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FOREWORD

These Design and Construction Procedures establish consistent design and construction practices and are the minimum acceptable standards for the design and construction of VA facilities.

These design and construction procedures are mandatory where specific statutes and/or regulatory references are included in the Topic text. For other Topics, the procedures and included minimum acceptable standards shall be utilized to the maximum extent practicable, commensurate with cost considerations.

VA Program Offices, project teams, designers and constructors are obligated to our Nation's Veterans and taxpayers to make the most effective and efficient use of resources, by providing a continuum of safe, secure, high quality, high performance, and high value environments of care and service for Veterans. The VA Office of Construction and Facilities Management (CFM) supports the Department's mission through development and application of standards as a basis for disciplined planning, design, and construction of VA facilities.

The VA Technical Information Library (TIL) is the culmination of a partnership among the Department of Veterans Affairs (VA), the VA Administrations, Program Offices, Clinicians, Industry, Academic and Research Organizations, Expert Consultants, and the Office of Construction and Facilities Management. TIL publications are developed through integration of VA-specific requirements, Federal law and regulation, benchmarking of industry best practice, evidence-based research and design, and value-based analysis of leading-edge innovation. The VA TIL (https://www.cfm.va.gov/TIL) establishes the basis of planning and design for all VA projects. TIL documents, when properly applied to projects, will maximize the effectiveness and efficiency of the planning and design process and support a high level of functionality and quality in the environment of care.

For additional information regarding the VA TIL development and application of VA planning, design, and construction standards, please contact Donald L. Myers, Director, Facilities Standards Service, US Department of Veterans Affairs, Office of Construction and Facilities Management.

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TOPIC 1 – CODES, STANDARDS AND EXECUTIVE ORDERS

PURPOSE: The Public Buildings Amendment Act of 1988, Public Law (Pub. L.) 100-678 requires Federal agencies to follow national recognized "model" building codes. The Federal Participation in the Development and Use of Voluntary Standards, Office of Management and Budget (OMB) Circular A-119, requires all executive agencies to rely on voluntary standards, both domestic and international, whenever feasible, and to participate in voluntary standard bodies.

GENERAL: VA has adopted the latest edition of the following codes and standards as a minimum for all projects performed in the modernization, alteration, addition, or improvement of its real property and the construction of new structures. VA design Manuals and Master Specifications specify other codes and standards that VA follows on its projects:

- VA Directives, Design Manuals, Master Specifications, VA National CAD Standard Application Guide, and other Guidance on the Technical Information Library (TIL) (www.cfm.va.gov/til/).
- International Building Code (IBC) (Only when specifically referenced in VA Design Documents, see notes below)
- NFPA 101 Life Safety Code (see notes below)
- NFPA National Fire Codes, with the exception of NFPA 5000 and NFPA 900
- Occupational, Safety and Health Administration (OSHA) Standards.
- VA Seismic Design Requirements, H-18-8
- National Electrical Code (NEC)
- International Plumbing Code (IPC)
- Safety Code for Elevators and Escalators, American Society of Mechanical Engineers (ASME) A 17.1.
- ASME Boiler and Pressure Vessel Code
- ASME Code for Pressure Piping
- Architectural Barriers Act Accessibility Standards (ABAAS) including VA supplement, Barrier Free Design Guide (PG-18-13)
- Building Code Requirements for Reinforced Concrete, American Concrete Institute and Commentary (ACI 318)
- Manual of Steel Construction, Load and Resistance Factor Design Specifications for Structural Steel Buildings, American Institute of Steel Construction (AISC)

- Energy policy Act of 2005 (EPAct)
- DOE Interim Final Rule: Energy Conservation Standards for New Federal, Commercial and Multi-Family High-Rise Residential Buildings and New Low-Rise Residential Buildings, 10 CFR Parts 433, 434 and 435.
- Federal Leadership in High Performance and Sustainable Buildings: Memorandum of Understanding (MOU)
- Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management.
- The Provisions for Construction and Safety Signs. Stated in the General Requirements Section 01010 of the VA Master Construction Specification.
- Ventilation for Acceptable Indoor Air Quality – ASHRAE Standard 62.1- 2004.
- Safety Standard for Refrigeration Systems – ASHRAE Standard 15 – 2007.

Local Codes: As an agency of the federal government, VA is not subject to local imposition of code enforcement procedures (drawing reviews, building permits, inspections, fees, etc.). VA must function as the Authority Having Jurisdiction (AHJ) and thus has the responsibility to guard public health and safety through enforcing its adopted codes. However, local authorities should be notified about planned projects and given opportunity to review drawings provided that VA does not pay for review or inspection fees.

NOTES:

1. NFPA 101 primarily addresses life safety and fire protection features while the IBC addresses a wide range of considerations, including, but not limited to, structural strength, seismic stability, sanitation, adequate light and ventilation, and energy conservation. VA buildings must meet the requirements of NFPA 101 and documents referenced by NFPA 101 in order to comply with the accreditation requirements of The Joint Commission. Therefore, designs shall comply with the requirements of the latest edition of NFPA 101 and documents referenced therein. Design features not addressed by NFPA 101 or documents referenced therein shall comply with the requirements of the latest edition of the IBC or as otherwise addressed above in this Program Guide. For design features that are addressed by both the IBC as well as NFPA 101 or a document referenced by NFPA 101, the requirements of NFPA 101 or the document referenced by NFPA 101 shall be used exclusively (this applies even if the IBC requirements are different).
2. Conflicts between Nationally Recognized Codes and Standards and VA Requirements – Should a conflict exist between VA requirements and VA adopted nationally recognized codes and standards, the conflict shall be brought to the attention of VA. The resolution of the conflict shall be made by the authority having jurisdiction for VA to ensure a consistency system wide.

TOPIC 2. DRAWINGS

1. **GENERAL INFORMATION:** For digital/electronic drawings refer to VA's BIM & CAD Standards (PG-18-13), available on VA's Technical Information Library (TIL) at https://www.cfm.va.gov/til/projReq.asp.

2. **IDENTIFICATION OF DRAWINGS**

   A. General. Bind all drawings into sets and identify drawing classification, relative order of issue, amendment, and change order by symbols placed on drawing title blocks as described below:

   Cover sheet (include Index to Drawings on small projects)
   Index to Drawings start with .....GI
   Critical Path Method start with .....GC
   Site Development start with .....GS
   Sub-Surface Investigation start with ..... BI
   Asbestos Removal start with .....HA
   Architectural* start with ..... AS
   Architectural Miscellaneous Detail drawings for single building projects shall follow numbers for architectural drawings. Architectural Miscellaneous Detail drawings start with (on projects of two or more buildings) ..... AS
   Plumbing start with .....PL
   Sanitary start with .....CU
   Structural start with .....SS
   Heating, Ventilating, Air Conditioning, and Refrigeration start with .....MH
   Steam Generation start with .....MP
   Outside Steam Distribution start with ..... MS
   Electrical start with.....ES
   Fire Protection start with ..... FA

   NOTE: *Normally Equipment Drawings are shown as part of the Architectural set.*

   1) Building number shall precede the classification identification (Building No. 20 as example) 20-BI 1, 20-GS 1, 20-AS 1, 20-SS 1. When a drawing reflects work that is associated with several buildings or the station in general, such as details sheets and exterior utility distributions systems, no building number will precede the symbol which identifies the classification.

   2) Number the drawings in sequence within each classification, for example 1-SS 1, first structural sheet Building No. 1; 1-SS 2, second structural sheet, etc. Directly below the drawing number, show the position within the series that each drawing

occupies, for example, sheet 1 of 30 (structural sheets), sheet 2 of 30 (structural sheets), etc.

3) Drawings for each new project shall begin with number one. Distinguish the drawings by their project titles and dates.

4) The preferred method for classifying drawings is by identification of technical information shown on drawing, for example, Architectural or Electrical. However, an exception is made when one design discipline has limited work. Show this limited work on a drawing with another classification. The drawing number shall show the symbol for the major work classification; indicate that other work is shown on the same drawing by a description, such as "Plumbing", above the title block.

5) When work including two or more buildings is described on a single drawing, the sheet shall bear the number of the building involving the work of the major magnitude; indicate that work on other buildings is shown on the same drawing by a note above the title block.

B. Amendment Construction Drawings

1) Issue a drawing which is produced to supersede an original working drawing as a corrected plot of the CAD file or as a photocopy reproduction of the original drawing, on vellum or mylar. Identify the number of this amendment drawing with the number of the sheet it replaces plus the suffix "R". Identify additional replacements of the same drawing as - "R2"-"R3", etc. Note the revisions dates. Place the words "Amendment Drawing" above the Title block with a statement of the original drawing which it supersedes.

2) Give a drawing, which supersedes a portion of an original working drawing, a new number in sequence with other drawing numbers. Place the notation "Amendment Drawing" above the title block with a statement of the drawing number of the original drawing it modifies. Insert the date of the amendment on the drawing. Place a cross reference note, on the superseded drawing, calling attention to the amendments.

