AIR MOBILITY COMMAND

MATERIAL HANDLING EQUIPMENT STORAGE FACILITY DESIGN GUIDE

TABLE OF CONTENTS

Description **Page**

Chapter 1 – Introduction

A. Purpose

This design guide provides the basic criteria to organize, evaluate, plan, program and design Air Mobility Command Material Handling Equipment (MHE) Storage facilities for strategic airlift and tanker squadrons and enroute locations.

The information presented is intended to make commanders and their staff aware of important design considerations and to aid them in project development. This document is for use by commanders, base civil engineers, and other involved personnel. It is intended to help all participants better understand MHE facility requirements and design criteria so they can effectively participate in the project development process.

Tunner

B. Project Development

The design guide is applicable to all design projects for the MHE Facilities. It provides standards and criteria for determining facility requirements, evaluation of existing facilities, programming, and overall facility design. The designer should use it in conjunction with other Air Force and Department of Defense (DoD) documents. Additional information is available at each base regarding the unique program and design requirements.

The elements to successful facility delivery are planning, programming, design and construction.

1. PLANNING

Good planning establishes the objectives for an effective program and provides the means to help meet the objectives of the MHE organization. It should also lead to a timetable for project completion. Planning must be long term. When planning a new facility, complete the site selection prior to preparing a DD Form 1391, Military Construction Project Data, for an individual project.

2. PROGRAMMING

Programming includes determining user requirements, developing solutions, identifying funding sources, and forwarding programming document to the approval authorities. Each programmed project should be consistent with the base comprehensive plan.

This guide details information required during preparation of the DD Form 1391, which initiates project development. Included are considerations of space criteria, overall facility size evaluation, and special factors for use in estimation costs.

Projects for which scope and cost exceed statutory limits for base of command funding require Congressional approval and funding through the Military Construction Program (MCP).

3. DESIGN

Design includes concept development, design reviews and construction documents. It is important for civil engineering and the user to actively communicate throughout the design process to bring about a successful project. All areas of the MHE facility should be barrier-free and accessible to the disabled in accordance with the Americans with

Disabilities Act (ADA) and Uniform Federal Accessibility Standards and Uniform Federal Accessibility Standards (UFAS).

4. CONSTRUCTION

Quality reviews of the contractor's submittals by project engineers and users with frequent on-site inspections by civil engineering construction management personnel and the user will help ensure design goals are met.

5. ORGANIZATIONS INVOLVED IN MHE FACILITY DESIGNS ARE:

- Wing Commander
- Maintenance Group
- Base Civil Engineering
- HQ AMC installations and mission support
- HQ AMC Logistics

