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CONCEPTUAL DESIGN REPORT

HAZARDOUS MATERIALS MANAGEMENT AND EMERGENCY RESPONSE
(HAMMER) TRAINING CENTER
PROJECT 95L-EWT-100

Issued by:
Westinghouse Hanford Company
September 21, 1994
for the

U.S. DEPARTMENT OF ENERGY
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CONCEPTUAL DESIGN REPORT

**HAZARDOUS MATERIALS MANAGEMENT AND
EMERGENCY RESPONSE (HAMMER)
TRAINING CENTER**

PROJECT 95L-EWT-100

Prepared for
Westinghouse Hanford Company

September 21, 1994

for the
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ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADP	automatic data processing
AEI	Architectural and Engineering Instructions
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
AREA	American Railway Engineering Association
ASTM	American Society for Testing and Materials
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
AWS	American Welding Society
BTU	British Thermal Unit
CFR	Code of Federal Regulations
CD	Compact Disk
CAST	Computer Aided Structural Technology
CDR	Conceptual Design Report
CRSI	Concrete Reinforcing Steel Institute
cfm	cubic feet per minute
cm	centimeters
CMU	concrete masonry unit
DOE	U.S. Department of Energy
DX	direct exchange
EIA	Electronic Industries Association
EOC	Emergency Operations Center
EM	USACE Engineering Manual
°F	degrees of Fahrenheit
FM	Factory Mutual
FACP	Fire Alarm Control Panel
FDC	Functional Design Criteria
ft	feet/foot
ft ²	square foot
ft/ft	foot per foot
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
HAMMER	Hazardous Materials Management and Emergency Response
HAZMAT	hazardous material
HLAN	Hanford Local Area Network
HPS	Hanford Plant Standard
HVAC	heating, ventilating, and air conditioning
Hz	Hertz

ACRONYMS AND ABBREVIATIONS (Continued)

IEEE	Institute of Electrical and Electronics Engineers
IES	Illumination Engineering Society
in.	inch
ISDN	Integrated Services Digital Network
IOS	Instructor/ Operator Station
ISO	Insurance Service Office
kV	kilovolt
KVA	Kilovolt ampere
lb/ft ³	pounds per cubic foot
lb/mg	pounds per million gallons
lb/ft ²	pounds per square ft
lb/in ²	pounds per square inch
LPG	liquid propane gas
LCP	Local Control Panel
mbh	thousand BTU/hour
MRP	Management Requirements and Procedures Manual
msl	mean sea level
MVA	mega-volt-amps
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
PNL	Pacific Northwest Laboratories
PCs	Personal computers
PDS	premise distribution systems
PLC	Programmable Logic Controller
psig	Pound-force per square in. gauge
QAPP	QA Project Plan
QA	Quality Assurance
ROM	Read Only Memory
RLIP	RL Implementing Procedure
SAR	Safety Analysis Report
SARA	Superfund Amendments and Reauthorization Act of 1986
SCBA	Self Contained Breathing Apparatus
SDC	Standards Design Criteria
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMRF	special moment resisting frames
TEC	total estimated cost
TDH	total dynamic head
TM	Technical Manual
UBC	Uniform Building Code of the International Conference of Building Officials
UPC	Uniform Plumbing Code
UCRL	University of California Research Laboratory

ACRONYMS AND ABBREVIATIONS (Continued)

USACE	U.S. Army Corps of Engineers
UTP	Unshielded Twisted Pair
VAV	variable air volume system
VCR	Video Cassette Recorder
V	Volt
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

For the next 30 years, the main activities at the U.S. Department of Energy (DOE) Hanford Site will involve the management, handling, and cleanup of toxic substances. If the DOE is to meet its high standards of safety, the thousands of workers involved in these activities will need systematic training appropriate to their tasks and the risks associated with these tasks. Furthermore, emergency response for DOE shipments is the primary responsibility of state, tribal, and local governments. A collaborative training initiative with the DOE will strengthen emergency response at the Hanford Site and within the regional communities.

Local and international labor has joined the Hazardous Materials Management and Emergency Response (HAMMER) partnership, and will share in the HAMMER Training Center core programs and facilities using their own specialized trainers and training programs.

The HAMMER Training Center will provide a centralized regional site dedicated to the training of hazardous material, emergency response, and fire fighting personnel.

1.1 HAZARDOUS MATERIALS MANAGEMENT AND EMERGENCY RESPONSE TRAINING CENTER DESCRIPTION

The DOE has tasked the U. S. Army Corps of Engineers, Walla Walla District (USACE), with the development of a conceptual design for a HAMMER Training Center at the Hanford site near Richland, Washington. The HAMMER Training Center will support high quality training in accordance with DOE Hanford Site and regional training requirements. The HAMMER Training Center will encompass 80 acres and consist of a classroom and hands-on training center for hazardous material and emergency response personnel.

1.2 CONCEPTUAL DESIGN REPORT PURPOSE

This Conceptual Design Report (CDR) is a culmination of the conceptual design activities performed to establish the baseline for the HAMMER Training Center in accordance with WHC-SD-T100-FDC-001, *Function Design Criteria - HAMMER Training Center*. The purpose of the CDR is to sufficiently develop the design to assure the following:

- Programmatic needs are met
- Operating needs are met
- Proposed design concepts are feasible
- Risks are identified and addressed
- Technical, cost, and schedule baselines are established.

The CDR will be used to establish funding and schedule requirements, obtain concept approval by interested parties, and document the project baseline.

The CDR contains sufficient detail for endorsement of the project concept and the development of reliable project cost and schedule baselines. The work breakdown structure (Appendix A), budget authorized/budget outlay schedule (Appendix B), cost estimate summary (Appendix C), and conceptual project schedule (Appendix D) provide information on the project cost and schedule baselines. The level of detail included in the CDR is not intended to restrict the ability to make technical decisions during definitive design.

2.0 SUMMARY

An 80 acre site near the southern edge of the Hanford Site, along Horn Rapids Road, has been set aside for the HAMMER Training Center. The project provides facilities for classroom lectures and hands-on practical training in realistic situations for hazardous material and emergency response personnel who are tasked with handling and clean-up of toxic substances. Realism for hands-on training will be obtained by utilizing simulated operating equipment, simulated hazardous materials, mocked up incident sites, and live fire props. The training props, simulated hazardous materials, transportation sites, storage equipment mockups, and emergency response equipment will be used to simulate potential incident scenarios given various conditions. The field training laboratories and props will be multipurpose and flexible. However, no actual radioactive or hazardous materials will be used in any of the training exercises. Simulated hazardous and radioactive materials, props, facilities, and training will include the following:

- Flammable liquid and gas training facilities and props for fire response and fire fighting training
- Simulated radiological training props for handling simulated radiological materials
- Generic hazardous materials holding and transportation props (i.e., petroleum tanks, tank trucks, rail cars, and pipelines) for emergency response to mock accidents and for leak containment exercises
- Spill containment simulation area for leak containment activities
- Laboratory emergency response
- Rescue training facilities for response to fires, hazardous material (HAZMAT) transport vehicle accidents, and laboratory accidents
- Respiratory equipment training facilities
- Equipment and personnel decontamination training facilities
- Confined space rescue
- High-angle and low-angle rescue techniques
- Hands-on fire extinguishing training
- Fire department pumper truck testing
- Support facilities including offices, classrooms, lavatories, cafeteria/lunchroom, shower rooms, run-off containment, student and staff parking area, and appropriate storage areas.

A summary of the buildings, training pads, and training props required for the variety of training scenarios is provided in Table 1. The systems that will be provided in each building, pad, or prop are indicated by shading. Additional details on system components are provided in the outline specifications (Appendix E) and the Energy Conservation Report (Appendix F).

The proposed facilities will provide safe, yet effective training for students. The preliminary Safety Evaluation for the HAMMER Training Center is discussed in Appendix G.

The utility system designs that are included in the CDR are justified by the economic and life cycle cost analyses in Appendix H. However, the analyses are contingent upon successful negotiations between DOE and the City of Richland, Washington. The total estimated cost (TEC) of this project is \$29,900,000.

TABLE 1. Facility Systems.

