidden cabinet recess to anchor the top of the cabinet to the angle. Similarly, from underneath, #12 screws at 300 mm on-center are screwed upward 10 mm from the back of the cabinet into the hidden cabinet recess to anchor the bottom of the cabinet to the angle.

B.3.4 Selection and Use of Anchors

Metal Expansion Anchors: This type of anchor consists of a stud with a steel sleeve that expands when the nut is tightened. It must be used in a solid concrete substrate meeting the manufacturer's minimum thickness. Anchors shall be installed in accordance with the manufacturer's instructions. Fastener spacing, embedment, edge distance, and strength of the concrete substrate must be taken into account. Equipment and drill bits provided by the manufacturer or recommended by the manufacturer must be used.

Holes shall be drilled with sharp, carbide-tipped drill bits. Drill bits must be changed frequently enough to ensure that accurate diameter holes are drilled. If reinforcing bars are encountered while drilling, a new hole must be drilled in a different location. Existing reinforcing shall not be cut without first consulting the structural engineer for the project.

Adhesive Anchors in a Solid Base Substrate: This type of anchor consists of a steel stud which is chemically bonded to the base material. It must be used in a solid concrete substrate and installed in accordance with the manufacturer's printed instructions. A properly sized hole is drilled in the concrete, and a measured amount of adhesive, such as epoxy or vinylester resin, is inserted, followed by the steel stud. Load can be applied after the adhesive sets, chemically bonding the anchor to the concrete.

Fastener spacing, embedment, edge distance, exposure to chemicals, fatigue loading, and strength of the concrete substrate must be taken into account. Equipment and drill bits provided by the manufacturer or recommended by the manufacturer must be used.

Screen-Tube Adhesive Anchors in a Hollow-Base Substrate: This type of anchor consists of a steel stud which is keyed into hollow base material such as CMUs, and installed in accordance with the manufacturer's printed instructions. A properly sized hole is drilled into the CMU, and a screen tube is inserted into the hole and filled with adhesive, followed by the steel stud. The stud forces the adhesive out of the screen tube, keying the anchor into the CMU face shell.

Anchors With Plastic Sleeves Expanded by Sheet Metal Screws: These anchors depend upon a screw expanding a plastic sleeve against the sides of a hole. These anchors are often used to attach items to a masonry substrate.

Anchors with plastic sleeves expanded by sheet metal screws shall not be used to anchor shelving, shelving standards, or cabinets to walls.

Metal-Impact Expansion Anchors: These anchors rely on an accurately sized hole; placement of the anchor, which is composed of a sleeve and a nail; and a hit with a hammer to make the nail expand the sleeve against the sides of the hole.

These anchors shall not be used in a tension-loading condition. These anchors are approved only for small-shear loads.

Toggle Bolts:Toggle bolts rely on a spring-loaded or expanding part to key the anchor to the back of a wall or ceiling. Toggle bolts may be used to attach items to hollow CMUs.

Toggle bolts are not to be used as structural fasteners in drywall. Drywall sheets are not designed to be a structural surface for hanging items.

B.3.5 Lumber for Wood Shelving

Specifications for wood shelving shall equal or exceed the lumber ordered by the NIH Division of Engineering Services for exposed wood shelving. The lumber shall meet or exceed the Western Lumber Grading Rules as published by the Western Wood Products Association, Portland, OR.

Lumber shelving shall be chosen from the following species, at the supplier's option. The species may be mixed, but the delivery tickets shall indicate the species being delivered.

- Ponderosa Pine
- Sugar Pine
- Idaho White Pine (Choice)
- Engelmann Spruce
- Alpine Fir
- Lodgepole Pine
- Douglas Fir

Material shall be "C Select" or better grade, 30 mm nominal thickness by 300 mm nominal width, surfaced four sides to 30mm thick (+1.5 mm, -3.0 mm) by 285 mm wide (+1.5 mm, -3.0 mm) by 3,000 mm and longer. Four edges shall be eased (rounded) full-length, or two edges of one narrow side, full length.

B.3.6 Wall-Mounted and Peninsula Shelving Height Policy

For maximum mounting heights of shelving and required clearances between shelving and sprinkler heads see Section H.8

B.4 Transport Systems

These guidelines are intended primarily for new construction, however, addition and alteration projects should meet these guidelines to the greatest extent possible. Program factors which are required for computing traffic demand loads will be provided by the NIH. Transportation systems should be selected on the basis of acceptable response and waiting time intervals. The intervals should be calculated from an analysis of car speed, traffic transfer time, door operation cycle and other applicable system capacity factors. This section is not intended to cover all aspects of transportation system analysis or design, but rather to act as a standard for use by qualified transportation consultants.

The use of a transportation consultant is recommended to assure system selection and design is in compliance with all applicable codes, including, but not limited to handicapped codes, building codes, all technical criteria, and the analysis of transportation needs, locations, and types.

B.4.1 Elevators

The location of elevators should be such that they are easily accessible and convenient to circulation routes. When additional elevator banks are provided, every effort shall be made to locate them along the same major circulation paths that serve the existing elevators, where feasible. They shall be designed in accordance with all applicable codes. Ample area for circulation and waiting of patients, staff, visitors, equipment and litters shall be provided. Elevators shall be located to provide positive separation between passenger and service traffic flows and between patient and animal traffic flows. Service, research laboratory, and inpatient elevators shall be separated from public elevators as much as possible.

Elevators shall be located so that they will serve all floors that require service. This includes the basement, sub-basement, and mechanical floors as well as all of the occupied floors of the facility. In facilities which utilize interstitial floors and mechanical penthouses, at least one elevator shall stop on these floors to facilitate equipment maintenance and removal. Elevators shall not be placed over occupied spaces as this will require counterweight safeties and reinforced pits.

Elevators shall be grouped in banks of adjacent cars or banks of cars facing each other. Where four or more cars are required within a group, cars should be placed in opposite banks, opening to a common lobby. For service and combined use cars, two across are preferred and not more than three in a row should be used; for passenger cars, three across are preferred and not more than four in a row should be used.

Consideration shall be given to the maximum walking distance from the vertical transportation service to the most distant function. This factor shall be weighed along with the advantages of locating elevators near the center of the building and the advantage of elevator clustering. In general, the maximum walking distance to passenger and combined use elevators should not exceed 46 m. Service elevators shall be planned to provide a maximum walking distance of 52 m. Any decentralized banks and/or clustering of elevators should be planned to include at least two cars to maintain an acceptable dispatch interval between cars and ensure continuity of service.