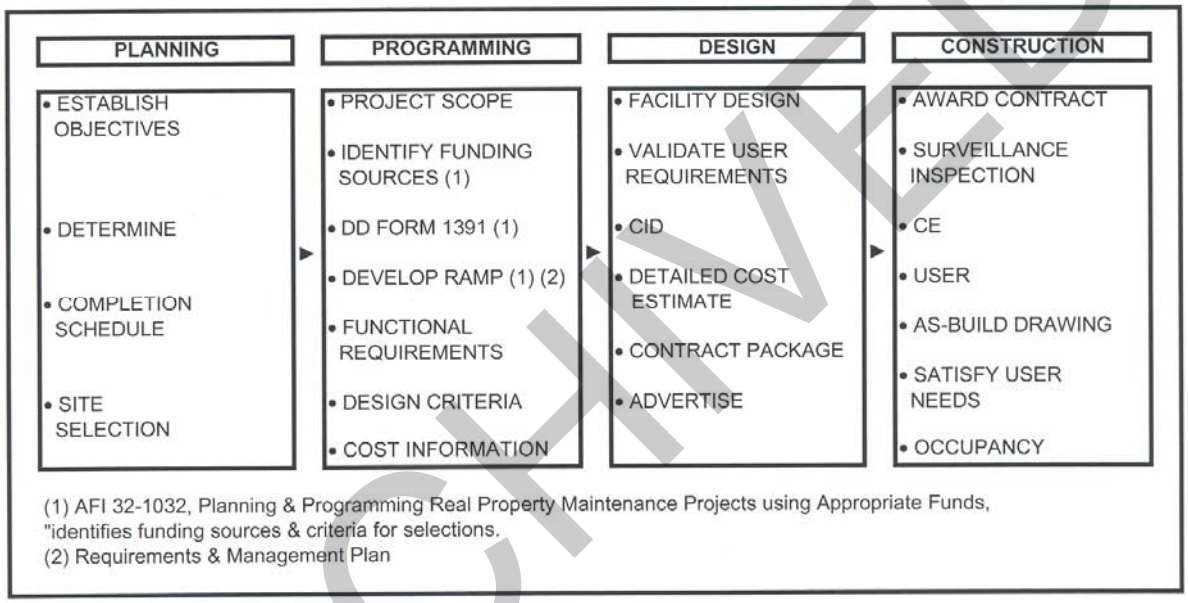


Figure 1.1: Project Process

Chapter 2 - Requirements

A. OVERVIEW

1. TRAFFIC FLOW PLAN

Every air terminal operation shall develop a local traffic flow plan using operation risk management (ORM) tools. The traffic flow plan will delineate traffic flow / direction within vehicle yards to and / from the flight line, fuel pump servicing, and other areas where MHE travel. Plans should include primary and secondary routes to ensure safe routes are available in case of road construction, adverse weather conditions, etc. When changes occur to the primary or secondary routes, the traffic flow plan must be updated. Squadrons will develop and publish traffic flow plans at frequently deployed locations. Deploying units will develop plans upon arrival. Plans should also address significant obstacles and risk mitigation procedures.

These procedures will be coordinated with local safety offices and will address minimum clearance from obstacles and spotter use. Use AFOSH STD 91-46, AFOSH 91-100, and AFJMAN 24-306 as guidance when developing these procedures.

2. GENERAL PARKING CONSIDERATIONS

MHE unattended or not positioned for immediate use are considered parked. Front-line supervisors and operators must apply sound judgment in storing and operating MHE.

3. MHE OPEN PARKING PLAN

Special consideration should be given to access ways to the facility by the Tunners. For example, markings shall be provided on the pavement surface to assist drivers in maneuvering and positioning the equipment into, out of, and within the facility.

For Tunners to operate safely, the maximum ramp angle in loading zones is 1 degree change over a 55 feet distance (to preclude ground contact in the rear). Loading zones are around the loading docks and aircraft when the loader is at the lowest chassis height. In addition, the Tunner requires ramp slopes to be under the following maximum allowances:

Max Ramp Longitudinal Slope: 3%
Max Ramp Longitudinal Slope over Short Distance, e.g., C-17 a/c ramp: 27% or 15 deg
Max Ramp Side Slope: 7% or 4 deg

The Tunner has a minimum turning radius of 50 feet. The back-end of the loader where the maximum swing occurs will be approximately 25 feet forward of the location where the turn was initiated. Other K-loaders that do not have articulated steering will swing, but to a lesser degree than a Tunner. A Tunner pulling forward into a hard turn will swing out approximately 6 feet.

Tunner

Each Tunners parking space shall have 7.5 feet of clearance on each side and 5 feet of clearance in front and at the rear. As a result, a Tunner, being approximately 15 feet wide, will sit in a 30 by 60 foot parking area. In cases where two or more parking spaces are adjacent the 7.5 feet of clearance may overlap. For all other K-loaders, the parking space will have 5 feet of side clearance on all sides, so that the resulting parking space is 10 feet wider and 10 feet longer that the maximum dimensions of the loader. As with the Tunner,

adjacent clearance may overlap, so a minimum of 5 feet is maintained between the sides of the non-Tunner K loaders. If one of the two adjacent loaders is a Tunner, then there must be a minimum of 7.5 feet of clearance. In cases where two or more parking spaces are end to end, the 5 feet of clearance may overlap between the parking spaces, so a minimum of 5 feet clearance remains between the parked Tunners, end to end. No obstacles will reside within the boundaries of the parking space. Drive-through parking spaces are desired but not mandatory.

