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MILITARY HANDBOOK

AVIATION TRAINING FACILITIES

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ABSTRACT

This handbook is provided as basic design guidance for facilities covered by facility Category Codes 171-20 and 171-35 for use by experienced architects and engineers. The contents include design criteria for simulator facilities and maintenance training facilities.

FOREWORD

This handbook has been developed from an evaluation of facilities in the shore establishment, from surveys of training manufacturer's facility requirements, and from selection of the best design practices of the Naval Facilities Engineering Command (NAVFACENGCOM), other Government agencies, and the private sector. This handbook was prepared using, to the maximum extent feasible, national professional society, association, and institute standards. Deviations from these criteria in the planning, engineering, design, and construction of Naval shore facilities cannot be made without prior approval of NAVFACENGCOM Headquarters (Code 15C).

Design cannot remain static any more than can the functions it serves or the technologies it uses. Recommendations for improvement are encouraged from within the Navy, other Government agencies, and the private sector and should be furnished on the DD Form 1426 provided inside the back cover to Commanding Officer, Southern Division, Naval Facilities Engineering Command, Code 4011DB, 2155 Eagle Drive, P.O. Box 190010, North Charleston, South Carolina 29419-9010; telephone (803) 743-0321.

THIS HANDBOOK SHALL NOT BE USED AS A REFERENCE DOCUMENT FOR PROCUREMENT OF FACILITIES CONSTRUCTION. IT IS TO BE USED IN THE PURCHASE OF FACILITIES ENGINEERING STUDIES AND DESIGN (FINAL PLANS, SPECIFICATIONS, AND COST ESTIMATES). DO NOT REFERENCE IT IN MILITARY OR FEDERAL SPECIFICATIONS OR OTHER PROCUREMENT DOCUMENTS.

TRAINING FACILITIES CRITERIA MANUALS

Criteria Manual	Title	PA
MIL-HDBK-1027/1	Firefighting School Facilities	LANTDIV
MIL-HDBK-1027/2	General Training Facilities (Proposed)	SOUTHDIV
MIL-HDBK-1027/3	Range Facilities and Miscellaneous Training Facilities other than Buildings	SOUTHDIV
MIL-HDBK-1027/4	Aviation Training Facilities	SOUTHDIV

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Section 1: INTRODUCTION

1.1 Scope. This handbook is intended to assist in design of the highest quality aviation training facilities at reasonable cost and in compliance with Department of Defense (DOD) criteria. It covers the design requirements for aircraft operational and maintenance training facilities. Special attention is focused on accommodating a dynamic training environment which is on the leading edge of current technology. Terse statements from other criteria may appear in the text for prompting the user on unique issues; however, references are generally made to appropriate criteria in order to avoid redundancy and assure the use of the latest criteria.

1.2 Distribution of Responsibilities. Shore activities and architect/engineer (A/E) designers using this handbook are advised that there are several participants in the development of aviation training facility design. First, there is the local command and resource sponsor that identify the need for a new, enlarged, or upgraded facility and initiate the project development process. Second, there is the Naval Training Systems Center (NTSC), which is responsible for the procurement of training systems for the Navy and Marine Corps as directed by the Naval Air Systems Command. Third, there is NAVFACENGCOM, which is responsible for management of design and construction of Navy shore facilities.

1.3 Background

1.3.1 Simulator Facilities. The flight simulator was introduced during World War II to train aviators quickly and safely in the fundamentals of flight. Today's simulators perform this function and, when combined with visual systems, can train pilots in landing at sea, air combat maneuvering and weapons delivery. Technology has produced stationary trainers capable of simulating the motion of high performance jet aircraft through seat assembly "g-cuing" dynamics with hydraulic and pneumatic-driven components and realistic cathode ray tube (CRT) projection systems mounted directly to the canopy. Adoption of these "stationary" trainers will undoubtedly reduce the mechanical and structural requirements typically required by trainers on motion pedestals with hydraulic needs and dynamic structural loads. Helicopters and certain other aircraft will continue to utilize motion systems. Demand for simulation devices will continue to grow as economic merits are fully realized and as both reservists and those on active duty are required to maintain a high state of readiness. Operational flight trainers (OFTs) with motion and visual capabilities are being utilized for flight hour substitution.

Innovations in visual display technology such as miniature visual display headgear, cockpit controls, and sophisticated dual screen touch screen CRTs may eventually enable commands to conduct intermediate level training exclusive of motion systems and domes. Single and double domes can be as large as 40 feet in diameter. Future trainers may downsize domes; however, visual equipment placed outside the smaller domes could still justify the same

spatial requirements in the high bay area. Advancements which can accurately simulate acceleration vectors, emerging head and eye-tracked display systems, and wider fields of view are major developments.

Future training systems will operate in an integrated mode. Facilities must then accommodate computer areas in close proximity to a central computer managing the training environment. Integrating training systems to perform combined operations, such as flying a mission with attack aircraft and fighter escort, could require the use of satellite communications between bases. Antisubmarine warfare (ASW) helicopter simulators can now be linked in pairs for combined training with each other and with the antisubmarine sensor operator and acoustic trainers. The P-3C OFT has the capability of coupling with a P-3C tactical operational readiness trainer which allows accomplishment of certain crew coordination qualification exercises. Previously, these quals had to be done in the aircraft. Use of simulators for mission preparation will drive some simulators to become portable for squadrons to carry on deployment yet retain sufficient capability to simulate the mission environment.

1.3.2 Maintenance Training Facilities. Maintenance trainers were developed to instruct students in the methods and procedures required to maintain aircraft systems. Trainers allow the students to see, and in some cases, gain hands on experience with the equipment prior to working on actual gear without producing wear on the actual equipment.

1.4 Planning Criteria. General planning criteria for training facilities is in NAVFAC P-80, Facility Planning Criteria for Navy and Marine Corps Shore Installations, under Category Code 171 in Chapter 2, Section 1. Specific planning criteria for administrative and maintenance areas is in MIL-HDBK-1190, Facility Planning and Design Guide, Chapter 4.

1.5 Project Engineering (PE) Phase. During the PE phase, a Total Team Pre-Design Process session at the host activity should be used to establish requirements and to familiarize all present with the roles of each team member. Include at the session a project team consisting of the using activity (or customer team which includes public works specialists, Resident Officer in Charge of Construction (ROICC), major claimant and end user), the Engineering Field Division (EFD) engineer- or architect-in-charge, the training equipment manufacturer, the facility design firm, if designed by A/E, and the equipment procuring agency. In addition, for simulators, include the NAVAIR Assistant Program Manager for Training (PMA205) and Shore Facilities Office (Code 09Y), NTSC Trainer Facilities and Electromagnetic Effects (Code 412), and the contracting officer technical representative (COTR). Include the Naval Air Maintenance Training Group Detachment (NAMTRAGRUDET) for aviation maintenance training facilities. Marine Corps projects must include the Fleet Introduction Team (FIT) and the S4 which is the Marine counterpart to the Navy Public Works Office.

The manufacturer's Trainer Facility Report (TFR) is required as a

precedent to ready for design certification. Training equipment may continue to undergo development as the building design progresses; therefore, methods of communication between the facility designer and manufacturer via the EFD must be established. NAVAIR engineering personnel are available during design and construction to provide specialized expertise to NAVFAC and can arrange for manufacturers' representatives to attend design reviews. Review sessions attended by the manufacturer must be approved in advance by NAVAIR Codes 09Y and PMA205 and NTSC Code 412. Manufacturer and facility designer schedules must be closely monitored. This will allow design personnel to schedule design submissions to avoid potential design change orders. The type of developmental modifications which traditionally have the greatest impact on the facility design should be identified by the manufacturer. Device related issues account for the majority of design changes. Repositioning of reaction bases and increasing electrical power, heating, ventilating, and air conditioning (HVAC), and hydraulics are often required.

1.6 Construction Phasing. Phasing can severely impact the cost of a project. Aviation Training Facility projects are dynamic in that development of training devices often parallels the building design development. Evaluate construction phasing closely to minimize unnecessary constraints on the construction contractor. The ROICC must be involved early on in the project to advise the project team on any proposed phasing plan. Additions and alterations to existing facilities require special attention since the work may cause unacceptable out-of-service conditions for existing devices.

1.7 Site Verification. The requirement for aviation training facilities to be located in close proximity to core activity and flight lines must be balanced with the need for a relatively noise free environment for classroom instruction and minimal vibration which can affect simulation equipment. Comply with OPNAV Instruction 11010.36A, Air Installation Compatible Use Zones (AICUZ) Program. Accordingly, aviation training facilities shall be classified as educational services and are not permitted in noise zones with day-night average sound level (DNL) of 75 or above. Refer also to NAVFAC P-970, Planning in the Noise Environment. Training equipment is designed to tolerate a certain strength of electromagnetic fields; however, exceeding the design limits could result in malfunctioning equipment and physical damage. Review siting to confirm if any of the following will impact the project:

a) Other construction

b) Future expansion

c) Archeological

d) Wetlands

e) Coastal zone management

f) Environmental permits

g) Fire protection water pressure

h) Flood plain

i) Security clear zone

j) Former hazardous waste spills (contaminated soils)

k) Storm water management

l) Historic preservation

m) Base fire departments

n) Separation of structures in accordance with MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design and Construction.

o) Significant biological features (vegetation, wildlife, etc.)

p) Micro-climatic conditions

q) Other land-use factors as noted in Master Plan

r) Soil stiffness impact on vibration control

s) High-intensity noise

t) TEMPEST requirements

u) Base Exterior Architecture Plan (BEAP)

v) Electromagnetic Interference (EMI) Survey

w) Radiation hazards

1.8 Operation and Maintenance Support Information. Type A Operation and Maintenance Support Information (OMSI) development is mandatory on aviation trainer facilities. The designer will normally prepare the OMSI package using material provided by the construction contractor. NAVFAC Instruction 11013.39A, Operation and Maintenance Support Information (OMSI) for Facilities Projects, implements procedures for the application of OMSI to the acquisition process.

Section 2: SIMULATOR FACILITIES

2.1 Functional Requirements. Aviation simulators range from part task trainers (PTT) to weapons tactics trainers (WTT) and vary in size from single room trainers to integrated complexes with several simulators performing the same mission.

a) Part task trainers, aircrew systems trainers, and cockpit procedures trainers are primarily used to instruct the pilots in the layout of the cockpit and Naval Aviation Training and Operating Procedures Standardization (NATOPS). This could be a mockup of the cockpit or an operators console. Normally the supporting computers for the trainers are not separated from the mockup. A trainer containing a mockup of the cockpit may include hydraulic systems to simulate the control stick resistance and requires approximately 120 additional square feet for the pump.

b) Tactics trainers normally simulate the non-piloting type positions of the aircraft such as the radar intercept officer (RIO), the anti-submarine warfare (ASW) aspects, and the Naval flight officer (NFO) of EA-6B aircraft. Many times these trainers are coupled to an OFT to integrate the pilots with the crewmen for missions.

c) OFTs can either be static or mounted upon a six degree of freedom (DOF) motion system. Visual systems range from cathode ray tube (CRT) type to the 40 feet diameter dome with projection systems. The procuring activity should include 60 Hz to 400 Hz conversion equipment in the procurement contract for any equipment requiring 400 Hz power.

d) Weapons system trainer (WST) is basically a combination of the OFT and the tactics trainer. Each portion of the WST is normally capable of operation in either the stand-alone or integrated mode.

e) Weapons tactics trainer (WTT) for the F14 and F18 high performance fighters is comparable to having two OFT's integrated into a single trainer. AH-1 and AH-64, on the other hand, utilize one cockpit for the pilot to fly the aircraft and the second cockpit for the gunner to control the aircraft weapons. The key items that make up a WTT are the visual systems for environment and targets and the ability to integrate as noted above.

The prime document in the facility development is the simulator manufacturer's TFR. The TFR typically outlines facility requirements to accommodate each trainer device and is normally not available until after the equipment contract has been awarded. Coordinate closely with the device manufacturer if the TFR is not available. This handbook contains trainer facility data sheets which reflect the pertinent requirements in standard format for the designer.

2.1.1 Special Program Considerations. Device support, physical security, future modification to the equipment, pollution avoidance from the hydraulic

fluid spills, adequate computer room air conditioning and clean power are prime considerations for training facilities.

2.1.2 Future Growth. Ascertain any future upgrades and growth patterns which may affect design flexibility for the high bay and computer rooms.

2.2 Facility Design. Locate simulator devices remote from sources of vibration within the building. Identify existing sources of vibration in buildings which are retrofitted for device installation and provide measures to control vibration. In the future, requirements for contractor office space will probably increase with more private contracting for training services.

2.2.1 Site Planning. Base the siting on a thorough investigation and analysis of the existing physical conditions of the land and the functional requirements of the project. Place structure(s) and paved areas to minimize disruption to any existing utilities and/or future expansion. See mechanical sections for requirements on utility entry points into the mechanical room. Accommodate future expansion plans.

The site must provide adequate truck turnaround and maneuvering space for the installation and removal of training equipment. The exterior access drives required for the installation and removal of equipment from the facility will be used for that purpose very infrequently. When not being used for equipment installation and removal, the maneuvering space can be used for other purposes such as extra parking. Consult the using activity and base for needs. Designated pilot and instructor parking spaces are recommended convenient to the building entry. Reevaluate site locations near sources of vibration due to extreme simulator sensitivity where laser projector systems are incorporated. Avoid simulator locations adjacent to heavy equipment vibration sources or truck traffic.

2.2.2 Architectural. Place emphasis on simple, straightforward functional solutions to both interior and exterior design and detailing. Careful interior planning and design are necessary to ensure the most efficient, productive work environment. Space planning should result in a furniture/equipment footprint with life safety considerations complying with NFPA 101, Safety to Life From Fire in Buildings and Structures. Seismic design may require limits on the height of structures and design configurations as prescribed in Chapter 6, par. B.3.d.(2), MIL-HDBK-1190. Follow guidelines given in MIL-HDBK-1001/1, Basic Architectural Requirements and Design Considerations, and MIL-HDBK-1190.

Massing for simulator facilities is usually governed by the high bay which encourages two levels of adjoining ancillary support space. If handled properly, this can eliminate multiple roof levels and minimize roof area and overall cost and trainees can usually access dome and motion based cockpits directly from second floor level. Maintain adequate floor to structure clearances. Minimizing heights in the high bay area can severely inhibit flexibility for future trainer modifications.

2.2.2.1 Adjacency. Some spaces require adjacency for the efficient and correct operation of the equipment installed therein while others provide adjacency for the convenience of the users of the facility. See figure 1. For instance, a training device with hydraulic systems requires a pump room adjacent to the trainer room, whereas briefing/debriefing rooms are located adjacent to the respective trainer for convenience of instructor and trainee.

A primary adjacency requirement is that the device area must be adjacent to the mechanical pump room, the computer room and the instructor station/console space. The maximum distance from six degree of freedom (DOF) devices to the hydraulic room is 150 feet. Place high bay areas of the same or nearly equal height adjacent to each other and combine into one level for simplification of roofing and structural systems and resultant cost savings.

2.2.2.2 Circulation. Circulation patterns in simulator facilities and intensity vary among aviation training facility types. Varying numbers of administrative personnel, contract personnel, trainees, and instructors contribute to the pedestrian traffic load. Arrange spaces to provide the most direct access. Group classrooms utilizing oversized equipment to minimize need for lengthy extra wide access corridors to the exterior. Widen corridors used for display.

Circulation intensities are similar to an administrative facility except that in/out traffic for instructors and pilots is brisk. Simulator facilities must also support contractor personnel, Government administrative support personnel, and visitor traffic. Accommodate pilot trainees' ready access from the building entry to the training stations and Ready Room.

A visitor control point is required for all building entrants for issue of badges and signing in and out. Classified storage areas and classified control can complicate the pedestrian flow and fire exiting patterns. Card reader and key pad access control may be required by the user and the base security officer in conjunction with Naval Criminal Investigative Service Command (NCIS).

2.2.2.3 Functional Priorities. The most important sections of the facility are those that are directly required to perform the training mission. Other portions of the facility are secondary. Space groupings in order of importance are:

a) Training rooms (e.g., classrooms, brief/debrief rooms, trainer rooms, etc.) required to perform the training.

b) Direct support spaces such as computer rooms, storage rooms for classroom materials, mechanical equipment rooms, instructors' offices, etc. Without these, the training would be degraded or impossible to perform.

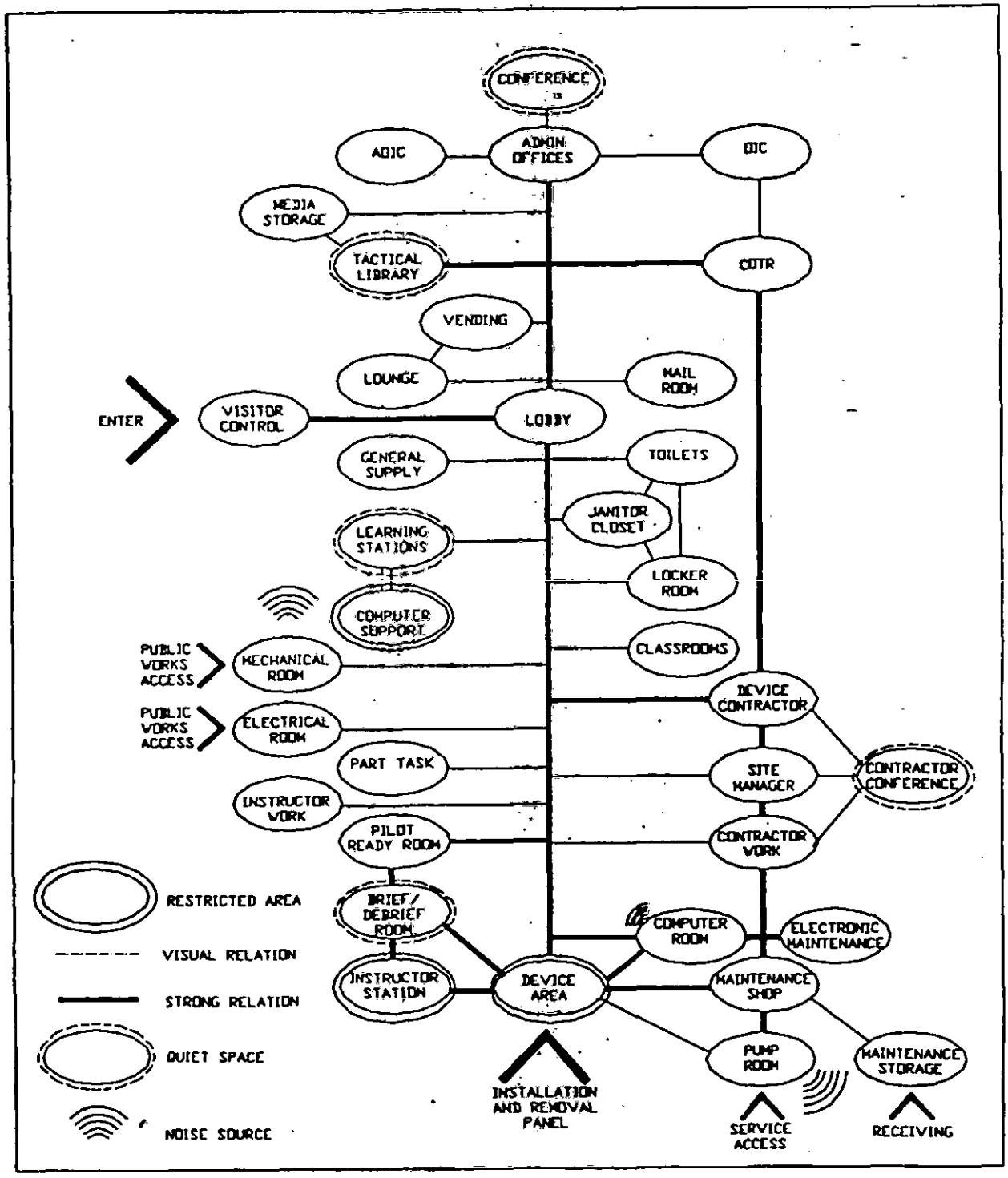


FIGURE 1
SIMULATOR FACILITY BUBBLE DIAGRAM

c) Indirect support spaces such as toilets, lounges, and administrative offices. Without these, training can be accomplished, but at acost in the efficiency of the training organization.

2.2.2.4 Spaces and Characteristics

a) Administrative Offices. Includes secretarial functions, supervisors, and/or security personnel. An open office partition plan in administrative areas should be used for economy of space and open intra-office communications. An acceptable path of travel must be established per NFPA 101 for fire exiting. Use sound absorbing materials as required in office areas. Provide access flooring where computer networks are utilized. Refer to MIL-HDBK-1034, Administrative Facilities, for additional data.

b) Assistant Officer in Charge (AOIC). Reports directly to the Officer in Charge. This space may not be required within all facilities since this person may already have adequate office space elsewhere.

c) Brief/Debrief Room. The debriefing room is used to instruct the trainees in the training mission prior to the simulated flight and to debrief the trainee on performance and improvement. This instruction incorporates the use of charts and replay of the mission from the simulator computer memory or tapes.

Accommodate two to eight people and a debriefing computer console where required by the TFR. Access flooring is required for consoles. A CRT screen, keyboard, and disk or tape drive unit cabinet are utilized. Provide chart pin-up wall space and a marker board where required. One room at 100 square feet is required for each WTT or OFT. Maintain a maximum noise level of 35 dBA complying with DM-1.03, Architectural Acoustics.

d) Classroom Equipment Storage. Use a lockable closet accessible from the classroom. Centralize other storage shared by other classrooms on the same floor.

e) Computer Room. Generally contains the visual image generation equipment, simulation computers, computer memory and peripherals, and freestanding cooling equipment. This space is subject to modifications whenever the training device is upgraded. Avoid other functions in computer rooms which require unnecessary intrusions increase dust and air conditioning loads.

A typical OFT requires computer equipment area, work space and access space plus additional space for computer room air conditioning equipment. The required access floor is typically 18 inches in height and, if possible, depress the concrete subfloor 18 inches so the top of the access floor is the same height as the facility finish floor adjacent to the room. The access floor space will usually serve as a supply air plenum.

f) Conference Room. Address all types of conference space utilization to ascertain needs. Accommodate flexibility in occupancy counts and table arrangements. Consider providing the capability of subdividing the room(s) with accordion folding partitions having a sound transmission class (STC) rating not less than 40 and provide maximum sound absorption in finishes. Provide porcelain marker board, bulletin board, and pull down projection screen. Provide two means of egress with door swings in the direction of exit travel for rooms exceeding an occupancy of 50 people.

g) COTR Office. The COTR monitors contractor performance and serves as the primary point of contact between the contractor and the Government. The COTR requires administrative office space in close proximity but separate from the contractor. Provide lockable private office for Government representative(s). COTR's require efficient access to a variety of spaces in the facility including the high bay, contractor offices and library.

h) Contractor Conference. Ready access to a conference room large enough for the contractor to meet in private with all personnel is required.

i) Contractor Work Room. The Contractor Operation and Maintenance of Simulators (COMS) personnel will require their own work areas to perform their administrative functions and work. Space requirements will vary with contract requirements.

j) Corridors. Set the width of corridors considering trainee occupancy loads and exiting, heavy circulation points such as stairways and vending areas, and the size of equipment to be transported to and from classrooms allowing for maneuvering equipment through doorways. Base minimum width dimensions on building occupancy complying with NFPA 101 and minimum width of equipment maneuvering space, whichever is greater. Where lockers are not provided, provide coat and foul weather gear hanging areas near entrance in recessed alcoves or in student lounges.

k) Darkroom. This facility may be required where instructional support work is done. A 12 feet by 16 feet space is usually adequate.

l) Dedicated Classroom. One or more dedicated classrooms may be required for classified teaching material. Provide adequate STC ratings for walls in accordance with levels of security.

m) Device Area or Trainee Room. Often referred to as the "high bay," this space contains the simulator device. Operational in-flight trainers usually incorporate some form of cockpit simulation with various combinations of motion/non-motion and dome/non-dome visual projection systems. Visual projection systems may require special maintenance access provisions in the manufacturer's TFR such as wrap around catwalks or mobile scaffolds. Organizational ("O") level maintenance is performed at the device.

Allow stowage space for moveable service platforms. Height of the high bay area should be set generously with regard to the highest excursion limit anticipated in proposed training device(s) and clearances for overhead crane during installation/removal and operation. Current worst case space requirements for a single trainer are for an OFT non-motion simulator with a 40 feet diameter dome utilizing externally mounted visual projectors. Keep all facility elements and fixtures outside the excursion limits of motion simulators.

Provide trenches instead of access floor systems and route from the device to the hydraulic pump room and mechanical and computer rooms. Provide trenches for pneumatic and hydraulic tubing and air ducts. Carefully coordinate trench layouts by device manufacturer to avoid conflicts with catwalk platform bases, trainer supports, motion system pads, and other obstructions.

n) Device Contractor Office. The office is required for the administrative work associated with fulfilling the contract for the operation and maintenance of the training equipment. It should be located near the maintenance room and the COTR office. This room may be combined with or be identical to the Site Manager's Office. Provide lockable office space. More than one contractor may be present on site. Provide work space for contract instructors if required by the COTR.

o) Electrical Room. This space contains the facility main distribution panel, subdistribution panels and step down transformers required for the operation of the facility. Frequency converter and telephone panelboard may be included. Do not combine the electrical room with the mechanical room.

p) Electronic Maintenance and Repair. Minor repair of the trainer components is undertaken here by the device contractor. Provide workbenches for minor repair. Include these on the collateral equipment list. Consider peg mounting boards on the wall for hanging cables. The standard Navy electronic workbench, type NEB-2 with PS-1A 24VDC electric-converter is recommended for electronic maintenance shops. Verify if 400 Hz and other power characteristics are required. Workbenches may be ordered through the Aviation Supply Office, Philadelphia, PA. Typical installation consists of three 24-inch wide modules with back panels for an assembled size of 72 inches wide by 33-7/8 inches deep by 60-1/4 inches high. Suggested components follow:

3 ea-FSN:	1N6625-851-2158	Back Panel and Shelf Assembly
3 ea-FSN:	1N6110-839-8026	Electrical Distribution Box
2 ea-FSN:	1N6625-851-2157	Base Assembly
2 ea-FSN:	1N6625-851-2156	Cabinet Assembly
1 ea-FSN:	1N6625-851-2159	Table Assembly
1 ea-FSN:	1HM613000-4108488TM	PS-1A electric-converter

q) General Academic Classroom. Seating arrangement is the most important factor in determining the size and shape of a classroom. Accommodate any special requirements for static and operative displays and team teaching, such as small, medium, and/or large class seating arrangement flexibility within the same classroom boundaries. The length required for the front marker board also affects the shape and orientation of the room. Refer to Timesaver Standards for Building Types, 2nd Edition, (McGraw-Hill Book Company) for detailed data on seating arrangements. Optimize the classroom sizes and shapes for flexibility and enhancement of instruction. Avoid "pie shape" and other configurations which limit alternate seating arrangements. Determine seating types and audio visual characteristics before finalizing configuration. Fixed seating tiers can decrease flexibility. Consider fixed seating and tiers only in facilities with a minimum of three classrooms. Use of maps and fold out materials by trainees may require seating at tables.

Aviation training facilities typically utilize training devices requiring mechanical systems support. Consequently, classrooms are often exposed to a variety of support equipment noises in addition to HVAC unit noise which can distract from instruction. Use sound baffles, absorbent materials at noise sources, and locate mechanical units remote from classrooms. Avoid sound masking in classrooms. Acoustic design level for classrooms shall be RC-30 with 50 STC (minimum) walls. Use sound absorbing materials in lecture rooms to limit reverberation time to 1.0 second and use sound-reflecting surfaces on the forward ceiling and wall surfaces for sound reinforcement. Since classrooms are repetitive spaces, intense effort is required to ensure quality in each duplicated space. Consider the following major factors for design of classrooms:

(1) Seating types and arrangements and writing surfaces

(2) Space and furnishings for the lecturer

(3) The use of wall space including teaching aids and windows

(4) Projection and TV facilities

(5) Coat racks, storage, and other conveniences

(6) Acoustics and lighting

(7) Heating and air conditioning

(8) Aesthetic considerations

Provide acoustically rated accordion folding panel partitions with integral door where flexibility is desirable for subdividing classrooms. Extend details above finished ceiling to assure integrity of specified STC in the interstitial space.

TV monitors and special projection systems in addition to traditional marker boards or porcelain boards may be used. Refer to par. 3.3.3.2. Porcelain marker boards are preferred over chalkboards. Include a display rail with clip fasteners. Wall perimeter tack strips should be provided for graphic display such as maps and charts. Non-obtrusive observation sidelights are required at classroom entries. Provide lockable storage space for items such as student guides, training aids, small portable mockups and trainers. Limit stowage areas for audio visual equipment to those items dedicated to each classroom.

Provide small portable platform units in lieu of permanent raised platforms (plus or minus 8 inches high) for classroom lectern areas utilizing demonstration techniques and in rooms with over five seating rows. Permanent platforms can severely limit future rearrangements in seating and subdivisions. Allow a generous width for the instructor to transverse the platform for the full length of the marker board. Centralize other storage on the same floor.

r) General Supply Storeroom. Provide double doors in lieu of overhead door to exterior loading area for better control of air infiltration. Verify if dutch door or issue counter is required by the user.

s) Instructor Station/Console. Instructor station/console controls the simulation. Depending upon the functional requirements of the training equipment, the instructor station or console is either a free standing unit or is incorporated into the trainee station to allow the instructor a direct view of the trainee. Visual contact with the device is often desirable and can provide relief to an otherwise cavernous space, as well as provision for monitoring pilot access in and out of the device. The console provides the instructor with the capability of monitoring trainee activities and controlling the training session. Separate space for this station is not always required for flight simulators.

Provide an access floor system. This may also be an integral part of the simulator device contained on-board or in other cases, both separated and integral stations could be required. Consoles for double dome trainers may be adjacent to each other, but a folding curtain must be incorporated for temporary separation. Wall mountings for charts may be required.

t) Instructor Work Room. Separate dedicated instructor work space from trainee gathering areas and trainee pedestrian traffic. Locate near or contiguous with the library/learning center for access to resource materials.

Provide large, clear areas for instructor work space to permit flexibility in reapportionment of spaces. This area should be designed around a modular scheme for the greatest possible flexibility in arrangement. When individual offices are required within general areas, they should be enclosed by lightweight, movable partitions. Systems or modular furniture provides privacy and acoustical control in an open environment and allows great

flexibility for changing instructor work space. Personal computer (PC) work stations may be used here on a network. Design power, telephone, and data distribution wiring systems in this area to allow for frequent changes.

u) Janitor Closet. Provide adjustable shelving and storage space for cleaning equipment and supplies, mop rack, and a deep sink or mop receptor on each floor.

v) Learning Stations. Learning stations are primarily computer aided instruction utilizing student carrels. Instruction proceeds at the students' own pace and ability to learn the material.

w) Learning Station Computer Support. Most computer aided instruction systems now in use require a central processor which is usually located adjacent to the learning stations area. Direct and dedicated support of learning stations is provided. Provide access floor where required. Future technology advancements may replace the central processor with a desktop computer unit located in the learning stations area.

Up to eight classified file safes may be utilized. Provide security measures as required by the user and the base security officer in conjunction with NCIS.

x) Library/Learning Center. This space provides information and resources. Larger centers require control of equipment and materials with a service counter and work space which will provide orderly issue and receipt as well as inventory control and repair. Audio visual or other equipment repair may be required.

In addition to books, the learning center may contain records, tapes, closed circuit TV facilities, film, cameras, video cassette recorders (VCRs) and projection equipment. Larger centers may need separate stack and reading areas. Provide storage for Navy publications and rate-training manuals. Accommodate a classified file safe where required by the user. Acoustic controlling materials are necessary to ensure a quiet environment.

Provide for computerized Electronic Information Delivery System (EIDS) and carrels if required by the user. Carrels where needed must be sized to accommodate the EIDS. The EIDS may require a separate room for the host computer depending on the system and may be restricted to authorized personnel only.

y) Lobby. Utilize wall area for building directory. Accommodate any memorabilia provided by the user. Include a recessed scuff area at the entry point for control of debris from foot traffic. A vestibule is recommended for energy conservation.

z) Locker Room. Avoid permanently built-in lockers since they can adversely affect future flexibility. Provide adequate lockers for trainee

occupancy load and adequate garment changing area..

aa) Lounge. Provide kitchen alcove, visually hidden from lounge with dishwasher, microwave oven, and small upright refrigerator. The seating area can double as conference and as an instructor work area if arranged so that kitchen users do not have to intrude.

bb) Mail Room. Locate the mail room off the corridor and contiguous to the administrative area for use by the staff. Provide individual mailboxes with two sided access. Design area to prevent queues of personnel from obstructing corridor passage.

cc) Maintenance Shop. Minor miscellaneous repair of the trainer components is undertaken here by the device contractor. Base size on the number of simulators to be housed within the facility and the number of proposed maintenance/support personnel. Provide space for the storage and maintenance of simulator system technical documentation and an area where the documentation can be laid out and used for maintenance procedures.

dd) Maintenance Storage. Size this space to support the number of simulators in the facility. This is primarily a storage space for electronic and mechanical equipment, fixtures, and publications. To keep the trainer functional for use, it is necessary to procure spare parts, technical documentation (including drawings), tools and test equipment. These items require storage and, in general, the larger the trainer the more storage will be required.

Locking hardware is required. Include an "On Site Spares" area which can be secured separately and can accommodate anticipated quantities. Utilize mobile shelving systems as needed to accommodate storage in retrofits where space allocations are restrictive.

ee) Mechanical Pump Room. Typically contains the hydraulic and pneumatic pumps. Since both device contractor and construction contractor furnished equipment may be located in the same space, determine interface point between the two.

Isolate floors and acoustically treat walls and doors where this source of vibration and sound can adversely affect adjacent spaces. Isolate the noise transmitted through the trench to the high bay area. Avoid locating pump rooms on upper levels where sound can reverberate through structural systems.