AREA #	SECTION #	BUILDING/PROP	UTILITIES (NOTE 1)						INTERIOR SYSTEMS (NOTE 2)										
			ELECTRIC	POTABLE WATER	SEWER	TRAIN WATER	RECIRC. DRAIN	LPG	COMM.	PHONE (NOTE 3)	INTER COM	HLAN	DISTANT LEARN/ TELECON	ELECTRIC	POTABLE WATER	REST ROOMS	HEAT	AIR COND.	VENT SYSTEM
1	4.2.2	ADMINISTRATION BUILDING																	
2	4.2.3	TRAINING SUPPORT BUILDING																	
3	4.2.4	COMFORT STATION																	
4	4.3.1	TRAINING TOWER																	
5	4.3.2	SCBA SEARCH AND RESCUE PROP																	
6	4.3.3	BURN STRUCTURE PROP								NOTE 5						NOTE 5	NOTE 5		
7	4.3.4.6.1	FLAMMABLE LIQUIDS BURN PAD								NOTE 5						NOTE 5	NOTE 5		
8	4.3.4.6.2	LIQUID PETROLEUM GAS (LPG) BURN PAD																	
9	4.3.4.6.3	RAILROAD/TRUCK TANK BURN PAD																	
10	4.3.4.6.4	HAZMAT TRAINING PAD																	
11	4.3.4.6.5	90-DAY STORAGE PAD PROP																	
12	4.3.4.6.6	ABOVE GROUND PIPELINE PAD																	
13	4.3.5.1	ARTIFICIAL STREAM AND POND																	
14	4.3.5.2	FIRE PUMPER TEST PLATFORM																	
15	4.3.5.3	EMERGENCY RESPONSE VEHICLE STAGING AREA																	
16	4.3.5.4	CHARACTERIZATION/REMEDIATION SITE																	
17	4.3.5.5	CRAFT SPECIFIC PROPS AND BURIED SIMULATED WASTE																	
18	4.3.5.6	JUNCTION/DIVERSION BOX (J-BOX) WITH TANK PROP																	
19	4.3.5.7	RAILROAD TANK CARS WITH RAIL PROP																	
20	4.3.5.8	BURIED AND ABOVE GROUND TANKS PROP																	
21	4.3.5.9	CONFINED SPACE/FALL PROTECTION PROP																	
22	4.3.5.10	WELL SAMPLING STATIONS																	
23	4.3.5.11	TRENCH SITE PROP																	

SHADED AREA INDICATES THE SYSTEMS WHICH WILL BE PROVIDED FOR EACH BUILDING/PROP

NOTE 1 - UTILITY SYSTEMS PROVIDED TO THE EDGE OR NEAR THE STRUCTURE.

NOTE 2 - INTERIOR SYSTEMS ARE PROVIDED WITHIN THE BOUNDARIES OF THE STRUCTURE.

NOTE 3 - EIGHT SITE PHONE STATIONS WILL BE DISTRIBUTED ON THE SITE.

NOTE 4 - CONDUIT WILL BE EXTENDED TO A STATION NEAR EACH PROP/PAD, BUT NO COMMUNICATIONS WILL BE PROVIDED.

NOTE 5 - PROVIDED IN CONTROL ROOM ONLY.

NOTE 6 - PROVIDED IN CONTROL AND EQUIPMENT ROOM ONLY.

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NOTE 5 - PROVIDED IN CONTROL ROOM ONLY.

NOTE 6 - PROVIDED IN CONTROL AND EQUIPMENT ROOM ONLY

3.0 JUSTIFICATION

In March 1989, the Code of Federal Regulations (CFR) Occupational Safety and Health Administration rules (29 CFR 1910) promulgated a regulation to protect workers in hazardous waste operations and emergency response. In addition, the National Fire Protection Association (NFPA) Standard 472 also defines professional requirements for responders to hazardous materials incidents. Two general types of training are addressed for hazardous materials; training for hazardous waste site workers and training for emergency response organizations. Site workers include both workers and managers. Emergency response organizations include fire departments, law enforcement agencies, emergency medical services organizations, and others (Westinghouse Hanford Company [WHC]-EP-0319-1990).

The hazardous operations worker standard sets forth general elements that should be covered in training courses for cleanup workers. Cleanup workers' health and safety depends to a great degree on the use of personal protective equipment and on their ability to recognize and respond appropriately to anticipated and unanticipated hazards. (Office of Technology, Background Papers Hazardous Ahead: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex, Washington, D.C.).

The law requires training at some level for essentially all persons who may work with or come into contact with hazardous materials. The regulations cover private enterprises and federal, state, and municipal governments. This law went into effect in March 1990 (WHC-EP-0319-1990). These new requirements are driven by the Superfund Amendments and Reauthorization Act of 1986 (SARA) Title II rules which identify far-reaching training requirements for emergency planning, community "right-to-know" education, and emergency response.

NFPA Codes and Standards are written to ensure that minimum health and safety standards are specified for the organization, training and education, vehicles and equipment, protective clothing and equipment, emergency operations, facility safety, and medical requirements of fire departments. The NFPA standards require that fire department facilities comply with all legally applicable health, safety, building and fire requirements. The standards further require that formal training and the demonstration of a variety of skills be accomplished, documented and certified to ensure that fire department personnel will be able to do their assigned tasks swiftly, safely and with competence. Meeting these training standards, particularly those that have a requirement to be demonstrated by actual use, entails the use of facilities ranging from classrooms and administrative space to highly specialized hands-on structures (WHC-SD-L094-ES-001).

Many training courses exist in hazardous materials handling but few training facilities in the nation are explicitly designed to give hands-on practical training in realistic situations. Even fewer provide practical training for radioactive and mixed hazardous-radioactive materials.

The hands-on props at the HAMMER Training Center are justified based on regulatory training requirements, the desire for enhanced safety, and a commitment to continuous improvement of training quality and training retention. All three elements must be considered because the regulations tend to describe broad goals but lack detailed guidance. The diversity of hazards, settings, and work tasks in environmental clean-up operations and the uncontrolled nature of the pollutants call for more in depth and focused skill training. The comprehensive HAMMER Training Center will permit the combination of classroom lecture for providing basic knowledge, hands-on skill development, and practice utilizing equipment in settings that provide challenges similar to those in the actual work environment.

4.0 PROJECT SCOPE

This section describes the project in detail and includes the regulatory requirements for the project. (Sketches are provided in Appendix L to illustrate the facilities anticipated to be constructed at the HAMMER Training Center.)

Some of the project concerns that were considered during preparation of the CDR include cost analysis, operational performance, safety, security, accommodating a blend of users, public perception, and public acceptability. Major controlling regulatory requirements were selected from requirements in DOE orders, *USACE Architectural and Engineering Instructions* (AEI), *Washington State codes*, *Uniform Building Code of the International Conference of Building Officials* (UBC), 1994 edition requirements, national standards, Hanford plant standards, Occupational Safety and Health Act (OSHA) requirements, and Americans with Disabilities Act (ADA)(36 CFR 1190).

All areas of the Administration Building, Training Support Building, Comfort Station, control rooms in prop structures, pad controls, roads, walks and paved areas meet the requirements of the ADA and will be accessible to the physically disabled. Pads and props (except control rooms and pad controls) are designed for training purposes and are not intended to meet the requirements of ADA. Obstacles are intentionally included to challenge the able-bodied and these facilities are not open to the public. Training pads and props would not be safe for untrained, unsupervised or physically disabled persons. The Physically Handicapped Assessment is contained in Appendix I.

4.1 IMPROVEMENTS TO LAND

The facility will occupy 80 acres. The improvements to the land will be designed to meet Performance Category 0 as defined in DOE Order 5480.28. This is based on the facility classification as a general use facility. All retaining structures, systems, and components will be designed as discussed in Section 4.2.1.1.

Site development for the HAMMER Training Center has considered the combination of buildings, props and facilities, and access to reduce cost and provide the most efficient use of the site. Earthwork requirements have been minimized by conforming, where practical, to existing topographic features.

4.1.1 Site Development

Layout of the site will include the following considerations:

- Combination of similar props and facilities
- Provision of perimeter access and central access to all the props and features
- Conform with existing topography to limit cuts and fills
- Predominant wind directions

- Visual appearance from main access routes
- Safety.

4.1.2 Storm Drainage

Drainage along the perimeter and access roads will be provided through ditches and through percolation into the ground. Parking facilities will be sloped to direct surface water to the perimeters to allow natural drainage. Storm drainage systems will be designed to accommodate a 25 year, 6 hour storm.

4.1.3 Landscaping

Landscaping will be used to create outdoor spaces for climate control, screening, buffers, and aesthetics for facility staff, students, and visitors. Trees, shrubs, and ground cover will be established around the Administration Building, Training Support Building and Comfort Station. Dry land grasses and wildflowers will be seeded in all other disturbed areas for reclamation and erosion control. Plant material selection is based on low-maintenance plants of the Hanford Site, Washington environment. A list of plant materials anticipated to be used is contained in Appendix K. Landscaped areas will be provided with an irrigation system. Irrigation will not be provided to the areas seeded with dry land grasses and wildflowers.

