



U.S. Department  
of Veterans Affairs

Office of Construction & Facilities Management

# designmanual

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## Architectural Design Manual





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## GLOSSARY OF ACRONYMS

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### 1.1 INTRODUCTION

Health care facilities encompass a wide range of types, from small and relatively simple medical clinics to large, complex, and costly, teaching and research hospitals. Large hospital medical centers may include various subsidiary healthcare facilities that are often co-located on a single campus. The old expression, "You never get a second chance to make a good first impression" applies to health care facilities. VA medical facilities convey a message to patients, visitors, volunteers, vendors, and staff that the mission is to help veterans by providing health care in all its forms, as well as for medical research.

The foundation of our mission in designing facilities for our nation's veterans is based on the VA Core Values:

- **Compassion:** We will design facilities that treat all veterans and their families with the utmost dignity and compassion. These facilities will provide services in a caring manner, with a sympathetic consciousness of others' distress together with a desire to alleviate it, and understanding that Veterans have earned our nation's gratitude and respect. Their health care needs to drive our actions.
- **Excellence:** Each VA facility shall strive to perform at the highest level of professional competence and take pride in our accomplishments.
- **Professionalism:** Our success depends on maintaining a highly-skilled, diverse, and compassionate workforce. We foster a culture that values equal opportunity, innovation, and accountability.
- **Integrity:** We recognize the importance of accurate information. We practice open, truthful, and timely communication with veterans, employees, and external stakeholders. By carefully listening and responding to their concerns, we seek continuous improvement in our programs and services.
- **Accountability:** We will perform in a manner at all times that makes us accountable, responsible and answerable to veterans and their families, our leaders and other employees as well as external stakeholders.
- **Stewardship:** The architect must ensure in the design responsible stewardship of the human, financial, natural and cultural resources as well as data and information entrusted to them in meeting the goals and mission of the VA. Each facility planned and designed must improve these performance measures through the use of innovative technologies, evidence-based medical practices, and sound business principles.
- **Design Intent:** The facility's design communicates a visual impression about the organization and the medical care being provided there. These visual clues start at the approach to the facility, the drop-off area, the parking facilities, and the street signage. The message should convey a sense of welcoming, caring, comfort, and compassion, and commitment to patient well-being and safety, where stress is relieved, refuge is provided, respect is reciprocated, competence is symbolized, way-finding is facilitated, accommodating all who utilize the facility. Likewise these attributes also influence employee service attitudes and behaviors. Finishes, signage, and artwork must be carefully selected, well-coordinated, and integrated. Security can

be balanced with some features apparent to patients/visitors, while conveying a message of safety. Thoughtful design can help ensure the proper first impression is created and sustained.

- The Department of Veterans Affairs (VA) owns, leases, and operates a nationwide system of healthcare facilities dedicated to serving veterans of U.S. Military Services. VA's infrastructure encompasses billions of dollars of total value and the average age of its buildings is approaching 60 years.
- The Architectural Design Manual (ADM) is the starting point for all design professionals engaged to work on any building design for VA. This Manual not only identifies VA's design philosophy and recent technological enhancements but also helps the designer to locate specific information for any building type or technical requirement.

### 1.2 PURPOSE

The purpose of this manual is to serve as the master reference document for architectural planning and design of Department of Veterans Affairs (VA) facilities. Architectural requirements and criteria in this manual are expected to be followed in planning of VA facilities.

Architect/Engineer (henceforth referred to as the A/E) engaged in the design and renovation of the VA facilities are required to follow this manual. VA facilities are defined as:

- New Hospitals
- Replacement Hospitals
- Ambulatory Care Centers – Hospital Based
- Clinical Additions
- Energy Centers
- Outpatient Clinics
- Animal Research Facilities
- Laboratory Buildings

It is expected that architectural components, elements and facilities designed with the use of this manual will meet their primary objective of providing a safe and functional healing environment for patients, staff and visitors. The Architectural design shall meet all VA Space Planning Criteria, VA Design Guide and Design Manual requirements, applicable codes, technical requirements, as well as being well coordinated with other trades and disciplines.

Deviations can be made from the requirements of this manual to accommodate new concepts, methods of construction and design enhancements. Such deviations shall be approved by the VA. Deviations not permitted from those requirements included Federal Regulations, Public Laws, Executive Orders, and other applicable codes and standards.

Throughout this manual, the statement is made: to obtain approval from the VA Authorities. The VA Authority is defined as the VA Project Manager or the local VA Medical Center's Chief Engineer.

### 1.3 HOSPITAL BUILDING SYSTEM (VAHBS)

VA policy on the design of new hospital buildings is to provide for their continuing adaptability to changing conditions and programs throughout their structural life.

The VAHBS concept described in VA Office of Construction Research Study Report (Red Book), Project No. 99-R047 (U.S. Government Printing Office Stock No. 051-000-00 112-5), provides such adaptability. All new and replacement VA hospital buildings shall use the VAHBS system. Consideration should also be given to this system for major additions to existing hospitals where future adaptability is an important factor.

### 1.4 INTEGRATED DESIGN PROCESS (IDP)

#### Overview:

VA is a proponent of the Integrated Design Process. IDP a project delivery method, following closely upon the heels of CM-at-large, Design/Build, and LEAN construction. But IDP goes beyond these other delivery methods in that it binds the parties into a contractual arrangement where risk and reward are truly shared. IDP, also, goes well beyond typical collaboration and team building efforts.

Preparation for a project is led by VA who identifies the need for building on the basis of quantifiable requirements for space and budgetary capacity to undertake the activity. A needs assessment accompanies this planning activity—it describes space use; develops estimates of requirements both spatial and technical; initiates assessment of possible environmental impacts, and arrives at a Program for Design (PFD) around which design activity can develop.

#### Pre-Design:

- **Schematic Design:** Once the Pre-design activities are complete and an A/E is selected as the Design Team, the **Schematic Design Phase** commences. The A/E design team produces initial graphic alternatives/options/scenarios for the project or portions of it. These are meant to stimulate thought and discussion, not necessarily describe the final outcome.

Involvement of all members of the Project Design Team, Owner, Users, A/E, and other consultants, is a critical part of the process at this stage - their individual insights made at this point can prevent costly changes further along in the process. Environmental impact assessment (EIA) and consultation with regulators and affected parties at this stage of the process helps identify alternative scenarios and potential impacts on the environment to be resolved through design. Gradually a design emerges which embodies the interests and requirements of all participants while also meeting the overall area requirements which the project budget established during Pre-Design activities. The resulting Schematic Designs produced at this stage show site location and organization, general building shape, space allocation, and an outline specification which makes an initial list of components and systems to be designed and/or specified for the final project design. It is often useful to have a cost estimate performed by a professional cost estimator at this point. For smaller projects, one or more possible building contractors may perform this service as part of a preliminary bidding arrangement.

- **Design Development** enlarges the scale of consideration—greater detail is developed for all aspects of the building—the collaborative process continues with the architect in the role of facilitator for the various contributors. Greater detail is achieved for all aspects of the building. The conclusion of this phase is a detailed design on which all players agree and may be asked to sign off. By the end of this phase, compliance with the National Environmental Policy Act and, where relevant, the National Historic Preservation Act should be complete, resulting in the incorporation of measures to minimize unnecessary negative impacts on significant aspects of the built and natural environments.
- **Contract Documentation:** The Development of Contract Documents involves translating the Design Development information into formats suitable for pricing, permitting, and construction. Contract document quality can be achieved by scrutiny, accountability to the initial program needs by the design team and the client, along with careful coordination among the technical consultants on the design team. Decisions continue to be made with the appropriate contributions of all team members. Changes in scope during this phase become more expensive due to the extensive level of documentation that may need to be adjusted due to the change and if project pricing has commenced. Cost estimates by an estimator may be made at this point, prior to or simultaneous with bidding, in order to assure compliance with the budget and to check the bids. Bids taken at this point may be used as a basis for selecting a builder.

After the award of the project to the general contractor the architect and other members of the team must remain fully involved. Decisions previously made may require clarification; suppliers' information must be reviewed for compliance with the Contract Documents; and substitutions must be evaluated. If changes affect the operation of the building, it is especially important that the user/client be involved. User requirements may change, necessitating changes in the building—these changes require broad consultation among the consultants and sub-consultants, pricing, and incorporation into the contract documents and the building.

The design team is responsible for assuring that the building meets the requirements of the Contract Documents, but the building's success at meeting the requirements of the original program can be assessed by the construction management team or third parties in a process known as Commissioning. A full range of functions in the building should be evaluated and the design and construction team can be called upon to make changes and adjustments as needed.

The architect acts as the lead designer coordinating the consultants, assuring compliance with the PFD, and assuring compliance with the budget. The architect participates in the construction phase of the project, assessing compliance with the contract documents by managing appropriate inspections, submissions approvals, and evaluations by the sub-consultants. The architect assists in the evaluation of requests for payment by the builder and other professionals.

- **Performance Measures and Functional Objectives:** The A/E shall ensure the design supports quality based performance measures for customer satisfaction, energy consumption, control of impacts on the built and natural environment, and reduced operations and maintenance. The A/E shall also identify all functional

expectations and establish alternative features that support attainment of those expectations. To the maximum extent possible, the A/E shall apply those architectural and engineering elements that optimize building performance and functional capabilities.

A landscape architect should be involved early in the project to assess natural systems, and how they will be affected by the project and the best ways to accommodate the project to those systems.

The Civil Engineer is essential for understanding the land, soil, and regulatory aspects of any construction project; early involvement is essential. The civil engineer prepares contract documents and assesses compliance of the work with the contract documents.

The Structural Engineer's duty is to provide safe designs. Typically, the Structural Engineer is responsible for the structural design of the overall project, including specification of the design loads, seismic and wind loading design, progressive collapse analysis, etc. The structural engineer prepares contract documents and assesses compliance of the work with the contract documents

Mechanical and Electrical Engineers can be engaged by the architect as part of his work or, on larger or more complex projects, may be engaged separately by the VA. They are responsible for the heating, ventilating and air-conditioning and the power, signal, and illumination aspects of the project. Each produces portions of the contract documents and should be involved in assessing their part of the work for compliance with those documents.

Specialized Consultants such as medical equipment planners, material management and vertical transportation consultants and environmental and historic preservation consultants should be involved as required by the special requirements of the project. These may include specifications writers, materials and component specialists, sustainability consultants, and technical specialists with expertise in food service, audio-visual, materials handling, historic preservation, and parking design. The size, complexity, and specialization of the project will suggest the kinds of additional experts who will be needed. Like all contributors to the integrated design process, they should be involved early enough to include their suggestions and requirements in the design, not so late that their contributions must be remedial.

After the facility is fully operational, a Post Occupancy Evaluation (POE) also known as a Facility Performance Evaluation (FPE) should be engaged no earlier than twelve months after the facility is commissioned as operational to assess how the building meets the original and emerging requirements for its use. Such information is useful for VA when additional construction of the same type is contemplated. Mistakes can be prevented and successes repeated.

This summary describes the standard operation of the integrated project team. But it depends on:

- clear and continuous communication
- rigorous attention to detail
- active collaboration among all team members throughout all phases of the project

## 1.5 BUILDING INFORMATION MODELING (BIM)

BIM is an integrated database of coordinated information to which many participants in the design process contribute. VA requires the design team to utilize the BIM tool in designing VA facilities. BIM modeling provides for continuous and immediate analysis of project design, scope, schedule, cost information and other matter. BIM identifies and enhances design documentation and brings numerous attributes and benefits such as:

- Higher quality of work performance
- Better coordination among design and engineering disciplines
- Costs savings in the design and engineering work
- Increased speed of delivery

Supporters of such model based technology indicate that the globalization of the design process especially on large projects is forcing increased efficiency. Speed to market issues is forcing new means of collaboration including advanced design build models and more sophisticated use of internet project management. BIM is at the forefront of this movement and is viewed by many as an important tool of change and competitive advantage for design professionals.

BIM enhances the collaborative process of design and engineering. It provides an integrated database of coordinated information among the contributors to the design and engineering of a building. In addition to graphically depicting the project, BIM offers key information about the building that can be used to analyze its performance. The use of coordinated, consistent, computable information results in a reliable, digital representation of the building that can be used during the design decision process, production of contract documents, planning and building performance. BIM allows information to be kept up to date and accessible to architects, engineers, contractors and others.

## 1.6 SUSTAINABLE DESIGN

The Federal Government has issued three Federal Mandates (one law and two Executive Branch policies) for Executive Branch agencies that outline sustainable and energy goals. In addition, on March 30, 2007 VA signed a *Green Buildings Action Plan* that provides guidance for compliance.

The VA Sustainable Design Manual is the agency's guidance to define a methodology to achieve these Federal Mandates. The Manual provides guidance in incorporating sustainable design on every phase of a project, from proposals, goal setting, and preliminary planning through design and construction for projects of all sizes. Recognizing that each space acquisition project is unique and will require different strategies, all projects are, nevertheless, required to meet the Federal Mandates as appropriate given the project scope and budget.

### 1.6.1 OPTIMIZE ENERGY PERFORMANCE

- **Energy Efficiency:** Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the Energy Star® targets for new construction and major renovation where applicable. For new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American



Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 building performance baseline.

- **Measurement and Verification:** In accordance with DOE guidelines issued under section 103 of the Energy Policy Act of 2005 (EP Act), install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. Compare actual performance data from the first year of operation with the energy design target. After one year of occupancy, measure all new major installations using the Energy Star® Benchmarking Tool for building and space types covered by Energy Star®. Enter data and lessons learned from sustainable buildings into the High Performance Buildings Database.

### 1.6.2 PROTECT AND CONSERVE WATER

- **Indoor Water:** Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.
- **Outdoor Water:** Use water efficient landscape and irrigation strategies, including water reuse and recycling, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design and construction strategies that reduce storm water runoff and polluted site water runoff.

### 1.6.3 EXECUTIVE ORDER 13514, REDUCTION OF GREENHOUSE GASES

This Executive Order requires agencies to measure, manage, and reduce greenhouse gas emissions toward agency-defined targets. It describes a process by which agency goals will be set and reported, additionally the Executive Order requires all Federal agencies to meet a number of energy, water, and waste reduction targets, including:

- 30% reduction in vehicle fleet petroleum use by 2020;
- 26% improvement in water efficiency by 2020;
- 50% recycling and waste diversion by 2015;
- 95% of all applicable contracts will meet sustainability requirements;
- Implementation of the 2030 net-zero-energy building requirement;
- Implementation of the storm water provisions of the Energy Independence and Security Act of 2007, section 438, and;
- Development of guidance for sustainable Federal building locations in alignment with the Livability Principles put forward by the Department of Housing and Urban Development, the Department of Transportation, and the Environmental Protection Agency.

It is the intent and responsibility that all A/E's designing projects for the VA whether they be minor or major in scope meet the goals of this Executive Order to reduce costs, reduce air and water pollution, and utilize clean energy. Implementation of the Executive Order will focus on integrating achievement of sustainability goals with agency mission and strategic planning to optimize performance and minimize implementation costs.

Implementation will be managed through the previously-established Office of the Federal Environmental Executive, working in close partnership with Office of Management and Budget (OMB) and Council on Environmental Quality (CEQ).

U.S. Department of Energy has developed a series of initiatives to more broadly implement cool roof technologies on U.S. Government Facilities and Buildings. Cool roofs use lighter-colored roofing surfaces or special coatings to reflect more of the sun's heat, helping improve building efficiency by reducing cooling costs and offsetting carbon emissions.

**Cool roofs** are one of the quickest and lowest cost ways to reduce the global carbon emissions. By demonstrating the benefits of cool roofs on our VA facilities, and can lead the nation toward more sustainable building practices, while reducing the federal carbon footprint and saving money for taxpayers.

Roofs and road pavement cover 50 to 65 percent of urban areas. Because they absorb so much heat, dark-colored roofs and roadways create what is called the "urban heat island effect," where a city is significantly warmer than its surrounding rural areas. Cool roofs significantly reduce the heat island effect and improve air quality by reducing emissions. A recent DOE initiative ([Read Secretary Chu's memorandum](#)) indicates that using cool roofs and cool pavements in cities can help reduce the demand for air conditioning, cool entire cities, and potentially cancel the heating effect of up to two years of worldwide carbon dioxide emissions.

### 1.6.4 ENHANCE INDOOR ENVIRONMENTAL QUALITY

The A/E shall implement and comply with the VA Green Buildings Action Plan: Implementing the Memorandum of Understanding on Federal Leadership in High Performance and Sustainable Buildings, dated February 28, 2006.

- **Ventilation and Thermal Comfort:** Meet the current ASHRAE Standards, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality.
- **Moisture Control:** Establish and implement a moisture control strategy pursuant to ASHRAE Standards 55-2004 and 62-2004 for controlling moisture flows and condensation to prevent building damage and mold contamination.
- **Day-lighting:** Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.
- **Low-Emitting Materials:** Specify materials and products with low pollutant emissions, including adhesives, sealants, paints, carpet systems, and furnishings.
- **Protect Indoor Air Quality during Construction:** Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with

maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.

### 1.6.5 REDUCE ENVIRONMENTAL IMPACT OF MATERIALS

- **Recycled Content:** For EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations. For other products, use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.
- **Bio-based Content:** For USDA-designated products use materials meeting or exceeding USDA's bio-based content recommendations. For other products, use bio-based products made from rapidly renewable resources and certified sustainable wood products.
- **Construction Waste:** During a project's planning stage, identify local recycling and salvage operations that could process site related waste. Program the design to recycle or salvage at least 50 percent construction, demolition and land clearing waste, excluding soil, where markets or onsite recycling opportunities exist.
- **Ozone Depleting Compounds:** Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with Title VI of the Clean Air Act Amendments of 1990 or equivalent overall air quality benefits that take into account life cycle impacts.