Access to both interior of the building and exterior is recommended. Pump rooms supporting large hydraulic systems may require high ceilings to allow maintenance access with a permanent or temporary overhead crane to assist in the maintenance procedures. Allow adequate access space around and above equipment for maintenance.

ff) Mechanical Room. This space normally contains the facility related HVAC equipment as well as the sprinkler valves and piping. Area requirement for facility HVAC equipment is typically 5 percent of gross floor space; however, the requirement can vary depending on space criteria and other factors such as use of a basewide steam system. Mechanical rooms for aviation training facilities typically contain a variety of equipment types which must be accommodated early in the design. Avoid locating rooms with HVAC equipment on upper levels where sound can reverberate through structural systems. Provide adequate access space around equipment for operation, maintenance, and servicing. Locate hydraulic and pneumatic equipment which support the trainer devices in a separate pump room due to air contaminants, noise, and safety considerations. The device manufacturer's TFR will provide space requirements for equipment to be located in the mechanical and pump rooms.

gg) Media Storage Room. Provisions for centralized storage and retrieval of each type media must be provided. In multifloor facilities, locate an additional media storage room on each floor. Include storage as needed for slides, film, microfilm, filmstrips, video tapes, audio tapes, records, computer discs and other storage media, maps and charts, projection equipment, and audio equipment. Refer to MIL-HDBK-1008 for fire protection requirements for magnetic tape and film storage. Adjustable shelving is required. Verify with the user and manufacturer if a centralized VCR control panel area is required. Provide issue window, dutch door, or counter where required for customer service.

hh) Officer in Charge (OIC). The person charged with controlling the use of the facility, scheduling the use of classrooms and training devices and maintaining curriculum occupies this space. This person is also typically the Training Officer. This space may not be required within all facilities since this person may already have adequate office space elsewhere.

ii) PTT. This is usually a one or two station trainer used to familiarize the trainee with the controls and operation of the station. Generally the computers are housed in the same area as the station. These generally do not require hydraulics, but do require 400 Hz power. Size varies on these units due to changes in the number of stations and complexity of the simulation. Access floor system is required.

jj) Pilot Ready Room. This is an area where the student pilots wait for their training briefing and "flight" in the simulator. Several trainers require the trainees to be in their flight suits during the training to make use of the g-suit in the simulation. This area must accommodate male and female changing areas where separate locker rooms are not available. The Ready Room could also double as a lounge.

kk) Print Shop. This space may be required where a subject facility provides regional instructional support such as a Trainer Systems Support Activity (TSSA). Include printing equipment in the collateral equipment list.

ll) Site Manager's Office. Provide a single person on-site private office for the device contractor's manager of operation and maintenance and supervisor of contractor personnel. Private conversations are conducted here between the supervisor and personnel. Provide quiet lockable office and acoustical rating complying with DM 1.03.

mm) Tactical Library. Base justification on trainee load. Vault may be required. Refer to MIL-HDBK-1013/1, Design Guidelines For Physical Security of Fixed Land-Based Facilities, for guidance in vault design. Provide sprinkler protection in the vault.

nn) Toilets. Specify ceiling hung partitions for easier cleaning and drainage to eliminate rusting of floor mounts. Use solid plastic partition finish for better hygiene and graffiti resistance. Provide shelf for temporary stowage of hand carried items such as hats and books.

oo) Trainer Systems Support Activities (TSSA). This function is administrative in nature and is required only at selected facilities and maintains the configuration of the hardware and software of the training equipment with each aircraft type. A TSSA is ordinarily dedicated to one major weapon system and is located at an installation that is a primary training site for that weapon system. A main frame computer room with access floor system and secure storage such as classified safes may be required. Numerous hardware and software publications are used.

pp) Vending. Provide an alcove or a separate area off the corridor such that pedestrian traffic is not restricted, but also located convenient to or within lounge area. Locate vending machines where they can be properly serviced and maintained with minimal disturbance to facility operations. Provide secure brackets to prevent overturning of machines and a hard surface floor sloped to floor drains adjacent to vending machines. Buildings having more than 100 federal employees located therein or 15,000 square feet or more should have one or more satisfactory sites for a blind-operated vending facility as noted in Chapter 5, par. D, MIL-HDBK-1190.

qq) Visitor Control. Locate the checkpoint at the primary pedestrian entrance to the facility adjacent to the lobby and near administrative areas. Provide 42-inch high counter with sign-in area, under counter files, lockable storage, intercom console where required, and staff phone. Accommodate number of personnel designated by the user. Include a recessed scuff area at the entry point for control of debris from foot traffic. A vestibule is recommended for energy conservation.

2.2.2.5 Interior Design. NAVFAC DM-14.01, Interior Design provides interior design guidance. Provide imaginative and creative use of colors and furnishings. Design solutions shall also be economical and the furnishings maintainable. Fully integrate interior design with the work of other design and engineering disciplines at all stages of the facility design process. Provide only those finish systems which have a proven track record of use and

testing. Selection criteria should balance all factors related to installation and usage: initial and life cycle costs, ease of maintenance, comfort, etc. Refer to appropriate tables for suggested interior finishes.

a) Color. Develop a color plan that is consistent with the building program. Use color to stimulate positive human physical and emotional reactions and to enhance the overall functions of the building. For example, color may be used to direct and orient users to color-keyed functions on floors. Color selection can also support maintenance management. As a general rule, fixed building materials (e.g., pavers, ceramic tile, resilient flooring, ceilings, etc.) should be relatively neutral. Introduce stronger accent colors on more changeable finishes (e.g., paint, wall coverings, carpet, furnishings). This will allow color changes at minimum cost as areas are refinished in the future.

b) Floors. Training facilities are subject to heavy trainee in/out pedestrian traffic. Entry points and corridors must withstand heavy foot traffic. Minimize tracked in dirt by using walk-off mats at entry points to protect flooring and to reduce maintenance. Use durable and easily maintained floors. Consider safety, noise impact, traffic bearing requirements, chemicals and compounds used on flooring and moisture that flooring will be subjected to under normal and special conditions. Carpeting may be used in accordance with Chapter 5, par. B1, MIL-HDBK-1190, Table 2.1, MIL-HDBK-1001/1, Basic Architectural Requirements, and MIL-HDBK-1008, Fire Protection for Facilities, Engineering, Design, and Construction.

c) Ceilings. Metal slat ceiling systems are prohibited, since they do not allow heat to collect at heat detectors. Value engineering reports also show significant implemented savings for acoustical tile ceilings over metal slat systems. Ceiling systems for corridors which usually must accommodate an array of utilities must be thoroughly evaluated against ease of access, sound control, fire protection requirements, future utility adaptations, life cycle cost, and maintainability. Techniques for maintenance, repairs, and changing lighting fixture bulbs in the high bay may render a finished ceiling with recessed fixture mounts inappropriate. Finished dropped ceiling in the high bay is prohibited.

2.2.2.6 Signs. Provide a signage plan, legend, and details. Design signs as an overall building and site system to be furnished and installed under the construction contract. Economy, flexibility, ease of installation and maintenance are important considerations of signage design. Design the system to inhibit vandalism but with flexibility to enable the addition or deletion of information. Select a mounting mechanism for the signs to permit the reuse of signs as the facility changes. Specify an easily-read letter form such as Helvetica Medium. Indicate the design, location, and installation method in the plan, elevations, and specifications. Require the contractor, in the project specifications, to make a comprehensive submittal of the proposed sign system and to provide information necessary for acquiring new or replacement signs. The exterior sign system must be respected both on

Table 2.1
Recommended Finishes - Simulator Facilities

ROOM	WALLS	FLOOR	BASE	CEILING	REMARKS
ADMINISTRATION	PTD OR VWC	VCT OR CPT	RUBBER	ACT	
AOIC	PTD OR VWC	CPT	RUBBER	ACT	
BRIEF/DEBRIEF	PTD	ACCESS	RUBBER	ACT	
CLASSROOMS	PTD	VCT OR CPT	RUBBER	ACT	1
CLASS EQUIP STO	PTD	VCT	NONE	ACT	
COMPUTER RM	PTD	ACCESS	RUBBER	ACT	2
CONFERENCE	PTD OR VWC	CPT	RUBBER	ACT	
CONTR CONFERENCE	PTD OR VWC	CPT	RUBBER	ACT	
CONTR SITE MGR	PTD/VWC	CARPET	RUBBER	ACT	
CONTRACTOR WORK	PTD	VCT OR CPT	RUBBER	ACT	
CORRIDORS	PTD	VCT	RUBBER	ACT	1,3,4
COTR	PTD/VWC	CARPET	RUBBER	ACT	
DEVICE CONTRACTOR	PTD	VCT OR CPT	RUBBER	ACT	
DEVICE/TRAINEE	PTD	CNC/SLR/HDR	RUBBER	EXP&P	5
ELECTRICAL ROOM	EXP	CNC	NONE	EXP&P	
ELECTRONIC MAINT	PTD	VCT	RUBBER	ACT	
GARAGE	PTD	CNC/SLR	NONE	EXP	
GENERAL SUPPLY	PTD	CNC/SLR	NONE	EXP	
INSTR STATION	PTD	ACCESS	RUBBER	ACT	
INSTRUCTOR WORK	PTD	CPT	RUBBER	ACT	
JANITOR CLOSET	PTD	VCT	NONE	EXP&P	
LEARNING STATIONS	PTD	ACCESS	RUBBER	ACT	7
LS COMPUTER SUPP	PTD	ACCESS	RUBBER	ACT	
LOBBY	PTD	QT	QT	ACT	1,4,6
LOCKER ROOM	PTD	VCT OR QT	RUBBER/QT	ACT	
LOUNGE	PTD	VCT/CPT	RUBBER	ACT	1
MAIL ROOM	PTD	VCT	RUBBER	ACT	
MAINTENANCE SHOP	PTD	VCT	RUBBER	EXP&P	1
MAINTENANCE STOR	PTD	CNC/SLR	NONE	EXP&P	1
MECHANICAL ROOM	EXP	CNC/SLR	NONE	EXP&P	
MECH PUMP ROOM	EXP	CNC/SLR	NONE	EXP&P	
MEDIA STORAGE	PTD	VCT	NONE	ACT	
OIC	PTD OR VWC	CPT	RUBBER	ACT	
PART TASK	PTD	VCT	RUBBER	ACT	9
PILOT READY ROOM	PTD OR VWC	CPT	RUBBER	ACT	
SHOP	PTD	CNC/SLR	RUBBER	EXP&P	1
SITE MANAGER	PTD OR VWC	CPT	RUBBER	ACT	
TACTICAL LIBRARY	PTD OR VWC	CPT	RUBBER	ACT	
TOILET	PTD	CT	CT	ACT	
VENDING	PTD	VCT/QT	RUBBER	ACT	1,8
VISITOR CONTROL	PTD	CPT	RUBBER	ACT	

Table 2.1 (Continued)
Recommended Finishes - Simulator Facilities

General Notes:

1. See Glossary for finish material abbreviations
2. VWC and alkyd paint use is limited.

Remarks:

1. Use washable paint with eggshell or semigloss finish.
2. Seal lower perimeter wall area and use pigmented hardener/sealer on concrete floor below raised computer room access flooring to accommodate air supply plenum.
3. Carpet is discouraged. Use other methods of sound control.
4. Metal slat ceilings are prohibited.
5. Device/Trainee spaces such as those for part task trainers adjacent to finish ceiling areas may use ceiling system to match.
6. Consider alternate durable floors such as terrazzo.
7. Consider acoustical wall panels where additional sound absorption is required.
8. Use quarry tile base for quarry tile floors.
9. Verify finishes with device manufacturer.

and off the specific facility site. Any signage must also be harmonious in the landscape. Care must be taken to use signs only when necessary and to restrict the use of random styles, placement and colors. Prepare a Signage Manual to instruct the activity in maintenance of the signage system and provide specialized equipment and materials necessary for same.

a) Entrance Sign. Entrance signs may be necessary to introduce the training facilities to visitors. Position these signs for visibility and install consistently in relationship to the roadway, walkway or building which they serve. Reinforce desired building entry points for all visitors, including the handicapped, with entrance signs. Entrance signs shall clearly identify the building name, function, number, and organization, and shall be consistent with the installation's overall signage system. Often, several building entry signs are required to identify those activities that may be reached via a specific entry point when a building has more than one primary entrance.

b) Building Identification Sign. Training facility identification signs identify a building by name and number. Design identification signs as part of the overall signing system of an installation and require freestanding signs and/or wall mounted signs. Locate and size building identification signs for visibility from the main access street. Coordinate building numbers with the Public Works Office and fire service requirements and position at standard locations on the building.

c) Building Directory. Locate a building directory where it is clearly visible to all visitors as they enter the building. The building directory shall consist of a permanent header panel with the name of the building or the major organization in the building, plus a directory section that lists each tenant. Utilize a changeable letter board with changeable letters or message slots for the directory section. In large training facilities, a building locator plan to identify building spaces, key activities, and personnel may be a necessary addition to the directory. Locate floor or building section directories to be clearly visible to pedestrians entering from elevators, stairs, or major corridors.

d) Directional Signs. Locate directional signs which direct to different areas, departments, and functions of a building at every decision point - opposite the elevators, opposite the stairways, and at each corridor intersection. Directional signs should point to only high priority destinations. Indicate route to classrooms by number groupings. Include directions to toilets, lounge, library, vending, and outdoor smoking areas.

e) Room Identification Signs. Room signs identify room entrances and services such as toilets, telephones, housekeeping activities, and stairs. Room numbers in addition to names are essential for repetitive spaces such as classrooms and offices.

f) Regulatory Signs. These prohibit certain activity, for example, "No Smoking" or "No Entry." Many safety signs are required by law or regulation and may include building evacuation, fire exit maps, or exit maps specifically for the handicapped.

g) Informational Signs. Additional signs may be required to list building and activity operating hours.

h) Notice/Bulletin Boards. These are especially important in training facilities to control clutter and readily accommodate changing information. Provide these throughout the building. Provide tack board surfaces or similar surface management systems to accommodate unanticipated messages, signs, posters, announcements, etc., in high traffic areas, doors, elevators, counters, columns, drinking fountains, public telephones, lounges, etc.

i) Handicapped Criteria. Coordinate all signs with the handicapped requirements of Federal Standard 795, Uniform Federal Accessibility Standards.

j) Additional Guidelines. Refer to NFGS-10440, Signs, for additional guidelines. Also, Air Force Pamphlet AFP 88-40, Sign Standards, provides excellent guidelines for DOD facilities in general. The information is nonproprietary and easily modified to match specific facility designs and BEAP standards.

2.2.2.7 Windows. Natural light is desirable, but certain rooms will require blackout shades or draperies for visual aids. Sun screens, roof overhangs, and recessed windows can effectively control direct light penetration. Provide window head details to accommodate installation of window coverings and ease of operations. Use operable windows for natural light and ventilation where permitted by security provisions. Provide windowless spaces where security regulations apply. Comply with NFPA 101 and MIL-HDBK-1008 for special requirements such as sprinklers and emergency lighting for windowless buildings. Do not use eye level windows which can be a distraction for trainees in classroom settings. Provide clerestory windows in the classrooms where practical for natural light and ventilation unless security criteria is prohibitive. Comply with NFPA 101 for window size and mounting heights.

Utilize non-obtrusive observation glass panels where desired by the user in classrooms, laboratories, and other non-private trainee occupied areas. Glazed openings that are subject to accidental human impact due to location, such as sidelights that extend to the floor, shall comply with 16 CFR Part 1201, Safety Standard for Architectural Glazing Materials, issued by the U.S. Consumer Product Safety Commission.

2.2.2.8 Doors and Hardware. Exterior wall overhead doors can be a critical source of extreme heat gain/loss and air and moisture infiltration into lab/classroom settings where temperature and humidity conditions must be maintained. Overhead coiling doors to the exterior are not acceptable for

environmentally conditioned spaces. Provide weather-sealed insulated vertical lift, or sectional doors, or insulated removable panels with lifting eyes. Insulated panels must be easily removable by facility personnel. Provide adequately sized interior corridor doors for classrooms with oversized equipment where possible in lieu of exterior openings into each classroom to minimize exposure to exterior elements. Size all doors to accommodate the path of oversized equipment from loading areas to destination and between rooms. Utilize inactive leafs and removable transoms where equipment moves are infrequent. Allow for maneuverability in tight corridors.

Security requirements at the main entry usually require a single entry point with visitor control. Remote locks, video cameras, card readers, and/or key pads may be required by NCIS as components of the intrusion detection system (IDS). Provide closers on doors with card readers and key pads. Emergency exits shall have no hardware on the door exterior. Consult public works and base fire departments for exterior hardware required for access to mechanical rooms, electrical rooms, sprinkler control rooms and fire alarm enunciator panels.

Use four hinges where required on heavy use doors. Avoid panic hardware except where specifically required by criteria since the Navy does not classify training facilities as schools.

2.2.2.9 Natural Lighting. The use of natural light is encouraged as it contributes significantly to the energy efficiency of the building and communicates a feeling of well-being and openness. Natural light can be used in conjunction with high efficiency artificial lighting featuring photosensitive controls for maintaining lighting levels automatically. Skylights are not permitted due to excessive solar heat gain and leak potential. Classroom wing corridors and other interior occupied spaces may incorporate monitors with conventional roofing and vertical windows. Perimeter instructional spaces may incorporate high bay or clerestory windows in cases where natural lighting is desired without any distracting or unsightly views.

2.2.2.10 Building Thermal Insulation and Vapor Retarders. Locate vapor retarders with care in view of the thermal differentials associated with training buildings. Do not use vinyl wall covering and impervious paint on the interior surface of exterior walls in humid areas (as defined in MIL-HDBK-1190) unless calculations show that condensation will not occur within the wall.

Special purpose rooms such as laboratories and computer rooms normally require stringent air conditioning requirements. Provide adequate insulation and vapor transmission barriers to minimize the loads on the mechanical system. Ceiling decks of spaces below supercooled computer rooms and perimeter walls are apt to collect condensate if not properly insulated.

2.2.2.11 Handicapped Design. Provide barrier-free access to civilian work spaces and spaces intended for public access. It is increasingly necessary to support handicapped access with the advent of more private contractors providing operation and maintenance personnel instead of utilizing military personnel. Design facilities to locate handicapped access spaces on first floor only, unless the size of the facility's administrative and other accessible areas requires a second floor. Certain portions of the facility will not lend themselves to a handicap design, such as the device area platforms, and are exempt from the requirement due to their hazardous nature. Comply with current criteria in Uniform Federal Accessibility Standards (UFAS).

2.2.2.12 Elevators and Stairs. Comply with requirements of DM-3.09, Elevators, Escalators, Dumbwaiters, Access Lifts, and Pneumatic Tube Systems and handicapped criteria in UFAS. For safety related measures, comply with ASME/ANSI A17.1, Safety Code for Elevators and Escalators, and NFPA 13, Standard for the Installation of Sprinkler Systems.

Provide freight elevators where stairs cannot accommodate the weight and size of routinely transported equipment. Consider the weight associated with transporting security vaults or training equipment to upper levels. Utilize stair tread nosings that are resistant to heavy trainee pedestrian traffic volume.

2.2.2.13 Dumbwaiters. Comply with requirements of DM-3.09.

Consider a dumbwaiter where high volume floor to floor transport of such items as audio visual equipment, publications and printing, and general supplies is required.

2.2.2.14 Access Floor Systems. Utilize access flooring in computer rooms and in administrative spaces where networks are used. The underfloor space must be properly sealed if used as an air conditioning supply plenum. Provide sealer to concrete decking and exposed perimeter lower walls. Use plastic laminate covering for access floor panels except where sound control is paramount.

Walls must penetrate access flooring and secure to structural slab to meet fire protection, security, and/or sound requirements. Provide sleeves and intumescent packing where pipes and conduit penetrate fire rated walls. Waterproof perimeter of depressed area if it adjoins a building edge below grade. The access floor space will usually serve as a supply air plenum.

2.2.2.15 Ceilings. Provide access where projection services, mechanical, and electrical equipment, including adjustment, maintenance, and shutoff devices, are located. Ceilings shall be maintainable and easily repaired.

Projections from the ceiling such as sprinklers and light fixtures can impinge on clearances required for device installation and removal, as

well as crane and hoist operations. Coordinate all ceiling items on a comprehensive reflected ceiling plan.

2.2.2.16 Walls. Impervious finishes applied to the interior side of exterior walls must be carefully evaluated against dew points to prevent vapor dams and subsequent failure of the installation. Protect the corners of walls and columns in areas where equipment moves are frequent.

2.2.2.17 Acoustical Control. A noise level reduction (NLR) minimum factor of 30 is required in the 70 to 75 DNL zone and an NLR minimum factor of 25 is required in the 65 to 70 DNL zone. There are no special requirements in the DNL zone below 65.

Use noise and sound transmission criteria cited in DM-1.03. Prevent sound transmission over walls. Acoustic absorbing material, where required, shall be fire and smoke rated as required in MIL-HDBK-1008.

2.2.3 Landscape Architecture. The framework for planning and design of all landscape architectural elements is found in the activity Master Plan and more specifically in the BEAP. General guidance for design elements can be found in NAVFAC P-960, Installation Design. Landscape design must enhance positive image for the facility and should direct pedestrians to a primary entry. Design for minimal maintenance. Provide landscape fabric for weed prevention. Select hardy specimen species indigenous to the area. Locate hose bibbs convenient for additional irrigation.

Outdoor pedestrian-oriented spaces are often useful for building entry plazas, for break and lunch areas, and to provide pleasant views from the building interior. Design outdoor areas to harmonize with the architectural and natural site character of their surroundings, but to also moderate environmental and climatic extremes such as noise, sun, wind, and seasonal precipitations.

2.2.3.1 Site Analysis and Development Concept. If the analysis and development is successful, the biological integrity of the site will be retained or improved while successfully meeting the program needs of the user in a comfortable, attractive, and functional setting. Minimize clearing of existing vegetation and avoid excessive grading.

2.2.3.2 Planting. Guidance for planting design is provided in NAVFAC Publication P-905, Planting and Establishment of Trees, Shrubs, Ground Covers, and Vines. Plantings can provide a pleasant setting and visual asset, and minimize the environmental impact of development. The following is a list of minimum guidelines to be considered in implementing new planting schemes for the facility:

a) Preserve Existing Vegetation. Existing mature stands of trees or other significant vegetation are to be preserved and enhanced where possible.

b) Use Indigenous Plant Materials. Plant materials chosen will be indigenous to the site.

c) Design for Minimum Maintenance.

d) Define Space and Screen Conflicting Uses. Use plant material to define space and screen visually conflicting uses where appropriate. See section on screens and walls below.

e) Promote Energy Conservation. Plant materials are to be used to reduce energy requirements, where possible, such as shading with deciduous trees. Enhance any desirable climatic effects such as clear areas at large glass areas oriented for winter sun heat gain.

f) Establish Unifying Elements. Use planting as a means to unify different elements of an installation.

2.2.3.3 Landscape Lighting. The visual character of a project landscape can be greatly improved while providing the nighttime functions of safety, security, and path finding. In addition to simply achieving a higher level of illumination, light levels, color, patterns, and style should be energy efficient, attractive, and functional in a coordinated landscape scheme.

2.2.3.4 Exterior Signs. Provide directional signage for pilot trainees from parking to entry.

2.2.3.5 Utilities. Grouping in corridors, underground placement, and screening and grading can de-emphasize the impact of utilities on a site. Flow tests must be conducted to determine the available water supply for fire protection. Indicate a static pressure and a residual pressure at a certain flow.

2.2.3.6 Site Furnishings. In conjunction with the site and landscape design, provide appropriate signs; structures; outdoor furniture and equipment, such as tables and seating; vending machine shelters; telephone booths; screen wall and fences; as well as the more symbolic elements such as flag poles, memorials, and military equipment displays. The lack of coordination, as well as concern for detail, are the primary problems related to site furnishings. Select site furniture that is simple, requiring low maintenance, and relating in color, texture, and form to the building design and established base character and BEAP guidelines. Definitive design and other data for flagstaffs are available in Section 6 of MIL-HDBK-1034.

2.2.3.7 Equipment Screens and Walls. Screens and walls for mechanical and electrical equipment are encouraged for aesthetic purposes, but can severely penalize equipment performance. Carefully coordinate design with each engineering discipline. Shade for mechanical equipment is desirable; however, leaves from deciduous trees may clog equipment.

2.2.3.8 Selection of Plant Material. Select plant materials on the basis of hardiness and degree of maintenance required. Avoid plants which require more frequent attention than the users can provide to stay in a healthy condition or have an attractive appearance.

2.2.4 Civil. NAVFAC criteria manual series (DM-5 and MIL-HDBK-1005 series) on civil engineering, provides general guidance for civil engineering, site work, and other related topics. Refer to MIL-HDBK-1008 for location and spacing of fire hydrants. Refer to Department of Transportation (DOT) D6.1, Manual on Uniform Traffic Control Devices for Streets and Highways (MUCTCD) for traffic control devices. Provide surface bearing capacity for heavy equipment or trucks outside the high bay doors. Consider loaded forklift wheel loads on the paving design. Forklifts will normally be used to transport equipment into the building from the delivery truck. Edges more than 1 inch in height cannot be negotiated by forklifts. Provide clear path for delivery and removal of equipment from access roads to loading dock. Account for obstacles and provide adequate turning radii.

Coordinate location of mechanical equipment pads with mechanical design and show major pieces of equipment on civil engineering drawings. Locate noisy equipment remote from occupied spaces and as near as possible to the mechanical spaces. Distribution piping (utilities, refrigerant, condenser water etc.) shall enter the building only through mechanical spaces. Shade is desirable; however, equipment should not be located beneath existing trees where it can become clogged with leaves and debris.

2.2.4.1 Roads, Parking, and Walkways. These are three of the most land consuming uses on a site. Negative visual impact can be minimized by locating facilities convenient to each other, encouraging pedestrian use and other non-vehicular modes of access.

Vehicular or pedestrian paving should be in character with a safe, functional, and visually pleasing landscape. The sharing of parking and road requirements will minimize total impact. Small parking lots are usually preferable to large lots since they allow for conforming to the natural topography and other site features and are visually less obtrusive. Provide appropriate paved area and adequate maneuvering space for semi-tractor trailer and other truck deliveries. Provide ramps at curbs along routes leading to storerooms to facilitate wheeled access. Accommodate training device transportation into and out of the building through adequate turning radii and appropriate loading facility. Provide vehicle protective barriers for transformers, light posts and fire apparatus as required.

Pedestrian access to training facilities is normally restricted to a single entrance point due to security criteria. Pedestrian traffic to and from the parking lot is heavy due to multiple daily training sessions. Determine if egress is permissible through secondary exterior doors and if so, accommodate with walkways. OPNAV Instruction 5530.14B, Department of the Navy Physical Security and Loss Prevention, prohibits parking of privately-

owned vehicles within 15 feet of any building. Designate special parking spaces for pilot trainees, COTR, and device contractor as required by the user.

Include concrete surfaces for bicycle racks and motorcycles. Storm drainage and other grates must be oriented with parallel slots perpendicular to the paths of bicycles. Criteria for vehicle parking area design is shown on NAVFAC Drawing No. 1404837, Parking Area Criteria for Vehicles.

2.2.4.2 Handicapped Access. Provide curb ramps, access aisles, and handicapped parking spaces near accessible entrances.

2.2.4.3 Loading Dock Ramp Protection. Each facility requiring a loading dock ramp shall be provided side-edge protection in compliance with Section 1910.23C of Public Law 29, CFR, Occupational Safety and Health Act Standards Manual.

2.2.5 Structural. Structural design shall comply with MIL-HDBK-1002 series, Structural Engineering, and NAVFAC P-355, Seismic Design for Buildings. Base an economical structural system on facility size, projected load requirements, quality of locally available materials, local labor and construction materials, and local wind, snow, seismic, geologic, and permafrost conditions. Design in flexibility for future high bay ceiling height extensions.

Depress structural framing and slabs in lab areas where access flooring occurs to provide uniform, continuous, finish floor levels between adjacent spaces.

Include the weight of any classified file safe such as those in Library/Learning Centers in floor loading.

2.2.5.1 Clearspan requirements. Columns in the high bay training area are typically prohibited. Check excursion limits for device and accommodate flexibility.

2.2.5.2 Weight Handling Equipment. Cranes and monorails shall comply with DM-38.01, Weight Handling Equipment. Utilize NAVFAC NFGS-14637, Cranes, Overhead Electric, Underrunning (Under 50,000 Pounds), and NFGS-L-14622, Monorails with Electric Powered Hoists, where applicable. Provide platforms, catwalks, access ladders, and any other provisions for inspection and maintenance of cranes and hoists which could put equipment temporarily out of service due to inaccessibility.

Three-ton bridge cranes or monorails are normally required for dome type devices. Obtain user and device manufacturer input regarding controls and speed criteria for hoist, trolley, and bridge, hook heights, capacities, and service area. Micro-inching is required in horizontal and vertical movement. Bridge cranes allow more extensive area of service and may

alleviate need for redundant smaller special purpose cranes. Acknowledge crane area of service. A 1/2-ton hoist may be required for servicing the visual displays, gravity ("G") seats, and canopy removal. Where mezzanine areas are used for storage, provide a 1/2-ton crane and rail. Provide crane hook height clearance and bridge crane operating limit diagrams on drawings as required by the device manufacturer for the highest expected level and area of operation. Note that lifting the device will require more clearance than necessary for stationary position.

2.2.5.3 Floors. Design floor slabs along the travel path of any equipment to withstand the heaviest wheel loads anticipated during the installation. Obtain the weights and attachment locations of the simulator and associated equipment from the equipment manufacturer via the procuring activity. Current computer equipment trends are toward more compact, yet denser and heavier components. Future floor loads will probably localize into more extreme concentrated loads. Some training systems may be highly sensitive to external shock and vibration and may require damping or shock isolation mounting. Six DOF motion systems require a substantial reaction mass to resist the forces and moments placed on the floor. Motion systems may require device area floor slab isolation from the rest of the facility. Isolate the mechanical equipment room floor slabs from the remainder of the facility.

2.2.5.4 Roof Loads. Mechanical equipment is preferred at ground level; however, where roof mounting is necessary, design screening in accordance with local wind loads and directional patterns. Anticipate other roof structure mounted accessories such as catwalks, ladders, hoists, and cranes.

2.2.6 Heating, Ventilating, and Air Conditioning. Provide 100 percent capacity backup HVAC equipment to maintain operations. Refer to MIL-HDBK-1008 for coordination with fire protection systems. Coordinate exterior mechanical equipment location with civil design. Locate noisy chillers and other equipment remote from occupied spaces and as near as possible to the mechanical spaces. Shade is desirable; however, equipment should not be located beneath existing trees where it can become clogged with leaves and debris. Distribution piping for utilities, including refrigerant and condenser water, should enter the building only through the mechanical room. Avoid routing chilled water piping over computer areas and trainer devices to prevent damage to high cost equipment from leakage and condensation. Provide isolation valves to facilitate maintenance without system shutdown. Comply with NAVFAC DM-3.10, Noise and Vibration Control of Mechanical Equipment, where adjacent spaces and/or sensitive equipment cannot tolerate noise and vibration. Special requirements for designated spaces follow:

a) Computer Rooms. Design spaces containing computers and other electronic equipment requiring access flooring systems in compliance with the Sections 4 and 8 of MIL-HDBK-1012/1, Electronic Facilities Engineering, and Chapter 17 of the ASHRAE HVAC Systems and Applications Handbook. The most demanding air conditioning requirement will be the computer room. A prime user complaint is lack of cooling for critical and high cost computer

equipment. Denser equipment modules require more air volume and generate intensely concentrated heat loads. Use HVAC units specifically designed for computer room installation. Divide required capacity incrementally and provide multiple units to match the load. Install one or more extra incrementally sized units to allow for backup. Computer equipment has a narrow range of operation with regard to temperature and relative humidity. Operation outside of the required range of temperature and relative humidity will cause damage and a decrease in the life of components. The building HVAC system should accommodate the personnel comfort and external environmental loads; however, a dedicated system to handle computer equipment loads is essential. Computer equipment is subject to revision and can easily overtax a building HVAC system. A dedicated system will help accommodate future upgrades with minimal impact on the building HVAC system. Provide methods for direct cooling to equipment. Most computer cooling fans are near the bottom of the equipment. Provide floor fed direct air. Avoid air current paths that overcool the occupants while undercooling computer equipment. Typical equipment units requiring direct fed cooling are freestanding computer processing units and instructor/operator consoles.

Dust and particulate filtration systems may be required in the TFR for the HVAC system to provide dust-free environment. Consider filters, seals, positive pressures, forced air at entrances, and anterooms as required.

b) High Bay Area. Coordinate structural, crane and hoist systems, and device equipment amenities with routing of supply and return air ductwork. Platforms, HVAC, and ductwork supporting the device are normally supplied by the device manufacturer.

2.2.6.1 Design Conditions. Design conditions for comfort conditioning shall be determined in compliance with MIL-HDBK-1190 and DM-3.03. Electronic and computer procurement documents require that equipment function properly in an air conditioning environment between 60 degrees and 80 degrees F and between 45 degrees and 120 degrees for mechanical equipment. Special facility conditions follow:

a) Space conditioning requirements below 75 degrees F at 50 percent relative humidity, or tolerances tighter than plus or minus 2 degrees F and plus or minus 10 percent relative humidity are prime causes of operational problems after the building is occupied. Such requirements shall be justified by NAVAIR and/or NTSC. If these are valid requirements, pay special attention to architectural treatments with respect to space moisture sealing and insulation.

b) Dedicated heat rejection equipment (such as compressors, condensers, and condensing units) serving training devices shall be located outside of environmentally conditioned spaces. For equipment requiring internal cooling (e.g., cockpit cooling, projection domes, etc.) or with

special cooling requirements outside normal comfort air conditioning limits, cooling shall be provided by the manufacturer of the training equipment. Avoid condenser air discharge into conditioned area.

c) The air conditioning environment for hydraulics shall be between 45 degrees and 120 degrees. Provide heat as necessary to maintain the minimum temperature.

2.2.6.2 Ventilation. Use ventilation rates for occupied spaces as required in ASHRAE STD 62, Ventilation for Acceptable Indoor Air Quality. Provide thermostatically controlled forced ventilation in mechanical, electrical and hydraulic spaces. Cool hydraulic pump rooms and compressor rooms by mechanical ventilation only.

2.2.6.3 Zoning, System Selection, and Part Load Performance. Occupancy of classroom areas varies drastically with respect to training schedule. Consider each classroom/training area as a separate temperature and humidity control zone. Provide individual temperature controls for each classroom. Size terminal equipment to accommodate minimum as well as maximum loads. Multiple air handling units (allowing staged turn-down of system capacity as sensible load falls) shall be considered. Terminal reheat is permitted to meet part-load humidity performance requirements; in electronic equipment spaces, the amount of reheat available shall be approximately equal to the sensible electronic load within the space. Provide adequate pre-heat to allow proper dehumidification when training devices are not operating.