The irrigation system will be automatically controlled by a programmable controller capable of scheduling the time and duration of watering for a minimum of one week. Water will be supplied from the potable water system. The irrigation system will be designed to automatically turn-off in the event that water supply is required for emergency fire suppression sprinkler systems.

In designing a sprinkler system for landscape irrigation, the following will be considered: sprinkler types, sprinkler spacing patterns; water requirements of different types of grass, groundcover, shrubs, and trees; the terrain and the ability of various types of soil to absorb and hold water; and climatic conditions.

Landscaping will be designed in accordance with AEI, which requires that landscaping be simple, functional, and economical to maintain.

4.1.4 Roads, Walks, and Paved Areas

Perimeter roads, access roads, footpaths, and parking areas will be provided on the HAMMER Training Center as discussed below. Roads, walks, and paved areas will be designed in accordance with the USACE Engineering Manual (EM) 1110-2-410, *Design of Recreational Areas and Facilities - Access and Circulation*, and the Washington State Department of Transportation Design Manual (WSDOT), and the Manual on Uniform Traffic Control Devices.

4.1.4.1 Roads. Main access to the facility will be from Horn Rapids Road. The main entrance road will provide access to the Administration Building and parking area. Road geometry and signs will be used to restrict access to the support and prop areas from the administrative area as well as an access control gate. Secondary access will be provided from the Patrol Academy Road.

Perimeter and service access roads will be utilized by all vehicle classes (WB-50). Roads will be 24 feet (ft) wide with 2 ft shoulders. Roads will have one vertical to four horizontal fill slopes and one vertical to four horizontal cut slopes, with a 1 ft deep drainage ditch and one vertical to three horizontal back slopes. A minimum 50 ft centerline radius will be used for perimeter and service access roads which is in accordance with EM-1110-2-410. The perimeter road alignment will provide a minimum of 5 ft of clearance between the roadway edge and the fence.

Access to training pads will consist of 20 ft wide paved driveways connecting to 20 ft wide crushed aggregate roads constructed adjacent to pad perimeters. The access driveways will be surfaced with 2 inches (in.) of asphaltic concrete over 13.5 in. of base course. The perimeter crushed aggregate road will consist of 13.5 in. of base course.

Intersections with Horn Rapids Road and the Patrol Academy Road will have edge radii of 50 ft. A 30 ft edge radius will be used for intersections within the HAMMER Training Center.

4.1.4.2 Parking. On site parking will be provided in the vicinity of the Administration Building and the Training Support Building for both the students and staff. Staff will have 30 dedicated parking spaces, and students will have 150 spaces at the Administration Building and 50 spaces at the Training Support Building. Six spaces will also be provided for the disabled. Parking for an additional 100 vehicles will be provided in an overflow parking area surfaced with 13.5 in. of base course.

The onsite parking area will be designed to accommodate large passenger cars (P), delivery vans (SU), and buses (B-40). Parking spaces will be 9 ft wide by 18 ft deep, delineated with paint striping. Surfacing will consist of 13.5 in. of base course overlain with 2 in. of asphaltic concrete pavement.

4.1.4.3 Footpaths. Footpaths will be constructed to provide access for pedestrians throughout the HAMMER Training Center. Footpaths from parking areas, around the Administration Building, and adjacent to buildings will be reinforced concrete construction. Asphalt paved footpaths, 6 ft wide with 1 ft shoulders, will be provided for pedestrian access to all training props and buildings.

4.1.4.4 Signs. Signs will be provided for safety, interpretation, and identification. Signs will provide direction to facilities that accommodate persons with disabilities.

4.1.5 Fences and Gate Control Points

A fence will be constructed around the project boundary. Entrance gates will secure all access roads into the facility in accordance with DOE Order 6430.1A, Section 0110. Gates will be double leaf, double swing. Gate leafs will be 12 ft wide, providing a 24 ft wide opening. A chain link style gate will be installed at the main and secondary entrances. Twelve-ft wide double-swing gates will also be provided in the north and east fence boundaries.

4.1.6 Physical Security, Safeguards, and Exterior Lighting

Physical protection of DOE property and unclassified facilities will be provided as required by DOE Order 5632.6.

4.1.6.1 Security.

In addition to the fencing as discussed in Section 4.1.5, all building exterior doors will be provided with security locks. All exterior building entrances will be illuminated and the lighting will be automatically controlled by photoelectric and/or motion sensors.

4.1.6.2 Lighting.

Exterior parking lot lighting will be pole mounted, high efficiency lamps. Walkway lighting fixtures will be high efficiency with no uplight. Exit doors without canopies will be supplied with high efficiency, wall-pack type lighting fixtures. All routine maintenance areas will be illuminated with high efficiency lamps.

Lights for illumination of the HAMMER Training Center props and parking areas will be provided in order to accommodate training during non-daylight hours. High-efficiency fixtures, mounted on 20 to 25 ft poles, will be installed to provide between 5 and 10 ft-candle maintained illumination. Night lighting will be controlled by a combination of photoelectric sensors and manual controls. Lighting is discussed further in Section 4.4.2, Electrical Transmission and Distribution Systems.

Site lighting will meet the requirements of DOE Order 6430.1A, *General Design Criteria*, regarding lighting within 25 miles of an observatory. Emergency exit lighting will be designed in accordance with NFPA 101.

4.2 BUILDINGS

The HAMMER Training Center provides a variety of support buildings and prop structures. A general description of each facility is provided in the *Functional Design Criteria for the HAMMER Training Center*, (WHC-SD-T100-FDC-001).

The arrangement and design of buildings will facilitate safe and efficient functional operations, meet programmatic needs, and provide flexibility for future needs. Support buildings will comply with current building and fire safety codes including, but not limited to, the UBC, national fire codes, and DOE Order 6430.1A. Building and fire safety code application to non-occupied training prop structures is discussed in the applicable sections for these facilities.

Multiple buildings will be required at the HAMMER Training Center to provide adequate training and to accommodate support services. The facilities will accommodate functional and safety requirements. All facilities will be permanent structures with a minimum design life of 30 years.

The HAMMER Training Center site will be located outside all floodways. The elevation of all buildings will be approximately 448 ft above mean sea level (msl). The Columbia River elevation at its entrance to the Hanford Site, during the maximum probable flood would be 448 ft above msl. Flood stage at the point nearest the HAMMER Training Center would be lower. Moreover, there is higher ground between the river and the HAMMER Training Center, and therefore river flooding is not a threat to the facility. Flash flooding in annual streams coming off Rattlesnake Mountain was reviewed as part of the site selection study and it was determined that the HAMMER Training Center is outside the flood zone (see Climatological Summary for the Hanford Area [Pacific Northwest Laboratories {PNL}-4622]). The site drainage system will be designed to accommodate storm runoff water.

4.2.1 General Requirements

General requirements described in this section apply to all buildings unless otherwise noted. The systems for utilities, communications, interior systems, and fire protection that will be provided in each building or prop are indicated (by shading) on Table 1 in Section 2.0.

4.2.1.1 General Architectural/Structural Design Requirements. All design loads will conform to or exceed the requirements of the UBC; the American Society of Civil Engineers (ASCE) Standard, ASCE 7-93 *Minimum Design Loads for Building and Other Structures*; the AEI; DOE Order 6430.1A, *General Design Criteria*; DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*; and Hanford Plant Standards Design Criteria, (SDC)-4.1. The buildings will be designed in accordance with the *Minimal Design Loads For Buildings and Other Structures*, ASCE 7-93 and the *Design and Evaluation Guidelines for Department of Energy Facilities Subject to Natural Phenomena Hazards*, University of California Research Laboratory (UCRL) 15910 for the following criteria:

- Average wind velocity: 70 miles per hour (mph) with exposure C
- Earthquake: UBC zone 2B
- Minimum horizontal acceleration: 0.09 minimum free field

The design will be governed by maximum wind or maximum earthquake load, whichever is greater.

The following are the specific weights of different construction materials for use in determining self weight (per Section 0111-2.2, DOE Order 6430.1A):

o Concrete:	150 lb/ft ³
o Steel:	490 lb/ft ³
o Aluminum:	169 lb/ft ³
o Masonry (8 in. wide):	60 lb/ft ³
o Masonry (12 in. wide):	90 lb/ft ³
o Fiberglass:	115 lb/ft ³
o Wood:	40 lb/ft ³

The following will also be included in dead load calculations:

- o All equipment and piping permanently attached to and considered part of the structure.
- o Ceiling; insulation; lighting; heating, ventilating, and air conditioning (HVAC) duct.