Elevators shall be selected and located to permit transportation of 10 percent of the anticipated visitor, staff, and ambulatory patient load within a 5-minute two way peak period. The number of elevators required will be selected based on a 35 second response waiting time interval between elevators.

If one elevator would normally meet the requirements in the facility where patient elevator service is essential (such as facilities over two stories high), two elevators or a hoist way for a future elevator shall be installed to ensure continuity of service. If there are financial limitations which restrict the inclusion of a second elevator, as a minimum, a hoist way for a future elevator shall be provided.

The possibility of changes in the occupancy type and/or reassignment of building areas that would result in a greater volume of passenger traffic shall be investigated. When such possibilities exist, the structural framing shall be designed to permit future installation of additional elevator equipment as will be required to handle the potential increase in traffic volume.

Special conditions which must receive consideration in estimating elevator usage include cafeteria traffic, store traffic, dietary distribution and retrieval, transient traffic, visitor traffic, outpatient traffic, pharmacy, building management, central sterile,

surgery**,** warehousing, grouping of elevators, external transport facilities, building entrances at more than one level, basement facilities, unusual interfloor traffic requirements, trash (if chutes are not used), lab equipment relocation, delivery of gas tanks, and animal rack movement (where elevators are required within or as access to the vivarium).

General Design Considerations:

Codes: Elevators shall be designed in accordance with the latest edition of all applicable federal, state and local codes, including the Uniform Federal Accessibility Standards, NFPA "National Electrical Code", ASME/ANSI A17.1, A17.2, A17.3 and A17.5. This includes designing to the appropriate rating / load classification for the intended application.

Hospital: All elevators in hospitals, with the exception of elevators planned exclusively for use in outpatient clinics, shall have hospital type cars with interior dimensions that accommodate a patient bed with attendants. Cars shall be at least 1.75 m wide by 2.75 m deep. Car doors shall be side opening with a minimum clear opening size of 1.25 m wide by 2.15 m high. Elevators used exclusively for outpatient clinics may be designed as passenger elevators.

Research Laboratory Buildings: Research labs will require primarily passenger elevators; however, at least one freight elevator with access to all floor levels will be required for each research building. One passenger elevator shall be designed as a freight elevator backup.

Elevator Speed and Type: Table No. 1 indicates the parameters for the selection of elevator speed and type. Electric traction-type elevators are preferred for passenger, service and hospital service applications. Hydraulic powered elevators may be considered for use where vertical travel is less than 14M, or where overhead clearance is limited.

Table No. 1
Elevator Speed and Type

Elevator Rise		Speed M/S (FPM), by elevator type		
Stops	Height M	Hydraulic	Geared	Gearless
2	< 4.6 (15)	.635 (125)	Not Applicable	Not Applicable
3	4.6 (15) to 13.7 (45)	.635 (125 Min)	Not Applicable	Not Applicable
4 to 7	< 27.4 (90)	Not Applicable	1.015 (200) 1.780 (350)	2.54 (500)
7 to 17	27.4 (90) to 54.9 (180)	Not Applicable	1.780 (350)	2.54 (500) 3.56 (700)
> 17	> 54.9 (180)	Not Applicable	See Note 1	See Note 1

Note 1: Consider separate high rise and low rise groups of passenger cars.

Elevator Lobbies and Groupings: Where four or more cars are required within a group, cars should be placed in opposite banks, opening into a common lobby. Where elevators are accessed from corridors, they shall be located on one side of the corridor only and shall be set back from the line of circulating corridors. Elevator ingress / egress should be from a distinct elevator lobby and not directly from a corridor. The lobby width between two banks of passenger elevators shall not be less than 3,600 mm or more than 4,200 mm. The lobby width between two banks of service elevators shall not be less than 4,200 mm or more than 4,800 mm. Care should be taken to avoid creating dead end lobbies in excess of life safety code requirements. Elevator lobbies generate noise and shall be acoustically isolated from critical care areas. Main elevator lobbies shall be separated from circulation corridors. Egress stairs shall be located adjacent to elevator lobbies.

Elevator Functional Separation: Traffic patterns shall be established to separate the various traffic types in an efficient, logical, safe and secure manner, while maintaining levels of aseptic control consistent with the requirements of the facility. A positive separation of passenger and service elevators shall be

provided. Provide separate clean and soiled material elevator facilities where required.

Size and Number of Elevators: The size and number of elevators required for a given facility depend upon various local conditions such as the size, type and location of the facility's functional areas, the density of the population, and the physical location of the elevator groupings, etc. The elevator installation for a given facility shall be estimated on the basis of anticipated local conditions and quality of service.

The anticipated population density figures shall be provided by the NIH and will be used for the purpose of designing the required transportation systems. However, in all cases the vertical transportation requirements shall be planned for the total population which the facility could reasonably house rather than be based on a forecast of initial occupancy.

Maximum Traffic Peak: This is the maximum percentage of the total population on the floors served by the elevators which must be handled during any 5-minute period. This maximum traffic peak will vary with the type of functional areas and special conditions applicable to the facility. The computations for vertical transportation equipment shall be based on transporting 10% to 14% of those persons who move between floors during periods of maximum demand in five minutes. The peak values, together with the population density factor, should provide a reserve capacity adequate to maintain satisfactory service during periods when one elevator is shut down for repairs.

Where groups of elevators serving identical floors are required to be furnished in two or more locations for the purpose of providing convenience of use, the elevators shall provide a minimum carrying capacity of not less than 120% of the maximum traffic peak.

Passenger and service elevators shall have the capability to handle their maximum peak loads while providing a satisfactory interval. A capacity and speed shall be selected that will require the fewest elevators to handle the peak loads with an acceptable interval. Where four or more passenger elevators are in a group, the interval shall be no greater than 45 seconds. Service elevators in a group shall have an interval of 60 seconds maximum. Where there are fewer than four elevators in a group, the interval shall be no greater than 45 seconds. For passenger elevators, except

special outpatient elevators or other special-purpose elevators, the most suitable car capacity is 1,800 kg. When separate service elevators are provided, they shall be 2,300 kg. capacity.