C. Change Order Construction Drawings. Give a drawing, which describes the work involved in a "Change Order", a number in sequence with the original drawings. Place the words "CHANGE ORDER" above the title block with a statement of the drawing that it modifies or supersedes. Insert the date of the change order on the drawing. Place a cross-reference note calling attention to the change order on the superseded or modified drawing. For reference prints in Central Office or on the project site in the possession of the Resident Engineer, stamp drawings with; "See Change Order Drawing No. _____, dated _____."

D. Reissue Construction Drawings

1) When a complete set of working drawings is to be reissued without change, remove the original date and insert the new date of the reissue.

2) When a complete set of working drawings is to be reissued with changes, replot the changed drawings, or provide a photocopy vellum or mylar reproduction of the original drawings, where feasible, with changes incorporated. These reproductions (or drawings) shall retain original dates and drawing numbers with the suffix - "R", but the reissue date shall appear in the Revision column.

3) When some drawings only of an entire set are changed, the entire set shall retain original dates and drawing numbers with the suffix "R" added; and the reissue date shall appear in Revision column of the changed drawings only.

E. Completion Item Construction Drawings. Completion Items are additional work required beyond the original contract and after its completion.

1) Provide drawings prepared to describe Completion Items with drawing numbers in sequence with last working drawing of a series, i.e., "Architectural", "Structural", "Electrical", etc., and earlier Change Order and Completion Item drawings. Insert the words, "COMPLETION ITEM NO._____" above the title block. The VA Project Manager shall assign the Completion Item numbers and drawing numbers.

2) In the title blocks of Completion Item drawings, show the same project titles and project numbers as the original working drawings. Show a sheet title in the top spaces of the title block. Date the drawings to reflect the date on which the completion item drawings were ordered by the VA Project Manager.

TOPIC 3 – VA HOSPITAL BUILDING SYSTEM

1. PURPOSE: 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.

2. VA HOSPITAL BUILDING SYSTEM (VAHBS): The VAHBS concept described in VA Hospital Building System Research Study Report, 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 should use the VAHBS system to the maximum practicable extent, to optimize construction, flexibility, accessibility, and systems accessibility and maintenance. Also consider using this system for major additions to existing hospitals where future adaptability is an important factor.

3. INTERSTITIAL SPACE – INTERIM GUIDANCE: The interstitial space is one component of the VAHBS, an unfinished or non-habitable space utilized for building service subsystems, of sufficient size to accommodate workmen and permit maintenance and alteration without disruption of activities in functional spaces. It is the predominant component of the VAHBS used in many medical facilities projects. See Design Alert 154, Interstitial Space - Interim Guidance, on https://www.cfm.va.gov/til/alerts.asp , for minimum requirements for the design and construction of interstitial space for VA medical facilities.

TOPIC 5 – PIPE BASEMENTS

1. GENERAL: Evaluate the use of full or partial pipe basements on an individual project basis through a design analysis of the most efficient and economical method of adapting piping, duct, and electrical conduit systems to the building. Design pipe basements to provide a minimum clearance of 1200 mm (4 ft.) under pipes, ducts, and electrical conduits for access to these systems for maintenance and repair. Provide pipe basements with two means of egress. Provide a means of access for personnel and equipment.

2. CONSTRUCTION

a. Insulate the exterior pipe basement walls to prevent freezing temperatures for locations where ambient temperatures are -7°C (20°F) or below.

b. Provide access to the pipe basement at stairwells and emergency egress to the exterior through the use of areaways where necessary.

3. HEATING AND VENTILATION

a. Provide thermostatically controlled mechanical ventilation to prevent excessive rise in basement temperature and/or prevent moisture problems.

b. Provide intake louvers with dampers of sufficient size to satisfy fan requirements.

c. Screen all ventilator and louver openings to prevent entry of insects and small animals.

d. As dictated by design computations for maintaining slab at 21°C (70°F), provide heating in the pipe basement or insulate the slab or both.

e. Provide heating in the pipe basement to avoid freezing conditions.

TOPIC 7 – PIPING AND DUCTS

1. GENERAL: Exposed piping and ducts are acceptable where finished ceilings are not provided. Maintain standard ceiling height in the space.

NOTE: *Do not allow pressure pipes, ducts, clean-outs, and drains, not serving the area, to enter or pass through gas storage rooms and elevator and dumbwaiter machinery rooms and hoistways.*

2. CONSTRUCTION:

a. Locate vertical runs in pipe spaces, pipe chases, or furred-in spaces, in walls adjacent to permanent structures such as stairwells or elevator shafts.

b. In main kitchens, place steam, condensate, gas, and water headers below the floor or in trenches. In laundries, place horizontal drain runs, and low-pressure condensate lines below the floor or in trenches; however, water and steam may be exposed overhead. In warehouse buildings or rooms, place horizontal runs at height that will not reduce or restrict the net usable space.

NOTE: *Do not locate piping and ducts where they will be subject to damage or rupture or other conditions of risk according to VA Physical Security Design Manual. Where unavoidable conditions occur, provide suitable protection.*

c. In geographical areas where pipes conveying liquids that are subject to freezing, minimize locating those pipes in exterior walls or in unheated areas, such as attics, spaces between ceilings and roofs, or near exterior doors. If pipes are located in those areas, provide appropriate insulation.

NOTE: *Do not design pipes conveying liquids or gases within masonry walls, concrete walls, or cast in place floors.*

d. Provide access panels or doors for concealed items requiring operation, maintenance, or periodic inspection; for example, clean-outs, coils, dampers, filter, fire alarm apparatus, strainers, switches, traps, and valves. Appropriately mark access panels and doors to preserve the required fire resistance and acoustical characteristics.

TOPIC 8 – ELECTRICAL ROOMS AND CLOSETS

1. GENERAL PROVISIONS FOR NEW BUILDINGS

a. Provide a minimum of two means of egress from switchgear rooms, transformer vaults, generator rooms. Egress by means of a ladder in an areaway is prohibited.

b. Provide doors that open under simple pressure leading from switchgear rooms, transformer vaults, and generator rooms with door swing in the direction of exit travel.

c. Provide standard hardware on doors of electrical closets. Doors must swing out.

d. Refer to the HVAC Design Manual for necessary mechanical ventilation or mechanical cooling system to maintain indoor temperatures as required for proper operation of the equipment for all electrical rooms, generator rooms, and transformer vaults.

2. SWITCHGEAR ROOMS AND TRANSFORMER VAULTS IN NEW BUILDINGS

a. Refer to the Physical Security and Resiliency Design Manual (PSRDM) for requirements. Additionally, locate switchgear rooms and transformer vaults as close as practical to the utility electrical service entrance.

b. Establish the required size of switchgear rooms and transformer vaults after the electrical loads and equipment layouts have been determined. For high, medium and low voltage switchgear, allow a minimum clearance of 1.2 m (4 feet) on both ends and rear, and 1.8 m (6 feet) in front, from any wall, column or other equipment. Additionally, NEC's required working clearance shall be complied with if more than 1.8 m (6 feet) is required.

3. ELECTRICAL CLOSETS IN NEW AND MAJOR ALTERATIONS TO EXISTING BUILDINGS

a. Except for the VA Hospital Building System (VAHBS) concept, provide one centrally located electrical closet for each wing with length of 45.7 m (150 feet) or less. When the wing length exceeds 45.7 m (150 feet), provide a minimum of two electrical closets. Where feasible, centrally locate electrical closets in the area to be served. The minimum size of electrical closets containing step-down transformers should be at a minimum 2.4 m (8 feet) by 3.0 m (10 feet). Establish the size of closets - that do not contain step-down transformers – with sufficient width to accommodate all installed panels. Provide closet with a minimum of 20% spare wall space for a future expansion. Walk-in closets should be a minimum 2.1 m (7 feet) wide.

b. In electrical closet where one, or a maximum of two branch-circuit panels are installed, shallow closet is permitted. The depth of the closet should be 0.6 m (2 feet) minimum. The length should be 1.8 m (6 feet) with double doors that swing 180 degrees out into the corridor.

c. Position electrical closet locations to avoid disturbances to building structural framing elements such as structural steel beams. This arrangement is to allow conduit feeder

risers to be routed vertically straight up and down the building, without going through building structural framing elements.

4. EMERGENCY and/or STAND-BY GENERATOR ROOMS

Size the generator room to accommodate the generator(s), and all associated electrical equipment. At a minimum, provide a horizontal clearance of 1.5 m (5 feet) between generators, and 1.2 m (4 feet) between a generator and a wall or other piece of equipment. Additionally, refer to the PSRDM for physical security requirements. Refer to the Architecture Design Manual for ceiling height requirements.

5. ALTERATIONS TO EXISTING BUILDINGS

Follow the recommended space requirements as described herein for new buildings.

TOPIC 9 – ENERGY CENTER

1. GENERAL

a. An Energy Center should house the boiler plant, chiller plant, engineering control center, associated electrical switchgear and boiler plant emergency generator. If practical, include other systems such as domestic water pumps, hot water generators, emergency generators and electrical switchgear serving the hospital.

b. Design boiler plants in accordance with the Steam Generation System Design Manual. Design air conditioning chiller plants and the Engineering Control Centers in accordance with the Heating, Ventilating, and Air-conditioning (HVAC) Design Manual. Design the electrical equipment areas in accordance with Department of Veterans Affairs (VA) Design Criteria for Engine-Generators and Distribution.