The following are the unit live loads for use in determining structural loads; per Section 0111-2, of DOE Order 6430.1A:

o Roof Loads (snow):	20 lb/ft ²
o Roof Loads (Training Support Building):	determined during definitive design
o Roof Loads (training props):	100 lb/ft ²
o Office Floors:	100 lb/ft ²
o Equipment Areas:	100 lb/ft ²
o Walkway, platform, and stairs:	100 lb/ft ²

Design aids include the Concrete Reinforcing Steel Institute (CRSI) - *Handbook*, the American Concrete Institute (ACI) *Design Handbook* Volumes 1, 2, and 3; the *Reinforced Masonry Engineering Handbook*; and *M-Strudl-A Structural Analytical Program by Computer Aided Structural Technology* (CAST).

Design assumptions used for structural design are as follows:

- o Design loads will be in accordance with the requirements of SDC 4.1 - *Design Loads for Facilities*.
- o The allowable stress for steel members and connectors will be in accordance with the requirements of the allowable stress design method of the American Institute of Steel Construction (AISC) specification.
- o Design, fabrication, and erection of structural steel will be in accordance with the requirements of AISC specifications.
- o Structural steel shapes, plates, and bars will be American Society for Testing and Materials (ASTM) A36.

- Structural steel pipe will be ASTM A501 or ASTM A53, Type E or S, Grade B.
- Structural tubing will be ASTM A500, Grade B.
- Connection bolts will be ASTM A307, A325, or A490. When high strength bolts are used, Type N connection will be used for regular framing design. When a structural member is subjected to vibration, cyclic or fatigue loading, then Type SC connections will be used.
- Connections will be designed for all tributary forces and the minimum force will be 6 kips.
- All welding will be in accordance with the requirements of American National Standards Institute (ANSI)/American Welding Society (AWS) code.
- All butt and bevel welds will be complete penetration, using E70XX electrodes.
- Shop connections may be either welded or bolted. The use of field bolt connections will be used when possible.
- Formed steel deck will be in accordance with the requirements of American Iron and Steel Institute (AISI) specifications.
- Open web, long span and deep long span steel joists can be used for roof support.
- Camber and other requirements will comply with the specifications of Steel Joist Institute (SJI).
- Seismic design will be in accordance with *Seismic Design for Buildings*, TM-5-809-10.

Load Combinations will be in accordance with UCRL 15910 as follows:

- Allowable Stress Design: DL + W or EQ
 (Use allowable stress appropriate for building material) 0.75(DL + LL + W or EQ)
- Strength Design: 0.9 DL + 1.3 W
 (Use strength reduction factors appropriate for building material) 1.2 DL + 0.5 LL + 1.3 W
0.75(1.4 DL + 1.7 LL + 1.87 EQ)
0.9 DL + 1.43 EQ
0.9 DL - 1.43 EQ

Where:

W = Wind Load
EQ = Earthquake Load
DL = Dead Load
LL = Live Load

4.2.1.1.1 Structural Steel Design. Steel structures will be designed in accordance with the requirements of AEI. Applicable codes and standards are listed below:

- 1994 edition of the UBC.
- *Manual of Steel Construction Allowable Stress Design*, Ninth edition of AISC 1989.
- *Minimum Design Loads for Buildings and Other Structures*, ASCE 7-93.
- *Structural Welding Code - Steel*, ANSI/AWS-D1.1, latest edition.
- *Specification for Welding Sheet Steel in Structure*, ANSI/AWS-D1.3, latest edition.
- *Specification of Design, Fabrication, and Erection of Structural Steel for Buildings*, AISC, latest edition.
- *Standard Specification for Open Web, Long span, and Deep Long span Steel Joists and Joists Girders* (SJI-1990).
- *Specifications for the Design of Cold Formed Steel Structural Members*, AISI, latest edition.

4.2.1.1.2 Concrete Design. Reinforced concrete structures will be designed in accordance with the requirements of AEI. Applicable codes and standards include the 1994 edition of the UBC, the *Building Code Requirements for Reinforced Concrete* (ACI 318-89), the *Building Code Requirements for Reinforced Concrete Commentary* (ACI 318R-89), and the *Geotechnical Investigation Report, Hazardous Materials Management and Emergency Response Training Center*, DOE/RL-12074-34, Rev. 0.

The Strength Design Method will be used in the design of reinforced concrete. The concrete for structures will develop a minimum 28 days compressive stress of 4,000 pounds per square inch (lb/in²). Reinforced steel will have a minimum yield strength of 60,000 lb/in² in accordance with ASTM A615-86. The unit weight of the soil is assumed to be 98 pounds per cubic foot (lb/ft³) dry unit weight and 100 lb/ft³ moist unit weight.

The foundation design will meet the following criteria:

- Minimum footing width: 18 in.
- Minimum footing embedment: 2 ft 6 in.
- Coefficient of friction: 0.45
- Allowable soil bearing: 2,200 lb/ft²
- Earth pressure:
 - At rest 50 lb/ft²
 - Active 33 lb/ft²
 - Passive 302 lb/ft²

4.2.1.1.3 Masonry Design. Reinforced masonry structures will be designed in accordance with the requirements of AEI. Applicable codes and standards include the UBC, Technical Manual (TM) 5-809-3, *Masonry Design for Buildings*, and *Specifications for Masonry Structures* (ACI 530.1-92/ASCE 6-88). Working stress design will be used in the designs. All cells containing reinforcement will be solidly grouted.

The material properties of concrete masonry will be as follows:

- Masonry unit - ASTM C90, Type I, Lightweight: $f'_m = 1,500 \text{ lb/in}^2$
- Grout: $f'_g = 2,000 \text{ lb/in}^2$
- Mortar type: M or S
- Reinforcing steel minimum yield strength: $f_y = 60,000 \text{ lb/in}^2$ per ASTM A615-92

Where:

- f'_m = specified compressive strength of masonry at the age of 28 days
- f'_g = minimum compressive strength of grout at the age of 28 days
- f_y = tensile yield stress of reinforcement.

4.2.1.1.4 Typical Roof Design. A typical roof system for the HAMMER Training Center consists of open web steel joist and steel beams. Joists cantilever over the walls to form a 4 ft soffit. Steel tube columns support the hip beams near the peak. The roof covering will be designed for an I-90 wind uplift.

4.2.1.1.5 Materials and Finishes. No asbestos containing materials will be utilized. Primers and finish paints will not contain lead, chromate, or cadmium. Interior finishes will be Class A, flame spread 0 to 25 and smoke development 0 to 450 per National Fire Protection Association (NFPA) 101.

Building materials and furnishings in the Administration Building and training rooms in other buildings will be checked to determine their potential for off-gassing and, thus, contributing to indoor air quality problems. Materials of concern include pressure treated materials, composite materials, paints, caulks, sealers, carpeting, insulation, furniture, some office machines and process machines used in offices.

4.2.1.2 Heating, Ventilation, and Air Conditioning. The HVAC systems will be energy efficient in accordance with DOE Order 6430.1A, Division 15, and Hanford Plant Standards,

Design Criteria, SDC-5.1. The HVAC systems will be designed in accordance with NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilation Systems* and will meet the seismic design requirements discussed in Section 4.2.1.1. DOE Order 6430.1A specifies use of 97.5 percent dry bulb for summer. Design criteria for the HVAC System includes the following:

- Winter Dry Bulb: 9 degrees of Fahrenheit (°F)
- Summer Dry Bulb: 97°F
- Summer Wet Bulb: 67°F
- Summer Degree Days: 1,286 (Base 65°F)
- Summer Degree Hours: 6,888 (Base 80°F)
- Occupied Space Indoor Design Temperature (winter): 70°F
- Occupied Space Indoor Design Temperature (summer): 75°F to 78°F
- Training Spaces as discussed in building/prop sections: 75°F to 78°F

The design philosophy of the HVAC systems will be to provide a dust free and comfortable environment for the occupants and for the operation of the electronic equipment.

Building ductwork will be lined with sound absorbing material to meet requirements for HVAC system sound control.

The HVAC equipment in the facilities will be provided with appropriate vibration isolators. Fans will be provided with structural steel bases and spring vibration isolators. Pumps will be attached to concrete bases. Piping systems will be provided with flexible connections at all pump intakes and discharges.

Ducts penetrating fire-rated walls and floors will be provided with listed or approved fire dampers. Dampers will be installed in accordance with NFPA 90A. Penetrations will be sealed to maintain the same fire rating as the penetrated barrier.

The HVAC control systems will monitor and control the operation of the HVAC system. The system will consist of an "off-the-shelf" control package. A distributed control system will be used to supervise the operation of all HVAC control functions.