2.2.6.4 Special Requirements for WTT and OFT

a) Mechanical Pump Room. This space is normally not air conditioned. Provide adequate ventilating airflow. Chilled water supply and return lines are required in six DOF motion systems for connection to a heat exchanger which is attached to the large hydraulic pumps. Chilled water source shall be provided by the manufacturer of the training device.

b) Device Area or Trainee Room. Most motion simulators will have integral air conditioners for the cockpit and dome areas. Locate condensers, condensing units and other device associated heat rejection equipment outside the facility such that heat removed from the device is not released into the device area and does not become part of the facility air conditioning load. Temperature and humidity control is critical. A target figure is 78 degrees F and 50 percent relative humidity. Non-motion simulators normally require specialized ducting from manufacturer provided air conditioners to cool the space inside the dome and cockpit. Maintain this space as dust free as possible. Training equipment installed in this area by the manufacturer should be equipped with integral filters at cooling air intakes to minimize dust circulation in and around sensitive electronic equipment. See "trenches" below for routing of ducts. Temperature stratification within the high bay must be avoided as the top of the dome visual display will collect heat on the inside surface, requiring cooling air at that point. Provide drains for

collection and discharge of condensate. High bay ceiling fans may assist in circulating stratified air. Locate ceiling fans above lighting to avoid distracting shadows from moving blades. Where tape and/or disc drives are used in this area, refer to requirements of Computer Rooms above.

c) OFT Trainer Room. Exhaust air from under the platform directly to outside. Provide supply make-up air.

d) Maintenance Storage. Air conditioning is required to prevent deterioration of the parts stored.

e) Computer Room and Instructor/Operator Station. Use air conditioning units specifically designed for automatic data processing facilities.

f) Maintenance Room. Provide standard shop air source where required.

g) Mechanical Room. Size mechanical rooms in high bay corners to accommodate access for maintenance.

2.2.6.5 Controls. Carefully scrutinize pneumatic control systems subject to water infiltration with regard to temperature maintenance for sensitive computer equipment. Where periodic maintenance of control systems is not available, consider merits of electronic controls.

2.2.6.6 Trenches. The simulator manufacturer may require adequate trench size to accommodate dome and cockpit air conditioning ducts. Flexible ducts for cockpit conditioning will extend through a trench cover cutout up and into the cockpit housing. Identify trenches which contain air ducts and provide cover plate cut out configurations per device manufacturer recommendations. Provide sprinkler protection in trench and route piping to underside of device for device protection. Seal inside of trench with epoxy except where synthetic hydraulic fluids are used. Consult hydraulic fluid manufacturer for trench sealer where synthetic fluids are used.

2.2.7 Plumbing. General guidance for plumbing design is provided in DM-3.01, Plumbing Systems, and MIL-HDBK-1190. Coordinate plumbing with structural design to avoid conflicts between underground pipes, trenches, and footings. Provide shutoff valves to isolate systems when doing maintenance so that entire facility is not affected by an outage. Do not locate roof drains and roof drainage piping over computer spaces and trainer devices to prevent damage to equipment in case of leakage or condensation.

a) Computer Room. Provide rising water alarm under the access floor to monitor condensate and water table seepage. Consider floor drains below access floor where water infiltration is likely.

2.2.7.1 Hydraulic Support and Pump Rooms. Provide adequate access for maintenance. Include space for hydraulic fluid storage. Provide concrete curbs around perimeter of hydraulic pump bases and/or metal pan under pump seals with drainage slope to sump to retain fluid waste for proper disposal. Floor drains subject to oil spills must drain to an oil separator. Use flexible couplings between pumps and piping systems for vibration and sound control.

Simulator hydraulic equipment is usually provided by the simulator manufacturer. Provide adequate access for maintenance. Include space for hydraulic fluid storage. Where six DOF motion systems are used, the hydraulic pumps normally include a manufacturer provided chilled water system to remove the heat from the fluid. Visual equipment within the high bay may also require accommodations for manufacturer provided chilled water supply and return lines for cooling. Any trainer device requiring chilled water cooling should include a chiller with its own procurement.

a) Hydraulic Repair Shop. Provide for on-site collection of hydraulic fluid. Pneumatic piping for standard shop air may be required by the user.

2.2.7.2 Trenches and Piping. Training equipment utilizing hydraulic power normally requires routing the hydraulic lines in trenches covered by metal plates. Plumbing, pneumatic hoses, ducts, sprinkler piping, and cabling are also routed in trenches. Trenches typically route utilities between the computer room and trainer and between the mechanical room and trainer. See Appendix A. Verify the layout of the trenches between equipment with the facility designer during the design. Use kerfed plate covers where drainage into trench from slab level is required. Trench covers must support the wheel load of a loaded forklift. The device manufacturer normally supplies all piping, clamps, brackets, and supports required for hydraulics.

Hydraulic systems can be pressurized to 2000 pounds per square inch (psi) and a leak in the line can be extremely hazardous. The heavier the load on the motion system and the more responsive a motion system has to be, then the higher the pressure used in the system. Assemble hydraulic fluid piping systems with O-ring sealed straight threaded connections. Tapered national pipe thread (NPT) joints are not permissible.

Slope hydraulic piping trenches away from computer rooms and to a sump to collect waste fluid for proper disposal. A dead level floor area is required where the trainer supports for six DOF and domes meet the floor at the same elevation. Comply with requirements of MIL-HDBK-1005/9, Industrial and Oily Wastewater Control, and MIL-HDBK-1005/8, Domestic Wastewater Control. Treat fluid as a pollutant in accordance with federal, state, and local regulations. Federal agencies are required to properly manage the use and disposal of all toxic substances in accordance with MIL-HDBK-1190, Chapter 2. Conform to the installation's spill prevention control plan. The simulator manufacturer may require adequate trench size to accommodate dome and cockpit

air conditioning ducts. Accommodate sprinkler piping also. Flexible ducts for cockpit air conditioning extend through a trench cover cutout up and into the cockpit housing. Pneumatic hoses may be routed in the trench by the manufacturer for flight crew filtered breathing air. Carefully coordinate trench layouts with device manufacturer to avoid conflicts with catwalk platform bases and other obstructions to trench access. See trench detail in Appendix A.

a) Device Area or Trainee Room. Provide condensate drains for the cockpit air conditioners. Incorporate a lip to prevent contamination of the drain with hydraulic fluid.

2.2.7.3 Compressed Air. Comply with the requirements of NAVFAC DM-3.5, Compressed Air and Vacuum Systems.

2.2.7.4 Electric Water Coolers. Splash resistant basins are recommended to prevent slippage on the floor and shock hazard. Handicapped models shall be recessed as required to minimize obstruction to passage.

2.2.7.5 Waste Systems. Guidance is provided in DM-3.01. Additionally, special consideration shall be given to the following:

a) Accommodate oil separators and interceptors.

b) Accommodate special drain requirements for HVAC, chillers, and trainer equipment.

2.2.7.6 Water Hammer Arresters. Utilize arresters in water supplies where quick-closing valves are installed.

2.2.8 Electrical. Typically, specific electrical requirements for training facilities and/or training device(s) are contained in a TFR or technical manual. Applicable NAVFAC design manuals and military handbooks provide general guidance on electrical engineering. Utilize them in conjunction with current editions of NFPA 70, National Electric Code, and ANSI C2, National Electric Safety Code.

Provide required filtered/conditioned power with the electrical parameters outlined in the Simulator or Training Device TFR. Provide centralized 400 Hz solid state invertor and 24 VDC power, both with backup and in accordance with parameters outlined in the TFR.

a) Hydraulic Pump Rooms. Use steel conduit with liquid type fittings where electrical cables are located in the same trench with hydraulic piping.

b) Classrooms. Locate 120 volt convenience outlets for use of portable audio visual equipment. Provide conduit stub-outs with pull wire in ceiling space for future ceiling mounted audio visual aids such as projection

systems.

c) Corridors. A shock hazard exists from convenience outlets where floor buffers are used. Use locking type outlets mounted high above splash zones.

2.2.8.1 Closed Circuit Television. Comply with MIL-HDBK-1004/7, Wire Communication and Signal Systems. Centralized VCR signal distribution system should be provided where possible, in lieu of portable equipment. Portable VCRs on mobile stands are repair intensive and require unnecessary set up time in individual rooms. Include cable outlet in the lounge for training.

2.2.8.2 Telephones. Administrative telephones are procured and installed under contracts administered by Naval Computer Telecommunications Command (NCTC). Provide support system to include interior and exterior conduits with pull wire, telephone backboard(s), and telephone outlets. Refer to the Navy Telephone Manual for the required telephone outlets, backboard(s) sizes, and conduit sizes. Locate outlets as directed. Consider telephone and communication outlets in maintenance areas and dedicated lines at devices where networking is anticipated. Accommodate any special simulator contractor communication requirements which may require intercom features integrated into the telephone system.

2.2.8.3 Warning Lights and Signal Circuits. Accommodate remote locks, card readers, safety alarms, and key pads for doors.

2.2.8.4 Computers and Training Devices. Refer to manufacturer's TFR and comply with MIL-HDBK-1004/1, Electrical Engineering Preliminary Design Considerations, MIL-HDBK-1004/4, Electrical Utilization Systems, and MIL-HDBK-1012/1. Comply with Federal Information Processing Standards (FIBS) PUB.94, Guidelline on Electrical Power for ADP Installations, for computer rooms. In training facilities with high concentrations of micro computers, control the effects of harmonics when designing branch circuits serving the computer areas. Provide surge protection, filter/conditioning power in accordance with requirements of the TFR. In the absence of specific requirements in the TFR, review the quality of power which will serve the proposed facility and provide surge protection, filters, and conditioners as necessary. See Trainer Facility Data and Equipment Summary Sheets for each aircraft type in this handbook for preliminary planning purposes.

2.2.8.5 Lighting. Lighting levels shall comply with MIL-HDBK-1190. Lighting level requirements exceeding those outlined in MIL-HDBK-1190 must be fully justified and approved. Utilize energy conservation techniques as prescribed in Chapter 9, par. A2a of MIL-HDBK-1190.

Overhead fluorescent lighting can hamper vision at radar scopes, test scopes, and other CRT screens. Use appropriate lighting for these functions to reduce glare. Utilize fluorescent fixtures with battery packs for emergency lighting and/or wall packs in lieu of a central system.

a) Brief/Debrief. Provide means for reducing light level by discrete switching of lights.

b) Console. Provide direct and aimable overhead lighting at trainer console location with dimming controls. Provide adequate lighting with discrete switching in addition to the dedicated console lighting for janitorial services and maintenance after working hours.

c) High Bay. In high bay areas, include provisions for maintenance access to fixtures for repair and relamping. Do not locate lighting fixtures directly over a motion-based simulator cockpit. Consider wall mounted lighting. Task lighting for device access platforms is normally supplied by the device manufacturer; however, circuitry (junction box) for this function must be provided convenient to the platforms.

d) Classrooms. Provide classroom lighting control (dimmers and/or selective lamp and ballast switching) with discrete circuits for the front of the room to allow for effective visual use of television monitors, projectors, view graphs, etc.

e) Instructor Station/Console. Task lights may be required.

2.2.8.6 Lightning Protection. Perform a lightning protection risk assessment on all aviation training facility types in compliance with Appendix I of NFPA 78, Lightning Protection Code, to justify lightning protection when required by the regional Engineering Field Division. Comply with applicable sections of MIL-HDBK-1004/6, Lightning Protection.

2.2.8.7 Facility Low Voltage Power. Refer to applicable TFR or technical manual and comply with MIL-HDBK-1004/1 and MIL-HDBK-1004/4. Generally provide 480Y/277 volt, three-phase, four-wire service to the facility. Utilize dry type transformers to step voltage down for 120, 208 and 240 volt requirements.

2.2.8.8 Intrusion Detection System (IDS). Facility IDS systems are procured and installed via contracts administered by NCIS. Coordinate with NCIS for facility planning, design, and construction schedules. IDS systems including commercial power supply, utility and control wiring system are considered personal property. Provide support system in the construction contract to include conduit with pull wire and device boxes as directed. IDS for Marine Corps projects are separately funded and managed and do not require NCIS coordination. Provide IDS support requirements and startup specification where required in accordance with MIL-HDBK-1012/1.

2.2.8.9 Uninterruptible Power Supplies (UPS). UPS systems when required and justified by the user and are dedicated to the support of an item of personal property are typically procured for military construction (MILCON) projects via contract administered by Naval Facilities Engineering Services Center East Coast Detachment (NFESC), and are installed by the facility construction

contractor (i.e., Government furnished/contractor installed). Provide UPS support requirements and startup specification where required in accordance with MIL-HDBK-1012/1.

2.2.8.10 400 Hz Power. Comply with MIL-HDBK-1004/5, 400-Hz Medium-Voltage Conversion/Distribution And Low-Voltage Utilization Systems. Due to the size of the load, solid state 400 Hz power supplies located in close proximity to the utilization equipment are required.

2.2.8.11 Facility Shielding. TEMPEST shielding must be validated by the Naval Electronics Systems Engineering Center (NESSEC). MIL-HDBK-1195, Radio Frequency Shielded Enclosures, provides additional guidance.

2.2.8.12 Grounding. Building grounding system shall comply with NFPA 70. Computer/electronic signal grounding system , if required, shall comply with MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities, and NFPA 70. When conflicts arise between facility and/or training device requirements and MIL-HDBK-419A and/or NFPA 70, MIL-HDBK-419A and NFPA 70 shall rule.

2.2.9 Fire Protection. Comply with MIL-HDBK-1008, Uniform Building Code (UBC), and NFPA 101. Classroom facilities for Navy installations are considered business occupancies per NFPA 101. Assembly occupancies, conference rooms and classrooms with fixed seating require special attention. Requirements for sprinkler systems, carbon dioxide extinguishing systems, fire alarm systems and protection of electronic equipment installations are determined by MIL-HDBK-1008. Hand held portable halon extinguishers are permitted; however, automatic halon extinguishing systems are not. Convey fire alarm signals to the base fire department via the base fire reporting system. Verify the type of system with the fire department.

a) Hydraulic Fluid Piping Systems. High pressure 2000 psi hydraulic fluid has a high flashpoint and atomizing fluid leaks can self ignite with friction. Spaces containing exposed hydraulic fluid piping are subject to special protection. Provide fire stop seal where piping and cable in trenches pass through fire rated walls.

b) Hydraulic Pump Rooms. Provide sprinkler protection in hydraulic piping trenches. Hydraulic piping trenches and pump rooms are potentially Class I electrical hazard areas per NFPA 70 depending on the characteristics of the hydraulic fluid used. Specify electrical fixtures in the pump room as Class I, Division I explosion proof. Provide 2-hour fire resistive rated perimeter walls if the ordinary petroleum-based hydraulic fluid is used.

c) Computer Rooms and Other Electronic Spaces. Comply with MIL-HDBK-1008. Provide sprinkler protection. Controls shall automatically shut down computer, electronic and simulator power upon activation of the sprinkler system. Provide a plaque citing, "WARNING--Fire suppression system will shut down computer power to minimize damage--loss of data may occur." Smoke

detection is required in subfloor spaces. Design computer/electronic and air conditioning equipment power to shut down upon activation of sub-floor smoke detectors in the associated room. An automatic carbon dioxide fire extinguishing system may be required by MIL-HDBK-1008. Place exits in accordance with occupancy counts and travel distances around equipment to comply with NFPA 101.

d) Media Storage Rooms. Comply with NFPA 232, Protection of Records.

e) High Bay. Fire protection beneath the simulator device shall consist of either a fixed, automatic carbon dioxide fire extinguishing system or smoke detectors and a wheeled carbon dioxide extinguisher. Refer to MIL-HDBK-1008. Provide ionization-type smoke detectors in either case. Provide a fire alarm audio and/or visual device connected to the building fire alarm system to alert the trainee in the simulator module. Provide sprinkler piping and heads with heat detectors in hydraulic trenches. Extend sprinkler piping and provide tap for device protection.

2.2.10 Safety. The design of all military facilities that serve as places of employment shall conform to, or be consistent with, all applicable standards published under the Occupational Safety and Health Act (OSHA) of 1970 in accordance with MIL-HDBK-1190. Note that Chapters 5 through 7 of this reference state that whenever construction criteria and OSHA standards conflict, "the standard providing the greatest degree of safety shall govern." Obtain a system safety work group (SSWG) hazard rating established by the activity and found in the facility study. Typical hazards include equipment guards and clearances, carbon dioxide discharge, and hydraulic systems.

Moving and electrically energized parts and pressurized hydraulic systems are primary concerns. Include a safety eyewash/shower in accordance with ANSI Z358.1, American National Standard for Emergency Eyewash and Shower Equipment where hydraulic or other petroleum, oil, and lubricant (POL) materials are used in the building. Arrange for hydraulic pumps to shut down automatically if a leak or break occurs in the line at any point. Provide emergency shutoff switches for the hydraulic pumps at the instructor's station. Provide three feet safety clearances around training devices. Paint floor around any rotating device yellow and black and indicate the type of hazard (i.e., "strike hazard-rotating device-stay clear"). The TFR requires equipment manufacturers to identify safety concerns for the facility design. Accommodate the following manufacturer provided safety features in the facility electrical design:

a) "DEVICE IN OPERATION - DO NOT ENTER" lighted flashing signs indicating trainer operation and red warning flashers are located at entry doors to operate whenever the motion system hydraulics are pressurized. Both indicators must be visible from all approach points.

b) Device area door alarms and/or hydraulic equipment shutdown for safety of entrants.

c) Emergency egress lights are located within the on-board trainee/instructor areas to allow safe egress in event of power failure. An emergency mode of OFT ingress/egress ramp deployment is also provided.

d) Emergency off switches are normally provided at rack clusters and other locations where personnel may be working to shut down the entire trainer system.

2.2.11 Security. A checkpoint for identification of entrants to the building may be required. NAVFAC Instruction 11010.44E, Shore Facilities Planning Manual provides guidance for the TEMPEST Vulnerability Assessment Request which is required when operating electronic equipment processing classified data.

2.3 Collateral Equipment. When MILCON personal property facility projects are programmed, the installation criteria for the equipment must be shown in, or attached to, the facility studies for the projects involved. Major claimants, users, and equipment procurement agencies for projects of this type are responsible for providing these criteria as part of the MILCON planning process. "Personal property" is defined as plant equipment which is procured and installed by the major claimants, users, or equipment procurement agencies with funds from other appropriations. This category of equipment includes technical, training, simulation, and automated data processing equipment. Detailed requirements for the aforementioned can be found in NAVFACINST 11010.44E.

Furniture selection criteria shall include function, anthropometric considerations, movesability, adjustability, maintenance, durability, comfort, and cost. A clear relationship between the furniture finishes and the building finishes shall be evident. Give similar attention to the selection of finishes of equipment and training aids. Select all furnishings from the Government's mandatory sources of supply. Primary sources include General Services Administration Federal Supply Schedules and Stock Catalogs, Federal Prison Industries, Blind-Made Products, etc. Selections made from other sources require a waiver with NAVFAC approval outlining the item's technical advantages and the inadequacies of Government mandatory sources.

2.3.1 Collateral Equipment List. The collateral equipment list is an essential programming and budgeting document. Preliminary collateral equipment lists are a means to establish a budget for funding purposes and are not intended to be used as a "buy" list. Consult the Project Interior Designer at the EFD to assist in developing functional requirements as part of the interior design process. Integrate these functional requirements with the building design and space planning effort which are reflected in the Furniture/Equipment Footprint. Maintain a continuing update of the collateral equipment list with the using activity to ensure all budget estimates are

current and are adequately accommodated in the design. Include fire extinguishers and consider shredders or incinerators where classified material is used.

2.3.2 Furniture/Equipment Footprint. The Furniture/Equipment Footprint shall use standard or "generic" furniture sizes to demonstrate the adequacy of each space area and the collateral equipment list and to communicate to other engineering disciplines the utilities and services required for each space. It also demonstrates that life safety exit patterns are accommodated with the furniture and equipment in place. Provide a Furniture/Equipment Footprint for the PE phase.

Locate lockers for books, if required by the user, for easy access between classes. Lockers in the corridor or elsewhere in the facility are at the discretion of the user. Consider locker groupings for personal belongings and foul weather gear near the main entry or student lounge.

2.3.3 Training Aids

2.3.3.1 Special Training Device Requirements. Maintain a continuing update of the proposed equipment with the user to ensure items are current and are adequately accommodated in the design.

2.3.3.2 Personal Computer (PC) Stations. PC based trainers with one or two monitors for use with interactive courseware may be required.

2.3.3.3 Audiovisual Requirements.

a) Rear Screen Projection. Rear screen projection is discouraged in light of improved state-of-the-art media and additional space requirements. Where rear screen projection is essential, provide at least 6 feet clear space width behind the screen which can accommodate the projection path and serve as media storage and teacher work space.

b) Presentation Hardware and Projection Systems. PC based digitizing graphics hardware and three gun ceiling mounted projectors are current state-of-the-art media for visual aids in the classroom.

c) Slide and Overhead Projectors. Provide stowage space for portable carts. See concerns for aspect ratios below.

d) Projection Screens. Base selection of permanently mounted or stand alone screens on user preference. Permanently mounted screens can limit marker board area. Base justification of electrified projection screens on local requirements; however, maintenance and repair costs must be considered. Successful visual presentations depend on arrangements of the marker board and projection screen relative to the seating configuration.

(1) Avoid visual obstructions. Use clearspan structural

systems where possible. Large demonstration tables when raised on platforms can obscure the lower areas of marker boards.

(2) Slope the floor and raise the speaker's platform only where space is dedicated to projection and large capacity lecture functions.

(3) Consider the viewing distances.

(4) Conform to the vertical and horizontal viewing angles. Place seats at a distance from a screen not less than twice nor more than six times the width of the screen image to be viewed. The angle of elevation from the eye to the top edge of the screen or marker board should not exceed 30 degrees. Where room or seating depth is known, the screen width can be determined by W=D/6 (preferred) or W=D/10 (minimum), where W=screen width and D=depth of room or seating. Select particular projection equipment based on aspect ratios compatible with height and width ratios for the screen. Refer to Timesaver Standards for Building Types, for graphic data on projection angles and screen widths. Consult Architectural Graphic Standards, John Wiley and Sons, for viewing zone limits and projection medium aspect ratios.

e) Chalkboard and Marker Boards. Porcelain surface marker boards are generally preferred since they are cleaner and can double as projection screens; however, scrutinize their use in high security areas due to the potential retention of images after erasure. Do not use chalkboards in computer rooms. Airborne chalk dust can damage computer hardware.

2.3.3.4 Electronic Information Delivery Systems (EIDS). Accommodate computerized EIDS and carrels where required. Carrels must be wider than normal to accommodate the EIDS.

2.4 Supporting Functions and Utilities. The facility usually requires administrative functions not directly related to the trainers, but necessary for the smooth functioning of the training organization. These functions usually include the OIC and NCO assistant, and the secretarial staff.

2.5 Supporting Personnel. These personnel include the administrative personnel, TSSA, training analysts, and others not absolutely essential to the day to day operations, but necessary for training effectiveness. Accommodate special contractor support spaces such as contractor total training systems support (CTTSS) or any level of private contractor support where required.

2.6 Special Contractor Support Spaces. The operation and maintenance of simulators is normally provided by contractors instead of Government personnel. As such, the contractor has control of simulator spare parts and maintenance areas and usually requires lockable spaces and an administrative office space.

2.7 Environmental Requirements. Design facilities to meet environmental requirements at Federal, State, and local levels. Comply with applicable pollution abatement criteria. For applicable discharge criteria, consult NAVFACENGCOM Headquarters and the cognizant EFD. Refer to MIL-HDBK-1005/8.

Table 2.2
Trainer Facilities Data - F/A-18 WTT

Non-motion devices with 2- 40' diameter projection domes
Room dimensions shown are minimums unless noted.
Model facility plates may show site specific larger dimensions.

** CAUTION: This document is for preliminary planning only.**
**Verify with NTSC and NAVAIR prior to use. **

REFERENCE DOCUMENTS

General Requirements for Aviation Training Facilities, NTSC Orlando
TRAINER FACILITY INFORMATION, NTSC Orlando
Trainer Facility Report, F/A-18 WTT TFR, September 1990, Hughes Aircraft Co.

ARCHITECTURAL

SPACE NAME	MIN DIMENSIONS (LxWxH)	MAX NOISE LEVEL	ACCESS FLOOR	REMARKS
Device/Trainee Area.	120'x 65'x 44'	55dB(A)	none	2
Instructor/Operator	40'x 23'x 10'	55dB(A)	18" h	
Debrief Station	23'x 17'x 10'	35dB(A)	verify	
Computer Room (CIG)	32'x 23'x 10'	65dB(A)	18" h	2
Computer Room (digital)	46'x 40'x 10'	65dB(A)	18" h	
Mech Pump Room (2-ea)	20'x 10'x 10'	75dB(A)	none	1

General Notes:
Above requirements are WTT specific. See other data for administrative & support spaces. Equipment noise is indicated on the F/A-18 (WTT) Trainer Equipment Summary.

Remarks:
1. Reduce noise to trainee and instructor area.
2. 44' is clear crane hook height. Clear ceiling height is dependent on crane configuration.

Table 2.2 (Continued)
Trainer Facilities Data - F/A-18 WTT

STRUCTURAL

Device transport method: 3 ton capacity overhead bridge crane at high bay.
Vibration Control. Isolate mechanical room. Resonant frequency = 13hz maximum for light valve platforms.
Special permanent installation/removal equipment: See 3 ton crane above.

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES(f)	HUMIDITY PERCENT	SPECIAL DUCTING	REMARKS
Device/Trainee Area	60-80	40-60	remark 1	2
Instructor/Operator	60-80	40-60	remark 4	
Debrief Station	60-80	40-60		
Computer Room (CIG)	60-80	40-60	remark 5	
Computer Room (digital)	60-80	40-60	remark 5	
Mechanical Pump Room.	50-90	10-90		3
Maintenance Room.	70-80	40-60		
Maintenance Storage.	70-80	40-60		

General Notes:
Refer to WTT Trainer Equipment Summary and architectural for equipment cooling supply/exhaust ports and equipment and personnel loads. Include heat release from cockpit and dome air conditioning.

Remarks:
1. Non-motion versions require special ducting by the manufacturer from trench to inside the dome and cockpit.
2. 24"wide x 18"deep trench. Slope to drain to sewer or sump.
3. Fresh air ventilation
4. Cool air supply ports direct to underside of console.
5. Under access floor supply plenum. Provide perforated panels as required for airflow.

Table 2.2 (Continued)
Trainer Facilities Data - F/A-18 WTT

ELECTRICAL

SPACE NAME	VOLTS	HZ	WIRE COUNT	PHASE	LIGHT LEVEL	ZONES	REMARKS
Device/Trainee Area	120/208	60	4+GND	3	50fc	2	1,4
Instructor/Operator	120/208	60	4+GND	3	50fc	2	2,4
Debrief Station	120/208	60	4+GND				4
Computer Room (CIG)	120/208	60	4+GND	3	50fc	2	4
Computer Room (digital)	120/208	60	4+GND	3	50fc		4,5
Mechanical Pump Room.	120/208	60	4+GND	3	50fc		3,4
Maintenance Room.	120/208	60	4+GND	3	50fc		
Maintenance Storage.	120/208	60	4+GND		15fc		

Remarks:

1. Primary zone shall be on/off. Secondary zone includes Instructor Station and should have dimmer.
2. Included in Device Area zone. Locate controls for Device Area and Instructor Station near the Instructor Station. Provide aimable & dimmable lights over console work surface.
3. Device contractor will step voltage up for 480v requirement.
4. Conditioned power.
5. Cable trenches and vertical cable raceways required between computer rooms and training devices as noted.

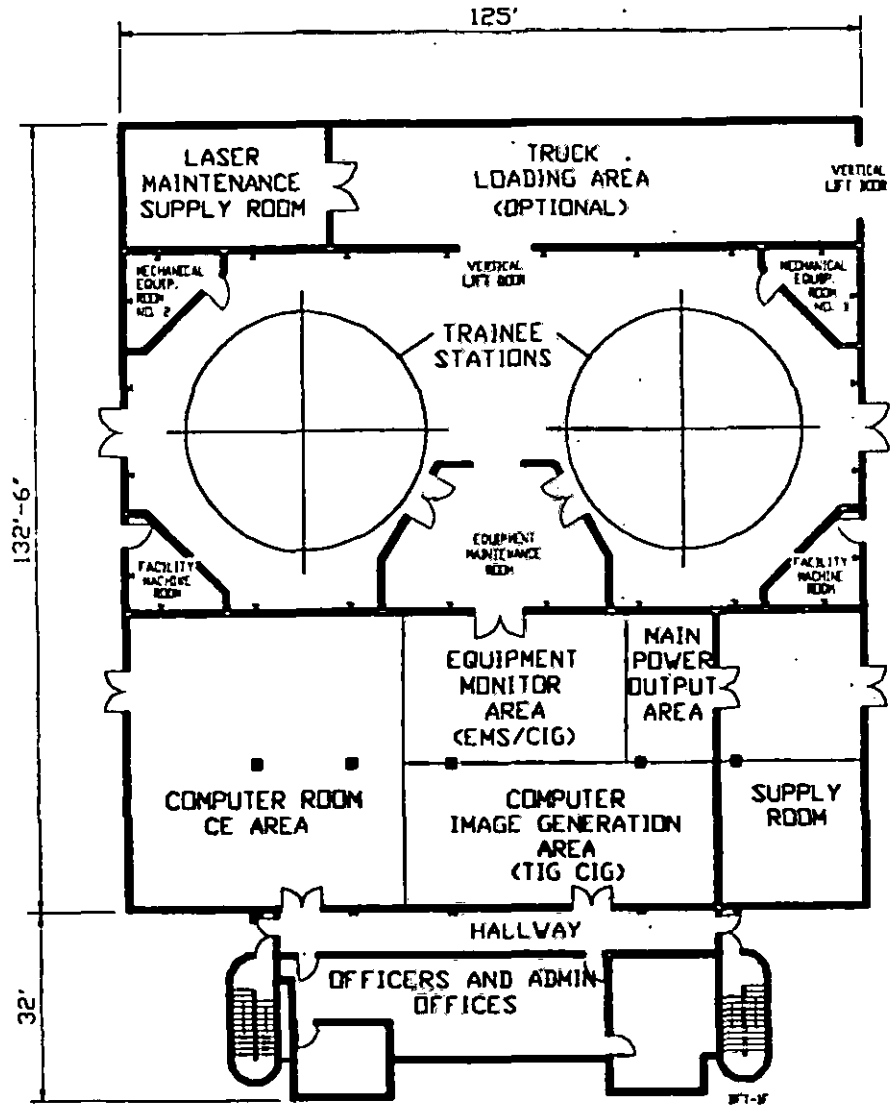
General Notes:

Training Devices Connects:
Device contractor supplies component wiring and conduit from device to government disconnects or panel. Main power switch in computer room.

Grounding: Building, Equipment, and Signal Grounds required.

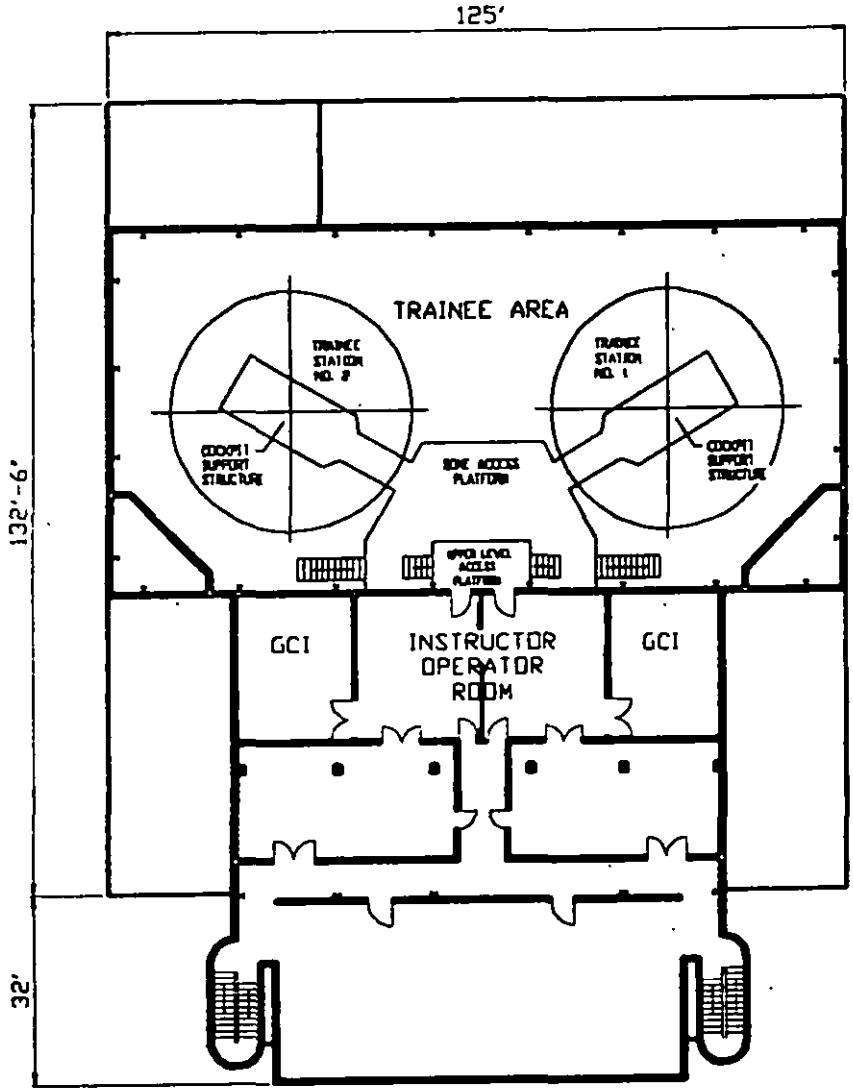
Lightning Protection: (if required)

CAUTION: This drawing is for preliminary planning only.
Verify with NTSC and NAVAIR prior to use.



TITLE F/A-18 SIMULATOR BUILDING FIRST FLOOR PLAN	DATE MAY 1991	FACILITY PLATE NO. 171 35	SHEET A1

CAUTION: This drawing is for preliminary planning only. Verify with NTSC and NAVAIR prior to use.

