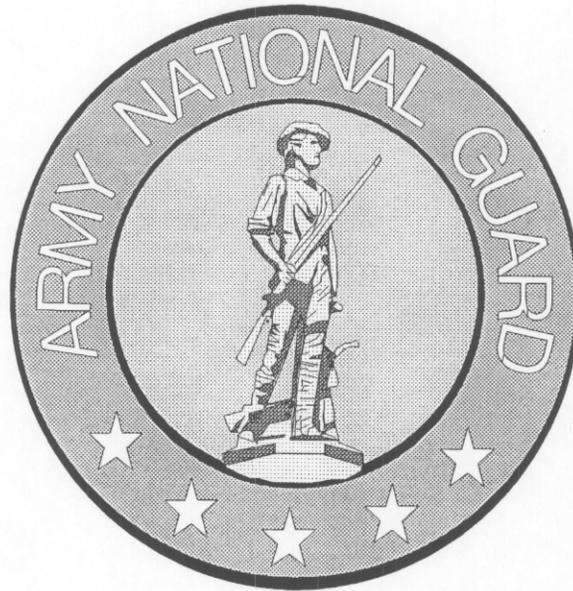


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DESIGN GUIDE FOR LOGISTICS FACILITIES

USPFO OFFICE/WAREHOUSE
SURFACE EQUIPMENT MAINTANCE FACILITIES
DIRECT SUPPORT LOGISTCS FACILITIES
UNHEATED ENCLOSED OR SHED-TYPE
VEHICLE STORAGE SPACE



NATIONAL GUARD BUREAU
INSTALLATIONS DIVISION
111 SOUTH GEORGE MASON DRIVE
ARLINGTON, VA 22204-1382

1 JULY 1997

ARMY INSTALLATIONS
THE FOUNDATION FOR READINESS

VOLUME 3

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VOLUME 3

SURFACE EQUIPMENT MAINTENANCE FACILITIES (SEMF)

CHAPTER 1 COMMON DATA FOR OMS, MATES, UTES, and CSMS

1-1 General: Volume 3 is divided into four (4) chapters. Chapter 1 provides common data and design criteria that applies to all the surface equipment maintenance shops. Specific design and construction criteria for the Organizational Maintenance Shop is given in Chapter 2; for Mobilization and Training Equipment Site (MATES) Shop and the Unit Training Equipment Site (UTES) Shop, Chapter 3; and for the Combined Support Maintenance Shop (CSMS), Chapter 4. The Surface Equipment Maintenance Facilities perform varying levels of maintenance depending upon the particular mission for the particular shop identified above. The missions of each type of shop will be explained further in the chapter for that shop; however, the overall mission of the SEMF is to maintain all authorized surface equipment assigned to all units in a readiness posture for training purposes, natural disaster relief, or combat.

1-2 Exterior Feature/Facilities: The designer should consult the approved programming documents to determine the scope and which exterior facilities are to be included in the construction documents.

a. Aesthetics: The State Military Department should provide the designer some specific guidance as to the type of building materials used in adjacent buildings and the near by surrounding community (including pictures if felt necessary); ask the designer to select the exterior materials and the Military Department would approve materials based on economics and aesthetics, or describe the exterior building materials to be used for the particular Surface Equipment Maintenance Facility using the general guidance provided in Volume 1, Chapter 2 and economics.

b. Cannibalization (at CSMS or MATES only): This outside storage area is where uneconomically repairable surface equipment is placed for future use for cannibalizing serviceable parts that are not obtainable within a reasonable time through standard supply channels. The storage area should be secured with a fence as described in Volume 1, Chapter 2, paragraph 2-1h. Generally there should be one (1) vehicle gate (two (2) ten feet (10') swinging or sliding gate leafs) and no more than two (2) personnel gates with a maximum of four foot (4') opening. The fence should be no further

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than five feet (5') from the edge of the paved surface. The authorized area for storage may be paved with six inches (6") of rigid concrete pavement.

c. Controlled Waste Handling Facility: Refer to Volume 1, Chapter 2, paragraphs 2-2c(15) and 1-2d for design criteria.

d. Covered (Enclosed) Unheated Parts Storage: General guidelines include:

(1) The design may consist of a pre-engineered metal building with a beam and column design of standard bay widths and lengths, with a minimum roof slope of one fourth inch (1/4") per foot. Interior columns (at equal bay spacings) should be used when economy of design dictates; a clear span rigid frame design may also be considered when determined to be more cost effective in any given instance or is required because of the type of operation going on inside the building. Although the general concept is to construct this space as a separate metal building, there may be instances where, because of the geometry involved, it is possible to construct the unheated storage space as part of the basic building at little or no increase in cost over that of a separate metal building. However, keep in mind that a separate structure is more easily expanded.

(2) Roof and wall panels should be standard zinc coated twenty-four (24) gauge cold formed steel sheets. The exterior finish should be a system which will provide a guaranteed life expectancy of twenty (20) years (twenty (20) year guarantee may be obtained), one example being a coating of mixed zinc and aluminum applied directly to the metal followed by a factory applied coating. Roof and wall panels may be 0.032 inch aluminum with a factory applied coating. Roof panels may contain some translucent panels provided those panels can be substituted for metal panels without the need for special design and construction. Panel seams may be of various types provided a twenty (20) year guarantee can be provided. If desired, CMU wall construction instead of metal wall panels could be bid as a contractor's option. Paint finish on exterior CMU surfaces would be authorized.

(3) Rain water drainage should be directed toward the perimeter of the roof.

(4) Ventilation should be provided by means of a series of fixed gravity roof ventilators or continuous rigid type fixed ventilation, in conjunction with personnel door and/or wall louvers for make-up air.

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(5) Windows are not authorized in order to provide additional security.

(6) Personnel doors should be single three foot by seven foot (3' X 7') hollow metal doors and frames with sixteen (16) gauge and fourteen (14) gauge material respectively, fitted with fixed pin hinges of suitable weight. Door closers are authorized. If the door hinges are exposed to the exterior, the hinge pins should be designed to prevent easy removal. All exposed fasteners should be non-removable and vandal proof. The locking devices should be U. S. Government tumbler type key operated hardened steel padlocks (not included in construction documents).

(7) The parts storage building supply door should consist of ten foot high by ten foot wide (10' X 12') overhead commercial metal doors constructed with outer skin of twenty (20) gauge steel sectional and manual operation. Generally, only one (1) door would be required for smaller parts storage building (buildings with less than 1,000 square feet of floor space), and two (2) for the larger buildings (building with 1,000 square feet of floor space or more).

(8) One (1) personnel door may be provided for a small building (less than 1,000 square feet of floor space) and two (2) for larger buildings (1,000 square feet of floor space or more). Additional doors would be allowed on the basis of one (1) door for each 100 linear feet of building perimeter.

(9) The building is to be oriented so that personnel and supply or vehicle doors are contiguous to the rigid concrete. A concrete apron or pad (four feet (4') deep and slightly wider than the door) should be provided at each door opening.

(10) Floor slab should be 4-inch thick, 3,000 - 4,000 PSI concrete slab (with 6 X 6 - W1.4 X W1.4 or 6 X 6 - 10/10 ungalvanized temperature steel) cast on top of no more than six inches (6") of granular base.

(11) Foundation walls should normally consist of reinforced concrete grade walls or CMU with grouted core on spread footings or the concrete floor slabs turned down at the perimeter edges of the building (poured independent of the column foundation support), with a maximum depth of eighteen inches (18") measured from the top of the floor slab and reinforced horizontally with two (2) number four (#4) bars. The load bearing columns may be supported on reinforced concrete piers on concrete footings established at frost depth or two feet (2') below grade (whichever is greater).

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Concrete compressive strength at twenty-eight (28) days should be 3,000 - 4,000 PSI.

(12) Interior height is to be 12-FT maximum measured from the finished floor to the bottom of the roof structural support system (measured at the 1/3 height point of the triangle formed by the sloping structural member). If the prefabricated building manufacturer's standard height exceeds that specified and would cost less than or equal to the authorized height, the standard height would be Federally supported. However, both heights (authorized and standard) should be bid with the less costly selected.

(13) Shelving may be provided. Shelving must be attached to the floor to be supportable with MCARNG funds.

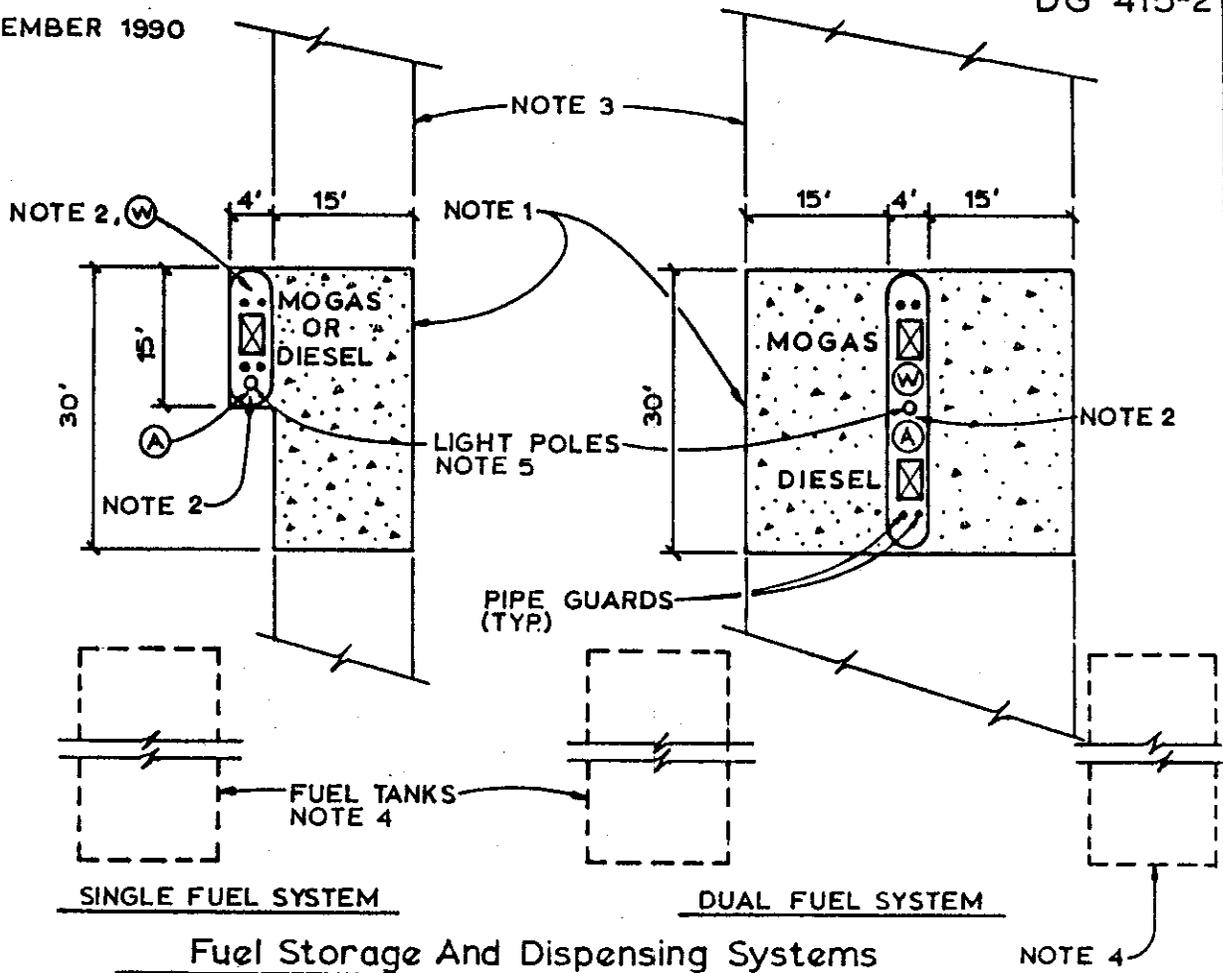
(14) Lighting shall consist of energy efficient fluorescent fixtures providing twenty (20) foot candles (FC) illumination. Cold weather ballasts should be used for cold regions. Suspension should be from the structural system using non-rigid (chain) hangers. Zone switching by subdivided areas is encouraged; three (3) or four (4) way switches are not authorized. Exterior lighting should be limited to energy efficient security lighting over personnel door(s) and lighted on sides without personnel doors to the level stated in Vol. 1 Chapter 2 para. 2-1n(2) for security.

(15) Roof insulation (two inch (2") batt maximum) may be included.

(16) Smoke/heat detection and fire alarm system should be included only if required by State Code.

(17) Other construction materials for the exterior walls, structural systems, and roof may be used to match those materials of the main surface equipment maintenance facility, if justified.

e. Fuel Storage and Dispensing System: Consult the program documents for authorization, type(s) of fuel, tank sizing, and refer to Figure 3-1-1 which shows typical layouts for both single fuel and dual fuel systems. A fifteen foot (15') by forty-five foot (45') rigid concrete pad poured directly on the compacted subgrade should be provided for each type of fuel. Except where more stringent State Regulations apply, the design should be in



- Ⓐ ONE COMPRESSED AIR QUICK CONNECT/DISCONNECT OUTLET OR BUILT-IN HOSE REEL.
 Ⓜ ONE HOSE BIBB (FREEZE PROOF IN COLD CLIMATES).

Notes:

1. RIGID CONCRETE SLAB, 6" THICK W/6x6-8/8 OR 6x6-W2.0xW2.0 FOR WHEEL VEHICLES. 8" THICK W/6x6-6/6 OR 6x6-W2.9xW2.9 FOR TRACKED VEHICLES. CONCRETE EDGES WHERE TRAFFIC RUNS OVER SLAB SHOULD BE THICKENED BY APPROX. 4" THICKER THAN SLAB THICKNESS. (POUR DIRECTLY ON COMPACTED SUBGRADE.)
2. ONE 110V WATER PROOF (WP) DUPLEX OUTLET LOCATED 2'-0" ABOVE THE CONCRETE ISLAND AND 2'-0" AWAY FROM THE DISPENSER.
3. A MAXIMUM OF 200 S.F. OF FLEXIBLE PAVEMENT ACCESS TO THE FUEL DISPENSING CONCRETE PAD MAY BE USED IF REQUIRED BY THE SITE LAYOUT.
4. SIZES SHALL BE AS SHOWN ON THE PROGRAMMING DOCUMENTS.
5. FLUORESCENT LIGHTS WITH A ILLUMINATION INTENSITY OF 20 F.C. AT THE PUMPING LEVEL MAY BE PROVIDED.

Figure 3-1-1 Typical Layout For Vehicle Fuel Dispensing System.

accordance with NFPA Standards. Dispensing units for ground vehicles should have an output capacity not greater than twenty-six (26) GPM and the pump should be located in the dispensing unit, rather than in the dispensing tank. Special approval is required for high speed, large capacity units involving multiple dispensing systems and a pump located in the tank. AR 710-2, paragraph C-7, requires that all plans for new construction, modification, or upgrading of petroleum facilities containing fuel purchased with Federal funds be submitted to the Commander, U. S. Army General Materials and Petroleum Activity (USAGMPA), ATTN: STRGP-FT, New Cumberland, PA 17070-5008, for review and technical assistance prior to bidding. This review is necessary to help ensure that the proposed facilities meet all requirements of regulations, specification, and safety. The following are most of the requirements that USAGMPA personnel will be checking for on the plans and in the specifications.

(1) Vegetation should be cleared from the area where POL is to be stored, including a strip ten feet (10') wide around perimeter.

(2) Aboveground storage tanks exceeding 500 gallons in size (or less if there is a possibility that the liquid contents could flow onto adjacent property or into a public waterway) should be surrounded by a liquid tight dike equipped with a drain sump, drain pipe, lockable typed gate valve, and a minimum of two (2) grounds. All vegetation should be cleared from within the diked area. A dike area may be made liquid-tight by lining the dike with neoprene, rubber, clay (like bentonite), concrete, or some other impermeable material, whichever is cost effective.

(3) All fixed facilities should be marked for identification of liquid petroleum products in accordance with Military Standard 161f.

(4) All loading and unloading points should be equipped with bonding and grounding equipment.

(5) All electrical equipment should be installed in accordance with state/local building codes.

(6) All valve and equipment pits should be equipped with water tight covers.

(7) All fuel dispensing facilities should be equipped with:

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- (a) Filter/separators qualified under Mil-F-8901E.
 - (b) Pressure gauge or pressure differential indicator.
 - (c) Water drain valve.
 - (d) Sight glass.
 - (e) Air eliminator valve.
 - (f) Data plate giving manufacturers part number, capacity, working pressure, and test pressure.
 - (g) A sampling probe with a quick connect/disconnect should be installed down stream from the filter/separator to allow for filter effectiveness testing required periodically after construction.
- (8) Storage tank fill lines, dispensing lines, and dispensing nozzles should be equipped with a 100 mesh (or finer) corrosion resistant screen.
- (9) All ground rods should be marked and identified in accordance with FM 10-69, Petroleum Supply Points and Operations, Chapter 13.
- (10) "No Smoking within fifty feet (50')" signs should be permanently displayed near all petroleum handling and storage areas.
- (11) The location and arrangement of parking pads for fuel tanker vehicles should consider safety and security and should provide for dispersion and a safe escape path to permit rapid removal of vehicles in an emergency.
- (12) Dispensing nozzles equipped with a locking device. The use of automatic shut off nozzles is authorized; however, graduated notches, latch open devices, or other wedging devices that permit unattended operations are not authorized. Any nozzle that is equipped with a lock or latch open device must be modified so that the nozzle must be held open by hand and attended at all times (reference FM 10-69, Table 9-1 and NFPA).
- (13) Underground storage tanks (with concrete hold down pad and anchor straps, if required by wet soil conditions) shall be designed and installed as required by the Federal Register 40 CFR,

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Parts 280 and 281, dated 23 September 1988, NFPA Standard 30 Chapter 2, and/or state/local codes whichever are more stringent and should only be doubled wall of either fiberglass reinforced plastic or steel construction. The steel tank is to be the standard and the fiberglass bid as an additive alternate with the least costly selected. The steel tank will be coated with either a coal tar or epoxy and will be cathodically protected or coated with glass fiber reinforced polyester resin. The tanks will be monitored between the outer and inner shells with a leak detection system (electronic, pressure, vacuum, or liquid monitoring that will indicate the presence of leaks) with an audible alarm and indicator lights. Underground piping will be steel or nonmetallic. Steel piping will be cathodically protected. Steel piping and fittings will be primed and protected with pressure sensitive organic plastic tape or coated with the same material used to coat the tank. Double walled piping may be used.