The building energy consumption will comply with energy conservation requirements as defined in DOE Order 6430.1A, Section 110-12. The Energy Conservation Report is contained in Appendix F.

4.2.1.3 Electrical. Each office or work station will be provided with a minimum of four electrical outlets. All other areas will be provided with outlets required by NFPA 70, *National Electric Code*, 1993 edition, and DOE Order 6430.1A.

Indoor office lighting will be recessed type 277 volt (V), 2 ft by 4 ft fluorescent troffers with parabolic reflectors for glare reduction. Conference rooms will be supplied with the same type of fixture as the offices, except with double ballasts for dual switching light level control. In addition, conference rooms will also have recessed down-lights over table areas.

Lunchrooms, restrooms, corridors, and storage areas will be supplied with 277 V, 2 ft by 4 ft fluorescent troffers with parabolic reflectors for glare reduction, and mechanical equipment room areas will be supplied with industrial type 277 V fluorescent fixtures with wire guards. All lighting fixtures will be equipped with energy-saving ballasts and low-energy type lamps. Emergency lighting will be provided through separate incandescent battery powered units as required by the *Life Safety Code*, NFPA 101. Lightning Protection will be provided in accordance with NFPA 78, *Lightning Protection Code*. The toggle switches will be 277 V, and 20 A specification grade.

Convenience receptacles will be provided in all rooms and corridors and will be a 125 V configuration 5-20 R duplex. There will be a dry-type transformer and panelboard for the convenience receptacles. In addition, computer receptacles will be located in the electrical equipment room.

The service disconnect switch will be located as required by code. The distribution panel, transformers, and panel boards will be located in the electrical room. Electrical systems will be designed and installed in accordance with NFPA 70.

The building energy consumption will comply with energy conservation requirements as defined in DOE Order 6430.1A, Section 110-12. The Energy Conservation Report is contained in Appendix F.

4.2.1.4 Communications. The communications infrastructure consists of the telecommunications room in the Administration Building and the following associated equipment: HVAC, and cable distribution. The telecommunications infrastructure will also include the common equipment used to distribute and terminate communications cabling.

Installation of cabling will follow current telephone industry standards. Cable runs will avoid obvious sources of high frequency energy such as HVAC systems, radio transmitters, and electric motors of any type. Specifically, when the above types of interference cannot be avoided, cables will be placed no closer than 40 in. to the source.

The telecommunications room will have electrical power fed by an uninterrupted power supply (UPS) and through a dedicated sub-power panel. There will be ready access to a building ground within the room. The telecommunications room will be secured with a five position cipher lock.

In the telecommunications room, telephone cabling will terminate on connection strips, modules, and/or 110 copper system distribution blocks. Fiber optics, terminated on distribution patch panels in the telecommunications room, will be routed with the telephone twisted pair cabling and terminated on one of the four outlet jacks. The modular jack used in the front of the outlet will be a RJ11/RJ45/SC insert.

Raceways will be provided throughout the buildings for the orderly distribution of communications cabling. Open metallic, ladder-type raceways will be installed above the ceiling. The sizing of the raceways will be sufficient to hold all communications cabling

plus 100 percent for growth. The raceways will be secured and be able to support the weight of all telephone and network cabling plus 100 percent for growth. Raceways will be grounded to building ground.

Spare conduit paths will be provided to allow for 100 percent growth without exceeding conduit fill ratios. Pull strings will be left in all conduits.

Cabling will be run continuously, utilizing conduits and raceways, from every outlet location to the nearest telecommunications room. Cable slack will be provided at both ends. The cabling will be labeled at each end with its assigned number which will incorporate the room number and be distinguishable from that labeling used for other cabling.

The Hanford Local Area Network (HLAN) electronic equipment will be furnished and installed as part of this project. The HLAN system will follow Electronic Industries Association (EIA)/TIA 568A/258A Standards. The HLAN will be configured in a physical star topology emanating from the Administration Building telecommunications room. File servers will be provided in the Administrative Building to serve the HAMMER Training Center site.

In the telecommunications room, HLAN cabling will terminate on cross connection blocks. At outlet locations, unshielded cabling will terminate on various outlet jacks. The modular jacks used in the front of the outlet will be category 5 wired per EIA/TIA 568A/258A Standards. The fibers will be terminated (two fibers per outlet) (ST-SC) at both ends.

Cabinets will be provided in the telecommunications room to house electronic and distribution equipment in logical groups. A grounding stud will be included.

HLAN copper cabling will be unshielded twisted pair (UTP), category 5, plenum rated, and meet EIA/TIA 568A/258A standards. A pair of fiber optic fibers will also be furnished to each outlet in the Administration Building.

The minimum number of conductors to the telephone stations from the terminal room will be eight conductors. Secretarial locations will be provided with a special telephone connection such as an integrated services digital network (ISDN) to avoid using a 25 pair cable.

The following telephone and HLAN allocation guidelines will be used for the Administration Building:

- Two HLAN drops/two ISDN phones/one fax in information/reception area
- Two phones in lobby
- One HLAN drop/one phone in each 130 square foot (ft²) office
- Two HLAN drops/two phones in each 200 ft² office
- One HLAN drop/one phone in manager's office
- Two HLAN drops/two ISDN phones/one fax in secretarial areas

- Two HLAN drops/two phones for visitor area
- One HLAN drop/one phone in resource center
- One drop in each classroom
- Two HLAN drops/nine phones in the Classroom/Emergency Operations Center (EOC) room
- One HLAN drop/three phones in Classroom/EOC control room
- Two phones available in cafeteria
- One HLAN drop/one phone in each conference room
- One fax in each copy room.

The following telephone and HLAN allocation guidelines will be used for the other facilities:

- Five phones in Training Support Building
- Two phones in Comfort Station
- One phone in Burn Structure Prop control room
- Two phones at the Training Tower
- Eight phones distributed on the training field
- One phone in Self Contained Breathing Apparatus (SCBA) Search and Rescue Prop

4.2.1.5 Fire Protection. Buildings identified in Table 1 as having fire protection will have fire sprinklers and an alarm enunciation system. Both fire sprinklers and fire alarm pull boxes will trigger fire alarms and signal the Hanford Fire Department when activated. Fire protection for the building will be designed in accordance with requirements of DOE Order 5480.7A, DOE Order 6430.1A, DOE/RL Order 5480.4C, SDC-7.8, WHC-CM-4-41, NFPA 13, NFPA 72, and NFPA 101. A fire hazards analysis will be performed in accordance with DOE Order 5480.7A and WHC-CM-4-41.

An ordinary hazard, hydraulically calculated, wet-pipe automatic fire sprinkler system, comprised of a separate system riser will be installed throughout the buildings identified in Table 1. A service connection will tie into the fire water loop. The system riser and backflow assembly will be located in the equipment room. The sprinkler system, piping supports, and attachments will be designed in accordance with NFPA 13. Fire hydrants will be provided along the fire water loop at a minimum spacing of 400 ft. The fire water will be part of the potable water system as discussed in Section 4.4.6.

Type II N (UBC) non-combustible construction will be used for buildings. Area and occupancy separation walls will be installed as required by UBC and in accordance with NFPA 101 requirements.

A local energy fire alarm system will be installed within the facilities. This system will be comprised of a fire alarm control panel (FACP), with standby battery power and auxiliary relays to activate radio fire alarm signals that will be received at the 200 Area Hanford Fire Department. Each fire suppression system will individually enunciate. Manual pull stations will be provided adjacent to the exits. Fire alarm systems, alarm devices, duct

smoke detectors, and fire dampers will be installed in accordance with NFPA 70, NFPA 72, and NFPA 90A.

4.2.2 Administration Building

The Administration Building will house operations and administrative support personnel and provide functional and flexible classroom space for proposed classes. This building will also provide a reception area for students and visitors, an EOC training area, and storage. The Administrative Building will be a one story concrete masonry unit (CMU) veneer steel framed building containing approximately 33,180 ft² of floor area.

Main functional areas are identified in Table 2. The administration area will consist of a lobby and reception/registration area, offices, restrooms, work areas, and conference rooms. The classroom area will consist of various sizes of classrooms, the EOC, a resource center, restrooms, a cafeteria, and miscellaneous storage rooms.

Table 2. Administration Building Areas.