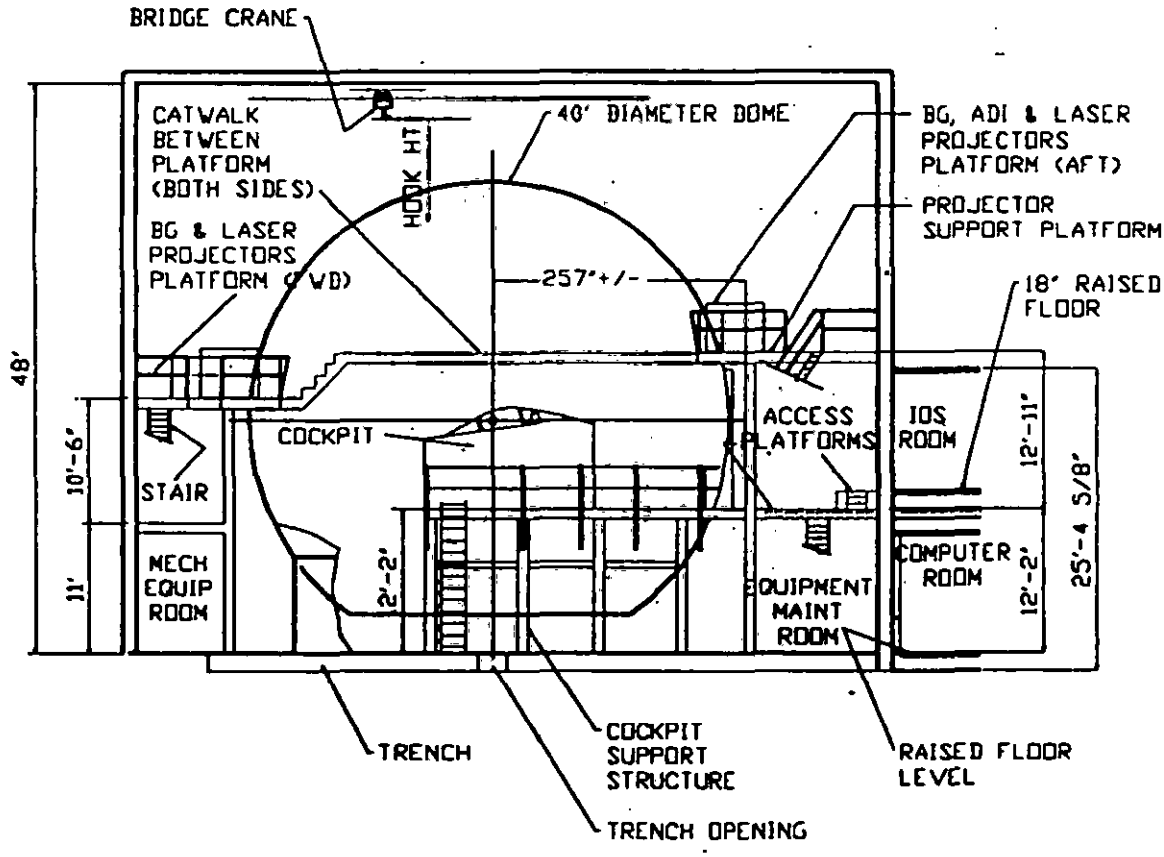


1/32" = 1'-0"

20' 0 20' 40' 60' 80' 100'

TITLE F/A-18 SIMULATOR BUILDING SECOND FLOOR PLAN	DATE MAY 1991	FACILITY PLATE NO. 171 35	SHEET A2

CAUTION: This drawing is for preliminary planning only.
Verify with NTSC and NAVAIR prior to use.



TITLE	DATE	FACILITY PLATE NO.	SHEET
F/A-18 (WTT) HIGH BAY SECTION	MAY 1991	171 35	A3

Table 2.3
Trainer Equipment Summary - F/A-18 WTT-Computer Room

** CAUTION: This document is for preliminary planning only.**
**Verify with NTSC and NAVAIR prior to use. **

REFERENCE

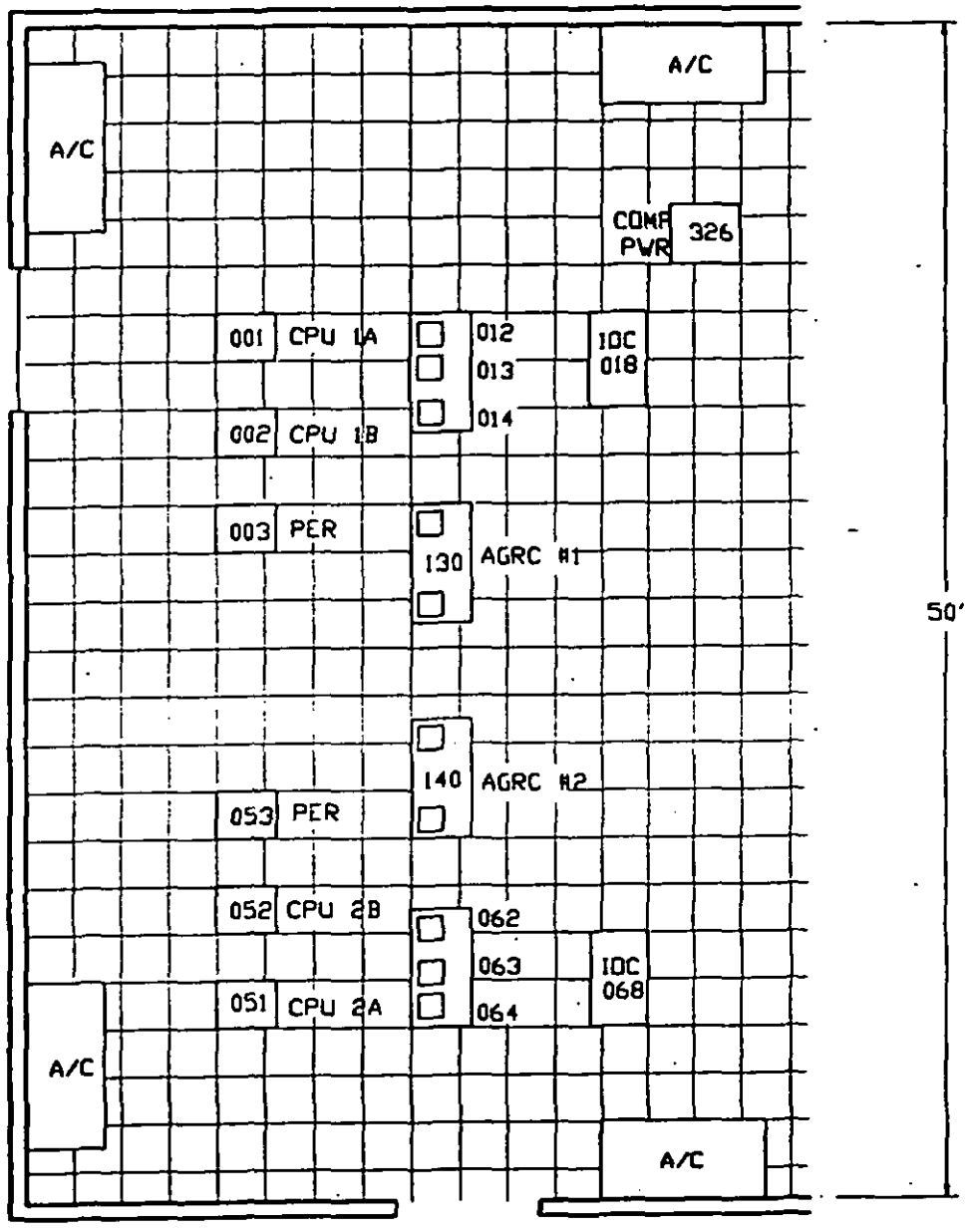
Trainer Facilities Report, Kuwait Weapons Tactics Trainer (WTT), HAC REF. NO. JO268, Hughes Aircraft Company, Training and Support Systems Group, PO Box 10011, Manhattan Beach, CA 90266-8511, July 1990.

Unit	Description	size(inches) W	D	H	weight (lbs)	heat (BTU/HR)	EST KVA	cool (CFM)
001	Proc/Periph Cab	48	38	71	950	44300	13.0	2738
012	I/O Terminals	20	20	20	120	5100	1.5	315
013	I/O Terminals	20	20	20	120	5100	1.5	315
014	I/O Terminals	20	20	20	120	5100	1.5	315
018	I/O Controller (IOC)	48	33	71	950	34000	10.4	2104
051	Proc/Periph	48	38	71	950	44300	13.0	2738
062	I/O Terminal	20	20	20	120	5100	1.5	315
063	I/O Terminal	20	20	20	120	5100	1.5	315
064	I/O Terminal	20	20	20	120	5100	1.5	315
101	Target Image Gen	26	38	71	600	15600	4.6	963
102	Target Image Gen	26	38	71	600	15600	4.6	963
103	TIG Terminal	16	21	14	130	10200	3.0	632
130	Radar Sys Maint	36	30	36	100	-	-	-
131	Alliant FX80	49	34	43	1200	35000	10.4	2160
132	Radar Sys Disc Cab	49	34	71	1500	22000	6.4	1358
134	SSIG Disk Cabinet	26	35	71	750	11000	3.2	679
135	Encore Processor	25	38	71	750	13600	4.0	840
136	SSIG Maint Station	36	60	36	100	0	0	0
136A1	VDT (Conrac)	16	21	14	85	6000	1.8	370
136A2	VDT (GE)	16	21	14	65	6000	1.8	370
136A3	Joystick	10	9	6	10	700	.2	43
137	Compuscene IV-A	360	36	78	16410	200000	58.5	12345
140	Radar Sys Maint	36	30	36	100	-	-	-
141	Alliant FX80	49	34	43	1200	35000	10.4	2160
142	Radar Sys Disc Cab	49	34	71	1500	22000	22.0	1358
144	SSIG Disc Cabinet	26	35	71	750	11000	3.2	679
145	Encore Processor	25	38	71	750	13600	4.0	840
146	SSIG Maint Station	36	60	36	100	-	-	-

Table 2.3 (Continued)
Trainer Equipment Summary - F/A-18 WTT-Computer Room

Unit	Description	size(inches) W	D	H	weight (lbs)	heat (BTU/HR)	EST KVA	cool (CFM)
146A1	VDT (Conrac)	16	21	14	85	6000	1.8	370
146A2	VDT (GE)	16	21	14	65	6000	1.8	370
146A3	Joystick	10	9	6	10	700	.2	43
147	Compuscene IV-A	360	36	78	16410	200000	58.5	12345
231	ASIC	75	30	76	1300	13600	4.0	843
241	ASIC	75	30	76	1300	13600	4.0	843
254	EMS	75	30	76	900	6800	2.0	421
321	Main Input Pwr Cab	60	30	65	1000	6800	2.0	421
323	EMG Power Cabinet	28	24	42	375	3400	1.0	210
324	Power Cabinet	32	30	60	1100	7000	2.0	432
326	Computer Pwr Cabinet	28	24	42	1000	3400	1.0	210

General Note:
1. "-" indicates unknown quantity.



CAUTION:
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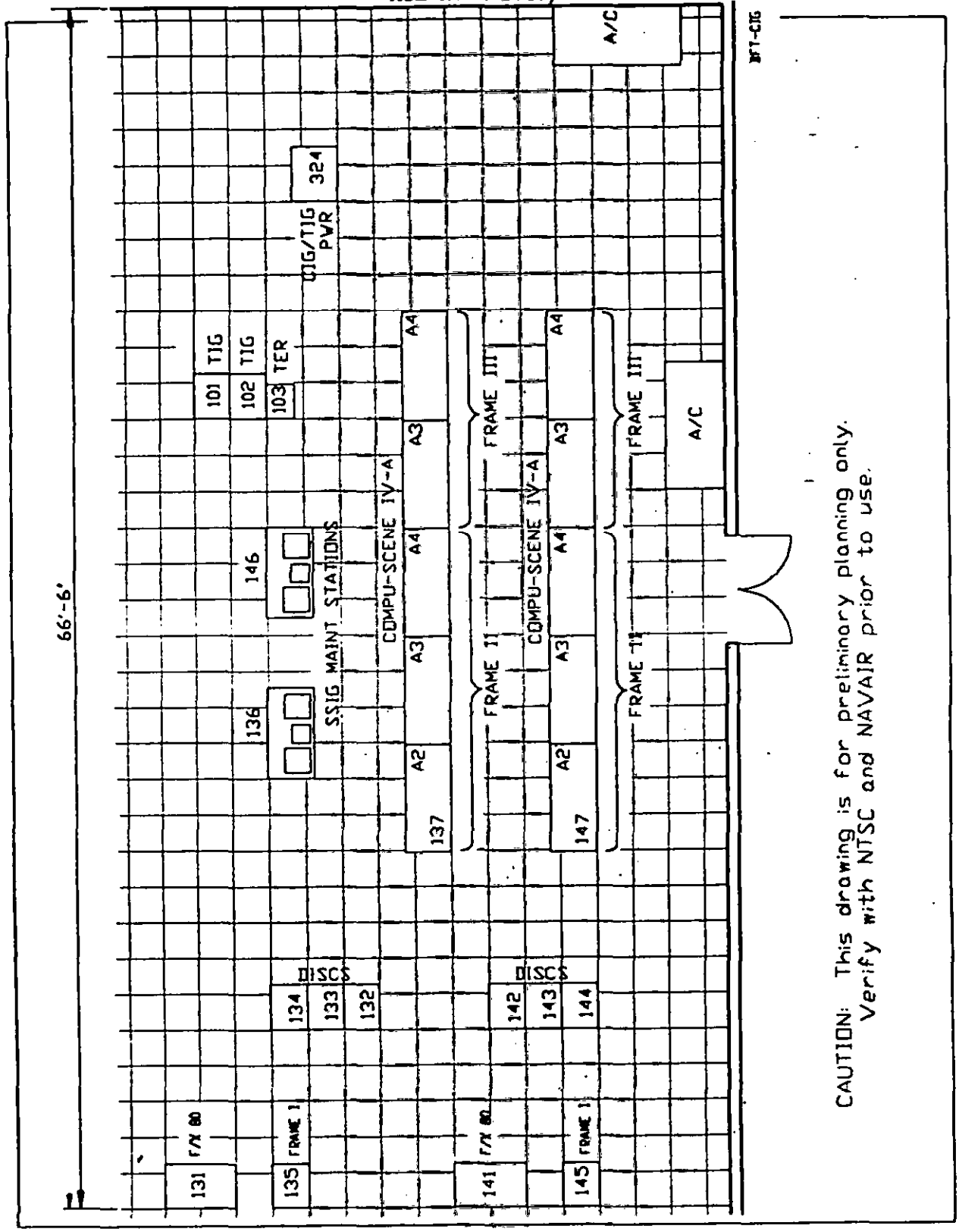
Verify with NTSC and NAVAIR prior to use.

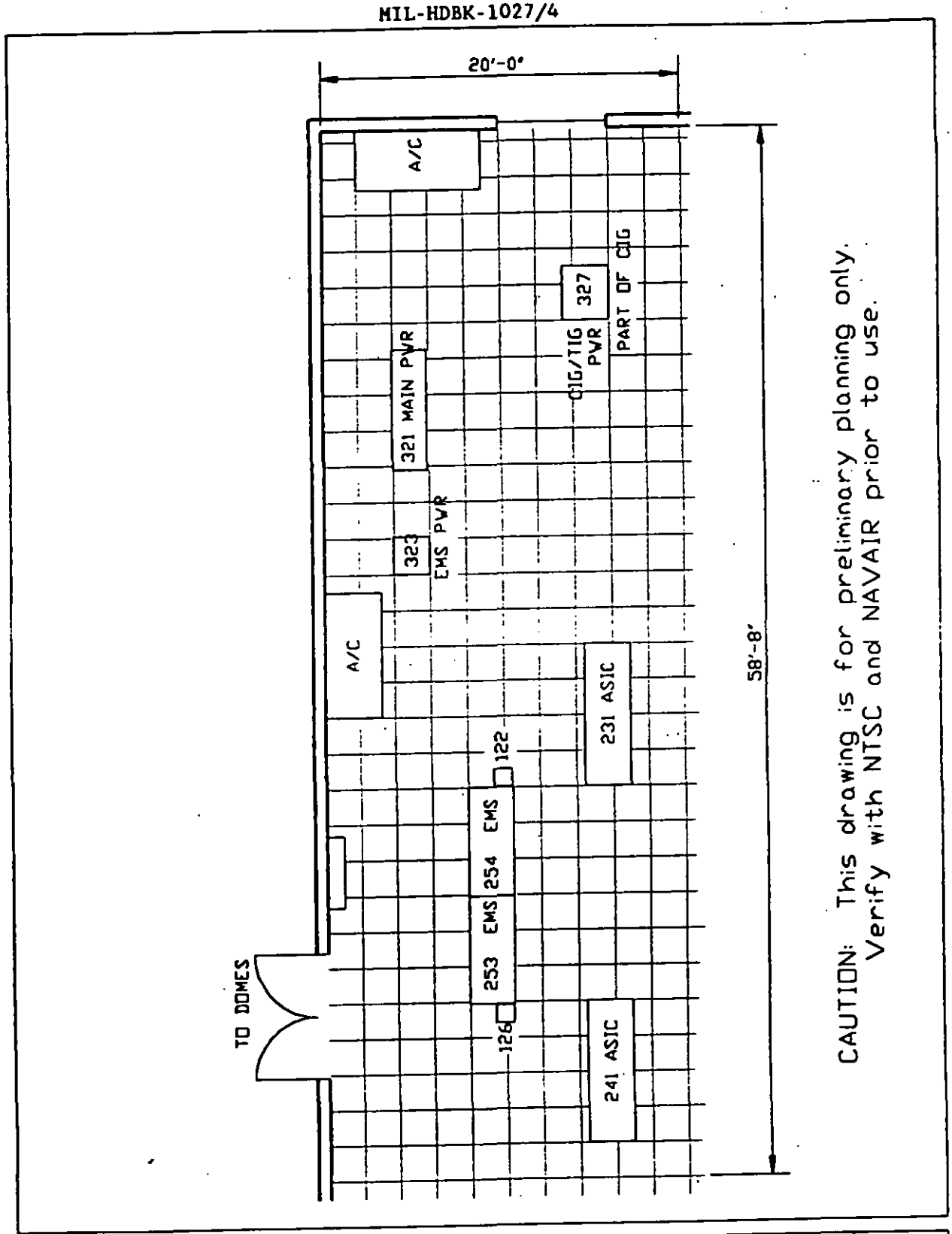
⅛" = 1'-0"

5' 0 5' 10' 15' 20' 25'

TITLE F/A-18 (WTT) COMPUTER ROOM-CE AREA	DATE MAY 1991	FACILITY PLATE NO. 171 35	SHEET A4



TITLE	DATE	FACILITY PLATE NO.	SHEET
F/A-18 (WTT) COMPUTER ROOM-TIG/CIG	MAY 1991	171 35	A5



TITLE	DATE	FACILITY PLATE NO.	SHEET
F/A-18 (WTT) COMPUTER ROOM-EMS/CIG	MAY 1991	171 35	A6

Table 2.4
Trainer Facilities Data - F/A-18 OFT

Motion device with visual system
Room dimensions shown are minimums unless noted.
Model facility plates may show site specific larger dimensions.

** CAUTION: This document is for preliminary planning only.**
**Verify with NTSC and NAVAIR prior to use. **

REFERENCE DOCUMENTS

Trainer Facilities Report, Device 2F132 F/A-18 OFT #7, Rev. A, March 1988, Honeywell, 13775 McLearen Road, Herndon, Virginia 22071

ARCHITECTURAL

SPACE NAME	MIN DIMENSIONS (LxWxH)	MAX NOISE LEVEL	ACCESS FLOOR	REMARKS
Device/Trainee Area.	17'x 31'x 18'	55dB(A)		1
Instructor/Operator	17'x 31'x 11.5'	55dB(A)	10" h	2,4
Computer Room	29'x 31'x 9'	65dB(A)	10" h	3,4
Utility Area	22'x 6'x 8'	remark 5		3

General Notes:
Above requirements are WTT specific. See other data for administrative & support spaces.

Remarks:
1. Special door @ 6'-0"w x 8'-6"h
2. Special door @ 4'-0"w x 8'-0"h
3. Special door @ 4'-0"w x 7'-0"h
4. Flooring to be IAW MIL F 29046 (TD) and electrostatic protected.
5. Equipment produces noise level of 95 Db.

Table 2.4 (Continued)
Trainer Facilities Data - F/A-18 OFT

STRUCTURAL

Device components transport method: Cockpit by casters and lifted by lifting fixtures or fork lift truck.
Special equipment: Overhead track and hoist with 500 pound capacity.
Maximum concentrated computer access floor load: 47.8 pounds per square inch.
Max column floor pad load from trainee station: 18.0 pounds per square inch.

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES(f)	HUMIDITY PERCENT	EQUIP HEAT (BTU/HR)
Device/Trainee Area	60-80	40-60	103,400
Instructor/Operator	60-80	40-60	9600
Computer Room	60-80	40-60	111,390
Utility Area	40-100	50-80	51,360

ELECTRICAL

SPACE NAME	VOLTS	HZ	WIRE COUNT	PHASE	LIGHT LEVEL
Device/Trainee Area	120	60	2+GND		50fc
Instructor/Operator	120	60	2+GND		75fc
Computer Room	120/208	60	4+GND	3	75fc
Utility Area	480Y/277	60	4+GND	3	50fc

General note: Electrical power furnished by the facility should be:
160 AMP, 120/208 VAC, 3 phase, 60 Hz, 4 Wire plus ground
55 AMP, 480Y/277 VAC, 3 phase, 60 Hz, 4 Wire plus ground

Grounding: Earth Ground required.

Table 2.5
Trainer Equipment Summary - F/A-18 OFT-DEVICE 2F132

** CAUTION: This document is for preliminary planning only.**
**Verify with NTSC and NAVAIR prior to use. **

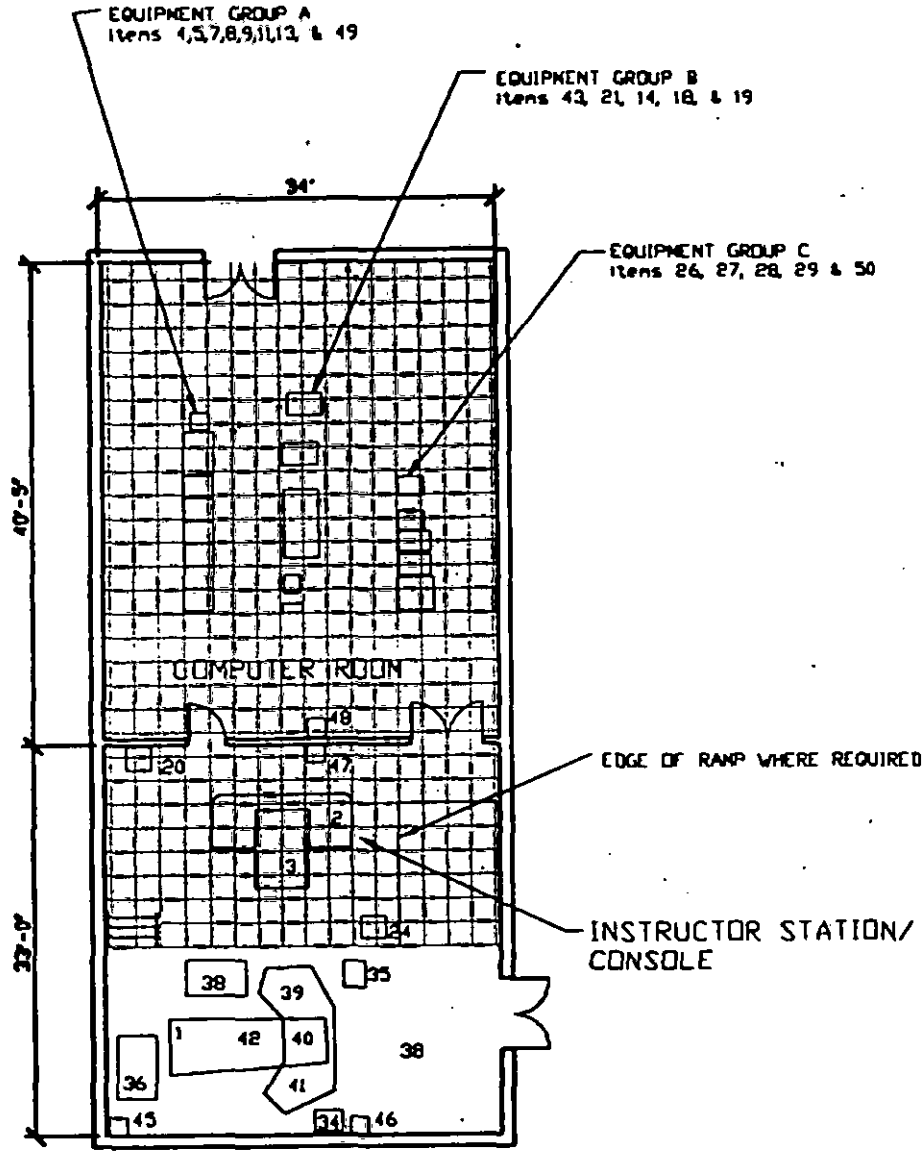
REFERENCE

Operation and Maintenance Instructions Overall Trainer
F/A-18 Operational Flight Trainer, Device 2F132, 6930-LL-C00-5211
Hughes Simulation System, Inc., Herndon, Virginia 22071, 2 October 1989

Unit Description	size (inches) W	D	H	weight (lbs)
1 Trainee Station	44	146	58	2000
2 Instructor Console	132	47	56	600
3 Visual/Monitor Cons	41	59	93	900
4 Input/Output Unit	22	28	79	500
5 Input/Output Unit	22	28	79	500
6 (not assigned)				
7 Aural/ICS	22	28	79	400
8 CRT Controller	22	28	79	500
9 Mission Computer	22	28	79	400
10 (not assigned)				
11 Flight Control Comp	22	33	79	400
12 (not assigned)				
13 AC Power Dist	44	28	79	1000
14 Digital Computer	69	35	56	1200
15-17 (not assigned)				
18 Sing Prt Disc Drv	22	36	36	567
19 Sing Prt Disc Drv	22	36	36	567
20 Printer/Plotter	24	24	37	120
21 A/N CRT	16	19	14	25
22-25 (not assigned)				
26 Mag Tape/Disc Drive	19	13	25	170
27 Visual Image Gen	22	31	79	700
28 Visual Image Proc	22	31	79	500
29 Visual Data Terminal	19	26	33	200
31 Hydraulic Power Unit	52	38	50	900
32 Pneumatic Power Unit	66	28	55	900

Table 2.5 (Continued)
Trainer Equipment Summary - F/A-18 OFT-Device 2F132

Unit Description	size (inches) W	D	H	weight (lbs)
33 Air Dryer	18	12	14	75
34 400 hz Freq Conv	28	21	28	300
35 Cockpit Pwr Sup Assy	22	27	41	350
36 Cockpit Air Cond	38	64	38	900
37 Cockpit Serv Platfrm	168	240	54	4000
38 Motion Control Assy	58	36	38	300
39 Visual Display Unit	40	26	33	400
40 Visual Display Unit	40	26	33	400
41 Visual Display Unit	40	26	33	400
42 Motion Seat Assembly	27	35	110	500
43 MICS Junction Box	21	10	8	15
44 MICS Station	18	18	43	25
45 MICS Station	18	18	43	25
46 MICS Station	18	18	43	25
47 MICS Station	18	18	43	25
48 MICS Station	18	18	43	25
49 MICS Station	18	18	43	25
50 MICS Station	18	18	43	25
51 MICS Station	18	18	43	25



CAUTION: This drawing is for preliminary planning only.
Verify with NTSC and NAVAIR prior to use.

1/16" = 1'-0"

10' 0 10' 20' 30' 40' 50'

TITLE F/A-18 (OFT) FLOOR PLAN	DATE DEC 1992	FACILITY PLATE NO. 171 35	SHEET A7

Table 2.6
Trainer Facilities Data - F/A-18 PTT

Non-motion devices
Room dimensions shown are minimums unless noted.
Model facility plates may show site specific larger dimensions.

** CAUTION: This document is for preliminary planning only.**
**Verify with NTSC and NAVAIR prior to use. **

REFERENCE DOCUMENTS

General Requirements for Aviation Training Facilities, NTSC Orlando
TRAINER FACILITY INFORMATION, NTSC Orlando
Trainer Facilities Report for F/A-18 Part Task Trainer, HI 84-33/7002, 21 June 1984, Gould Inc., Systems and Simulation Division, 50 Marcus Drive, Mellville, NY 11747

ARCHITECTURAL

SPACE NAME	MIN DIMENSIONS (LxWxH)	OCCUPANT COUNT	MAX NOISE LEVEL	ACCESS FLOOR	REMARKS
Device/Trainee Area.	30'x 22'x 8'	6	55dB(A)	12" h	1 & 2
Computer Area					3
Maintenance Area					3

General Notes:
Above requirements are PTT specific. See other data for administrative & support spaces. Equipment noise is indicated on the Trainer Equipment Summary.

Remarks:
1. 10' ceiling height preferred in this size room.
2. 72"w x 84"h hinged door required for equipment access.
3. Space is included in Device/Trainee Area.

STRUCTURAL

Device transport method: 4 casters at 2 square inches each load bearing surface.
Vibration Control: None required.
Permanent installation pads: 4 at 2.76 square inches each

Table 2.6 (Continued)
Trainer Facilities Data - F/A-18 PTT

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES(f)	HUMIDITY PERCENT
Device/Trainee Area	50-98.6	80 (max)
Computer Room Area	50-98.6	80 (max)
Maintenance Area	70-80	40-60

ELECTRICAL

SPACE NAME	VOLTS	HZ	AMPS	WIRE COUNT	PHASE	LIGHT LEVEL	ZONE	REMARKS
Device/Trainee Area	120/208	60	75	4+GND	3	50fc	2	1,2,3
Computer Area	(see TFR)							3
Maintenance Area	120	60	20	2+GND	3	70fc	1	

Remarks:
1. 100 ampere service recommended for trainers.
2. Dimming control or fluorescent tube switching recommended.
3. Provide utility outlets at every other cabinet and at each trainee station for service lighting.

General Notes:

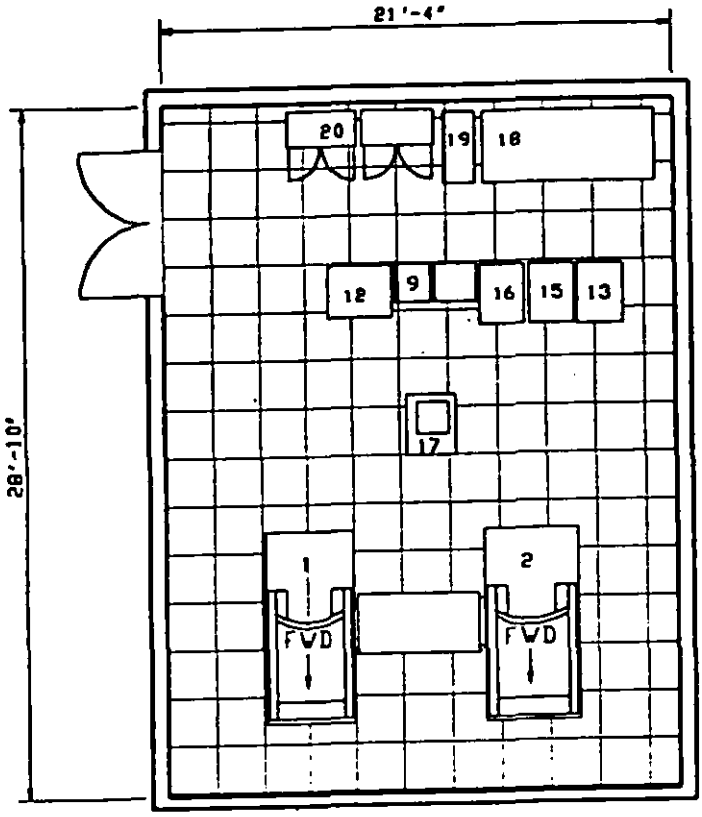
Power Regulation & Filtering: Provide 3 power line interference suppression filters.

Training Devices Connects: Provide 75 ampere master switch circuit breaker. Device contractor supplies component wiring and conduit from device to government disconnects or panel.

Grounding: DC power supply ground and digital and analog signal grounds required. Use isolated system tied to single common point.

Lightning Protection: (if required)

Bonding: Conform to MIL-STD-1310.



CAUTION: This drawing is for preliminary planning only. Verify with NTSC and NAVAIR prior to use.

	Unit Description	size (inches) W	D	H	weight (lbs)	heat (BTU/HR)	cooling intake	notes
1	Cockpit #1	46	96	52	774			
2	Cockpit #2	46	96	52	774			
3	Table	60	60	30				
4	Portable Contr Term #1	4	7	2	.75			
5	Portable Contr Term #2	4	7	2	.75			note 1
6	CPU	25	33	71	750			
7	Mag Tape Unit	19	17	24	85			
8	10 Meg Disc				6			
	a. Formatter	19	20	3	25			note 1
	b. Drive	19	29	9	130			note 1
9	Mag Tape/Disc Cab	25	33	71	234			
10	Battery Backup Unit	19	28	12	200			note 1
11	CPU CRT/Keyboard Term	15		15	25			note 1
12	Line Printer	33	26	45	370			
13	AC Power Dist & Contr	22	30	70	400			
14	400 HZ Converter	14	15	12	165			note 1
15	RTI Unit & Cabinet	22	30	78	300			
16	Mission Computer Cab	22	30	78	520			
17	Comp Operator's Table	60	30	30	80			
18	Work Bench	84	36	30	147			
19	File Cabinet	15	26	52	143			
20	Storage Cabinets	36	18	72	238			

REFERENCE:
Trainer Facilities Report for F/A-18 Part Task Trainer, Device 15C13, HI 84-33/7002, Gould Inc., Systems and Simulation Division, Melville, NY 11747, 21 June 1984.

NOTE 1: Sizes are rounded to nearest foot.

TITLE F/A-18 (PTT) FLOOR PLAN AND EQUIPMENT SUMMARY	DATE JAN 1992	FACILITY PLATE NO. 171 35	SHEET A8

Section 3: AVIATION MAINTENANCE TRAINING FACILITIES

3.1 Functional Requirements. A NAMTRAGRUDET is an organizational subunit of the Naval Air Maintenance Training Group composed of an OIC, AOIC, and experienced enlisted Navy and Marine Corps maintenance instructors. NAMTRAGRUDETs are established and positioned to provide on-station academic classroom and laboratory type technical training. They contain maintenance trainers, training aids, curricula, lesson guides, technical library, standard and special tools, supporting test equipment, and such other training material as may be required to effectively teach the approved courses of instruction. NAMTRAGRUDETs are normally co-located at the station (homeport) of the specific model aircraft they teach to facilitate on-site academic classroom and laboratory training. They typically provide technical training for officer and enlisted personnel in the operation, maintenance, and repair of the particular aircraft.

Maintenance trainers may evolve into larger composite trainers which will require larger rooms. Address the potential for future expansion and reconfiguration of spaces at the programmatic phase.

3.2 Facility Design. Flexibility is a critical need. Educational philosophies and training devices and aids are subject to change as new techniques are accepted. Identify future growth areas and accommodate through user input and careful monitoring of program directions.

A primary concern in the design of Aviation Maintenance Training Facilities is the access and efficient circulation patterns of training equipment for use in the lab/classrooms. Ensure adequate accessibility for servicing and removal/replacement of equipment.

3.2.1 Site Planning. Base the siting on a thorough investigation and analysis of the existing physical conditions of the land and the functional requirements of the project. Place structure(s) and paved areas to minimize disruption to any existing utilities and/or future expansion. See mechanical sections for requirements on utility entry points into the mechanical room. Accommodate future expansion plans.