Hoisting Machines: Geared hoisting machines shall be used for elevators in buildings of 10 stories or less. Gearless machines shall be used for elevators in all buildings of 11 floors or more. The placing of hoisting machines in basement machine rooms adjacent to the hoist way shall be limited to special cases where conditions do not permit the installation of overhead machines.

Limited Rise Elevators: Oil-hydraulic and direct-plunger elevator equipment shall be considered for the limited-rise (four stops, approximately 15 m rise) and low-speed elevators. The machine room and pump unit shall be located adjacent to the hoist way at the lowest landing. All hydraulic type elevators will be required to have a nordic starter for the pump motor. All hydraulic elevators shall be equipped with scavenger pump to reterieve the waste oil.

The use of generator field or SCR control is appropriate for unlimited applications.

A single-wrap, geared-traction configuration shall be used for up to 1.8 m/s.

A double-wrap, or single wrap gearless-traction configuration shall be used with speeds of 2.0 m/s and greater. Roping shall be 1:1. Secondary sheaves shall be used with a secondary sheave area. All hydraulic elevators shall be equipped with emergency power outage car return controls.

Elevator Operation and Controls:

Special control and medical emergency service shall be provided in areas serving surgery, intensive care, emergency, patient care, and dietary usage. Each elevator bank serving these areas shall be provided with key operated emergency switches for hospital priority service. Provide these switches at each landing. This switch will cause the closest available car to bypass other calls in response to an emergency call.

An on-demand microprocessor system shall be provided for all elevator controls. Three or four car banks shall be group operation.

Controls shall operate properly with a 500 KHZ to 1300 MHZ radio frequency signal, transmitted at a power level of not less than 100 watts effective radiated power (ERP) at a distance of 1m. The equipment shall be provided with electro magnetic interference (EMI) shielding within FCC guidelines. Noise level rating to the elevator equipment and its operation shall not exceed 80 dBa in the machine room, measured 1m above the finished floor and 1 m from the equipment.

Elevator Capacity and Platform Design: Passenger elevators shall have 1,800 kg capacity, and a platform 2,400 mm wide by 1,900 mm deep. Service and patient elevators shall have up to a 1,800 kg capacity, and a platform 1,100 mm wide by 2,600 mm deep. Service and Patient elevators shall have up to a 2,300 kg capacity and a platform 2,000 mm wide by 2,600 mm deep. Platform size is to be evaluated relative to the type of patient travel and equipment requirements.

The maximum size of vehicles or other loads and the maximum weight of portable laboratory, medical or X-ray equipment should be determined before setting the elevator size and capacities. The maximum area allowed by the ASME/ANSI A17.1 Standard shall be used to develop the inside dimensions of car enclosures.

Elevator Cars: Car enclosures shall have no front and rear entrance or corner post, shall be of a single-entrance type, and shall be of standard design unless modifications are dictated due to special project conditions. Cab design shall be detailed on the project drawings. Materials for elevator cabs shall be selected so that the cart enclosures conform to ASME/ANSI A17.1.

Entrances: Passenger and hospital service elevators shall have single-speed, center opening doors. Two-speed side opening doors may be provided in hospitals with separate material handling systems. Door closing time must comply with ASME requirements. All elevators will be equipped with buttons to extend door opening time, adjustable between 0 to 30 seconds. All elevator car doors shall be provided with infrared screen detectors. The passenger elevator door width shall be: 1,200 mm standard. Service elevators shall have a width of 1,200 mm standard; a 1,500 mm width is optional if required by the facility's function.

Tamper-proof screws shall be used for all car and corridor fixture

plates.

Stainless steel entranceways shall be provided for service and patient elevators.

Raised lettering and other provisions required to assure accessibility to the handicapped shall be provided.

Signals: Hall push button stations will be provided with call register LED lights and shall be Adam's Survivor or Survivor Plus(As required in certain areas) series or approved equal. Hall lanterns with an audible signal will be installed on all elevators. Hall Position Indicators shall be designed visible from each side. Such as Central Elevator Electronics(CEE) designed on Adam Control Board for compatiablity with Swift Futura Controller. Car position indicators will be installed in each car with floor designations, a floor directory signal and direction arrows. . Car operating panels will use car register type floor rectangular buttons and shall be engraved with building and elevator number. Car operating panels shall be Adam's Survivor or survivor Plus (As required in certain areas.) series. A lobby control panel will be provided on elevator banks with two or more cars. Signal fixtures and gongs shall conform to the requirements of ASME/ ANSI A17.1 for use by the handicapped.

Seismic Design: Seismic protection shall be provided where required.

Emergency Power Supply: An emergency power supply shall be provided per ASME/ANSI A17.1 and tailored to the needs of the building.

The equipment specified shall depend upon the service demand and the equipment commercially available to meet that demand. Care shall be exercised to avoid specifying noncompetitive methods in features of elevator dispatching and control operation.

Door Operation: Power door operation shall be provided for all elevators. The door opening shall be capable of opening doors at the rate of .9m/s. This is a capability speed, with actual speed being adjusted to meet the requirements of the specific installation. The closing speed shall be set per ASME/ANSI A17.1. All power-operated doors shall be equipped with an automatic reopen device for passenger protection.

Elevator Car Enclosure: Car lighting will be either indirect or of the luminous ceiling type. Mechanical exhaust will be provided for elevator cars.

Hoist Machine: Geared and gearless hoisting machines shall be located directly above the hoist way in a machine room where practical by design. For speeds up to 0.5 mps, alternating-current, two-speed control system with a low-speed range from 0.15 to.2 mps. For car speeds of 0.8 mps and faster, generator field control system shall be provided. The hoisting machine and its control system shall be capable of stopping the car floor level within plus or minus 5 mm of hoist way doorsills. It shall also be capable of correcting for car overtravel, undertravel, and rope stretch. Car stopping shall be automatic and independent of operating devices.

Hoist ways shall be illuminated per ASME/ANSI A17.1.

Elevator Machine Rooms: Elevator machine rooms shall be large enough to install the elevator equipment, including space for controllers, safe clearances, for equipment maintenance, and ventilation; to provide sight lines for technicians; and to meet code requirements. Clearances for control equipment shall be no less than required by the National Electrical Code and shall provide enough working space between the various items of equipment for maintenance purposes. It must be possible to remove the major equipment components of each elevator for repair without dismantling the components of an adjacent elevator. Minimum headroom shall be 2,300 mm.