NOTE: *It is recommended that VA technical experts in the Office of Facilities Management review the design of each proposed facility.*

2. BUILDING

a. Provide a structural system which permits access to overhead members for pipe and duct support and allows for future expansion.

b. Design the building to allow all equipment to be installed (and removed in the future) after the building is architecturally and structurally complete.

c. Locate the main equipment floor above finished grade to preclude flooding and to permit horizontal rigging of equipment in and out of the building.

d. Establish roof height to provide adequate clearance above all equipment and piping.

e. Provide basement area if necessary for proper operation.

f. In boiler plants, provide a mezzanine for the feedwater heater.

g. In Energy Centers, provide a block wall partition between the chiller portion of the building and other areas.

h. Provide overhead roll-up doors and/or removable panels through which all equipment can be rigged. Locate roll-up security grills inside the doors.

i. Design the building to allow for future expansion of boiler plant and chiller plant areas and associated expansion of electrical equipment.

3. SITE

a. Provide space for future expansion of the boiler plant and chiller plant.

b. Provide an area for underground or aboveground fuel oil tanks for boilers and engine-generators.

4. PLANT FACILITIES

a. **Plant Arrangement**

(1) Arrange boilers, chillers, emergency generators, control and instrumentation panels, motor control center along an aisle.

(2) Locate all equipment to allow operation, maintenance, repair and replacement without disturbing other equipment or piping systems.

(3) Provide unobstructed view from aisle of all boiler-mounted and burner-mounted gages and indicators.

(4) Design the control and instrumentation panels to be visible from the aisle, and to the maximum extent possible, visible from the operations room.

(5) Locate all valves not more than 2100 mm (7 ft.) above a floor, mezzanine, or platform. Limited exceptions are permitted for valves that are rarely used and can be reached with portable ladders.

(6) Locate electrical generators so they are visible from the room that contains their paralleling and distribution equipment, via view window.

b. **Access Platforms**

(1) Provide platforms as necessary to allow access to equipment requiring maintenance which is located more than 4.5 m (15 ft.) above the floor or which is not accessible directly from a portable ladder;

(2) Provide permanent ladders for access to all platforms. The design of ladders and platforms should conform to Occupational Safety and Health Administration (OSHA) requirements; and

(3) Provide platforms as required by the Steam Generation Design Manual for boiler plant.

c. **Building Heating, Ventilating, Air-Conditioning and Noise Control**

(1) Provide combustion and ventilation air intakes through the building walls and roof;

(2) Provide roof-mounted exhaust fans;

(3) Provide heat in personnel rooms to maintain 21°C (70°F);

(4) Provide heat as necessary in the equipment spaces to maintain 18°C (65°F);

(5) Provide air-conditioning in the personnel spaces including operations room, eating area, office, toilet, shower and locker rooms;

(6) Provide noise control in the operations room and the office in accordance with Noise Transmission Control (Chapter 8); and

d. **Boiler Stack and Diesel Engine Exhaust**. Locate boiler stack and diesel engine exhaust outlets to avoid entraining the gases into building air intakes.

TOPIC 11 – NOISE TRANSMISSION CONTROL

1. GENERAL: Where rooms do not contribute to or are not affected by sound transmission from an adjacent space, conventional construction is satisfactory.

2. PARTITION-CEILING-DOOR-DUCT SYSTEM ACOUSTIC DESIGN

a. **Acoustical Isolation**. Design the sound resistant enclosures of the following spaces to suppress generated noise and provide a satisfactory degree of acoustical isolation for adjacent occupied spaces. Achieve a minimum Sound Transmission Class (STC) rating of 45.

NOTE: *When the VA Hospital Building System (VAHBS) is used, achieve the required rating using construction such as a double layer of 16 mm (5/8 in.) gypsum board (GB) on both sides of 100 mm (4 in.) nominal metal studs and 64 mm (2 1/2 in.) sound attenuation blankets between the studs. These should extend above conventional lay-in ceilings to the underside of walk-on deck/platforms.*

(1) A/C and other mechanical equipment rooms.

(2) Manual arts therapy shops.

(3) Auditoriums.

(4) Multipurpose rooms.

(5) Mental Health and Behavioral Sciences Service i.e. group therapy rooms.

(6) Emergency generator rooms.

(7) Kitchen & Dishwashing spaces.

NOTE: *Alternatively, provide a gypsum board ceiling or gypsum board lay-in panels both with a 65 mm (2 1/2 in.) sound attenuation blanket for non-VAHBS type of construction where ducts, pipes, etc., make it impractical to extend sound partitions to slabs or deck above. Where gypsum board ceilings with attenuation blankets are used, the double GB partitions and sound attenuation blanket should extend 100 mm (4 in.) above the ceiling. Studs should continue to the floor above. Give special attention to details shown on the construction documents to prevent possible flanking paths for noise transmission.*

b. **Speech Privacy**. Design the sound resistant enclosures of the following spaces to assure speech privacy and achieve an STC rating of 40 (45 for space marked with an asterisk).

(1) Conference rooms.

(2) Consultation offices.

(3) Examination and Treatment Rooms.

(4) Individual Offices in Mental Health and Behavioral Sciences Service.

(5) Audiology and Speech Pathology Areas.

(6) Medical Media Production Services* (Recording Areas).

NOTE: *Partition and ceiling construction should be similar to Paragraph 1.a., except that for spaces requiring an STC value of 40, use only a single layer of gypsum board on both sides.*

c. **Sound Dampening**. Provide sound damping in libraries, chapels, quiet rooms, telephone operator's room, and similar areas by finish materials shown for these areas in Program Guide PG-18-14, "Room Finishes, Door, & Hardware Schedule".

NOTE: *Where an area generating unusual noise or vibration is located adjacent to occupied spaces, the A/E should obtain the services of a professional acoustical consultant to design the sound suppression measures required to produce a comfortable working environment in the adjacent spaces.*

d. **Door Types**. Use door types 19 and 20 with mechanical seal at entrances to spaces where noise suppression or speech privacy is a requirement. See VA Standard Detail Nos. 08100-1.DWG and 08100-2.DWG.

NOTE: *Duct system sound attenuation and room noise criteria are shown in the heating, ventilating, and air-conditioning (HVAC) design manual.*

3. MECHANICAL AND ELECTRICAL ITEMS: Properly locate, detail, and caulk or insulate penetrations of the sound resistant enclosure by electrical boxes, light fixtures, air conditioning or ventilating ducts and grills, and other mechanical and electrical components to suppress generated noise or provide speech privacy for the spaces listed in paragraph 2.a. and 2.b. Evaluate equipment and mechanical rooms for noise problems and provide recommendations during the design phase as to additional sound attenuation required. In the analysis, list the possible flanking paths for noise transmission and the methods recommended to prevent this leakage through the enclosure.

4. EXTERIOR ENCLOSURES: In the design of exterior building walls and fenestrations at sites near airports, freeways, or heavy city traffic, give consideration for the control of noise transmission from external sources.

TOPIC 12 – FUTURE VERTICAL EXPANSION

1. GENERAL: When the approved scope of a project includes provisions for future expansion, design the structural, mechanical, and electrical systems in accordance with the following guidelines. Indicate future equipment and floors on the design development and construction drawings by broken or dotted lines.

2. ARCHITECTURAL AND STRUCTURAL

a. Design columns, bearing walls, and foundations for future loads. Design details to facilitate splicing future columns. In preparing design analyses, use live load reductions permissible for future gross areas.

b. Design columns for the more critical of the two possible interacting future load conditions (combinations of bending moment and axial load).

c. Base wind and seismic analyses on gross projected future configuration and mass of building.

d. If the planned future expansion includes additional stories intended to align with an existing floor, depress the roof slab 50 mm (2 in.) minimum below the existing finished floor to receive a future leveling topping for the future functional floor.

e. Provide removable floor slabs, wall panels, etc., for future openings for stairways and elevator and other shafts.

f. For record purposes, note structural design assumptions on contract drawings. Indicate future column loads and also gross loads used in designing original structures on column schedules.

3. **PLUMBING AND SANITARY**

a. Size main interior cold water, hot water, waste, fire sprinkler, medical laboratory, and dental gases, and fuel gas lines to serve future loads.

b. Size underground water, fuel, gas, and oxygen service lines, and storm and sanitary sewers serving the building to serve future loads.

c. Size selected equipment, such as hot water generators, air compressors, and vacuum pumps for original loads in accordance with plumbing design manuals. Indicate locations for future equipment on schematic drawings.

4. HEATING AND AIR CONDITIONING

a. Size main chilled water and condenser water lines for future loads.

b. Design chillers and chilled water pumps for original loads in accordance with HVAC design manuals. Indicate locations for future chillers and chilled water pumps on design development and construction drawings.

c. Provide pipe fittings and valves for connections to future chillers, pumps, and accessories.

d. Size cooling towers to match originally installed chillers. Indicate locations for future cooling towers on design development and construction drawings.

e. Provide sufficient capacity for engineering control center panels to accommodate controls for future equipment.

f. Size main steam and condensate return lines for future loads. Use diversity factors applicable to future conditions.

g. Size boilers for original plus known future loads in accordance with the Steam Generation Design Manual. Indicate locations for future boilers and related equipment on design development and construction drawings. Size fuel, condensate and feedwater piping system, and condensate storage tanks for probable future maximum design-day demands. Size deaerating feed water heaters for future loads. (Do not size pumps and control valves for future; add additional capacity later.)

h. Size natural draft stacks for future loads.