The site must provide adequate truck turnaround and maneuvering space for the installation and removal of training equipment. The exterior access drives required for the installation and removal of equipment from the facility will be used for that purpose very infrequently. When not being used for equipment installation and removal, the maneuvering space can be used for other purposes such as extra parking. Consult the using activity and base for parking needs.

The loading area may have requirements for elevating heavy equipment up to truck bed height. A freestanding detached ramp or dock lift is an alternative to a raised loading dock or depressed ramp. A raised dock

requires a high finish floor level which may hamper day to day operations and a depressed ramp is subject to standing water and debris.

3.2.2 Architectural. Place emphasis on simple, straightforward functional solutions to both interior and exterior design and detailing. Seismic design may require limits on the height of structures and design configurations as prescribed in Chapter 6, par. Bd2, MIL-HDBK-1190. Follow the guidelines given in MIL-HDBK-1001/1. Group facility spaces requiring high ceilings to minimize changes in the roof levels. Group classrooms utilizing oversized equipment to minimize need for lengthy extra wide access corridors to the exterior. Aviation maintenance training facilities are often sited near flight lines where sound transmission control is essential.

3.2.2.1 Adjacency. Some spaces require adjacency for the efficient and correct operation of the equipment installed therein while others provide adjacency for the convenience of the users of the facility. See Figure 2. For instance, a training device with hydraulic systems requires a pump room adjacent to the trainer room, whereas briefing/debriefing rooms are located adjacent to the respective trainer for convenience of instructor and trainee.

Place high bay areas of the same or nearly equal height adjacent to each other and combine into one level for simplification of roofing and structural systems and resultant cost savings.

3.2.2.2 Circulation. Circulation patterns and intensity vary among aviation training facility types. Varying numbers of administrative personnel, contract personnel, trainees, and instructors contribute to the pedestrian traffic load.

Maintenance training facilities typically support heavy trainee pedestrian traffic. Separate trainee circulation patterns from instructors where possible. Arrange spaces to minimize circulation and to provide the most direct access. Widen corridors used for display, gathering areas, and casual CRT viewing. Provide a security checkpoint for identification of all entrants to the building.

3.2.2.3 Functional Priorities. The most important sections of the facility are those that are directly required to perform the training mission. Other portions of the facility are secondary. Space groupings in order of importance are:

a) Training rooms (e.g., classrooms, trainer rooms, etc.) required to perform the training.

b) Direct support spaces such as computer rooms, storage rooms for classroom materials, mechanical equipment rooms, and instructors offices. Without these, the training would be degraded or impossible to perform.

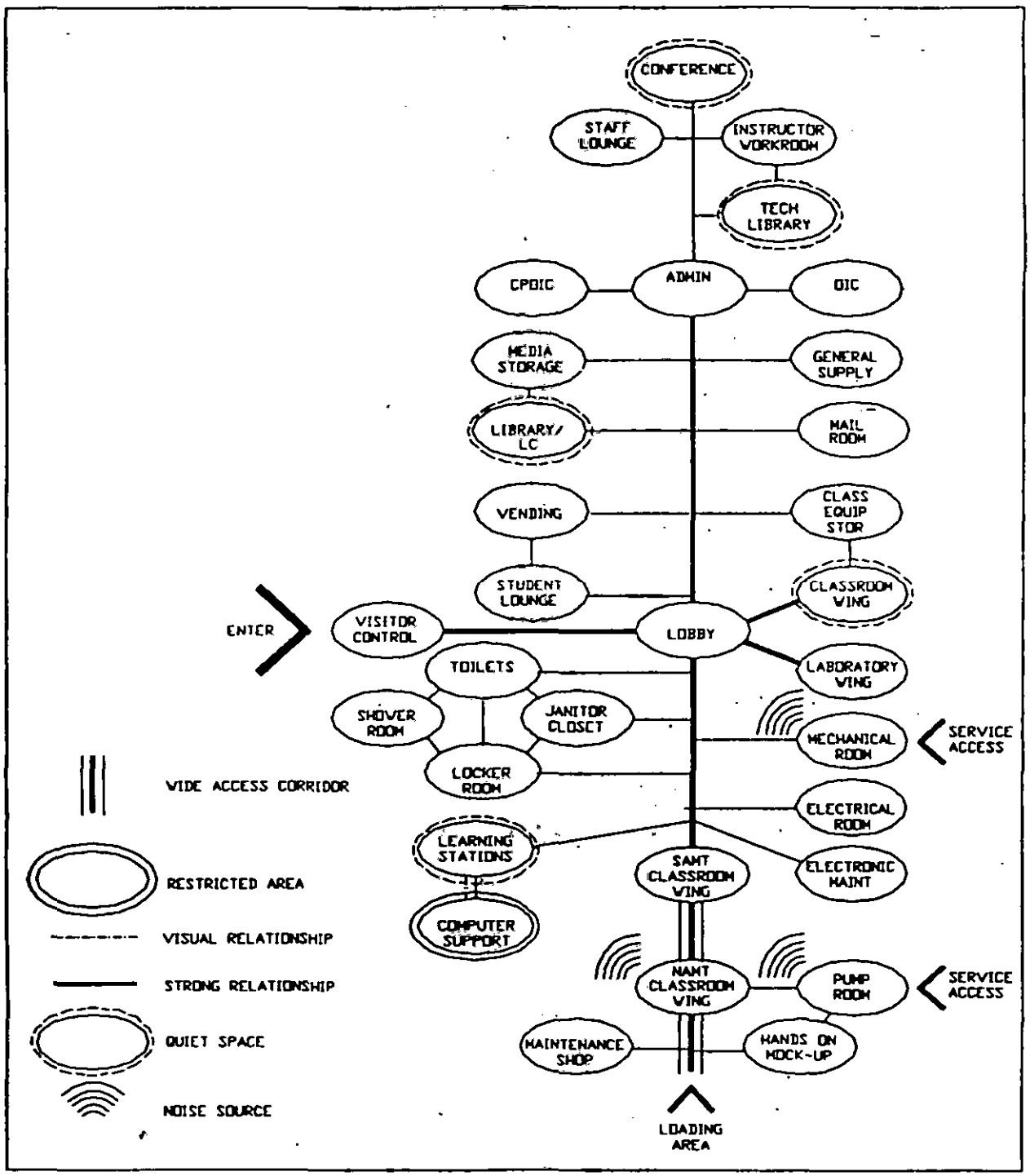


FIGURE 2
MAINTENANCE TRAINING BUBBLE DIAGRAM

c) Indirect support spaces such as toilets, lounges and administrative offices. Without these, training can be accomplished, but at a cost in the efficiency of the training organization.

3.2.2.4 Spaces and Characteristics

a) Administrative. Includes secretarial functions, supervisors, and/or security personnel. An open office partition plan in administrative areas should be used for economy of space and open intra-office communications. An acceptable path of travel must be established per NFPA 101 for fire exiting. Use sound absorbing materials as required in office areas. Refer to MIL-HDBK-1034, for additional data.

b) Armament Systems Trainer. Simulates armament systems. These are simulated for normal testing and troubleshooting as specified by the manuals. the students may be trained in the removal and installation procedures for the pylons, ejector rack, practice multiple bomb rack, and missile launchers.

c) Avionics Trainer. Provides systems maintenance training on avionics and related systems. The instructor may induce malfunctions such as broken wiring, bad components and defective switches or antennas with all appropriate indications occurring.

d) Berthing Room. A one-person overnight watch may be required.

e) Chief Petty Officer-in-Charge (CPOIC). Reports directly to and assists the OIC.

f) Conference Room. Provide porcelain chalkboard, bulletin board, and pull down projection screen. Accommodate flexibility in occupancy counts and table arrangements. Address all types of applicable space utilization to ascertain needs. Consider providing the capability of subdividing the room(s) with accordion folding partitions having a STC rating not less than 40 and provide maximum sound absorption in finishes. Provide two means of egress with door swings in the direction of exit travel for rooms exceeding an occupancy of 50 people.

g) Corridors. Consider trainee occupancy loads and exiting, heavy circulation points such as stairways and vending areas, and the size of equipment to be transported to and from classrooms allowing for maneuvering equipment through doorways. Base minimum width dimensions on building occupancy complying with NFPA 101 and minimum width of equipment maneuvering, whichever is greater. Where lockers are not provided, provide coat and foul weather gear hanging areas near entrance in recessed alcoves or in student lounges where lockers are not provided.

h) Electrical Room. This space contains the facility main distribution panel, subdistribution panels and step down transformers required for the operation of the facility. Frequency converter and telephone panelboard may be included. Do not combine the electrical room with the mechanical room.

i) Electrical Systems Trainer. Simulates the aircraft electrical system, lighting, AC/DC power generating and bus logic.

j) Electronic Maintenance and Repair. Minor repair of the trainer components is undertaken here by the device contractor. Provide workbenches for minor repair. Include these on the collateral equipment list. Consider peg mounting boards on the wall for hanging cables. The standard Navy electronic workbench, type NEB-2 with PS-1A 24 VDC electric-converter is recommended for electronic maintenance shops. Verify if 400 Hz and other power characteristics are required. Workbenches may be ordered through the Aviation Supply Office, Philadelphia, PA. Typical installation consists of three 24-inch wide modules with back panels for an assembled size of 72 inches wide by 33-7/8 inches deep by 60-1/4 inches high. Suggested components follow:

3 ea-FSN:	1N6625-851-2158	Back Panel and Shelf Assembly
3 ea-FSN:	1N6110-839-8026	Electrical Distribution Box
2 ea-FSN:	1N6625-851-2157	Base Assembly
2 ea-FSN:	1N6625-851-2156	Cabinet Assembly
1 ea-FSN:	1N6625-851-2159	Table Assembly
1 ea-FSN:	1HM613000-4108488TM	PS-1A electric-converter

k) Fuel Systems Trainer. Demonstrates the operation, fault isolation, adjustment, and testing of fuel systems.

l) General Academic Classrooms. Seating arrangement is the most important factor in determining the size and shape of a classroom. Accommodate any special requirements for static and operative displays and team teaching, such as small, medium, and/or large class seating arrangement flexibility within the same classroom boundaries. The length required for the front chalkboard can also affect the shape and orientation of the room. Refer to Timesaver Standards for Building Types, for detailed data on seating arrangements. Optimize the classroom sizes and shapes for flexibility and enhancement of instruction. Avoid "pie shape" and other configurations which limit alternate seating arrangements. Determine seating types and audio visual characteristics before finalizing configuration. Fixed seating tiers can decrease flexibility. Consider fixed seating and tiers only in facilities with a minimum of three classrooms. Use of maps and foldout materials by trainees may require seating at tables. Since classrooms are repetitive spaces, intense effort is required to assure quality in each duplicated space. Consider the following major factors for design of classrooms:

(1) Seating types and arrangements and writing surfaces

(2) Space and furnishings for the lecturer.

(3) The use of wall space, including teaching aids and windows.

(4) Projection and TV facilities.

(5) Coat racks, storage, and other conveniences.

(6) Acoustics and lighting

(7) Heating and air conditioning

(8) Aesthetic considerations

TV monitors and special projection systems in addition to traditional chalkboards or porcelain boards may be used. Verify and document the requirement for rear screen projection before accommodating in the design. See audio visual requirements for projection systems.

Aviation training facilities typically utilize training devices requiring mechanical systems support. Consequently, classrooms are often exposed to a variety of support equipment noises in addition to HVAC unit noise which can distract from instruction. Use sound baffles, absorbent materials at noise sources, and locate mechanical units remote from classrooms. Avoid sound masking in classrooms. Acoustic design level for classrooms shall be RC-30 with 50 STC (minimum) walls. Provide acoustically rated accordion folding panel partitions with integral door where flexibility is desirable for subdividing classrooms. Extend details above finished ceiling to assure integrity of specified STC in the interstitial space.

Porcelain marker boards are preferred over chalkboards. Include a display rail with clip fasteners. Wall perimeter tack strips should be provided for graphic display such as maps and charts. Non-obtrusive observation sidelights are required at classroom entries. Limit stowage areas for audio visual equipment to those items dedicated to each classroom.

Provide small portable platform units in lieu of permanent raised platforms (plus or minus 8 inches high) for classroom lectern areas utilizing demonstration techniques and in rooms with over five seating rows. Permanent platforms can severely limit future rearrangements in seating and subdivisions. Allow a generous width for the instructor to transverse the platform for the full length of the chalkboard. Centralize other storage.

m) General Supply Storeroom. Provide double doors in lieu of overhead door to loading area for better control of air infiltration. Verify if dutch door or issue counter is required by the user.

n) Dedicated Classroom. One or more dedicated classrooms may be required for classified teaching material. Provide adequate STC ratings for walls in accordance with levels of security.

o) Flight Control Systems Trainer. A full size aircraft mockup which is used to train future aircraft structural and hydraulic mechanics and electricians in the moving systems which control the aircraft in flight. It utilizes real and like-real aircraft components in areas of training where intricate physical relationships need to be demonstrated and fine mechanical skills are to be practiced.

p) Hands-On Mockups. The major determinant for room volume is typically the training device and how it is demonstrated and operated. Allow for a maximum of six students except where directed otherwise. Where high bay spaces are required, utilize mezzanine space for storage or observation area. Accommodate any clearances and other requirements for rolling service platforms. Avoid obstructing moving parts with utility feeds. Exposed structure provides ready access to utilities for service. Acoustic absorbing materials will be required in spaces where device noise such as hydraulic pump support equipment is a nuisance to instruction and in other spaces with noise level above RC-30, and/or above levels of ear safety. Direct application of acoustical material to the underside of deck instead of using suspended acoustical ceiling tiles allows more ease of access and visibility to service utilities.

q) Instructor and Staff Lounge. Provide kitchen alcove, visually hidden from lounge with dishwasher, microwave oven, and small upright refrigerator. The seating area can double as conference and as an instructor work area if arranged so that kitchen users do not have to intrude.

r) Instructor Work Room. Requirements can vary from work stations for supervisors only to work stations for all instructors. Separate dedicated instructor work space from trainee gathering areas and trainee pedestrian traffic. Locate near or contiguous with the Library/Learning Center for access to resource materials.

Provide large, clear areas for instructor work space to permit flexibility in reapportionment of spaces. This area should be designed around a modular scheme for the greatest possible flexibility in arrangement. When individual offices are required within general areas, they should be enclosed by lightweight, movable partitions. Systems or modular furniture provides

privacy and acoustical control in an open environment and allows great flexibility for changing instructor work space. PC work stations may be used here on a network. Design power, telephone, and data distribution wiring systems in this area to allow for frequent changes.

s) Janitor Closet. Provide adjustable shelving and storage space for cleaning equipment and supplies, mop rack, and a deep sink or mop receptor on each floor.

t) Lab/Classroom. Academic classroom areas in the same space with the trainer device allows instructors to relate directly to devices under study during lectures. An unusually low trainee/teacher ratio such as 4:1 can be expected due to safety concerns related to devices. A second instructor in the class is considered a safety observer. Provide space for two trainees per table. Tables are preferred to individual desks due to the array of manuals and fold-out data used in the classroom. Normal class size is eight. Up to 10 trainees per class may be accommodated under extreme conditions.

Laboratory. Trainees are instructed here in electronics and hydraulic testing. Lab hoods may be required for soldering.

v) Landing Gear Trainer. Allows aircraft hydraulic and pneumatic mechanics, aircraft electrical systems technicians and aircraft structures mechanics to receive organizational level maintenance training related to the landing gear components for which they are responsible. They can demonstrate both normal and abnormal operation of the landing gear and subsystems, location of landing gear components and troubleshooting techniques for isolating faults.

w) Learning Stations. The learning stations are primarily computer aided instruction utilizing student carrels. The instruction proceeds at the students' own pace and ability to learn the material.

x) Learning Station Computer Support. Most computer aided instruction systems now in use require a central processor which is usually located adjacent to the learning stations area. Direct and dedicated support of learning stations is provided. Provide access floor where required. Future technology advancements may replace the central processor with a desktop computer unit located in the learning stations area.

Up to eight classified file safes may be utilized. Provide security measures as required by the user and the base security officer in conjunction with NCIS.

y) Library/Learning Center. This space provides information and resources. Larger centers require control of equipment and materials with a service counter and work space which will provide orderly issue and receipt as well as inventory control and repair. Audiovisual or other equipment repair may be required.

In addition to books, the learning center may contain records, tapes, closed circuit TV facilities, film, cameras, VCRs, and projection equipment. Larger centers may need separate stack and reading areas. Provide storage for Navy publications and rate-training manuals. Accommodate a classified file safe where required by the user. Acoustic controlling materials are necessary to ensure a quiet environment.

Provide for computerized EIDS and carrels if required by the user. Carrels where needed must be sized to accommodate the EIDS. The EIDS may require a separate room for the host computer depending on the system and may be restricted to authorized personnel only.

z) Lobby. Utilize wall area for building directory. Accommodate any memorabilia provided by the user.

aa) Locker Room. Avoid permanently built-in lockers since they can adversely affect future flexibility. Provide adequate lockers for trainee occupancy load and adequate garment changing area.

bb) Mail Room. Locate off the corridor and contiguous to the administrative area for use by the staff. Provide mailboxes with two sided access. Design area to prevent queues of personnel from obstructing corridor passage.

cc) Maintenance Shop. Some facilities may require intermediate ("I") level maintenance. Provide appropriate workbenches for minor miscellaneous repair. Include these on the collateral equipment list.

dd) Media Storage Room. Provisions for storage and retrieval of each type media must be provided. In multifloor facilities, locate an additional media storage room on each floor. Include centralized storage as needed for slides, film, microfilm, filmstrips, video tapes, audio tapes, records, computer discs and other storage media, maps and charts, projection equipment, and audio equipment. Refer to MIL-HDBK-1008 for fire protection requirements for magnetic tape and film storage. Adjustable shelving is required. Verify with the user if a centralized VCR control panel area is required. Provide issue window, dutch door, or counter where required for customer service.

ee) Mechanical Room. This space normally contains the HVAC equipment as well as the sprinkler valves and piping. Avoid locating rooms with HVAC equipment on upper levels where sound can reverberate through

structural systems. Preliminary designs should allow 5 percent of the gross floor area for facility related mechanical room space. This floor area requirement can vary in the final design due to factors such as use of a basewide steam system. Mechanical rooms for aviation training facilities typically contain a variety of equipment types which must be accommodated early in the design. Provide adequate space for operation, maintenance, and servicing of both device contractor and construction contractor supplied equipment. Locate hydraulic and pneumatic training device equipment in a separate dedicated space due to air contaminants, noise, and safety considerations.

ff) Mechanical Pump Room. Access to both interior of the building and exterior is recommended. Pump rooms supporting large hydraulic systems may require high ceilings to allow maintenance access with a permanent or temporary overhead crane to assist in the maintenance procedures. Allow adequate access space around and above equipment for maintenance. Avoid locating pump rooms on upper levels where sound can reverberate through structural systems. Isolate floors and acoustically treat walls and doors where vibration and sound can adversely affect adjacent spaces.

gg) OIC. The person charged with controlling the use of the facility, scheduling the use of classrooms and training devices and maintaining curriculum occupies this space.

hh) Power Plants Trainer. Trains aircraft mechanics to operate, test, and troubleshoot the aircraft engine system. The engine as simulated on the trainer responds to changes of atmospheric conditions, altitude, and airspeed.

ii) Shower Room. Verify if facilities are required for training mission support.

jj) Student Lounge. Locate convenient to vending machines and coffee mess.

kk) Technical Library. This space is used by trainees and instructors. It is heavily used by those involved with avionics.

ll) Toilets. Specify ceiling hung partitions for easier cleaning and drainage to eliminate rusting of floor mounts. Use solid plastic partition finish for better hygiene and graffiti resistance. Provide shelf for temporary stowage of hand carried items such as hats and books.

mm) Vending. Provide an alcove or a separate area off the corridor such that pedestrian traffic is not restricted, but also located convenient to or within lounge area. Locate vending machines where they can be properly serviced and maintained with minimal disturbance to facility operations. Provide secure brackets to prevent overturning of machines. Provide a hard

surface floor sloped to floor drains adjacent to vending machines. Buildings having more than 100 Federal employees located therein or 15,000 square feet or more should have one or more satisfactory sites for a blind-operated vending facility as noted in Chapter 5, par. D, MIL-HDBK-1190.

nn) Visitor Control. Locate the checkpoint at the primary pedestrian entrance to the facility adjacent to the lobby and near administrative areas with a visitor control security checkpoint. Include a recessed scuff area at the entry point for control of debris from foot traffic. A vestibule is recommended for energy conservation. Provide 42 inch high counter with sign-in area, intercom system where required, under counter files, lockable storage, and staff phone. Accommodate number of personnel designated by the user.

3.2.2.5 Interior Design. NAVFAC DM-14.01, provides interior design guidance. Provide imaginative and creative use of colors and furnishings. Design solutions shall also be economical and the furnishings maintainable. Fully integrate interior design with the work of other design and engineering disciplines at all stages of the facility design process. Provide only those finish systems which have a proven track record of use and testing. Selection criteria should balance factors related to installation and usage: initial and life cycle costs, ease of maintenance, comfort, etc. Refer to appropriate tables for suggested interior finishes.

Maintenance training buildings are heavily used. The continued success of initially achieved design objectives is dependent upon the longevity of the materials used. Select interior materials and finishes on the basis of their durability, safety, and suitability for cleaning procedures. Corridors, for example, shall be designed for transportation of training aids and devices as well as heavy trainee traffic. Terrazzo flooring in laboratory settings has proven high resistance to wear and maintains good appearance.

a) Color. Develop a color plan that is consistent with the building program. Use color to stimulate positive human physical and emotional reactions and to enhance the overall functions of the building. For example, color may be used to direct and orient users to color-keyed functions on floors. Color selection can also support maintenance management. As a general rule, fixed building materials (e.g., pavers, ceramic tile, resilient flooring, ceilings, etc.) should be relatively neutral. Introduce stronger accent colors on more changeable finishes (e.g., paint, wall coverings, carpet, furnishings). This will allow color changes at minimum cost as areas are refinished in the future.

b) Floors. Training facilities are subject to heavy trainee in/out pedestrian traffic. Entry points and corridors must withstand heavy foot traffic. Minimize tracked in dirt by using walk-off mats at entry points to protect flooring and to reduce maintenance. Use durable and easily maintained

Table 3.1
Recommended Finishes - Aviation Maintenance Training Facilities

ROOM	WALLS	FLOOR	BASE	CEILING	REMARKS
ADMINISTRATION	PTD OR VWC	VCT OR CPT	RUBBER	ACT	
AVIONICS TRAINER	PTD	VCT OR ACCESS	RUBBER	ACT	
CLASSROOMS	PTD	VCT OR CPT	RUBBER	ACT	5
CLASS EQUIP STOR	PTD	VCT	NONE	ACT	
CONFERENCE	PTD OR VWC	CPT	RUBBER	ACT	
CORRIDORS	PTD	VCT	RUBBER	ACT	6,4,5
CPOIC	PTD OR VWC	CPT	RUBBER	ACT	
ELECTRICAL ROOM	EXP	CNC	NONE	EXP&P	
ELECTRONIC MAINT	PTD	VCT	RUBBER	ACT	
ENTRY LOBBY	PTD OR VWC	QT	QT	ACT	7,4,5
GEN SUPPLY	PTD	CNC/SLR	NONE	EXP	
HANDS ON MOCKUP	PTD	CNC/SLR	RUBBER	EXP&P	
INSTRUCTOR WORK	PTD	CPT	RUBBER	ACT	
JANITOR CLOSET	PTD	VCT	NONE	EXP&P	
LAB/CLASSROOM	PTD	VCT	RUBBER	ACT	1,2
LABORATORY	PTD	VCT	RUBBER	ACT	8
LIBRARY/LC	PTD OR VWC	CPT	RUBBER	ACT	3
LOCKER ROOM	PTD	VCT OR QT	RUBBER/QT	ACT	
I & S LOUNGE	PTD	VCT/CPT	RUBBER	ACT	5
MAIL ROOM	PTD	VCT	RUBBER	ACT	
MAINTENANCE SHOP	PTD	CNC/SLR	RUBBER	EXP&P	
MECHANICAL ROOM	EXP	CNC/SLR	NONE	EXP&P	
MECH PUMP ROOM	EXP	CNC/SLR	NONE	EXP&P	
MEDIA STORAGE	PTD	VCT	NONE	ACT	
OIC	PTD OR VWC	CPT	RUBBER	ACT	
SHOWER ROOM	CT	CT	CT	PGWB	9
STUDENT LOUNGE	PTD	VWC	RUBBER	ACT	
TECH LIBRARY	PTD OR VWC	CPT	RUBBER	ACT	
TOILET	PTD	CT	CT	ACT	
TRAINER ROOM	PTD	CNC/SLR/HDR	RUBBER	EXP&P	10,11
VENDING	PTD	VCT/QT	RUBBER/QT	ACT	
VISITOR CONTROL	PTD	CPT	RUBBER	ACT	

Table 3:1 (Continued)
Recommended Finishes - Aviation Maintenance Training Facilities

General Notes:
1. See Glossary for finish material abbreviations
2. VWC and alkyd paint use is limited due to vapor infiltration.

Remarks:
1. Alternate durable floors include concrete with hardener/sealer.
2. Exposed and painted ceilings are also acceptable.
3. Consider acoustical wall panels where additional sound absorption is required.
4. Metal slat ceilings are prohibited. Refer to par. 3.2.2.5 for further data.
5. Use washable paint with eggshell or semigloss finish.
6. Carpet is discouraged. Use other methods of sound control.
7. Consider alternate durable floors such as terrazzo.
8. Consider functions and consult user to verify floor and ceiling finishes.
9. Use washable and mildew resistant paint with gloss finish.
10. Use acoustical ceiling tile where sound absorption is needed. See "Avionics Trainer" for special finishes.
11. Use a white color "dry shake" hardener.

floors. Consider safety, noise impact, traffic bearing requirements, chemicals and compounds used on flooring and moisture that flooring will be subjected to under normal and special conditions. Carpeting may be used in accordance with Chapter 5, par. B1, MIL-HDBK-1190, Table 2.1, MIL-HDBK-1001/1, and MIL-HDBK-1008.

c) Ceilings. Metal slat ceiling systems are prohibited, since they do not allow heat to collect at heat detectors. Value engineering reports also show significant implemented savings for acoustical tile ceilings over metal slat systems. Ceiling systems for corridors which usually must accommodate an array of utilities must be thoroughly evaluated against ease of access, sound control, fire protection requirements, future utility adaptations, life cycle cost, and maintainability.

3.2.2.6 Signs. Provide a signage plan, legend, and details. Design signs as an overall building and site system to be furnished and installed under the construction contract. Economy, flexibility, ease of installation and maintenance are important considerations of signage design. Design the system to inhibit vandalism but with flexibility to enable the addition or deletion of information. Select a mounting mechanism for the signs to permit the reuse of signs as the facility changes. Specify an easily-read letter form such as Helvetica Medium. Indicate the design, location, and installation method in the plan, elevations, and specifications. Require the contractor, in the project specifications, to make a comprehensive submittal of the proposed sign system and to provide information necessary for acquiring new or replacement signs. The exterior sign system shall be respected both on and off the specific facility site. Any signage shall also be harmonious in the landscape. Care shall be taken to use signs only when necessary and to restrict the use of random styles, placement, and colors. Prepare a Signage Manual to instruct the activity in maintenance of the signage system and provide specialized equipment and materials necessary for same.

Since course durations are often short, each incoming class must be able to orient easily. Place emphasis on directional signage to immediately familiarize trainees with the room names and numbers. Wall-mounted signs extending into the corridor will cite room identifications from a distance and greatly enhance efficient access to the appropriate classrooms.

a) Entrance Sign. Entrance signs may be necessary to introduce the training facilities to visitors. Position these signs for visibility and install consistently in relationship to the roadway, walkway or building which they serve. Reinforce desired building entry points for visitors, including the handicapped, with entrance signs. Entrance signs shall clearly identify the building name, function, number, and organization, and shall be consistent with the installation's overall signage system. Often, several building entry signs are required to identify those activities that may be reached via a specific entry point when a building has more than one primary entrance.

b) Building Identification Sign. Training facility identification signs identify a building by name and number. Design identification signs as part of the overall signing system of an installation and require freestanding signs and/or wall mounted signs. Locate and size building identification signs for visibility from the main access street. Coordinate building numbers with the Public Works Office and fire service requirements and position at standard locations on the building.

c) Building Directory. Locate a building directory where it is clearly visible to all visitors as they enter the building. The building directory shall consist of a permanent header panel with the name of the building or the major organization in the building, plus a directory section that lists each tenant. Utilize a changeable letter board with changeable letters or message slots for the directory section. In large training facilities, a building locator plan to identify building spaces, key activities, and personnel may be a necessary addition to the directory. Locate floor or building section directories to be clearly visible to pedestrians entering from elevators, stairs, or major corridors.

d) Directional Signs. Locate directional signs which direct to different areas, departments, and functions of a building at every decision point - opposite the elevators, opposite the stairways, and at each corridor intersection. Directional signs should point to only high priority destinations. Indicate route to classrooms by number groupings. Include directions to toilets, lounge, library, vending, and outdoor smoking areas.

e) Room Identification Signs. Room signs identify room entrances and services such as toilets, telephones, housekeeping activities, and stairs. Room numbers in addition to names are essential for repetitive spaces such as classrooms and offices.

f) Regulatory Signs. These prohibit certain activity, for example, "No Smoking" or "No Entry." Many safety signs are required by law or regulation and may include building evacuation, fire exit maps, or exit maps specifically for the handicapped.

g) Informational Signs. Additional signs may be required to list building and activity operating hours.

h) Notice/Bulletin Boards. These are especially important in training facilities to control clutter and readily accommodate changing information. Provide these throughout the building. Provide tack board surfaces or similar surface management systems to accommodate unanticipated messages, signs, posters, announcements, etc., in high traffic areas, doors, elevators, counters, columns, drinking fountains, public telephones, lounges, etc.

i) Handicapped Criteria. Coordinate signs with the handicapped requirements of FED STD 795.

j) Additional Guidelines. Refer to NFGS-10440 for additional guidelines. Also, AFP 88-40 provides excellent guidelines for DOD facilities in general. The information is nonproprietary and easily modified to match specific facility designs and BEAP standards.

3.2.2.7 Windows. Natural light is desirable, but certain rooms will require blackout shades or draperies for visual aids. Sun screens, roof overhangs, and recessed windows can effectively control direct light penetration. Provide window head details to accommodate installation of window coverings and ease of operations.

Use operable windows for natural light and ventilation where permitted by security provisions. Do not use eye level windows which can be a distraction for trainees in classroom settings. Provide clerestory windows in the classrooms where practical for natural light and ventilation unless security criteria is prohibitive. Comply with NFPA 101 for window size and mounting heights.

Utilize non-obtrusive observation glass panels where desired by the user in classrooms, laboratories, and other non-private trainee occupied areas. Glazed openings that are subject to accidental human impact due to location, such as sidelights that extend to the floor, shall comply with 16 CFR Part 1201.

3.2.2.8 Doors and Hardware. Exterior wall overhead doors can be a critical source of extreme heat gain/loss and air and moisture infiltration into lab/classroom settings where temperature and humidity conditions must be maintained. Overhead coiling doors to the exterior are not acceptable for environmentally conditioned spaces. Provide weathersealed insulated vertical lift or sectional doors or insulated removable panels with lifting eyes. Insulated panels must be easily removable by facility personnel. Provide adequately sized interior corridor doors for classrooms with oversized equipment where possible in lieu of exterior openings into each classroom to minimize exposure to exterior elements. Size all doors to accommodate the path of oversized equipment from loading areas to destination and between rooms. Utilize inactive leafs and removable transoms where equipment moves are infrequent. Allow for maneuverability in tight corridors.

Classrooms or other areas where classified information is used shall not have doors with viewing windows.

Use four hinges where required on heavy use doors. Avoid panic hardware except where specifically required by criteria since the Navy does not classify training facilities as schools.

3.2.2.9 Natural Lighting. The use of natural light is encouraged as it contributes significantly to the energy efficiency of the building and communicates a feeling of well-being and openness. Natural light can be used in conjunction with high efficiency artificial lighting featuring photosensitive controls for maintaining lighting levels automatically. Skylights are not permitted due to excessive solar heat gain and leak potential. Classroom wing corridors and other interior occupied spaces may incorporate monitors with conventional roofing and vertical windows. Perimeter instructional spaces may incorporate high bay or clerestory windows in cases where natural lighting is desired without any distracting or unsightly views.

3.2.2.10 Building Thermal Insulation and Vapor Retarders. Locate vapor retarders with care in view of the thermal differentials associated with training buildings. Do not use vinyl wall covering and impervious paint on the interior surface of exterior walls in humid areas (as defined in MIL-HDBK-1190) unless calculations show that condensation will not occur within the wall.

Special purpose rooms such as laboratories and computer rooms normally require stringent air conditioning requirements. Provide adequate insulation and vapor transmission barriers to minimize the loads on the mechanical system. Ceiling decks of spaces below supercooled computer rooms and perimeter walls are apt to collect condensate if not properly insulated.

3.2.2.11 Handicapped Design. Provide barrier-free access to civilian work spaces and other spaces intended for public access. Design facilities to locate handicapped access spaces on first floor only, unless the size of the facility's administrative and other accessible areas requires a second floor. Areas hazardous to handicapped persons need not be accessible. Comply with current criteria in UFAS.

3.2.2.12 Elevators and Stairs. Comply with requirements of DM-3.09 and handicapped criteria in UFAS. For safety related measures, comply with ASME/ANSI A17.1 and NFPA 13.

Provide freight elevators where stairs cannot accommodate the weight and size of routinely transported equipment. Consider the weight associated with transporting security vaults or training equipment to upper levels. Utilize stair tread nosings that are resistant to heavy trainee pedestrian traffic volume.

3.2.2.13 Access Floor Systems. The underfloor space must be properly sealed if used as an air conditioning supply plenum. Use plastic laminate covering for access floor panels. Utilize access flooring in computer rooms and in administrative spaces where networks are used.

3.2.2.14 Ceilings. Provide access where projection, mechanical, and electrical equipment, including adjustment, maintenance, and shutoff devices, are located. Ceilings shall be maintainable and easily repaired.

Projections from the ceiling such as sprinklers and light fixtures can impinge on clearances required for device installation and removal, as well as crane and hoist operations. Coordinate ceiling items on a comprehensive reflected ceiling plan.

3.2.2.15 Walls. Impervious finishes applied to the interior side of exterior walls must be carefully evaluated against dew points to prevent vapor dams and subsequent failure of the installation. Protect the corners of walls and columns in areas where equipment moves are frequent.

3.2.2.16 Acoustical Control. A NLR minimum factor of 30 is required in the 70-75 DNL zone and an NLR minimum factor of 25 is required in the 65-70 DNL zone. There are no special requirements in the DNL zone below 65.