Before pulling into a parking space, the loader must be directly in line with the parking space. This will ensure the vehicle does not enter at an angle. A painted line or suitable marking 15 feet before the entrance of the parking space shall mark the minimum distance at which the loader must be straight before entering the parking area. When exiting the parking space, the loader must be kept straight until the end is clear of the area. A painted line or suitable marking not less than the length of the loader (50 feet for the Tunners) beyond the parking space is the point that the front loader must cross before beginning a turning maneuver to ensure the rear of the loader has cleared other parked loaders or obstacles.

"Taxi lines" shall be placed where the center of the cab will travel so the loader is centered in the parking space. These taxi lines shall extend to the entry / exit line markings mentioned in the two preceding paragraphs. Aligning the loader's cab directly over the taxi line will center the loader in the parking space during parking operations.

Referenced parking dimensions meet the minimum physical requirements. Commanders may elect to increase these dimensions.

4. ENCLOSED MHE FACILITY

A facility to house the MHE, is not mandatory, but is left to the discretion of the base commander based on climatic conditions and operational requirements at the local base. The aesthetics of the facility should closely follow the Base Architectural Plan.

A MHE facilities' primary function is to house and protect material loaders either during loading or when the loader is not in use. There are two primary planning concepts considering a covered MHE facility: drive through or closed end.

Each unit will include in their local traffic flow plan detailed covered storage parking procedures using each existing bay. Drive through parking is desired but not mandatory. One spotter, positioned to optimize the safety of the operation, is required for all MHE maneuvering through covered storage. An additional spotter will be required if the following requirements are not met.

- The covered storage parking location must allow 2.5 feet of clearance on each side of the loader during the most constrained portion of the parking process. For a Tunner, this means the most constrained portion of the entrance, parking space, and exit will not be less than 20 feet wide. In cases where two or more parking spaces are adjacent (side-by-side), the 2.5 feet of clearance may overlap. No obstacles will reside within the boundaries of a parking space. At locations with existing entrance doors that are less than 20 feet wide but at least 18 feet wide, comply with the AMC deviation requirements. Maintain 5 feet of clearance from the front and rear of the loader; end-to-end parking with a 5 foot buffer separation is permissible. Doors and overhead obstacles should be at least 15 feet (desired, not mandatory) above the parking surface.

- Before pulling into the covered storage, ensure loader is directly in line with the parking space. This will ensure the vehicle does not enter at an angle. A painted line or suitable marking, 15 feet before entering the covered storage will ensure proper alignment.

- When exiting parking spaces, the loader shall be kept straight before turning the unit. The Turnner shall be clear of the most exterior obstacle. A painted line or suitable marking, not less than the length of the loader (50 feet for Tunners) in front of the most exterior obstacle will ensure sufficient clearance. The taxi lines will assist the loader is centered during parking operations.

The alternate planning concept is the back in / pull out facility, where the equipment must be carefully backed into the parking space beneath the enclosure. This will need to be accomplished with assistance from spotters to avoid collision with building elements and other equipment. In this configuration the entry marker and exit marker will both be on the same side of the facility, refer to figure 4.4.

Chapter 3 - Covered Parking Criterion

A. Entry & Exit
The MHE facilities equipment doors shall be electric operated roll-up doors with a minimum clear height of fifteen feet and a clear width of twenty feet. There shall be a single man door at both ends of the building, located adjacent to the overhead doors.

