

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%
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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 rationale 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 AGV/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.