Use noise and sound transmission criteria cited in DM 1.03. Prevent sound transmission over walls. Acoustic absorbing material, where required, shall be fire and smoke rated as required in MIL-HDBK-1008.

3.2.3 Landscape Architecture. The framework for planning and design of landscape architectural elements is found in the activity Master Plan and more specifically in the BEAP. General guidance for design elements can be found in NAVFAC P-960. Landscape design must enhance positive image for the facility and should direct pedestrians to a primary entry. Design for minimal maintenance. Provide landscape fabric for weed prevention. Select hardy specimen species indigenous to the area. Locate hose bibbs convenient for additional irrigation.

Outdoor pedestrian-oriented spaces are often useful for building entry plazas, for break and lunch areas, and to provide pleasant views from the building interior. Design outdoor areas to harmonize with the architectural and natural site character of their surroundings, but to also moderate environmental and climatic extremes such as noise, sun, wind, and seasonal precipitations.

3.2.3.1 Site Analysis and Development Concept. If the analysis and development is successful, the biological integrity of the site will be retained or improved while successfully meeting the program needs of the user in a comfortable, attractive, and functional setting. Minimize clearing of existing vegetation and avoid excessive grading.

3.2.3.2 Planting. Guidance for planting design is provided in NAVFAC P-905. Plantings can provide a pleasant setting and visual asset, and minimize the

environmental impact of development. The following is a list of minimum guidelines to be considered in implementing new planting schemes for the facility:

a) Preserve existing vegetation. Existing mature stands of trees or other significant vegetation are to be preserved and enhanced where possible.

b) Use indigenous plant materials. Plant materials chosen will be indigenous to the site.

c) Design for minimum maintenance.

d) Define space and screen conflicting uses. Use plant material to define space and screen visually conflicting uses where appropriate. See section on screens and walls below.

e) Promote energy conservation. Plant materials are to be used to reduce energy requirements, where possible, such as shading with deciduous trees. Enhance any desirable climatic effects such as clear areas at large glass areas oriented for winter sun heat gain.

f) Establish unifying elements. Use planting as a means to unify different elements of an installation.

3.2.3.3 Landscape Lighting. The visual character of a project landscape can be greatly improved while providing the nighttime functions of safety, security, and path finding. In addition to simply achieving a higher level of illumination, light levels, color, patterns, and style should be energy efficient, attractive, and functional in a coordinated landscape scheme.

3.2.3.4 Exterior Signs. Conform to requirements of the BEAP.

3.2.3.5 Utilities. Grouping in corridors, underground placement, and screening and grading can de-emphasize the impact of utilities on a site. Flow tests must be conducted to determine the available water supply for fire protection. Indicate a static pressure and a residual pressure at a certain flow.

3.2.3.6 Site Furnishings. In conjunction with site and landscape design, provide appropriate signs; structures; outdoor furniture and equipment, such as tables and seating; vending machine shelters; telephone booths; screen wall and fences; as well as the more symbolic elements such as flag poles, memorials, and military equipment displays. Definitive design and other data for flagstaffs are available in Section 6 of MIL-HDBK-1034. Lack of

coordination, as well as concern for detail, are primary problems related to site furnishings. Select site furniture that is simple, requiring low maintenance, and relating in color, texture, and form to building design and established base character and BEAP guidelines.

3.2.3.7 Equipment Screens and Walls. Screens and walls for mechanical and electrical equipment are encouraged for aesthetic purposes, but can severely penalize equipment performance. Carefully coordinate design with each engineering discipline. Shade for mechanical equipment is desirable; however, leaves from deciduous trees may clog equipment.

3.2.3.8 Selection of Plant Material. Select plant materials on the basis of hardiness and degree of maintenance required. Avoid plants which require more frequent attention than the users can provide to stay in a healthy condition or have an attractive appearance.

3.2.4 Civil. NAVFAC Criteria Manual Series on civil engineering (DM-5 and MIL-HDBK-1005 series) provides general guidance for civil engineering, site work, and other related topics. Refer to MIL-HDBK-1008 for location and spacing of fire hydrants. Refer to DOT D6.1 for traffic control devices. Provide surface bearing capacity for heavy equipment or trucks outside the high bay doors. Consider loaded forklift wheel loads on the paving design. Forklifts will normally be used to transport equipment into the building from the delivery truck. Edges more than 1 inch in height cannot be negotiated by forklifts. Provide clear path for delivery and removal of equipment from access roads to loading dock. Account for obstacles and provide adequate turning radii.

Coordinate location of mechanical equipment pads with mechanical design and show major pieces of equipment on civil engineering drawings. Locate noisy equipment remote from occupied spaces and as near as possible to the mechanical spaces. Distribution piping (utilities, refrigerant, condenser water, etc.) shall enter the building only through mechanical spaces. Shade is desirable; however, equipment should not be located beneath existing trees where it can become clogged with leaves and debris.

3.2.4.1 Roads, Parking and Walkways. These are three of the most land consuming uses on a site. Negative visual impact can be minimized by locating facilities conveniently to each other, encouraging pedestrian use and other non-vehicular modes of access.

Vehicular or pedestrian paving should be in character with a safe, functional, and visually pleasing landscape. The sharing of parking and road requirements will minimize total impact. Small parking lots are usually preferable to large lots since they allow for conforming to the natural topography and other site features and are visually less obtrusive. Provide appropriate paved area and adequate maneuvering space for semi-tractor trailer and other truck deliveries. Provide ramps at curbs along routes leading to

storerooms to facilitate wheeled access. Accommodate training device transportation into and out of the building through adequate turning radii and appropriate loading facility. Provide vehicle protective barriers for light posts and fire apparatus.

Pedestrian access to training facilities is normally restricted to a single entrance point due to security criteria. Pedestrian traffic to and from the parking lot is heavy due to multiple daily training sessions. Determine if egress is permissible through secondary exterior doors and if so, accommodate with walkways. OPNAV Instruction 5530.14B, prohibits parking of privately owned vehicles within 15 feet of any building. Include concrete surface spaces for bicycle racks and motorcycles. Storm drainage and other grates must be oriented with parallel slots perpendicular to the paths of bicycles. Criteria for vehicle parking area design is shown on NAVFAC Drawing No. 1404837.

3.2.4.2 Handicapped Access. Provide curb ramps, access aisles, and handicapped parking spaces near accessible entrances.

3.2.4.3 Loading Dock Ramp Protection. Each facility requiring a loading dock ramp shall be provided side-edge protection in compliance with Section 1910.23C of Public Law 29, CFR.

3.2.5 Structural. Structural design shall comply with MIL-HDBK-1002 series, Structural Engineering and NAVFAC P-355. Base an economical structural system on facility size, projected load requirements, quality of locally available materials, local labor and construction materials, and local wind, snow, seismic, geologic, and permafrost conditions.

Depress structural framing and slabs in lab areas where access flooring occurs to provide uniform, continuous, finish floor levels between adjacent spaces.

Account for the weight of any classified file safe and fuel weights at fuel trainers.

3.2.5.1 Clearspan Requirements. Columns in the high bay training area are typically prohibited. Check excursion limits for device and accommodate flexibility.

3.2.5.2 Weight Handling Equipment. Cranes and monorails shall comply with DM 38.01. Utilize NAVFAC NFGS-14637 and NFGS-L-14622, where applicable. Provide platforms, catwalks, access ladders, and any other provisions for inspection and maintenance of cranes and hoists which could put equipment temporarily out of service due to inaccessibility.

Obtain user and device manufacturer input regarding controls and speed criteria for hoist, trolley, and bridge, hook heights, capacities, and

service area. Note that lifting the device will require more clearance than necessary for stationary position. Hoists may be required at specified lab/classrooms.

3.2.5.3 Floors. Design floor slabs along the travel path of any equipment to withstand the heaviest wheel loads anticipated during the installation in compliance with criteria in MIL-HDBK-1002/2, Loads. Training equipment incorporating motion systems will impose static and dynamic forces upon the facility structure.

Isolate the mechanical equipment room floor slabs from the remainder of the facility.

Current computer equipment trends are toward more compact, yet denser and heavier components. Future floor loads will probably localize into more extreme concentrated loads.

3.2.5.4 Roof Loads. Mechanical equipment is preferred at ground level; however, where roof mounting is necessary, design screening in accordance with local wind loads and directional patterns. Anticipate other roof structure mounted accessories such as catwalks, ladders, hoists, and cranes.

3.2.6 Heating, Ventilating, and Air Conditioning. Consider 100 percent capacity backup HVAC equipment to maintain operations. Refer to MIL-HDBK-1008 for coordination with fire protection systems. Coordinate exterior mechanical equipment location with civil design. Locate noisy chillers and other equipment remote from occupied spaces and as near as possible to the mechanical spaces. Shade is desirable; however, equipment should not be located beneath existing trees where it can become clogged with leaves and debris. Distribution piping for utilities, including refrigerant and condenser water, should enter the building only through the mechanical room. Avoid routing chilled water piping over computer areas and trainer devices to prevent damage to high cost equipment from leakage and condensation. Provide isolation valves to facilitate maintenance without system shutdown. Comply with NAVFAC DM-3.10, where adjacent spaces and/or sensitive equipment cannot tolerate noise and vibration.

Ceilings may be higher than normal for classroom settings due to lab trainer requirements. Accommodate appropriate airflow requirements at the trainee table working level.

a) Lab/Classroom. High ceiling areas may require use of ceiling fans to distribute conditioned air to seated occupants.

3.2.6.1 Design Conditions. Design conditions for comfort conditioning shall be determined in compliance with MIL-HDBK-1190 and DM 3.03. Electronic and computer procurement documents require that equipment function properly in an air conditioning environment between 60 degrees and 80 degrees F for

electronics and between 45 degrees and 120 degrees for mechanical equipment. Special facility conditions follow:

a) Dedicated heat rejection equipment (such as compressors, condensers, and condensing units) serving training devices shall be located outside of environmentally conditioned spaces.

b) The air conditioning environment for hydraulics shall be between 45 degrees and 120 degrees. Provide heat as necessary to maintain the minimum temperature.

3.2.6.2 Ventilation. Use ventilation rates for occupied spaces as required in ASHRAE STD 62. Provide thermostatically controlled forced ventilation in mechanical, electrical and hydraulic spaces. Cool hydraulic pump rooms and compressor rooms by mechanical ventilation only.

3.2.6.3 Zoning, System Selection, and Part Load Performance. Occupancy of classroom areas varies drastically with respect to training schedule. Consider each classroom/training area as a separate temperature and humidity control zone. Provide individual temperature controls for each classroom. Size terminal equipment to accommodate minimum as well as maximum loads. Multiple air handling units (allowing staged turn-down of system capacity as sensible load falls) shall be considered. Terminal reheat is permitted to meet part-load humidity performance requirements; in electronic equipment spaces, the amount of reheat available shall be approximately equal to the sensible electronic load within the space. Provide adequate pre-heat to allow proper dehumidification when training devices are not operating.

3.2.7 Plumbing. General guidance for plumbing design is provided in DM-3.01 and MIL-HDBK-1190. Coordinate plumbing with structural design to avoid conflicts between underground pipes, trenches, and footings. Provide shutoff valves to isolate systems when doing maintenance so that entire facility is not affected by an outage. Do not locate roof drains and roof drainage piping over computer spaces and trainer devices to prevent damage to equipment in case of leakage or condensation.

Carbon dioxide containers used for "I" level maintenance are preferred at a protected outdoor location.

3.2.7.1 Hydraulic Support and Pump Rooms. Provide adequate access for maintenance. Include space for hydraulic fluid storage. Provide concrete curbs around perimeter of hydraulic pump bases and/or metal pan under pump seals with drainage slope to sump to retain fluid waste for proper disposal. Floor drains subject to oil spills must drain to an oil separator. Use flexible couplings between pumps and piping systems for vibration and sound control.

3.2.7.2 Compressed Air. Comply with the requirements of NAVFAC DM-3.5.

3.2.7.3 Electric Water Coolers. Splash resistant basins are recommended to prevent slippage on the floor and shock hazard. Handicapped models shall be recessed as required to minimize obstruction to passage.

3.2.7.4 Waste Systems. Guidance is provided in DM-3.01. Additionally, special consideration shall be given to the following:

a) Accommodate oil separators and interceptors

b) Accommodate special drain requirements for HVAC, chillers, and trainer equipment.

3.2.7.5 Water Hammer Arresters. Utilize arresters in water supplies where quick-closing valves are installed.

3.2.7.6 Emergency Shower. Locate for ready access from hazard areas. Slope floor to drain beneath shower head. Provide curtain and testing apparatus.

3.2.8 Electrical. Typically, specific electrical requirements for training facilities and/or training device(s) are contained in a TPR or technical manual. Applicable NAVFAC design manuals and military handbooks provide general guidance on electrical engineering. Utilize them in conjunction with NFPA 70 and ANSI C2.

Provide two way communications from classrooms to administrative area or security desk if required by the user. Provide centralized 400 Hz solid state invertor and 24 VDC, both with backup for service to appropriate trainers without integral units.

a) Hydraulic Pump Rooms. Use steel conduit with liquid type fittings where electrical cables are located in the same trench with hydraulic piping.

b) Classrooms. Locate 120 volt convenience outlets for use of portable audio visual equipment. Provide conduit stub-outs with pull wire in ceiling space for future ceiling mounted audio visual aids such as projection systems.

c) Corridors. A shock hazard exists from convenience outlets where floor buffers are used. Use locking type outlets and metal device covers mounted high above splash zones.

3.2.8.1 Closed Circuit Television. Comply with MIL-HDBK-1004/7. Centralized VCR signal distribution system should be provided where possible, in lieu of portable equipment. Portable VCRs on mobile stands are repair intensive and require unnecessary set up time in individual rooms. Include cable outlet in the lounge for training.

3.2.8.2 Telephones. Administrative telephones are procured and installed under contracts administered by NCTC. Provide support system to include interior and exterior conduits with pull wire, telephone backboard(s), and telephone outlets. Refer to the Navy Telephone Manual for the required telephone outlets, backboard(s) sizes, and conduit sizes. Locate outlets as directed. Consider telephone and communication outlets in maintenance areas and dedicated lines at devices where networking is anticipated. Accommodate any special simulator contractor communication requirements which may require intercom features integrated into the telephone system.

3.2.8.3 Computers and Training Devices. Refer to manufacturer's TFR and comply with MIL-HDBK-1004/1, MIL-HDBK-1004/4, and MIL-HDBK-1012/1. In training facilities with high concentrations of micro computers control the effects of harmonics when designing branch circuits serving the computer areas. Provide surge protection, filter/conditioning power in accordance with requirements of the TFR. In the absence of specific requirements in the TFR, review the quality of power which will serve the proposed facility and provide surge protection, filters, and conditioners as necessary. See Trainer Facility Data and Equipment Summary Sheets for each aircraft type in this handbook for preliminary planning purposes.

3.2.8.4 Lighting. Lighting levels shall comply with MIL-HDBK-1190. Lighting level requirements exceeding those outlined in MIL-HDBK-1190 shall be fully justified and approved. Utilize energy conservation techniques as prescribed in Chapter 9, par. A2a of MIL-HDBK-1190.

Overhead fluorescent lighting can hamper vision at radar scopes, test scopes, and other CRT screens. Use appropriate lighting for these functions to reduce glare. Utilize fluorescent fixtures with battery packs and/or wall packs for emergency lighting in lieu of a central system.

a) Classrooms. Lighting control (dimmers and/or selective lamp and ballast switching) with discrete circuits for the front of the room allow for effective visual use of television monitors, projectors, view graphs, etc. Special lighting consideration may be required for lab/classrooms. Ceilings may be higher than normal for lab/classroom settings for better spatial quality due to the size of the room and to accommodate lab trainer device size and excursion limit requirements. Accommodate appropriate lighting intensity requirements at the trainee table working level. Extend lighting fixtures down below any ceiling fans. Trainer mockups may require more intense lighting than the general classroom ambient level. Use spectrum ranges appropriate for classroom settings. Emergency lighting is required as a safety precaution for operation of equipment during power failures.

3.2.8.5 Lightning Protection. Perform a lightning protection risk assessment on all aviation training facility types in compliance with Appendix I of NFPA 78, to justify lightning protection when required by the regional EFD. Comply with applicable sections of MIL-HDBK-1004/6.

3.2.8.6 Facility Low Voltage Power. Refer to applicable TFR or technical manual and comply with MIL-HDBK-1004/1 and MIL-HDBK-1004/4. Generally provide 480Y/277 volt, three-phase, four-wire service to the facility. Utilize dry type transformers to step voltage down for 120, 208, and 240 volt requirements.

3.2.8.7 Intrusion Detection System (IDS). Facility IDS systems are procured and installed via contracts administered by NCIS. Coordinate with NCIS for facility planning, design, and construction schedules. IDS systems including commercial power supply, utility and control wiring system are considered personal property. Provide support system in the construction contract to include conduit with pull wire and device boxes as directed. IDS for Marine Corps projects are separately funded and managed and do not require NCIS coordination. Provide IDS support requirements and startup specification where required in accordance with MIL-HDBK-1012/1.

3.2.8.8 Uninterruptible Power Supplies (UPS). UPS systems when required and justified by the user and are dedicated to the support of an item of personal property are typically procured for MILCON projects via contract administered by NFESC, and are installed by the facility construction contractor (i.e., Government furnished/contractor installed). Provide UPS support requirements and startup specification where required in accordance with MIL-HDBK-1012/1.

3.2.8.9 400 Hz Power. Comply with MIL-HDBK-1004/5. Due to the size of the load, solid state 400 Hz power supplies located in close proximity to the utilization equipment are required.

3.2.8.10 Facility Shielding. Provide electromagnetic and/or TEMPEST shielding if required by with MIL-HDBK-1195.

3.2.9 Fire Protection. Comply with MIL-HDBK-1008, UBC, and NFPA 101. Classroom facilities for Navy installations are considered business occupancies in accordance with NFPA 101. Assembly occupancies, conference rooms and classrooms with fixed seating require special attention. Provide visual fire alarm signals on a case by case basis where ambient noise in classrooms can prevent hearing audible alarms. Requirements for sprinkler systems, carbon dioxide extinguishing systems, fire alarm systems, and protection of electronic equipment installations are determined by MIL-HDBK-1008. Hand held portable halon extinguishers are permitted; however, automatic halon extinguishing systems are not. Convey fire alarm signals to the base fire department via the base fire reporting system. Verify the type of system with the fire department.

a) Hydraulic Fluid Piping Systems. High pressure 2000 psi hydraulic fluid has a high flashpoint and atomizing fluid leaks can self ignite with friction. Spaces containing exposed hydraulic fluid piping are subject to special protection. Provide fire stop seal where piping and cable in trenches pass through fire rated walls.

b) Hydraulic Pump Rooms. Specify electrical fixtures in the pump room as Class I, Division I explosion proof. Provide 2-hour fire resistive rated perimeter walls if the ordinary petroleum-based hydraulic fluid is used.

c) Computer Rooms and Other Electronic Spaces. Comply with MIL-HDBK-1008. Provide sprinkler protection. Controls shall automatically shut down computer, electronic and simulator power upon activation of the sprinkler system. Provide a plaque citing, "WARNING--Fire suppression system will shut down computer power to minimize damage--loss of data may occur." Smoke detection is required in subfloor spaces. Design computer/electronic and air conditioning equipment power to shut down upon activation of sub-floor smoke detectors in the associated room. An automatic carbon dioxide fire extinguishing system may be required by MIL-HDBK-1008. Place exits in accordance with occupancy counts and travel distances around equipment to comply with NFPA 101.

d) Media Storage Rooms. Design in accordance with NFPA 232.

3.2.10 Safety. The design of military facilities that serve as places of employment shall conform to, or be consistent with, applicable standards published under the OSHA of 1970 in accordance with MIL-HDBK-1190. Note that Chapters 5 through 7 of this reference state that whenever construction criteria and OSHA standards conflict, "the standard providing the greatest degree of safety shall govern." Obtain a SSWG hazard rating established by the activity and found in the facility study. Typical hazards include equipment guards and clearances, carbon dioxide discharge, and hydraulic systems.

Moving and electrically energized parts and pressurized hydraulic systems are primary concerns. Include a safety eyewash/shower in accordance with ANSI Z358.1 where hydraulic or other POL materials are used in the building. Arrange for hydraulic pumps to shut down automatically if a leak or break occurs in the line at any point. Provide emergency shutoff switches for the hydraulic pumps at the instructor's station. Provide three feet safety clearances around training devices. Paint floor around any rotating device yellow and black and indicate the type of hazard (e.g.,"strike hazard-rotating device-stay clear").

3.2.11 Security. A checkpoint for identification of entrants to the building may be required. Accommodate storage and use of classified teaching materials. NAVFAC Instruction 11010.44E provides guidance for the TEMPEST Vulnerability Assessment Request which is required when operating electronic equipment processing classified data.

3.3 Collateral Equipment. When MILCON personal property facility projects are programmed, the installation criteria for the equipment shall be shown in, or attached to, the facility studies for the projects involved. Major claimants, users, and equipment procurement agencies for projects of this type are responsible for providing these criteria as part of the MILCON

planning process. "Personal property" is defined as plant equipment which is procured and installed by the major claimants, users, or equipment procurement agencies with funds from other appropriations. This category of equipment includes technical, training, simulation, and automated data processing equipment. Detailed requirements for the aforementioned can be found in NAVFAC Instruction 11010.44E.

Furniture selection criteria shall include function, anthropometric considerations, moveability, adjustability, maintenance, durability, comfort, and cost. A clear relationship between the furniture finishes and the building finishes shall be evident. Give similar attention to the selection of finishes of equipment and training aids. Select furnishings from the Government's mandatory sources of supply. Primary sources include General Services Administration Federal Supply Schedules and Stock Catalogs, Federal Prison Industries, Blind-Made Products, etc. Selections made from other sources require a waiver with NAVFACENGCOM approval outlining the item's technical advantages and the inadequacies of Government mandatory sources.

3.3.1 Collateral Equipment List. The collateral equipment list is an essential programming and budgeting document. Preliminary collateral equipment lists are a means to establish a budget for funding purposes and are not intended to be used as a "buy" list. Consult the project interior designer at the EFD to assist in developing functional requirements as part of the interior design process. Integrate these functional requirements with the building design and space planning effort which are reflected in the Furniture/Equipment Footprint. Maintain a continuing update of the collateral equipment list with the using activity to ensure budget estimates are current and are adequately accommodated in the design. Include fire extinguishers and consider shredders or incinerators where classified material is used.

3.3.2 Furniture/Equipment Footprint. The Furniture/Equipment Footprint shall use standard or generic furniture sizes to demonstrate the adequacy of each space area and the collateral equipment list and to communicate to other engineering disciplines the utilities and services required for each space. It also demonstrates that life safety exit patterns are accommodated with the furniture and equipment in place. Provide a Furniture/Equipment Footprint for the PE phase.

Locate lockers for books, if required by the user, for easy access between classes. Lockers in the corridor or elsewhere in the facility are at the discretion of the user. Consider locker groupings for personal belongings and foul weather gear near the main entry or student lounge.

3.3.3 Training Aids

3.3.3.1 Special Training Device Requirements. Maintenance training devices are broadly classified as simulation (SAMTS) or hands-on equipment (NAMT). SAMTS trainers are used primarily in teaching troubleshooting and operational theory and typically utilize interactive multipurpose displays (IMPDs). NAMT

trainers are actual aircraft stock assemblies with mechanical and/or electrical actuation to simulate functions. Electrical power for NAMT equipment usually matches actual naval aircraft power characteristics of 200Y/115 volt, three phase, 400 cycle with 28 VDC. Some training facilities utilize hybrid trainers which utilize actual hands on equipment with computer enhancement. Hybrid systems are usually operated from a PC or mini/microcomputer which requires the same air conditioning needs as other automated data processing (ADP) systems. Totally PC based interactive courseware may be utilized with dual touch screen.

Maintain a continuing update of the proposed equipment with the user to ensure all items are current and are adequately accommodated in the design.

3.3.3.2 Audiovisual Requirements

a) Rear Screen Projection. Rear screen projection is discouraged in light of improved state-of-the-art media and additional space requirements. Where rear screen projection is essential, provide at least 6 feet clear space width behind the screen which can accommodate the projection path and serve as media storage and teacher work space.

b) Presentation Hardware and Projection Systems. PC based digitizing graphics hardware and three gun ceiling mounted projectors are current state-of-the-art media for visual aids in the classroom.

c) Slide and Overhead Projectors. Provide stowage space for portable carts. See concerns for aspect ratios below.

d) Projection Screens. Base selection of permanently mounted or stand alone screens on user preference. Permanently mounted screens can limit chalkboard area. Base justification of electrified projection screens on local requirements; however, maintenance and repair costs must be considered. Successful visual presentations depend on arrangements of the chalkboard and projection screen relative to the seating configuration.

(1) Avoid visual obstructions. Use clearspan structural systems where possible. Large demonstration tables when raised on platforms can obscure the lower areas of chalkboards.

(2) Slope the floor and raise the speaker's platform only where space is dedicated to projection and large capacity lecture functions.

(3) Consider the viewing distances.

(4) Conform to the vertical and horizontal viewing angles. Place seats at a distance from a screen not less than twice nor more than six times the width of the screen image to be viewed. The angle of elevation from the eye to the top edge of the screen or chalkboard should not exceed 30 degrees. Where room or seating depth is known, the screen width can be

determined by W-D/6 (preferred) or W-D/10 (minimum), where W=screen width and D=depth of room or seating. Select particular projection equipment based on aspect ratios compatible with height and width ratios for the screen. Refer to Timesaver Standards for Building Types, for graphic data on projection angles and screen widths. Consult Architectural Graphic Standards, for viewing zone limits and projection medium aspect ratios.

e) Chalkboard and Marker Boards. Porcelain surface marker boards are generally preferred since they are cleaner and can double as projection screens. Scrutinize their use in high security areas due to the potential retention of images after erasure; however, do not use chalkboards in computer rooms. Airborne chalk dust can damage computer hardware.

3.3.3.3 Electronic Information Delivery Systems (EIDS). Accommodate computerized EIDS and carrels where required. Carrels must be wider than normal to accommodate the EIDS.

3.4 Environmental Requirements. Design facilities to meet environmental requirements at Federal, State, and local levels. Comply with applicable pollution abatement criteria. For applicable discharge criteria, consult NAVFACENGCOM Headquarters and the cognizant EFD. Refer to MIL-HDBK-1005/8.

Table 3.2
Trainer Facilities Data - F/A-18 Landing Gear and Arresting Hook

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual F18-NAMT-03 Volume 1, Main Landing Gear Trainer, 74D090003-1001 and 74D090003-1003, and 74D090003-1005, McDonnell Aircraft.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)	OCCUPANT COUNT
Device/Trainee Area.	30' x 27'	10
Device Operating Envelope	115"x 91"x 95"	(none permanent)

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

STRUCTURAL

Device installation transport method: casters
Device shipping weight = 3460 pounds, operating weight = 3100 pounds. (note 1)
Floor loading in operating configuration with jack pads = 15.2 psi

Note 1: Trainers #960183 and up

Table 3.2 (Continued)
Trainer Facilities Data - F/A-18 Landing Gear and Arresting Hook

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY
Device/Trainee Area	78	30

Hydraulic pressure/flow rate: 3000 psi/8 gpm. Air Supply: Nitrogen, 1500 psi

General Note: Refer to specific device equipment list for loads.

ELECTRICAL

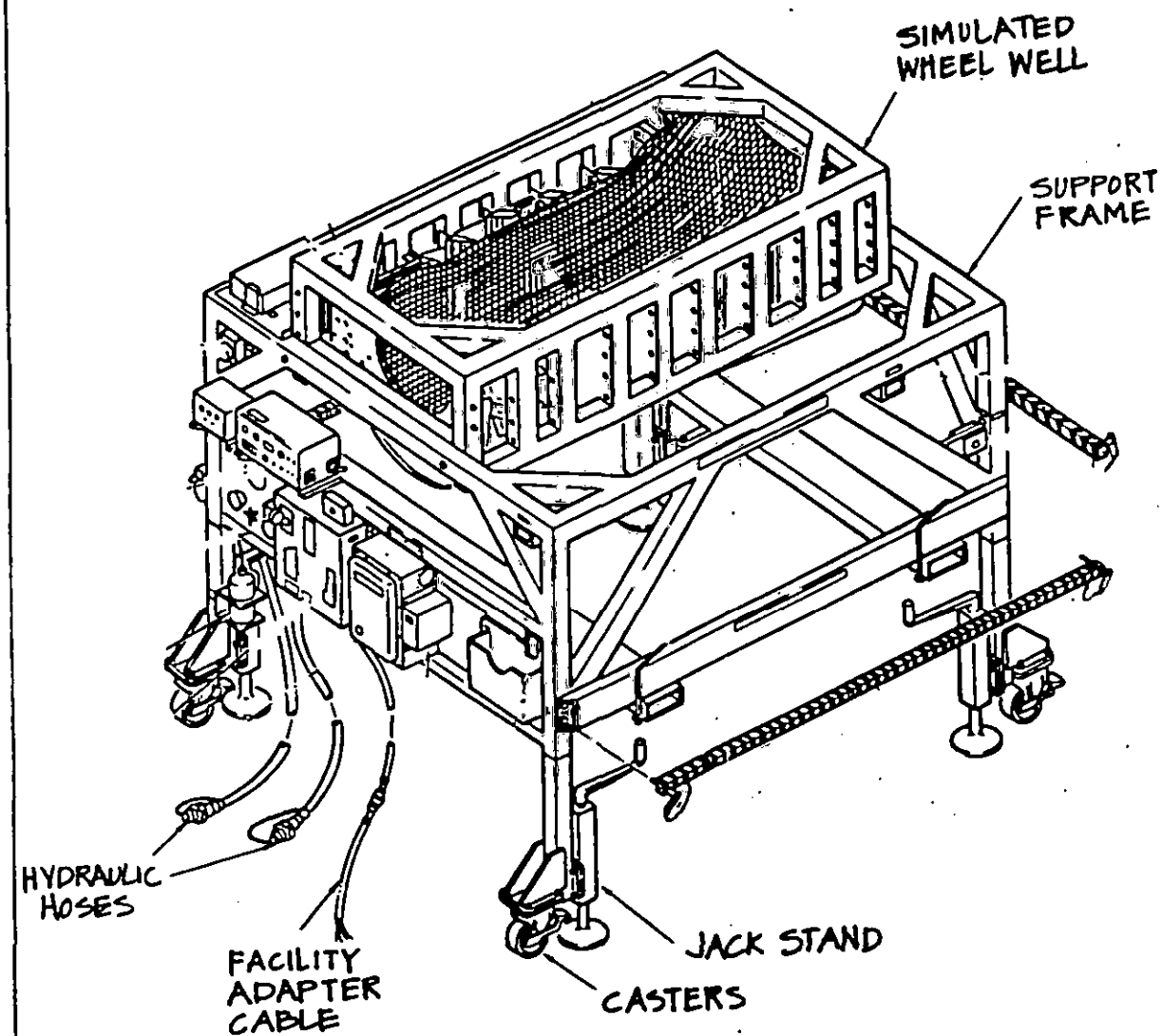
	VOLTS	HZ	WIRE COUNT	AMPERES PER PHASE A	B	C	REMARKS
Device/Trainer	120/208	60	5	0.20	0.05	0.05	standby
				6.00	0.50	0.05	start
				1.20	0.50	0.05	operate

SAFETY

Device/Trainee area: eyewash/shower and safety striping

EQUIPMENT

Hydraulic power unit:
supplied by: construction contractor
installed by: construction contractor



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 MAIN LANDING GEAR TRAINER- ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B1

Table 3.3
Trainer Facilities Data - F/A-18 Secondary Flight Control Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual F18-NAMT-05 Volume 1, Secondary Flight Controls Trainer, 74D090005-1001 and 74D090005-1003, 74D090005-1005, McDonnell Aircraft.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)	OCCUPANT COUNT
Device/Trainee Area.	30'x 26.5'	10
Device Operating Envelope	204"x 172"x 78"	(none permanent)

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

STRUCTURAL

Device installation transport method: casters
Device shipping weight = 2866 pounds, operating weight = 2701 pounds.
Floor loading in operating configuration with jack pads = 13.4 psi

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY
Device/Trainee Area	78	30

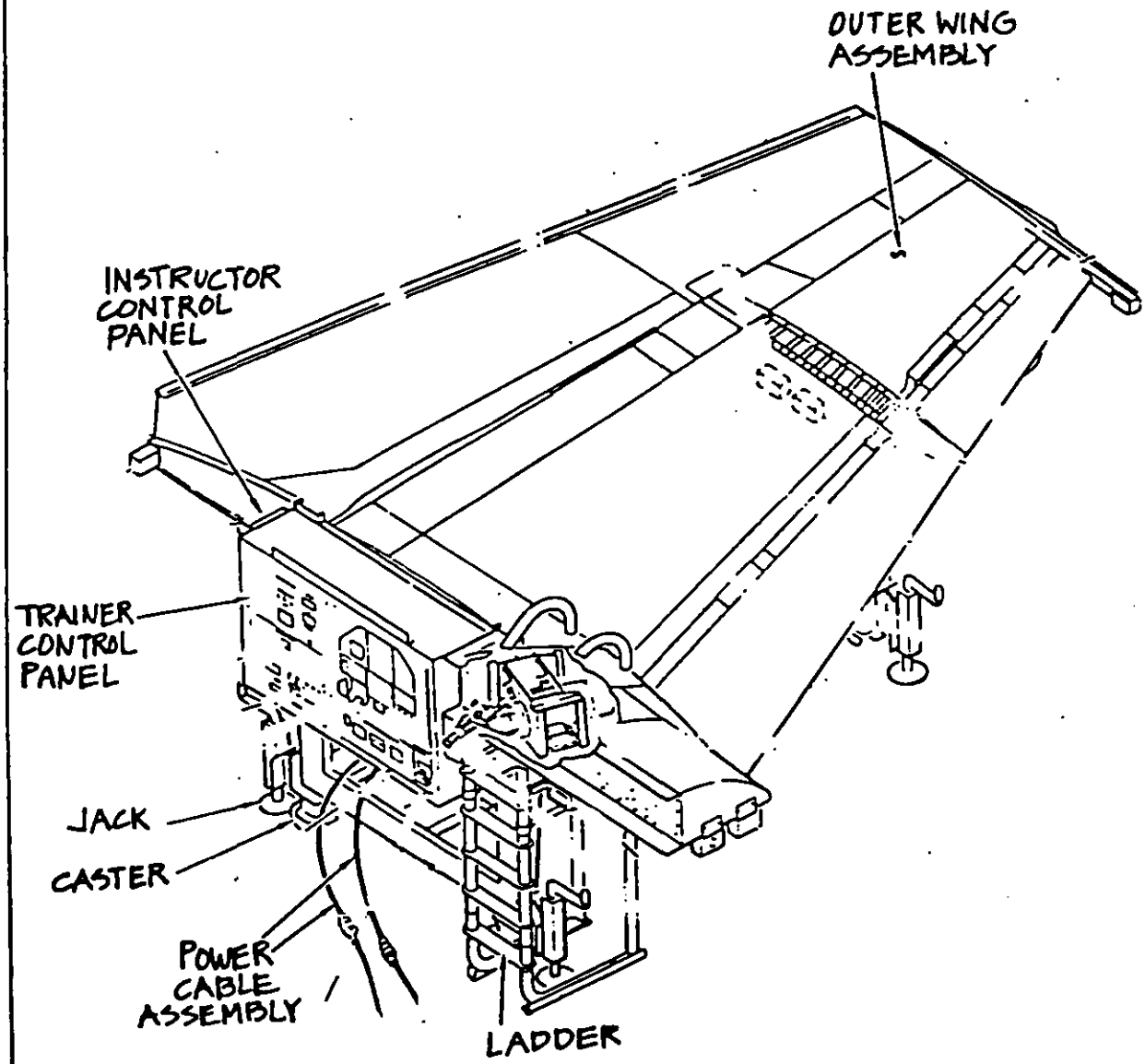
General Note: Refer to specific device equipment list for loads

Table 3.3 (Continued)
Trainer Facilities Data - F/A-18 Secondary Flight Control Trainer

ELECTRICAL					
	VOLTS	HZ	WIRE COUNT	PHASE	REMARKS
Device/Trainer	120/208	60	5	3	7 KVA

SAFETY	
Device/Trainee area:	eyewash/shower and safety striping

EQUIPMENT	
Hydraulic power unit:	
supplied by:	construction contractor
installed by:	construction contractor



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 SECONDARY FLIGHT CONTROLS TRAINER- ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B2

Table 3.4
Trainer Facilities Data - F/A-18 Environmental Control System Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code H5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual F18-NAMT-01 Volume 1, Environmental Control System Trainer, 74D090001-1001 and 74D090001-1003, McDonnell Aircraft.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Device Operating Envelope	
panel 1	225.5"x 127"x 101.6"
panel 2	114.5"x 48.3"x 63.4"
panel 3	54"x 35"x 63"

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

STRUCTURAL

Device installation transport method: casters
Device panel 1 operating weight = 5790 pounds, shipping weight = 6255 pounds.
Floor load for panel 1 in operating configuration with jack pads = 14.0 psi
Device panel 2 operating weight = 1295 pounds, shipping weight = 1635 pounds.
Floor load for panel 2 in operating configuration with jack pads = 6.5 psi
Device panel 3 operating weight = 565 pounds, shipping weight = 565 pounds.
Floor load for panel 3 in operating configuration with casters = 400 psi

Table 3.4 (Continued)
Trainer Facilities Data - F/A-18 Environmental Control System Trainer

MECHANICAL

Air Supply:	Nitrogen(Air), 50 psi	
Pneumatic:	For panel 1 lift system	80 psi-10scfm
	For panel 1 cockpit pressurization	30 psi-10scfm

General Note: Refer to specific device equipment list for loads.