### 1.6.6 PRIORITY TO RENOVATION OF EXISTING FACILITIES.

- If not inconsistent with mission needs, priority should be given to the renovation of existing buildings and other facilities over new construction. Renovation saves energy and physical resources and is often more cost-effective than new construction.
- Where historic buildings or building complexes are present, special efforts should be made to rehabilitate and reuse them in accordance with the National Historic Preservation Act of 1966, as amended, provided doing so achieves VA's mission requirements.

## 1.7 ACCESSIBILITY

Refer to the *TIL - Accessibility (PG-18-13)*

## 1.8 PHYSICAL SECURITY

### 1.8.1 OVERVIEW

VA facilities that are owned, leased, or managed; to be constructed or modernized; or to be purchased shall have countermeasures designed into the facility's infrastructure to abate potential threats.

### 1.8.2 CONSIDERATIONS

- Providing for secure design that meets all facility requirements is often a challenge. With limited resources, it is not always feasible to provide for the most secure facility, architecturally expressive design, or energy efficient building envelope. From the planning and concept stages through the development of construction documents, it is important that all project or design stakeholders work cooperatively to ensure a balanced design. Successful designs must consider all competing design objectives and make the best selections.
- Care should be taken to implement physical security measures that allow Fire Protection forces access to sites, buildings and building occupants with adequate means of emergency egress.
- Consideration should be given to integrating various stand-alone security systems, integrating systems across remote locations, and integrating security systems with other systems such as communications, and fire and emergency management.

Refer to the *TIL – Physical Security Design Manual*

### 1.9 SEISMIC AND OTHER NATURAL HAZARDS

Consideration should be given to seismic and blast resistant design as they share some common analytical methodologies and a performance based design philosophy that accepts varying levels of damage in response to varying levels of dynamic excitation. Both design approaches recognize that it is cost prohibitive to provide comprehensive protection against all conceivable events and an appropriate level of protection that lessens the risk of mass casualties can be provided at a reasonable cost. Both seismic design and blast resistant design approaches benefit from a risk assessment that evaluates the functionality, criticality, occupancy, site conditions and design features of a building. Weather related (hurricane and tornado) protection requires blast resistant design. Blast resistant façade systems require the glass to satisfy the debris hazard conditions in response to the specified blast loading, while the mullions and anchors are required to resist the collected forces within the specified deflection and ductility limits. In addition to resisting the specified blast loads, the criteria often require the designer to consider the damages resulting from a more extreme blast loading. The criterion requires a balanced design, for which the mullions must develop the capacity of the selected glass within allowable deformation limits and the anchors must develop the capacity of the selected mullions.

- **Window Fenestration:** The total fenestration openings are not limited; however, a maximum of 40 percent per structural bay is a preferred design goal. In renovation of older buildings, and in new construction in ensembles of older buildings, the impacts of fenestration design on historic buildings and views must be considered and addressed in planning.
- **Window Frames:** The frame system should develop the full capacity of the chosen glazing up to 750 breaks per 1000, and provide the required level of protection without failure. This can be shown through design calculations or approved testing methods.

- Anchorage: The anchorage should remain attached to the walls of the facility during an explosive event without failure. Capacity of the anchorage system can be shown through design calculations or approved tests that demonstrate that failure of the proposed anchorage will not occur and that the required performance level specified is provided.

### 1.10 PATIENT CENTRIC DESIGN

The VA provides a full spectrum of medical, surgical and rehabilitative care of our country's veterans. The VA has embraced the principles, spirit and intent of Evidence Based Design (EBD) together with the *Planetree* model of care which creates a healing environment for all their facilities. VA Medical Centers around the country have realized these principles can assist in identifying standards and solutions to veteran-centered care approaches to health care.

Veteran-Centered Design is a core guiding principle approach to design as it focuses specifically on supporting the veteran. It is the patient that is the central focus of the design. It means designing for the experience of what the Veteran is going through to support positive outcomes. The VA philosophy supports the body, mind and spirit of the veteran and his/her family and friends.

Care that is truly patient-centered that considers patients' cultural traditions, their personal preferences and values, their family situations, and their lifestyle, is to be the mainstay of VA facilities. It makes the patient and their loved ones an integral part of the care team who collaborate with health care professionals in making clinical decisions. Patient-centered care puts responsibility for important aspects of self-care and monitoring in patients' hands — along with the tools and support they need to carry out that responsibility. Patient-centered care ensures that transitions between providers, departments, and health care settings are respectful, coordinated, and efficient. When care is patient centered, unneeded and unwanted services are reduced.

### 1.11 COMMISSIONING

In 2006, the VA co-signed the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (MOU), along many other federal agencies, which was subsequently included in Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management. One of the requirements of this MOU is for total building commissioning (Cx) practices for federal buildings.

Total building commissioning practices shall be employed in the design, construction, and guarantee phases of a project. VA will identify a Commissioning Agent (CxA) who works directly for VA at the pre-design phase. The A/E shall work collaboratively with the CxA in all aspects of commissioning work from the pre-design, Schematic, Design Development and Construction Document phases of the design work. Moreover, the A/E shall work collaboratively with the CxA during the construction phase of the project.

The VA utilizes the services of an independent third party commissioning authority to oversee the project from design to construction documents, and Post Occupancy commissioning plan to verify design and engineering performance including the installation and performance of systems to be commissioned, and provide the VA with a commissioning report.

## CHAPTER 1: OVERVIEW

The A/E shall use and follow the VA Whole Building Commissioning Process Manual located in the Technical Information Library as a guide for the commissioning work.

The A/E shall use and modify, as needed, the VA General Commissioning Specifications, located in: TIL – Master Construction Specifications (PG-18-1), Div 01, General Requirements, Section 01 91 00, to suit the design criteria, size and complexity of a project.

### 2.1 RESPONSIBILITY

The A/E shall provide all necessary professional services to perform planning and design of the systems for the project. The A/E is responsible and liable for the professional design in accordance with the contract, good engineering practices, VA standards, VA project-specific requirements if any, and applicable codes.

### 2.2 AUTHORITY HAVING JURISDICTION

Unless otherwise directed by VA, the Authority Having Jurisdiction is the VISN Safety Officer.

### 2.3 COORDINATION

#### 2.3.1 DESIGN QUALITY CONTROL:

The Architect-Engineer shall coordinate planning and design work with the architectural, structural, civil, plumbing, mechanical, fire protection, and LEED/Sustainable designs as applicable.

The A/E shall implement and maintain a quality-control program assuring that all services, designs, drawings, and specifications required by the contract are performed and provided in a manner that meets professional architectural and engineering quality standards adopted and utilized by the Department of Veterans Affairs.

The design documents shall be systematically and thoroughly reviewed for compliance with VA's project requirements and applicable codes, commitments made in EIA documents, and agreements entered into under environmental and historic preservation regulations. VA approved deviations in the design documents shall be documented. The A/E shall furnish to the VA and sub-consultants copies of all instructions, manuals, and other documents pertaining to design requirements to insure a completely coordinated design. The A/E shall be held responsible for ensuring that all sub-consultants comply with the design requirements. Likewise, all Sub-consultants shall be held responsible for insuring that their portion of the project is in compliance with the design requirements.

#### 2.3.2 EXISTING CONDITIONS:

For renovations of and/or additions to existing buildings, the A/E shall investigate the building to determine if sufficient structural, mechanical, plumbing, site utilities and electrical capacity is available to accommodate the new renovations of and/or additions. Special attention should be directed towards structural loads, medical gas, HVAC and electrical systems. If applicable, the A/E shall inform the VA Project Manager if additional structural, mechanical, plumbing and electrical capacity required.

### 2.4 VA DESIGN REQUIREMENTS AND STANDARDS:

The following are requirements and standards of VA's Office of Construction and Facilities Management Technical Information Library (TIL):

#### 2.4.1 MASTER CONSTRUCTION SPECIFICATIONS (PG-18-1)

Located in Technical Information Library

<http://www.cfm.va.gov/til/spec.asp>

**Purpose:**

Defines a standardized method for the A/E to assure that the contractor provides equipment and systems that meet the design intent in terms of performance, quality and cost

The Specifications accomplish this by:

- Providing specific narrative descriptions of required equipment, salient elements, and system construction
- Listing applicable standards and codes and references
- Requiring individual submittal of equipment and systems for review and approval prior to contractor purchase
- Defining specific installation methods to be used

**2.4.2 DESIGN AND CONSTRUCTION PROCEDURES (PG-18-3)**

Located in Technical Information Library

<http://www.cfm.va.gov/til/cPro.asp>

**Purpose:**

Establishes minimum consistent design/construction practices

The Procedures section accomplishes this by:

- Referencing applicable codes and policies
- Describing standard drawing formats
- Listing security strategies
- Including miscellaneous design details

**2.4.3 NATIONAL CAD STANDARD, VHA APPLICATION GUIDE & STANDARD DETAILS (PG-18-4)**

Located in Technical Information Library

<http://www.cfm.va.gov/til/projReq.asp>

<http://www.cfm.va.gov/til/sDetail.asp>

**Purpose:**

The VHA Application Guide adopts the NIBS National CAD Standard, establishes VA-specific drafting standards for the preparation of design and construction documents provides utility and sheet template files and standard construction details organized by discipline, for use in design and construction documents for VA projects.

**2.4.4 EQUIPMENT GUIDE LIST (PG-18-5)**

Located in Technical Information Library

<http://www.cfm.va.gov/TIL/equip.asp>

**Purpose:**

Provides information for planning and developing requirements for all equipment and furnishings to be provided in all VA rooms/spaces.

**2.4.5 SEISMIC DESIGN HANDBOOK (H-18-8)**

Located in Technical Information Library

<http://www.cfm.va.gov/TIL/seismic.asp>



**Purpose:**

Provides the A/E with specific requirements and design parameters for seismic design and addresses the following topics of concern:

- New Critical and Essential Facilities
- New Ancillary Facilities
- Existing Facilities, both for evaluation and rehabilitation including alternative seismic approaches.
- Spectral Response Acceleration
- Special Provisions for Structures in Seismic Categories C, D, E and F
- Limitations on Steel Structures and Reinforced Concrete Structures
- Drift Limitations, including Modifications of IBC requirements for new Critical and Essential facilities in high seismic design categories.

### **2.4.6 TIL - SPACE AND FACILITY PLANNING (PG-18-9)**

Located in Technical Information Library

<http://www.cfm.va.gov/TIL/planning.asp>

**Purpose:**

Provides a listing of all rooms and spaces and the net square foot area of each for all departments/services within VA medical facilities.

Space planning criteria PG 18-9 also provides definitions of key terminology, operating rationale and basis of criteria, and the program data required to justify and define the space criteria.

### **2.4.7 DESIGN MANUALS (PG-18-10)**

Located in Technical Information Library

<http://www.cfm.va.gov/til/dManual.asp>

**Purpose:**

To convey the general and specific VA design philosophy for the HVAC, Electrical, Plumbing, Fire Protection, and other systems for VA medical and support facilities, the Manuals accomplish this purpose by:

- Explaining specific design methodologies
- Listing acceptable system types
- Setting the overall energy consumption target
- Codifying certain code interpretations
- Listing values for design parameters
- Referencing certain sections of the Master Specification and Standard Details
- Containing examples of certain design elements

*Note: The A/E shall submit to VA a list of Design Manuals along with the TIL posted dates that were in effect on date of contract award.*

### **2.4.8 DESIGN GUIDES, GRAPHICAL, BY FUNCTION (PG-18-12)**

Located in Technical Information Library

<http://www.cfm.va.gov/til/dGuide.asp>

**Purpose:**

Provides the A/E with specific layout templates and medical equipment lists for all types of spaces/uses, and specific design parameters for structural, electrical and mechanical service. The Design Guides accomplish this by:

- Design Guides are documents which contain descriptive and graphical concepts of specialized areas of medical services provided by the VA. The Design They are instrumental in describing and graphically annotating components and relationships to one another specific to the area of specialization. Additionally they contain:
  - Design narratives
  - Functional diagrams and room guide plates
  - Identifies baseline room finishes and engineering design requirements
  - Updated on a three to five year cycle.
  
- The User of the Design Guides should be aware that major updates and revisions to the VA Design Guides is a work in progress that is continually changing based on advances in medical technology and changing medical practices. Updates and revisions are incremental and where major updated occur design alerts are issued and remain effective until such time as the Guide is updated; completed Guides are posted on the Technical Information Library (TIL) and noted as current. Information in the Design Guides may be dated and it is recommended that they be used with moderate caution to assure that current standards of the health care industry are addressed in meeting VA's needs.
  
- Design Guides are intended to help speed the design process, control cost, avoid errors and omissions, and get value for dollars spent. Design guides are developed in partnership with the using service and are benchmarked with similar private sector guides. They are to be applied flexibly, not as rigid standards.

**2.4.9 BARRIER FREE DESIGN GUIDES (PG-18-13)**

Located in Technical Information Library

<http://www.cfm.va.gov/TIL/accessibility.asp>

**Purpose:**

Provides the A/E with VA standards that exceed minimums of the Architectural Barriers Act (ABA) and the Americans with Disabilities Act (ADA) for health care projects. These standards relate to specific Veteran population needs.

**2.4.10 ROOM FINISHES, DOOR, AND HARDWARE SCHEDULES (PG-18-14)**

Located in Technical Information Library

<http://www.cfm.va.gov/til/room/RoomFinishes.pdf>

**Purpose:**

This document provides guidelines for VA Facility Interior finishes, doors, and hardware for new or renovated facilities constructed within the Department of Veterans Affairs. The essential criteria for selection of products/materials is based on their appropriateness for function and space, sustainability, life cycle costs, durability, and ease of maintenance.

**2.4.11 MINIMUM REQUIREMENTS FOR A/E SUBMISSIONS (PG-18-15)**

Located in Technical Information Library

<http://www.cfm.va.gov/contract/aeDesSubReq.asp>

**Purpose:**

To provide a staged listing of tasks in various design categories as a way to define the A/E scope in order to assure thorough and timely completion of the final design package and bid documents

The Instructions accomplishes this purpose by:

- Progressively listing tasks as Schematic, Design Development and Construction Documents stages
- Requiring task completion and submission for each stage according to a Critical Path Method (CPM) calendar
- Implementation of a QA/QC process to assure a quality design product
- Requiring life cycle analysis of alternatives in order to optimize the design/cost tradeoff
- Listing and detailing all the drawings, calculations and specifications required for a complete design package indicating the final distribution of bid documents

**2.4.12 ENVIRONMENTAL COMPLIANCE MANUAL (PG-18-17)**

Located in Architect/Engineer Information

<http://www.cfm.va.gov/til/spclRqmts.asp>

**Purpose:**

This manual provides guidance to VA project proponents for ensuring the required evaluation of potential impacts under National Environmental Policy Act (NEPA) is technically adequate and legally sufficient. This evaluation may be concluded at one of three levels of evaluation as appropriate: a Categorical Exclusion (CATEX) for projects meeting one of the definitions in VA's Implementing Regulations (Title 38 CFR Part 26) with no extraordinary circumstances; an Environmental Assessment (EA) resulting in a Finding of No Significant Impact (FONSI) for projects which do not meet a CATEX definition; or an Environmental Impact Statement (EIS) for those projects which will have an impact(s), but still make sense to proceed with legally binding Mitigation Measures to be implemented. This document also provides guidance with respect to the interaction of the NEPA evaluation and other environmental / historical regulatory requirements.

**2.4.13 VA CULTURAL RESOURCE MANAGEMENT (H-7545)**

Located in Technical Information Library

[http://www1.va.gov/vapubs/viewPublication.asp?Pub\\_ID=312&FTtype=2](http://www1.va.gov/vapubs/viewPublication.asp?Pub_ID=312&FTtype=2)

**Purpose:**

This handbook describes the procedures DVA uses to meet Federal preservation requirements for all program and construction activities that may affect cultural resources, including historic buildings, landscapes and districts, archaeological sites, Indian tribal spiritual sites and burial places, historical documents and artifacts, and the cultural and historic values of neighborhoods and communities, all of which may be affected by VA construction projects..

**2.4.14 TIL - DESIGN REVIEW CHECKLISTS**

Located in Technical Information Library, TIL - Project Document & Software Requirements, Design Review Checklists

<http://www.cfm.va.gov/til/projReq.asp>

**Purpose:**

Provides the VA Peer Reviewer with a minimum list of critical items, which must be included in each A/E submission

The Checklist accomplishes this by referring to all applicable VA design tools, included but are not necessarily limited to the listed checklists, which apply to the specific project

- Site and Landscape
- Architecture
- Detailing Life Safety and coordination requirements
- Structural
- Heating, Ventilating, and Air Conditioning
- Plumbing / Fire Protection / Sanitary
- Steam Distribution
- Steam Generation
- Boiler Safety Devices - Operation Checklist
- Electrical
- Incineration

### 2.4.15 TIL - DESIGN ALERTS

Located in Technical Information Library

<http://www.cfm.va.gov/til/alertDesign.asp>

**Purpose:**

Communicates current design issues and solutions by:

- Publishing periodic alert memos
- Summarizing design solutions

### 2.4.16 TIL QUALITY ALERTS

Located in Technical Information Library

<http://www.cfm.va.gov/til/alert.asp>

**Purpose:**

Communicates quality deficiencies from recent A/E design submissions The Quality Alerts accomplish this by:

- Publishing checklists of design details often missed
- Including references to technical resources

### 2.4.17 TIL - SPECIAL REQUIREMENTS-PHYSICAL SECURITY

Located in Technical Information Library

<http://www.cfm.va.gov/til/spclRqmts.asp>

**Purpose:**

Design Manual for VA Facilities Mission Critical Facilities & Life Safety Protected Facilities sets physical security standards for facilities required to continue operation during a natural or man-made extreme event and for facilities that are required to protect the life safety of patients and staff in an emergency.