Air conditioning will be provided in elevator machine rooms to maintain ambient temperatures above 15 degrees centigrade and below 32 degrees centigrade. Provide a minimum of 100 CFM exhaust. Filters will be provided to remove dust.

All elevator machine rooms should be electronically and acoustically isolated to prevent interference from building electronic equipment and objectionably noises. Elevator machine rooms shall be acoustically separated from all critical care and occupied rooms.

Elevator machine room access shall conform to ASME/ANSI A17.1.

Stairs shall be provided for convenient access to machine rooms. Access to machine rooms should preferably not require passage

across a roof or similar exposed area.

Geared and gearless machines and motor generator sets shall be mounted on vibration-and sound-isolating devices. These isolating devices, when required, shall conform with seismic design requirements. Trap doors and hoisting beams shall be installed in all machine rooms to facilitate maintenance and removal of equipment for repairs.

Adequate lighting shall be provided to ensure proper illumination in the front and rear of all controllers, on supervisory and selector panels, and over each hoisting machine. Convenience outlets shall be provided for each elevator area within the machine room.

Access doors to secondary levels shall be "B" label and a minimum of 760 mm wide by 1,100 mm high. Each door shall be of the self-closing, self-locking type and shall have a cylinder lock that requires a key for entry only. Stairway and ladders to access doors shall be installed in compliance with ASME/ANSI A17.1.

Dedicated Elevators: Dedicated elevators may be considered for transportation of patients, staff, or material between two distinct points when the service is required to satisfy critical functional relationships which may not be satisfied by locating departments adjacent to each other. An example of such a critical relationship is the location of the surgical suite in relation to the intensive care unit. The controls of dedicated elevators shall prevent the frequent use of the elevators for other purposes.

B.4.2 Elevator Fire Protection (ANSI A17.1, NFPA 13 and 72)

Elevator fire safety arrangements shall meet the latest version of the ASME/ANSI A17.1 Elevator Code and NFPA 13 & 72. The requirements of these documents shall be supplemented by the latest General Services Administration (GSA) requirements for elevators and by the additional NIH requirements listed below.

Phase 1 Emergency Recall Operation (ANSI A17.1 - 211.3a)

A three position (OFF, ON, and BYPASS) key-operated switch for Phase I Emergency Recall Operation shall be provided only at the primary designated level and alternate level for each single elevator or group of elevators. The key shall be removable in the OFF and ON positions only. The switch shall normally be in the

OFF position. Operation of the three positions shall be as follows:

OFF Position - Restoration of normal elevator service to the elevator or group of elevators served by the switch.
ON Position - Recall of the elevator or group of elevators served by the switch to the designated or alternate level.

BYPASS Position - Allows the restoration of normal elevator service to all elevators served by the switch, regardless of elevator smoke detector(s) status.

The contractor shall provide Phase I Emergency Recall Operation and Phase II Emergency In-Car Operation key switches (which come with the installation of the elevators) for use during construction. After complete installation and before final acceptance by the Government, the contractor shall replace the aforementioned switches by installing Government furnished phase I Emergency Recall Operation and Phase II Emergency In-car Operation key switches. These Government furnished switches shall be tested by the Government during the final inspection and acceptance testing of the elevators.

Smoke Detectors (ANSI A17.1 - 211.3b)

Smoke detectors (multiple detectors where lobby areas are large enough to acquire them) shall be provided in each elevator lobby/ landing and in all elevator machine rooms. Smoke detectors shall NOT be installed at the top of the elevator shaft/hoistway.

The activation of a smoke detector in any elevator lobby/ landing, other than the designated level, or in any associated elevator machine room shall cause all cars in the group (common to the machine room or hoistway) to return nonstop to the designated level in conformance with the requirements of ANSI A17.1.

If the smoke detector at the designated level is activated, the operation shall conform to ANSI A17.1 except that the cars shall return nonstop to an alternate level approved by the NIH Fire Prevention Section.

Phase II Emergency In-Car Operation (ANSI A17.1 - 211.3c)

A three position (OFF, ON, and HOLD) key-operated switch for phase II Emergency Recall Operation shall be provided in all

elevator cabs. The key shall be removable in the OFF , ON and HOLD positions. The switch shall normally be in the OFF position. Operation of the three positions shall be as follows:

OFF Position - Automatically cause the elevator to return to the "designted level" for use by later arriving firefighters.

ON Position - Permits the firefighter to take control of the elevator overriding automatic operations.

HOLD Position - Allows the firefighters to remove the key and leave the car without danger of the car being taken to another floor.

The contractor shall provide Phase I Emergency Recall Operation and Phase II Emergency In-Car Operation key switches (which come with the installation of the elevators) for use during construction. After complete installation and before final acceptance by the Government, the contractor shall replace the aforementioned switches by installing Government furnished Phase I Emergency Recall Operation and Phase II Emergency In-Car Operation key switches. These Government furnished switches shall be tested by the Government during the final inspection and acceptance testing of the elevators.

Sprinklers in Machine Rooms (ANSI A17.1 - 102.2)

Sprinklers shall be provided in all elevator machine rooms in accordance with NFPA 13. Sprinkler heads shall be rated at 141°C and be equiped with sprinkler head guards. The temperature rating of the sprinklers in the machine room must be higher than the heat detectors (57.2°C). Sprinklers shall not be provided in elevator hoistways. Means shall be provided to interrupt power to the elevator driving machine upon activation of sprinklers in the elevator machine rooms.

Fixed-temperature (57.2°C) heat detectors shall be provided in each elevator machine room. Activation of a heat detector shall cause shunt-trip breaker(s) to disconnect the main line power to the affected elevator. The actuation of heat detector(s) shall cause a "supervisory alarm" on the building's fire protective signaling system, if provided. No heat detectors are required in the elevator hoistway. Heat detectors shall be placed within 0.61 meters laterally of each sprinkler.

A sprinkler system waterflow switch shall be provided for the elevator machine room sprinklers, it shall not be equipped with a time delay mechanism, and the waterflow switch shall not cause elevator power to shunt trip. Each sprinkler supply line serving elevator machine room (EMR) sprinklers shall be equipped with a supervised (tamper switch) O.S.&Y. control valve located immediately outside the EMR.