B. Interior Requirements
Within the facility, there shall be minor storage for parts, tools, and a hazardous material storage locker. Adjacent to the storage area should be a compressor and an eye wash station. In this area an additional 3'-0" clear circulation area should be provided between parking and equipment, refer to figure 4.2. There shall be no office or toilet facilities within the MHE facility. There is no need for wash racks. Bollards should be positioned adjacent to the loader doors to prevent accidental damage to the door or facility. Likewise, bollards should be planned adjacent to internal structural columns and doorways to reduce the potential for accidental damage.

C. HVAC & Electrical Requirements
Heating and ventilation should be per the local climatic conditions. Heating of the facility should only prevent the interior from freezing conditions, not necessarily to make it comfortable. Likewise, ventilation is desirable, but only to the extent to alleviate exceedingly hot conditions.

Fire sprinklers are not needed unless required by local building codes. A hose bib should be provided if water supply is practically available.

Interior lighting should provide a minimum of 75 foot candles (fc) with a High Intensity Discharge (HID) type fixtures. Light levels provided should be adequate to work within and read technical manuals. Natural lighting may also be a consideration with the use of clearstory windows or an opaque wall system if local conditions permit.

Exterior lighting is required. The location and type should be evaluated with adjacent fixtures and light levels.

Electrical outlets should be located on internal structural columns between Tunners. 110-volt outlets are used in the CONUS while 220-volt should be anticipated for overseas installations.

Consideration should be given to floor drains inside the facility and the proximity of underground storm water outside and adjacent to the facility. If floor drains are provided, then the need for grease interceptors should be anticipated. Alternatively, if water and oil is sheet drained away from inside the facility, then proper drainage slopes must be taken into consideration.

D. Structural
The foundation design should accommodate a 63-ton loader when fully loaded.

The facility should be constructed of non-combustible unprotected type building materials that meet the prevailing building codes. The clear height within the facility is 25 feet to accommodate rising/servicing the MHE within the facility. The buildings structural elements such as columns, beams and piping should be protected. Consideration should also be given to protect the building from roosting birds.

Chapter 4 - Specifications and Site Plan Examples

GENERAL

Loader Type:
Tunner Specifications

Gross Weight (unloaded)
66,000 lbs. (27,240 kg) wet, maximum

Gross Payload Weight
60,000 lbs. (27,240 kg)

Combined Gross Vehicle Weight (maximum load)
126,000 lbs. (57,204 kg)

Overall Length
592 in. (1,503.7cm)

Overall Width
171 in. (434.3 cm)

Loader Turning Radius (curb to curb)
50 ft. (15.3m) minimum

*Tunner Specifications is most restrictive and guide for design.