The Manuals accomplish this by:

- Setting objectives for physical security
- Providing strategies for use in design and construction to provide protection to VA facilities
- Providing cost effective design criteria

### **2.4.18 COST ESTIMATING MANUAL**

Located in Technical Information Library

<http://www.cfm.va.gov/cost/>

#### **Purpose:**

To convey the general and specific VA cost estimating philosophy for medical facilities The Manual accomplishes this by:

- Explaining specific estimating methodologies
- Containing examples of certain design elements

### **2.4.19 TIL - SUSTAINABLE DESIGN & ENERGY REDUCTION**

Located in Technical Information Library

<http://www.cfm.va.gov/til/sustain.asp>

#### **Purpose:**

This manual identifies the seven sustainability goals outlined in the Federal Mandates, and maps each goal to the appropriate LEED strategy for implementation. Methods for consideration to achieve the goals, budget considerations, case studies, and checklists are also included.

The Manual accomplishes this by:

- Prescribing the use of integrated design practices
- Providing strategies for optimization of energy performance
- Providing strategies for protection and conservation of water resources
- Providing strategies for enhancement of indoor environmental quality
- Providing strategies for reduction of environmental impact of materials

### **2.4.20 TIL - SPECIAL REQUIREMENTS-FIRE PROTECTION DESIGN MANUAL**

Located in Technical Information Library

<http://www.cfm.va.gov/til/spclRqmts.asp>

#### **Purpose:**

This document provides fire protection design criteria for all VA facilities including fire alarm requirements.

## **2.5. VA HOSPITAL BUILDING SYSTEM**

The VA Hospital Building System (VAHBS) is a methodology based on a modular concept for planning, designing and constructing hospitals.

## CHAPTER 2: GENERAL REQUIREMENTS

The methodology has been used nationwide with success in capital and operating cost containment, shortened delivery schedules and improved space utilization flexibility. All new and replacement VA hospital buildings should use the VAHBS system. The VAHBS system should also be considered for use on major additions to existing hospitals where future adaptability is an important factor.

Refer to VHA Program Guide PG-18-3, Design and Construction Procedures, Topic 3, VA Hospital Building System for further guidance. The complete reference for the VAHBS is contained in the 1976 Development Study (called the Redbook) and the 2006 Supplement.

### **2.5.1 COMPUTER AIDED FACILITIES MANAGEMENT REQUIREMENTS (CAFM)**

VA is implementing Computer Aided Facility Management (CAFM) systems in all new and replacement hospital construction, including all existing hospitals as feasible. The CAFM concept requires that all pertinent data regarding a facility be contained in a master digital database, accessible by facilities personnel at their workstations for use in operations, energy/cost management, and maintenance and for planning modifications in facility infrastructure due to space utilization changes.

## **2.6 THERMAL DESIGN CRITERIA**

### **2.6.1 ENERGY CONSERVATION**

The need to conserve energy is mandated by the Federal Government by Executive Order and by Law enacted by Congress. In addition, 19 Federal Agencies have signed a Memorandum of Understanding (MOU) outlining specific goals and targets for energy conservation and sustainable design. VA is one of the signatory agencies. In the following paragraphs, references and details of various requirements are listed and compliance with VA energy conservation and water management is defined. Facilities designed shall comply with:

- VA Directive 0055, VA Energy and Water Management Program
- Energy Policy Act of 1992
- Energy Policy Act of 2005
- Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management
- Executive Order 13514, Federal Leadership in Environmental, Energy and Economic Performance
- National Energy Conservation Policy Act (NECPA)
- 41 CFR 102-74, Energy Conservation
- 10 CFR 434, Energy Code for New Federal Commercial and Multi-Family High Rise Residential Buildings
- 10 CFR 435, Energy Conservation Voluntary Performance Standards for New Buildings: mandatory for Federal Buildings, Subpart C, mandatory Performance for New federal residential Buildings
- 10 CFR 436, Federal Energy management and planning Programs
- VA Energy Management Action Plan and Secretary's Decision Statement
- EPA's Energy Star Program

### **2.6.2 DOE INTERIM FINAL RULE**

In the Federal Register (Volume 71, No. 232) dated December 4, 2006, the Department of Energy (DOE) issued mandatory energy conservation guidelines, as the interim final rule for

implementing provisions in the Energy Policy Act (EPACT 2005). Provisions of the interim final rule are as follows:

### 2.6.3 ASHRAE STANDARDS

#### 2.6.3.1 ASHRAE STANDARD 90.1

- **ANSI/ASHRAE/IESNA Standard 90.1 – 2004:** ASHRAE Standard 90.1 – 2004 is a component of the DOE final rule. Provisions of this standard shall be used as a baseline for computing energy savings. By reference, DOE has incorporated Standard 90.1 – 2004 into 10 CFR Part 433. Also, the U.S. Congress has prescribed this standard in section 109 of the Energy Policy Act of 2005 (EPACT).
- **ANSI/ASHRAE/IESNA Standard 90.1 – 2007:** ASHRAE has published the revised Standard 90.1 – 2007. HVAC systems shall be designed to comply with the ANSI/ASHRAE/IESNA Standard 90.1 – 2004 for Buildings except Low-Rise Residential Buildings. The A/E is expected to fully comprehend and implement the practices dictated in ASHRAE 90.1 – 2004.
- **ASHRAE/IESNA/USGBC Standard 189.1 – 2009:** Standard for the Design of High Performance Green Buildings except Low-Rise Residential Buildings.
- **ASHRAE/IESNA/ASHE Standard 180 – 2008:** Ventilation of Health Care Facilities
- **ANSI/ASHRAE Standard 62.1 – 2007:** Ventilation for Acceptable Indoor Air Quality
- **ASHRAE Guideline 1.1 – 2007:** HVAC & R Technical requirements for the Commissioning Process
- **ASHRAE Guideline 0 – 2005:** The Commissioning Process
- **ANSI/ASHRAE Standard 55 – 2004:** Thermal Environmental Conditions for Human occupancy
- **ASHRAE:** An Introduction to Building Information Modeling (BIM)

#### 2.6.3.2 ADDITIONAL MANDATED ENERGY CONSERVATION MEASURES

In addition to complying with the ASHRAE Standard, DOE has mandated that a new Federal building must be designed to achieve an energy consumption level that is at least 30 percent below the level achieved under Standard 90.1-2004, **if life-cycle cost effective**. Use the Performance Rating Method – Appendix G of ASHRAE Standard 90.1 -2004 to document the energy savings.

- **Life-Cycle Cost (LCC) Analysis (Requirements):** If an additional 30 percent reduction in energy consumption is not lifecycle cost effective, the A/E must evaluate alternate designs; at successive decrements (e.g.: 25 %, 20 %, or lower) in order to identify the most energy efficient design that is lifecycle cost-effective. To do so, the A/E shall consider and evaluate readily available energy conservation measures which the industry is generally familiar with and should be considered and evaluated. DOE further stipulates that the “agencies must estimate the life-cycle costs and energy consumption of the planned building as designed and an otherwise building

## CHAPTER 2: GENERAL REQUIREMENTS

just meeting the minimum criteria set forth in the baseline ASHRAE Standard”. This measure is meant to demonstrate and record the mandated compliance and the extent of it.

- **Life-Cycle Cost Analysis (Methodology):** To comply with the Public Law 95-619, an engineering economic analysis shall be performed in accordance with the procedure outlined by the Department of Energy (DOE) in the National Institute of Standards and Technology (NIST) Handbook 135 dated February 1996 (or the latest version) - Life Cycle Costing Manual for the Federal Energy Management Program.

Use the following parameters when performing the analysis:

- 20 year life cycle period for system comparison
- Other features are:
  - 7 percent discount factor
  - No taxes or insurance, while computing cost

### **2.6.4 EXECUTIVE ORDER 13423 DATED JANUARY 26, 2007**

Mandatory energy conservation requirements are also published in the above Executive Order. The MOU is mentioned in Section 2, paragraph f of the Executive Order. The MOU was signed under the Federal Leadership in High Performance and Sustainable Buildings.

The stated goals and objectives of the MOU are as follows:

#### **2.6.4.1 NEW CONSTRUCTION**

For new construction, the energy cost budget, shall be reduced, by 30 percent compared to the baseline performance rating of ASHRAE Standard 90.1 - 2004. This requirement is identical to the interim rule published in the Federal Register.

#### **2.6.4.2 MAJOR RENOVATIONS**

For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline. In the event pre-renovation 2003 baseline data is not available, the A/E shall calculate the lighting energy consumption before renovation, compare it with the energy consumption after renovation, and document the mandated saving. It is assumed that the use of the facility shall remain similar before and after the renovation. A project classified as “major renovation” shall meet the following two criteria:

- For a facility selected for renovation, the area of renovation is greater than 50% of the total area.
- A project is planned that significantly extends the building’s useful life through alterations or repairs and totals more than 30% of the replacement value of the facility.

#### **2.6.4.3 VA POLICY: ENERGY AND WATER MANAGEMENT PROGRAM**

VA Directive 0055 dated January 15, 2010 the directive updates VA’s Green Management Program energy policy to include new and updated requirements of executive orders and legislation. This document also expands the scope and applicability of this policy to water management.



### 2.6.4.4 ADDITIONAL MEASURES (MOU)

MOU also addresses related issues, such as commissioning and measurement and verification. These issues are described below.

### 2.6.5 MEASUREMENTS AND VERIFICATION

Per DOE Guidelines issued under Section 103 of EPACKT, install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. MOU mandates that the actual performance data from the first year of operation should be compared with the energy design target. After one year of occupancy, measure all new major installations using the Energy Star® Benchmarking Tool for building and space types covered by ENERGY STAR® or FEMP designated equipment.

## 2.7 APPLICABLE CODES AND STANDARDS

### 2.7.1 GENERAL

Use the latest edition of Codes, Regulations and Standards as a basis of design. Refer to PG-18-3, Topic 1, Codes, Standards, and Executive Orders. Unless otherwise indicated by VA criteria, use the Codes and Standards of the following organizations:

- American National Standards Institute (ANSI)
- American Society for Testing Materials (ASTM)
- Building Industry Consulting Service International (BICSI)
- Federal Communications Commission (FCC), all Regulations, Procedures and Standards for Two-Way Radio Equipment, Systems and Operation
- Illuminating Engineering Society of North America (IESNA)
- Institute of Electrical and Electronic Engineers (IEEE)
- International Organization for Standardization (ISO), Standards for Protocols and Interfaces that include Open System Interconnections (OSI)
- Joint Commission on Accreditation of Healthcare Organizations (JACHO), Environment of Care Guidelines and Standards
- Facilities Guidelines Institute (FGI): 2010 , *or most current issue*, Guidelines for the Design and Construction of Health Care Facilities
- U.S. Green Building Council (USGBC) LEED Program & Sustainable Building Design Council
- The Green Building Initiative (GBI), Green Globes Environmental Assessment and rating System
- The American Institute of Architects (AIA) and National Society of Professional Engineers(NSPE) recent additions to their professional codes of ethics encouraging **“environmentally responsible design”**
- National Fire Protection Association (NFPA): A/E shall pay particular attention to the following publications:
  - NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection
  - NFPA 70 – National Electrical Code
  - NFPA 70 E – Standard for Electrical Safety Requirements for Employee Workplaces
  - NFPA 72 – National Fire Alarm Code
  - NFPA 75 – Standard for the Protection of Electronic Computer/Data Processing Equipment
  - NFPA 77 – Recommended Practice on Static Electricity
  - NFPA 80 – Standard for Fire Doors and Fire Windows
  - NFPA92A– Recommended Practice for Smoke-Control Systems

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- NFPA92B – Guide for Smoke Management Systems in Malls, Atria, and Large Areas
- NFPA 99 – Standard for Healthcare Facilities
- NFPA99B – Standard for Hypobaric Facilities
- NFPA 101 – Life Safety Code
- NFPA 110 – Standard for Emergency and Standby Power Systems
- NFPA 780 – Standard for the Installation of Lightning Protection Systems
- National Electrical Manufacturers Association (NEMA)
- Underwriters' Laboratories, Inc. (UL)
- Telecommunications Industry Association and Electronic Alliance Standards Association (EIA/TIA) 568 and/or 569A, Communications Cabling Circuits and Equipment
- Building Industry Consulting Service International, Inc. (BICSI): A/E shall pay particular attention to the following publications:
  - Outside Plant Design Reference Manual
  - Telecommunications Distribution Methods Manual
  - Network Design Reference Manual
- ANSI/TIA/EIA-942 – Telecommunications Infrastructure Design for Data Centers.
- United States Department of Commerce, National Telecommunications and Information Administration (NTIA), Manual of Regulations and Procedures for Federal Radio Frequency Management for all Two-Way Radio and Radio Paging Systems, all Narrow-Band and Frequency Use Standards

### 2.7.2 LOCAL CODES AND CONDITIONS

The A/E shall bring local and regional climatic and geographic conditions, and provisions of local building codes that are significantly different from the codes and standards listed above to the attention of VA and shall provide specific information on how the proposed design will reflect these conditions and codes. Of particular focus shall be local codes, code amendments, and/or conditions related to coastal, hurricane-prone, arctic, or seismically active regions, or other climatic or regional conditions that warrant additional measures to protect the integrity of systems.

### 2.8 ABBREVIATIONS

Terms and Abbreviations of the Uniform Drawing System (UDS) of the U. S. National CAD Standard (NCS) for more complete listing of terms and abbreviations can be found on the CSI website under Standards and Formats.

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

### 3.1 TECHNICAL REQUIREMENTS

**3.1.1 PURPOSE:** This manual serves as the master reference document for architectural planning and design at the Department of Veterans Affairs (VA) facilities. Architectural requirements and criteria in this manual are expected to be followed in planning of VA facilities.

**Responsibility:** VA's Office of Construction and Facilities Management is responsible for all components of the built environment (buildings, open spaces and infrastructure including *VBA and NCA*).

**Building Goals:** The Office of Construction and Facilities Management is entrusted with providing VA with facilities which incorporate highest degree of medical planning, design and construction which reflect:

- Functional Efficiency
- Innovative, but appropriate, design
- Contextual harmony with the site
- Appropriately Selected Materials and Systems
- Health and safety characteristics
- Accessibility for the Disabled
- Life Cycle Value

**Applicability:** These Architectural and Engineering Design Standards have been compiled to establish general and, in some cases, specific design policies as a guide to consultant architects and engineers (A/E) for designing new facilities, as well as the alteration or renovation of existing structures.

#### 3.1.2 DESIGN PRINCIPLES:

General: New and renovated facilities must provide the functional, aesthetic, environmental, and safety needs of the VA with a reasonable balance between initial cost and life-cycle value. The VA is dedicated to improving the quality of its facilities through architectural, planning and engineering services which must:

- Ensure the highest degree of professionalism from the A/E Team to develop and implement innovative and functional design concepts, in harmony with the site environment, and appropriate to the project needs.
- Implement reliable procedures for controlling project estimates, construction costs, life-cycle factors, and time schedules.
- Establish thorough quality-control coordination during all phases of the A/E Scope of Services
- Respond to governing codes and standards ensuring environmental health and safety.
- Ensure that design concepts for repair, alterations and renovations are executed with the same professional consideration as that for new facilities.

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

The VA's expectations are that architectural components, elements and facilities designed with the use of this manual will meet their primary objective of providing a safe and functional healing environment for patients, staff and visitors. The Architectural design shall meet all VA design criteria, VA design requirements, applicable codes, technical requirements, as well as being well coordinated with other trades and disciplines.

Deviations can be made from the requirements of this manual to accommodate new concepts, methods of construction and design enhancements. Such deviations shall be approved by VA. Deviations are not permitted from those requirements included Federal Regulations, Public Laws, Executive Orders, and other applicable codes and standards.

Throughout this manual, the statement is made: to obtain approval from VA Authorities. Authority is defined as the VA Project Manager or the local VA Medical Center's Chief Engineer.

### 3.1.3 CHANGES DURING DESIGN

Do not withhold proposals for changes in plan arrangement, materials of construction, or architectural design for the periodic scheduled reviews. Changes shall be discussed with the Project Manager by telephone and correspondence, and forward drawings for review as soon as they are sufficiently developed for consideration.

### 3.1.4 COORDINATION OF DOCUMENTS

The drawings and specifications shall be complete, clear, and coordinated. The Construction Contractor only agrees to produce what is depicted on the drawings and described in the specifications and performs within the precise scope of the contract documents. The A/E is responsible for coordinating the various documents to eliminate ambiguous requirements.

### 3.1.5 CONSTRUCTION TERMINOLOGY

To avoid conflicts over ambiguous terms and statements, use identical terms on drawings and specifications. For example, "roofing system" in the specifications should not be called a "built-up roof" on the drawings.

### 3.1.6 NAMES OF SPACES

Names of rooms and departments also play an important role in coordination. The names on the drawings must be the same as in the Program for Design, as they impact not only finishes and equipment, but also construction details and mechanical & electrical systems. As far as possible, all room names should be placed on the drawings within the specific rooms named.