For buildings with a multiplex/ addressable fire alarm system, the interuption of power to the elevator driving machine upon activation of sprinklers in the elevator machine rooms shall be accomplished through the fire alarm system software. The elevator shall perform Phase I recall prior to the interuption of power.

B.4.3 Dumbwaiters

Codes: Dumbwaiters shall be designed in accordance with the latest edition of all applicable federal, state and local codes, including ASME/ANSI A17.1; electrical equipment and wiring with NFPA Standard 70, National Electrical Code; and Hoist way doors with NFPA Standard No. 252, Fire Test of Door Assemblies. Dumbwaiters shall not be located over occupied spaces as this will require counterweight safeties and reinforced pits.

Capacity and Speed: The dumbwaiter capacity shall not exceed 225 kg and its area shall not exceed 0.8 m^2. Speeds of dumbwaiters serving three to four floors shall be 0.5 mps; up to six floors, 0.8 mps; and seven or more floors 1.5 mps.

Operation: The Dumbwaiter shall be operated by means of dispatch and return program controls at the central station. Automation operations shall include cart loading and unloading transfer features, car and hoist way doors, car-floor leveling, and car return to central station.

Signals: A combination position indicator and hall lantern with gong shall be located above the entrance unit at the central station. A bank of buttons for dispatching the dumbwaiter to other floors shall be provided at the front opening of the central station. Each central station dispatching button fixture shall have an “In Use” and “Malfunction” signal light and a reset button for the

automatic transfer equipment. Hoist way openings at floors other than the central station hall have call buttons with hall-registration lights, cart-return lights, and remote-hall arrival lights with gongs located over entrance units.

Intercommunication System: A dedicated automatic intercom system shall be provided, including a master station at each floor served by the dumbwaiter.

Cars: The dumbwaiter car enclosure shall be stainless steel, 760 mm wide, 1,100 m.m. deep and 1,500 mm high. Stainless steel, vertical-sliding biparting car doors shall be provided at each car entrance.

Insolation of Material Handling and Transportation Systems: Chutes, pneumatic tubes, and vertical conveyors shall not be located adjacent to any acoustically sensitive space and shall be resiliently isolated from the building structure at each floor penetration by means of rubber-in-shear or glass-fibre isolators providing a minimum, static deflection of 10 mm, The exterior of each trash chute and large pneumatic tube shall be coated with a viscoelastic, vibration-damping compound or other damping material.

Wherever possible, other vertical and horizontal system~~s~~ run*s*, such as pneumatic tubes, conveyors, and monorails shall not be located adjacent to, over, or under any acoustically sensitive space. They shall be isolated from the building structure by resilient hangers, isolated support traps, resilient pads, or trapeze hangers and shall have no direct physical connection with the finished ceiling system of the space below. If the horizontal runs are routed over acoustically sensitive spaces such as private offices or examination and treatment rooms, the pneumatic tubes shall be coated with viscoelastic damping compound or other damping material, such as a 25 mm thick glass-fibre blanket, with an impervious outer covering, such as metal foil. Other pipe-sleeving material is available. These materials can be shop applied for the majority of the system run, with field application required only at the joints. If horizontal tube runs are routed over acoustically critical spaces, such as recovery, surgery, cardiology exam, or Intensive Care Unit (ICU), a suspended-ceiling system providing a sound isolation rating in the range of NIC 40 shall be required in addition to the resilient isolation of the service runs. Alternatively, these system runs can be boxed, encased, or wrapped with an impervious barrier material such as dense

plaster, gypsum board, or a 50 mm thick glass-fibre material (96 kg/m^3 density) or covered with an impervious outer wrapping such as reinforced leaded vinyl or sheet lead.

In addition to resiliently isolating the service from the building structure, the drive units, transfer or diverter units, and exhauster associated with each type of system runs shall also be isolated, as will the motors, pumps, compressors, and gear and drive assemblies.

B.5. Elevator Controls

B.5.1 Controller

All new elevator installations and upgrades to existing elevators Shall be equipped with the solid-state micro processor-based controller. These controllers are available to all elevator manufacturers and as such, do not constitute a sole source. The NIH, Division of Engineering Services, Public Works Branch has a program of updating all of the older elevators throughout the campus and will use controllers manufactured by either Computerized Elevator Controls (CEC Swift Futura or later version) or Motion Control Engineering (MCE performa controller or later version). MCE Hydraulic controllers are recommended for hydraulic applications.

B.5.2 DC-SCR Drives

All new elevator installations and upgrades to existing elevators using CEC equipment shall be equipped with DC silicone-controlled rectifier (SCR) drive in lieu of motor -generator sets. Either the Magnetek DSD412 or the Lewis-Allis Sabor SCR drive for elevator hoist motors is acceptable. Both of the above drives are available on the open market and do not constitute a sole source. MCE IMC controls require a new system 12 SCR drives and are acceptable. All above mentioned drives or latest version of any are acceptable for installation.

B.5.3 Fixtures

All new elevators fixtures shall be Adam's Survivor or Survivor Plus(As required in certain areas.) series panels engraved with building number, elevator number and LED illumination. The hall

stations will be engraved with the firestation information and shall be Adam's Survivor or Survivor Plus Series(As required in certain areas.) or approved equal.

Car operating Panels shall be Adam's Survivor or Survivor Plus Series, equipped with emergency lighting, digital position indicator, built in autodialer telephone with call tracking capability and fire fighter return service controls and signals. An integral floor announciator shall be provided to announce floor stops, car direction, nudging and Firefighter's return service and code blue in Hospital. Floor buttons shall be rectangular in shape with numerals and LED illumination. Car station shall be provided with a 120 V GFI recepticle and the following key switch arrangements:

- Inspection Key Switch Duo # 7320.
- Car Lighting Key Switch Duo # 7336
- Fan Key switch. Duo # 7336
- Independant Service Key Switch Duo # 7336
- Hall access Key Switch Duo # 7320

B.5.4 Safety Curtains

Safety curtains shall be waterproof Gatekeepers series 2000 infrared units or latest version by Adams.

B. 5.5 Door Operators

The new elevators shall be equipped with GAL door operators for standard and bi-parting freight doors.

Freight Elevators with horizontal doors shall be equipped with-Peele door operators.

B.6 Energy Conservation

B.6.1 Compliance with Executive Order 13123

All NIH facilities shall incorporate energy and water conservation features to comply with the requirements set forth in Executive Order (EO) 13123, Greening the Government Through Efficient Energy Management, dated June 3, 1999.