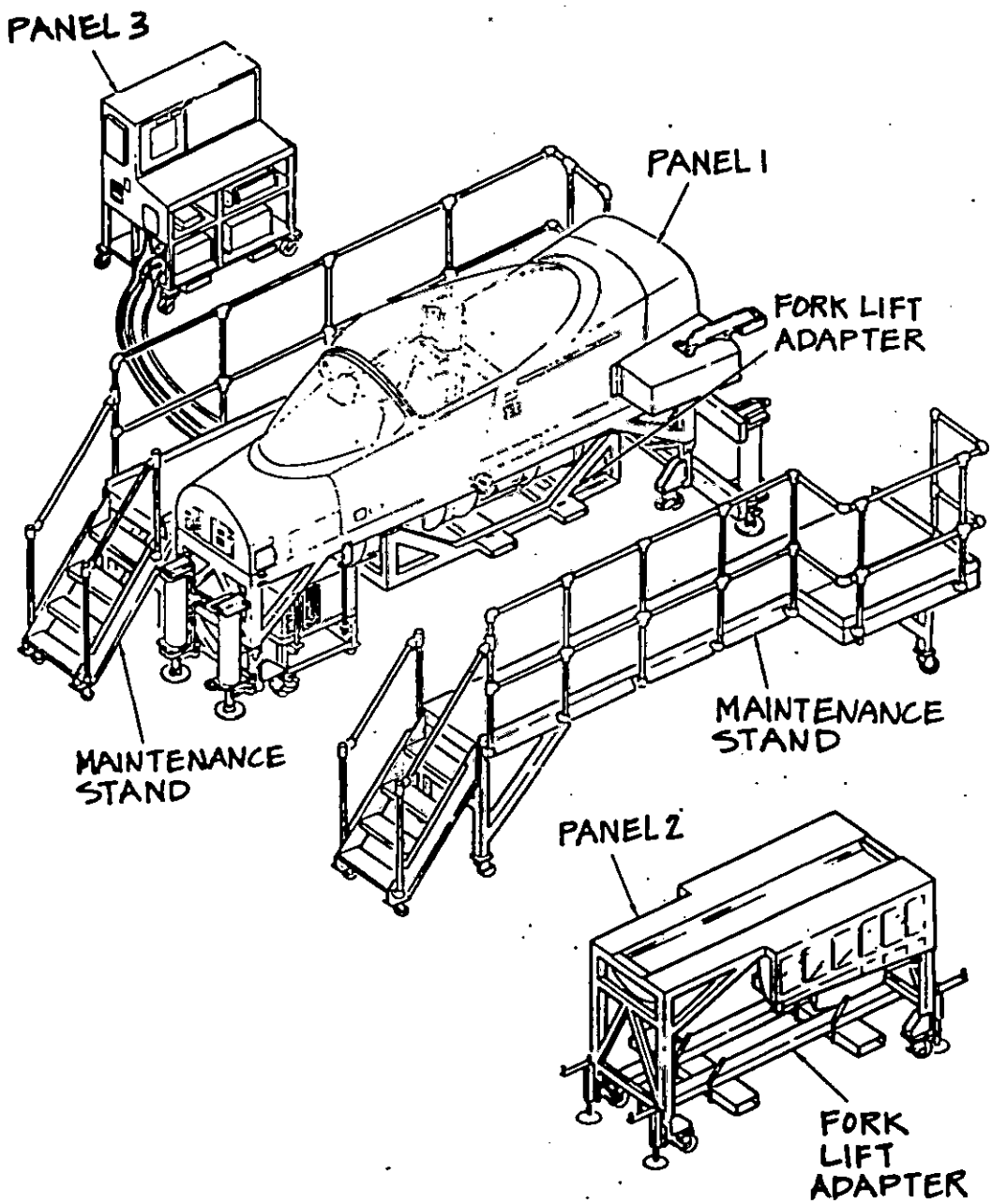
ELECTRICAL

Panel 3 General Power:

	VOLTS	HZ	WIRE COUNT	PHASE	REMARKS
To control box from facility	120/208	60	5	3	
	120/208	400	4	3	9KVA

SAFETY

Device/Trainee area: eyewash/shower and safety striping



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 ENVIRONMENTAL CONTROL SYSTEM TRAINER ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B3

Table 3.5
Trainer Facilities Data - F/A-18 Primary Flight Controls Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual F18-NAMT-04 Volume 1, Primary Flight Controls Trainer, 74D090004-1001 and 74D090004-1003, and 74D09004-1005, McDonnell Aircraft.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Device Operating Envelopes	
panel 1	130"x 98"x 78"
panel 2	161"x 184"x 61"
panel 3	58"x 36"x 61"

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

STRUCTURAL

Device installation transport method: casters
Device panel 1 operating weight = 1580 pounds, shipping weight = 1580 pounds
Device panel 2 operating wt = 3575 lbs, shipping wt = 1690 pounds (each section)
Device panel 3 operating weight = 800 pounds, shipping weight = 800 pounds

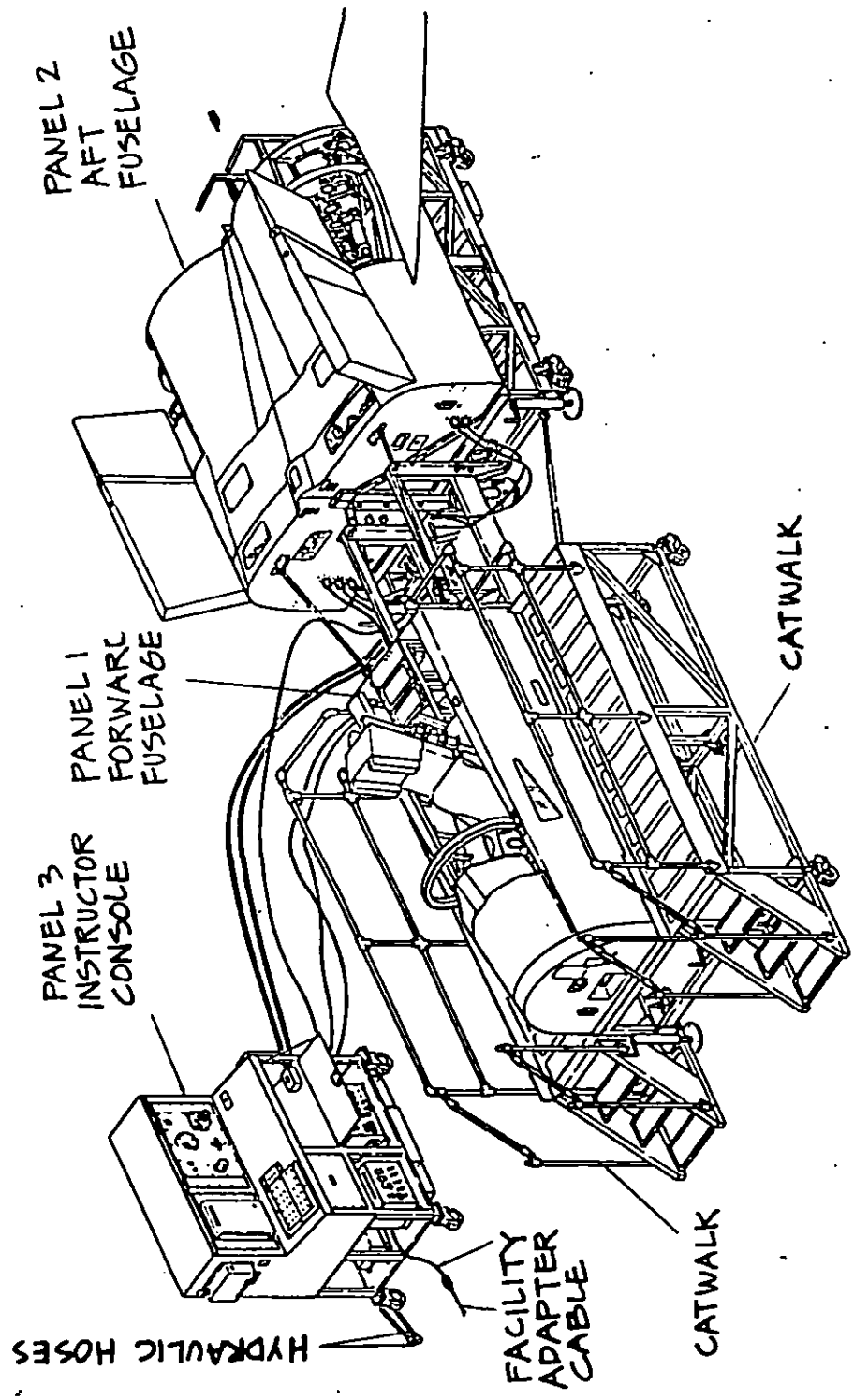
Table 3.5 (Continued)
Trainer Facilities Data - F/A-18 Primary Flight Controls Trainer

MECHANICAL

Hydraulic: For panel 3 3000 psi/20 gpm.
Air Supply: Nitrogen(Air) 1500 psi
General Note: Refer to specific device equipment list for loads.

ELECTRICAL

General Power	VOLTS	HZ	WIRE COUNT	PHASE	REMARKS
To control box from facility	120/208	60	5	3	5KVA



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 PRIMARY FLIGHT CONTROLS TRAINER ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B4

Table 3.6
Trainer Facilities Data - F/A-18 Fuel System (SAMT) Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual NAVTRADEV P-5148-1, dated 18 August 1988, F/A-18 FUEL SYSTEM SIMULATED AIRCRAFT MAINTENANCE TRAINER, DEVICE 11B105, ECC International Corp.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Device Component sizes	
panel display #1	108"x 30"x 76"
panel display #2	108"x 30"x 76"
instructor station	60"x 24"x 40"
computer console	29"x 29"x 67"
UPS	18"x 7"

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

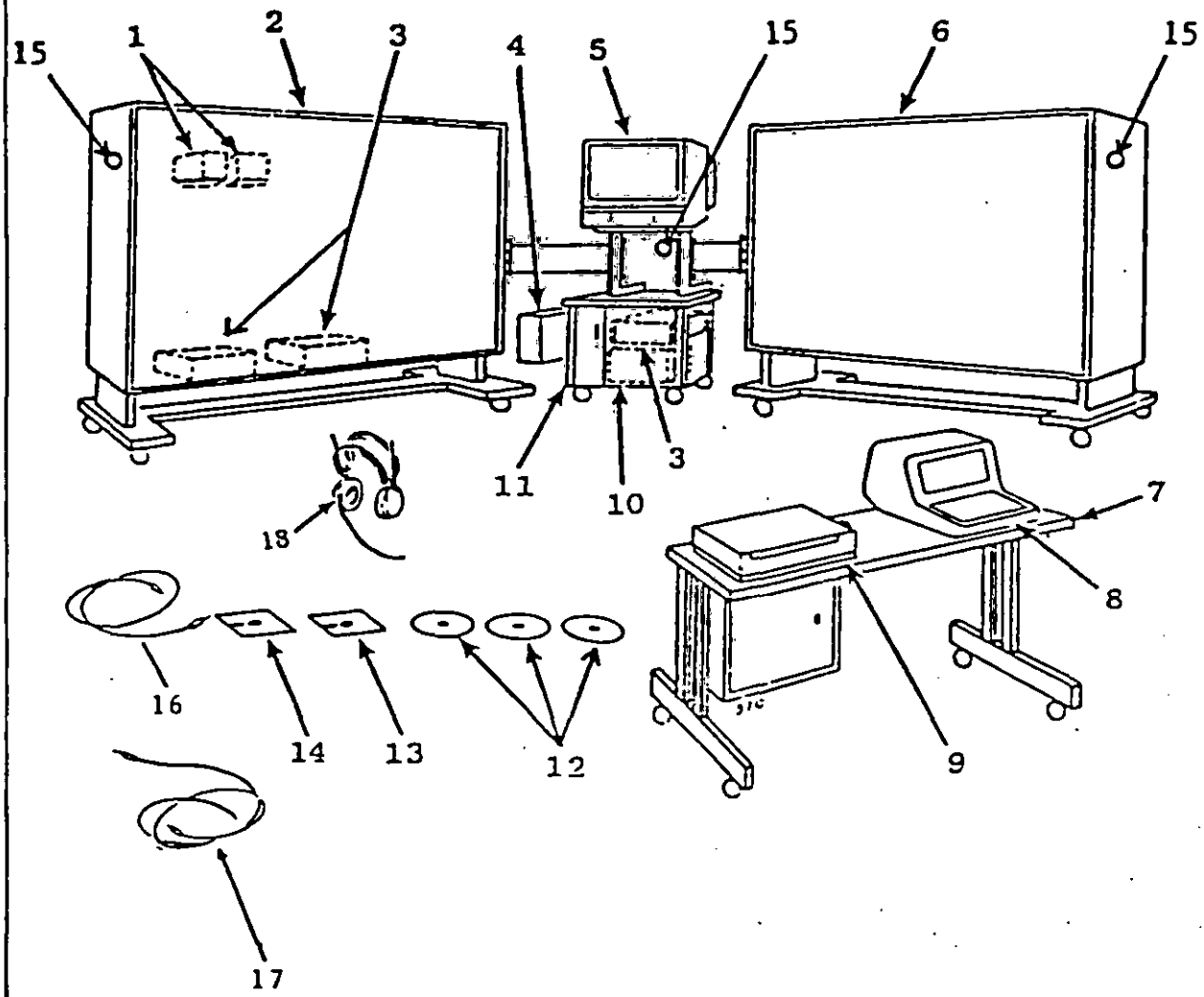
MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY (per cent)	
Device/Trainee Area	39-100	80 (operating)	90 (non operating)

General Note: Specific device equipment loads not available.

Table 3.6 (Continued)
Trainer Facilities Data - F/A-18 Fuel System (SAMT) Trainer

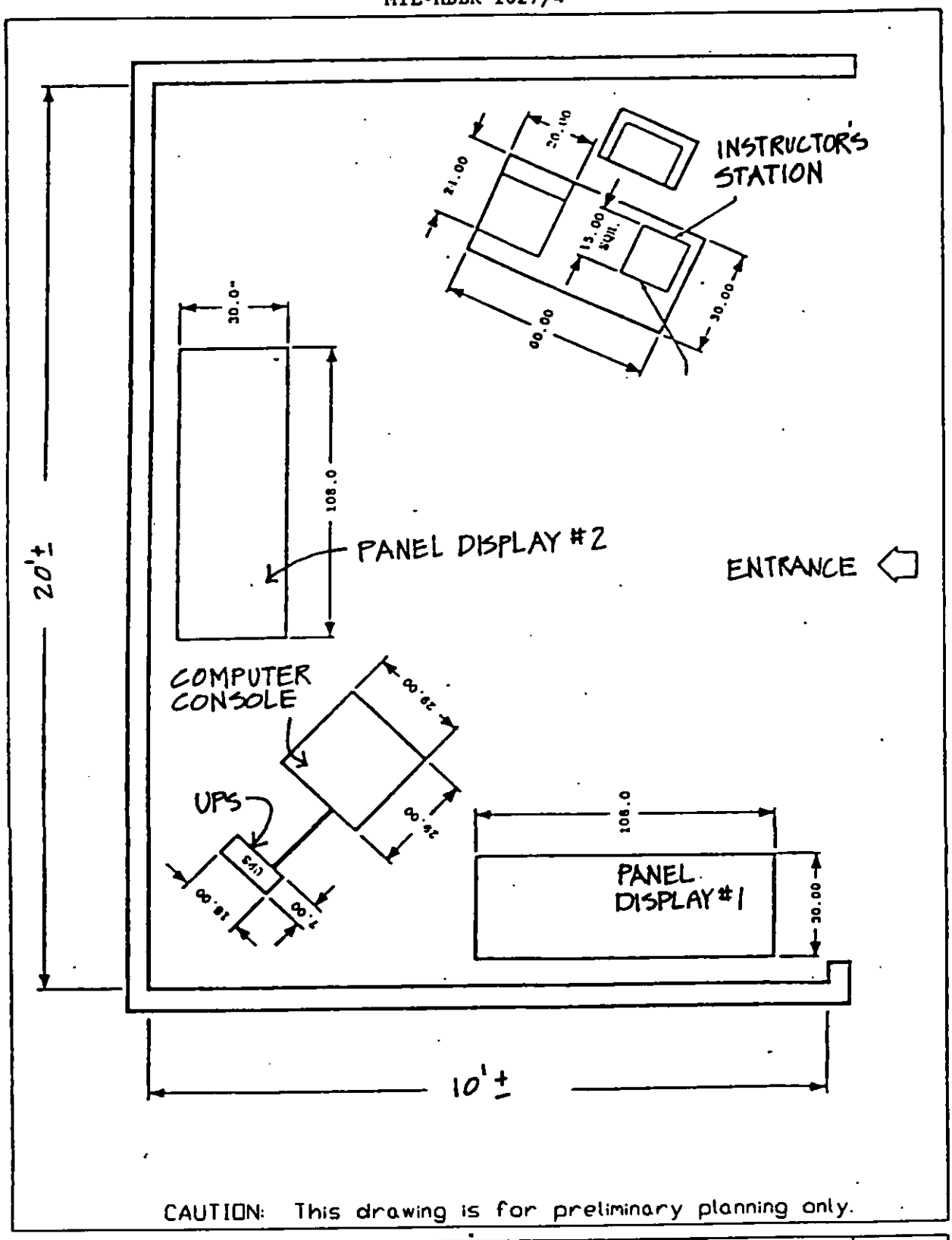
ELECTRICAL			
General Power:	VOLTS	HZ	PHASE
From facility	115	60	1



1. Digital display indicators (DDI)
2. Simulation panel 1 (SP1)
3. Videodisc player
4. Uninterruptable power source (UPS)
5. Video monitor
6. Simulation panel 2 (SP2)
7. Instructor station
8. Instructor CRT terminal
9. Printer
10. EC 3 computer
11. Control computer console
12. Videodisc player disc
13. Simulation program diskette
14. Procedural program diskette
15. Emergency Stop Switch
16. Red test lead
17. Black test lead
18. Head set

CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 FUEL SYSTEM SIM AIRCRAFT MAINTENANCE TRAINER- ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B5



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 FUEL SYSTEM SIM AIRCRAFT MAINTENANCE TRAINER- FLOOR PLAN	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B6

Table 3.7
Trainer Facilities Data - F/A-18 Avionics System (SAMT) Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual NAVTRADEV P-5140-1, Revision A: dated 5 December 1986, F/A-18 AVIONICS SYSTEM SIMULATED AIRCRAFT MAINTENANCE TRAINER, DEVICE 11H103, Educational Computer Corporation.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Trainee Area.	20'x 18'x 10'

General Notes: Additional space required for classroom. See other data for administrative and support spaces.

STRUCTURAL

System overall weight: 1200 pounds

MECHANICAL

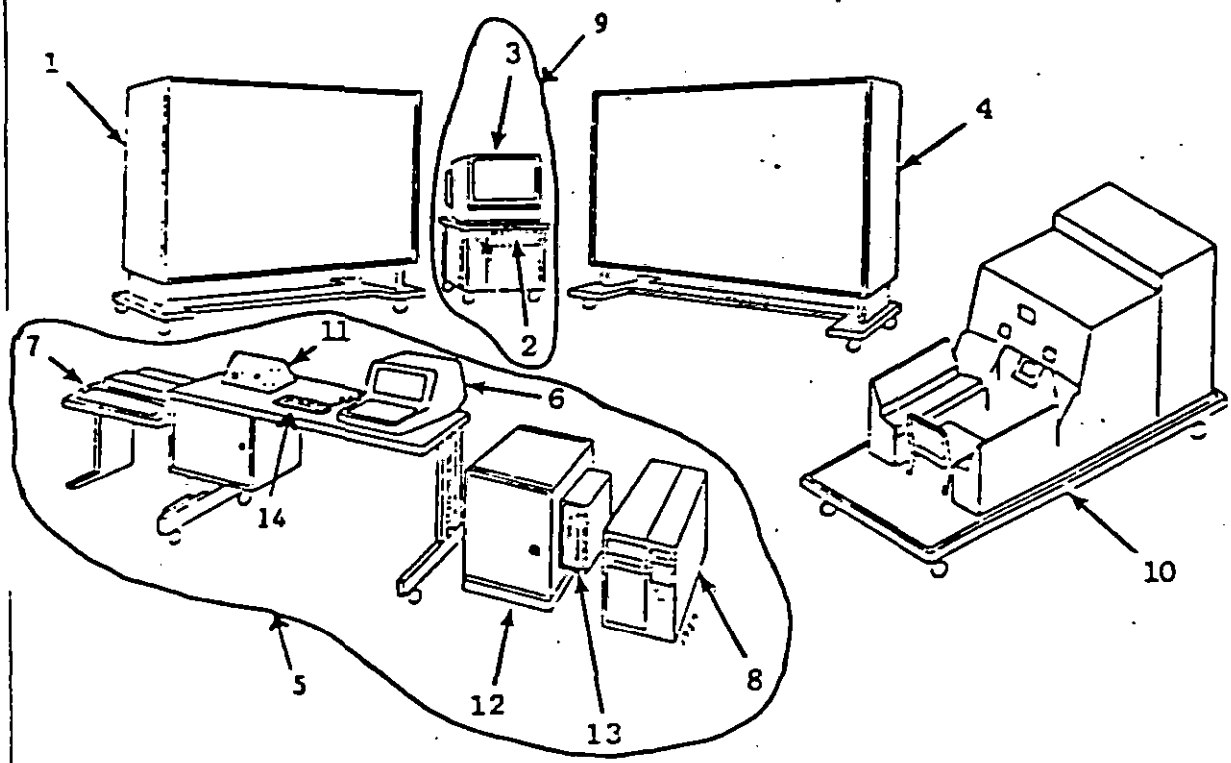
SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY (per cent)
Device/Trainee Area	60-90	50-90 (operating-non condensing)

General Note: Specific device equipment loads not available.

Table 3.7 (Continued)
Trainer Facilities Data - F/A-18 Avionics System (SAMT) Trainer

ELECTRICAL				
General Power:	VOLTS	WIRE COUNT	AMPERES	REMARKS
From facility	220	3	20	Note 1

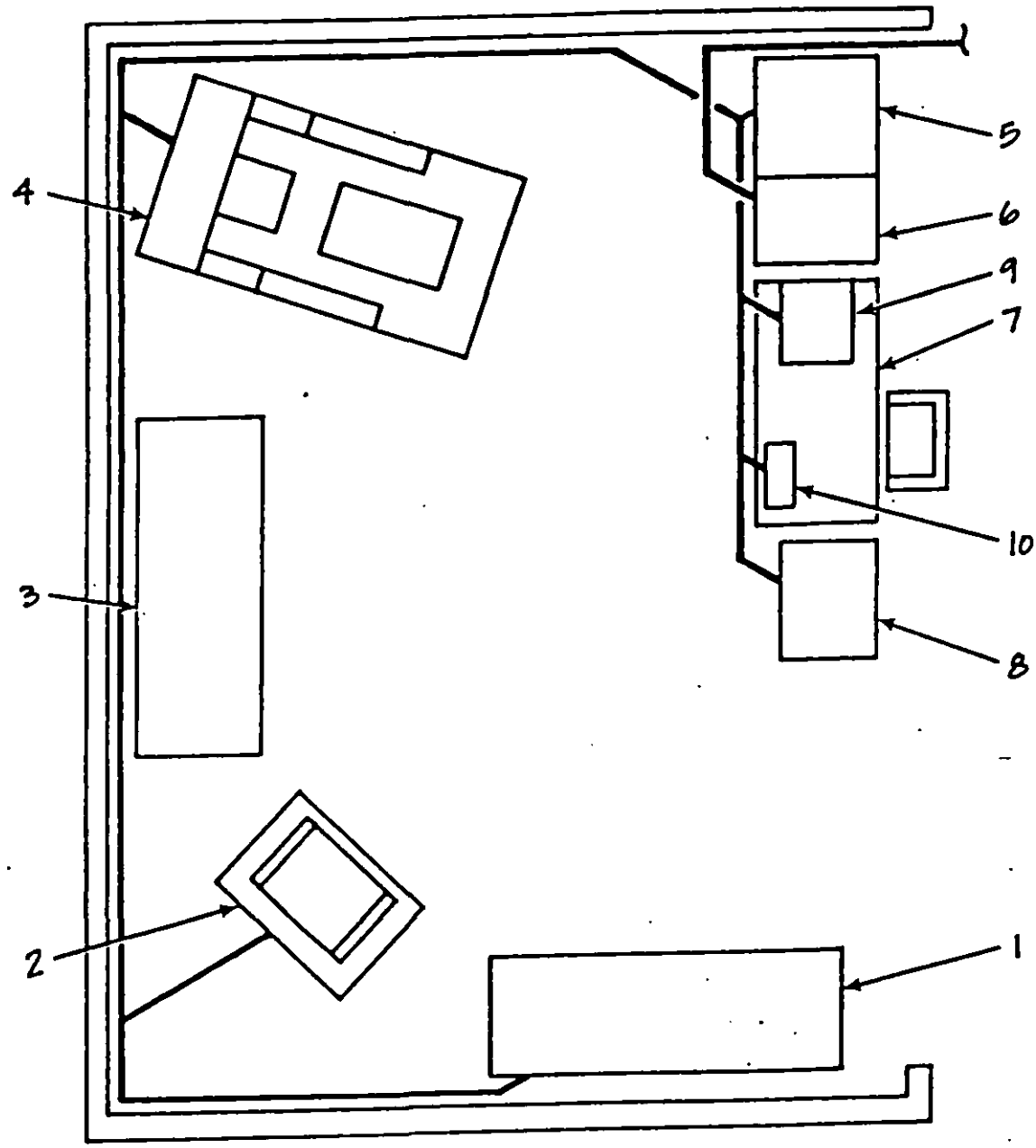
Note 1: A 2510 or 2516 Hubbell receptacle is required at the above ratings. See Technical Manual for component electrical characteristics.



1. Simulation panel 1 (SP1)
2. Videodisc player
3. Video monitor/touchscreen
4. Simulation panel 2 (SP2)
5. Instructor station
6. Instructor CRT terminal
7. Printer
8. VAX computer
9. Student interactive display device (SIDD)
10. Cockpit
11. Radio communications controller
12. Graphics controller
13. Master ac power distribution unit
14. Keypad

CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 AVIONICS SYSTEM-ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B7



1. Simulation panel 1 (SP1)
2. Student interactive display device (SIDD)
3. Simulation panel 2 (SP2)
4. Cockpit
5. VAX computer
6. Graphics controller
7. Instructor station
8. Printer
9. CRT terminal
10. Radio communications controller

CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 AVIONICS SYSTEM-FLOOR PLAN	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B8

Table 3.8
Trainer Facilities Data - F/A-18 Flight Control Electronics System (SAMT) Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual NAVTRADEV P-5136-1, 25 July 1988, F/A-18 FLIGHT CONTROL ELECTRONICS SYSTEM SIMULATED AIRCRAFT MAINTENANCE TRAINER, DEVICE 11H102, ECC International Corp.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Trainee Area.	20'x 18'x 10'

General Notes: Additional space required for classroom. See other data for administrative and support spaces.

STRUCTURAL

System overall weight: 1200 pounds

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY (per cent)
Device/Trainee Area	60-90	50-90 (operating-non condensing)

General Note: Specific device equipment loads not available.

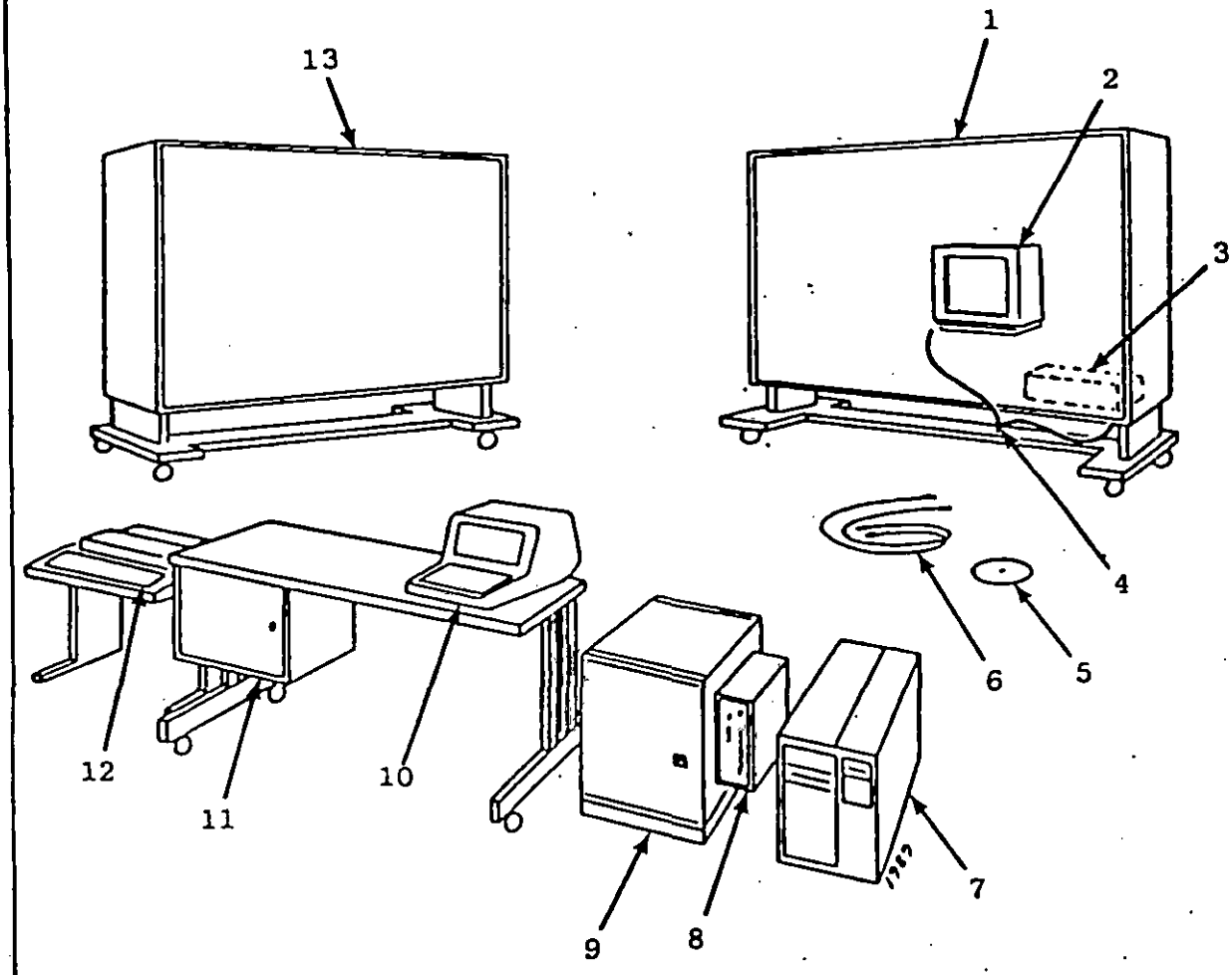
Table 3.8 (Continued)
Trainer Facilities Data - F/A-18 Flight Control Electronics System (SAMT) Trainer

ELECTRICAL

General Power:

	VOLTS	WIRE COUNT	AMPERES	REMARKS
From facility	220	3	20	Note 1

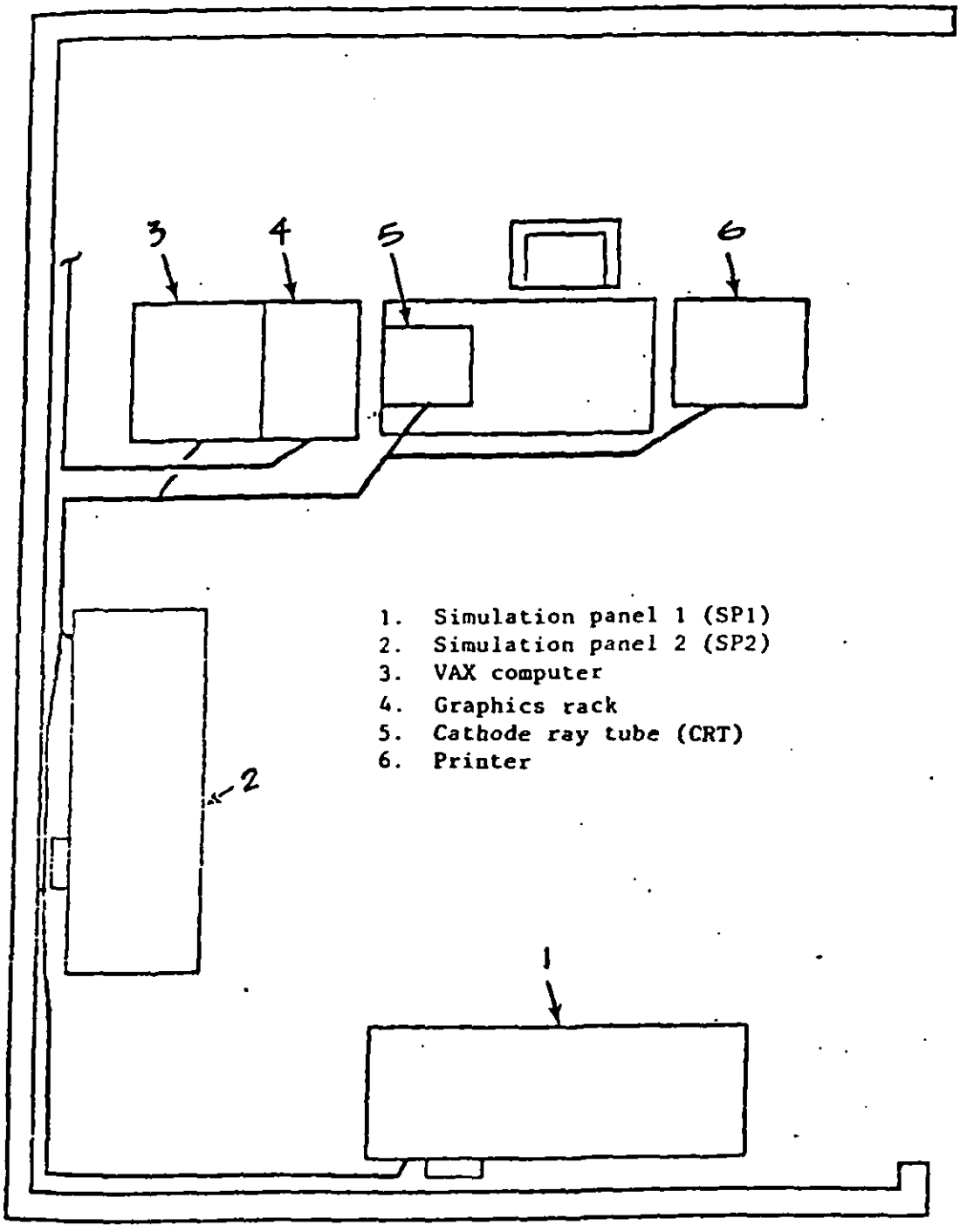
Note 1: A 2510 or 2516 Hubbell 2511-P receptacle is required at the above ratings. See Technical Manual for component electrical characteristics.