(14) Aboveground tanks may be used instead of underground tanks if allowed by state/local codes. Aboveground tanks are to be designed and installed in accordance with the American Petroleum Institute and NFPA Std 30 and 30A, Chapter 2, 40 CFR 112 SPCC, and ICBO UFC 79.

f. Lube and Inspection Rack: The rack should be designed for the maximum anticipated vehicle weights, tread widths, and include a suitable walkway (platform) with safety railings and steps to grade to allow the vehicle operator to dismount safely after positioning the vehicle on the rack. The rack should generally be located within or adjacent to the military vehicle parking and allow for easy access without conflicting with traffic flow. When other support features are authorized, such as the wash platform and fuel dispensing, these items and the lube/inspection rack should be located in close proximity to each other to reduce common utility runs and costs.

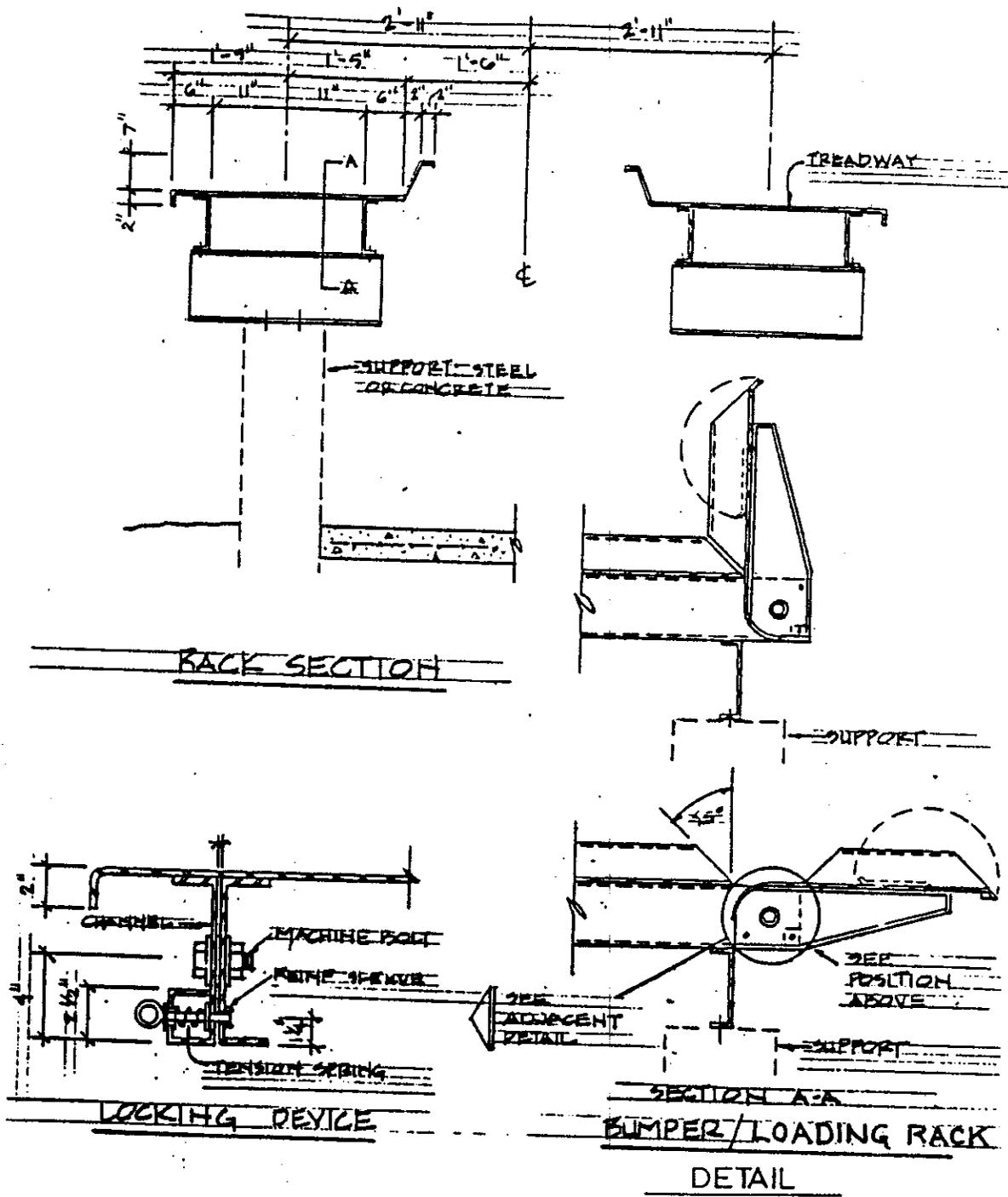
(1) No sump area or drain line should be designed into the rack area and the area under and around the rack should be designed to carry the run-off water away from the rack. Standard operating procedures for immediately cleaning up any spilled oil or grease products should be established. If the 1,000 gallon waste oil tank is used, it should be located near the rack and may have a pipe running from the rack to the tank for directly draining waste oils directly to the tank. The tank may be installed above or underground see the paragraph on waste oil storage tanks.

(2) One (1) compressed air outlet, one (1) water proof duplex outlet (ground fault), one (1) 110v electrical built-in cord/reel system, and one (1) domestic water hose bib should be

conveniently located for vehicle servicing. One (1) four (4) reel (engine oil, grease, gear oil, and water/antifreeze) built-in lockable system should be installed at a convenient location. If the programming document authorizes the lube/ inspection rack to have an unheated enclosure, the enclosure should be as described in this chapter, paragraph entitled "Covered (Enclosed) Unheated Parts Storage", except the lighting level of fifty (50) foot candle, maximum height of eighteen feet (18') over the level part of the rack, width of twenty feet (20'), length of eighty feet (80'), one (1) three foot by seven foot (3' X 7') metal personnel door with a cylinder and/or deadbolt type lock, one (1) fourteen foot high by sixteen foot wide (14' X 16') vehicle door, standard door hinge installation and a four inch (4") concrete slab (from wall to wall) should be use for design. A wheeled vehicle lube and inspection rack is shown on Figures 3-1-2 and 3-1-3. A tracked vehicle rack is shown on Figure 3-1-4.

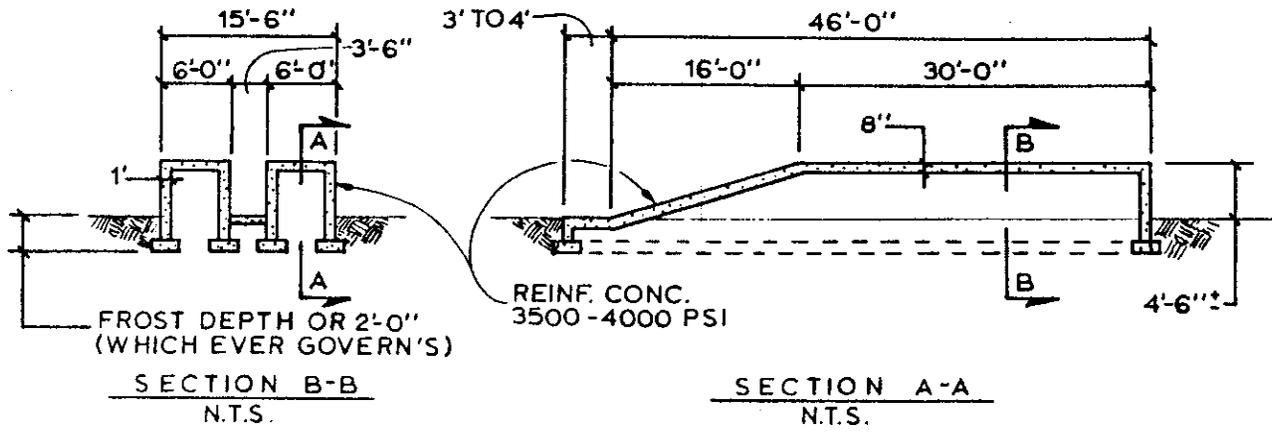
g. Military Vehicle Loading Ramp: The loading ramp may be used to assist in loading and unloading of military vehicles from vehicle transporters or used to load and off load supplies and equipment with a forklift or hand trucks. Generally, the ramp should be located to take advantage, where possible, of existing land contouring, close to a paved area to reduce the amount of access paving to the ramp and close to where the vehicles, equipment or supplies will be stored. The wheeled vehicle lube/inspection rack (see Figure 3-1-2 and 3-1-3) may be designed as a loading and off loading ramp. Other acceptable types of loading ramps would be a built up area of compacted soil with an eight inch (8") thick concrete slab with 6 X 6 - W2.9 X W2.9 or 6 X 6 - 6/6 WWM for the rough finished running surface with steel reinforced concrete retaining walls at the loading end of the ramp and on the other two (2) sides; or, with the two (2) sides sloped and paved with a four inch (4") thick concrete slab with 6 X 6 - W1.4 X W1.4 or 6 X 6 - 10/10 WWM. Bumper blocks (wood or rubber) may be used if required. The driving surface should be no more than twelve feet (12') wide and the level part no more than thirty feet (30').

h. Service and Access Aprons: Paved services and access aprons may be provided adjacent to workbay doors. All workbay aprons for all shops will be rigid concrete sixty feet (60') deep by the width of the workbays. The pavement construction should be as stated in Volume 1, Chapter 2 for rigid concrete pavement. Where rigid concrete access aprons are used, the free floating edges should be designed as a thickened edge and if the edge of the workbay door is supported on the building foundation system,

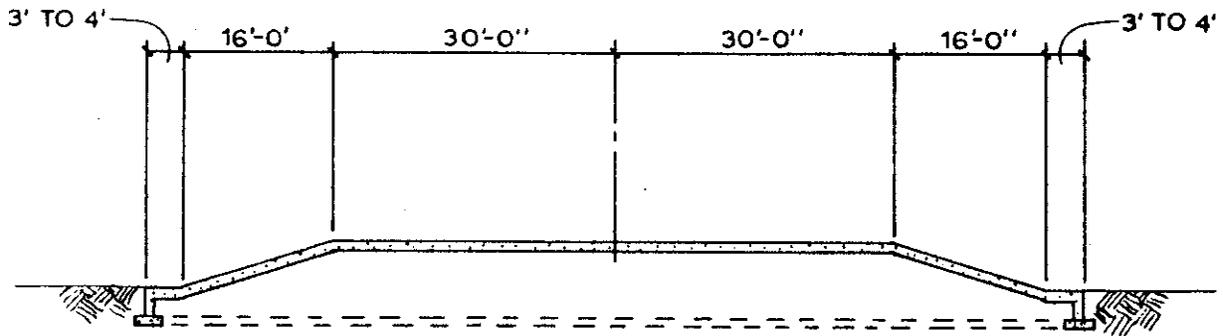


NOT TO SCALE

Figure 3-1-3 Lube / Inspection / Loading Rack Details-Wheel Vehicles.



ONE LUBE / INSPECTION RACK



TWO LUBE / INSPECTION RACKS (END TO END)

N.T.S.

NOTE:

DESIGNER MUST VERIFY ALL DIMENSIONS AND DESIGN CONCRETE TO WITHSTAND THE MAXIMUM EXPECTED LOADING.

Figure 3-1-4 Lube / Inspection Rack-Tracked Vehicles

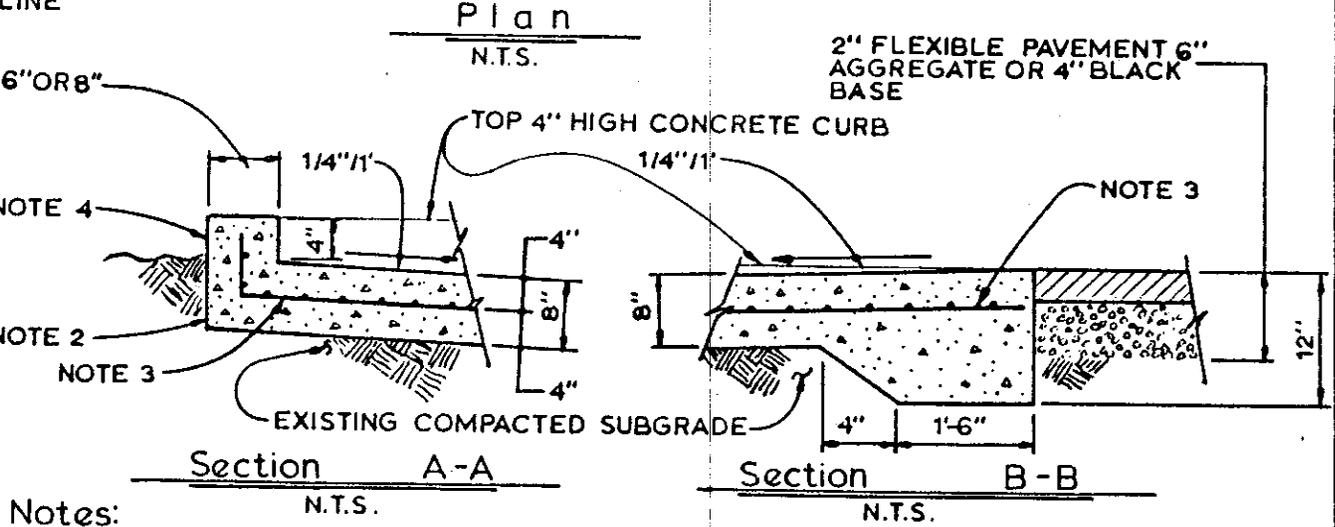
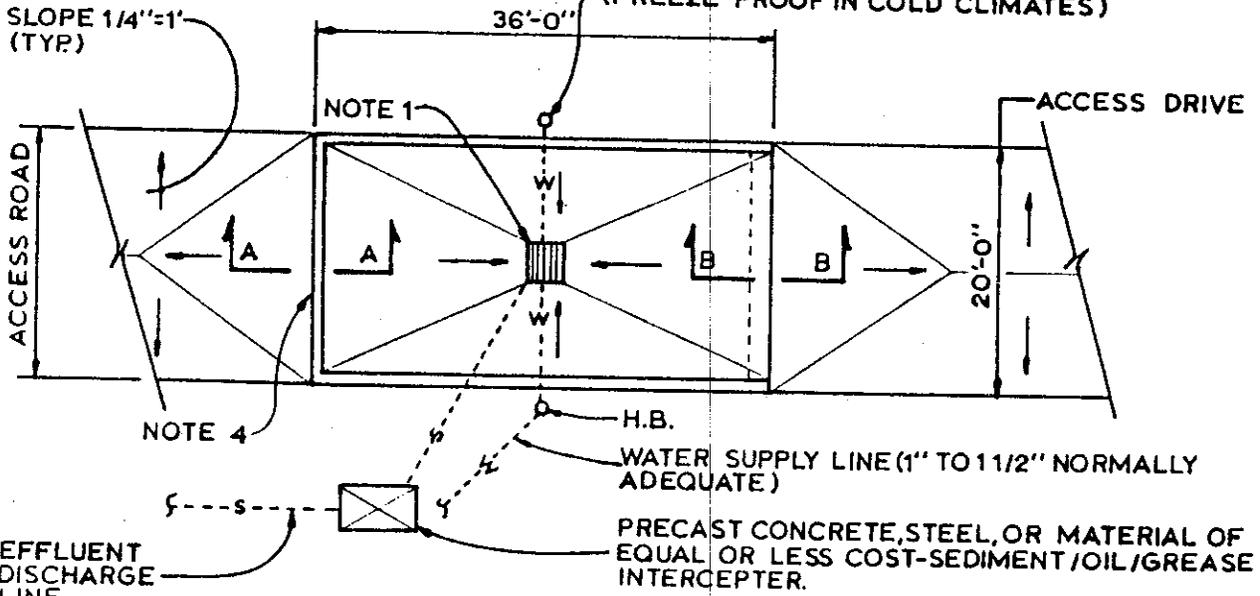
then the slab for an appropriate distance out from the door (generally eight to ten feet (8-10')) would be designed as a structural slab (with steel reinforcing bars instead of the WWM) supported at two (2) points (door edges and at the eight to ten foot (8-10') point. The access road (if required) to these aprons is to butt up to the sixty feet dimension and not parallel the outer edge of the apron.

i. Wash Platform:

(1) **Outside Wash platform.** A vehicle wash platform single station out-to-out dimensions should be approximately twenty-five feet by forty feet (25 X 40') (maximum surface area of eighty (80) square yards). The construction of a vehicle/equipment wash platform is shown in Figure 3-1-5. Consideration of the location should be as stated in above lube and inspection rack paragraph. As a minimum the effluent should pass through a premanufactured sediment/oil/grease separator before being discharged to a detention pond, if required by state/local requirements prior to discharging or recirculation to platform or discharged to a subsurface disposal system, storm drainage system, or an open ditch (if allowed by regulations/ codes/ordinances). Pretreatment of the effluent (if required by state/local codes) is supportable. The effluent is to comply with the Pollutant Discharge Elimination System (NPDES) and state/local discharge requirements. Therefore, a NPDES discharge permit may be required and, if required, it has to be obtained prior to any effluent being discharged. If a detention pond or effluent pretreatment is required by state or local code a certificate to the specific code with the other information required by NGR 415-5, paragraph 3-13 is to be provided along with the preliminary design documents. If the programming document authorizes the wash platform to have an unheated enclosure, the enclosure should be as described in this chapter, paragraph entitled "Covered (Enclosed) Unheated Parts Storage", except the lighting level of fifty (50) foot candle, maximum inside clear height of fifteen feet 15' unless justified and approved as a different height, width of twenty feet (20'), length of forty feet (40'), one (1) three foot by seven foot (3'x 7') metal personnel door with a cylinder and/or deadbolt type lock, one (1) fourteen foot high by sixteen foot wide (14'x 16') vehicle door, standard door hinge installation and a six inch (6") concrete slab for wheeled vehicles and eight inch (8") for tracked vehicles should be used for design. Wash platforms may be covered by roof (no sides) if required by state/local codes.