5. ELECTRICAL

a. To serve future expansion, allow space in main electrical rooms for addition of future equipment for following systems:

(1) Secondary power distribution system.

(2) Essential electrical system.

(3) Local fire alarm system.

(4) Telephone system.

(5) Other communication systems.

b. Where feeder raceways cannot be readily installed in the future, install empty raceway in original design.

6. ELEVATORS, DUMBWAITERS, AND TRANSPORT SYSTEMS

a. Locate elevators, dumbwaiters, and transport systems, requiring future vertical and horizontal expansion, to serve functions and activities in original building and proposed future expansion.

b. Select types of vertical and horizontal transport designs on the basis of the kind and volume of original and projected future traffic.

c. Analyze traffic during preliminary design stage to determine the economic feasibility of originally installing vertical and horizontal transport systems having future additional capacity. If that is not feasible, provide spaces for future hoistways. Provide future hoistway space with knockout floor slabs to allow that floor space be utilized until the future expansion takes place.

d. When the designed equipment is overhead traction type, design the machine room area and the machine beams to be removable. This facilitates machine room relocation and extensions of hoistways.

e. When the designed equipment in hydraulic and designed for future vertical expansion, structure the hoistway for future electric traction elevator.

TOPIC 13 – SERVICE LIFE AND REPLACEMENT COSTS

1. GENERAL: Design VA facilities in a cost-effective manner while providing an environment that promotes quality health care, which:

a. Allows staff to maximize patient care and provide efficient medical services.

b. Is safe and user friendly to patients and staff.

c. Offers best value for construction dollars.

d. Provides longevity and meets industry standards for maintainability.

e. Remains attractive and provides a visual statement of quality health care.

2. SERVICE LIFE: Design the structure and exterior skin, respectively, to support specific loads and to provide a weather tight enclosure so that the critical building systems inside the building have a finite service life. Recommended service life of the building's critical individual components are identified below, assuring appropriate maintenance:

CRITICAL BUILDING COMPONENT	SERVICE LIFE	PERCENTAGE OF COST OF FACILITY
Structural (foundation, sub-structure, & superstructure)	Indefinite	20%
Exterior Skin	Indefinite	12%
Roofs	20 Years	2.5%
Interior Construction/Equipment	10 Years	24%
Mechanical Systems	25 Years	25%
Electrical Systems	20 Years	12%
Automatic Transport	25 Years	4.5%

3. DEFINITIONS

a. **Service Life**. The average time during which a particular system or component remains in it original service application and when it should be replaced. Replacement may occur for any reason, including, but not limited to failure, general obsolescence, reduced reliability, excessive maintenance cost, and changed system requirements due to such influences as changed functional programs or energy prices.

b. **Critical Component**. Major system without which the facility could not provide its primary function

c. **Major Component**. Building System that is 10% or more of the cost of the facility.

4. CRITICAL BUILDING SYSTEMS: The following is a list of **typical, but not limited to,** design for critical building systems which impact service life of facilities:

a. **Architectural Systems**

(1) Roofs. Provide long-lived and leak-free roofs. Geometry of very large buildings dictates a flat roof, restricting the choice of materials to built-up or single-ply membranes. Smaller buildings may have pitched roofs, allowing more material options, such as asphalt shingles, metal, or tile.

(2) Windows. Design windows for low maintenance, trouble-free operation, weather-tightness, insulating value, security (in psychiatric areas), and appearance. Operable windows are the easiest and least costly type if the facility cleans its windows with in-house staff. For large scale facilities, such as hospitals, the most satisfactory type are side-hinged windows. Fixed windows (non-opening) are less costly initially and may last indefinitely since they have no moving parts. However, fixed windows have higher maintenance cost since they must be washed from the outside, usually by professional window washers

(3) Interiors. Use materials that are typically hard surfaced and durable and have an architecturally pleasing appearance. Damage to finishes may occur more frequently because of extended footrests on wheelchairs or type of patients, such as those with substance abuse or psychological problems.

(4) Ceilings. Normally, provide lay-in acoustical tile (AT) systems, which is the most common and cost-effective system that is in line with the standard practice of private sector. Use plaster only in limited areas where infection, cleaning and security are of paramount concern. Avoid the use of AT systems with regular (recessed) edges that cost more. Base ceiling selection on acoustic performance, low replacement cost, and initial cost.

(5) Floors. Provide vinyl composition tile (VCT) or sheet vinyl (SV) for general use medical areas, ceramic tile (CT) for wet areas, quarry tile (QT) for heavy duty areas like kitchens and SPD, carpeting (CP) for office, waiting, and special areas, and special material, such as pavers, for entrance/lobby spaces. Select flooring for safety and functional appropriateness first, then life cycle maintenance and durability (see PG-18-14 for recommended finishes and materials).

(6) Walls. Use (1) gypsum wall board (GWB) with bumper guards and handrails for corridors; (2) gypsum wall board for rooms with paint or wall covering; ceramic tile; (3) full height or wainscot for wet areas; (4) hard plastic panels, ceramic tile, painted plaster, or concrete masonry units for heavy duty areas; (5) plaster/veneer plaster for operating rooms; and (6) special materials for lobbies. Select colors and textures that keep the best appearance for the longest period possible. Base selections of initial cost, required maintenance, and potential for damage (see PG-18-14 for recommended finishes and materials).

b. **Mechanical Systems**

(1) Air Handling Systems. Design air handling systems to provide temperature, humidity, ventilation, and air quality control of indoor space. Include component equipment such as heating and cooling coils, fans, air filters, dampers, intake louvers, humidifiers, and controls. Select equipment based on size constraints, functional areas being served, available space, and environmental conditions required. Consider hours of operation, ambient air conditions, cleanliness of ventilation air, quality of water service, ability or accessibility, and quality of maintenance.

(2) Ductwork Systems. Design galvanized metal ductwork/air distribution systems in accordance with the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) national standard. For a few limited areas, including surgery, provide wet hood exhausts and corrosive hood exhausts; use other materials, such as stainless steel, for safety and infection control.

(3) Chiller Systems. Design chiller systems, including controls, pumps, piping, and valves, to provide chilled water for cooling. A minimum of two chillers is needed to provide efficient operation and redundancy.

(4) Boiler Systems. Design boilers to distribute steam throughout the medical center for space heating, sterilization, food preparation, and dishwashing. Typically, boilers are gas/oil fired high-pressure steam generators with dual fuel capability and required safety and operating controls. A minimum of three boilers is required. Select units based on connected loads, air pollution standards, and federal energy conservation statutes.

(5) Piping Systems. Design a piping system that distributes fluids and gases throughout the facility. HVAC piping is predominately black steel piping systems; copper piping used for domestic water and medical gases; and cast iron and PVC used for waste lines.

c. **Medical Gas Systems.** Design these systems. to include air compressors, air dryers, filters, vacuum pumps, manifolds, alarms, and piping systems, to provide life support for patients' critical needs.

d. **Elevators.** Design hydraulic type elevator systems in buildings with 4 floors or less and electric traction-type elevator systems in buildings of 5 or more floors use.

e. **Electrical Systems.** Design electrical systems to provide lighting and communications for occupants, and power for specialty equipment and building systems such as elevators and air conditioning. Select system components based on user requirements, safety, and life-cycle costs.

TOPIC 18 – TRANSPORTATION, MATERIALS AND SOLID WASTE MANAGEMENT, AND AUTOMATED DELIVERY SYSTEMS

1. SCOPE

A. This Program Guide applies to the design of transportation and logistical requirements for materials and waste management, transportation equipment, methodologies required for efficient, cost-effective, and timely movement of people, equipment, related materials, and waste management functions. This guide provides direction to designers and helps to coordinate transportation activities detailed in other Program Guides (PG) and Design Manuals (DM). This Guide applies to all applicable facilities whether new or existing. Addition and alteration projects must meet these guidelines to the extent practical.

B. **There must not be deviations from these requirements except when permitted by a detailed and specific waiver granted to the Architecture/Engineering (A/E) and to the Medical Transport Logistics Consultants (MTLC) by the VA in a hardcopy authorization/waiver format.**

C. This Program Guide does not prescribe when specific systems are required or where they should be employed. Table 18-1 prescribes when different technical analyses are required based on a facility's size. It is the responsibility of the designer of record to develop a holistic and efficient design incorporating the campus and individual facility's transportation needs.

D. Design, specifications, and installations of all systems must be based on providing a complete "turnkey" operation. All components, subsystems, devices, and controls required for a complete and useable transportation system must be provided in the final construction documents. This includes equipment and devices such as integrating cart washers, carts and elevators into the designs and specifications of Automatic Guided vehicles (AGV) and Automated Mobile Robots (AMR) systems, carriers and inserts for Pneumatic Tube System (PTS) systems, Trash and Linen bags for Pneumatic Trash and Linen Systems (PTLS).