Administration Building Area	Size (ft²)
Classroom Area (includes restrooms and EOC)	10,020
Kitchen Area	1,520
Cafeteria Area	3,670
Visitors Offices	500
Resource Center Area	920
Lobby/Reception Area	1,680
Conference Area	920
Administrative Area	5,160
Storage Area	1,390
Circulation Area	5,470
Building Equipment Rooms	1,930
TOTAL AREA	33,180

The Administration Building classrooms are sized to accommodate 25 to 35 students with partitions between three classrooms to provide an expanded classroom for 100 students. The office area will provide space for approximately 25 permanent staff and six temporary staff (turn-around offices).

The Administration Building will accommodate support staff required for effective operation of the HAMMER Training Center. The staffing needs for the HAMMER Training Center will include but not be limited to the following:

- **HAMMER Training Center Manager.** The manager will be responsible for the successful operation of the HAMMER Training Center. Management and administrative responsibilities will include all aspects of operation, maintenance and administration.
- **Operations Manager.** The manager will be responsible for the operation and maintenance of the HAMMER Training Center. This will include scheduling the facility trainers. The manager will also be responsible for handling any emergencies initiating on the HAMMER Training Center site.
- **Safety Officers.** The safety officers will be responsible for ensuring that equipment is used in a safe manner and that adequate safety equipment and personnel are on site during training activities.
- **Schedulers/Facilitators.** The schedulers/facilitators will be responsible for scheduling classrooms, instructors, hands-on training activities, setting up props as required by various users of the facility, and ensuring that training materials and equipment are available.
- **University Liaison/External Affairs.** The program development staff will be responsible for developing new programs and ensuring compliance with applicable codes and regulations. The program development staff will also have the responsibility of contacting and responding to possible users of the HAMMER Training Center and determining if their needs can be met.
- **Senior Instructors and Training Officers.** Instructors and training officers will include permanent Hanford staff and various personnel from other training organizations.
- **Administration Manager and Staff.** Responsible for general administrative functions directly related to the HAMMER Training Center operations including record keeping, resource material control, accounting, and procurement. The staff will coordinate their functions and activities with various Hanford administrative organizations.
- **Other Federal Agency Personnel.** A number of other federal agency personnel will be required to provide instruction and coordinate various areas of training anticipated to be offered at the HAMMER Training Center.
- **Other Support Staff.** Maintenance and operations support services, as necessary.

The lunchroom/cafeteria will be designed for meal preparation and service for up to 150 people per seating. Kitchen facilities will include, but are not limited to, refrigeration, stoves, ovens, dry storage cabinets, sinks, food preparation counters, dishwashing, receiving, and wash down capability.

4.2.2.1 Architectural/Structural. The structure will consist of a steel frame with a CMU veneer on steel studs. The CMU will be textured and colored to produce an aesthetically pleasing appearance. CMU was chosen to provide a durable, low maintenance finish at an economical cost.

The building will be constructed on a reinforced concrete floor and foundation. The footing will consist of a continuous concrete footing for exterior walls and isolated concrete footings for interior columns. Seismic and wind loads will be resisted by a steel deck roof diaphragm with steel special moment resisting frames (SMRF) transmitting loads to the foundations.

The roof will be constructed from steel roof deck welded to open web steel joist and structural steel sections. Standing seam roof panels will have a factory applied finish. The roof insulation will be rigid foam providing a minimum of R-30 insulation. All systems will have a Factory Mutual (FM) Class 1 fire hazard rating.

The building will be provided with anodized aluminum entry doors, anodized aluminum windows and standard metal doors. Panic hardware will be provided as required by NFPA 101. Window frames will be sized as shown on the elevations and factory coated to match frames will be pressed metal and interior doors will be solid core wood.

Partitions except hallways in the classroom wing will be 5/8 in. thick gypsum board on metal studs. Hallway partitions will be constructed from CMU. Fire rated partitions will be provided where required by UBC, NFPA 101, DOE/EP-0108, DOE 5480.7A, and WHC-CM-4-41.

A minimum of ten file cabinets will be contained in the records area. This area will be capable of being locked and will have a minimum 1 hour fire rating.

Suspended acoustical tile ceiling will be provided in the entire building except restrooms and equipment rooms. The restrooms will have a gypsum board ceiling and equipment rooms will be exposed structure.

4.2.2.2 Heating, Ventilation, and Air Conditioning. A HVAC system will be provided as discussed below and in Section 4.2.1.2.

The proposed cooling source is estimated at a 80 to 90 ton peak cooling requirement. It is proposed to use an air cooled water chiller circulating a 30 percent propylene glycol solution as the primary cooling unit. A single cooling unit will be mounted on the ground, with dual compressors and independent refrigerant circuits (R-22).

The proposed heating source will be an Liquid Propane Gas (LPG) fired, forced draft, flexible water tube heating boiler sized for 20 to 40°F water temperature differential, 150 to 180°F setpoint range, and an estimated capacity of 1,500 thousand BTU/hour (mbh). Heating water will circulate to points of use, such as heating coils, radiation, and unit heaters, etc. Two boilers will be sized for 65 percent of the maximum anticipated heating load. Base mounted, end suction centrifugal pumps will be fitted with integral strainer suction diffusers. The system will include a captive, air type, expansion tank, a shot type chemical feeder and air elimination. A 25 percent propylene glycol solution with oxygen scavenger and corrosion inhibitor is proposed for use in the heating system.

Energy conservation and comfort features include: low emissivity windows, R-19 or better wall construction, R-30 roof construction, and insulation board provided at the perimeter of the foundation.

The HVAC system will consist of year around circulated air (ventilation), summer air conditioning, and winter time heating for perimeter rooms with maintained air circulation. A variable air volume (VAV) system will be used. Heating can be provided in several ways including: baseboard radiation, ceiling panel radiation, heating coils in fan powered VAV boxes, or heating coils in conventional VAV boxes. Both the radiation and the fan powered box concepts allow night set back heating without use of the central fan.

This building can be served by a single central fan (approximately 40,000 cubic ft per minute [cfm]) supported by a cooling coil, heating coil, filter bank and an outdoor air economizer (full mixing capability). Primary ductwork between fan and VAV box will be spiral duct of medium pressure design in accordance with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Class 6. Low pressure ductwork downstream of the VAV boxes would be a combination of rectangular and round duct in accordance with SMACNA Class 2. All supply ducts will be insulated. It is intended to use the incombustible ceiling space as a return air path and plenum to avoid the cost of ducting the return air.

The kitchen will be supplied with an exhaust hood over the primary cooking surfaces. A dishwasher exhaust hood and an air curtain at the outside personnel door is also anticipated.

4.2.2.3 Electrical. Electrical systems will be provided as discussed in Section 4.2.1.3.

4.2.2.4 Communications. Communications systems will be provided as discussed in Section 4.2.1.4, with the following additions:

- Television monitors for classroom use.
- A Compact Disk (CD)-Read Only Memory (ROM) or Video Cassette Recorder (VCR) computer controlled system to send videos to the classrooms over cable.
- Overhead projectors, slide projectors, and audio cassette recorders.

- Personal computers (PCs) connected to the HLAN in the administration offices and the EOC (PCs are existing equipment).
- Stand-alone PCs that can access hazardous materials databases in the EOC and one classroom (PCs are existing equipment).
- Sixteen stand-alone PCs with compact discs for the resource center (PCs are existing equipment). These are not connected to HLAN.
- Telecommunications system designed to receive telephone microwave/satellite distant learning from other academic and training facilities. This system will be down-linked only but designed not to preclude adding uplink.
- An intercom system will be provided and will be zoned to provide paging capabilities in the administration area only, the cafeteria only, the classroom area only, or the entire building. Paging capabilities will be provided between the Administration Building and Training Support Building.

4.2.2.5 Fire Protection. A fire protection system will be provided as discussed in Section 4.2.1.5.

4.2.3 Training Support Building

The Training Support Building is needed to support training activities and to store training materials, supplies and equipment required for various training exercises. Space will be provided for storage of fire fighting equipment, SCBA maintenance and tank filling, indoor training activities during inclement weather, craft-specific training activities (i.e., scaffolding erection, overhead ductwork, piping, etc.), and for mock-up of craft specific props (i.e., confined space, greenhouse construction, etc.). The garage portion of the building will provide parking bays for one HAZMAT vehicle, one fire truck, and an ambulance and additional space for indoor training activities including retractable type bleacher seating. This building will also provide classrooms, change rooms, and personnel decontamination areas. The Training Support Building will be a one story steel frame building with pre-fabricated metal panels containing approximately 33,800 ft² of floor area and a mechanical loft.