(2). **Optional Inside Wash Platform.** One authorized exterior wash platform is allowed to be installed within one of the authorized organizational maintenance workbays (not in a

SLOPE 1/4"=1'
(TYP)



Notes:

1. APPROXIMATELY 12"x12" GRATE AND NON-CLOG DRAIN.
2. CONCRETE (3000-4,000 PSI 28-DAY COMPRESSIVE STRENGTH) POURED DIRECTLY ON COMPACTED SUBGRADE.
3. W6X6-6/16, 6X6W2.9X2.9, 4X4-8/8, OR 4X4-W2.0XW2.0 WELDED WIRE MESH.
4. THE CONCRETE CURB USED NORMALLY TO CONTROL TRAFFIC ONTO AND OFF OF THE PLATFORM IS OPTIONAL. HOWEVER, IF THE CURB IS OMITTED, THE SLAB SHOULD HAVE A THICKENED EDGE TO STRENGTHEN THE EDGES.
5. NORMALLY PLAN 20'-0" BETWEEN WASH PLATFORMS.
6. EXTENSION OF WATER LINE, SEWER OR STORM WATER LINES IS AUTHORIZED. ELECTRIC AND COMPRESSED AIR LINES ARE NOT REQUIRED.
7. IF THE EFFLUENT IS DISCHARGED INTO A SANITARY SEWER IT WOULD APPEAR THAT NO SPECIAL STORM WATER DIVERSION SYSTEM WOULD BE REQUIRED SINCE THE AMOUNT OF RAIN WATER COLLECTED BY THE WASH PLATFORM AS SLOPED ABOVE WOULD ONLY ADD ABOUT 450 GALLONS OF RAIN WATER FOR EACH INCH OF RAIN FALL. THIS AMOUNT OF RAIN WATER WOULD BE NEGLIGIBLE; HOWEVER, IF THE MUNICIPALITY OR STATE CODES/REGULATIONS REQUIRE THAT NO RAIN WATER ENTER THE SANITARY SEWER SYSTEM, A CERTIFICATION WOULD BE REQUIRED TO JUSTIFY FEDERAL FUNDING SUPPORT FOR SPECIAL RAIN WATER DIVERSION EQUIPMENT.

Figure 3-1-5 Vehicle Wash Platform.

support maintenance workbay). The wash platform should be located in a bay adjacent to an exterior wall with the remaining perimeter of the bay enclosed by a concrete block stub wall not to exceed 10'-0" in height, or, to allow a drive through capability. The one end between the end-to-end workbays may have a plastic strip air curtain. However, a state would not be authorized both the option of the inside Wash Platform and the Unheated Covered Wash Platform. One or the other must be selected.

j. Waste Oil Storage Tanks: Whenever feasible, storage of waste oil should be aboveground in drums or tanks in order to avoid the expense and operational problems associated with leak detection systems and other features that may be required for underground storage. If a tank is used, the maximum sized tank would be 1,000 gallon capacity, however, a larger tank may be authorized if justified on the basis of maximum of three (3) months storage of waste oil determined by the number of each type of vehicle times the crank case capacity times the number of times changed in three (3) months. The tank should be located close to and adjacent to the lube/inspection rack or lubrication bay with a pipe running from the rack or bay to the tank for draining waste oils directly to the tank. Provide a standard connection for pumping out the tank.

(1) Aboveground tanks may be either steel or fiberglass reinforced plastic if allowed by state/local codes and should be designed and installed in accordance with the American Petroleum Institute and NFC 30, Chapter 2. If the tanks exceed 500 gallons in size (or less if there is a possibility that the liquid contents could flow onto adjacent property or into a public waterway) should be surrounded by a liquid tight dike equipped with a drain sump, drain pipe, locked type gate valve, and a minimum of two (2) grounds. All vegetation should be cleared from within the dike area.

(2) Underground storage tanks (with concrete hold down pad and anchor straps, if required by wet soil conditions) shall be double walled steel or double walled fiberglass reinforced plastic construction. The steel tank is to be the standard and the fiberglass bid as an additive alternate with the least costly selected. The steel tank will be coated with either a coal tar or epoxy and will be cathodically protected or coated with glass fiber reinforced polyester resin. The tanks will be capable of being monitored between the outer and inner shells with a leak detection system (electronic, pressure, vacuum, or liquid monitoring that will indicate the presence of leaks) with an audible alarm and indicator lights. The monitoring equipment should not be included in the design (unless it is a state/local code requirement) since

there isn't any Federal requirement to monitor waste oil tanks. Underground piping will be steel or nonmetallic steel piping will be cathodically protected. Steel piping and fittings will be primed and protected with pressure sensitive organic plastic tape or coated with the same material used to coat the tank. Double walled piping may be used.

k. Flammable Material Storage (FMS) Building or Area: The net floor area may be obtained from the approved programming document. This space may be built as a separate prefabricated metal building, concrete masonry block or the same material as the main building as long as the design meets all State, local and Federal codes, regulations and ordinances. If designed as part of the main building, there should be an exterior door and may have an interior automatic self-closing non-combustible fire door with a liquid-tight 4" high curb. Provide gravity-type ventilation with a roof or ceiling ventilator (6 air changes per hour) and a wall or door louver near the floor to prevent accumulation of hazardous vapor within the FMS area. This space will not generally be heated. The FMS area is a Class I, Division I, hazardous location for electrical work; and the industrial metal total shelf area may not exceed the floor area and should be fastened to the floor. No floor drain is to be provided. If the interior area is to be separated for item or organizational control, a 10-gauge black painted industrial wire mesh partition may be provided.

l. Firefinder Radar (AN/TPQ-36/37) Facility. The firefinder will be stored in a building as a set which consists of either the XM 1048, AN/TPQ-36 and the S250, or, the XM 1048, AN/TPQ-37, and the S250. Each set as defined above requires a twenty (20) feet by forty (40) feet of net floor area providing a special purpose readiness bay. The number of bays required is to be obtained from the NGB approved programming documents. When more than one bay is required, the most economical and practical arrangement of bays side by side (20'x 40', 40'x 40', etc.), or, end to end (20'x 80', 40'x 80', etc.) should be selected. This facility should generally be located within a military vehicle parking area or adjacent to some other paved area.

(1). Access Paving. The access paving to each bay may be approximately 20'-0" wide by the depth required for access to the bay, but generally not to exceed 100-SY per bay. The paving is to be rigid concrete. The pavement design is to comply with Vol. 1, Chapter 2.

(2). Building. The building may be a pre-engineered insulated metal building with a light-weight insulated roof system, or other materials at equivalent or less cost. The architectural,

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structural, electrical, heating and ventilating design considerations to be used may be found in Vol. 1, Chpt 2.

(3). Additional Requirements.

(a) Heating. This facility should be heated, where required by geographic location with unit heaters. One (1) 110v duplex outlet may be included on each wall of the facility.

(b). Electrical. The electrical power requirements for each type of firefinder radar is:

<u>TYPE RADAR</u>	<u>kW</u>	<u>HZ</u>
AN/TPQ-36	10	400
AN/TPQ-37	60	400

Adequate commercial electrical power and converter capacity has to be provided to exercise all sets at the same time. Also, the 400HZ frequency converter(s) may be included in the design to be purchased and installed with MCARNG construction funds. The converter should be solid state which may be installed inside the building. If a motor generator converter is selected as more cost effective and the noise level is higher than 85 db., install a weather resistant unit on the outside of the building. A 1'-0" square or round floor drain may be provided for each bay.

(c). Outside Lighting. Refer to Vol. 1, Chapter 2, para. 2-1n (2) (c).

1-3 Design Considerations:

a. Interior Finishes and Lighting Criteria. Table 3-1-1 contains the functional areas/room finishes and lighting levels to be used for all Surface Equipment Maintenance Facilities (OMS, OMSS, UTES, CSMS, and MATES).

TABLE 3-1-1 Interior Finishes and Lighting Criteria-Surface Equipment
Maintenance Facilities (SEMF)

Functional Area	Interior Room Finishes					Interior Illumination Intensity (FC)
	Floor5/	Base5/	Wainscot3/	Walls5/	Ceiling	
1. Office/Admin/ Insp. & Library	VCT/CPT	GSU/RB	Epoxy	EXP-P	ACST/ GWB-P	70
2. Tool Room	CONC/H	None <u>2</u> /	None	EXP-P	EXP	50
3. Supply	CONC/H	None <u>2</u> /	None	EXP-P	EXP	30 <u>11</u> /
4. Battery Room	CONC/H <u>7</u> /	None <u>2</u> /	None	EPOXY	EXP	30
5. Comm/EL <u>4</u> /	RT	RB	Epoxy	ACST	ACST	70
6. Inst/Calib/ COMSEC Repair/ Radiation Calib.	RT	RB	Epoxy	GWB-P	GWB-P	70
7. Small Arms	CONC/H <u>7</u> /	None <u>2</u> /	None	EXP-P	EXP/ACST	70
8. Missile Shops	RT/CONC/ H <u>7</u> /	RB	EPOXY	ACST	ACST	70
9. Vault/Calib Stge	CONC/H	None	None	EXP-P	EXP-P	20
10. Injector Test RM <u>4</u> /	CONC/H <u>7</u> /	RB	Epoxy	ACST	GWB-P <u>1</u> /	70
11. Engine Test RM <u>4</u> /	CONC/H <u>7</u> /	None <u>2</u> /	None	ACST	EXP-P	50
12. Mech/Cust/ Elec/Telecom/ Equip. Rms	CONC/H	None <u>2</u> /	None	EXP	EXP <u>1</u> /	20
13. Machine Shop <u>4</u> /	CONC/H	None <u>2</u> /	None	ACST	EXP-P	50
14. Fuel & Ignition/Radia- tor Test/Repair	CONC/H <u>7</u> /	None <u>2</u> /	None	EXP-P	EXP-P	70
15. Carpenter Shop	CONC/H	None <u>2</u> /	None	EXP-P	EXP-P	70
16. Lumber Storage	CONC/H	None <u>2</u> /	None	EXP	EXP	10

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17. Latrine CT/QT GSU/CT GSU/CT EXP-P EXP-P
LIPP 40

TABLE 3-1-1 Interior Finishes and Lighting Criteria - SEMF - Continued

Functional Area	Interior Room Finishes					Interior Illumination Intensity (FC)
	Floor5/	Base5/	Wainscot3/	Walls5/	Ceiling	
18. Shower	CT/QT	GSU/CT	None	CT	PLAS-P GWB-P6/ LIPP	20
19. Locker Room	VCT	RB/Epoxy	Epoxy	EXP-P	GWB-P	40
20. Break/Assy	VCT	GSU/RB	Epoxy	EXP-P	ACST GWB-P	30
21. Canvas/ Glass Repair	CONC/H	None2/	None	EXP-P	EXP-P	70
22. Pop Valve Room4/	CONC/H	None2/	None	ACST	EXP	50
23. Welding/ Body Shop	CONC/H	None2/	None	EXP-P	EXP	50
24. Wash and Steam	CONC/H	None2/	None	EXP-P	EXP-P	50
25. Paint BAY	CONC/H7/	None2/	None	EPOXY	GWB-EPOXY	70
26. Paint prep	CONC/H7/	None2/	None	EXP-P	EXP	50
27. Paint Stripp'g	CONC/H7/	None2/	None	EPOXY	GWB-EPOXY	50
28. Lubrication/ Tire Shop	CONC/H	None2/	None	EXP-P	EXP	50
29. Transmission/ Powerpacks	CONC/H	None2/	None	EXP-P4/	EXP	50
30. Workbays/Add'l Bay spaces/Warm- Up Bays/Firefinder Radar Bays 14/	CONC/H	None2/	None	EXP-P	EXP	50
31. Lobby and Corr serving Admin	VCT 12/	GSU/RB/ Epoxy 13/	Epoxy	EXP-P	ACST/ GWB-P	15
32. Corr Others	CONC/H	None2/	Epoxy	EXP-P	ACST	10
33. FMS/BII/Bulk POL Stge/CWHF	CONC/H	None	None	EXP	EXP	20
34. Phys. Fit. Area	CPT	RB/ GSU10/	10/	EXP-P8/	ACST9/	50

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35.	Small Arms/ Test Area 7/	CONC/H	NONE	NONE	EPOXY	EPOXY	70
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TABLE 3-1-1 Interior Finishes and Lighting Criteria - SEMF - Continued

NOTES FOR TABLE 3-1-1

- 1/. Unless ceiling is required for fire protection.
- 2/. RB or GSU is authorized when required on other than masonry construction to prevent damage.
- 3/. Wainscot to be 5 feet high where authorized. In metal buildings, wainscot paneling 8 feet high is authorized to cover exposed insulation.
- 4/. Acoustic treatment is authorized to keep noise levels in the remainder of the facility below 85dBA and 140dBp (noise management techniques such as equipment isolation, vibration mounts, and exhaust noise control should be used as much as possible in conjunction with the acoustic treatment).
- 5/. Seamless epoxy floor, base, and walls may be substituted for CT, QT, or GSU.
- 6/. Epoxy base paint may be substitute.
- 7/. Concrete with a chemical/acid resistant urethane finish is authorized instead of a clear liquid hardener/sealer. Workbays may use any substance designed to prevent track damage.
- 8/. Mirror walls, one foot (1'-0") above floor to six feet six inches high by three feet four inches wide (6'-6" X 3'-4") installed in front of each machine which faces the wall. A four foot (4'-0") double door and a second exit as a standard double door should be provided.
- 9/. Dropped ceiling height should be approximately nine feet (9'-0") or more if obtainable when complying with the ten foot (10') structure height requirement.
- 10/. A kickboard to one foot (1') above floor may be provided. The rug may be extended one foot (1'-0") up the wall instead.

11/. May be increased to 50 FC. Depending on task requirement.

12/. OMS and OMSS should be CONC/H.

NOTES FOR TABLE 3-1-1 - Continued

13/. OMS and OMSS should be None, except RB or GSU is authorized when required on other than masonry construction to prevent damage.

14/. Acoustic treatment may be used to meet noise attenuation requirements of OSHA.

KEYS TO ABBREVIATIONS

- ACST - Acoustical suspended tile, two feet by four feet (2' X 4') or two feet by two feet (2' X 2').
- CONC/H - Clear Liquid Hardener/sealer finish over exposed concrete floor.
- CPT - Carpet. A 26-28 oz. (face weight), permanent static-free (2.5KV or less), cut or loop pile nylon or acrylic commercial grade (direct glue down without cushion) carpet is authorized.
- CT - Ceramic Tile (Thick or thin set) and ceramic or marble threshold.
- Epoxy - Base Paint (coating should not exceed two (2) application system).
- EXP - Exposed construction (one (1) coat of paint is authorized for corrosion protection of exposed ungalvanized metal only; touch up of factory prime coat is authorized on ungalvanized metal not exposed to public view).
- EXP-P - Exposed Construction, Painted *.
- GSU - Glazed Structural Units (without cove on base units defined as prefaced concrete masonry unit, Federal Specification SS-C-621b, Form B.)
- GWB-P - Gypsum Wallboard, painted *.
- PLAS-P - Plaster, painted *.

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* Painted means use enamel, latex or equivalent cost paint.

KEYS TO ABBREVIATIONS (Cont'd.)

QT - Quarry Tile.
RB - Resilient Base.
RT - Rubber Tile Static Dissipative with a static generation of less than 20 volts at 70°F, 20% RH
VCT - Vinyl Composition Tile (thickness 3/16" or less) on monolithic concrete finish; Final wax coat, if recommended, by the tile manufacturer is authorized.
LIPP - Lay-in Plastic Panels

b. Interior Heights. The interior height of functional areas is measured from the finished floor to the bottom of the roof or the above floor's lowest structural support member (as measured at the 1/3 height point of the triangle formed by the lowest sloping roof or floor structural support member, plus or minus 4-inches to match masonry coursing, if masonry is selected). The interior heights are as stated below.

Table 3-1-2 Interior Heights - Surface Equipment Maintenance Facilities

Functional Area	Height in Feet
Adm Offices, Shop Work Areas, Vault, and FMS	10
AN/TPQ-36/37 Firefinder Radar Readiness Facility	23
General Maintenance and Special Purpose Workbays without a crane (unless a greater height is justified).	15
General Maintenance Workbays with 5, 7-1/2 or 15 Ton overhead crane (Hook height 17 FT)	20 to 21

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General Maintenance Workbays with 25 Ton overhead crane, 80Ft. span (hook height 20 Ft)	27 to 28
Basic Issue Items (BII) Storage of MATES	14
Supply Room/Tool Room	14

Table 3-1-2 Interior Heights - Surface Equipment Maintenance Facilities (Continued)

Functional Area	Height in Feet
Mechanical Room (lower floor as required to maintain one roof height).	10 to 12
Controlled Waste Handling Facility (12 feet may be used with forklifts)	10
Paint Shop	18

c. Installed Equipment. The authorized installed equipment to support the shops will be shown on the functional area layouts, Functional Area Discussions/Design Criteria or in Table 3-1-3. The installed equipment list in Table 3-1-3 is authorized for each type of maintenance shop unless indicated otherwise in the notes of the table. Installed equipment should be included as a part of the building base bid and not bid as separate items.

Table 3-1-3 Installed Equipment for Surface Equipment Maintenance Facilities

ITEM
1. Compressed air with options of desiccant/Refrigerated Air Dryer when desired &/.
a. Built-in hose/reel system: (one/workbay).
b. One outside air outlet per every other workbay.
2. Electrical:
4 duplex (110V) outlet/bay.

- 1 duplex (220V) outlet/bay.
- 1 28V DC outlet/bay (converter N.I.C.) as required.
- 1 110V or 220V outlet for every piece of installed electrical-powered equipment.

Table 3-1-3 Installed Equipment for Surface Equipment Maintenance Facilities - Continued

ITEM
1 Built-in Cord/Reel system per workbay. 1 grounding rod/bay. 1 outside duplex outlet per every other bay. 1 208V Three phase outlet per every other maintenance workbay for DC power supply as required.
3. Hose bibbs: (one per workbay; one outside per every other bay)1/
4. Hot water heater (also one hot water outlet per bay).
5. Overhead 2-speed traveling cranes mounted on a traveling bridge serving the full workbay length (i.e. 64-Ft or 80-Ft for bays oriented end to end)3/.
6. Vehicle hydraulic lift capacity up to 1-1/4T vehicles (Not applicable to UTES, MATES (COL) or MATES)2/.
7. Special exhaust systems: Carpenter & paint shop Battery room Vehicle tailpipe exhaust (1 outlet per workbay)2/ Flexible hose to point of use in welding shop.
8. Welding bench with special exhaust. 100 FT per minute at point of welding.
9. Built-in or installed shelving, benches and counters, when not in TDA
10. Lube/Water Dispensing System 4/
11. Hot water generator (Wash Bay and Wash Platform only)5/
12. Breathing Air System: Paint/Welding shop only 6/

- 13. One 1/2" diameter eye bolt anchor/bay
- 14. One load test anchor per shop (when authorized a crane)
at the load testing capacity for the crane.