E. This Program Guide provides guidance for the study, selection, and design of transportation and logistics systems in support of the design and construction of VA facilities and provides guidance for the completion of the feasibility study requirements listed in PG-18-15.

2. MEDICAL TRANSPORTATION LOGISTICS CONSULTANT (MTLC)

A. The A/E will submit the qualifications of their preferred MTLC to the VA for review and approval. A qualified MTLC must have successfully provided for a period of not less than five years comprehensive study, design, and Construction Administration services in the areas of materials management, food and nutrition receiving and distribution, solid

waste management, horizontal and vertical transport of people, materials and equipment, sterile supply processing and distribution, automated and manual materials handling. The MTLC must provide resumes for all System Design staff associated with the project for approval by the VA. The MTLC must demonstrate prior experience on a minimum of three (3) successful, completed and fully operational healthcare facilities with similar scope. Previous project experience must include designs and specifications for the equipment and systems being incorporated into the VA project. For example: if the VA project in question is to have a PTS the MTLC must show experience with three (3) completed projects that contained a successful PTS that was fully designed and specified by the MTLC.

B. The designs of the Food and Nutrition Services (FNS) functions and associated departments is a specialized discipline and may be provided by a consultant that specializes in that area. The MTLC must provide the studies and recommendation for functions and areas that support FNS such as the receiving docks, waste management, internal transportation service to both in-patient and non-patient areas to ensure consistency and uniformity of those functions with all other logistics functions and departments.

C. The VA recognizes that the studies and designs of certain automated materials transportation systems such as AGV, AMR, PTS, and Pneumatic Trash/Linen Systems (PTLS) are not considered standard in VA facilities. Where these systems are included in a project and the MTLC does not have the required three (3) project experience then the A/E team must assign that element of design to an approved Specialist Medical Transportation Logistics Consultant Subcontractor (SMTLCS) that meets all the requirements stated above. The qualifications for the SMTLCS must be submitted to the VA for approval. The SMTLCS must work as an integral part of the MTLC's team and will be assigned the design responsibilities associated with the special systems. Where this document refers to the MTLC those conditions and requirements must also apply to the SMTLCS if one is assigned.

D. The MTLC must use the VA specifications where available and develop new specifications where VA specifications are not available. Copies of these base specifications must be submitted to the VA for approval during design review. The MTLC must provide examples of the design considerations, utilities, interfaces, etc. that will be required as the project moves forward.

E. **Vendors or their employees must not be used as a MTLC**. A/E must not act as the MTLC unless they can demonstrate that they provide these services as a regular part of their business and meet all the requirements for a MTLC.

   1) The Transport Consultant/MTLC may contact vendors as necessary for specific product information required by the MTLC designer to provide proper competitive specifications and designs.

F. Recommendations and designs must be non-proprietary as to promote competitive bidding. Where desirable system/equipment features are protected by patents these

features must be functionally described in detail in the bidding documents to allow competitors to provide those functions using their standard technologies. Designs must not eliminate any qualified competitor by a failure to provide adequate and reasonable utilities, spaces and clearances.

G. Table 18-1 prescribes the level of technical analyses needed based on a facility's size and different transportation systems that may be required. It is the responsibility of the designer of record to develop a holistic and efficient design incorporating the facility's operational and functional needs based upon observations and staff interviews.

Table 18-1 Analysis Requirements

Analysis	Facility Characteristic
Transportation Logistics Analysis (TLA)	Any facility or contiguous medical campus =>200,000 BGSF Renovations and new construction of Ambulatory Care and Hospitals
Elevator Traffic Study & Analysis (ETSA)	All facilities >1 story
Material Management Analysis (MMA)	All facilities or contiguous medical campus =>100,000 BGSF All Warehouse facilities => 20,000 BGSF
Waste Management Analysis (WMA)	All facilities or contiguous medical campus => 50,000 BGSF All dedicated Food Service facilities => 10,000 BGSF

Notes Table 18-1: Medical Campus Facilities include Outpatient Clinics, Health Care Clinics, Ambulatory Care Centers, Hospitals, Medical Centers, and Research/Laboratory buildings.
BGSF – Building Gross Square Feet

3. TRANSPORTATION SYSTEMS EVALUATION

A. For all projects requiring a Logistics Analysis (TLA, ETSA, MMA, WMA) the A/E must ensure the services of a qualified MTLC is included in the request for planning and architectural services. The A/E must utilize the services of the consultant as noted herein.

B. The MTLC must be an integral part of the design team and must be the primary planner in every aspect of the project as it relates to transportation, materials management, waste management, central sterile processing, and logistics. This includes, but not limited to:

- vertical and horizontal circulation
- facility logistics
- designs and specifications for vertical transportation and materials handling systems
- materials management
- central sterile processing
- food and nutrition services
- waste management

C. The A/E and the MTLC must ensure all transportation and material handling systems selected are designed in accordance with design documents and applicable codes and standards. The MTLC must be responsible to coordinate with and provide the A/E the required design criteria to ensure the designs incorporate the necessary spaces, adjacencies, utilities, and other appropriate building elements for the equipment to be installed.

D. In any study all human activities, such as walking speeds, pushing, pulling, and lifting, etc. must be studied and designed to meet all applicable codes and standards including VA, Occupational Safety and Health Administration (OSHA), and National Institute of Occupational Safety and Health (NIOSH).

1) Circulation studies dealing with walking and pushing speeds must recognize that movement through straight and uncrowded pathways is the maximum attainable speed and through crowded pathways with turns will be slower. It is understood that these speeds will vary by many factors but for the purposes of VA studies those shown in Table 18-2 must be used for corridor widths of approximately eight (8) feet. Where designs encourage high volumes of movements wider corridors must be studied and used as required.

Table 18-2 Travel Speeds

Average Movement Speeds for Studies (Note that weights noted assume larger sizes contribute to slower speeds)	**Feet Per Minute - Straight Unobstructed Pathway**	**Feet Per Minute - Straight Crowded Path** (speed considers patients and wheelchairs in the corridors)	**Feet Per Minute - % of straight speed through 90 Degree turns with speed for 3 feet going into and after the turn.**
Purposeful Walking without pushing or carrying a load.	275	175	At 80%
Purposeful Walking while carrying a >15 <25-pound load.	235	175	At 80%
Purposeful Walking while carrying a >25-pound load.	215	150	At 80%
Pushing Cart or wheelchair <500 Pounds Gross Weight <150 feet distance.	150	125	At 85%
Pushing Cart or wheelchair <500 Pounds Gross Weight >150 feet distance.	140	115	At 80%
Pushing Cart or wheelchair >500 Pounds Gross Weight <150 feet distance.	140	115	At 90%

Pushing Cart or wheelchair >500 Pounds Gross Weight >150 feet distance.	125	100	At 75%

Notes Table 18-2: Assumed Travel Speeds Through eight (8) foot wide main corridors. Use wider corridors when required.
Travel speeds shown may be lower than non-VA medical facilities due to the higher number of patients (walking, in wheelchairs, etc.) in the corridors. Different speeds may be considered if they are verified in on-site observations/evaluations.

4. TRANSPORTATION AND LOGISTICS ANALYSIS (TLA) REQUIREMENTS.

A. Different transportation and logistics analyses are required for facility designs as indicated in Table 18-1. These analyses must address the transportation, logistics, SPS, materials and waste management requirements of the project as required by this document. When required by Table 18-1 the MTLC will be the lead planner in the development of concepts identifying the general transportation and logistics requirements for the project.

1) All studies and designs for bulk/cart automated transport systems such as AGV/AMR must recognize that pathways for those systems must be dedicated, for proper operation of the system and per code, and any use of that pathway for manual transport where allowed by code is to be limited to occasional very low volume usage. Should a high transport volume department such as Food and Nutrition Services or Waste Management not be included on the automated cart system another route must be provided.

2) Calculations must clearly show the input and output values and provide brief discussions and examples of the “math” formulas used to demonstrate the methodologies used in reaching results. Recommendations must not be accepted that are not adequately supported.

B. The TLA studies and narratives must provide a complete and detailed recap of the activities performed and the study and design status of the various systems and equipment studied and/or recommended.

1) Where an Option or System has not been accepted or recommended and not included in a Project the rational for that decision must be identified in the ongoing TLA reports, for future reference, and further studies or analysis of that Option must not be required. This will help eliminate repetitive studies.