## 3.2 SCHEDULED PROGRESS REVIEWS

The A/E contract includes designated specific intervals for review of the development of the work. These reviews are joint consultations between the VAMC, CFM Consulting Support Service, and other VA Services to exchange information, reconcile differing views on objectives, judge the quality and completeness at each stage, assure that previously noted changes have been incorporated, and warn of unacceptable departures from criteria or standards during the development of design. The design review encompasses all disciplines. They are not for the purpose of discovering errors or omissions in detail. The quality, accuracy, coordination, and completeness of the contract documents remain the A/E's responsibility; *Refer to TIL - VA Program Guide, A/E Submission Instructions (PG-18-15).*

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

### 3.3 DRAWINGS

#### 3.3.1 COMPUTER AIDED DESIGN AND DRAFTING (CADD)

For general drawing requirements, including organization, size, scales, and Computer Aided Design and Drafting (CADD) format, refer to *TIL - Standard Details, VA CAD Standards PG-18-4*.

#### 3.3.2 ROOM FINISHES, DOORS AND HARDWARE:

Refer to *TIL - Standard Details, Room Finishes, Door and Hardware Schedule (PG-18-14)*.

#### 3.3.3 FIRE-PROTECTION AND EQUIPMENT DRAWING SYMBOLS:

Utilize the following: Industry Standards, NFPA, and/or National CAD Standards refer to *TIL - Design Manuals (PG-18-10)*.

#### 3.3.4 REFLECTED CEILING PLANS

- Provide a reflected ceiling plan (RCP) indicating acoustical tile grids, lights, diffusers, return air grilles, ceiling tracks, ceiling-mounted brackets or hangers, etc.
- Provide reflected ceiling plans of all operating rooms at 1:50 (1/4 in.) scale indicating all ceiling mounted oxygen and vacuum outlets, installation of ceiling mounted tracks, etc., show room numbers and ceiling heights on these drawings.
- Provide reflected ceiling support plans at 1:50 (1/4 in.) scale for X-ray tube stands in Radiographic - Fluoroscopic Rooms, Special Procedures Rooms, etc. including all ceiling mounted infusion injectors and other ceiling mounted accessories required for the specific imaging modality.

#### 3.3.5 PRESENTATION OF DESIGN

When reviewing the design, suitable illustrations of the exterior should be presented which address the relationship to adjacent buildings and surroundings. Elevations may suffice but any other drawings, sketches, or models that clearly show the design intentions as to massing, fenestration, and materials are encouraged. If future vertical expansion is planned, the building must be illustrated with and without the future floors. A written description of design concept and intent may be helpful, especially for unusual or complex solutions. Color boards and photos of adjacent facilities are also helpful for evaluating the exterior design concept.

#### 3.3.6 COLOR RENDERINGS

Renderings, if required by the contract, shall show the true colors of the materials to be used in the construction of the project and the surroundings, including road systems and planting groups, in sufficient detail to predict the final appearance of the project. Show all penthouses, architectural screens, roof enclosures, skylights, stacks, and breechings that will be visible from the station point by accurate perspective projection. Show roof mounted equipment unless hidden by architectural screens. On aerial perspectives, show major masses of mechanical equipment located behind architectural screens in block form. If exact size, color and/or appearance of exposed roof mounted equipment are not known, show as accurately as possible or provide a drawing of similar equipment on the rendering(s). Mount the rendering(s) on 750 mm high by 1000 mm wide (30 in. by 40 in.) "Bristol" board. Provide borders of 125 mm (5 in.) at the top and sides and 150 mm (6 in.) at the bottom. The Project

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

Manager will advise the A/E as to the appropriate labeling for renderings, which should be lettered on the mat rather than on the rendering itself.

### 3.3.7 COMPARISON OF EXTERIOR MATERIALS

If a primary exterior material is proposed which differs from the primary material of existing buildings, submit studies and sketches of the exterior with both the existing and the proposed materials, and an analysis of the costs of the different exteriors.

## 3.4 GENERAL ARCHITECTURAL REQUIREMENTS

### 3.4.1 FLOOR-TO-FLOOR HEIGHTS

#### 3.4.1.1 NEW CONSTRUCTION ADJOINING EXISTING BUILDING

Ceiling heights and space to economically install mechanical and electrical systems above the ceiling require certain minimum dimensions. In developing the preliminary design, give special attention to conditions where a new structure joins an existing structure. Immediately inform the Project Manager if you find that the existing building's floor-to-floor heights are inadequate for:

- Maintaining VA minimum ceiling heights (refer to: Article 4.27.2, "CEILING HEIGHTS").
- Installing mechanical and electrical systems above the ceiling.

#### 3.4.1.2 ANALYSIS OF RESTRICTED FLOOR-TO-FLOOR-HEIGHTS

If the existing building's floor-to-floor heights are inadequate, submit composite section drawings of the most difficult conditions along with the suggested solutions to the problem so that VA can make a decision based on the A/E's recommendations.

## 3.5 SEISMIC DESIGN

VA Policy for design of structural and non structural elements of buildings to resist damage caused by earthquakes and seismic events.

Refer to *TIL - VA Standards for Construction, Seismic Design Handbook H-18-8*.

## 3.6 VA HOSPITAL BUILDING SYSTEM (VAHBS)

**3.6.1** Refer to *TIL - VA Standards for Construction, Design and Construction Procedures (PG-18-3)*. VA policy on the use of interstitial-space system

**3.6.2** For a complete description, refer to *TIL - VA Standards for Construction, Hospital Building System Development Study*.

- Development Study — VA Hospital Building System
- Supplement to Development Study — VA Hospital Building System

**3.6.3** For a summary of fire protection requirements for buildings using the VAHBS, Refer to *Non-Building Specific and Other Design Manuals: TIL - VA Standards for Construction, VA Fire Protection Manual (PG-18-10)*.

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

### 3.7 EQUIPMENT, CASEWORK, AND PLUMBING FIXTURES

On the 1:100 (1/8 in.) scale architectural floor plans, show all fixed items of equipment, shelving, casework, etc., which occupy floor space (and any items which require utilities). Note the proper symbols, contained in the *TIL - VA Standards for Construction, Standard Details (PG-18-4)* on or immediately adjacent to each unit of shelving, casework, etc. However, when 1:50 (1/4 in.) scale equipment floor plans are drawn for certain rooms or area, show the proper symbols on these plans and not on the 1:100 (1/8 in.) scale plans. Show numerical designations ("P" numbers) for plumbing fixtures on plumbing drawings only, not on architectural drawings.

### 3.8 FIRE RATED AND SMOKE-BARRIER PARTITIONS

Use fire protection symbols for fire-rated and smoke-barrier partitions, as indicated in *TIL - VA Standards for Construction, Special Sections, Architectural Symbols (PG-18-4)*. Indicate on the 1:100 (1/8 in.) architectural floor plans where the partition types are designated, and on the fire protection plans (FA drawings).

### 3.9 FLOOR DRAINS

Indicate all floor drains on the 1:100 (1/8 in.) architectural plans. Because of possible problems from sewer gases, the number of floor drains is to be minimized. Provide floor drains in all locations where indicated. Additionally, provide floor drains at walk-in refrigerators and controlled temperature rooms for condensation return. Indicate the pitch of floor to drains on the 1:100 (1/8 in.) scale drawings only.

### 3.10 SPECIFIC REQUIREMENTS

#### 3.10.1 BARIATRIC AND SPECIAL NEEDS ACCOMMODATION

- **Overview:** Veterans who receive care at VA Facilities have higher rates of overweight and obesity than the general population. As the largest integrated U.S. health system, the VA has a unique opportunity to respond to the epidemic of obesity. Therefore the A/E shall incorporate bariatric accommodations into all types of VA facilities: Hospitals, Clinics, Ambulatory Surgical Centers, Community Living Centers, etc. Accommodations for each type VA facility shall be designed on an individual basis specific to that locality and bariatric census.

- **Design Parameters Hospital Based:**

**Patient lift system:** At least one room in each bariatric unit shall be provided with a built-in mechanical lift system (e.g., a ceiling rail system) capable of transporting a 600-pound (272.16-kilogram) patient from the bed to the toilet room.

**Patient Room:**

- Entry Door width: 72 inches (1524 mm), unequal leaf swing doorway 48 inch (1220 mm) leaf and 24 inch (610 mm) leaf.
- Minimum patient room width: 14'-6" (368.3 mm), Minimum patient room depth 14'-4" (364 mm).
- Provide dialysis connection within patient room proximal to bed.

## CHAPTER 3: ARCHITECTURAL DESIGN PARAMETERS AND CRITERIA

- Lifting devices shall be either ceiling mounted or portable types as preferred by facility.
- Family seating within patient room shall have at least one bariatric sized chair as family members tend to have a bariatric condition as well.
- Acute Care Patient rooms should be at least 285 square feet (26.48 m<sup>2</sup>) minimum excluding entry vestibule.
- The number of bariatric patient rooms shall be determined for each specific project or facility.

### **Patient Toilet-Shower Room:**

- Door width: 48 inches (1219.2 mm) minimum with swing-clear continuous hinge.
- Water closet and water closet carrier capacity; 1,000 lbs (453.59237 kg), centerline of water closet 24 inches (610 mm) from sidewall.
- Provide adequate clearance on either side of water closet for caregiver assistance.
- Sink and/or vanity sink countertop shall be structurally adequate to resist pulling away from wall and/or collapse.
- Grab bars and toilet paper dispenser positioned to facilitate ease of use from toilet.
- Roll-in type or “euro” style shower (shower integral with toilet) configured to allow caregivers to assist patient in a 4’-6” x 5’-0” (114.3 mm x 127 mm) shower area without curbs.
- Minimum toilet-shower room should be at least 62 square feet (5.75 m<sup>2</sup>).

**Portable Lift Storage:** Provide additional space above and beyond the minimum required equipment storage space necessary on patient care units to accommodate bariatric wheelchairs, commode chairs and portable lifts.

**Waiting Areas:** Provide accommodation for bariatric individuals.

**Elevators:** Refer to *VA Standards for Construction TIL - Design Manual, Transport Systems PG-18-10* also listed as *Auto Transport*.

### **3.10.2 DESIGN PARAMETERS CLC BASED:**

Refer to *VA Standards for Construction TIL - Design Guide, Community Living Center Nursing Home (PG-18-12)*.

### **3.10.3 DESIGN PARAMETERS SCI BASED:**

Refer to *VA Standards for Construction TIL - Design Guide, Spinal Cord Injury Center (PG-18-12)*.

### **3.10.4 DESIGN PARAMETERS PRC BASED:**

Refer to *VA Standards for Construction TIL - Design Guide, Polytrauma Rehabilitation Center “PR”, (PG-18-12)*.



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### 3.11 ENERGY CENTER

For guidance on design of a hospital energy center, including boiler plant, chiller plant, and engineering control center refer to ***VA Standards for Construction TIL - Design Manual, Energy Centers (PG-18-10)***.

### 3.12 HVAC EQUIPMENT SPACES

For guidance on locating HVAC equipment, cooling towers, and air compressors, refer to ***VA Standards for Construction TIL - Design Manual, HVAC Design Manual (PG-18-10)***.

### 3.13 ELECTRICAL ROOMS CLOSETS AND VAULTS

**3.13.1 ELECTRICAL SWITCHGEAR AND SERVICE ENTRY ROOMS:** For guidance on planning electrical switchgear rooms, transformer vaults, and emergency generator rooms, refer to ***VA Standards for Construction TIL - Electrical Design Manual (PG-18-10) and NFPA-70 National Electrical Code***.

**3.13.2 CEILINGS:** For ceiling heights in above spaces, see chart below.

**3.13.3 TRANSFORMER VAULTS:** For required fire ratings for transformer vaults, refer to ***NFPA-70 National Electrical Code***.

### 3.14 MINIMUM SPACE REQUIREMENTS (for Mechanical, Electrical, IT and Security Rooms):

**GENERAL SPACE REQUIREMENTS:** Electrical-Telecom-Security-Mechanical Closets and Rooms

Room Description	Suggested Area (net square feet)	Minimum Dimensions	Necessary Adjacent Support Spaces
Electrical Closet	140 SF	10 ft wide x 14 ft deep no finish ceiling	Based on one electrical room per 10,000 DGSF area. Provide additional 9' x 6' foot print for UPS if required.
Telecommunications Room	<i>Refer to OIT Design Guide</i>	<i>Refer to OIT Design Guide</i>	<i>Refer to OIT Design Guide</i>
Security/Fire Alarm Closet	<i>Refer to OIT Design Guide</i>	<i>Refer to OIT Design Guide</i>	Co-Locate in Telecommunications Room
Mechanical Room 10,000 to 16,000CFM AHU	600 SF	20 ft wide x 30 ft deep no finish ceiling	Room size based on room's length being 6 feet plus AHU's length and the room's width being two times the AHU's width to allow for coil replacement

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Room Description	Suggested Area (net square feet)	Minimum Dimensions	Necessary Adjacent Support Spaces
Mechanical Room 17,000 to 21,000CFM AHU	704 SF	22 ft wide x 32 ft deep no finish ceiling	Room size based on room's length being 6 feet plus AHU's length and the room's width being two times the AHU's width to allow for coil replacement
Janitor / Housekeeping Closet/HAC	60 SF	6 ft wide x 10 ft deep 9 ft finish ceiling	Based on one HAC closet per 20,000GSF area.

### 3.15 EMERGENCY COMMAND CENTER

For design guidance on fire alarm equipment rooms, refer to ***VA Standards for Construction TIL - Electrical Design Manual (PG-18-10) and NFPA-72 National Fire Alarm and Signaling Code.***

The fire command center constructed of one-hour fire-rated fire assembly. These rooms often have exterior entrances which should be prominently marked. The room shall be at least 96 square feet with a minimum dimension of 8 feet, provide at least a three-foot clearance in front of all control equipment.

The fire command center shall comply with NFPA 72 and shall contain the following features:

- The emergency voice/alarm communication system unit.
- The fire department communications system.
- Fire-detection and alarm system annunciates system.
- An annunciator visually indicating the location of the elevators and whether they are operational.
- Status indicators and controls for air-handling systems.
- The fire-fighter's control panel required by Section 909.16 for smoke control systems installed in the building.
- Controls for unlocking stairway doors simultaneously.
- Sprinkler valve and water-flow detector display panels.
- Emergency and standby power status indicators.
- A telephone for fire department use with controlled access to the public telephone system.
- Fire pump status indicators.
- Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access.
- Work table.
- Generator supervision devices, manual start and load transfer capabilities and procedures.
- Public address system, where specifically required by other sections of this code.
- Fire command centers shall not be used for the housing of any boiler, heating unit, generator, combustible storage, or similar hazardous equipment or storage.

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### 3.16 OFFICE OF INFORMATION TECHNOLOGY

OIT supports each VA facility the scope of work includes but is not necessarily limited to: management consulting; user support and training; technical management; around-the-clock operations; and maintenance of hardware, software, and telecommunications systems. The scope and organization of OIT responsibilities may vary among medical centers. OIT may assume oversight for those systems outside OIT's purview (such as FMS systems) once specific system(s) have been specifically addressed and approved. The room shall be **directly accessible** from public corridors and spaces for unrestricted access by OIT and FMS personnel. For design guidance on OIT, refer to **VA Standards for Construction TIL - Design Guide, Office of Information & Technology "OIT" (PG-18-12)**.

### 3.17 ELECTRICAL EQUIPMENT ROOMS (Refer To Electrical Design Manual for Additional Details)

#### 3.17.1 MAIN SERVICE ROOM

- **Vertical Clearances:** Main electrical equipment rooms generally should have a clear height to the underside of the structure for compliance with requirements of the NEC.
- **Hoists:** Where maintenance or equipment replacement requires the lifting of heavy parts, hoists should be installed.
- **Horizontal Clearances:** Electrical equipment rooms should be planned with clear circulation aisles and adequate access to all equipment. Layout should be neat, and the equipment rooms should be easily cleanable. Horizontal clearances should comply with requirements set forth by the NEC.
- **Lighting:** Lighting in equipment rooms should be laid out so as not to interfere with equipment. Switched emergency lighting must be provided in main electrical rooms.
- **Housekeeping Pads:** Housekeeping pads should be at least 75 mm (3 inches) larger than the mounted equipment on all sides.
- **Posted Instructions:** Posted operating instructions are required for manually operated electrical systems. They should consist of simplified instructions and diagrams of equipment, controls and operation of the systems, including selector switches, main-tie-main transfers, ATS by-pass, UPS by-pass, etc. Instructions should be framed and posted adjacent to the major equipment of the system.
- **Means of Egress**

**600 Volts, Nominal, or Less.** The minimum number of means of egress for working space about electrical equipment, other than existing electrical equipment, shall be in accordance with *NFPA 70, National Electrical Code*, Article 110.26(C).

**Over 600 Volts, Nominal.** The minimum number of means of egress for working space about electrical equipment, other than existing electrical equipment, shall be in accordance with *NFPA 70, National Electrical Code, Article 110.33(A)*.

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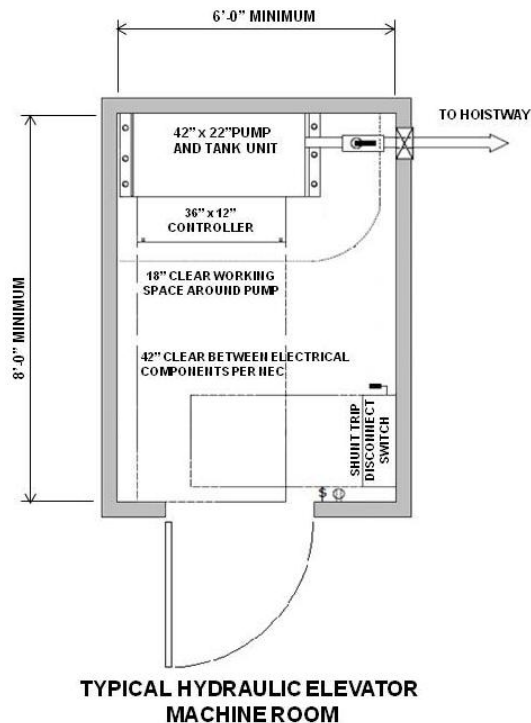
### 3.17.2 ELECTRIC CLOSET REQUIREMENTS:

Refer to *VA Standards for Construction TIL - Electrical Design Manual (PG-18-10)*.