NOTES FOR TABLE 3-1-3

- 1/. Outside hose bibb should be a yard hydrant in northern states.
- 2/. Vehicle tailpipe exhaust system. The vehicle tailpipe exhaust system should be overhead instead of under the floor slab to provide more flexibility and to reduce initial costs, maintenance problems, and possible collection of explosive vehicle exhaust creating a potential safety hazard. Until such time as a cost-effective system for accommodating M-1 tanks is developed, venting for these vehicles should be through an open workbay door; however, in cold climates it may be necessary to use a shroud (purchased and/or fabricated with other than Federal construction funds) similar to the one shown on Figures 3-1-7A and B; or place the exhaust of the tank near the overhead door and open the door to a point where it would allow the exhaust gases to escape to the outside and the intake of fresh air for the M1 tank engine, minimizing the requirement to heat large quantities of make-up air. Or use some similar field-expedient device. The minimum quantity of vehicle tail pipe exhaust to be used in designing the TPE system should be determined by the type of vehicles that are maintained in the facility. The horse power, typical RPM at which the equipment is operated, and the turbocharge capabilities of the equipment must be identified. When these specifications are identified, the US Army Corps of Engineer specifications listed in figure 3-4-45 will be used to size duct work and fans. It is suggested that one TPE system be designed for every 4 bays. In addition it will be necessary to provide a general exhaust system to handle vehicle exhaust generated by vehicles entering and leaving the facility. This system should be designed IAW ASHRAE

NOTES:

1. EXHAUST OUTLET WAS DESIGNED BY THE MAINTENANCE DEPARTMENT, FORT KNOX, KENTUCKY AND TESTED BY GENERAL DYNAMICS/AVCO ENGINEERS. THIS SYSTEM ALLOWS SAFE OPERATION OF THE M1 ABRAMS ENGINE IN A SHOP ENVIRONMENT THROUGH VARIOUS RPM'S TO INCLUDE THE STALL TEST.
2. CURRENTLY THE EXHAUST OUTLET MUST BE LOCALLY FABRICATED BY YOUR MAINTENANCE FACILITY, BY FOLLOWING THE ATTACHED INFORMATION.
3. ASSISTANCE MAY BE OBTAINED BY CALLING MR HORNBACK 464-6761/2960, PERIODIC SERVICES DIVISION, MAINTENANCE DEPARTMENT, US ARMY ARMOR SCHOOL, FORT KNOX, KENTUCKY 40121-5200.
4. HOOK ON TOP IS USED TO HOLD SYSTEM IN PLACE DURING MOUNTING PROCEDURES.
5. MOUNTING TO ENGINE IS ACCOMPLISHED BY UTILIZING EXISTING HOLES IN REAR OF THE M1 EXHAUST SYSTEM.
6. CRITICAL MEASUREMENTS ARE CYLINDERS AT REAR OF SYSTEM AND MOUNTING HOLES LOCATED ON FRONT OF SYSTEM.
7. BUILDING MATERIAL IS 1/4" ALUMINUM PLATE.
8. FLEXIBLE EXHAUST PIPE AVAILABLE FROM MCMASTER-CARR SUPPLY COMPANY "STAINLESS" STEEL-MEDIUM WEIGHT 10 (ID-NO. 524K65).
9. SEAL USED ON FRONT OF EXHAUST SYSTEM IS: SEAL, EXHAUST DUCT, 5340-01-099-6331, TM 9-2350-255-20 P-1.

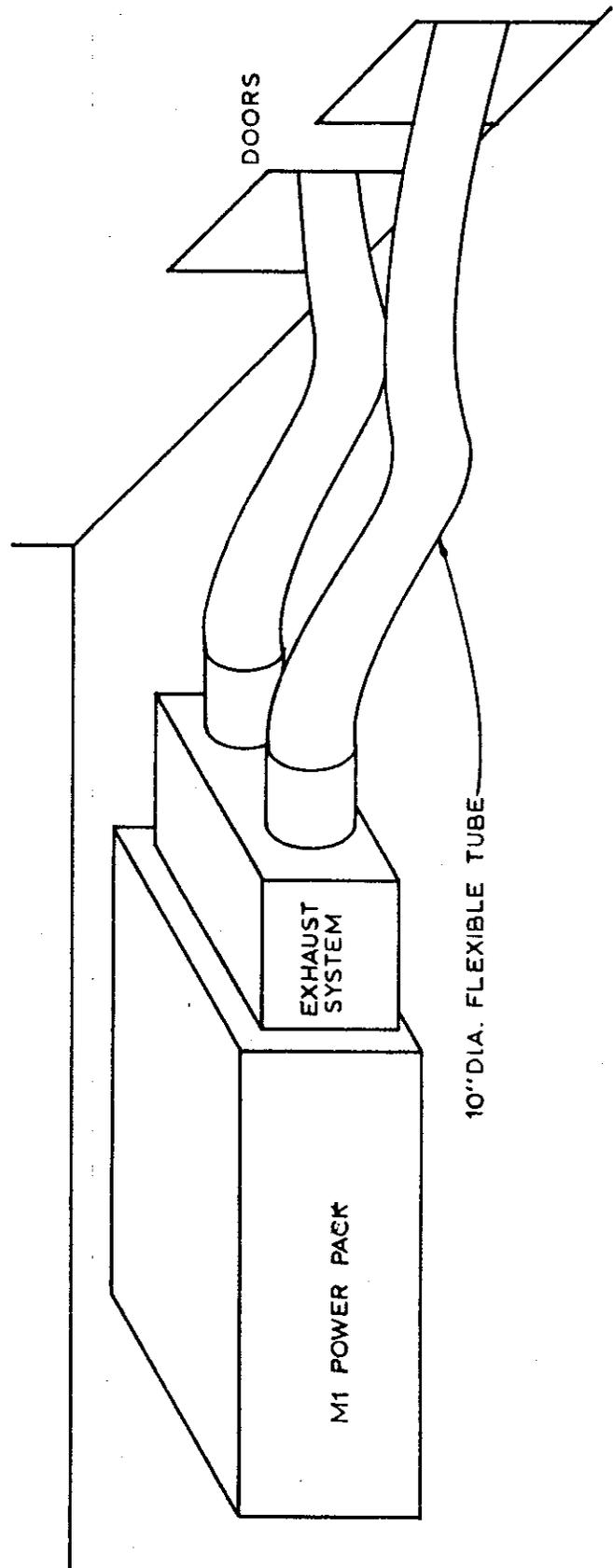


Figure 3-1-7A Exhaust Outlet For The M1 Tank-OMS /OMSS

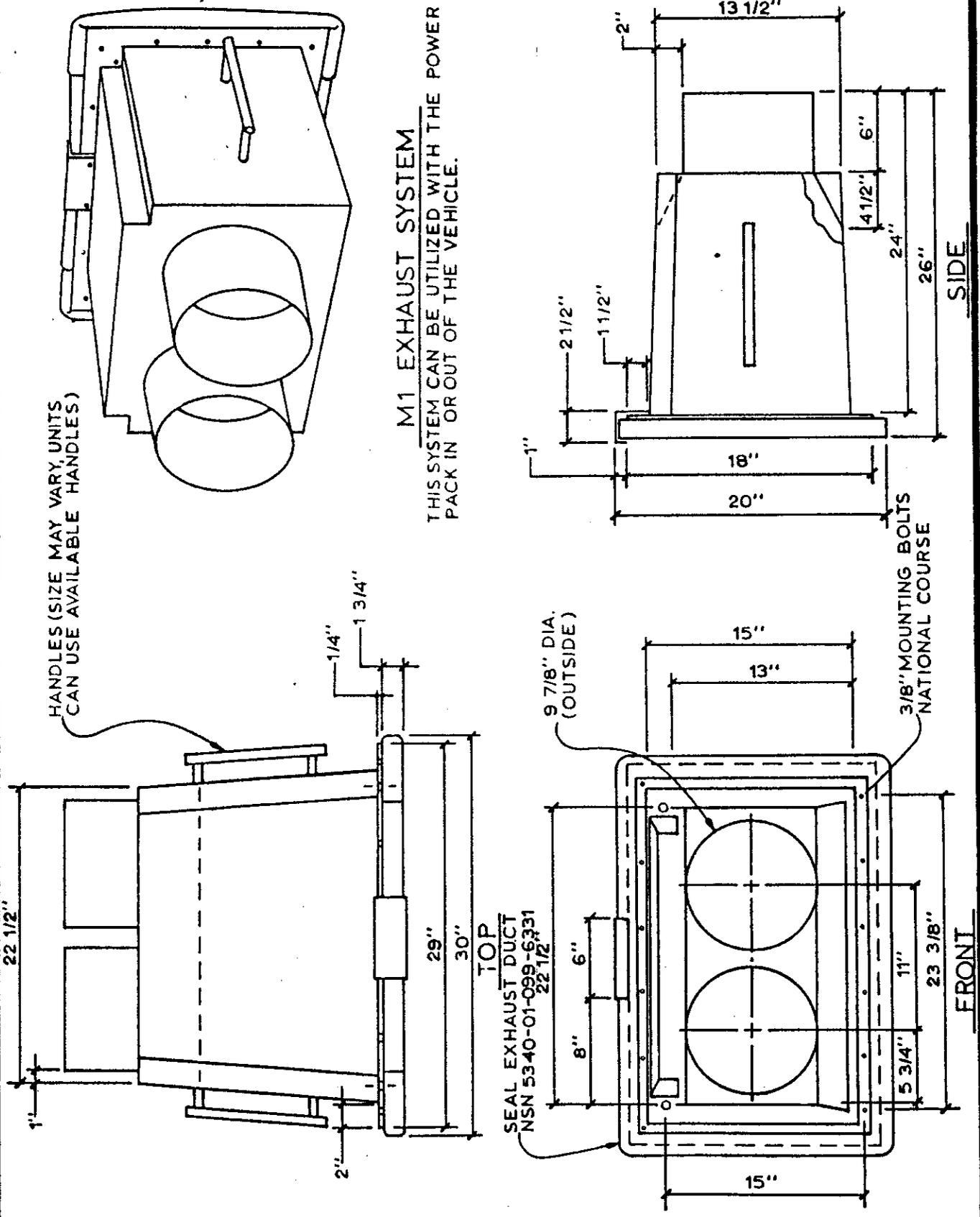
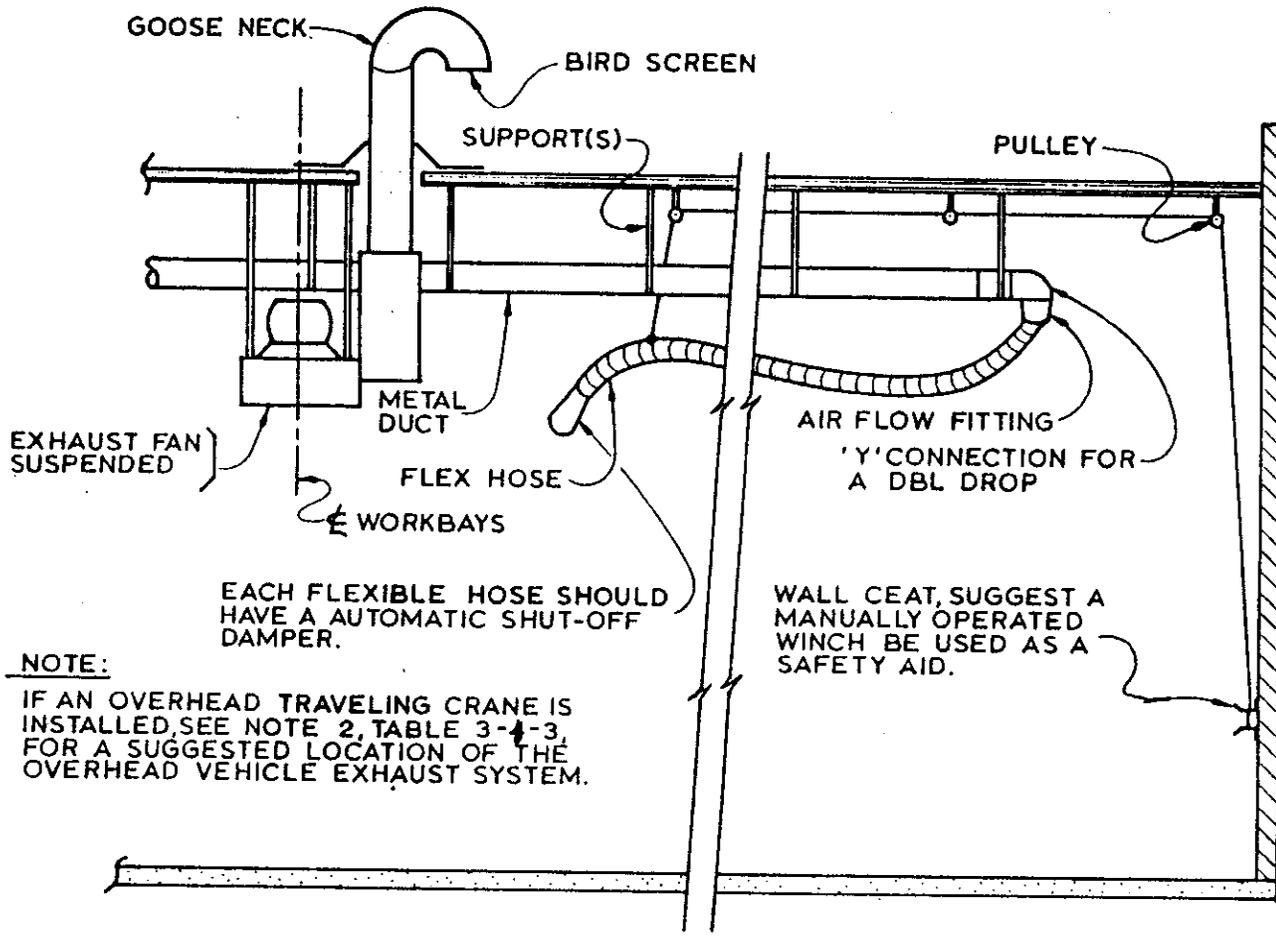


Figure 3-1-7B Exhaust Outlet For M-1 Tank-CSMS /MATES

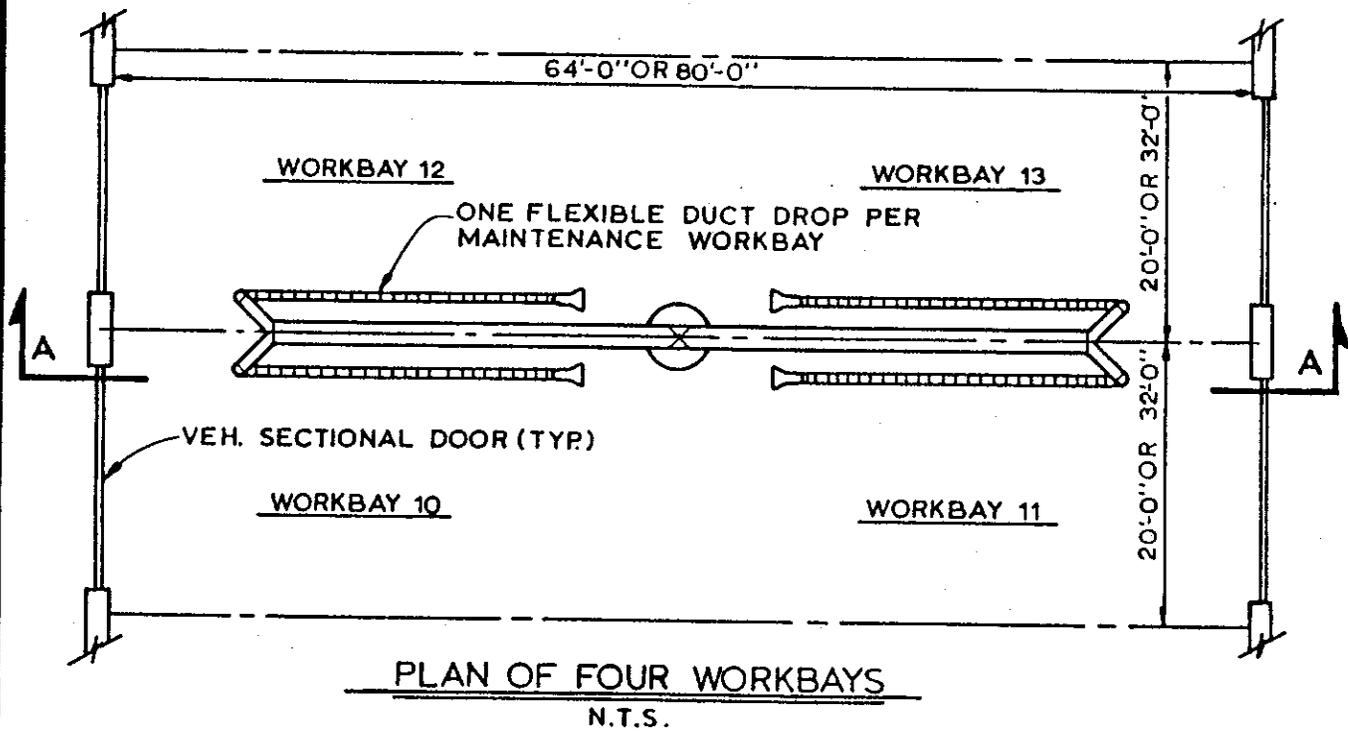


NOTE:
 IF AN OVERHEAD TRAVELING CRANE IS INSTALLED, SEE NOTE 2, TABLE 3-4-3, FOR A SUGGESTED LOCATION OF THE OVERHEAD VEHICLE EXHAUST SYSTEM.

EACH FLEXIBLE HOSE SHOULD HAVE A AUTOMATIC SHUT-OFF DAMPER.

WALL CEAT, SUGGEST A MANUALLY OPERATED WINCH BE USED AS A SAFETY AID.

SECTION A-A
 N.T.S.



PLAN OF FOUR WORKBAYS
 N.T.S.

Figure 3-1-7c Overhead Vehicle Exhaust System-OMS/OMSS

NOTES FOR TABLE 3-1-3 - Continued

standards for maintenance facilities. The air in the maintenance facility will meet OSHA or other more restrictive regulations for air containment levels. The systems shall be constructed to withstand the exhaust temperatures generated by the vehicles being serviced. Exhaust temperatures and engine specifications are listed in the applicable Technical Manual for each vehicle. TMs to be furnished by government. Hazardous gas monitoring equipment (such as carbon monoxide monitors, with remote sensors and alarm devices) when installed to operate ventilation systems can be installed with Federal construction funds. The safety, occupational health, and industrial hygiene office at NGB should be contacted for further guidance. The specification should require the contractor to hire an independent testing agency to verify that the constructed exhaust systems meet all applicable codes and specifications (OSHA, State, COE, etc.)