2) The TLA studies must include everything that needs to move in the facility: people, clean and soiled materials/supplies, equipment, medications, specimens, etc. with recommendations for the mode of transport including elevators, stairway, manual and/or AGV/AMR, gravity chutes, PTS, etc. to be used for each material category.

a) Studies to include the movement from the point of entry into the facility, the mode(s) of transport through the facility, and the mode of transport for exiting soiled and/or salvage materials.

b) Materials and Equipment studies and systems planning must be comprehensive and must include the following materials categories as applicable to the project:

- General Wastes
- Infectious Waste
- Lab Wastes
- Sharps
- Hazardous Wastes
- Chemical Wastes
- Radioactive Wastes
- Food Wastes
- Recycling
- Cardboard
- Confidential Papers
- Salvage Materials
- Construction Wastes
- Soiled Linens
- Soiled Surgical Instruments
- Clean Linens
- Clean Uniforms
- Clean Supplies
- Standard and Special Pallets
- Others applicable to the project
- Clean Medical Supplies
- Clean Surgical Supplies
- Sterile Surgical Instruments
- Medical gases
- Bulk and Unit Pharmaceuticals
- Patient Medications
- Lab Supplies
- Lab Specimens
- Food Supplies
- Patient Food
- Kitchen Materials
- Cafeteria Food
- Crash Carts
- Surgical Supplies
- Clean Medical Equipment
- Empty Carts

3) The TLA must include all aspects of the Elevator Traffic Study and Analysis (ETSA), Material Management Analysis (MMA), and Waste Management Analysis (WMA) studies and designs provided as a single unified and totally holistic, coordinated logistics, transportation system study, design, and must be accomplished in that high level of integration by the MTLC.

4) The TLA studies for the various Materials Handling, ETSA, MMA, WMA system options must include and discuss the space impacts of these systems on the project. Many AGV/AMR installations have saved space in the target project and this potential needs to be documented in the TLA Studies. This would be the same where a system might require more space than the other options.

5) Many automated and semi-automated systems such as an AGV/AMR, PTLS, and Gravity Chutes almost always require different spaces and adjacencies than required for a manual system.

   a) Adjacency revisions to VA Standards to accommodate the proper design, installation and operation of a system or equipment item must be specifically identified in detail and included in the submittals.
   b) Any space or adjacency irregularities must be identified immediately to the Project Manager for resolution.

C. Material Management Analysis (MMA) to include a comparison of automatic to manual material handling systems. Automatic systems include Automatic Guided Vehicles (AGV), Automated Mobile Robots (AMR), Pneumatic Tube Systems (PTS), and Pneumatic or Gravity Chutes in addition to other or newer technologies.

D. Life Cycle Cost Analysis (LCCA) must be used to evaluate the alternatives and to determine the appropriate system. The LCCA must include all costs of "Ownership" including elements listed below and as applicable to the system studied from day zero (0) through the first 30 years of operation.

- installed equipment costs
- costs of space used
- related construction costs
- utility costs
- operational labor costs
- maintenance parts and labor
- expendables
- periodic upgrades
- overhauls
- replacement

1) Provide charts and five (5) year recap showing Cumulative Life Cycle Costs of the options considered and a second chart showing the annual cash flows for the options.

a) The LCCA must be based on traffic matrices developed and maintained by the MTLC for the various systems in question.

E. The MTLC must sign the transportation logistics analysis and report certifying the information contained therein is accurate, vendor neutral, and based on empirical data.

F. Recommendations must be provided on replacements, upgrades, or modernizations required to meet the needs of the project and the current standards and criteria. New construction must, where applicable and practical augment any shortfalls in the existing buildings or utilize any excess capacities offered by existing structures that will remain in service.

G. The TLA must describe in detail and contain scaled drawings of the MTLC recommendations to maximize the transportation and logistics efficiencies and how the recommendations are implemented into the design. The MTLC must coordinate with and provide the A/E Design Team with the design details applicable to the space, flow, adjacency, machine rooms, maintenance area, and other building elements necessary to install, operate and maintain the systems and equipment for the project in question.

H. The TLA must focus on optimizing adjacencies, efficiencies and safety and minimize overall patient, staff, and material movement costs in the project design.

I. The TLA must be based on empirical data provided by the using facility. When such data is not available the MTLC must work with the using facility to reach final estimates that are acceptable to the affected facility user departments.

1) Site visits must be made to the existing facility, by the MTLC or ETSA/MMA/WMA Consultant as applicable to inspect and observe conditions and operations and to gather relevant operational and equipment information. The MTLC or

ETSA/MMA/WMA Consultant as applicable must conduct detailed interviews of the various departments that represent the Users (including nursing and surgical staff) and Providers of the various Support Services. Complete notes for these interviews must be transmitted to the facility for verification of the information contained. These interview notes must be used as an important part of the data base used for the project and must be included in the TLA. The MTLC must make detailed non-technical inspections of all applicable departments and equipment, including the elevators, SPS processing equipment, and materials handling systems to estimate their potential life expectancy, need for more detailed inspections and potential use for the project. Facility and departmental tours must be arranged as requested by the VA if required to complete the data collection process. The following functions must be included in the interview/data collection process as applicable.

- Administration
- Human Resources
- In-Patient Care Services/ Nursing
- Outpatient Patient Care Services and Nursing Services
- Surgical Services
- Emergency Department
- Sterile Processing Services
- Infection Control
- Logistics/Materials Management
- Food and Nutrition Service
- Environmental Services
- Linen Services/Laundry
- Patient Transport Service
- Pharmacy Services
- Laboratory Services
- Imaging Services
- Facility Management Engineering & Shops
- Mail Room
- Other departments as required

J. Data including site constraints: Design Concept of Operations for the logistical departments like food service, linen and waste management, materials management, housekeeping, pharmacy, sterile processing, distribution, and projected workload for the new facility will be noted and documented.

K. Elevator loading density and the load/unload time must be based on site visit observations to account for unique conditions at a facility and the cultural aspects of the area, e.g., amount of “personal space” required by individuals, number of visitors per patient, number of escorts or companions accompanying outpatients. Studies must also include the factors and requirements for the proper and safe transport of the various devices required by handicapped users (i.e., wheelchairs, scooters, walkers, etc.) and other expected vehicles (strollers, carriages, carts, etc.). Refer to: PG-18-10 Elevator Design Manual, Elevator Traffic Study and Analysis (ETSA).

5. ELEVATOR TRAFFIC STUDY AND ANALYSIS (ETSA)

A. Data about the use of the Vertical Transportation System (VTS) must be provided by the VA and through a site visit for projects where it is anticipated that three or more elevators will be required.

B. An ETSA must be provided as a detailed stand-alone document except where MMA and WMA studies are required in which case these are provided as a single report with the information from these studies clearly showing how they inform and coordinate with

the ETSA. Where a TLA is required the ETSA must be integrated into that study and design as indicated in the TLA requirements noted herein.

C. Elevators provide the basic transportation mechanism for most vertical moves in multistory buildings. The MTLC must prepare the ETSA to determine the appropriate types, locations, sizes, speeds, and groupings of elevators that result in a cost-effective and efficient operation. See VA Standards and Design Guide located on the Technical Information Library (TIL).

D. The ETSA must document the following:

1) A description of the elevator plant proposed, including an analysis of the walking distances, elevator types, and locations as described in PG-18-10 and within this document. Elevator studies and designs must consider the complete horizontal and vertical circulation for the populations studied.

2) The pedestrian population (the number of ambulatory patients, working and visiting population within the facility) must be divided to those pedestrians that are estimated to be on the elevators and those using stairs.

3) The number and average size and timing of material movements within the facility are provide in the MMA and WMA. If MMA/WMA studies are not authorized, the ETSA Consultant must interview the relevant departments and create a materials movement matrix for use in the VTS studies.

4) The peak hours of vertical transportation must be studied, including but not limited to: Morning Shift Change Peak (primarily a one-way peak period in upward travel), Lunch Peak (heavy two-way traffic), Afternoon Shift Change Peak (primarily a one-way peak period in downward travel, with moderate opposing traffic).

E. Elevator Performance - Study Criteria. Studies to show and include:

1) The estimated assumed population load/unload times, the average space occupied by the individual elements that make up the population, making sure that the studies are based on the cumulative occupied space and not the weight of the occupants. Weight being a separate calculation to ensure adequate and safe lifting capacity is provided.

a) Include local population characteristics, i.e., wheelchairs, scooters, family members, etc.

2) In determining the elevator performance (as described in PG-18-10 Elevator Design Manual) provide the following information and considerations in the transportation logistics analysis:

a) Elevator machine(s) studied i.e., geared/gearless traction and holed/hole less hydraulic.
b) Door types, sizes and the time required to open and time to close the doors.
c) Elevator traveling speeds studied.
d) Acceleration rates studied.

e) Door hold open times based on Americans with Disabilities Act and PG-18-13 Barrier Free Design Standard requirements.
f) Lobby hold times.
g) Elevator design travel considerations such as total rise, number of total stops, number of probable stops, high call reversal, and location of main lobby.
h) Provide the proposed elevator average intervals and handling capacities for the groups studied.
i) The study results must include final recommendations based on meeting the VA criteria for average intervals and handling capacity.

3) The Transport equipment must be designed and specified by the MTLC to meet VA Standards and Specifications.

6. MATERIAL MANAGEMENT ANALYSIS (MMA)

A. The Material Management Analysis is a reduced version of a Transportation Logistics Analysis and is required for smaller projects =<100,000 BGSF and all warehouse facilities that are =>20,000 BGSF. For these projects material would assume to be manually moved throughout a facility unless the designer's studies show an automated system is physically and economically justified. The specific systems included in a project must be determined by detailed physical, functional, and economic factors including Life Cycle Cost Analysis (LCCA). The MTLC must prepare the MMA to determine the appropriate types, locations, sizes, and design of material management and movement methods that result in a cost-effective and efficient operation.