### 3.18 ELEVATOR PLANNING

Once they are located, elevators become pivotal, but inflexible, elements of a multi-story building. Refer to the VA TIL “Quick Links” Design Manuals- *VA Standards for Construction TIL - Design Manual, Transport Systems (PG-18-10)*, also listed as *Auto Transport* at the earliest stages of schematic and design development for guidelines addressing Elevator, Lifts and Dumbwaiters Criteria, Guidelines, Etc.

#### 3.18.1 HYDRAULIC ELEVATOR MACHINE ROOM



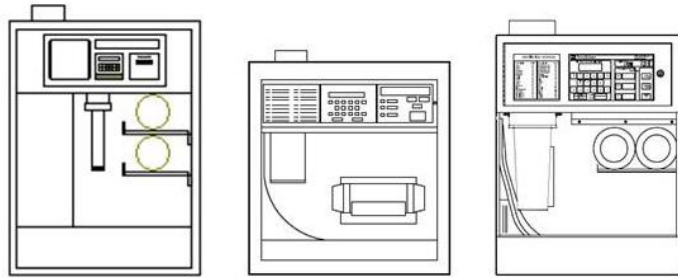
### 3.19 PNEUMATIC TUBE SYSTEMS

Pneumatic tube systems may be incorporated into VA Medical Facilities as an efficient method of transporting medications, laboratory samples, etc. from various locations within the facility such as the pharmacy to the patient care unit or the patient care unit to the laboratory. The pneumatic tube system is composed of carriers, tubes, blowers, stations, diverters and a computer control center, pneumatic tube delivery systems are designed for the high-speed, cost-effective transport of small materials weighing up to 6 lbs.



*Example of typical pneumatic tube station*

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TYPICAL PNEUMATIC TUBE STATION ELEVATIONS



## CHAPTER 4: TECHNICAL METHODS AND MEANS

### 4.1 TECHNICAL METHODS AND MEANS

**4.1.1 PURPOSE:** The purpose of this Chapter is to serve as the master reference guide for architectural planning and design of Department of Veterans Affairs (VA) facilities. Architectural requirements and criteria concepts that focus on the technical methods, means and components of building design and/or systems which are general in nature and common to all VA facilities.

### 4.2 SITEWORK, FOUNDATIONS, BASEMENTS, SLABS

#### 4.2.1 BUILDING PERIMETER FOUNDATION DRAINAGE

Refer to *TIL - Design and Construction Procedures (PG-18-3), Topic 4, Foundation Drainage*

#### 4.2.2 MEMBRANE WATERPROOFING AT INTERIOR FLOOR DRAINS

##### 4.2.2.1 GENERAL

Provide membrane waterproofing under floor finishes surrounding floor drains in areas subject to wet conditions to prevent water and moisture from penetrating the underlying floor slabs and damaging the finishes and contents of the rooms or spaces below. Attach the membrane waterproofing to the floor drain by a clamp, and extend outward from the floor drain under the entire area of the surrounding floor surface which slopes toward the floor drain or which is subject to surface water, and carry up abutting vertical surfaces at least 75 mm (3 inches).

##### 4.2.2.2 EXCEPTIONS

Do not provide membrane waterproofing if:

- The floor slab is placed on grade; or
- The floor finish itself is latex mastic with waterproofing membrane.

#### 4.2.3 KITCHEN MEMBRANE INSULATION

##### 4.2.3.1 GENERAL

The waterproof membrane in a kitchen floor can be damaged by the intense heat of a rack oven since these ovens rest directly on the floor. To protect the membrane, provide an insulating concrete floor under rack ovens, or specify the prefabricated insulated floor panel supplied by the oven manufacturer. The floor, in each case, should be flush with the adjoining kitchen floor.

##### 4.2.3.2 DRAWINGS

The design drawings must show details of the waterproof membrane, insulating concrete or panels, the thermal break between the rack-oven floor slab and the surrounding floor slab, and the structural support and anchors for the rack ovens.

### 4.3 PIPE BASEMENTS

Refer to *TIL - Design and Construction Procedures (PG-18-3), Topic 5, Pipe Basements*

#### 4.4 FLOOR SLAB DEPRESSIONS

Refer to *TIL - Design and Construction Procedures (PG-18-3), Topic 6, Floor Slab Depressions*

#### 4.5 BUILDING ENVELOPE

##### 4.5.1 ENERGY CONSERVATION

##### 4.5.2 GOVERNING REGULATIONS

All new VA facilities must comply with **Executive Order 13423** "Technical Guidance for Implementing the Five Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings, and meet the requirements of Department of Energy (DOE) regulations, **10 CFR Part 435**, "Energy Conservation Voluntary Performance Standards for Commercial and Multi-Family High Rise Residential Buildings; Mandatory for New Federal Buildings".

##### 4.5.3 ARCHITECTURAL REQUIREMENTS

The exterior closure of a building, the "thermal envelope", plays a major role in a structure's energy performance. It must be designed to minimize heat gain and loss from conduction, solar radiation, and air leakage. Refer to **ASHRAE 90.1, 2007**, for recommended "U" values for walls, glazing, roofs, and floors.

#### 4.6 EXTERIOR ENTRANCES AND PLATFORMS

##### 4.6.1 AMBULANCE ENTRANCES

##### 4.6.1.1 AMBULANCE PLATFORMS

Provide ambulance entrances for backing in and unloading with a platform 150 mm (6 inches) above the access drive. The platform shall have a minimum length of 3.9 m (13 ft.) and a minimum depth of 3 m (10 ft.). Platforms are not required for drive through unloading, but require a ramp at the entrance door. Use drive through ambulance entrance only as a second consideration and where the outside winter design temperatures are above 0 degrees C (32 degrees F), refer to **ASHRAE Handbook, 2009** - Fundamentals.

##### 4.6.1.2 AMBULANCE CANOPIES

Provide a noncombustible canopy at backing in and drive through unloading areas. Clearance from grade to the underside of any canopy obstruction shall be 3 m (10 ft.) minimum. Final determination of canopy height shall be based on an assessment of the typically emergency vehicles arriving at the site. Since some ambulances may require even more clearance, the A/E must coordinate with the medical center and local sources of emergency transportation before firmly establishing the canopy height.

##### 4.6.1.3 OTHER PROVISIONS

- Make additional provisions, if deemed necessary, to provide protection from weather for patients arriving by ambulance.
- Ambulance entrances shall include provisions for wheelchair and litter access for emergency patients arriving in vehicles other than an ambulance.



### 4.6.1.4 ENCLOSED AMBULANCE ENTRANCES

Enclose ambulance entrances where the outside winter design temperature is below -12 degrees C (10 degrees F) refer to *ASHRAE Handbook, 2009* - Fundamentals. Equip the enclosed entrances with automatic overhead type doors operable from both outside and inside of the enclosure.

### 4.6.2 OTHER PATIENT ENTRANCES

#### 4.6.2.1 CANOPIES

Provide non-combustible canopies over entrances to outpatient clinics, ambulatory care facilities, main hospitals, spinal cord injury facilities, emergency entrances and nursing home care units. The canopies shall extend 600 mm (2 feet) beyond the curb lines to protect patients from inclement weather. Modifications to this standard may be negotiated for entrances to historic buildings, provided such modifications do not impact the safety and comfort of veterans and their families.

#### 4.6.2.2 REVOLVING DOORS

Provide revolving door(s) at all main entrances to Health Care Facilities except spinal cord injury, nursing home care units, and emergency entrances, to exclude inclement elements from the building. For persons with disabilities, provide a secondary set of 1200 mm (4 ft.) wide, automatically operated swinging door(s) with an air lock vestibule of 6.3 m (21 ft.) between doors. Modifications to this standard may be negotiated for entrances to historic buildings, provided such modifications do not impact the safety and comfort of veterans and their families.

#### 4.6.2.3 AIR LOCKS

At spinal cord injury unit (SCIU), nursing home care unit (NHCU), and emergency entrances, provide air locks consisting of vestibules formed by automatically operated sliding doors placed not less than 6.3 m (21 ft.) apart. These must be break-away type doors that can be manually operated during a power failure. If swinging doors must be used, both the inner and outer doors shall swing outward.

### 4.6.3 MORGUE ENTRANCES/EXITS

- Provide morgue entrances for back-in unloading with a platform 150 mm (6 in.) above the access drive.
- Provide a noncombustible canopy with a clearance from grade of 3 m (10 ft.) minimum.
- Screen morgue entrances from public view.

### 4.6.4 LOADING DOCKS

#### 4.6.4.1 PLATFORMS

All warehouse, dietetic, laundry, and animal research facility loading dock platforms shall be 1200 mm (4 ft.) above the driveway. Platforms shall have a minimum depth of 2400 mm (8 ft.) front to back or between the back of the dock lift/leveler and the back wall.

### 4.6.4.2 CANOPIES

Provide a noncombustible canopy over the platform with 4.2 m (14 ft.) clearance from grade to the underside of the canopy.

### 4.6.4.3 PEDESTRIAN ACCESS

Provide a stair or a ramp to the platform; for platforms which are more than 15 m (50 ft.) long, provide a stair or a ramp at each end.

### 4.6.5. OVERHEAD CLEARANCE FOR TRUCKS AND BUSES

Maintain soffits under portions of buildings, canopies, or overhanging building extensions over truck and public bus traffic areas at a height which will provide 4.2 m (14 ft.) minimum head room. Maintain a grade either side of the passageway to provide the required head room for the longest wheel base trailer permitted by the state.

### 4.6.6 MAINTENANCE-SHOP ENTRANCE PLATFORMS

Entrance platforms to maintenance shop floors shall be 150 mm (6 in.) high above grade, at same level as shop floors, and shall be a minimum of 3 m (10 ft.) wide. Slope platform away from the building. Provide double doors at platforms to permit direct transfer of long lengths of pipe, lumber, etc. to maintenance shop storage areas.

### 4.6.7 ENTRANCE AND EXIT ACCESSIBILITY

- All platforms, ramps and stairs adjacent to entrances shall have non-slip surfaces.
- All entrances and all exits at grade shall be accessible to and usable by persons with disabilities, that is level or provided with ramps, and free of steps or other obstructions. Fire stair exits, loading docks, boiler and chiller buildings, etc., are exempt.

## 4.7 EXIT AND EGRESS DOOR LOCKS

### 4.7.1 BUILDING ACCESS AND EGRESS DOORS (EXTERIOR)

### 4.7.2 ELECTROMAGNETIC LOCKING SYSTEM

#### 4.7.2.1 GENERAL

If requested by the medical center, equip all building access and egress doors (pedestrian) with centrally controlled, listed locking devices, i.e. an electromagnetic locking system, meeting the requirements of Special Locking Arrangements contained in ***NFPA 101, Life Safety Code, Chapter 7, Means of Egress***. On the exterior side, provide locks that are controlled by key.

#### 4.7.2.2 MONITORS AND ALARMS

Locate a central door control and monitoring console in the security service operations room. Install a second monitoring-only panel in the Engineering Control Center if requested by the medical center. An audible and visual alarm will be activated at the control panels when an individual attempts to exit through a door equipped with an electromagnetic locking system.

#### 4.7.2.3 DESIGN BY SECURITY CONSULTANT

The A/E shall obtain the services of a security consultant to design the exit door locking

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system. The consultant shall coordinate the design with the station security officials, especially where an existing system is in place, to attempt to achieve compatibility.

### 4.7.2.4 MANUALLY OPERATED LOCKS

If a centrally controlled electromagnetic locking system is not used, provide exterior door locks that are controlled by key on the outside but allow egress from inside by turning a lever handle or depressing a panic bar.

## 4.8. STAIRWAY DOORS

### 4.8.1 EXTERIOR EXIT DOORS AT STAIRWAYS

Design doors and hardware for stairway exit doors leading directly to the exterior in accordance with paragraphs above, except that only panic hardware may be used.

### 4.8.2. INTERIOR STAIRWAY DOORS

Provide interior stairway doors with passage latch sets having inside and outside door handles free at all times. Exceptions are where stairway doors are required to be locked to prevent entrance into or elopement from areas such as ICUs, surgery, hemodialysis, radiology, and psychiatric nursing units. When these doors are locked from stair side, outside handles shall allow free egress into stairwells at all times, except from psychiatric areas.

### 4.8.3 ALARMS, BELLS, AND COMMUNICATORS ON DOORS

Refer to the following VA standards and requirements regarding door alarms, bells, communicators for specific applications in ICUs, surgery, hemodialysis, radiology, and psychiatric nursing units and as directed by the VA:

- *TIL - Master Construction Specifications (PG-18-1), Division 8 - Doors and Windows*
- *TIL - VA Standards for Construction (PG-18-14), Room Finishes, Door, and Hardware Schedules*
- *Refer to TIL - Special Requirements, Physical Security*
- *Refer to TIL - Special Requirements, Fire & Safety*

## 4.9 AUTOMATIC DOORS

### 4.9.1 GENERAL

Design automatic doors shall operate manually in event of power failure. Equip controls with safety devices for pedestrian protection. Provide door-operator controls and equipment that are easily accessible for maintenance. Design automatic doors to open from both sides. Automatic doors shall comply with:

- *TIL - VA Standards for Construction, Environmental Planning Guidance, Fire & Safety (PG 18-17)*
- *TIL - VA Standards for Construction, Room Finishes, Door, and Hardware Schedule (PG 18-14)*

### 4.9.2 TYPES AND LOCATIONS

**4.9.2.1 MOTION DETECTORS:** Use sliding doors operated by motion detectors and an electric-eye safety device with emergency breakaway features at:

- Main entrance, if revolving doors are not practical

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- Ambulatory Care patient entrance, if revolving doors are not practical
- Spinal Cord Injury entrances
- Nursing Home Care Unit entrances
- Corridor doors to Congregate Baths and Congregate Toilet Rooms (Spinal Cord Injury, Orthopedic, Neurological, and Rehabilitation Medicine Service (RMS) Nursing Units)
- *Other areas as deemed appropriate to facilitate function of space(s).*

**4.9.2.2 SCI/D:** Use sliding doors operated by remote push plates at doors from Spinal Cord Injury bedrooms into toilet/shower rooms.

**4.9.2.3 REMOTE PUSH PLATES:** Use swinging doors with remote push plate operation at:

Main entrance doors to and from Surgery Suite

- Recovery Room doors into corridors
- Spinal Cord Injury: Patients' Dining Rooms, Dayrooms, Recreation Therapy Rooms, Physical Therapy (PT), and Occupational Therapy (OT) Clinics
- Entrance Doors to Life Support Rooms, Minor Operating Rooms, and Observation and Treatment C. Corridor Doors to Radiation Treatment Rooms
- Spinal Cord Injury: Patients' Dining Rooms, Dayrooms, Recreation Therapy Rooms, Physical Therapy (PT), and Occupational Therapy (OT) Clinics
- Entrance Doors to Medical and Surgical Intensive Care Units (ICUs), Coronary Care ICU, and General Purpose ICU
- NHCU & SCIU entrance doors to courtyards, patios, etc.

**4.9.2.4 WALK-OFF MATS:** Use walk-off mats (requires floor slab depression) pursuant to **VA Standards for Construction, TIL - Design and Construction Procedures (PG-18-3), Topic 6** including:

- Ambulance entrances
- Entrances, storm vestibules and lobby entrances
- Exit doors at stairways.
- As indicated on the drawings and/or as specified

**4.9.2.5 CHAIN PULL:** Use swinging doors with pull-chain operation at doors between loading platform and interior corridors.

### 4.10 EXTERIOR WINDOWS

#### 4.10.1 HISTORIC BUILDINGS

Generally speaking, any building more than about 45 years old is likely to be regarded as historic, and newer buildings are occasionally thought historic because of their architectural excellence or specific histories. During early design of any new construction or renovation, the historic character of any affected building should be determined, following regulations at 36 CFR Part 800 (See Directive/Handbook 7545). Specific design guidelines may then be developed in consultation with the State Historic Preservation Officer and other stakeholders. In many but not all cases these guidelines require using the Secretary of the Interior's "Standards for Treatment of Historic Properties" <http://www.nps.gov/hps/tps/standguide/> as a guide for projects affecting windows of historic buildings, to the extent this is possible while achieving project goals. Refer to **TIL - NCA Design & Construction Criteria, Historic Preservation.**

#### 4.10.2 ENERGY CONSERVATION

Design aluminum windows in accordance with energy requirements, Refer to the following standards:

- ***TIL - Design Manuals, HVAC Design Manual for Hospitals, (PG-18-10)***
- ***ASHRAE Standard 90, Energy Standard for Buildings except Low-Rise Residential Buildings***
- ***ASHRAE Standard 189.1, Standard for the Design of High-Performance, Green Buildings except Low-Rise Residential Buildings.***
- Energy-conservation requirements will result in double-glazed windows for most locations. For double glazed windows, provide a continuous thermal break between inner and outer sash; also between inner and outer frame components including window sill.

#### 4.10.3 INTEGRAL VENETIAN BLINDS

Provide double glazed thermally broken windows units with enclosed horizontal venetian blinds between the two glazed surfaces, required for all windows in VA hospitals/medical centers and medical facilities.