3/. General maintenance workbays authorized for organizational or support level maintenance are generally arranged in two parallel rows, with workbays end-to-end. The traveling bridge should span the longest dimension of two workbays end-to-end (64-FT or 80-FT), with tracks provided to allow the bridge to move from one end of the rows to the other.

a. **OMS or OMSS.** A lifting device with a 7-1/2 Ton working capacity and a minimum 16-foot hook height is authorized.

b. **MATES (COL) or UTES.** One traveling lifting device for each 10 or major fraction of maintenance workbays, with a 7-1/2 Ton working capacity and a 16-foot hook height is authorized; if only wheeled vehicles are supported, the working capacity is reduced to 5 tons. There is no requirement for support level maintenance at a MATES (COL) or UTES.

c. **CSMS or MATES.** One traveling lifting device for each 10 or major fraction of maintenance workbays, with a 7-1/2 Ton working capacity and a 16-foot hook height. General maintenance workbays authorized for support level maintenance should be provided with one of the lifting devices as follows:

- (1) One traveling lifting device with a 35-Ton working capacity and a 20-foot or 21-foot 6 inch hook height for facilities serving armored vehicles.
- (2) One traveling lifting device with a 15-ton

NOTES FOR TABLE 3-1-3 - Continued

working capacity and a 17-foot hook height for facilities serving only wheeled vehicles.

- (3) The machine shop is authorized one 2000 pound capacity lifting device.
- (4) Special purpose workbays do not require a lift capability except the welding and body shop should be serviced by a 2000 pound capacity lifting device, and the canvas repair shop is authorized a 1000 lb. lifting device with a hook height of 14 feet.

4/. One four-reel (engine oil, grease, gear oil, and water/antifreeze) overhead system is authorized for each group of up to four organizational and support maintenance bays arranged side by side and end to end; and one four-reel system is also authorized each authorized lubrication bay.

5/. The use of construction funds is authorized to procure and install a high temperature/high pressure hot water generator permanently fixed in place to serve the washbay.

6/. When airline respirators are required, the breathing air furnished to respirators must meet the OSHA standards 29 CFR 1910.134 for grade D breathing. The main shop compressor may be used to supply the air. The compressor must be equipped with an outside air intake, an air filtration panel and, if oil lubricated, with a high temperature carbon monoxide alarm, or both (if only a high temperature alarm is used, the air from the compressor must be tested frequently for carbon monoxide). The quick connect/disconnect coupling should be a unique coupling system that only allows respirators to be connected to it as required by OSHA.

7/. When selecting and specifying overhead traveling cranes consider:

a. Items to specify are:

1. Roving (traveling) push button control. The roving (traveling) push button control is necessary for safety. It will allow the operator to move far enough away from the heavy loads being lifted so that if any failure happens the operator will be safe.

NOTES FOR TABLE 3-1-3 - Continued

2. Geared limit switch.
3. Overload cutoff.
4. Weston type load brake.
5. Multiple speed frequency inverter control.
6. Speeds: 2 Speed Hoist 18 FPM maximum and 2 FPM maximum 2 speed Bridge/Trolley 85 FPM maximum and 10 FPM maximum.
7. True vertical lift.
8. Direct current hoist brake.
9. Travel limit switch.
10. Thermal protection (the frequency investor has this).
11. Start-up and maintenance training for user.
12. Two year warranty from acceptance.
13. Specify crane requiring the least building height.

b. Items to avoid:

1. MIL-H-15317.
2. Time delay or hoist brakes.
3. Rail clamps.
4. Spring bumpers (Use travel limit switches).

c. The frequency inverters provide the following benefits:

1. Infinite speed selection between the maximum and minimum speeds selected.

NOTES FOR TABLE 3-1-3 - Continued

2. Field adjustment to change speeds is extremely easy to do.
3. Diagnosis problems by code numbers reducing repair time.
4. Ramp up and down - speeds automatically increase slowly to the preset speed.
5. Eliminates plugging/reverse plugging.
6. Has the capability to be by-passed so operations can continue.
7. Motor protection from thermal overloading, reverse plugging, and decrease electrical peaking demand for motor start-up.

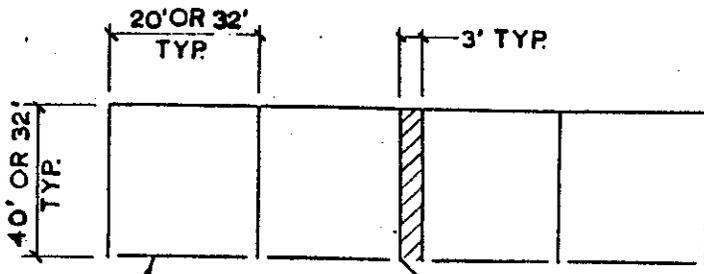
8/. The compressor should preferably be located in the mechanical/electrical room. However, if this is not economically practical, the next choice should be outside the building with a cover over it. The decibel level transmitted through the walls to the work areas will not exceed code or OSHA acceptable levels.

9/. At OMS's where two exterior lube/inspection racks would be authorized, a vehicle lift may be installed in one of the workbays in lieu of one of the exterior racks, provided there are 100 or more vehicles of 1 1/4 ton or less maintained at the OMS.

d. Workbay Exitways/Personnel Doors. To comply with NFPA to allow for personnel traffic in open workbay areas to have an exitway to the outside and entrance into the workbays without opening the vehicle doors, personnel doors and 3'-0" wide exitways (see Figure 3-1-8) are authorized as follows:

(1) For shops with four adjacent vehicle doors (no partitions separating the workbays), one personnel door and a 3'-0" wide exitway would be authorized.

(2) For shops with more than four adjacent vehicle doors (no partitions separating workbays), one additional personnel door and a 3'-0" wide exitway would be authorized for each three additional vehicle doors.



LEGEND

- 3'x7' PERSONNEL DOOR
- 3' WIDE EXITWAY
- W.B. WORKBAY

W.B. PLAN

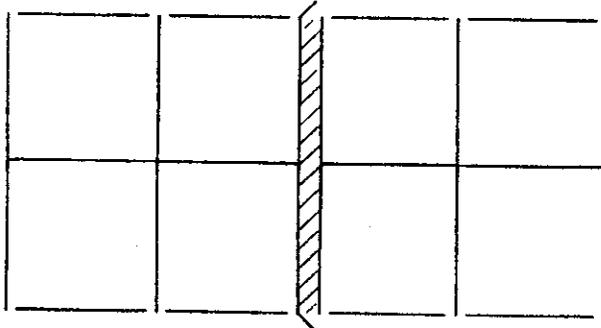
W.B. VEHICLE DOOR TYP.

NOTE:

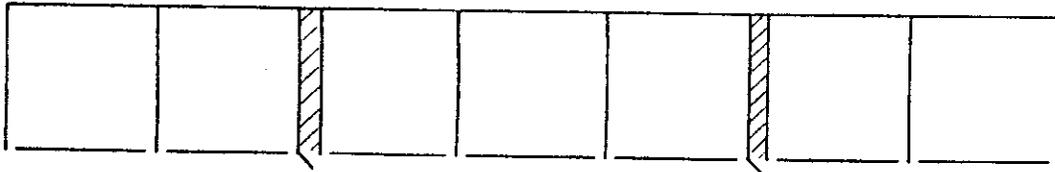
WORKBAYS ARE EITHER 20'x40' OR 32'x32' UNLESS AN EXCEPTION HAS BEEN APPROVED ON PROGRAMMING DOCUMENT.

DRAWING NOT TO SCALE

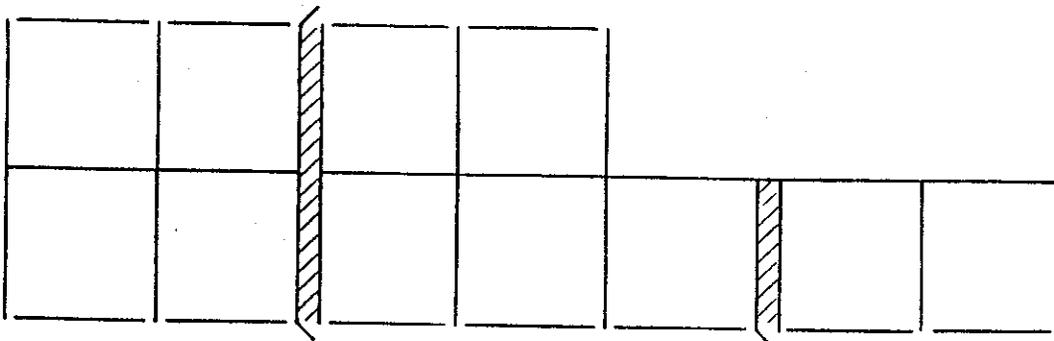
PERSONNEL DOORS MAY BE LOCATED IN THE ENDS OF THE BUILDING IN ADDITION TO DOORS LOCATED AT THE END OF THE EXITWAYS IF DESIRED.



W.B. PLAN



W.B. PLAN



W.B. PLAN

Figure 3-1-8 FIRE EXIT WAYS / PERSONNEL DOORS WORKBAYS.

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(3) The 3'-0" exitway is to be located perpendicular to the vehicle door along one side of a workbay.

(4) The 3'-0" wide exitways are not authorized for workbays that are separated by walls or separately enclosed (Special Purpose Workbays).

(5) The vehicle and personnel doors are to be insulated. Vehicle doors may be either 14'-0" H X 16'-0" W for workbays, 20'-0" X 40'-0" or 14'-0" H X 28'-0" W for workbays 32'-0" X 32'-0". Personnel doors should be 3'-0" X 7'-0".

e. Bulk POL Storage for Lubricating/Antifreeze Dispensing System. This area is to be designed to allow for storage of 55 gallon barrels of oil, gear oil, grease, and antifreeze used to supply the overhead lubrication/water/antifreeze dispensing system located in the workbays. The lub/antifreeze pumps are to be purchased and installed with Federal construction funds. The 3/8" diameter copper or steel tubing from the central air compressor to supply compressed air to the lub/antifreeze pumps and the copper or steel tubing from the lub/antifreeze pumps to the overhead Lubrication Station at the workbays should be included in the design and construction documents. The net floor area may be obtained from the programming document. There are three functional area sizes: 89, 96 and 120-NSF. One possible sketch showing these three sizes are shown on Figure 3-1-9. This area should generally be centrally located allowing the smallest size pumps and supply lines to be used and to have only one bulk POL Storage Room. However, the authorized area may be at multiple locations when distances and layout requirements dictate. No duplex electrical outlets are necessary; however, it is suggested that one outlet be located just inside or outside the door to the room. If this room is located within the building and the walls are surrounded by

heated space, heating the room in cold climates may not be necessary. However, in cold climates this area should have a room design temperature of 55°F.

(f) **Battery Room.** This room is used to put electrolyte in new batteries, charge vehicle batteries, in rare cases remove electrolyte from unserviceable batteries (electrolyte is poured into a container not down the sanitary sewer), add electrolyte and store new-dry batteries, electrolyte and bicarbonate of soda. This room shall be equipped with an eyewash and deluge shower combination fixture without floor drains and

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Insert Figure 3-1-9
Bulk POL Storage for Lubrication/Antifreeze Dispensing System

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equipped with an audible automatic alarm activated when the eyewash/shower is operated with the alarm located where workers outside the battery room can hear the alarm and respond, and, the eyewash/shower located for easy access from any point in the room without obstructions; shall be adequately ventilated (louvered door or wall and non-explosion proof spark resistant exhaust fan; ANSI 29.1-1971 stipulates minimum of 2 CFM per SF of floor area) to prevent build-up of gases during charging operations. Explosions proof lights, motors, switches are not required by the National Electric Code for small charging operations that are properly ventilated. Built-in acid resistant PVC shelving area may be approximately equal to the battery room net floor area. An acid resistant built-in workbench (with shelves below it) located adjacent to the sink may be provided. The number of charging circuits may vary with the size of the battery shop (generally, two chargers per battery shop); however, these circuits should be connected to the exhaust fan, so that when charging operations starts, the exhaust fan goes on automatically. A switch to control all electrical power to the room should be located in accordance with applicable codes and regulations.

(g) Supply and Tool Room. The supply/tool room technician is responsible for requisitioning; stockage; accounting; issuing repair parts/supplies, and special tools; and, assists in scheduling preventive maintenance services, maintaining maintenance logbooks/records and prepares maintenance status reports. The supply and tool room are generally adjacent or contiguous with each other for convenience of operation. Office area for supply technician is taken out of the authorized supply room space (110-SF for one supply technician and 60-SF for each additional technician). The layout is based on the assumption there are five workbays giving 750-SF authorized of which approximately 110-SF would be a supply office. Tool room authorized area is 200-SF. The supply room outside apron or dock (if authorized) for unloading/loading supplies may be covered.

(h) Small Arms Repair. This room is used to maintain, repair, and adjust small fire arms, i.e., machine guns, coax guns, mortars, etc. taken off of the combat vehicles. The combat vehicle small arms are usually removed from the vehicles, and permanently located at the shop and stored in the combat vehicle arms vault. A small arms vault is not authorized at these shops. This repair area would generally be located adjacent to the vault(s) and the basic items of issue (BII) functional area. This area must be ventilated to meet ASHREA standards.

(i) Break Area. This is the area where shop personnel take breaks, eat, and attend group meetings. A metal enameled or

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formica covered 8 to 10 feet long base cabinet with a double stainless steel sink; metal enameled or formica wall cabinets 8 to 10 feet long over the base cabinet; and five 110V duplex electrical outlets may be provided.

(j) Men's and Women's Latrine/Shower and Locker Room.

The latrines/showers and locker rooms are based on the program document. The location of the locker room should be adjacent to or included within the latrine shower area. The State Plumbing Code should be used to determine the number of plumbing fixtures, except showers should be two showers for 1 to 40 technicians, three showers for 41-80, four showers for 81-120, etc.

(k) Physical Fitness Area. The physical fitness machines/ equipment is classified as portable equipment to be purchased through standard supply channels and purchased and installed from other than Federal Construction funds. The specific pieces of equipment including installation instructions is to be obtained by the State FMO and provided to the designer to aid in layout and design. Generally, the equipment should be installed perpendicular to the walls with access to the equipment and workout areas from a 6 or 7 foot aisle down the center of the room. The room finishes, HVAC and lighting requirements are listed elsewhere in this guide. Locker Room. The authorized net floor area approved on the programming document generally would be allocated to men; however, there could be National Guard women and in order to provide some locker space for them, the total locker area authorized may be proportioned between the men and women. The location of the locker room should be adjacent to or included in the latrine/shower area.

(l) Circulation. All net functional areas shown on the approved programming document have intra-circulation space included in the net floor area. The net office and work shop floor areas (excluding workbays) are authorized a 15% inter-circulation, (i.e., 15% times the net office and work shop areas) to allow a common corridor for access from one functional area to another. The office and shop areas should be laid out to minimize the amount of inter-circulation (corridor) space required. The corridor width should generally be no wider than 8'-0" unless justified and approved by NGB-ILE-IC. Lobbies should not normally be used for an OMS; however, in cold climate areas a vestibule at the main entrance (same width as corridor) with two sets of doors to conserve energy may be used. Corridors should provide direct access to functional spaces without the use of offsets or elaborate circulation patterns. Perpendicular inter-corridor connections are desirable. All corridors should be double loaded if possible and serve at least two or more functional areas.

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(m) **Mechanical/Electrical/Telecom Equipment Room(s).**

This area may accommodate heating, ventilation, air conditioning, communication equipment, air compressor, and electrical distribution equipment associated with the building. There could be one room or more to accommodate the above requirements depending on the size of the facility, shape of the building, and building layout. Generally, the workbays would be heated by oil or natural gas infrared radiant heating system which would be separated from the heating system for the other functional areas. Since the floor plan layouts for this area could vary greatly depending on geographic location, equipment selected, etc. no layout will be provided. For each separate room required, generally, only one general purpose 110V duplex outlet and one floor drain would be necessary. The room height would generally be 10 feet; however, some equipment may require a height of up to 12 feet (obtain 12 feet height by lowering the floor).

VOLUME 3

CHAPTER 2 ORGANIZATIONAL MAINTENANCE SHOP (OMS) AND OMS SUB-SHOP (OMSS)

2-1 General: These shops perform organizational maintenance on automotive, engineer, artillery, communications, electronics, small arms, and other Federal equipment. Schedules and performs preventive maintenance, requisitions and accounts for repair parts; inspects military equipment and pertinent records of supported units to assure that unit maintenance responsibilities are fulfilled; conducts maintenance training for various unit personnel on a regular basis. This chapter will provide specific design guidance for these shops and their functional areas. In the office area the use of systems furniture is encouraged to save floor space and provide an individual with adequate and efficient space.

2-2 Design Consideration:

a. Interior Finishes and Lighting Criteria: Table 3-1-1 in Chapter 1 contains the room finishes and lighting levels to be used for the OMS/OMSS functional areas.

b. Interior Heights: The interior height of functional areas is explained in Chapter 1, paragraph 1-3b and Table 3-1-2.

c. Installed Equipment: The installed equipment to support the shop will be shown on the functional area layouts when completed in the future, discussions that are included below in paragraph 2-4, "Functional Area Discussion/Design Criteria", and in Table 3-1-3 of Chapter 1.

2-3 Optimum Physical Relationship For Functional Areas: One example of an "Optimum Physical Relationship for Functional Areas" diagram for an OMS is provided as Figure 3-2-2. After the designer has prepared a diagram for the specific project, the Military Department, Facilities Management Officer should approve it and coordinate it with the user.