1. Simulation panel 2 (SP2)
2. Video monitor
3. Videodisc player
4. Student interactive display device (SIDD)
5. Videodisc player disc
6. Test Leads
7. VAX computer
8. Master AC Power Distribution Unit
9. Graphics Rack
10. Instructor CRT terminal
11. Instructor station
12. Printer
13. Simulation panel 1 (SP1)

CAUTION: This drawing is for preliminary planning only.

TITLE FLT CNTRL ELECTRONICS SYS SIMULATED AIRCRAFT MAINT TRAINER- ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B9



1. Simulation panel 1 (SP1)
2. Simulation panel 2 (SP2)
3. VAX computer
4. Graphics rack
5. Cathode ray tube (CRT)
6. Printer

CAUTION: This drawing is for preliminary planning only.

TITLE FLT CNTRL ELECTRONICS SYS SIMULATED AIRCRAFT MAINT TRAINER- FLOOR PLAN	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B10

Table 3.9
Trainer Facilities Data - F/A-18 Armament System (SAMT) Trainer

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual NAVTRADEV P-5144-1, change 5: 6 November 1987, F/A-18 ARMAMENT SYSTEM SIMULATED AIRCRAFT MAINTENANCE TRAINER, DEVICE 11H104, ECC International Corp.

ARCHITECTURAL

	MIN DIMENSIONS (LWH or noted)
Trainee Area.	20'x 18'x 10'

General Notes: Additional space required for classroom. See other data for administrative and support spaces.

STRUCTURAL

System overall weight: 1200 pounds

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY (per cent)
Device/Trainee Area	39-100	80 (operating-non condensing)

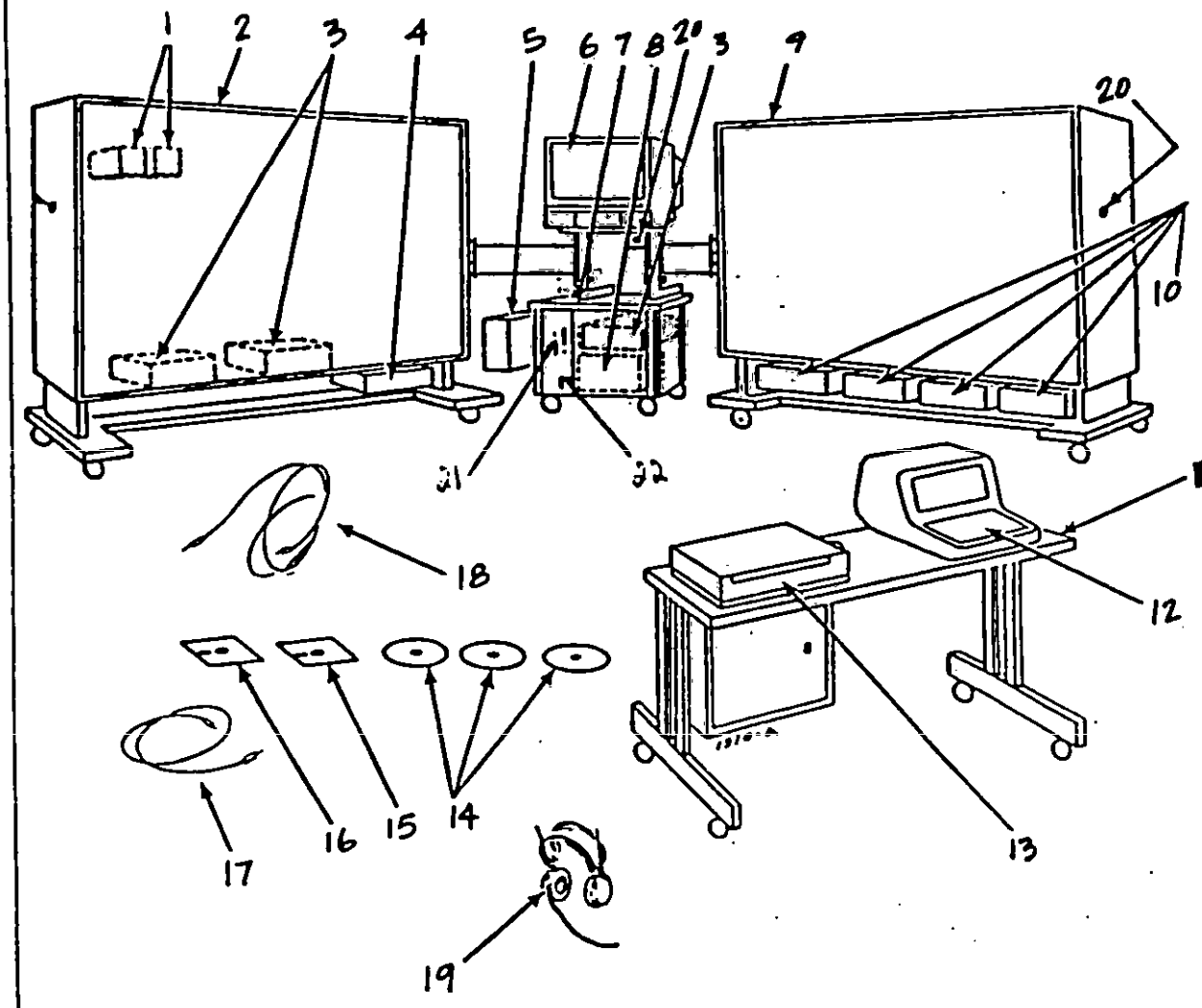
General Note: Specific device equipment loads not available.

Table 3.9 (Continued)
Trainer Facilities Data - F/A-18 Armament System (SAMT) Trainer

ELECTRICAL

General Power:	VOLTS	WIRE COUNT	AMPERES	REMARKS
From facility	115	3	20	Note 1

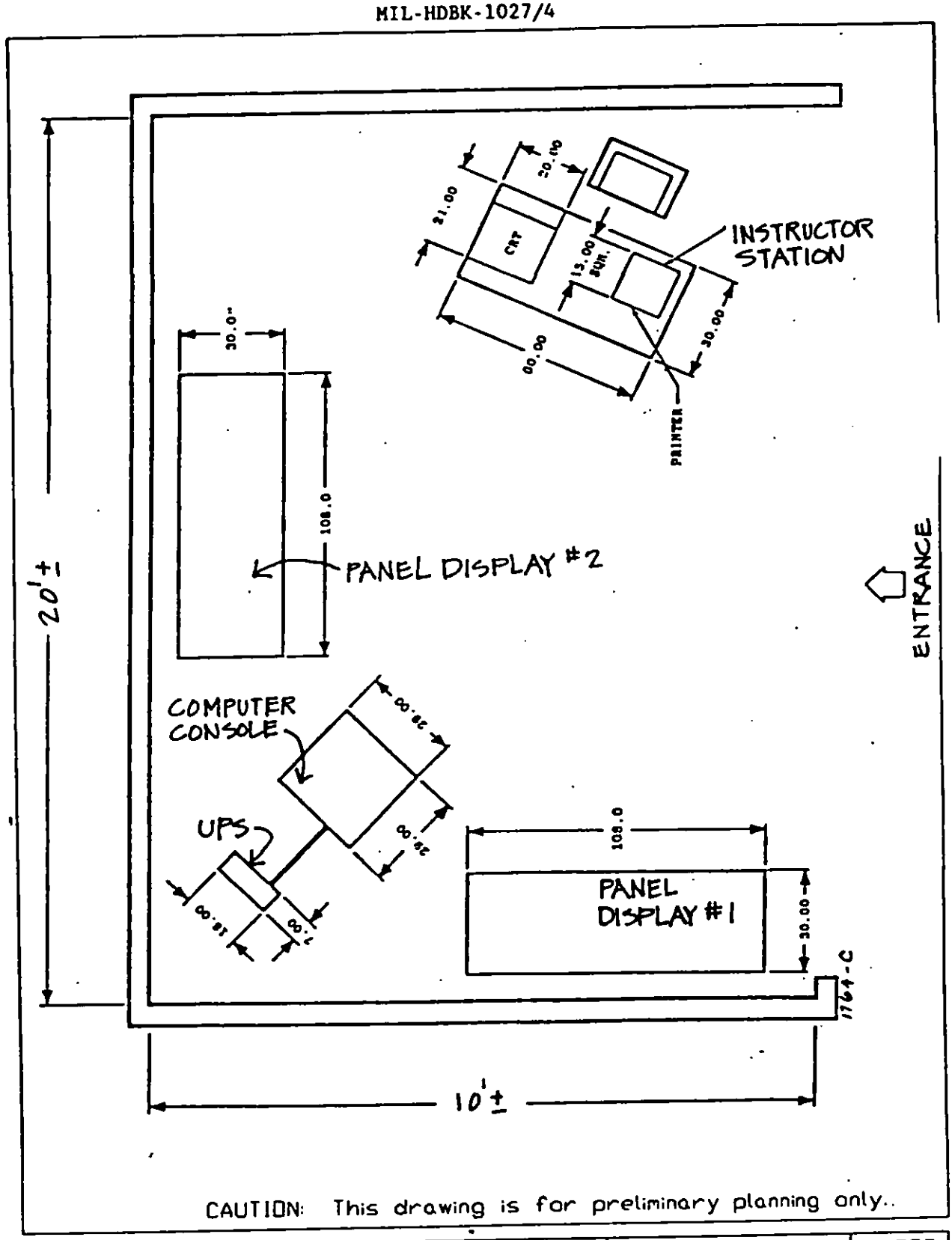
Note 1: A standard three-prong receptacle is required at the above ratings to mate with a Hubbell #8215-C. See Technical Manual for component electrical characteristics.



1. Digital display indicators (DDI)
2. Simulation panel 1 (SP1)
3. Videodisc player
4. Enclosure
5. Uninterruptable power source (UPS)
6. Video monitor
7. Control computer console (CCC)
8. EC 3 computer
9. Simulation panel 2 (SP2)
10. Test sets
11. Instructor station
12. Instructor CRT terminal
13. Printer
14. Videodisc player disk
15. Simulation program diskette
16. Procedural program diskette
17. Red test lead
18. Black test lead
19. Audio headset
20. Emergency stop switch
21. Upper diskette drive
22. Lower diskette drive

CAUTION: This drawing is for preliminary planning only.

TITLE ARMAMENT SYSTEM SIMULATED AIRCRAFT MAINT TRAINER- ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B11



CAUTION: This drawing is for preliminary planning only..

TITLE ARMAMENT SYSTEM SIMULATED AIRCRAFT MAINT TRAINER- FLOOR PLAN	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B12

Table 3.10
Trainer Facilities Data - F/A-18 Hydraulic System

Room dimensions shown are minimums unless noted.

** CAUTION: This document is for preliminary planning only.**
**Verify with NAMTRAGRU Code N5 prior to use. **

REFERENCE DOCUMENTS

Technical Manual F18-NAMT-06 Volume 1, Hydraulic System Trainer, 74D0090006-1001 and 74D090006-1003, McDonnell Aircraft.

ARCHITECTURAL

NOISE	MIN DIMENSIONS (LWH or noted)	OCCUPANT COUNT	SPECIAL DOOR	LEVEL
Device/Trainee Area.	29'x 30'x 10'	10	21'x30'	65db
Device Operating Envelope	118"x 124"x 104"	0	none	65db

General Notes: Above requirements are Trainer Device specific. See other data for administrative & support spaces.

STRUCTURAL

Device installation transport method: casters
Device shipping weight = 1713 pounds, operating weight = 1550 pounds.
Floor loading in operating configuration with jack pads = 7.7 psi

MECHANICAL

SPACE NAME	TEMPERATURE DEGREES (f)	HUMIDITY
Device/Trainee Area	78	30

Hydraulic pressure/flow rate: 3000 psi/1 gpm. Use MIL-H-83282.
Air Supply: Nitrogen(Air)

Table 3.10 (Continued)
Trainer Facilities Data - F/A-18 Hydraulic System

ELECTRICAL

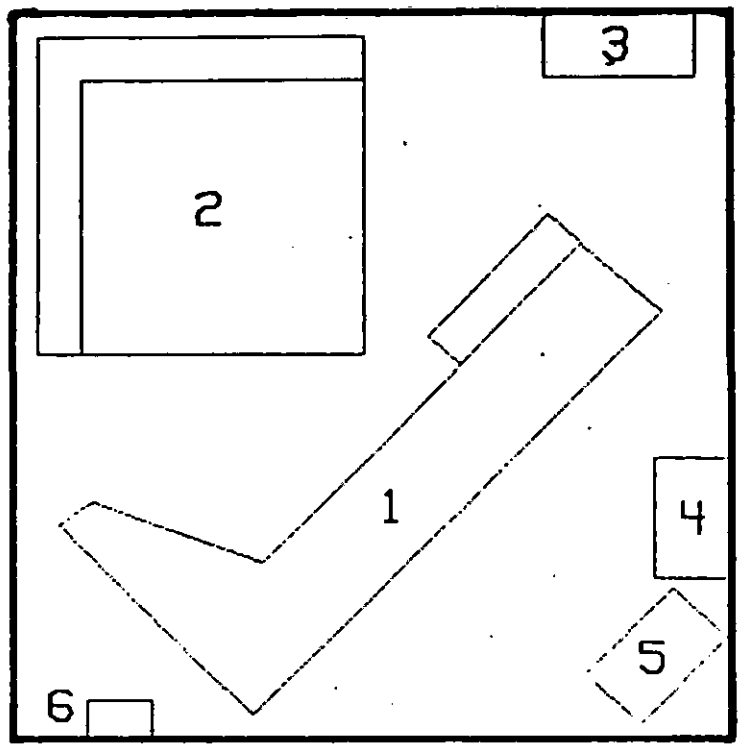
	VOLTS	HZ	WIRE COUNT	AMPERES PER PHASE A	B	C	REMARKS
Device/Trainer	120/208	60	5	0.10	0.05	0.05	standby
				1.20	0.05	0.30	start
				0.80	0.05	0.20	operate

SAFETY

Device/Trainee area: eyewash/shower and safety striping

EQUIPMENT

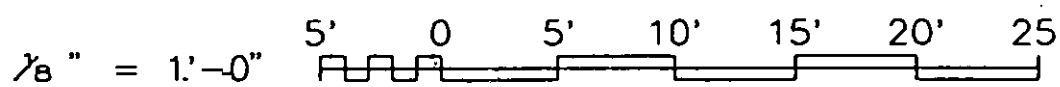
Hydraulic power unit:
supplied by: construction contractor
installed by: construction contractor



1. HYDRAULIC SYSTEM SAMT (36X78X282)
2. HYDRAULIC SYSTEM TRAINER (108X156X156)
3. BENCH (30X72)
4. DESK (36X60)
5. CONTROL CONSOLE (36X60)
6. LOCKER (18X30)

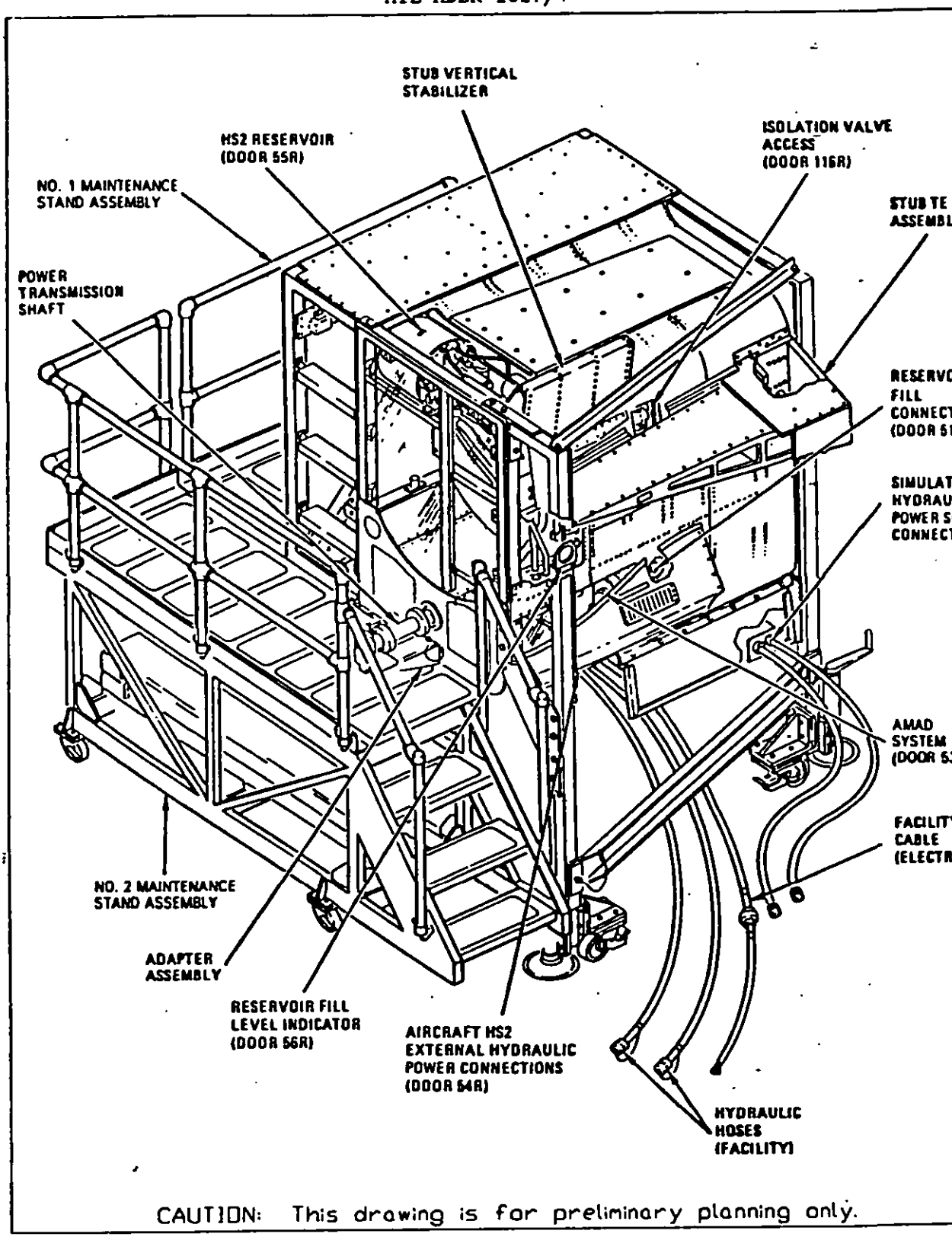
NOTE: ALL DIMENSIONS ABOVE ARE IN INCHES

ROOM SIZE = 29 FEET X 30 FEET AREA = 870 SQUARE FEET



CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 HYDRAULIC SYSTEM TRAINER ROOM FLOOR PLAN	DATE MAY. 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B13

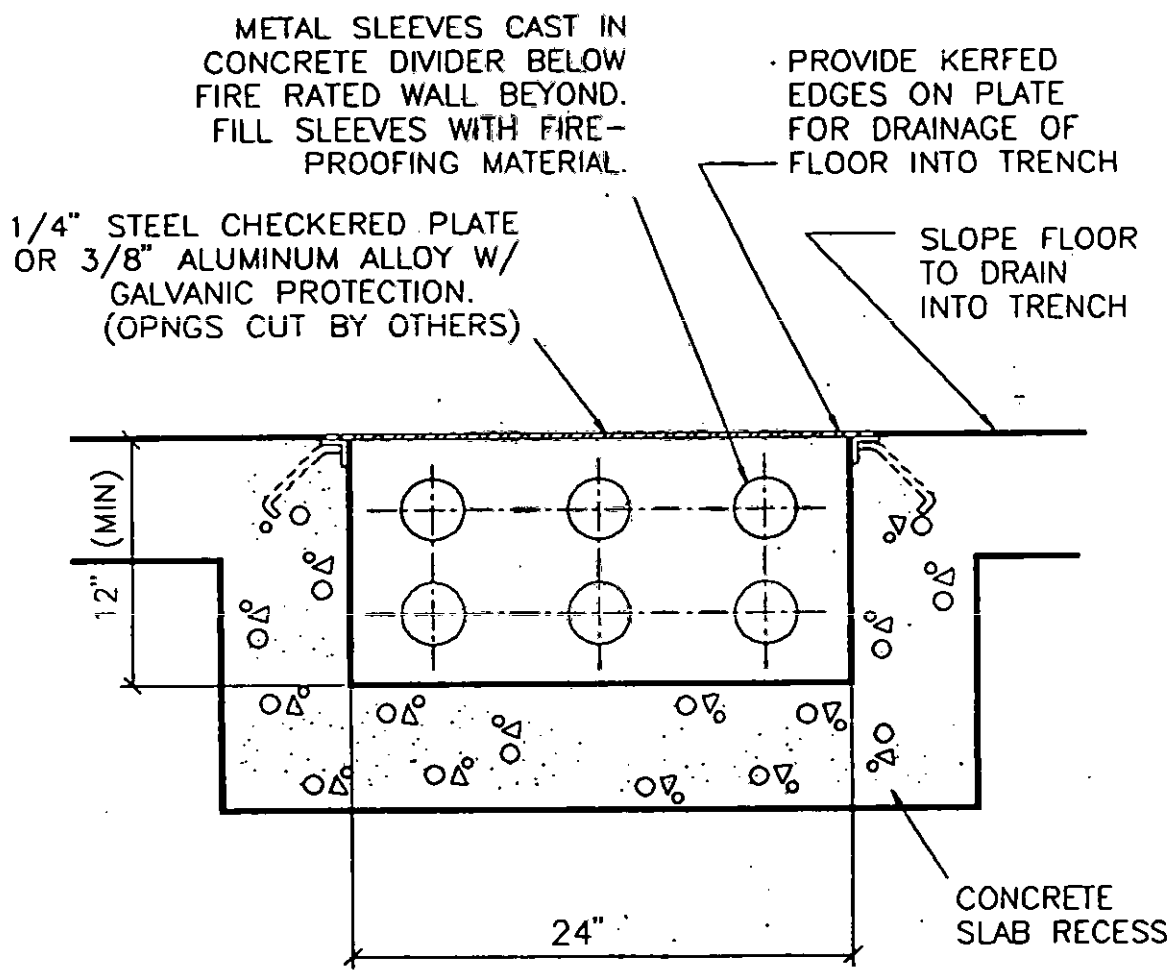


CAUTION: This drawing is for preliminary planning only.

TITLE F/A-18 HYDRAULIC SYSTEM - TRAINER ISOMETRIC	DATE MAY 1992	FACILITY PLATE NO. 171 20	SHEET FA18 B14

APPENDIX A

SECTION HYDRAULIC TRENCH



NOTES:

1. DIMENSIONS ARE RECOMMENDATIONS ONLY.
2. SLOPE TRENCH BOTTOM AND FLOOR PER TFR.
3. SEAL SIDES AND BOTTOM OF TRENCH PER TFR.

NO SCALE

REFERENCES

NOTE: THE FOLLOWING REFERENCED DOCUMENTS FORM A PART OF THIS HANDBOOK TO THE EXTENT SPECIFIED HEREIN. USERS OF THIS HANDBOOK SHOULD REFER TO THE LATEST REVISIONS OF CITED DOCUMENTS UNLESS OTHERWISE DIRECTED.

FEDERAL/MILITARY SPECIFICATIONS, STANDARDS, BULLETINS, HANDBOOKS, AND NAVFAC GUIDE SPECIFICATIONS:

Unless otherwise indicated, copies are available from the Defense Printing Service STANDARDIZATION DOCUMENT ORDER DESK, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

HANDBOOKS

MIL-HDBK-419A	Grounding, Bonding, and Shielding for Electronic Equipments and Facilities (Volume 1 - Basic Theory; Volume 2 - Applications)
MIL-HDBK-1001/1	Basic Architectural Requirements and Design Considerations
MIL-HDBK-1002/2	Loads
MIL-HDBK-1004/1	Electrical Engineering Preliminary Design Considerations
MIL-HDBK-1004/4	Electrical Utilization Systems w/ Change
MIL-HDBK-1004/5	400-Hz Medium-Voltage Conversion/Distribution and Low-Voltage Utilization Systems
MIL-HDBK-1004/6	Lightning Protection
MIL-HDBK-1004/7	Wire Communication and Signal Systems
MIL-HDBK-1005/8	Domestic Wastewater Control
MIL-HDBK-1005/9	Industrial and Oily Wastewater Control
MIL-HDBK-1008	Fire Protection for Facilities Engineering, Design, and Construction
MIL-HDBK-1012/1	Electronic Facilities Engineering
MIL-HDBK-1013/1	Design Guidelines for Physical Security of Fixed Land-Based Facilities

MIL-HDBK-1034	Administrative Facilities
MIL-HDBK-1190	DOD Facility Planning and Design Guide
MIL-HDBK-1195	Radio Frequency Shielded Enclosures

GUIDE SPECIFICATIONS

NFGS-10440G	Signs
NFGS-L-14622	Monorails With Electric Powered Hoists
NFGS-14637H	Cranes, Overhead Electric, Underrunning (Under 50,000 pounds)

FEDERAL STANDARDS

FED STD 795	Uniform Federal Accessibility Standards (UFAS)

NAVY MANUALS, DEPARTMENTAL INSTRUCTIONS, P-PUBLICATIONS, AND MAINTENANCE OPERATING MANUALS:

Available from Commanding Officer, Naval Publications and Forms Directorate, ASO Code 10, 5801 Tabor Avenue, Philadelphia, PA 19120-5099. To order these documents: Government agencies must use the Military Standard Requisitioning and Issue Procedure (MILSTRIP); the private sector must write to NPFD, ATTENTION: Cash Sales, Code 1051, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

P-PUBLICATIONS

P-80	Facility Planning Criteria for Navy and Marine Shore Installations
P-355	Seismic Design for Buildings
P-905	Planting and Establishment of Trees, Shrubs, Ground Covers, and Vines
P-960	Installation Design
P-970	Planning in the Noise Environment

DEPARTMENTAL INSTRUCTIONS

NAVFAC 11010.44E	Shore Facilities Planning Manual
NAVFAC 11013.39A	Operation and Maintenance Support Information (OMSI) for Facilities Projects
OPNAV 5530.14B	Department of the Navy Physical Security and Loss Prevention
OPNAV 11010.36A	Air Installation Compatible Use Zones (AICUZ) Program

DESIGN MANUALS

DM-1.03	Architectural Acoustics
DM-3.01	Plumbing Systems
DM-3.03	Heating, Ventilating, Air Conditioning, and Dehumidifying Systems
DM-3.5	Compressed Air and Vacuum Systems
DM-3.09	Elevators, Escalators, Dumbwaiters, Access Lifts, and Pneumatic Tube Systems.
DM-3.10	Noise and Vibration Control Mechanical Equipment (ARMY)
DM-14.01	Interior Design
DM-38.01	Weight Handling Equipment

OTHER GOVERNMENT DOCUMENTS AND PUBLICATIONS:

Guideline on Electrical Power for ADP Installations, (FIPS PUB 94), September 21, 1983, Springfield, VA 22161

Safety Standard for Architectural Glazing Materials, (16 CFR Part 1201), July 6, 1977, U.S. Consumer Product Safety Commission, Washington, DC 20207

DOT D6.1	Manual on Uniform Traffic Control Devices for Streets and Highways
NAVY	Navy Telephone Manual
OSHA	Occupational Safety and Health Act
29CFR Chapter 12	Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs

DEPARTMENT OF LABOR

CFR 1910.23C	Occupational Safety and Health Act Standards Manual
CFR 1910.141	Sanitation

(Copies can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

NON-GOVERNMENT PUBLICATIONS

Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the Department of Defense Index of Specifications and Standards (DODISS).

Architectural Graphic Standards, John Wiley & Sons

(Unless otherwise indicated, copies are available from The AIA Bookstore, 1735 New York Avenue, Washington, DC 20006, ph. 202 626 7475)

Timesaver Standards for Building Types, 2nd Edition, McGraw-Hill Book Company

(Unless otherwise indicated, copies are available from The AIA Bookstore, 1735 New York Avenue, Washington, DC 20006, ph. 202 626 7475)

AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS, INC. (ASHRAE)

ASHRAE	HVAC Systems and Applications Handbook
ASHRAE std 62	Ventilation for Acceptable Indoor Air Quality

(Unless otherwise indicated, copies are available from American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI C2	National Electric Safety Code
ANSI Z358.1	American National Standard for Emergency Eyewash and Shower Equipment
ASME/ANSI A17.1	Safety Code for Elevators and Escalators

(Unless otherwise indicated, copies are available from ANSI, 1430 Broadway, New York, New York 10008.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 70	National Electrical Code - 1990
NFPA 78	Lightning Protection Code
NFPA 101	Safety to Life from Fire in Buildings and Structures
NFPA 232	Protection of Records

(Unless otherwise indicated, copies are available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269)

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

Uniform Building Code (UBC)

(Unless otherwise indicated, copies are available from International Conference of Building Officials, 5269 South Workman Mill Road, Whittier, CA 89691.)

GLOSSARY

ACT. Acoustical Ceiling Tile

AST. Aircrew Systems Trainer

ATT. Aircraft Tactics Trainer

BEAP. Base Exterior Architecture Plan

CIG. Computer Image Generation

CNC. Concrete

CPT. Carpet

CT. Ceramic Tile

CTOL. Conventional Takeoff and Landing (simulator).

CTTSS. Contractor Total Training Systems Support. This can include operator and maintenance training by private contractor.

Device Area. The facility space dedicated to the training device. Typically referred to as "high bay" area where domes or high excursion training devices such as those in training pools are used.

Excursion Limit. The envelope of movement for trainer devices.

EXP. Exposed.

EXP&P. Exposed and Painted.

HDR. Hardener for Concrete.

High Bay. Areas, which are usually device areas, requiring additional ceiling height.

"I" Level Maintenance. Intermediate level maintenance is that level of maintenance which is the responsibility of, and is performed by, designated maintenance activities for direct support of using organizations. Its phases normally consist of calibration, repair or replacement of damaged or unserviceable parts, components, or assemblies; the emergency manufacture of non-available parts; and the provision of technical assistance to using organizations.

IFT. Instrument Flight Trainer

MCOT. Aircraft Mission Trainer

Motion Envelope.

MFT. Mission Flight Trainer

NAMT. Trainers which incorporate actual aircraft stock assemblies with mechanical and/or electrical actuation to simulate functions.

"O" Level Maintenance. Organizational level maintenance is that level of maintenance which is the responsibility of, and is performed, by a using organization on its assigned equipment. Its phases normally consist of inspecting, servicing, lubricating, adjusting and replacing parts, minor assemblies and subassemblies.

OF/NT. Operational Flight/Navigational Trainer

OF/WST. Operational Flight/Weapons System Trainer

OFT. Operational Flight Trainer

PGWB. Painted Gypsum Wall Board

PT. Position Trainer

PTD. Painted

PTT. Part Task Trainer

QT. Quarry tile

SAMT. Trainers which are used primarily in teaching troubleshooting and operational theory and typically utilize interactive multipurpose displays (IMPDs)

SLR. Sealer

TERR. Terrazzo

TEST. Tactical Environment System Trainer

TRAINEE. Usually the pilot.

TT. Tactics Trainer

TTT. Tactical Team Trainer

VCT. Vinyl Composition Tile

VTOL. Vertical takeoff and landing (simulator).

VWC. Vinyl wall covering

WST. Weapons System Trainer

WST/VS. Weapons System Trainer/Visual System

WTT. Weapons Tactics Trainer

CUSTODIAN
NAVY - YD2

PREPARING ACTIVITY
NAVY - YD2

PROJECT NO.
FACR-1115