1) The MMA must include the designs and requirements for materials moving from the point of receipt (docks, etc.) to and from the departments being served including main and satellite storage and the order fulfillment process and cycle. Materials returned to the point of origin, such as surgical instruments, food service trays and utensils, etc. must also be covered within the MMA studies.

2) Transport for soiled and other items to be removed from the facility as waste, salvage, etc. must be studied in combination with "clean" transport for MH Options that can safely transport both clean and soiled materials such as manual and AGV systems. A trash chute may be studied as an option to move only rubbish.

B. MMA Requirements – General.

1) The MTLC must be responsible for the detailed studies and designs of the Materials Management functions including; docks, stores, order fulfillment, distribution, linen stores and distribution, sterile supply distribution, and equipment cleaning/holding/ distribution as required by the VA design standards including PG-18-12 Chapter 284 Logistics Services and Chapter 285 Sterile Processing Service, and as required to support the various User and other Support departments including: Nutrition and Food Services (PG-18-9 Chapter 224) and Environmental Management Service Laundry And Linen Operation (PG-18-9 Chapter 408).

2) For new construction the MTLC must follow the VA design requirements for the spaces in question and must fully integrate the applicable materials handling systems into the physical, functional and operational aspects of those areas. A complete functional narrative must be provided for the departments in question, including descriptions of how they integrate with the applicable materials handling systems. Where space can be reduced or where additional space might be required this must be detailed in the TLA or MMA report with a request for a deviation.

3) For major additions and alterations, the MTLC must provide adequate site inspections and departmental interviews to determine the physical, functional and operational conditions of the existing transport systems and material management departments and issue a report on the adequacy of those systems and departments in meeting the needs of the total planned facility. If service shortfalls are predicted the report must include detailed recommendations with drawings of the recommended renovations and/or additions that are required to match their capabilities with the estimated needs. Where capacity can be provided from existing systems the MTLC must study and recommend whether it would be in the VA's best interest to build new departments or operate from the existing facilities. A final report must include the functional narratives and the basis for the decisions.

C. MMA Requirements – Movement Methods

1) The MMA must document the following:

a) The number of estimated scheduled and non-schedule demand transports that would be applicable to transport by a PTS (i.e., Lab Specimens, Medications, etc.). This data to be used in the VTS and Material Handling Studies (MHS) and possible development of alternative delivery methods. The list should indicate the approximate volume of transports to and from each major User Department.

b) The traffic information must be separated into three categories: items transportable by a 4" PTS, items transportable by a 6" PTS, and items not transportable by PTS.

2) MLTC must provide a listing of estimated major bulk clean and soiled materials handling moves that would be transportable by cart, indicating the number of transports, their origins and destinations and the hour of the day, and the assigned transport system (i.e., specific elevator group, etc.) on which the movements are to occur. This data must be used in the Elevator Studies and the Materials and Waste Management and Handling Life Cycle Cost analyses (LCCA).

3) The MMA Transport Studies and Reports must include the following:

a) The studies must determine the numbers of FTE's involved with the automated and manual options and use that information in the LCCA.

b) The material volumes to be moved by the proposed systems must be analyzed to determine which users would justify automation.

c) Location, size, speeds of proposed systems.

d) Specific requirements for each type of system.

e) An LCCA comparing manual movement vs. realistic semi-automated and automated alternatives. As a minimum the following methods must be evaluated: for an MMA evaluate AGV/AMR for cart and bulk transports, demand 6" pneumatic tube systems, pneumatic and gravity trash and linen chutes and fully/partially manual options.
f) All information relating to the vertical transport elements must be included in the elevator studies and any requirements (vertical and/or horizontal circulation, space, adjacencies, etc.) specific to the building design must be coordinated with and provided to the A/E Design Team.

7. WASTE MANAGEMENT ANALYSIS (WMA)

A. Waste Management is understood to be an integral part of the overall Logistics and Materials Management Systems and it is expected that the MMA and Logistics operations and designs must coordinate with and assist in the overall waste reduction process to the extent practical for the facility in question. The MTLC must coordinate the MMA and WMA studies and recommendations as applicable.

B. The proper preliminary design of a VA Facility waste management system requires consideration of the operational and mission characteristics of the facility, the existing waste disposal practices of the facility and local jurisdiction, the governmental regulations affecting the design, and the costs and application of system handling and disposal technologies.

C. WMA Requirements

1) Determination of the solid waste stream components and soiled linen types. As a minimum provide the following approximate breakdowns, transport and disposal methodologies for:

- general trash/rubbish
- regulated medical wastes
- sharps
- recyclables
- chemical wastes
- radioactive wastes
- wet and dry food waste
- soiled patient linen
- soiled surgical linen
- soiled uniforms

a) Estimation of waste and soiled linen volumes by type/category.
b) Concepts for segregation, holding at the generating departments and central bulk holding.
c) Space and utility requirements for departmental and facility soiled holding rooms.
d) Concepts for collecting and transporting waste and soiled materials within the facility.
e) Soiled dock arrangement, layout, and equipment.
f) On site Regulated Medical Waste (RMW) processing (sterilization and grinding) must be investigated and evaluated with LCCA provided to support recommendations for or against that methodology.

g) Recommended disposal methodologies must be consistent with the ability of local waste haulers and landfills to work with and support the proposed operations and systems.

8. FACILITY DESIGN

A. Transportation and logistics requirements must be integrated into the overall campus/facility design. The A/E must design the overall floor plan and circulation to provide the most direct routing practical and will utilize the transportation systems and circulation/routing as determined by the MTLC studies listed in Table 18-1.

1) Designs for all automated systems must be fully inclusive and comprehensive for the extent of the campus and not done an area at a time. Where projects are phased AGV/AMR/PTS/PTLS designs must include the early concept designs for any future buildings together with estimated traffic to use in the Campus LCCA's and to ensure the initial installation is sufficiently robust to handle the known future additions.

B. Establish traffic patterns to separate the various traffic types in an efficient, logical, safe, and secure manner, while maintaining levels of aseptic control consistent with the requirements of the facility. Consider all these factors for separation for horizontal and vertical circulation: patient privacy; accessible access; aseptic control; routing efficiency; utilization of appropriate hardware systems; safety; and security. Where circulation conflicts occur prioritize traffic as listed here: patient, staff, equipment, visitors, clean and soiled materials, and logistics. Separate lobbies are required for Patient Transport Elevators and must not be shared with Passenger (Public) Elevators and Material Transport Elevators as per the VA National Infectious Diseases Service (NIDS).

C. The MTLC must consider traffic demand, vertical travel distance, mix of traffic type in the areas to be served, and mode of containerization. Traffic demand and vertical travel distance must determine equipment type and speed required. Traffic mix and mode of containerization must determine load capacity, platform size, configuration, and door type for elevators.

D. Corridors must be studied for adequate traffic capacity. Provide multiple lanes for high volume hallways to allow passing of slow traffic (wheelchairs, walkers, etc.).

E. Where separate elevators are not required, separate the materials traffic by schedule and policy. Careful, simple, and clear space planning can maximize separation between visitor/patient and staff/materials/logistics. Primary horizontal materials circulation should occur on a single level, with vertical penetrations that are convenient to heavy use areas.

F. It is undesirable for AGV/AMR, carts, tuggers (manually driven or automated), pallet trucks, and similar material carriers to be moved long distances on floors and corridors routinely traveled by patients or visitors. For example, it is preferred to use two (or more) single elevators in distributed areas if traffic needs dictate more than one service/AGV elevator is required.

Table 18-3 Separation of Traffic by Facilities

Analysis	Facility Characteristic
Separate Passenger Traffic. Separate Inpatient Traffic. Separate Logistics/Materials Traffic.	All facilities and campuses =>200,000 BGSF All Ambulatory Care Centers, Hospitals, and Medical Centers regardless of size
Combine all elevators regardless of function	All facilities <50,000 BGSF, multi-story
Combined and separated elevators acceptable	All facilities <200,000 BGSF
Separate Passenger Traffic from Animal Transport and Medical Waste	All facilities >200,000 BGSF All Ambulatory Care Centers, Hospitals, and Medical Centers regardless of size

Notes for Table 18-3: The decision to separate or combine any elevator function must be supported in the ETSA. Combines operations should include at least one elevator of service configuration.

G. Materials management programs must provide for clean and soiled separation consistent with all applicable codes and standards, including those of the Joint Commission.

H. Soiled materials must be transported in separate covered or closed carts designed to provide containment of the material and to maintain infection control. Soiled material transport may occur in the same corridors that handle other traffic except those restricted to sterile materials. Soiled materials are not transported on elevators with patients, visitors, or sterile materials. Separate lobbies are required for Passenger (public) Elevators and Material Transport Elevators. **Separate lobbies are required for Patient Transport Elevators and must not be shared with Passenger (Public) Elevators and Material Transport Elevators as per the VA National Infectious Diseases Service (NIDS).**

I. Transport circulation design must require soiled carts to be properly washed and sanitized prior to reuse as a soiled container and prior to use for transporting clean materials.