#### 4.10.4 SILL HEIGHT

Window sills/stools in patient bedrooms shall be a minimum of 450 mm (18 in.) above the finished floor.

#### 4.10.5 OPERABLE WINDOWS

- The VA refrains from utilizing operable windows since they are more costly than fixed windows and subject to drafts, leaks, and maintenance problems, but may be required or justifiable for:
  - Washing and glazing from within the building
  - Ventilation in non-air-conditioned building
  - Code compliance (patient bedrooms in non-sprinklered buildings)
  - Emergency ventilation in case of loss of electrical power to HVAC system (when HVAC system is not on emergency power system)
  - For limited openings.
- The A/E shall make design decisions concerning operable windows in close consultation with the medical center, and shall document and distribute to **VA-00CFM1** and **VA Medical Center** a signed letter of mutual agreement and understanding with the medical center on the use of operable windows. Furthermore, operable windows shall be in-swinging and side hinged unless historic design compatibility or other specific conditions dictate otherwise. All operable windows in air conditioned buildings shall normally be closed and locked. For safety, operable windows in patient bedrooms shall have hold-open hardware which secures the window at a maximum opening of 150 mm (6 in.) for emergency ventilation.
- Refer to ***TIL - VA Standards for Construction, Master Construction Specifications (PG-18-1)***.
- When in open position for ventilation, window sash shall not project into the room

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beyond edge of window sill or face of heating convector or beyond exterior reveals of window sills within 2,000 mm (6 ft. 6 in.) of grade.

- Mechanically operated windows shall be avoided. If they are necessary for high or inaccessible windows, then the mechanical operators shall be simple and durable.

### 4.10.6 SAFETY GLAZING

- Glaze all windows in Psychiatric Nursing Units, Alcohol Dependency Treatment Nursing Units, Drug Abuse Treatment Nursing Units, Medical, Surgical and Neurological (MS&N) Security Bedrooms, Security Exam Rooms, and Security Holding Rooms with laminated glass. Laminated glass shall be 11 mm (7/16 in.) thick in locked patient units and security rooms, 8 mm (5/16 in.) thick elsewhere.
- If laminated glass is required for double-glazed windows, provide it for interior panes only except in Mental Health and Behavioral Nursing Units for windows facing a courtyard with sill/stools less than 2000 mm (6 ft. 6 in.) above the ground. Where this occurs, laminated glass is required for both panes.

### 4.11 SCREENS - WINDOW, DETENTION, SECURITY AND VENTILATION

#### 4.11.1 INSECT SCREENS

Provide screens only on operable windows in spaces that are not air conditioned.

#### 4.11.2 DETENTION SCREENS

Use detention screens only in existing buildings where limitations of architectural character or cost do not permit replacement of existing screened windows whose design will not accommodate laminated safety glass.

#### 4.11.3 SECURITY SCREENS

Provide security screens on windows where required, Refer to *TIL - VA Standards for Construction, Design and Construction Procedures (PG-18-3), Topic 14 Security*.

#### 4.11.4 VENTILATION SYSTEM SCREENS

Provide bird screens on mechanical ventilation supply and exhaust openings in exterior walls. Provide insect screens on the inside of louvered openings in exterior walls where there are no duct connections.

### 4.12 LOUVERS

Location of ventilation louvers requires careful consideration of prevailing winds, as well as close coordination between the architect and mechanical engineer, to avoid the re-entry of exhaust air and the intake of exhaust fumes from vehicles and other engines, including emergency engine generators. Refer to: *TIL - VA Standards for Construction, HVAC Design Manual (PG-18-10)*.

### 4.13 PARAPET WALLS, ROOF STRUCTURES, AND WALKWAYS

#### 4.13.1 PARAPET WALLS

Masonry parapet walls are potential sources of water penetration, unequal thermal expansion, additional structural loads, and increased costs. Therefore, do not use such walls

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for any building unless specifically permitted by the Project Manager. Proposed parapet walls must be justified by aesthetic, functional or economic considerations. Where permitted, design and reinforce them to assure stability and water tightness when subjected to lateral or thermal forces.

### 4.13.2 ROOF STRUCTURES

Make roof structures, such as penthouses and architectural screens enclosing or concealing roof mounted mechanical equipment, compatible in appearance and with the material, texture, color, and shape of the building. Where it is necessary to expose roof mounted mechanical equipment, minimize its appearance by location, low silhouette, and color.

### 4.13.3 ROOF WALKWAYS

Provide roof walkways of prefabricated asphalt planks with non-slip surfaces on access routes over roofs to mechanical equipment requiring recurrent maintenance. Where necessary for safety of maintenance workers, provide ladders, stairs and/or platforms. Show their locations and provide details on architectural drawings.

### 4.13.4 ATTIC WALKWAYS

In attic spaces having batt or loose fiber insulation, provide walkways for access to mechanical and electrical equipment. Show the location and details of attic walkways on architectural drawings.

### 4.13.5 ROOFTOP GUARDRAILS

Whenever mechanical equipment requiring periodic maintenance is installed on a roof more than 6 m (20 ft.) above the ground, provide guardrails or fences between the roof edge and any equipment or walkways less than 3 m (10 ft.) from the edge. Design the guardrails 1,050 mm (42 in.) high and in accordance with OSHA requirements for standard guardrails.

## 4.14 LOW-SLOPE ROOF SYSTEMS

### 4.14.1 GENERAL

Design low-slope roof systems in accordance with the recommendations of *The NRCA Roofing Manual: Membrane Roof Systems* and this manual.

- Low slope roof systems include but are not limited to the following roofing membranes with roof insulation:
  - Bituminous built-up roofing systems
  - Modified bituminous roofing systems
  - Single-ply sheet roofing system
  - Fluid applied roofing systems
- Re-roofed areas shall conform to this Section.
- Where alterations or repairs are required to over 40 percent of flat roof, consider entire roofing replacement.

### 4.14.2 FLAT ROOF POLICY

No roofs shall be dead flat; design all roofs with slope to roof drains or gutters.

### 4.14.3 DESIGN LAYOUT OF LOW-SLOPE ROOFS

Design low slope roof systems with a positive slope: a minimum of 1:50 (0.25 in. per ft.) up to

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a maximum of 1:12 (1.0 in. per ft.) to drains:

- Use tapered insulation, sloped structural systems, or level structural system with sloped fill to achieve the required slope.
- Do not use NRCA defined "One way slope" (Sloping to a level valley). See NRCA – "Tapered Roof Insulation Systems."
- Use NRCA defined "Two Way slope" (actually slopes in four directions).
- Use a uniform square grid to lay out roof slopes to drains. Roofs shall not slope to level valleys, but may have one way slopes to gutters at gravel stop edges.
- Locate drains at points of maximum deck deflection; generally at mid span of the deck between supports where possible.

### 4.14.4 ROOFING SELECTION

It is important to select the right roofing system. Some of the factors that may influence the roofing choice are:

- The shape of the building and roof
- The location of the drains, whether exterior or interior
- Aesthetic considerations
- Historic preservation considerations, where relevant
- Roof and insulation attachment methods that are dictated by the deck type
- The insulating values desired for energy conservation and HVAC sizing
- The type of building use and operations. For example, the water vapor generated from a swimming pool, or emissions from a boiler plant, may dictate the choice of roofing
- Use of thermal insulation versus storm water management
- Compliance with "**Cool Roof**" Concepts

### 4.15 ANCHORAGE OF INSULATION

Anchor insulation to deck. Loose laid insulation is not permitted except for protective membrane roof insulation system.

### 4.16 BALLAST

Should ballasted roofing membrane systems be required, indicate ballast types and weight(s) on roof plans and describe in detail in project specifications. Refer to **TIL - VA Standards for Construction, Master Construction Specifications (PG-18-1)** for guidance.

### 4.17 BASE FLASHING AND PENETRATIONS

Use 200 mm (8 in.) high base flashing at walls and penetrations. Do not use pitch pockets or similar penetration seals.

### 4.18 SCUPPERS

Locate overflow scuppers in parapet walls (*when permitted*) at top of membrane so that ponding does not exceed high point of slopes.



#### 4.19 PROVISION FOR FUTURE VERTICAL EXPANSION

Where the roof deck is to become a future floor slab, design the roof system as follows:

- Depress roof slab as required, Refer to *TIL - Design and Construction Procedures (PG-18-3) Design and Construction Procedures, Topic 12, Future Vertical Expansion*.
- Provide a separation between the roof system and the roof deck (future floor slab).
- Design for ease of removal of the roofing system completely to the roof deck assembly.
- Detail connections for future columns and exterior walls to prevent water infiltration into the roof system.

#### 4.20 EXTERIOR INSULATION FINISH SYSTEM

If an exterior insulation finish system (EIFS) is used for the exterior finish, use only "Drainable" type. Sheathing shall be concrete backer board.

#### 4.21 STRUCTURAL STEEL ANGLE GUARDS

Provide structural steel angle guards, protected from corrosion by painting or galvanizing, for exterior use in the paths of motor vehicle traffic to the loading dock and at exposed corners on the platform.

#### 4.22 BUILDING INTERIOR

##### 4.22.1 DOORS

##### 4.22.2 GENERAL

- Comply with *TIL - VA Standards for Construction, Room Finishes, Door and Hardware Schedule (PG-18-14)*, for sizes, types and symbols of doors. Provide solid core wood or hollow metal interior doors. Wood is preferred, except for locations where metal is required for functional reasons.
- Provide metal door frames.
- For automatic-door requirements, refer to Section 4.9 above.

##### 4.22.3 CORRIDOR-TO-CORRIDOR DOORS

All corridor to corridor doors shall have 0.06 sq. m (100 sq. in.) glass vision panels and shall swing in opposite directions from each other.

##### 4.22.4 FIRE-PARTITION AND SMOKE-BARRIER DOORS

- Doors in fire partitions and smoke barriers shall have fire rated glazing vision panels and be held open with electromagnetic holders, except doors which should remain closed for functional reasons.
- Do not use wood labeled fire doors in areas where they may be subjected to heavy traffic or hard use, such as by carts, trucks, kitchen equipment, etc., nor for pairs of opposite-swinging (cross corridor) doors. In these locations, use hollow metal labeled doors.

## 4.23 SHADES, BLINDS, DRAPERIES, AND CURTAINS

### 4.23.1 LIGHTPROOF SHADES

Provide lightproof shades to prevent outside light from infiltrating into the room on windows in electron microscopy rooms and fluorescent microscopy rooms. Refer to *TIL - VA Standards for Construction, Master Construction Specifications (PG-18-1), Division 12 Furnishings*.

### 4.23.2 OPAQUE SHADES

Provide opaque (room-darkening) shades on windows of radiographic and fluoroscopic rooms, special procedures rooms, cardiac catheterization rooms, eye-clinic rooms, and rooms containing image intensifiers.

### 4.23.3 WINDOW HEADS

The construction of window heads shall include a wood plate, board, or trim piece above the head designed to accommodate the attachment of window treatments that may be installed by the medical center after completion of the building construction.

## 4.24 PARTITIONS

### 4.24.1 METAL STUD PARTITIONS

- For general interior partition framing, refer to *TIL - VA Standards for Construction, Master Construction Specifications (PG-18-1), "non-structural metal framing"*.
- For X-ray Suites utilizing lead shielding systems, use 100 mm (4 in.) metal studs. Use double row of 100 mm (4 in.) studs between adjacent X-Ray rooms (with lead shielding between rows of studs) and 150 mm (6 in.) studs for other walls of X-ray rooms. Isolated power units require thicker walls, generally 150 to 200 mm (6 to 8 in.), depending on size of units. Use nominal 150 mm (8 in.) partitions for surgical operating rooms until completion of design development determine a more precise size. Certain recessed electric panels outside of electrical closets may require walls thicker than usual; coordinate with Project Electrical Engineer. For walls with piping and other special requirements, use other sizes or systems as appropriate.

### 4.24.2 STRUCTURAL DESIGN

Coordinate with Structural Engineer for design of partitions supporting wall-hung equipment and TV support brackets, and for wind-load design of exterior walls.

### 4.24.3 GYPSUM BOARD

Where gypsum board is called for, use 16 mm (5/8 in.) thick Type X gypsum board, except for special conditions.

### 4.24.4 RADIATION PROTECTION

- The requirements for furnishing and installing X-Ray Protection Materials including lead backed gypsum wallboard, lead lined doors, interlocking lead bricks, lead lining of door frames, window frames and x-ray protective lead glass will require services of a registered physicist to establish the shielding protection required.
- Specifications for radiation protection refer to *TIL - VA Standards for Construction*,

*Master Construction Specifications (PG-18-1), Division 13 Special Construction.*

**4.24.5 HEIGHT OF GYPSUM BOARD**

- Refer to ***TIL - VA Standards for Construction, Master Construction Specifications (PG-18-1), Division 9 Finishes***, for height of gypsum board on metal stud partitions in most applications.
- For smoke barriers, extend one layer of gypsum board from floor to underside of structure above on partitions enclosing isolation room or suite, and firestop juncture of gypsum board and adjoining material to prevent the passage of smoke.

**4.24.6 SECURITY PARTITIONS**

Partitions housing service windows of pharmacy, agent cashier, and credit union must be of solid masonry or other special construction to provide security. Refer to ***TIL - VA Standards for Construction, Design and Construction Procedures (PG-18-3), Topic 14, Security***,

**4.25 VA GUIDE TO ROOM FINISHES**

- All interior finishes are indicated in the specifications. The project management team must review any deviation from the finishes described in this document prior to start of construction document phase. The A/E shall combine the finish schedule and color design schedule and include them in the specifications. Do not indicate on the drawings. Use the finish schedule format included in Room Finishes, Door, and Hardware Schedule.
- Refer to ***TIL - VA Standards for Construction, (PG-18-14), Room Finishes, Door, and Hardware Schedules***.

**4.26 HANDRAILS, WALL GUARDS, AND CORNER GUARDS**

- Provide, except in administrative areas, handrails, wall guards (crash rails) should be installed on both sides of all corridors with walls constructed of gypsum board, veneer plaster, or plaster. This includes all nursing units, clinical and patient care areas, and dietetic and service areas where walls are not ceramic tile or masonry. Provide continuous reinforcing in the wall for attachment of handrails and wall guards. Corners shall also be protected with appropriate materials.
- Provide resilient or stainless steel corner guards for the external corners of finished interior walls and columns in the paths of wheeled traffic within the following:
  - Corridors within:
    - â Domiciliary Buildings
    - â Nursing Units
    - â Operating and Interventional Suites
    - â Kitchen and Dietetic Areas
    - â Ambulatory Care and Clinical Areas
    - â Maintenance and Repair Areas
    - â Warehouse and Receiving Areas
    - â Laundry and Linen Areas

**Note:** Corner guards are not required in corridors where continuous handrails and wall guards are used around external corners.

- Areas within:
  - Food Preparation and Distribution
  - Food Serving and Dining
  - Cart Storage
  - Pharmacy
  - Supply Processing and Distribution
  - Morgue and Autopsy Rooms
  - Service Elevator Lobbies
  - Rooms containing dumbwaiters or cart-lift elevators
  - Maintenance and Repair
  - Warehouse and Receiving
  - Laundry and Linen
  
- Choice of corner-guard material is governed by wall finish:
  
- Use surface-applied (full height) resilient type corner guards on gypsum board, veneer plaster, or plaster walls.
  
- Use stainless steel corner guards on masonry or ceramic tile walls.
  
- Refer to:
  - ***TIL - VA Standards for Construction (PG-18-1), Master Construction Specifications, Division 12 Specialties***
  - ***TIL - VA Standards for Construction (PG-18-4), Standard Details and CAD Standards.***

### **4.26.1 RIGID ADHESIVE-APPLIED ACRYLIC/VINYL CORNER GUARDS**

At external corners in patient bedrooms, use rigid, acrylic corner guards, as recommended by the manufacturer.

### **4.26.2 STRUCTURAL STEEL CORNER GUARDS**

Provide structural steel angle guards, suitably painted or galvanized, for the external corners of exposed masonry interior walls and columns in the paths of motorized wheeled vehicles in corridors and areas within:

- Warehouse and Receiving
- Laundry and Linen Service
- Parking Garages and Ambulance Garages

## **4.27 CEILINGS**

### **4.27.1 CUBICLE CURTAIN TRACKS**

Examination rooms, and patient bedrooms, except in Mental Health and Behavioral Patient Care Units, are to have cubicle curtain tracks for privacy. All cubicle curtain tracks are to be surface mounted.