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Insert Figure 3-2-2
Optimum Physical Relationship for OMS

2-4	Functional	Area	Discussion/Design
Criteria/Layouts:			

a. **General:** The following sub-paragraphs provide the designer, when appropriate, with background information pertaining to the operations and functions within certain functional areas; design criteria that applies to certain functional areas; and examples of equipment schedules (figure 3-2-3); and functional area floor plan layouts for which the arrangements and sizes may or may not be adjusted by the designer to fit an efficiently cost effectively shaped building, to fit the actual authorized equipment floor demands or size of functional area specified in the NGB approved programming documents, or, if not on the approved programming document, as approved by NGB-ILE-I and the State Military Department. The intent in providing actual layouts of functional areas is to convey one of several possible layout as an example for the designer to follow. Some procedures used to do the actual equipment schedule and floor plan layouts are found in this Volume, Chapter 1, para. 1-21.

b. **Supervisor's Office:** Supervises operations of the shop in performing organizational level maintenance on Federal surface equipment. Establishes production goals and work schedules, evaluates effectiveness of maintenance effort, establishes quality controls and work standards, and maintaining liaison with other maintenance shops and using activities are the primary functions of the foreman. The space allowance for this office includes space for a library. The library may be a separate room from the supervisor's office.

c. **Communication/Electronic Room:** This room is used to maintain, repair, and install electronic and communication equipment; i.e., telephones, telegraph, radios, radars, surveillance equipment, etc. This room should be insulated to reduce the air conditioning requirement; be located near the workbays; have weather stripping seals on doors and windows to provide a relatively dust free environment; have a 110V continuous wall electrical outlet strip over each workbench; provide 28 VDC power at each bench; and should have temperature controlled to 74 plus or minus 2 degrees F. dry bulb. Work benches should be shown on drawings, but marked to be provided by the state or others if authorized on a TDA.

d. **Additional Workbay Space:** This area should generally be centrally located between maintenance workbays so the tire changers, floor jacks, welding equipment, etc. in this area are

centrally located for use.

e. Organizational Maintenance Workbays: In this area a lower level maintenance (i.e., small component replacement and general equipment servicing like lubrication, oil changes and tune-ups) called organizational maintenance is performed on vehicles, basic issue items, and components of equipment; and, also verifies user maintenance is performed by units assigned the equipment. The workbays should be clear span with no columns or walls obstructing operations and generally be arranged end-to-end to allow for repair of oversized equipment and a pull through capability. When workbays cannot be arranged end-to-end, one of the single rowed workbays may be equipped with two vehicle doors for a pull through capability; however, the number of single rowed workbays with two doors should be minimized to save first cost construction funds and to save energy costs for the life of the building. Circulation space will meet OSHA and local codes for evacuation purposes. Installed workbay equipment may be found in Table 3-1-3 of Chapter 1.

f. Warm-Up Bays: These bays may be authorized in a cold climate, refer to the NGB approved programming document to determine if authorized. The warm-up bay is not used for maintenance/repair; however, the area should be heated to 50 degrees F (generally be located adjacent to and may be partitioned off from the maintenance workbays), include a floor drain adequate to handle sediment that falls off the vehicles, one 110V duplex outlet per two bays, one grounding rod per two bays, one compressed air outlet per two bays, and one hose bibb per two bays. If there is an existing or proposed unheated enclosed or shed type vehicle storage area, this facility should be used to partition off and heat the area for the number of warm-up bays authorized instead of construction a separate facility for warm-up bays.

g. Mechanical/Electrical/Telecom Equipment Room: This area may accommodate HVAC equipment, communication equipment, and/or electrical distribution equipment associated with the building. Generally, the workbays would be heated by an infrared radiant heating system separate from the heating system for the other functional areas.

h. Custodial Room: This area may accommodate a mop sink, racks and shelving for custodial operations. For small maintenance shops only one custodial room may be required; larger shops may have more than one room.

i. Over Building Floor Plan Layout: This layout should

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be prepared by using the "Optimum Physical Relationship for Functional Spaces" and the individual functional area floor plan layouts drawn as previously described to obtain most economical and operationally efficient layout. Some of the individual functional area floor plans will have to change in shape and size (within the flexibility allowed) to obtain the desired results (i.e., to reduce the total length of exterior walls, number of building corners, minimize interior wall lengths, minimize utility and duct lengths, etc. to provide as economical and functionally operational facility as practical within design constraints).

j. Floor Plan Layouts/Equipment schedules: The floor plan layouts and equipment schedules for each authorized functional area may be prepared using the ideas presented in Volume 1, Chapter 2, paragraph 2-2c(17).

VOLUME 3

Chapter 3 Mobilization and Training Equipment Site (MATES) Collocated and Unit Training Equipment Site (UTES)

3-1 General: These shops receive, store, maintain and issue equipment selected from the National Guard units home station authorization to be used during annual (two week training period) and inactive duty (Weekend training period usually two days) training at a major training site. These shops generally perform organizational maintenance on all stored equipment (automotive, engineer, artillery, communications and electronic, small arms repair, and other Federal equipment) and the support maintenance (high level maintenance) is performed by other shops in the vicinity. These shops schedule and perform maintenance; requisition and account for repair parts; inspect military equipment and pertinent records of support units to assure that maintenance has been performed; and conduct maintenance training programs. Assist in the event of an emergency in equipment movement planning and action for mobilization. This chapter will provide specific design guidance for these shops and the functional areas. In the office areas the use of systems furniture is encouraged to save floor space and provide an individual with adequate and efficient space.

3-2 Design Considerations:

a. Interior Finishes and Lighting Criteria. Table 3-1-1 in Chapter 1 contains the room finishes and lighting levels to be used for the MATES (COL) and the UTES.

b. Interior Heights. The interior height of functional areas is explained in Chapter 1, paragraph 1-3b and Table 3-1-2.

c. Installed Equipment. The authorized installed equipment to support the shops will be shown on the functional area layouts when completed in the future, in discussions that are included below in the para. 3-4, "Functional Area Discussions/Design Criteria", and in Table 3-1-3 of Chapter 1. Installed equipment should be included as a part of the building base bid and not bid as separate items.

3-3 Optimum Physical Relationship for Functional

Areas: One example of an "Optimum Physical Relationship for Functional Area" diagram for the MATES (COL) and UTES is provided as Figure 3-3-2. After the designer has prepared a diagram for the specific project, the Military Department, Facilities Management Officer will approve it and coordinate it with the user.

3-4 Functional Area Discussion/Design Criteria/Layouts:

a. General. The following subparagraphs provide the designer, when appropriate, with background information pertaining to the operations and functions within certain functional areas and design criteria that applies to certain functional areas. The arrangements and sizes of these functional areas, may or may not be adjusted by the designer to fit an efficiently cost effective shaped building; to fit the actual authorized equipment floor demands; or, size of functional areas specified in the NGB approved programming documents (if not on the approved programming document, as approved by NGB-ILE-I and provided to the State Military Department).

b. General Supervisor/Production Control/Clerk Typist. Every shop may not have a general supervisor's position if the shop is too small. The general supervisor/supervisor oversees personnel and operations of the shop in performing organizational level maintenance on Federal surface equipment. The production control office assists the supervisor in work production control, repair schedules, equipment inventory and status.

c. Supply/Tool Room. Refer to Volume 3, Chapter 1.

d. Inspector Supervisor. The inspector provides technical guidance and assistance to shop personnel.

e. Inspector and Library. The inspector helps in the above tasks and the library contains all equipment shop manuals and other publications for reference by shop personnel.

f. Battery Room. Refer to Volume 3, Chapter 1.

g. Communication/Electronic Room. This room is used to maintain, repair, and install electronic and communication equipment; i.e., telephones, telegraph, radios, radar,

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Insert Figure 3-3-2
Optimum Physical Relationship for MATES (COL)/UTES Functional Areas

surveillance equipment, etc. This room may be insulated to reduce the air conditioning requirement; be located near the workbays; have weather stripping and seals on doors and windows to provide a relatively dust-free environment; have a 110V continuous wall electrical outlet strip over each work bench; provide 28V DC power at each bench; and should have temperature controlled to $74^{\circ} \pm 2$ degrees F. dry bulb. Work benches should be shown on drawings, but marked to be provided by the state or others.

h. Vault (Combat Vehicle Arms). Refer to Vol 1, Chapter 2-2c. One possible floor plan layout arrangement and cross section is provided as Figure 1-2-2.

i. Basic Issue Items (BII) Area. Many vehicles have a specific amount of accessory items (i.e., chains, tools, jacks, machine guns, track pads & links, compressors and the like) which are removed from the vehicles and stored in the BII area. These items are held in the BII area until guard units need vehicles for either weekend or two week annual training exercises. This area would be of a warehouse type construction. The personnel functions are to coordinate training equipment requirements with guard units; store, account for, and issue BII; and order and receive replacement BII lost, damaged or worn-out items. A 20-FT wide 6-inch thick concrete covered dock for forklift to load BII equipment may be installed on one side of the BII warehouse with the length of the dock not to exceed twice the minimum BII storage area dimension.

j. Small Arms Repair. Refer to Volume 3, Chapter 1.

k. Additional Workbay Space (UTES only). This area should generally be centrally located between maintenance workbays so the tire changers, floor jacks, equipment stands, welding equipment, etc. in this area are centrally located for common use. Small shops would generally locate all authorized additional workbay space at one location; but, larger shops may want the space located in more than one location depending upon the number of authorized bays, travel distance, amount of equipment authorized and amount of authorized floor area.

l. Organizational Maintenance Workbays. In this area a lower level maintenance (i.e., small component replacement and general equipment servicing like lubrication, oil changes and tune-ups) called organizational maintenance is performed on vehicles, basic issue items and components of equipment along with verification of maintenance performed by units assigned the equipment. The workbays should be clear span with no columns or walls obstructing

operations and generally be arranged end-to-end to allow for repair of oversized equipment and a pull through capability, when workbays cannot be arranged end-to-end, one of the single rowed workbays may be equipped with two vehicle doors for a pull through capability; however, the number of single rowed workbays with two doors should be minimized to save first cost construction funds and to save energy costs for the life of the building. Intra-circulation space has been included in the 20-Ft x 40-Ft and the 32-Ft x 32-Ft workbay size. However, to comply with NFPA to allow for personnel traffic in open workbay areas to have an exitway to the outside and entrance into the workbays without opening the vehicle doors, personnel doors and 3'-0" wide exitways may be authorized. Installed workbay equipment may be found in Table 3-1-3 of Chapter 1.

m. Warm-Up Bays. These bays may be authorized in a cold climate, refer to the NGB approved programming document to determine if authorized. The warm-up bay is not to be used for maintenance/repair; however, the areas should be heated to 50 degrees F (generally be located adjacent to and may be partitioned off from the maintenance bays), include a floor drain adequate to handle sediment that falls off the vehicles, one 110V duplex outlet, one grounding rod, one compressed air outlet, and one hose bib. If there is an existing or a proposed unheated enclosed or shed type vehicle storage area, this facility should be used to partition off and heat the area for the number of warm-up bays authorized instead of constructing a separate facility for warm-up bays.

n. Mechanical/Electrical/Telecom Equipment Room(s). Refer to Volume 3, Chapter 1.

o. Mens and Womens Latrine/Shower and Locker Room. Refer to Volume 3, Chapter 1.

p. Break/Assembly Area. Refer to Volume 3, Chapter 1.

q. Physical Fitness Area. Refer to Volume 3, Chapter 1.

r. Circulation. All net functional areas shown on the approved programming document have intra-circulation space included in the net floor area. The net office and work shop floor areas (excluding workbays) are authorized a 15% inter-circulation (i.e., 15% times the net office and workshop areas), to allow a common corridor for access from one functional area to another. The office and shop areas should be laid out to minimize the amount of inter-circulation (corridor) space required. The corridor width

should generally be no wider than 8'-0" unless and approved by NGB-ILE-IC. Lobbies would not normally be required for small shops (3-5 workbays); however, in cold climate areas a vestibule at the main entrance (the same width as the corridor) with two sets of doors to conserve energy may be used. For larger shops (6 workbays or more) the lobby area may be sized based on 12 to 16 percent (12 percent for the larger shops and the 16 percent for the smaller shops) of the authorized circulation shown on the approved programming document. The total net floor area of the lobby plus corridors must not exceed the net floor area authorized on the approved program document. Corridors should provide direct access to functional spaces without the use of offsets or elaborate circulation patterns. Perpendicular inter-corridor connections are desirable. All corridors should be double loaded, if possible, and serve at least two or more functional areas.

s. Overall Floor Plan Layout (MATES (COL)/UTES). This layout may be prepared by using the "Optimum Physical Relationship for Functional Spaces" and the individual functional area floor plan layouts drawn as previously described to obtain most economical/operationally efficient layout. Some of the individual functional area floor plans will have to change in shape and size to obtain the desired results (i.e., to reduce the total length of exterior walls, number of building corners, minimize interior wall lengths, minimize utility and duct length; etc., to provide as economical and functionally operational facility as practical within design constraints). One example of a layout is provided on Figure 3-3-25 for the MATES (COL) and Figure 3-3-26 for the UTES.

t. Floor Plan Layouts/Equipment Schedules (MATES/UTES). The floor plan layouts and equipment schedules for each authorized functional area may be prepared using the ideas presented in Volume 1, Chapter 2, paragraph 2-2c(17). One possible floor plan layout, one work flow diagram or work flow narrative, and one possible equipment schedule will be attached for each authorized functional area for a MATES (COL) and UTES when published. The data and floor plan layout for the Battery Shop are to be published at a later date.

VOLUME 3

Chapter 4 Combined Support Maintenance Shop (CSMS) and Mobilization and Training Equipment Shop (MATES)

4-1 General: The CSMS performs direct and general support maintenance (generally no lower level maintenance called organizational maintenance; and, the MATES performs organizational maintenance on military equipment permanently assigned to the MATES and direct and general support maintenance on all military equipment not maintained at the CSMS. The type of military equipment maintained includes wheeled and tracked motor vehicles, towed vehicles (including trailers & artillery), engineer, Communications/Electronics, small arms and other Federal equipment. This chapter will provide specific design guidance for these shops and the various functional areas. In the office areas the use of modular furniture is encouraged to save floor space and provide an individual with adequate and efficient space. The modular furniture would have to be furnished and installed with other than Federal Construction funds.

4-2 Design Considerations:

a. Interior Finishes and Lighting Criteria. Table 3-1-1 in Chapter 1 contains room finishes and lighting levels to be used for the CSMS/ MATES functional areas.

b. Interior Heights. The interior height of functional areas is explained in Chapter 1, Paragraph 1-3b and Table 3-1-2.

c. Installed Equipment. The authorized installed equipment to support the shops will be shown on the functional area layouts when completed in the future, in discussions that are included below in the para. 4-4, "Functional Area Discussions/Design Criteria", and in Table 3-1-3 of Chapter 1. Installed equipment should be included as a part of the building base bid and not bid as separate items.

4-3 Optimum Physical Relationship for Functional

Areas: One example of an "Optimum Physical Relationship for Functional Area" diagram for the CSMS/MATES is provided as Figure 3-4-2. After the designer has prepared a diagram for the specific project, the Military Department, Facilities Management Officer will approve it and coordinate it with the user.

4-4 Functional Area Discussion/Design Criteria/Layouts:

a. General. The following subparagraphs provides the designer, when appropriate, with background information pertaining to the operations and functions within certain functional areas; design criteria that applies to certain functional areas; and examples of equipment schedules and functional area floor plan layouts. The arrangements and sizes of these functional areas, may or may not be adjusted by the designer to fit an efficiently cost effective shaped building; to fit the actual authorized equipment floor demands; or, size of functional areas specified in the NGB approved programming documents (if not on the approved programming document, as approved by NGB-ILE-I and provided to the State Military Department).

b. General Supervisor/Supervisor/Production Control/Clerk Typist. The shop control office generally include the positions as listed above, however, every shop may not have a general supervisor's position if the shop is too small. The general supervisor/supervisor oversees personnel and operations of the shop in performing organizational and support level maintenance on Federal surface equipment. The production control office assists the supervisor in work production control, repair schedules, equipment inventory and status. The clerk typist performs the administrative and clerical functions to support the shop operations.

c. Instrument Repair. This room is used to maintain and repair electronic and hydraulic instrumentation on military equipment. The instrument repair function should be located in a sealed room equipped with weather-stripped doors, dust-free walls, and ceiling finishes painted white; fixed pane (i.e., non-operable windows), with optical quality glass, for viewing target sighting area; and, temperature/humidity control equipment to maintain a temperature of 74 + 2 degrees F dry bulb 50 + 5 percent RH.

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Insert Figure 3-4-2
Optimum Physical Relationship for CSMS/UTES Functional Areas

d. **Small Arms Test Room.** This room is used to test fire small arms. The area consists of a firing area (4-feet X 8-feet), a firing tunnel (4-feet X 32-feet) and a bullet storage area (4-feet X 20-feet). The test room should be located on the exterior wall and should meet the safety requirements of an indoor range. The basic design requirements of the Small Arms Test Room should be in accordance with para 3-2a.(1) thru (6) of NGR (AR) 385-15 for building envelope, ventilation, lighting, target carriers, lead/carbon monoxide levels and bullet stops designed for 4,500 foot pound muzzle energy.

e. **Vault (Small arms and Combat Vehicle Arms).** The CSMS is authorized a small arms vault, but a MATES is not. The CSMS receives small arms (hand guns, rifles, and machine guns) that are not repaired at the unit level, but are repaired at the CSMS. Both the CSMS and MATES are authorized a vault for combat vehicle arms (machine gun, coax guns, mortars, etc.) which are removed from the vehicles. For the CSMS where both vaults are authorized, it would be more economical to design one larger vault to accommodate the storage of all weapons. It is important for the vault to be located near the arms repair area and in or adjacent to the BII area for efficiency of repairing and issuing, because other items of issue are picked up by the unit at the BII area. Vaults should not be located adjacent to an exterior wall. An intrusion detection system described in Volume 1, Chapter 2, Electrical Interior is to be installed in each vault. Volume 1, Chapter 2-2 provides vault design guidance. See Figure 1-2-2 for typical vault layout and cross section.

f. **Injector Test Room.** This room has stationary and portable equipment and tools for testing of various types of injectors. The fuel injector test stand (FITS; stationary equipment) requires a minimum of 127-SF and a maximum of 230-SF set up and operating space. An additional 25-SF of storage area is required for the adapter supplied with the FITS. The manufacturer's recommendations should be followed. The general room ventilation should be in accordance with the recommendation of ASHRAE for this type of function or one of a similar function. The CMU walls, ceiling and doors should be sound-attenuating and of a washable material that does not retain the fuel fumes. There should be two 3'-0" x 7'-0" doors with one-half the door wire glass and an astragal or a removable center mullion.

g. **Transmission/Engine Test Room. Dynamometer Room.** This area is used to accomplish repairs, test and inspect the transmissions and/or engine used on military equipment. The following items are considered as minimum essential requirements:

- (1) 7 1/2 ton crane designed to allow the lifting of the transmission and engine.
- (2) Control Room and viewing window located so that both the transmission and engine can be viewed during operation. Window should be shatter-proof.
- (3) Ceiling heights should be comparable to the ceiling heights of other maintenance bays.
- (4) The room needs to be sound-attenuated to prevent exposure to noise hazards.
- (5) Temperature control - should be able to maintain an environment of from 60 to 80 degrees F.
- (6) Make-up air system designed to meet largest engine requirement.
- (7) A direct exhaust system capable of handling the volume and heat of the largest engine requirement.
- (8) A minimum of one roll-up door or leaf door wide enough for a fork lift are needed to set in equipment.
- (9) A cooling system consisting of cooling tower, water storage, pumps and connections must be designed for the specific dynamometer and be located outside the test room.