J. Transport all sterile material for use in Surgery or other areas requiring strict aseptic controls from the sterile processing/storage area to its destination via a clean route or using a properly designed closed cart that must not compromise the integrity of the material. Where case carts are used, they must be transported from sterile storage to the clean surgical core by means that protect the cart and its contents from contact with less clean environments. A direct connection between sterile processing service to the surgical core by a dedicated clean only elevator is required by the US Department of Veterans Affairs.

9. DRAWING AND SUBMITTAL SCHEDULE – AGV/AMR

A. Concepts - 50%

1) Show general building and AGV/AMR configurations and information that are required to support the Life Cycle Cost studies, including the data needed to provide the necessary system budget estimates.

2) At this early-stage full coordination with the A/E plans is not required but the designs should be a reasonable representation of the actual plans. Also provide these plans in reduced size with the TLA if an AGV/AMR is recommended.

3) Show the space and general configurations and locations of the corridors and departments served by the system. Provide notes specific to where additional or less space is required than what is identified in the VA Standards (PG's, DM's, etc.).

4) Show the centerline of the proposed pathways with dimensions verifying adequate clearances from walls, columns, fixed building features, etc.

5) Provide scaled plan view drawings of elevators, cart washers, and general areas where pickup and drop-off activities occur.

6) Approximate locations and sizes of battery charging activities.

7) Approximate locations, configurations and sizes of any proposed AGV/AMR storage/retrieval and parking functions.

8) Approximate location, configuration and size of the AGV/AMR central maintenance area.

B. Concepts - 100%

1) Provide a composite scaled AGVS/AMR Plan view drawing showing the complete concept level routing plan and locations of all elevators, cart washers, and battery chargers. Show maintenance area, pickup/drop off areas and storage/retrieval areas fully coordinated with the latest A/E plans.

2) Submit a waiver request where the spaces for the recommended AGV/AMR creates designs that differs from that indicated in the VA standards. Designs for the AGV/AMR must proceed only after the waiver(s) is granted.

3) Provide scaled plans to show all controlled AGV/AMR hold stop positions along the pathways and queuing lanes.

4) Show all doors which will allow passage of an AGV/AMR with vehicle pathways and hold stops and queuing positions shown.

5) Show all fire and smoke doors that interface with an AGV/AMR vehicle and the stop and queuing positions when a fire alarm condition is active in the local zone and in a remote zone.

6) Submit scaled plan view drawings of elevators and vehicle hold stop positions entering and exiting the elevators.

7) Submit scaled plan view drawings of cart washers and enclosed cart wash clean and soiled rooms. Show vehicle stop and queuing positions entering and exiting the rooms and the cart washers.

8) Show the number, type and configurations of all pickup and drop-off locations in the system and local automated and manual activities in those areas.

9) Show opportunity battery charging locations and numbers of chargers estimated at each location.

10) Show locations, configurations and approximate cart count for any proposed AGV/AMR storage, retrieval, and parking function.

11) Location, configuration and size of the AGV/AMR central maintenance area.

C. Schematic Design - 50%

1) Update Traffic Matrix and relevant traffic studies.

2) Adjust elevator, cart wash, and horizontal pathways as necessary to meet new traffic volumes.

3) Update all AGV/AMR designs provided in the Concepts Phase to reflect the latest A/E and MTLC plans and changes to traffic and operational requirements.

4) Provide scaled drawings for all dispatch, system information panels and screens, passive and electrical warning signs and show on the pathway drawings where they will be located and how they will be mounted (floor/pedestal or wall mounted or etc.).

5) Show dimensioned concept plan views and elevations of carts and trolleys to be used in the system.

6) Show dimensioned concept plan views and elevations for all major AGV/AMR equipment including, but not limited to, elevators and cart washers as applicable.

D. Schematic Design - 100% (Coordination and Development)

1) Update Traffic Matrix and relevant traffic studies.

2) Adjust elevator, cart wash, and horizontal pathways as necessary to meet new traffic volumes.

3) Update all AGV/AMR designs to reflect the latest A/E and MTLC plans and changes to traffic and operational requirements.

4) Plans must show all controlled and queuing AGV/AMR stop positions. Planning must be fully coordinated with the A/E plans and planning of other disciplines.

5) Provide scaled plan and elevation drawings of the elevators, cart wash and other large equipment. Elevator drawings must be consistent with VA Elevator drawing standards and requirements. Plan views must incorporate any lobbies or rooms associated with those devices.

6) Show vehicle stop and queuing positions when in, entering, or exiting a room associated with the elevators or the cart washers. Show adjacent corridors and rooms.

7) Show the number, type and configurations of all pickup and drop-off locations and local activities.

8) Show opportunity battery charging locations and numbers of chargers at each location.

9) Show locations, configurations, and approximate cart count for any proposed AGV/AMR storage, retrieval, and parking function.

10) Location, configuration and size of the AGV/AMR central maintenance area.

11) Show locations and power required for all devices requiring 50 VAC service or greater including any cart detection device or other AGV/AMR system devices.

12) Provide drawings of the text and graphics for all dispatch and system information panels and screens and where they will be located.

13) Provide drawings of the text and graphics for all for all passive and electrical warning signs and where they will be located.

14) Show dimensioned concept plan views and elevations of carts used in the system.

15) Show dimensioned concept plan views and elevations for all major AGV/AMR equipment including elevators, and cart washers.

E. Design Development - 100%

1) Update Traffic Matrix and relevant traffic studies.

2) Meet with the VA users to revise traffic volumes, methodologies, delivery times, and cart sizes if the updated Traffic Matrix shows traffic volumes that exceed the capacities of fixed equipment (i.e., elevators, cart washers, etc.) if that equipment cannot be realistically upgraded to meet those requirements. Adjust elevator, cart wash and horizontal pathways as necessary to meet new traffic volumes.

3) Update all AGV/AMR designs to reflect the latest A/E and MTLC plans and changes to traffic and operational requirements.

4) Plans to show all controlled and queuing AGV/AMR stop positions. Planning must be fully coordinated with the A/E plans and planning of other disciplines.

5) Provide scaled plan and elevation drawings of the elevators, cart washers and other large equipment. Elevator drawings must be consistent with VA Elevator drawing standards and requirements. Plan views must incorporate any lobbies or rooms associated with those devices.

6) Show vehicle stop and queuing positions when entering and or exiting a room associated with the elevators or cart washers. Show adjacent corridors and rooms.

7) Show the number, type and configurations of all pickup and drop-off locations and local activities.

8) Show opportunity battery charging and numbers of chargers at each location.

9) Show locations, configurations and approximate cart count for any proposed AGV/AMR storage, retrieval, and parking function.

10) Location, configuration and size of the AGV/AMR central maintenance area.

11) Provide engineering data for the AGV/AMR elevators such as reactions, etc. as required by VA Standards.

12) Show locations and power required for all devices requiring 50 VAC service or greater including cart detection device or other AGV/AMR system devices.

13) Show all utility (water, steam, HVAC, electric, drainage, etc.) requirements for the cart washers and any other AGV/AMR related equipment.

14) Provide drawings showing the text and graphics and sources for all dispatch and system information panels and screens and where they will be located.

15) Provide drawings showing the text and graphics for all for all passive and electrical warning signs and where they will be located.

16) Show mounting methodology for all panels, signs and screens.

17) Provide scaled drawings for all system control and interface panels and mounting methodologies (assume space is required for local UPS to each panel).

18) Show dimensioned plan and elevation views of carts and trolleys used in the system. Drawings to indicate the materials used in constructing the carts/ trolleys and details on the construction of the fixed and swivel casters.

19) Show dimensioned concept plan and elevation views for all major AGV/AMR equipment including elevators, and cart washers.

F. Construction Documents - 100%

1) Update Traffic Matrix and relevant traffic studies.

2) Meet with the VA users to revise traffic volumes, methodologies, delivery times, cart sizes, etc. if the updated Traffic Matrix shows traffic volumes that exceed the capacities of fixed equipment (i.e., elevators, cart washers, etc.) if that equipment cannot be realistically upgraded to meet those requirements. Adjust elevators, cart washers and horizontal pathways as necessary to meet new traffic volumes.

3) Update all AGV/AMR designs to reflect the latest A/E and MTLC plans and changes to traffic and operational requirements.

4) Update all plans, and information required in the 100% DD submission to CD levels of completion and correlate all equipment, controls, operations and functions with the detailed AGV/AMR specifications prepared by the MTLC.

5) Provide Bid Ready Documents.

10. ELEVATOR DESIGN

PG-18-10 Design Manual and PG-18-1 Division 14 for specifications.

11. AUTOMATIC GUIDED VEHICLES/AUTOMATED MOBILE ROBOTS DESIGN MANUAL

PG-18-10 Design Manual

12. PNEUMATIC TUBE SYSTEM (PTS)

PG-18-10 Design Manual

13. DUMBWAITERS and CARTLIFTS

PG-18-10 Design Manual and PG-18-1 Division 14 for specifications.

14. MATERIAL AND SOLID WASTE MANAGEMENT, LINEN AND TRASH CHUTES

PG-18-10 Design Manual and PG-18-1 Division 14 for Specifications.