Main functional areas are identified in Table 3. The SCBA area will consist of a compressor room, a SCBA tank fill and storage area, and a SCBA repair/disinfecting/drying area. The vehicle parking and training area will consist of an open area with foldout bleachers for indoor training and an open area with roll-up doors for vehicle parking. The personnel decontamination and change room area will consist of a personnel decontamination area, restrooms, change rooms, and lockers. The warehouse area will consist of an open area for indoor training, secured storage areas for each trade, and a loading dock. The classroom area will consist of two classrooms and a break room.

Table 3. Training Support Building Areas.

Training Support Building Area	Size (ft²)
Vehicle Parking Training Area	6,070
SCBA and Fill Area	1,650
Storage Areas	2,460
Training/Equipment/Storage Area	13,790
Classroom Area (includes breakroom)	2,470
Personnel Decontamination Training Area	1,180
Restrooms/Locker Rooms/Suit Drying Rooms Area	3,900
Loading Dock Area	500
Circulation Areas	1,780
TOTAL AREA	33,800

The Training Support Building is sized to accommodate a class of 50 students. The SCBA area is sized to maintain approximately 250 SCBA tanks and masks, and the fill area is designed to handle up to 300 tanks per day. The personnel decontamination and change room area is sized to accommodate approximately 100 students of each gender. The indoor parking area is designed to accommodate a fire truck, an ambulance, and a HAZMAT vehicle.

4.2.3.1 Architectural/Structural Systems. The structure will consist of a steel frame with pre-fabricated wall metal panels and metal roof deck. The metal panels will be textured/colored to produce an aesthetically pleasing appearance. A metal building was chosen to economically provide a durable, low maintenance structure and finish.

The building will be constructed on a reinforced concrete floor and foundation. The footing will consist of a continuous concrete footing for exterior walls and isolated concrete footings for columns.

Seismic and wind loads will be resisted by a steel deck roof diaphragm with steel frames and braces, transmitting loads to the foundations. The roof will be constructed from steel roof deck welded to open web steel joist and structural steel section designed to meet live loads, including training roof loads. Metal roof and wall panels will have a factory applied finish. The roof insulation will provide a minimum of R-30 insulation. The roof will have a FM Class 1 fire hazard rating.

Exterior doors and frames will be standard metal doors with panic hardware. Window frames will be sized as shown on the elevations and factory coated to match door frames.

All glass will be 1 in. double glazed insulated, tinted glass. Interior door frames and doors will be pressed metal.

Partitions will be 5/8 in. thick gypsum board on metal studs. Fire rated partitions will be provided where required by UBC, NFPA 101, DOE/EP-0108, DOE 5408.7A, and WHC-CM-4-41.

A suspended acoustical tile ceiling system will be provided in the SCBA area, breakroom, and classrooms. Restroom and locker room area will be provided with gypsum board ceilings. All other ceilings will be open to the structure above.

4.2.3.2 Mechanical Systems. The HVAC system will be provided as discussed below and in Section 4.2.1.2.

The equipment, storage and training areas will be supplied with an LPG fired radiant tube system, with greater than 85 percent efficiency. A ventilating fan will blow filtered, but unconditioned, air in the vicinity of the bleachers.

The remaining rooms including the breakroom and decontamination room will be served by a single zone air handling unit with gas (propane) fired heat to treat all of the south side spaces as one large zone. This system will include a condensing unit and cooling coil for air conditioning. Exhaust fans will be supplied for each restroom.

Ventilation for the garage area will include elephant trunks or a similar system adequate to remove exhaust fumes. The water supply will be potable water. Both the water supply and sewer system will be connected to the City of Richland system.

4.2.3.3 Electrical. Electrical systems will be provided as discussed in Section 4.2.1.3. The SCBA area will have 220 V service.

4.2.3.4 Communications. The communications system will be provided as discussed in Section 4.2.1.4. Conduit for future HLAN needs will be provided to this building. An intercom will be provided and will be zoned to provide paging capabilities in the classrooms only, the remaining building only, or the entire building. Paging capabilities will be provided between the Training Support Building and the Administration Building.

4.2.3.5 Fire Protection. A fire protection system will be provided as discussed in Section 4.2.1.5.

4.2.3.6 Landscaping. Shade trees and a minimum lawn area will be provided around the Training Support Building. Irrigation will be provided for these plantings.

4.2.4 Comfort Station

The Comfort Station will be located so that restroom service is provided within a maximum of 600 ft radius from any prop on the HAMMER Training Center site. Restrooms will be provided in the Administration Building, the Training Support Building, and the Comfort Station. All restrooms and the Comfort Station will be furnished with hot and cold potable water and flush toilets.

The Comfort Station will provide an outdoor group shelter area, a vending area, a first aid cabinet, and restroom facilities. The Comfort Station is needed to provide rest areas during training exercises and areas for field discussions/classes. The Comfort Station will be a one story CMU building containing approximately 2,050 ft² of floor area. The Comfort Station will be landscaped with shade trees and a small lawn area.

Main functional areas are identified in Table 4. The restroom area will consist of restrooms, and a janitor's closet. The vending area will provide drinking fountains, vending machines, telephones, and a first aid cabinet.

Table 4. Comfort Station Areas.

Comfort Station Area	Size (ft²)
Covered Open Area	940
Restroom Area	700
Vending Area	270
Equipment Area	140
TOTAL AREA	2,050

The group shelter area is sized to accommodate five 8-person picnic tables, with space between the tables for circulation. The restrooms are sized for 40 students based on an industrial type of use.

4.2.4.1 Architectural/Structural Systems. The structure will consist of reinforced concrete masonry. The CMU will be textured/colored to produce an aesthetically pleasing appearance. CMU was chosen to provide a durable, low maintenance structure and finish.

The building will be constructed on a reinforced concrete floor and foundation as discussed in Section 4.2.1.1. The footings will consist of a continuous concrete footing for exterior walls and isolated concrete footings for columns.

Seismic and wind loads will be resisted by a steel deck roof diaphragm with reinforced masonry shear walls. The roof will be constructed from steel roof deck welded to open web joist and structural steel sections. Standing seam metal roof will have a factory applied

finish. The roof insulation in the enclosed areas will be rigid foam providing a minimum of R-30 insulation. The roof will have a Factory Mutual Class 1 fire hazard rating.

Exterior doors and frames will be standard metal doors with panic hardware. Window frames will be sized as shown on the elevations and factory coated to match door frames. All glass will be double paned, insulated, tinted glass. Interior door frames will be pressed metal and interior doors will be pressed metal. Partitions will be 8 in. CMU and/or steel studs with insulation and gypsum. A suspended acoustical tile ceiling will be provided in the vending area. Restrooms will be provided with gypsum board ceilings. The remaining areas will be open to the roof structure.

4.2.4.2 Heating, Ventilating, and Air Conditioning. The HVAC system will consist of a simple residential furnace or electric radiant heat system and air conditioning. Heated air from the restrooms will pass through the double wall cavity to protect piping. The HVAC system will meet the requirements discussed in Section 4.2.1.2.

4.2.4.3 Electrical. An electrical system will be provided as discussed in Section 4.2.1.3.

4.2.4.4 Communications. Two telephone connections will be provided in the Comfort Station as discussed in Section 4.2.1.4.

4.2.4.5 Fire Protection. No fire protection will be provided for this building.

4.2.4.6 Landscaping. The Comfort Station will be landscaped with shade trees and a ground cover. Irrigation will be provided for these plantings.

4.3 OTHER STRUCTURES

The various training pads, training props, and miscellaneous other structures that will be provided to enhance hands-on training activities are discussed in this section.

4.3.1 Training Tower

The Training Tower will provide realistic fire fighting training for structural and laboratory fires. However, live fire exercises will not be conducted in this structure. Ladder exercises, hose drills, rappelling, and high-angle rescue training will be performed at this prop. The lower two levels will provide a simulated laboratory setting for mock accidents (i.e., chemical spills, smoke release, and vapor releases using simulated hazardous substances). Exterior and interior stairs will be constructed from ground level and will extend to the tower roof. The Training Tower will be a six story CMU and cast-in-place concrete building containing approximately 5,850 ft² of floor area.

The building will have a self-draining dry-riser stand pipe in the exterior stairway. The pipe will rely on a pumper truck for water supply and will not be connected to the water system. Two training water fire hydrants will be provided near the structure. Floors will be

sloped to drains that will drain to the recirculation system. One room will be supplied with a sprinkler system connected to the riser pipe for training on wet pipe work. The laboratory rooms will include non-functional laboratory equipment, sinks, and emergency eye wash showers. Building systems will include potable cold water, lighting, sewer, and heating. Laboratory sinks and emergency eye wash shower drains will be connected to the sanitary sewer system.

Main functional areas are identified in Table 5. The Training Tower will include laboratory prop rooms, training rooms, interior stairs, and exterior stairs.