Table 4.1 Specifications

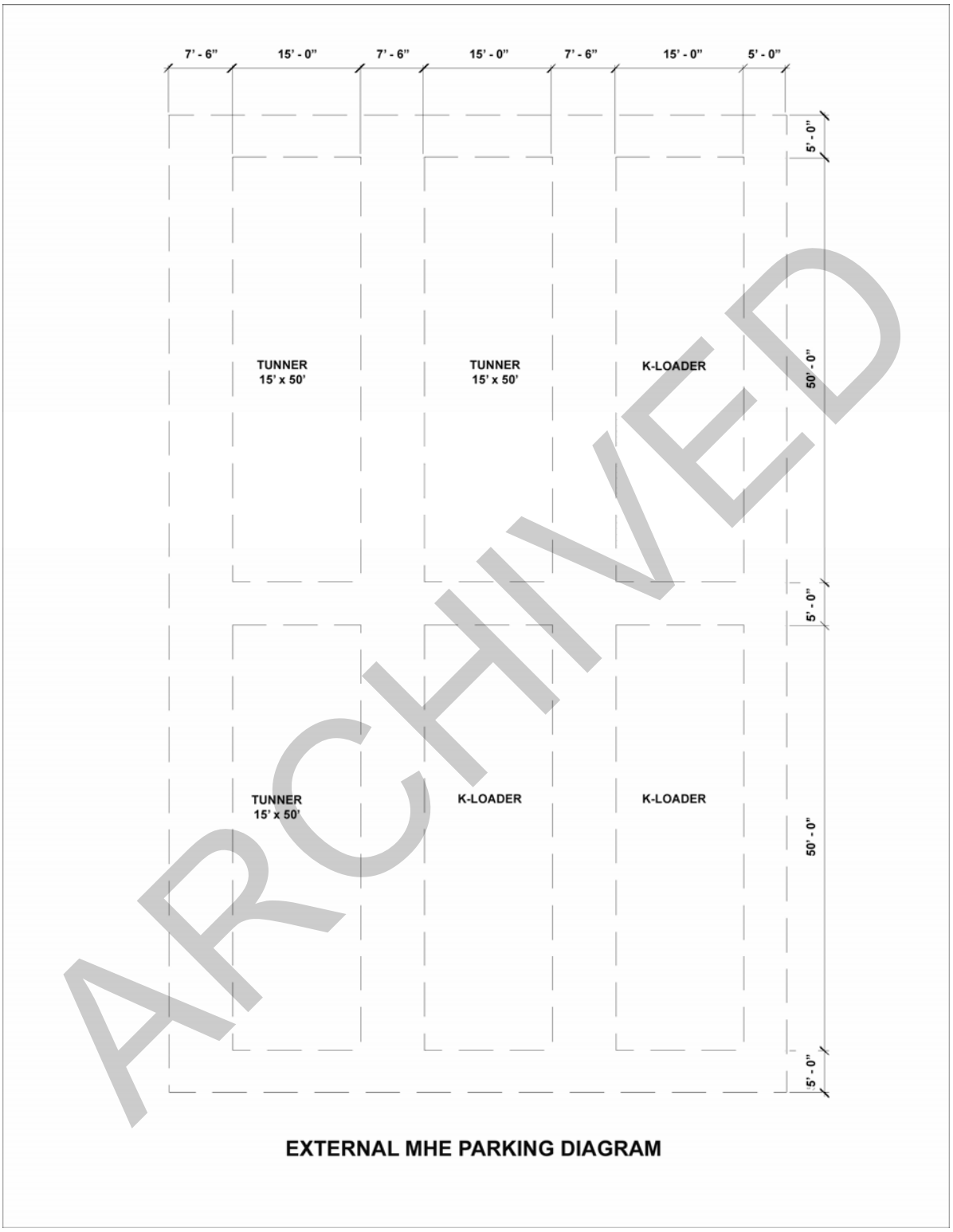