Sustainable Design Principles and Guidance: EO13123 required the General Services Administration (GSA) and the Department of Defense (DOD) to issue sustainable design and development principles for new construction. These principles and guidance are available and are currently being embedded in the "Whole Building Design Guide" Web site at

http:/www.wbdg.org

These principles and guidance shall apply to the siting, design and construction of new facilities at NIH, and to the greatest extent practicable, to those portions of existing facilities undergoing renovation or upgrade.

Life-Cycle Costs: Throughout the development of a project, life-cycle cost analysis shall be used in making decisions about which products, services, and constructions are utilized to lower the Federal Government's costs and to reduce energy and water consumption. Inefficient systems and equipment shall be retired on an accelerated basis where replacement results in lower life-cycle costs to the greatest extent practicable. All project cost estimates and budget activities for design, construction, and renovation of facilities shall be based on life-cycle costs. Facilities shall be designed and constructed to the lowest life-cycle cost whenever possible. This guidance is also included in the "Whole Building Design Guide" Web site.

Reducing Energy and Water Use in Federal Facilities: The Department of Energy (DOE) has issued guidelines titled "Performance Goals for Industrial, Laboratory, and Other Energy-Intensive Facilities" which shall be incorporated into the designs of all NIH facilities. These guidelines are available on the Web at .

http://www.eren.doe.gov/femp/aboutfemp/indust.html

Use of Energy Efficient Products: Design and construction documents shall incorporate requirements to encourage the use and purchase of ENERGY STAR® and other energy efficient products for all NIH construction projects. Additional information is available on GSA's Federal Supply Schedule Web site at

http://pub.fss.gsa.gov/environ/

B.6.2 General

Energy and water conservation features incorporated in the design shall not restrict or interfere with medical and laboratory functional requirements, cause a reduction in dependability of required services, or result in an inability to achieve environmental conditions required by other sections of these Guidelines.

B.6.3 Climate Factors

Climate data establishes performance requirements for the thermal design of the building. Overall composite heat transfer "U-values" and shading coefficients for glazing shall be used in conjunction with local climatology data to establish thermal performance requirements for NIH facilities. Insulation values may be altered when determined to be cost effective, utilizing life cycle cost analysis, for the given climatic conditions and building operating characteristics.

B.6.4 Solar Shading

Building orientation and shading shall be arranged, when practicable, to minimize solar cooling load and maximize winter daylighting. Solar shading may be accomplished by using solar-shading screens or baffles, recessed exterior windows, light-reducing glass, heat-absorbing tinted glass, reflective glass, insulating glass, adjustable blinds, or combinations of these materials to provide the most desirable, economic and aesthetic solution.

B.6.5 Building Envelope Design Factors

The design of building envelopes shall comply with criteria for thermal loss and gain as stated in the latest edition of ASHRAE Standard 90, Section 4.0; Building Officials and Code Administrators (BOCA) International Building Code, Article 31,

Energy Conservation; and the Code of Federal Regulations (latest edition of 10 CFR, Part 435, "Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings"). In applying ASHRAE Standard 90, the following design characteristics shall be used for all NIH buildings:

- **Windows:** All new windows shall be double-glazed with a continuous thermal break. Condensation should not be apparent on window glass when the indoor design temperature is 22^0C at 30% relative humidity.
- **Perimeter Insulation:** Perimeter insulation shall be provided inside all foundation walls to assure foundation walls are thermally isolated from concrete floor slabs. Perimeter and underfloor insulation shall be a closed cellular type to provide moisture resistance.

B.7 Interior Elements

B.7.1 Finishes Criteria

Finish materials are what the user sees, touches, walks on, etc. They therefore produce an immediate impact. Since the Interior Designer is required to make selections of finishes from the Federal Supply Schedule, products with specifications must be selected from the current contract schedule. All finishes shall be evaluated against such factors as space purpose, user needs, engineering limitations, maintenance factors, budget requirements, the applicable code and regulations, and the appropriate use of any particular material or combination of materials in the space.

B.7.2 Floor Treatments

In developing a finish schedule for floor coverings, the Interior Designer's selections should be influenced by an understanding of the specific use of the particular area. It is important that selections strike a balance among functional, aesthetic, and related cost requirements. Other design considerations must include observation of existing wear and/or damage patterns; the kind of equipment to be used in the area; the effect of wheelchairs and crutches upon the density and pile height of carpeting; and the necessity for biological levels of sanitation in areas such as intensive care or operating rooms, etc. Nonslip walking surfaces

shall be provided in all showers and tubs. The designer must consider the expiration dates of those contracts to assure availability at the anticipated time of ordering. All standard information about the manufacturer's installation instructions, fire ratings, static and acoustic characteristics, and the manufacturer's maintenance and stain removal techniques shall be a part of the Contract documents.

B.7.3 Wall Treatments

Wall treatments shall consider the use and purpose of the area any antimicrobial requirements; and reduction of an institutional look; the need to divide a space into visually separated areas; a special need for sound control; the limits set upon the materials necessary to meet applicable codes, regulations, guidelines, and policy. Specification requirements include but are not limited to the following. There shall be no double hanging of wall coverings. The Designer shall inspect the substrate to determine the need for any liners or other appropriate treatment to the substrate prior to installing finish and use edge beads at ceiling where needed. The Designer shall provide any installation guides, fire ratings, maintenance techniques, warranty, acoustic characteristics, and stain-removal techniques as part of the final construction documents.

Whereas the use of multicolored coatings reduces cost, improves maintenance, and saves restripping, the Designer must consider the area to which they are to be applied, since they contain odorous mineral spirits and therefore require adequate ventilation during installation.

B.7.4 Ceiling Treatments

Ceiling treatments shall be evaluated by the designer considering accessibility, acoustics, aesthetics and maintenance. Coordination with lighting fixtures, access panels, sprinkelers, diffusers and fire alarm devices shall be considered during design.

Where appropriate, lay-in acoustical ceiling tile in public areas shall be 2 feet x 2 feet x 3/4 inch regular edge (reveal edge) tiles. Public areas are defined as lobbies, elevator lobbies, cafeterias and

corridors used by the general public, patient room corridors and other areas as determined by the Facilities Engineering Branch/ DES. Unless otherwise stated, all ceiling tiles shall be the NIH standard.