h. Basic Issue Items (BII) Area. This functional area is not required for a CSMS, but is for a MATES. Many vehicles have a specific amount of accessory items (i.e., chains, tools, jacks, machine guns, track pads & links, compressors and the like) which are removed from the vehicles and stored in the BII area. These items are held in the BII area until guard units need vehicles. This area would be of a warehouse type construction. The personnel functions are to coordinate training equipment requirements with guard units; store, account for, and issue BII; and order and receive replacement BII lost, damaged or worn out items. A 20-FT wide 6-inch thick concrete covered dock for forklift to load BII equipment may be installed on one side of the BII warehouse with the length of the dock not to exceed twice the minimum BII storage area dimension.

i. Machine Shop. This shop is used to repair, fabricate,

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rebuild and modify parts and components for vehicles and equipment. This shop contains equipment such as, lathes, drill presses, sawing machines, layout tables, hydraulic presses, and metal storage racks for metal pipes/bars stock/sheet metal. This shop should be located close to the welding and body shop and workbays.

j. Carpenter Shop/Lumber storage shed. These functional areas are used to remove, make-up, and crate-up , equipment and components with wood that are being received or shipped out. Also wood items, such as, desks, cabinets and shelving are fabricated or repaired. The lumber storage shed would generally not require heating since it is only used for storage. This shed could be constructed of the same material as the rest of the shop or be a pre-fabricated uninsulated metal building similar to the waste handling facility building.

k. Canvas Shop. This shop is authorized at a CSMS and only authorized at a MATES if a canvas repair person is authorized on the approved TDA. This shop is used to make repair and inspect canvas items, such as truck covers, tents (large and small), storage and carrier bags. The larger tents and canvas covers are spread out on the floor. A 1000 pound lifting device with a hook height of 14 FT is authorized to lift large items for inspection. A pit (approximately 6-Ft X 8-Ft and 3-Ft deep) may be provided to allow the sewing machine (Government furnished and installed) to be installed level with the floor. The pit should have one 110V duplex outlet for the sewing machine and be enclosed by a protective removable railing. If desired, commercial standard metal shelving no more than 3'-0" deep may be provided along one wall to allow for a work backlog. One 110V duplex outlet may be installed in each wall. One possible pit plan layout is shown on Figure 3-4-21.

l. Missile Repair/Vault. These functional areas are used to provide maintenance, repairs, adjustments and storage of the Towed/Dragon missile system. The missile repair area is to be located adjacent to the vault and near the instrument repair, COMSEC repair, and Commo/Elec. shops. The authorized missile vault storage area may be combined with the other vault requirements; and, therefore, one larger vault may be designed to save construction costs. The interior of the vault may be subdivided into three areas by metal caging to separate the missile systems, small arms (none authorized at MATES), and combat vehicle arms. The vault design requirements are provided in Volume 1, Chapter 2. The repair area should be in a sealed room with stripping and seals on all doors and windows to provide a relatively dust-free area; and, the temperature and humidity controlled to 74 ± 2

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degrees F dry bulb and 50 ± 5 degrees percent RH. For the layout it was assumed the missile shop was 400-SF and the vault space of 60-SF was partitioned off in the main vault with metal caging.

m. Calibration/Calibration Storage. The calibration repair shop is used to repair and adjust instruments and apparatus utilized to measure, test, control and indicate temperature, pressure, vacuum, fluid flow, liquid levels, mechanical motion, rotation, humidity, density, acidity or alkalinity, and combustion; including tools, dial pressure gauges; scales and balances; fire direction and sighting devices; and instruments for measuring, recording, and controlling electrical or communication equipment. The calibration shop should be in a sealed room without windows and have weather-stripped doors; and, the temperature and humidity controlled to 74 ± 2 degrees F dry bulb and 50 ± 5 percent RH. Secure storage is required for calibration and radiation calibration equipment awaiting repair; equipment not in use, but required for repair and testing responsibilities; and, stock item storage.

n. Pop Valve Test Room. This room is used for maintenance and testing of pressure levels and pop valves in compression systems.

o. Glass Repair. This area is used to fabricate and replace glass in vehicles.

p. Fuel and Ignition Repair. This area is used for inspecting, testing and repairing, if necessary or practical, generators, alternators, starters, distributors, brakes, carburetors, fuel pumps, clutch assemblies, and hydraulic hose assemblies. A net floor area of approximately 144-SF with industrial type shelving (total square foot of shelving not to exceed twice the net floor area) may be partitioned off with wire caging, CMU, or studs and gypsum board both sides to provide a secure area to store components. A 1000 pound capacity monorail and hoist is authorized.

q. Radiator Test and Repair. This area is used for inspection, testing and performing minor repairs to the engine cooling system. This area should be located close to the welding and body shop. This shop is authorized a net floor area of 660-SF; and, one possible floor plan layout is shown on Figure 3-4-27.

r. COMSEC Repair. This area is used to test, adjust, repair and modify cryptographic, ciphony, teletype, and related equipment. The design of this area is to provide the degree of physical security outlined in Appendix F of AR 380-5. This room is to be without windows and the door weather-stripped to provide a

relatively dust-free area. The temperature and humidity control equipment should be designed to maintain 74 ± 2 degrees F dry bulb and 50 ± 5 percent RH. This area should be located near the Commo/Elec Shop.

s. Radiation Calibration. This area is used for diagnostic analysis, repair and adjustment of instruments and apparatus which utilizes radioactive material as an operational component to measure, test, or indicate equipment operational requirements. This functional area should be located close to the calibration shop, not have windows, and doors are to be weather-stripped to provide a relatively dust-free environment. The temperature and humidity control equipment should be designed to maintain 74 ± 2 degrees F dry bulb and 50 ± 5 percent RH.

t. Organizational Maintenance Workbays. In this area the required lower level maintenance (i.e., small component replacement and general equipment servicing like lubrication, oil changes and tune-ups) is performed on vehicles, basic issue items, and components of equipment; and, also verifies user maintenance is performed by units assigned the equipment. The workbays should be clear span with no columns or walls obstructing operations and generally be arranged end-to-end to allow for repair of oversized equipment and a pull through capability, when workbays cannot be arranged end-to-end, one of the single rowed workbays may be equipped with two vehicle doors for a pull through capability; however, the number of single rowed workbays with two doors should be minimized to save first cost construction funds and to save energy costs for the life of the building. Intra-circulation space has been included in the 20-Ft x 40-Ft and the 32-Ft x 32-Ft workbay size. However, to comply with NFPA to allow for personnel traffic in open workbay areas to have an exitway to the outside and entrance into the workbays without opening the vehicle doors, personnel doors and 3'-0" wide exitways (Refer to para. 1-3d and Figure 3-1-8 of Chapter 1). Installed workbay equipment may be found in Table 3-1-3 of Chapter 1.

u. Support Maintenance Workbays. In this area a higher level of maintenance (i.e., minor and major component replacement, repair, or overhaul, major tune-ups and adjustments) called support maintenance is performed on wheeled, tracked & towed vehicles; engineer equipment such as graders, dozers, scrapers, gasoline or diesel powered generators; and, material handling equipment; and, also verifies user maintenance is performed by units assigned the equipment. For the discussion on arrangement, sizing, exitways, personnel doors, and installed equipment (Table 3-4-3), refer to the above paragraph, "Organizational Maintenance Workbay".

v. **Warm-Up Bays.** These bays may be authorized in a cold climate, refer to the NGB approved programming document to determine if authorized. The warm-up bay is not to be used for maintenance/repair; however, the areas should be heated to 50 degrees F (generally be located adjacent to and may be partitioned off from the maintenance bays), include a floor drain adequate to handle sediment that falls off the vehicles, one 110V duplex outlet, one grounding rod, one compressed air outlet, and one hose bibb. If there is an existing or a proposed unheated enclosed or shed type vehicle storage area, this facility should be used to partition off and heat the area for the number of warm-up bays authorized instead of constructing a separate facility for warm-up bays.

w. **Welding/Body Shop.** This area is used to repair, fabricate, rebuild or modify operational and training equipment by welding or brazing automotive equipment frames and other equipment bodies or frames; and plates castings using electronic or acetylene processes. This area should be located close or adjacent to the radiator, machine, and glass. This area should be serviced by one of the overhead traveling cranes installed for organizational or support maintenance bays. A hooded prefabricated or built-in place welding booth, approximately four to six feet wide by three to four feet deep (dimension may be modified for prefab units to meet standard manufactured units), enclosed on three sides with a small individual working vision shield, and a hood exhaust is authorized. A metal table three to four feet wide by six to eight feet long (if not existing) may be fabricated; and, a point-of-work flexible neoprene or galvanized metal five inch (maximum) diameter hose assembly to provide 100 fpm exhaust at the point of fume generation with a minimum of 240 degree working range may be provided over the metal work table.

x. **Wash Bay.** This area is used to clean vehicles, other equipment assemblies, components and parts by means of steam, low and/or high pressure hot water. Only one bay is authorized.

y. **Paint Shop (Stripping/Preparation/Paint Bays).** The paint shop (stripping, preparation, and paint bays) may be a separate building and is to be designed to comply with all applicable codes (i.e. NFPA, OSHA, ASHRAE, EPA, local, etc.). A decontamination room consisting of locker room space, latrine and shower may be provided for the paint shop. Paint and Stripping bays may have flush mounted fluorescent lighting in the ceiling and walls, and the paint bay may be equipped with a waterfall type filtration system. Vehicle doors may be 14-FT high by 16-FT wide insulated (exterior doors only) metal roll-up or sectional overhead steel doors in one end of the bay, and generally one 3-FT wide by 7-FT

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high insulated (exterior doors only) metal personnel door is sufficient. Environmental Agencies approval will be required prior to operating any paint shop. It is suggested that the paint shop might be bid as a separate additive item so that unforeseeable delays in receiving approvals would not prohibit timely bidding. The user of the paint bay should consider purchasing and using a high volume, low pressure, air supplied paint (HVLP) spray system. This system provides better spraying control and uses about 40% less paint.

(1) The general ventilation systems for all the bays in the paint shop are to be designed to comply with all applicable environmental health and safety codes; i.e., NFPA, OSHA, ASHRAE, etc. The stripping bay will be provided with mechanical ventilation with the air velocity passing across the smallest cross sectional area of the stripping bay of 55 FPM plus or minus 5 FPM. To provide laminar flow, the supply of air (filtered for the paint bay and unfiltered for the stripping bay) for both bays should enter on both sides and over top of the vehicle door and the greatest portion of the far wall should be used to exhaust the air. The paint bay will be provided with mechanical ventilation with the air velocity passing across the smallest cross sectional area of the paint bay of not less than 100 linear feet per minute when the paint operation is in progress. Slight negative pressure should be maintained in the paint and stripping bays. The paint bay should generally be prefabricated.

(2) **Paint and Stripping Bays.** These bays will be fully enclosed with no protrusions from the walls and have smooth walls, floors and ceilings to minimize paint spray collection, dust collection and air turbulence. The intake air may be heated to a design temperature of 55 degrees F. In warmer climates, the cost and problems associated with installing and operating a heated make-up air system should be weighed against the cost and inconvenience of not being able to use the system during days the inside temperature would be lower than an acceptable working temperature. An air compressor is authorized if it is not practical or economical to use the main shop compressor and would have to be of adequate capacity to supply both the stripping and paint bay equipment (compressor motors may require 3ph, 460V 60HZ electric power). A separate compressor to furnish Grade D, Type I compressed respirator air to the breathing equipment for both the stripping and paint bay operators is required (the capacity sized for two workers for each bay would generally be adequate).

(3) **Stripping Bay.** If media blasting is used, in addition to the 25-FT x 60-FT bay size, an additional area is required to house the plastic media blasting apparatus including the air

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compressors. This equipment may be included in an enclosed area and would be considered as a mechanical equipment room for space calculations. A storage area for storing the media is required.

(a) A media blasting recovery system may be provided. A full grated floor system should not be considered because of excessive construction cost, down time, and maintenance costs. Systems to consider are an opened vacuum system along one wall where beads can be blown (portable hand held blower) or swept into the vacuum system composed of an open grate 1 or 2 Ft wide along one wall; or, open grates (2 to 3-FT wide) in the center and on each side of two 48-inch wide concrete ribbon driving slabs from the vehicle door to the end of the media blasting room. The grating in between the driving slab bay be installed 48 to 60-inches below the floor level to allow blasting the underside of equipment.

(b) The requirement and type of blasting system has to be approved by NGB-ARL prior to the programming stage. All stripping equipment is considered installed equipment to be obtained with MILCON funds. NGB-ILE-I-C should be closely coordinated with in the process of selecting the media blasting equipment and recovery system.

(4) Mechanical/Electrical Equipment for Paint Shop. The mechanical/electrical equipment room is to be laid out to provide adequate clearance space around equipment for maintenance of the equipment, circulation space for personnel and material handling equipment to aid in repair of blasting equipment and handling of blasting supplies. The authorized space may be found in the programming documents; however, the actual area required may be less or more than the authorized based on the NGB approved final review of the layout.

(5) **Floor Plan Layout.** The net floor plan layouts for the stripping, preparation, and paint bays are all 25 by 60-FT (exclusive of mechanical equipment).

z. Lubrication Bay. This area is used to inspect lubrication levels, change lubricants, lubricate fittings, inspect and replace damaged fittings, and make visual inspection on other items such as belts, hoses, and leakage around hose, gaskets, etc. This area should be located near or adjacent to the Wash Bay. The floor plan layout was based on the assumed dimensions of a twenty by forty foot (20 x 40) workbay. Refer to Table 3-4-1, Installed Equipment, for additional design guidance. Only one bay is authorized.

aa. Tire Inspection/Selection for Recapping. This area is used to change, repair, turn-in and inspect tires.

bb. Supply/Tool Room. Refer to Volume 3, Chapter 1.

cc. Battery Room. Refer to Volume 3, Chapter 1.

dd. Communication/Electronic Room. Refer to Volume 3, Chapter 1.

ee. Small Arms Repair. Refer to Volume 3, Chapter 1.

ff. Men's and Women's Latrine/ Showers and Locker Room. Refer to Volume 3, Chapter 1.

gg. Break/Assembly Area. Refer to Volume 3, Chapter 1.

hh. Physical Fitness Area. Refer to Volume 3, Chapter 1.

ii. Mechanical/Electrical Equipment. Refer to Volume 3, Chapter 1.

jj. Circulation. Refer to Volume 3, Chapter 1.

kk. Overall Floor Plan Layout (CSMS/MATES). This layout may be prepared by using the "Optimum Physical Relationship for Functional Spaces" and the individual functional area floor plan layouts drawn as previously described to obtain most economical/operationally efficient layout. Some of the individual functional area floor plans will have to change in shape and size to obtain the desired results (i.e., to reduce the total length of exterior walls, number of building corners, minimize interior wall lengths, minimize utility and duct length; etc. to provide as economical and functionally operational facility as practical within design constraints). One example of a layout is provided on Figure 3-4-43 for the CSMS and Figure 3-4-44 for the MATES.

ll. Floor Plan Layouts/Equipment Schedules (CSMS/MATES). The floor plan layouts and equipment schedules for each authorized functional area may be prepared using the ideas presented in Volume 1, Chapter 2, paragraph 2-2c(17). One possible floor plan layout, one work flow diagram or work flow narrative, and one possible equipment schedule will be attached for each authorized functional area for a CSMS and MATES when published.