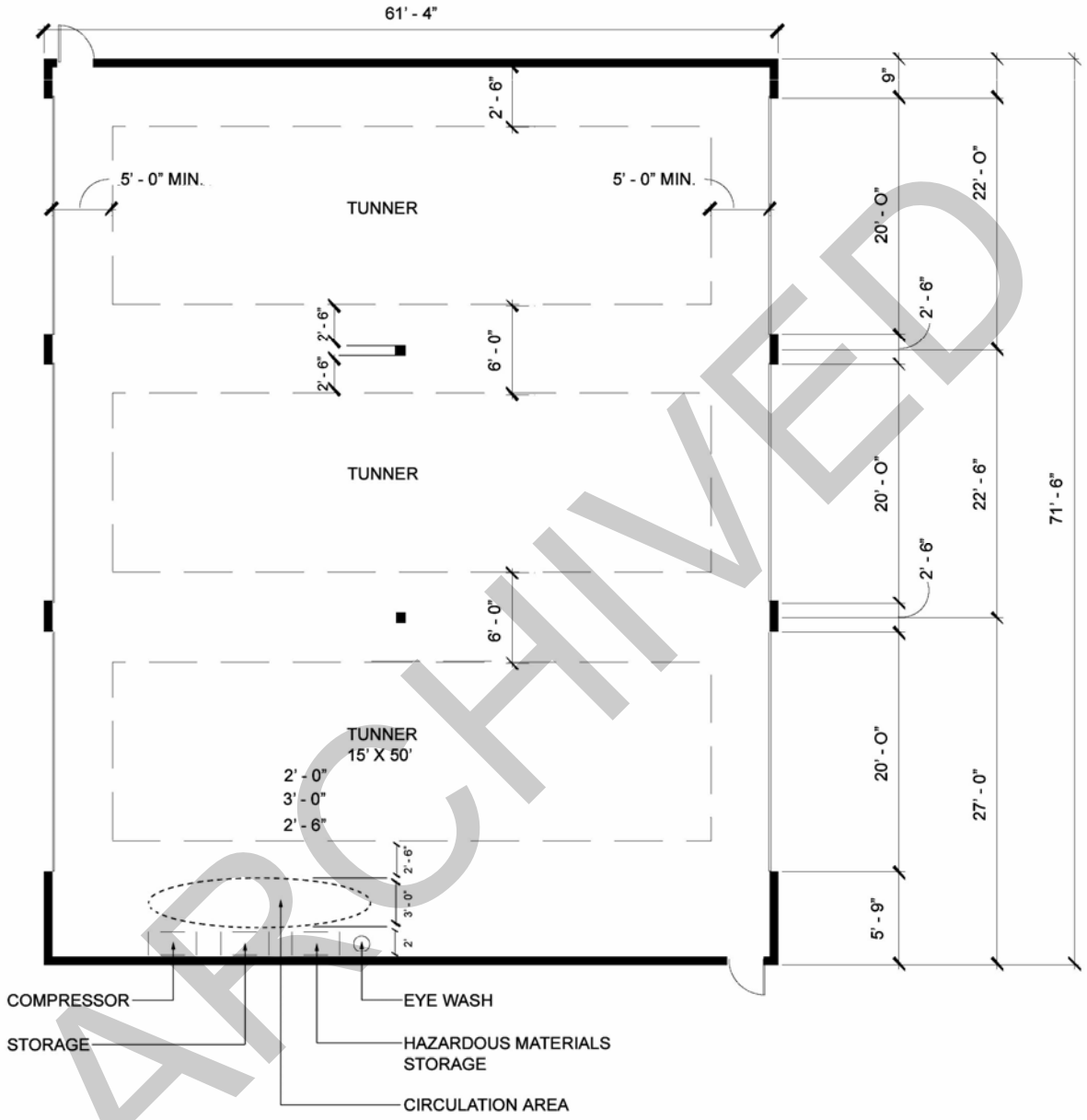