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### 4.27 2 MINIMUM CEILING HEIGHTS

Minimum clear ceiling heights from finished floor to finished ceiling or underside of any obstruction above finished floor shall be 2700 mm (9 ft.) except for areas listed below:

	Space - Room - Area	Metric (meters)	Imperial (feet- inches)
1	Animal Research Operating Rooms and Radiographic rooms	2.9 m	9 ft. 6 in.
2	Camera Rooms (Medical Media Production)	3.0 m	10 ft. 0 in.
3	Cardiac Catheterization Rooms (X-ray) <i>Note: Some manufacturers' equipment for cardiac catheterization labs and special procedures rooms may require more than the standard 3.0 m (9 ft. 6 in.). Verify requirements with medical center before establishing a firm ceiling height in these spaces.</i>	2.9 m	9 ft. 6 in.
4	Chapels constructed as separate buildings <i>Note: The wall height at the nave shall be to the intersection of the underside of the roof slab with the exterior surface of the nave wall.</i>	3.6 m	12 ft.0 in.
5	Corrective Therapy Rooms (Rehabilitation Medicine)	3.0 m	10 ft. 0 in.
6	Emergency Generator Rooms: Generators smaller than 500 KW Generators 500 KW and larger	3.6 m 3.8 m	12 ft. 0 in. 14 ft. 0 in.
7	Engineering Shops	3.0 m	10 ft. 0 in.
8	Laundries <i>Note: clear headroom below duct work, piping, conveyors and other obstructions</i> Clean linen distribution areas, Production area, Soiled linen area	4.8 m	16 ft. 0 in.
9	Libraries (health science and patients)	2.9 m	9 ft. 6 in.
10	Vocational rehabilitation therapy	2.9 m	9 ft. 6 in.
11	Operating Rooms Operating Room Note: <i>Additional 200 mm (8 in.) of accessible space must be available above the ceiling to accommodate ceiling mounted operating microscopes: Otherwise, ceiling height must be 3.1 m (10 ft. 2 in.).</i>	3.0 m	10 ft. 0 in.
12	Hybrid Operating Rooms	2.9 m	9 ft. 6 in.
13	Multipurpose Recreation Rooms, smaller than 225 SM (2400 SF)	3.0 m	10 ft. 0 in.
14	Multipurpose recreation rooms 225 SM (2400 SF) and larger Multipurpose Recreation Room Note: <i>For hospital buildings, locate multipurpose recreation rooms having ceiling heights of 6.6 m (22 ft.) outside of and contiguous to the exterior wall of the main structure. For nursing home care buildings and domiciliary buildings, ceiling heights of multipurpose rooms 225 sq. m (2,400 sq. ft.) and above shall be in keeping with the design and uniformity of the structure.)</i>	6.6 m	22 ft. 0 in.
15	Pet/Cyclotron Rooms	3.0 m	10 ft. 0 in.
16	Operating Rooms Operating room note: <i>Additional 200 mm (8 in.) of accessible space must be available above the ceiling to accommodate ceiling mounted operating microscopes: Otherwise, ceiling height must be 3.1 m (10 ft. 2 in.).</i>	3.0 m	10 ft. 0 in.

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	Space - Room - Area	Metric (meters)	Imperial (feet- inches)
17	Hybrid Operating Rooms	2.9 m	9 ft. 6 in.
19	Parking structures - minimum clearance, Refer to Parking Design Guide <i>Note: Life Safety Code, NFPA101, requires a means of egress to have minimum headroom of 2300 mm (7 ft. 6 in.) and any projection from the ceiling to be at least 2800 mm (6 ft. 8 in.) from the floor.</i>	2.3 m	7 ft. 6in.
20	Patient Bedrooms without ceiling hung television sets	2.4 m	8 ft. 0in.
21	Physical Therapy Clinics (Rehabilitation Medicine)	2.9 m	9 ft. 6 in.
22	Radiation Therapy Rooms	2.9 m	9 ft. 6 in.
23	Switchgear Rooms (High Voltage)	3.3 m	11 ft. 0 in.
24	Therapeutic Pools - <i>the height from floor to underside of truss or ceiling</i>	3.0 m	10 ft. 0 in.
25	Transformer Rooms	3.3 m	11 ft. 0 in.
26	Warehouses	4.5 m	15 ft. 0 in.
27	Diagnostic Imaging Rooms includes: <i>X-Ray Radiographic-Fluoroscopy Nuclear Medicine-Gamma Pet / CT Computed Tomography Magnetic Resonance Bone Densitometry Mammography</i>	2.7 m	9 ft. 0 in.

### 4.27.3 EFFECTS OF VA HOSPITAL BUILDING SYSTEM

When the VA Hospital Building System concept is used as the basis of design, maintain to the extent feasible uniform walk-on deck and ceiling elevations in accordance with the principles of the system concept.

### 4.28 TOILET PARTITIONS, Screens AND WALL PROTECTION

#### 4.28.1 TOILET ROOM PARTITIONS

- All toilet stall partitions are to be ceiling hung.
- Use steel with baked-on enamel finish for toilet stall partitions and room entrance screens. Exceptions:
  - Provide stainless steel toilet stall partitions adjacent to urinals.
  - Room entrance screens that double as part of a toilet partition enclosure shall be of typical stud construction, from floor to ceiling.
- Provide stainless steel wall-hung urinal screen partitions.
- Do not use toilet stalls or divider partitions in single-user toilet rooms in which only a lavatory and water closet are provided.

### 4.28.2 VISUAL SCREENING

In planning the layouts of toilet rooms and bathrooms, use hinged doors or provide visual screening, so as to block the view from the corridors into such rooms. **Refer to TIL - Standard Details (PG-18-4), Division 10 – Specialties.**

### 4.28.3 WALL PROTECTION AT PLUMBING FIXTURES

Provide vinyl wallcovering on walls with lavatories, sinks, or electric water coolers, unless space has ceramic tile wainscot or other impermeable finish.

### 4.29 WATER COOLERS

Provide electrical water coolers in alcoves near all waiting areas and on nursing units and where specifically required by the **TIL - Equipment Information (PG-18-5), Equipment Guide List**. All water coolers are to be accessible per requirements of the Uniform Federal Accessibility Standards.

### 4.30 SHOWERS

#### 4.30.1 SHOWER ENCLOSURES

Use ceramic tile applied with thin set Portland cement to concrete-fiber reinforced backer board for shower enclosures and partitions of adjoining areas. Use prefabricated shower stalls in boiler plants, chiller buildings, and energy centers.

#### 4.30.2 SHOWER FLOORS

Use non-slip finished floors for showers and contiguous spaces. Depress the structural floor of patient showers and adjoining spaces in new hospital buildings 75 mm (3 in.) and place a 75 mm (3 in.) removable fill on the entire floor area. In new buildings, slope finished floors of patient bathrooms toward showers to assure drainage to the shower drain. In existing buildings where standard depression is not feasible, use other means to ensure positive drainage and water tightness. Floor slopes in and around a shower shall not exceed 5 percent.

#### 4.30.3 SHOWER ACCESSIBILITY

Construct all patient showers without curbs, and at least one shower stall in non-patient shower rooms. Provide grab bars for all showers. Refer to **TIL - Accessibility (PG-18-13)**.

### 4.31 ROOM NUMBERING

Refer to **TIL - Design Criteria - Special Requirements & Studies, Signage**

#### 4.31.1 ADDITIONS TO EXISTING BUILDINGS

When a new building joins an existing building, make the new room numbering consistent with the existing room numbering system used for the spaces in the existing building.

### 4.32 SIGNS, PLAQUES AND EMBLEMS

#### 4.32.1 GENERAL

Refer to **TIL - Design Criteria - Special Requirements, Plaques & Seals**

#### 4.32.2 SAFETY SIGN

Provide a safety sign for each VA construction project over \$2 million in cost. Refer to **TIL -**

***Master Construction Specifications (PG-18-1) and Standard Details (PG-18-4) Division-1, General Requirements.***

**4.32.3 CONSTRUCTION SIGN**

Provide a construction sign at the site of VA construction projects over \$2 million in cost. Refer to ***TIL - Master Construction Specifications (PG-18-1) and Standard Details (PG-18-4) Division-1, General Requirements.***

**4.32.4 DEDICATION PLAQUE**

VA will furnish a dedication plaque and the contractor will install it. The plaque will be located in the lobby of the building, and shown on contract drawings. Refer to ***TIL - Special Requirements, Plaques & Seals VA Facilities Dedication Plaques and Seals Procurement***

**4.32.5 VA EMBLEM**

The VA emblem (seal) is to be prominently displayed on all major buildings. Replicas are available in bronze in three sizes as indicated within ***TIL - Standard Details (PG-18-4) Division 10 - Specialties.*** Incorporate the emblem in the design near the main entrance so as to be seen by persons approaching either in vehicles or on foot.

**4.33 ATRIUMS, MALLS AND LARGE SPACES**

**4.33.1 GENERAL REQUIREMENTS FOR ATRIUMS, MALLS AND LARGE SPACES**

- It is recommended that consideration be given to the design of atria, malls, sky-bridges and similar appurtenances, which are accessible to the public, patients, staff, etc. and shall be designed in such manner to prohibit individuals from doing harm to themselves.
- Barriers should be designed with both aesthetics and safety in mind with the heights of barriers not less than 72" above the finished floor on all levels. Where a handrail can be utilized to boost an individual, the height of the barrier should not be less than 96" above the finished floor on all levels.
- The A/E should also realize that it is important to consider that furniture should not be designed or placed against the barrier. When designing open, multi-level spaces a toe kick needs to be included to prevent objects from falling onto to the level below. Falling objects can present a series risk of injury to staff and patients on the lower levels. The toe kick should be installed along the entire perimeter of the atrium on all elevated floor levels.

**4.33.2 ANIMAL RESEARCH FACILITY (ARF) / VETERINARY MEDICAL UNIT (VMU)**

- Veterinary Medical Unit, a part of Research and Development, has many special requirements. They range from HVAC, electrical, and plumbing, to equipment and finishes. If automatic cage washers are used, they require large floor depressions, which will affect the structural design. Refer to ***TIL - Design and Construction Procedures (PG-18-3), Topic 6, Floor Slab Depressions.***
- Refer to ***TIL - Design Guides (PG-18-12), Research Series*** for a comprehensive graphic consolidation of VA Design Criteria for VMUs, including room-by-room guide plates.



- For Animal research technical summary refer to *TIL - Technical Summaries, Research Facilities*.

#### 4.34 AUDIOLOGY SOUND SUITES

- Sound suites (prefabricated audiometric suites or booths) are the key elements of Audiology and Speech Pathology Clinics. They require slab depressions for level access. Refer to *TIL - Design and Construction Procedures (PG-18-3), Topic 6, Floor Slab Depressions*
- Refer to *TIL - Space Planning Criteria (PG-18-9), Chapter 204, Audiology and Speech Pathology Service*, for numbers, sizes, and detailed requirements for sound suites.

#### 4.35 COMPUTER ROOMS

Refer to *TIL - Design Guides (PG-18-12), Office of Information & Technology* for guidelines on design of all OIT and FMS spaces within VA facilities as a minimum standard for all projects performed in the modernization, alteration, addition, or improvement of its real property and the construction of new structures.

#### 4.36 ELECTROMAGNETIC SHIELDING

##### 4.36.1 GENERAL

Attenuate electromagnetic interference (EMI) to insure satisfactory operation of electroencephalography (EEG) suites, electromyography (EMG) suites, neurosurgical operating rooms and other functional spaces housing EMI-sensitive instrumentation, as described below.

##### 4.36.2 AVOIDANCE OF EMI SOURCES

Avoid electromagnetic interference by locating EEG suites, neurosurgical operating rooms, and other functional spaces housing EMI-sensitive instrumentation with the following separation from sources:

- At least 15 m (50 ft.) from elevator motors, air handling motors, and electrical distribution transformers
- At least 7.5 m (25 ft.) from electrical lines carrying 100 A (amperes) or more
- As far as practicable from hospital broadcasting and wireless stations

##### 4.36.3 SIGNAL STRENGTH TEST

- During the construction phase of the project after the structure has been constructed but prior to installing the finish work in the neurosurgical operating room, EEG and EMG suites, and other spaces housing EMI-sensitive instruments, conduct a signal strength test to measure the field strength of radio and television signals in these spaces if the building is located within a mile of the following facilities:
  - A short-wave radio antenna transmitting at over 100,000 W (watts)
  - A VHF television or FM radio antenna transmitting at over 250,000 W (watts)

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- A UHF television antenna transmitting at over 1,000,000 W (watts)
- These tests are also required if the separation requirements given above in paragraph 4.36.2 are not met. If signal strength exceeds 0.07 V/m (volts/meter), then provide these areas with EMI shielding. This may require a floor slab depression.
- An organization that has had previous experience in signal strength measurements shall conduct the field tests and evaluate them over the entire frequency spectrum up to 200 MHz (megahertz).

### 4.37 INTENSIVE CARE UNIT (ICU)

- The Intensive Care Units are specialized nursing facilities for patients whose conditions are too acute to provide care on the acute care nursing units. They are categorized as Medical, Surgical, Coronary Care, and, for small hospitals, General Purpose. All ICUs, except Coronary Care, have one or more isolation rooms;
- Refer to ***TIL - Space and Facility Planning (PG-18-9), Chapter 102, Intensive Care Units***, for room sizes, design considerations, and relationship diagrams and matrices.
- For complete criteria, refer to ***TIL - Design Guides (PG-18-12), Inpatient Care Units - Medical Surgical Patient Care Units and Intensive Care Units***.

### 4.38 ISOLATION ROOMS

#### 4.38.1 FUNCTION

- Isolation rooms may either be negative isolation (AI; for those whose communicable diseases must be contained) or positive isolation (PEI; for those whose immune systems cannot tolerate normal exposures), depending on the difference in air pressure between the rooms and adjoining spaces.
- Isolation rooms shall be designed as negative pressure environments pursuant to the FGI Guidelines as well as the CDC (Center for Disease Control) and ASHE.

#### 4.38.2 NEGATIVE PRESSURE ISOLATION PATIENT ROOMS (AI):

- Negative pressure isolation is required for containment of tuberculosis. Refer to ***TIL - Design Criteria, Special Requirements & Studies, Tuberculosis Facilities*** in the Technical Information Library for detailed guidance on the many functional areas where isolation rooms or some degree of isolation may be required for TB containment.
- Refer to ***TIL - Design Guides (PG-18-12), Inpatient Care Units - Medical Surgical Patient Care Units and Intensive Care Units, and Design Manuals (PG-18-10), HVAC Design Manual***, for a comprehensive graphic consolidation of TB criteria, as well as a functional narrative and guide plates. VA Space Planning criteria does not specifically address TB, but provides for non-specific isolation rooms, which may serve as TB rooms, in several areas.

### 4.38.3 PATIENT CARE ISOLATION ROOMS (NURSING UNITS)

VA Space Planning Criteria provides isolation rooms: negative and positive, in all:

- Intensive Care Units
- MS&N (Medical, Surgical, and Neurological) Patient Care Units
- Spinal Cord Injury Centers

### 4.38.4 PATIENT CARE ISOLATION ROOM DESIGN

The most significant feature of an isolation room is its air pressure with regard to that of adjoining spaces; thus it must be clearly designated as negative or positive. The pressure differential depends on the design of the HVAC system.

- Architectural Details:
  - Surfaces and furnishings: All surfaces (e.g., floors, walls, ceilings, doors, and windows) shall be cleanable.
  - Window treatments shall be selected for ease of cleaning. Smooth-surfaced, easy-to-clean, wipe-able, non-pleated window treatments shall be used. Window shades should be a neutral color to maintain true coloration of patient skin.
  - Fabric drapes and curtains shall not be used for window treatments.
  - Use of fabric privacy curtains shall be permitted if they are washable. A wipe-able fabric with a smooth surface is preferable.
  - Refer to ***TIL - VA Standards for Construction, (PG-18-14), Room Finishes, Door, and Hardware Schedules.***
- Building Systems
  - The pressure differential depends on the design of the HVAC system. Refer to ***TIL Design Manuals (PG-18-10), HVAC Design Manual.***
  - Lighting fixtures shall have lenses and shall be sealed.
- For size and number of isolation rooms in a given functional area, Refer to ***TIL - Space Planning Criteria (PG-18-9), Space Planning Criteria.***
- Isolation rooms require tight enclosure to maintain the desired pressure differentials.
- All room perimeter walls, ceiling, and floor, including penetrations, shall be sealed tightly so that air does not infiltrate the environment from the outside or from other spaces.
- Airborne infection isolation room(s) shall have self-closing devices on all room exit doors.
- Doors shall have edge seals.
- Anterooms:
  - The anteroom may be used for hand hygiene and for storage of personal protective equipment (PPE) (e.g., respirators, gowns, gloves) and clean equipment.
  - The walls and floor of the anteroom servicing isolation room shall be designed to withstand any passage of air from external side of the anteroom so as to positive seal between rooms and areas surrounding the isolation room.
  - The anteroom shall provide space for persons to don personal protective equipment before entering the patient room.
  - All doors to the anteroom shall have self-closing devices.

**4.38.5 ISOLATION ROOMS IN AMBULATORY CARE**

Space Planning Criteria provides a negative isolation room called "Multi-Purpose Exam Room" in Emergency Care (ER) suites.

**4.38.6 ISOLATION AUTOPSY ROOM IN MORGUE**

Space Planning Criteria provides an "Isolation/Teaching Autopsy Room" in the morgue (a part of Pathology and Laboratory Medicine Service) of larger hospitals.

**4.38.7 PATIENT PROTECTIVE ENVIRONMENT ROOM (PEI)**

- Patient protective environment rooms (Pei) are generally required for protection of patients who are immune suppressed. These patients are auto-immune, transplant, and/or bone marrow transplant recipients.
- Refer to *TIL - Design Guides (PG-18-12), Inpatient Care Units - Medical Surgical Patient Care Units and Intensive Care Units.*

**4.38.8 PROTECTIVE PATIENT ROOM DESIGN**

The most significant feature of patient protective environments room (PPE) is its air pressure is positive with regard to that of adjoining spaces; thus it must be clearly designated as positive.