Layout ceiling tiles symmetrically so that tiles and grid members retain modular dimensions.

Ceiling-mounted accessories secured through the ceiling to secondary support members is mandatory. Secure suspended heavy equipment or equipment tracks to independent structural assemblies attached directly to the structural floor and roof framing members overhead.

When acoustic treatment is required in the presence of high levels of moisture, use mylar-faced acoustic tiles.

Provide maximum accessibility in corridor ceilings to the mechanical and electrical distribution systems above. Do not use concealed-spline ceiling systems requiring special tools to lower tile assemblies. Color-code the access panels into ceiling plenums with tabs to identify the type of utility present.

B.7.4 Window Treatments

A window treatment is an important element in the overall design solution. Successful window treatment choices must satisfy both functional and aesthetic requirements for the space.

During predesign programming, the Interior Designer must make observations to determine the direction of the source of natural light; the effects of natural light on the user throughout the day; requirements for filtering, blocking, or redirecting light; the effect of natural light in fading of fabrics and carpets and upon heating and cooling; the requirements for use of a video monitor, etc.

The NIH seeks to standardize and reduce drapery fabric selections to no more than two neutrals per building. Since standardization per building is an ongoing process, the designer must check with the NIH Division of Engineering Services, Facilities Engineering Branch, before making selections. Both draperies and blinds are on

General Services Administration Federal (GSA); therefore the Designer must assure that their design library is current and that selections consider contract expiration dates in anticipation of future ordering dates.

B.7.5 Laboratory Casework

Basic components follow the NIH Laboratory Casework Specifications, which are available from the NIH Division of Engineering Services. All casework shall match Federal Standard color #27769. If desired drawer fronts may be accent colors #21136 "Red", #25109 "Blue" or #30045 "brown".

B.7.6 Work Stations

In addition to following standard design procedures for product and component selection, particular attention shall be paid to providing supplementary space outside the workstations for general, shared use (i.e., conference, library, fax, copier, or other related equipment). All power, telephone, and computer outlets shall be provided well in advance of the furniture installation to give technical installers time to provide necessary services. Installation follow-up by the Designer is vital to the overall success of the project. Documentation must include but is not limited to scaled drawings which indicate panel and component locations, accessories, and seating and a component list of parts to be made a part of the NIH computer data base. This is necessary for future reconfiguration of workstations.

The interior designer must coordinate design decisions with architects and engineers of the design team to resolve such issues as telephone, electrical, local area networks, and ventilation. It is recommended that systems workstation design be in generic form since procurement regulations presently require presentation to Unicore (Federal Prisons Industry) for their review, production, or waiver.

B.7.7 Interior Finish Requirements for Prefabricated Furniture Panels

The flamespread requirements of the *Life Safety Code* are to be applied to prefabricated panel furniture systems when such panels are ceiling high or extend sufficiently close to the ceiling so that the larger space divided by the panels is considered to be multiple rooms.

The flamespread requirements of the *Life Safety Code* are not to be applied to prefabricated panel furniture systems when such panels do not sufficiently extend close to the ceiling so that the larger space divided by the panels is considered to be a single room.

The application, or nonapplication, of flamespread requirements to prefabricated furniture panels does not override any requirements concerning the combustibility of the panels as may be governed by other Standard.

B.7.8 Vision Panels (Lites) in Doors

Vision panels should be provided in all doors where someone could be struck by a door opened suddenly from the opposite side. Specifically, all doors crossing corridors or enclosing stairways shall be provided with vision panels. Individual offices, laboratories, or spaces where privacy may be needed do not require vision panels but may have translucent glass panels to admit light without permitting vision. Other spaces may have vision panels when coordinated with user requirements. Vision panels shall not be provided in doors to toilets, bedrooms, and examination rooms. See Clinical Center Guidelines for additional locations which require vision panels.

There is usally no limit to the size of a vision panel in a door unless it is a rated fire or smoke barrier door. In rated fire and smoke barrier doors, vision panel size, placement and glazing materials are required to comply with minimum NFPA requirements.

The dimension from the latch edge of the door to the nearest edge of the vision panel shall comply with minimum NFPA requirements, regardless of whether the door is required to be fire/ smoke rated or not. These measurements are to the visible glass edge and not to the edge of the opening which is cut in the door.

See Clinical Center Guidelines for vision panel dimensional requirements specific to that facility.

In the case where the door with a vision panel is limited in size to 64,500 mm^2 a , 100 mm by 645 mm vision panel shall be used.

Where panic hardware is installed on a door and the lower edge of the vision panel is below the mounting height of the panic hardware, glass shall be safety glazed.

B.7.9 Interior Signage and Graphics

Signage: All interior signage shall comply with NIH guidelines as defined in the NIH *Interior Signage Users Manual* and in conformance with the Clinical Center, Art and Signage Program.

Room Numbering: The room-numbering and room-naming system for the identification of all spaces for new projects is determined by the NIH Division of Space and Facility Management (DSFM), Space Planning Branch. The Architect/Engineer shall submit plans to DSFM for review and approval prior to the beginning of construction documents.

B.7.10 Equipment and Furnishings

Design: Equipment plans shall be developed as building systems and be integrated with the planning of architectural, structural, mechanical, and electrical systems. Equipment shall be arranged and organized so as to provide adequate circulation, work flow, and maintenance clearances.

Equipment Groups: The following are definitions of equipment by groupings:

Group 1	Contractor Furnished, Contracted Installed
Group 2	Government Furnished, Contractor Installed
Group 3	Government Furnished, Government Installed
Group 4	Movable Equipment and Furnishings

Catalogue Cut Sheets: An appropriate catalog cut sheet(s) shall be provided for all items of equipment having a logistical category and

code and for any items having unique utility requirements, structural support or space requirements. GSA catalogues shall be referred to for procurement wherever possible.

Layout and Clearances: Equipment shall be arranged to provide service clearances and maintenance access with minimum disruption to work spaces. When expansion is anticipated in a project, the Designer shall allow for the addition of equipment without disruption or reconfiguration of work flow in the layout of sterilizing and sanitizing equipment spaces.

Floor Preparation: Floor depressions shall be provided to accommodate cart washers, floor-loading sterilizers, radiographic electrical raceways and environmentally controlled room equipment, walk-in refrigerators, audiometric suites, computer rooms, high-density shelving, and any other appropriate space except in laboratory spaces where future flexibility is a requirement.