Figure 4.1: External MHE Parking Diagram



EXAMPLE OF ENCLOSED DRIVE THROUGH STORAGE FOR MHE (TUNNERS)

Figure 4.2: Enclosed Storage for MHE Parking Diagram

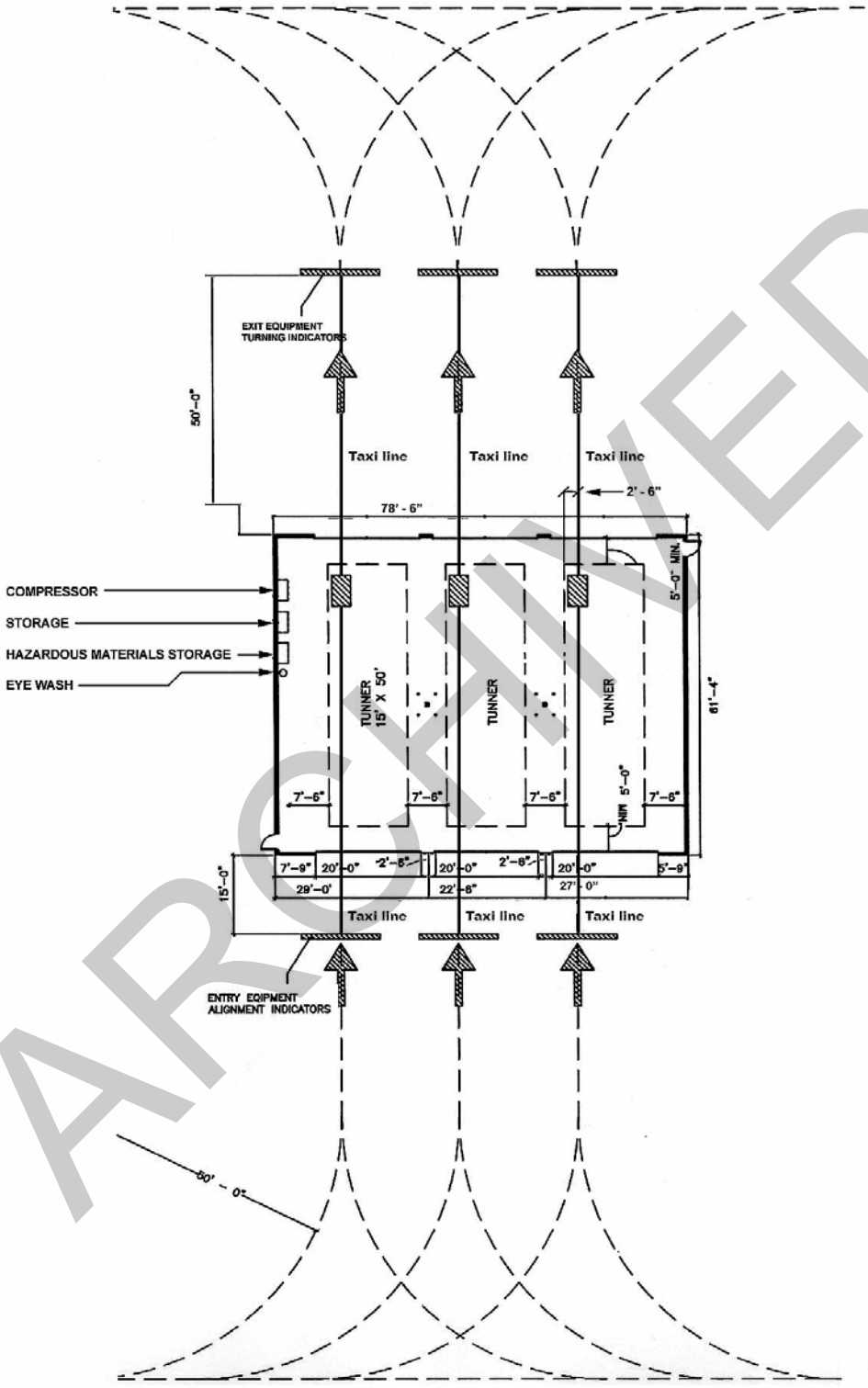


Figure 4.3: Enclosed Drive Through Storage for MHE

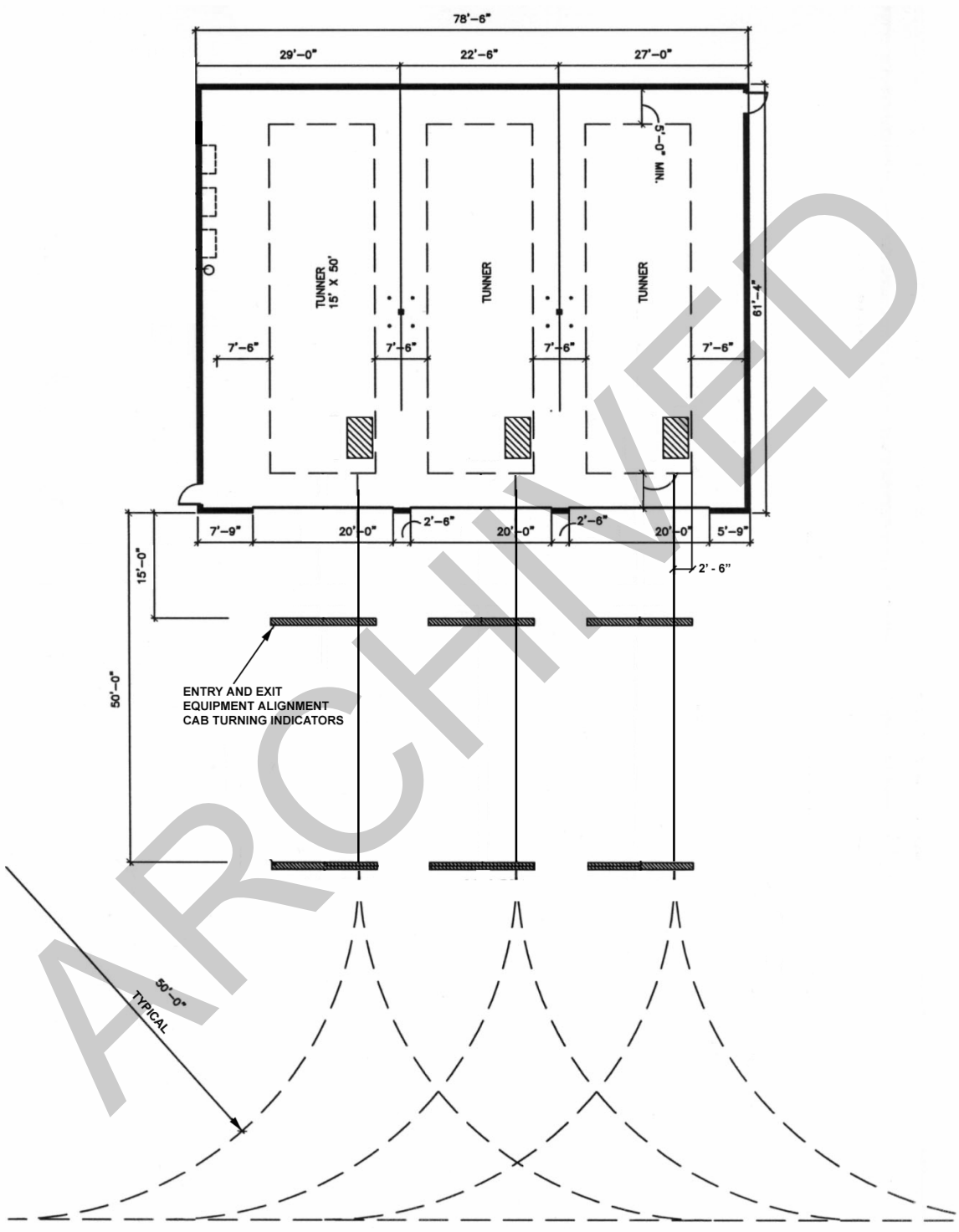


Figure 4.4: Enclosed Back In – Pull Out Storage

References

AFM 88-3	Design Standards for Critical Facilities
AFMAN 24-306	Manual for the Wheeled Vehicle Driver
AFOSH 91-100	Aircraft Flight Line-Ground Operations and Activities
AFOSH STD 91-46	Material Handling and Storage Equipment
AFPAM 32-1097	Sign Standards Pamphlet
MIL-HDBK-1190	Facility Planning and Design Guide
MIL HDBK-1008	Fire Protection for Facilities Engineering, Design and Construction
	Air Force Environmentally Responsible Facilities Guide
	AMC Commanders Guide to Facility Excellence
ETL 93-02	AMC Sign Standards
	Local Base Architectural Compatibility Plan
UFC 1-200-01	Design: General Building Requirements
ADAAG	Americans with Disabilities Act / Accessibility Guidelines for Buildings and Facilities
ANSI A58-1	Building Code Requirements for Minimum Design Loads for Buildings and Other Structures
NEC	National Electric Code
NFPA	National Fire Protection Association
NFPA 101	Life Safety Code
UFAS	Uniform Federal Accessibility Standards
UFC2-600-01	Unified Facilities Criteria
AMCI 24-101, Vol 11	Transportation, Cargo and Mail