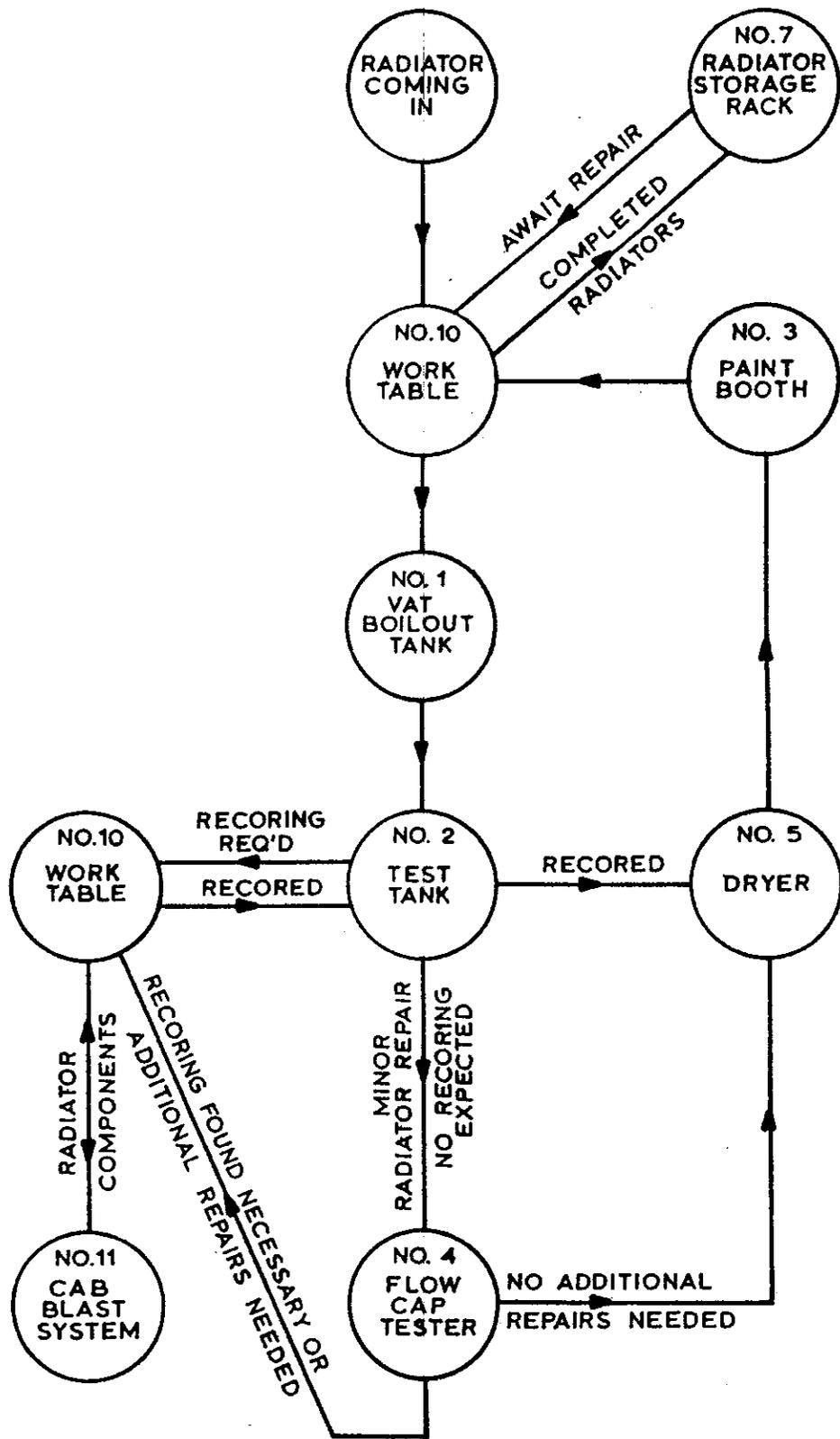
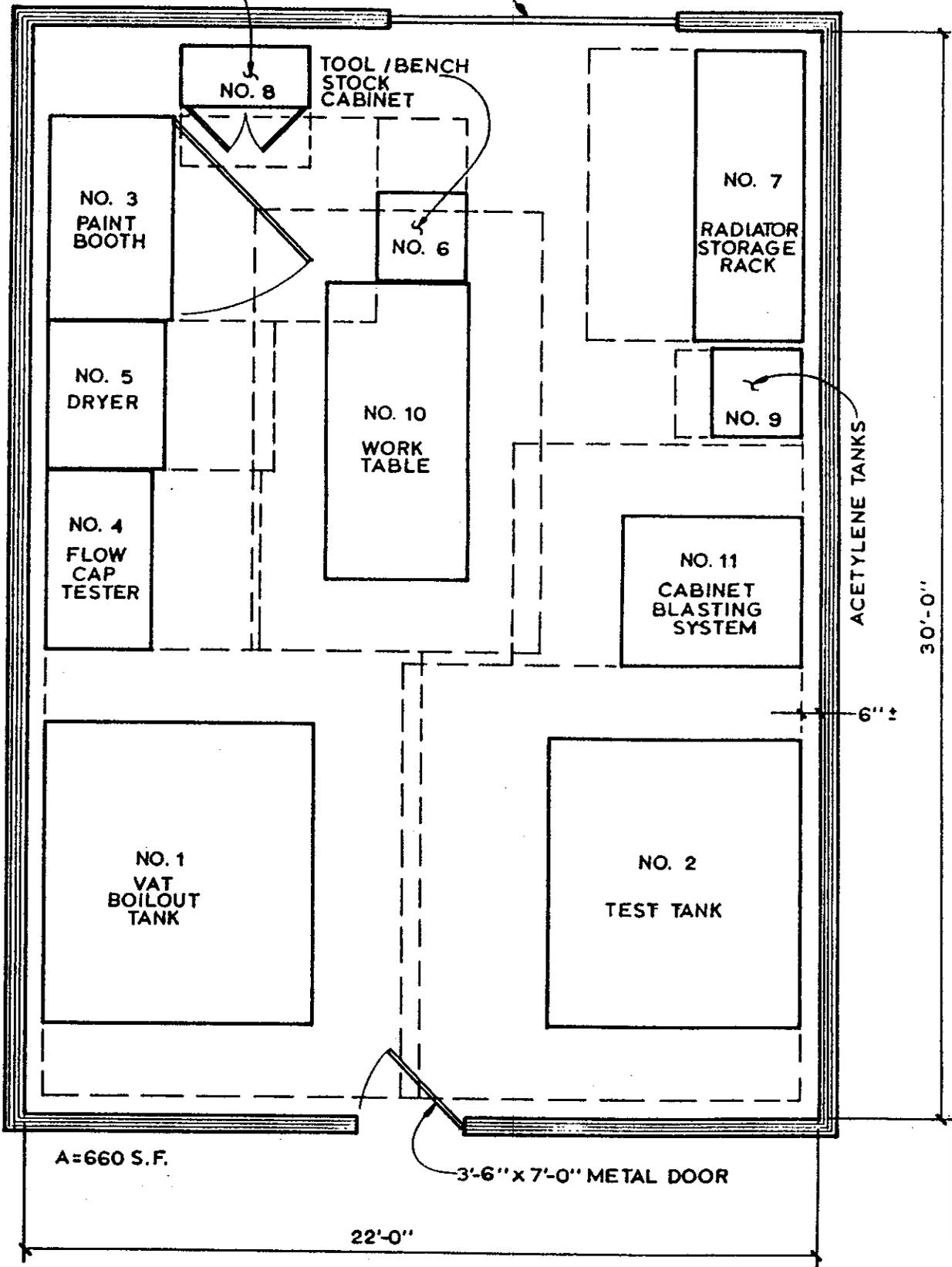


Figure 3-4-27 Radiator Test /Repair (Work Flow Diagrams) - CSMS /MATES

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8'-0" x 8'-0" STEEL ROLL-UP OR DG 415-2
SECTIONAL DOOR OR 2'-4'-0" x 8'-0"
DOUBLE DOORS WITH ASTRAGAL

FLAMMABLE
MATERIAL
STORAGE



A=660 S.F.

3'-6" x 7'-0" METAL DOOR

22'-0"

ACETYLENE TANKS

30'-0"

6"±

Figure 3-4-27 Radiator Test / Repair - CSMS / MATES

SCALE: 1/4" = 1'-0"

SHEET 2 OF 3

30 NOVEMBER 1990

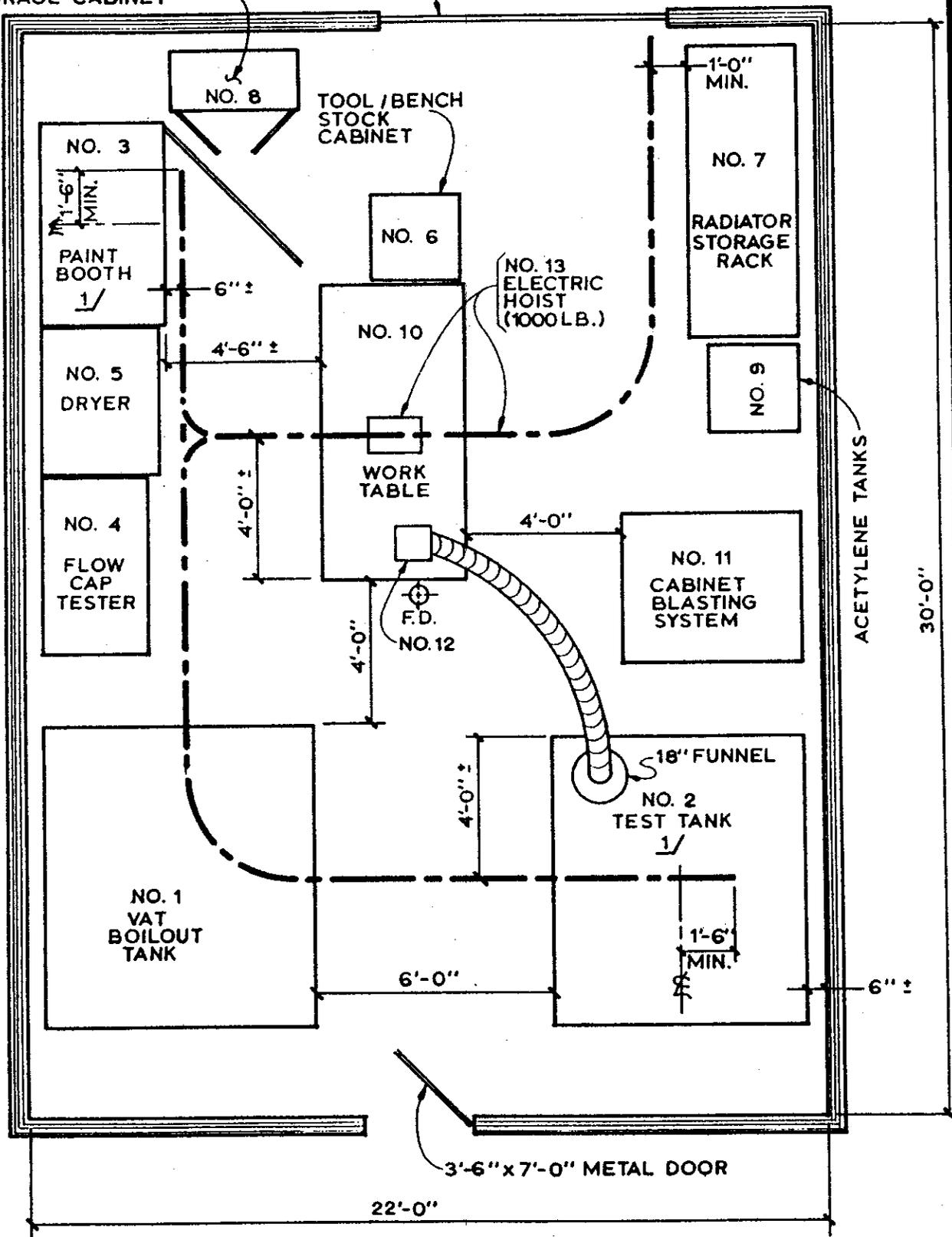
DG415-2

1/CONNECT 2" DIA. DRAIN LINE FROM EQUIPMENT DIRECTLY TO THE SANITARY SEWER.

2/UTILITY CONNECTIONS-SEE EQUIP. SCH.

8'-0"x8'-0" STEEL ROLL-UP OR SECTIONAL DOOR; OR, 2-4'-0"x8'-0" DOUBLE STEEL DOORS WITH ASTRAGAL.

FLAMMABLE MATERIAL STORAGE CABINET



AREA = 22'-0" x 30'-0" = 660 S.F.

Figure 3-4-27 Radiator Test /Repair-CSMS /MATES

SHEET 3 OF 3

DATE: 31 August 1990		EQUIPMENT SCHEDULE FOR:			CSMS/MATES		RADIATOR TEST AND REPAIR	
Equip. Item #	Equip. Class	QTY	Item Description	Dim. (W) (L) (H) (H)	TDA/TOE & LN # MFGRS STK #	TYPE OF FACILITY	REMARKS	FUNCTIONAL AREA
1	B	1	VAT BOIL OUT TANK (Degreaser)	7'-6" X 3'-6" X 6'-7" H. 8'-4" X Open Top H.	T35483 (Line Item No.) same number for all listed equip. items.	Working/maint. clearances: 2'-0" both sides and 4'-0" front. Need 7" Exh. vent for gas htr and a 7'-6" X 8'-4" overhead exhaust hood.	Compressed air directly connected to Vat; 1" natural gas line; 110V 6A 1/3 Hp motor (or 208/230V 3A)	Utilities
2	B	1	Test Tank, Water	7'-0" X 5'-2" X 8'-0" X	-	Working clearances of 4'-0" in front and 2'-0" on the two sides.	Compressed air directly connected to tank (CFM @ PSI) plus one outlet; one natural gas (if available) outlet for soldering.	
3	B	1	Paint/Flushing Booth	3'-6" X 7'-9" X 5'-8" X	-	Working clearances of 5'-0" in front. Exhaust system with 16" dia. duct from top of hood to outside the building.	1" cold water direct-connect for water filtration system. Exhaust system - 110V 8.6A or 230V 4.3A 1/2 Hp motor.	
4	B	1	Flow Capacity Test Machine	3'-0" X 5'-7" X 5'-0" X	-	Working clearance of 3'-0" in front.	110V 6A 60 HZ for water circulating pump 1/3 Hp, one 3/4 inch hose bibb; and, floor drain in immediate area.	

Figure 3-4-27 Equipment Schedule for Radiator Test/Repair - CSMS/MATES

DATE: 31 August 1990		EQUIPMENT SCHEDULE FOR:			CSMS/MATES		RADIATOR TEST AND REPAIR	
Equip. Item #	Equip. Class	QTY	Item Description	Dim. (W) (L) (H) Inches	TDA/TOE & LN # MFGRS STK #	Remarks	Utilities	
5	B	1	Dryer/Leak Exposer	3'-4" X 4'-2" X 3'-4"	-	Working clearance of 3'-0" in front.	One 110V 6A 60 HZ duplex outlet for 1/3 Hp (or 208/230V 3A); 1/2" dia. gas hook-up.	
6	C	1	Cabinet, Tools/Small Bench Stk Stge	2'-6" X 2'-6" X 3'-1"	-	Working clearance of 2'-0" in front.	None.	
7	C	1	Storage Rack, Radiator	3'-0" X 8'-0" X 7'-0"	-	Working clearance of 3'-0" in front.	None.	
8	C	1	Cabinet, Flammable Storage	1'-8" X 3'-7" X 5'-6"	-	Working clearance of 1'-8" in front.	None.	
9	C	1	Cart/Tank Acetylene	2'-6" X 2'-6" X 4'-0"	-	Working clearance of 1'-0" in front.	None.	
10	*C	1	Work Table	4'-0" X 8'-0" X 3'-0"	-	Working clearance of 2'-0" on all sides	One compressed air hose and one electric cord reel overhead long enough to reach all equipment; and, one 110V 15-20A duplex or quadplex outlet.	

Figure 3-4-27

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* If not on a TDA this may be purchased and installed as part of the construction project.

DATE: 31 August 1990		EQUIPMENT SCHEDULE FOR:			CSMS/MATES		RADIATOR TEST AND REPAIR	
Equip. Item #	Equip. Class	QTY	Item Description	Dim. Inches (W) (L) (H)	TDA/TOE & LN # MFGRS STX #	FUNCTIONAL AREA		
						TYPE OF FACILITY	Remarks	Utilities
11	B	1	Blasting Cap. Sys.	4'-2" X 5'-0" X 6'-0"	-	Working clearance of 2'-0" on ends and 3'-0" in front.	Compressed air 62 CFM @ 80 PSI direct connect; disconnect switch box for the 2 Hp motor 230/460V 6/3A 3Ph 60 HZ, and one 110V duplex outlet for 15W fluorescent machine light.	
12	A	1	Flexible Exhaust System	-	N.A.	Ceiling mtd., 1100 CFM 6" dia. approx. 14' long flexible hose with an approx. 18" dia. funnel with light in funnel.	110V service to exhaust fan motor; and, an on/off switch controlling fan and light located near the funnel.	
13	A	1	1000# Electric Operated Hoist and Trolley	-	K39061	The monorail and supporting structural members should be designed to carry a 2000# capacity hoist for possible future heavier loads. Min. hook height 7'-0".	As required.	

Figure 3-4-27

3-4-20

c. **Supply/Tool Room.** The supply/tools/parts technicians are responsible for requisitioning, stocking, accounting and issuing repair parts/supplies/ special tools/POL to shop personnel. The supply/tool room is generally located adjacent to each other for convenience of operation and control. The supply/tool room shall comply to the physical security standards set forth in Appendix C, AR 190-51. The door to these areas should be operable from the inside when locked from the outside. The main doors should be double 3'0" x 7'0" metal with one side being a dutch door, if desired by the user. For shelving, see Volume 1, Chapter 2, Specialties. There may be two undedicated 110V duplex electrical outlets in each functional area. The Supply Room outside apron or dock (if authorized) for loading/unloading supplies may be covered. The supply/tool room may have metal casing or a permanent wall between the two areas and was laid out based on the assumption two technicians were authorized; therefore, 260-SF of the authorized supply room area may be partitioned off as office space, and it was assumed twenty workbays were authorized giving a supply room area of 3,000-SF (150-SF/WB. x 20 WB). Therefore, the layout shows 600-SF for the tool room, 2,740-SF for the supply room, and 260-SF of office space (Finishes on walls, ceiling and floor and HVAC should be the same as any other administrative area).

d. **Inspector Supervisor.** The inspector provides technical guidance an assistance to shop personnel, conducts in-process and final inspections for quality control, performs technical inspections for classification of equipment, provides manpower for maintenance evaluation teams, and makes recommendations to increase efficiency and economy of operations. The inspector supervisor is to be provided a private administrative office of 100 SF.

e. **Inspector and Library.** The inspector helps in the above tasks and the library contains all equipment shop manuals and other publications for reference by shop personnel.

f. **Battery Room.** This room is used to put electrolyte in new batteries, charge batteries, in rare cases remove acid from unservicable batteries (acid is poured into an acid resistant container not down the sanitary sewer), and storage of new dry batteries, electrolyte, and bicarbonate of soda. No compressed air outlets should be installed in this area. This room shall be equipped with an eyewash and deluge shower combination fixture without floor drains, equipped with an audible alarm activated when the eyewash/shower is operated with the alarm located where workers outside the battery room can hear the alarm and respond, and the eyewash/shower located for easy access from any point in the room without obstructions; shall be adequately ventilated (louvered door or wall and non-explosion proof spark resistant exhaust fan); and ANSI std. 29.1-1971 stipulates minimum of 2 CFM per SF of floor area) to prevent build-up of gases during charging operations. Explosion proof lights, motors, and switches are not required by the National Electric Code for small charging operations that are properly ventilated. An acid resistant sink with cold water only should be

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provided; however, the electrolyte is to be disposed of in accordance with Federal, state and local environmental regulations, and not poured into the sanitary or storm drainage systems. For this reason, special neutralization/dilution chambers in the drain lines are not normally necessary; however, where specifically required by State code, such a device may be provided as long as a Certificate of Code Requirement is submitted (see NGR 415-5). Built-in acid resistant shelving (preferably wood or PVC pipe) area may be approximately equal to the battery room net floor area. An acid resistant built-in workbench (with shelves below it) located adjacent to the sink may be provided. The number of charging circuits may vary with the size of the battery shop (generally, two chargers per battery shop); however, these circuits should be connected to the exhaust fan so that when the charging operation starts, the exhaust fan goes on automatically.

Two undedicated 110V duplex outlets may be provided. A switch to control all electrical power to the room should be located adjacent to and just outside the Battery Room door. This layout has been made for a maintenance shop that has 20 workbays which then requires a floor area of 700-SF (220 SF Basic x 25-SF/WB. x 20 WB. = 700 SF; however, the maximum net floor space for a CSMS or MATES is limited to 600-SF by NGB PAM 415-12 which will be used in the layout).

Communication/Electronic Room. This room is used to maintain, repair, and install electronic and communication equipment; i.e., telephones, telegraph, radios, radar, surveillance equipment, etc. This room may be insulated to reduce the air conditioning requirement; be located near the workbays; have weather stripping and seals on doors and windows to provide a relatively dust-free environment; and should have temperature controlled to 74 ± 2 degrees F. dry bulb and 50 ± 5 percent RH. For 5 technicians the net floor area used is 600-SF (100-SF Basic + 100-SF/Tech X 5 Tech).