Structural Support: Wall-partitioning systems for toilet accessories, physical therapy equipment, radiographic equipment, hanging supply carts, and other items of wall-hung equipment shall be adequately reinforced. All fixed equipment shall be mounted to resist seismic forces in accordance with seismic levels.

Recessed Equipment: Surgical storage consoles, wall-mounted panels, and accessories in operating rooms shall be flush mounted for aseptic control.

Special Ventilation Requirements for Equipment: Control of ventilation for the employee working environment must be provided in accordance with the latest edition of the Occupational Safety and Health Act of 1970.

Dust and debris collection shall be provided for locations where generated. Exterior air supply, exhaust with filtration, and dust containers must be provided.

The Architect/Engineer shall develop equipment specifications for all equipment that does not have current guide specifications. All equipment specifications should permit procurement of the latest

model of equipment through GSA services where possible. All equipment specifications should accommodate reputable vendors. Equipment specifications, shall discuss the scope of services to be provided by mechanical and electrical contractors for installing Government-furnished equipment.

Sterilizing Equipment: The use of an equipment consultant with knowledge of sterilizing equipment is recommended. Particular emphasis should be placed on the selection of ethylene oxide sterilizer due to codes and changing regulatory requirements. All ethylene oxide sterilizers applications shall be reviewed and approved by the NIH Division of Safety.

Dental Equipment: Various models of dental radiographic units require different structural wall supports. When two or more units are installed in the same room, a single control unit shall be used when feasible.

High-Technology Equipment: The planning for and inclusion of new or unique medical technology, such as linear accelerators, positron emission tomography and lithotripsy, require special consultants. Project-specific guidance on equipment of this category should be obtained. The design shall be in accordance with the selection and guidance of the respective manufacturers.

Magnetic Resonance Imaging (MRI) Facilities: The planning, design, and installation of aN magnetic resonance imaging (MRI) system for a medical treatment and research facility requires extreme care to assure that the magnet is sufficiently isolated from ferromagnetic and radio frequency influences of the impacted environment and that the surrounding environment is isolated from the effects of the magnetic field. Therefore, the selection of the proper location for the magnet is extremely important and shall be addressed in the earliest stages of the planning and design of the MRI system. The specific guidance of the manufacturer of the selected equipment shall be followed. Consultants should be used to verify specific requirements.

Equipment Consultants: Equipment consultant's are recommended to define and specify the hospital and research equipment required for procurement. They shall also provide

information on equipment during the design and construction document phases to assist the Architect/Engineer in planning and documentation

B.8 Loading Docks and Receiving Elements

B.8.1 Loading Docks

Roadways leading to loading docks and adjacent tarmacs must be of sufficient size to accommodate varied sized vehicles up to and including those in the tractor-trailer class. Tarmac lighting should be a minimum of two foot-candles, tarmacs on grade must have wheel chocks available which meet OSHA requirements, and adequate short term parking should be available for courier service vehicles. In addition to allowing area for a trash compactor, a minimum of two loading berths should be provided. Loading berths should be equipped with hydraulic load levelers, and at least one berth should be equipped with a hydraulic scissor lift capable of carrying a two ton load as a minimum. In addition to protective metal dock plates at the edge of the dock, commercial-grade dock bumpers (shock-absorbing and of pliable rubber design) should be mounted under load levelers. Loading dock designs must allow materials to be protected from inclement weather conditions while loading/unloading vehicles. A walk ramp with a gentle grade should be provided near the loading berths to allow for small deliveries via light-weight equipment such as two-wheeled hand trucks or four-wheeled platform trucks. A “house” telephone should be available on the loading dock, an loading dock size must allow for the safe maneuver of loading/unloading equipment such as pallet trucks.

B.8.2 Access Into and Within Buildings

Passageways leading from the loading dock to the freight elevator should be as direct as possible. Passageway design must include epoxy-coated, hard-surfaced flooring. Passageway walls must include protective bumpers not less than eight inches from floor level and at a height of 30 inches from floor level. All outside corners in passageways must be protected. Passageway doors must be protected with bummers, and for safety reasons, doors must include non-glass windows which allow passageway users to see

traffic on the opposite side of the door. Freight elevators must be available for delivery of mail and print materials to NIH customers located within the building. Entrance to freight elevators should be from the materials passageway, and not from the lobby. Lighting within passageway should not be less than 50 foot- candles.

B.8.3 Mail Cluster Box Systems

DSS requires the use of mail cluster boxes in lieu of door-to-door mail services as part of all major renovation and new construction projects, and as part of acquiring new lease space. These units will be used for delivery of mail to NIH customers in the building. Mail cluster boxes must be installed at a ratio of one per every 50 building occupants. Mail cluster boxes should be centralized in the building lobby, but may be decentralized to a single location on each building floor when approved by the DSS . Cluster boxes must be wall mounted, front loading units with rear covers. Each unit must be not less than eleven (11) inches wide, twelve (12) inches high, and sixteen (16) inches deep. Each cluster box must be marked with self-adhesive numbers to identify the recipient's mail stop code (MSC) which will be directed by the DSS. The construction of cluster boxes must meet or exceed US Postal Service specifications. Each cluster box door must be secured with a cylinder cam lock, each keyed individually and master keyed for DSS use. Three keys must be provided for each cluster box. The exterior surface of cluster boxes should not detract from building aesthetics. Exceptions to style/type cluster boxes (electronic, rotary, rear loading, etc.), occupant/box ratio, and location of mail cluster boxes may be granted by DSS when thoroughly justified and warranted.

Two secured mail drop boxes are required at each mail cluster box bank to support outgoing mail services. One will be used for outgoing interoffice mail, and the other for outgoing official mail. Drop boxes should be wall mounted, front loading units and have a rear cover. The interior of these mail drop boxes should be sized not less than eighteen (18) inches wide, thirty (30) inches high, and eighteen (18) inches deep. Each drop box must have a mail slot protected with a gravity or spring-loaded flap sized not less than fifteen (15) inches wide and four (4) inches high. These drop boxes must be secured with cylinder cam locks, and be master keyed (2

keys required) for DSS use. Drop box construction must meet or exceed US Postal Service specifications. At each location, one box must be marked “Interoffice Mail,” and the other marked “Office Mail.” The exterior surface of these drop boxes should not detract from building aesthetics.