- Architectural Details:
  - The ceiling shall be monolithic.
  - The floor shall be smooth, with sealed seams.
  - Surfaces and furnishings: All surfaces (e.g., floors, walls, ceilings, doors, and windows) shall be cleanable.
  - All windows in the room shall have fixed sash and be sealed to eliminate infiltration.
  - Window treatments shall be selected for ease of cleaning. Smooth-surfaced, easy-to-clean, wipe-able, non-pleated window treatments shall be used. Window shades should be a neutral color to maintain true coloration of patient skin.
  - Fabric drapes and curtains shall not be used for window treatments.
  - Use of fabric privacy curtains shall be permitted if they are washable. A wipe-able fabric with a smooth surface is preferable.
  - Refer to *TIL - VA Standards for Construction, (PG-18-14), Room Finishes, Door, and Hardware Schedules.*
- Building Systems
  - The pressure differential depends on the design of the HVAC system refer to *TIL Design Manuals (PG-18-10) HVAC Design Manual.*
  - Lighting fixtures shall have lenses and shall be sealed.
- For size and number of PPE rooms in a given functional area, Refer to *TIL PG-18-9 Space Planning Criteria.*
- PPE rooms require tight enclosure to maintain the desired pressure differentials.
- All room perimeter walls, ceiling, and floor, including penetrations, shall be sealed tightly so that air does not infiltrate the environment from the outside or from other spaces.

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- Patient protective environments room(s) shall have self-closing devices on all room exit doors.
- Doors shall have edge seals.
- Anterooms:
  - The anteroom may be used for hand hygiene and for storage of personal protective equipment (PPE) (e.g., respirators, gowns, gloves) and clean equipment.
  - The walls and floor of the anteroom servicing PPE room shall be designed to withstand any passage of air from external side of the anteroom so as to positive seal between rooms and areas surrounding the PPE room.
  - The anteroom shall provide space for persons to don personal protective equipment before entering the patient room.
  - All doors to the anteroom shall have self-closing devices.

### 4.38.9 SECLUSION ROOMS MENTAL HEALTH AND BEHAVIORAL (PSYCHIATRIC) PATIENT UNITS

These spaces are sometimes called "isolation rooms", but, they serve a different function, prevention of self-injury, rather than limiting the spread of disease.

### 4.39 MAGNETIC RESONANCE IMAGING (MRI)

#### 4.39.1 DESCRIPTION

MRI is a diagnostic imaging technique that utilizes a strong magnetic field. The magnetic field is produced by a high-strength magnet cooled to a very low temperature (about 4 degrees Kelvin).

#### 4.39.2 MRI SUITE DESIGN

- The magnetic field is subject to distortion by ferrous materials within its critical area, both fixed items of construction and moving items such as carts and elevators. Since such distortions reduce the quality of the desired image, limiting them is a major consideration of MRI unit design. The magnetic field may also affect computerized equipment and devices such as pacemakers within its critical area, so control of access to this area is a major design consideration.
- The space that houses the magnet, patient table, and related equipment is called the gantry room. The gantry room requires radio-frequency shielding, and may require special magnetic shielding, usually of steel sheets. All equipment in the room should be made of non-magnetic material. Ductwork, plumbing, and electrical items must also be non-magnetic within certain distances, depending on the MRI unit to be installed.
- The magnetic field extends in three dimensions, outward from the MRI unit; thus proper siting of an MRI unit is of critical importance, and larger units are often best accommodated in new space at ground level.
- For details of space, design, construction, and equipment, and For a comprehensive functional narrative, functional diagrams, and guide plates refer to:
  - ***TIL - Design Guides (PG-18-12), Magnetic Resonance Imaging (MRI)***

- ***TIL - Space and Facility Planning (PG-18-9), Magnetic Resonance Imaging (MRI) Chapter 275.***
- ***TIL Equipment Information (PG-18-5), Equipment Guide List***

#### **4.40 PHARMACY**

##### **4.40.1 PHARMACY DESIGN CONSIDERATIONS**

Pharmacy design must reconcile the need for security with the functional need to distribute medications throughout the facility. Ideally, this leads to a layout focused on a dedicated dumbwaiter or other secure transport system. Diagrams of the pharmacy as well as space, design considerations, and relationship diagrams and matrices, including Pharmacy (in the Clinical series) and Outpatient Pharmacy (in the Primer series) are to be found within the VA Technical information Library (TIL). They include narratives of pharmacy operations, functional diagrams, and guide plates. Also, the VA employs sterile compounding procedures which require clean facilities, specific training for operators, air quality evaluations, and a sound knowledge of sterilization and stability principles. USP 797 provides guidelines, procedures and compliance requirements for compounding sterile preparations. VA Pharmacies must compound under sterile conditions, there are two primary focuses of USP 797. The primary purpose is to reduce the risk of contact contamination. The second goal is to provide more environmental controls. Additional specialty compounded Sterile preparations are addressed in USP 797. They include: Hazardous Drugs, Allergen Extracts and Radiopharmaceuticals. Refer to:

- ***TIL - Design Guides (PG-18-12), Pharmacy Service***
- ***TIL - Space and Facility Planning (PG-18-9), Pharmacy Service***
- ***USP 797, Guidebook to Pharmaceutical Compounding - Sterile Preparations.***  
The USP 797 document can be purchased  
at <http://www.usp.org/products/797Guidebook/>

##### **4.40.2 PHARMACY SECURITY**

Both inpatient and outpatient pharmacies require special features for security, including vaults for controlled substances; for vault construction and other security requirements, including "bullet-proof" outpatient dispensing (service) windows refer to:

- ***TIL - Design Guides (PG-18-12), Pharmacy Service***
- ***TIL - Design and Construction Procedures (PG-18-3), Topic 14 - Security***
- ***TIL - Design Criteria, Special Requirements & Studies, Physical Security***
- ***TIL - Standard Details (PG-18-4), Division 8 – Openings, Pharmacy Service Window and Package Transfer***

#### **4.41 MENTAL HEALTH FACILITIES**

##### **4.41.1 GENERAL**

- Mental Health Services provided by VA include:
  - Inpatient Mental Health Units
  - Mental Health Residential Rehabilitation Treatment Program
  - Mental Health Clinic - Substance Abuse Clinic
  - Psychosocial Rehabilitation and Recovery Center

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- Psychology Service
- Primary Care – Integrated Mental Health Services
- Detailed space criteria, including design considerations, space relationship diagrams, and inter-functional relationship matrix, refer to:
  - ***TIL - Design Guides (PG-18-12), Mental Health***
  - ***TIL - Space and Facility Planning (PG-18-9), Mental Health and Behavioral Patient Care Units Chapter 110 and Mental Health Clinic Chapter 260***

### 4.41.2 FINISHES AND DOORS MENTAL HEALTH FACILITIES

Room-by-room listings of finishes, door size and type, and hardware in the various psychiatric areas including for special door hardware requirements, refer to:

- ***TIL VA Standards for Construction (PG-18-14), Room Finishes, Door, and Hardware Schedules***
- ***TIL - Master Construction Specifications (PG-18-1), Division 8 - Doors and Windows***

### 4.41.3 BARRIER DOORS AND STAIRWAY DOORS

Barrier doors and stairway doors in Mental Health and Behavioral Patient Care Units shall be locked at all times (rigid handle), but locks shall be operable by key from either side of doors. Attendants, nurses, and other psychiatric nursing unit staff shall carry keys at all times to control entry and exiting from psychiatric units for special requirements for psychiatric keys, refer to:

- ***TIL - Master Construction Specifications (PG-18-1), Division 8 - Doors and Windows***

### 4.41.4 WINDOWS MENTAL HEALTH FACILITIES

- For glazing requirements in psychiatric areas, refer to paragraph 4.10.6 above.
- Use of floor to ceiling window wall system in psychiatric areas is not recommended without addressing all patient safety and security concerns. Provide details for holding glass in the framing system in such a manner that it can withstand lateral forces in excess of force required to break the glass.

### 4.41.5 CUBICLE CURTAIN TRACKS MENTAL HEALTH FACILITIES

Do not use cubicle curtain tracks in patient bedrooms of Mental Health and Behavioral Nursing Units.

### 4.41.6 PATIENT TOILETS AND BATHROOMS MENTAL HEALTH FACILITIES

- The VA Equipment Guide List call for grab bars in all Psychiatric toilets and baths, although the Uniform Federal Accessibility Standards requires only 10% of them to be so equipped. For areas to be used by high-risk patients, “institutional grab bars are available with a continuous flange, closing the space between the bar and the wall.
- Mirrors in Mental Health and Behavioral Patient Care Units should be heat tempered glass.
- Refer to ***TIL - Equipment Information (PG-18-5), Equipment Guide List, Mental***

### ***Health and Behavioral Patient Care Units, Chapter 110***

- Shower rods in Mental Health and Behavioral Patient Care Units should not support the weight of a patient.
- Refer to ***TIL - Master Construction Specifications (PG-18-1), Section 10800, Toilet and Bath Accessories.***

## **4.42 RADIATION THERAPY**

### **4.42.1 GENERAL**

- Radiation therapy employs high energy X-rays, gamma rays, and electron beams to treat tumors and other malignancies. This radiation is generated by devices ranging from 50 kilovolt X-ray units, to super voltage units (Cobalt 60) for gamma rays, to linear accelerators of more than 10 million electron volts.
- The more powerful units usually require shielding by concrete vaults with maze-like entries.

### **4.42.2 SHIELDING POLICY**

Provide shielding as prescribed by a physicist, approved by the American Board of Radiology in accordance with the appropriate standards and regulations contained in Report No.102 of the National Council on Radiation Protection and Measurements, obtainable from **NCRP Publications (not on VA Website, VA not responsible for content)**, 7910 Woodmont Avenue, Suite 400, Bethesda, MD-20814.

### **4.42.3 SPECIFICATION OF PROTECTIVE SHIELDING**

State the prescribed shielding in terms of millimeters of lead or in millimeters (in.) of wall, ceiling, floor and door construction of equivalent protection thickness.

### **4.42.4 CERTIFICATION**

Post a certificate, stating the lead equivalent protection of each surface, in all rooms with radiation shielding.

### **4.42.5 DESIGN**

- Refer to ***TIL - Space and Facility Planning (PG-18-9), Chapter 277 Radiation Therapy Service*** for space requirements, operating rationale, and design considerations.
- Refer to ***TIL - Design Guides (PG-18-12), Radiation Therapy*** for consolidated requirements, including a functional narrative and guide plates for radiation therapy modalities, treatment planning, dosimetry, etc.

## **4.43 RADIOLOGY (DIAGNOSTIC X-RAY)**

### **4.43.1 GENERAL**

- Radiology consists of various spaces for diagnostic imaging, primarily by the use of X-rays (ionizing radiation):
  - Radiographic/Fluoroscopic Rooms, including general radiology rooms, dedicated



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- chest rooms, and automated radiographic rooms
- Special Procedure Rooms complex radiographic/fluoroscopic interventional radiology rooms which may be designated as angiographic or vascular/neuroradiology
- Mammography Room – a specialize, dedicated radiographic room
- Computerized Tomography Imaging System Suite (CT Suite)
- Ultrasound Rooms are also part of Radiology, although they do not use X-rays.
- Existing radiology suites currently utilizing film processing areas should accommodate both automated daylight film processing systems and darkroom facilities. A central silver collection room (for recovery of silver from film processing solutions) should be located below radiology.

### 4.43.2 EQUIPMENT ACQUISITION AND INSTALLATION FOR X-RAY ROOMS

- All rooms with digital radiology equipment should be designed for a generic installation system, or to be shelled in with finish work scheduled for completion as late as possible in the construction process, as procurement of the specific radiology equipment is often delayed to a later point in the construction phase.
- Where a generic installation system will be used, provide a universal X-ray raceway system (DOD/VA Universal X-ray (R-F) Room), The universal raceway system is capable of accepting all routine radiographic, fluoroscopic, and tomographic equipment, but should not be used in potentially wet locations, such as cystographic rooms.
- Refer to *TIL - Standard Details (PG-18-4), Division 13 – Special Construction*.

### 4.43.3 SHELLED-IN OPTION

If the shelled-in option is chosen, for Special Procedures Rooms, the A/E shall develop a list of work items and materials required for the completion of shelled-in spaces and list these on the construction documents. Unit costs for these items will be provided by the construction contractor.

### 4.43.4 DESIGN

For space needs, functional descriptions, design considerations, and overall functional layout diagrams for a detailed narrative of operations, technical requirements, detailed functional diagrams of Special Procedures and CT Suites, and guide plates refer to:

- *TIL - Design Guides (PG-18-12), Radiology*
- *TIL - Space and Facility Planning (PG-18-9), Radiology Service Chapter 276*

### 4.43.5 X-RAY CONTROL ROOMS

#### 4.43.5.1 SINGLE-PANE VIEWING WINDOWS OF CONVENTIONAL LEAD GLASS

- Provide for all X-ray control rooms, including where the control room projects into and is located near the corner of the diagnostic X-ray room, the projecting control room partition shall have a portion of wall angled toward the X-ray work space. Locate the viewing window in this angled section.

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- To allow for clearance of X-ray tube crane travel, do not exceed a height of 2300 mm (7 ft. 6 in.) above the floor for that portion of the shielded partition of a control room which projects into a diagnostic X-ray room. Feed all electric service into the projecting control-room partition up from the floor or horizontally from the wall where the control room projects. Leave the space above the projecting control area clear to allow X-ray equipment to traverse.

### 4.43.5.2 PARTITIONS AND SHIELDING

Use lead-lined gypsum board for shielding, in accordance with Architectural Standard Details

### 4.43.5.3 CEILING HEIGHTS

Some manufacturers' equipment for cardiac catheterization and special procedures rooms may require more than the standard 3.0 m (9 ft. 6 in.). Verify requirements with medical center before establishing a firm ceiling height in these spaces.

### 4.43.5.4 CEILING SUPPORT SYSTEM

Provide a ceiling support system for all diagnostic rooms in accordance with Architectural Standard Details

### 4.43.5.5 FLOOR DEPRESSIONS

Floors in radiographic and special procedure rooms must be depressed to accommodate the floor trench duct system. Some floors of the CT Suite must be similarly depressed for an access floor system. Refer to *TIL - Design Guides (PG-18-12), Radiology*

## 4.44 REFRIGERATORS AND FREEZERS (BUILT-IN)

### 4.44.1 REFRIGERATORS AND FREEZERS IN KITCHEN AREAS

#### 4.44.1.1 TYPE AND SIZE

When walk-in refrigerators and freezers are programmed, provide the prefabricated sectional type, with a minimum size of 4.5 sq. m. (48 sq. ft.) net floor area. If smaller size is required, use reach-in type.

#### 4.44.1.2 DOORS

Doors shall be 1200 mm (48 in.) wide. Exception: Doors for freezers with floor area less than 14 m<sup>2</sup> (150 sq. ft.) may be 900 mm (36 in.) wide.

#### 4.44.1.3 FLOOR

Refrigerator/freezer floor shall be flush with the floor of adjoining room. Exception: a raised refrigerator/freezer floor with ramp may be used in existing buildings where it would be impracticable to install a flush floor. Floor finish shall be non-slip quarry tile on tile setting bed. Floor insulation shall be load bearing type. For freezer spaces on grade or above grade with fill, provide floor heating system beneath floor insulation to prevent frost formation and subsequent floor heaving.

#### 4.44.1.4 CEILING SPACE ENCLOSURE

Enclose ceiling space above refrigerator/freezer along corridors and finished rooms with finish materials as required from top of refrigerator/freezer up to finished ceiling. Do not locate compressor on top of refrigerator or freezer.

**4.44.1.5 SPACE FOR COOLING SYSTEMS**

Coordinate with Mechanical Engineer to provide appropriate space for refrigeration cooling systems. Refer to *TIL - Design Manuals (PG-18-10)*, *HVAC Design Manual* for guidance.

**4.44.1.6 ENTRY TO FROZEN FOOD FREEZERS**

Provide entrance to frozen food freezer through a refrigerator of higher temperature.

**4.44.2 MORTUARY REFRIGERATORS**

**4.44.2.1 TYPES**

Provide prefabricated walk-in type mortuary refrigerators, except at small facilities where self-contained mortuary refrigeration units are specifically requested.

**4.44.2.2 DESIGN AND CONSTRUCTION**

Walk-in-type mortuary refrigerators shall be built as described above for kitchen refrigerators and freezers except:

- Door shall be standard 1200 mm (48 in.) width.
- Install mortuary refrigerators in existing buildings so that the finished floor levels are the same. This shall be accomplished by installing such a prefabricated refrigerator enclosure, minus the enclosure floor, directly upon the floor slab. Seal the enclosure perimeter against air and waste leakage, and, where required by climate or location, place insulation with vapor barrier below the slab to avoid condensation.

**GLOSSARY OF ACRONYMS**

A/E	Architect Engineer
ARF	Animal Research Facility
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BIM	Building Information Management
CADD	Computer Aided Design and Drafting
CDC	Centers for Disease Control and Prevention
CLC	Community Living Center (formerly NHCU)
CT	Computerized Tomography
DD-1	Design Development 1
DD-2	Design Development 2
DOD	Department of Defense
DOE	Department of Energy
EEG	Electroencephalograph
EIFS	Exterior Insulation Finish System
EMG	Electromyography
EMI	Electromagnetic Interference
FGI	Facility Guidelines Institute
HVAC	Heating, Ventilating, and Air Conditioning
ICU	Intensive Care Unit
MRI	Magnetic Resonance Imaging
MS&N	Medical, Surgical, and Neurological
NFPA	National Fire Protection Association
NHCU	Nursing Home Care Unit, now known as CLC
NIBS	National Institute of Building Sciences
OSHA	Occupational Safety and Health Administration
OT	Occupational Therapy
R-F	Radiographic - Fluoroscopic
RMS	Rehabilitation Medicine Service
SCIU	Spinal Cord Injury Unit
TB	Tuberculosis
UFAS	Uniform Federal Accessibility Standards
VA	Department of Veterans Affairs
VAHBS	VA Hospital Building System
VHA	Veterans Health Administration
VMU	Veterinary Medical Unit