Table 5. Training Tower Areas.

Training Tower Area	Size (ft²)
Laboratory Prop Area	900
Training Area	1,600
Equipment Room	210
Enclosed Vertical Circulation Areas (Stairs)	1,330
Horizontal Circulation	640
TOTAL ENCLOSED AREA	4,680
Exterior Stair Area	1,170
TOTAL AREA	5,850

4.3.1.1 Architectural/Structural Systems. The structure will consist of colored/textured reinforced concrete masonry with cast-in-place concrete columns and floors. CMU was chosen to provide a durable, low maintenance structure and finish. The roof will be constructed of reinforced concrete. The concrete roof and interior surfaces will be sealed. Insulation and additional finishes will be provided on the first and second levels of the building in the laboratory prop areas.

The building will be constructed on a reinforced concrete floor and foundation. The foundation will consist of a continuous concrete footing for exterior walls and isolated concrete footings for columns.

Seismic and wind loads will be resisted by reinforced concrete floor slabs and a roof diaphragm with reinforced masonry shear walls. The reinforced concrete roof will be designed in accordance with Section 4.2.1.1. The roof will have a FM Class 1 fire hazard rating.

Interior and exterior doors and frames will be factory-finished, Type III, extra-heavy duty. Exit doors will be equipped with panic hardware. Window frames will be sized as shown on the elevations and factory coated to match door frames. Steel window shutters

finished to match the doors and frames will be provided in the training areas to darken rooms when required. Insulated window shutters will be provided in the laboratory prop areas. Partitions will be 6 in. thick minimum CMU.

4.3.1.2 Mechanical Systems. A heating and ventilation system, meeting the requirements discussed in Section 4.2.1.2, will be provided in the laboratory areas only. Due to the small size of the heated area, a direct LPG fired, forced air furnace will be selected. The laboratory rooms will be heated to approximately 50°F. No heating or plumbing will be provided in the remaining parts of Training Tower. Drain lines will be provided to return the recirculated water to the artificial pond by gravity.

4.3.1.3 Electrical. An electrical system will be provided in the laboratory training area in accordance with Section 4.2.1.3. Indoor lighting will be supplied throughout the prop by weatherproof 277 V, 2 ft by 4 ft fluorescent troffers.

4.3.1.4 Communications. A telephone will be provided to the Training Tower equipment room and first floor laboratory as discussed in Section 4.2.1.4.

4.3.1.5 Fire Protection. No fire protection system will be provided.

4.3.2 SCBA Search and Rescue Prop

The SCBA Search and Rescue Prop will provide a flexible training area for simulating various SCBA search and rescue scenarios. This building will utilize a cold smoke system, but is not designed for actual fire training. This building will be a two-story CMU structure with an attic space. The structure contains approximately 5,010 ft² of floor area.

Main functional areas are identified in Table 6 and include training areas, equipment and control rooms, and attic training areas.

Table 6. SCBA Search and Rescue Prop Areas.

SCBA Search and Rescue Prop Area	Size (ft²)
Training Area	3,090
Building Equipment and Control Rooms	290
Attic Space (Training Areas)	1,630
TOTAL AREA	5,010

The SCBA Search and Rescue Prop is designed to be flexible in the type of training and in the number of students participating. This structure will be equipped with a sound system, television monitors, and infra-red cameras.

4.3.2.1 Architectural/Structural Systems. The structure will consist of reinforced concrete masonry. CMU was chosen to provide a durable, low maintenance structure and finish.

Exterior doors and frames will be standard metal doors with panic hardware. Window frames will be sized as shown on the elevations and factory coated to match door frames. Glass in the control room will be double-paned, insulated, tinted glass. Windows and interior door frames and interior doors will be pressed metal.

The building will be constructed on a reinforced concrete floor and foundation as discussed in Section 4.2.1.1. The footing will consist of a continuous concrete footing for exterior walls and isolated concrete footings for columns.

Seismic and wind loads will be resisted by a steel deck roof diaphragm with reinforced masonry shear walls. The roof will be constructed from steel roof deck welded to open web joist and structural steel sections. Standing seam metal roof will have a factory applied finish. The roof insulation in the enclosed areas will be rigid foam providing a minimum of R-30 insulation. The roof will have a Factory Mutual Class 1 fire hazard rating.

Exterior doors and frames will be standard metal doors with panic hardware. Window frames will be sized as shown on the elevations and factory coated to match door frames. All glass will be double glazed insulated, tinted glass. Interior door frames and interior doors will be pressed metal. Partitions will be 8 in. CMU and/or steel studs with insulation and gypsum board. All ceilings will be open to the structure above. All materials will be selected for durability, low maintenance, and economy of construction.

4.3.2.2 Mechanical Systems. A small electrical HVAC unit will be provided only in the Control Room. The HVAC unit will meet the requirements discussed in Section 4.2.1.2. Ventilation only will be provided throughout the remaining portions of the building.

4.3.2.3 Electrical. The electrical system will be provided as discussed in Section 4.2.1.3. Indoor lighting will be supplied with 277 V, 2 ft by 4 ft fluorescent weatherproof fixtures. A pull-cord switch will be provided at a height of approximately 6 ft along all walls to illuminate the building in the event of trainee panic situations.

4.3.2.4 Communications. Communications will be provided as discussed in Section 4.2.1.4.

4.3.2.5 Fire Protection. No fire protection system will be provided.

4.3.3 Burn Structure Prop

The Burn Structure Prop is a three-story structure, providing different space configurations, access/egress possibilities, stairway and roof features, and fire props which form a complete fire training system. The structure is constructed of concrete masonry and cast-in-place concrete which categorizes this structure as Type I-FR or Type II-FR (UBC) fire-resistive construction. Facility elevations are designed to simulate a residence, warehouse, office building, and apartment complex. The three fire prop rooms will be patterned after a warehouse/living room, bedroom, and electrical room. A warning light and alarm will be installed outside of each burn room to indicate that a test is about to begin or is

underway. Adjacent rooms will support the fire prop rooms by providing furniture and fixtures normally found in these types of occupancies. Fire props will be controlled in rooms completely separated from the prop rooms. Utilities will include fire training water, electricity, telephone, and LPG.

The fire props and all associated equipment will be designed and provided by a vendor specializing in this type of work. The basic prop, or fireplace, will consist of a steel frame mock-up, with an igniter and one or more burner elements, which are concealed from the trainee. Also, located within the mock-up is at least one extinguishing agent sensor, which will be utilized by the computer control system to determine the effectiveness of agent application by the trainees. A cold smoke generation system will be provided in the prop rooms, which will create obscuration of less than 1 ft visibility at the 3-ft level. The artificial smoke is non-toxic and safe for use with open flame.

The training exercise is controlled by the instructor/operator station (IOS) and the local control panel (LCP). The IOS is a personal computer located in the control room on the first floor. The PC runs the preprogrammed training exercise, controlling fire and smoke, and monitors fuels and temperatures with respect to time. The LCP is mounted near the entrance to each fire prop room, and allows the instructor to run, pause, continue and end the training scenario.

The training session begins when the instructor activates the run mode at the LCP. The fire will begin to spread and grow to a predetermined flame height over a predetermined growth time. Water must then be applied for a predetermined extinguish temperature. The trainees must then continue to apply water to the mock-up for an additional soak time to adequately overhaul the Class A materials. If the exercise is performed correctly, then the fire will remain extinguished and smoke emission will stop. If adequate soaking is not detected, the computer will cause the fire to reflash.

A flashover effect will be included with the bedroom prop. This option will provide an additional independently operated burner and sensor at the ceiling level, mounted so as not to be obvious to the trainees. The flashover must first be programmed into the training scenario, then be initiated by the instructor at the LCP. The flashover will then produce a burst of flame that will engulf the ceiling area in front of the fireplace.

Main functional areas are identified in Table 7. The fire prop rooms include live fire training props and all equipment. The circulation areas include stairways, corridors, and connecting spaces.

4.3.3.1 Architectural/Structural. The architectural goals of the Burn Structure Prop are functional design, durability, economy, and fire resistance inside and out. The structure will consist of reinforced concrete masonry. The CMU will be textured to produce an aesthetically pleasing appearance. CMU was chosen to provide a durable, low maintenance structure and finish.

Table 7. Burn Structure Prop.

Burn Structure Prop Floor Area	Size (ft ²)
Control Room Area	90
Storage Room Area	160
Fire Prop Room Areas	730
Garage Area	220
Vent Shaft Area	30
Equipment Room Area	210
Circulation Areas	230
TOTAL FIRST FLOOR AREA	1,670
Training Areas	940
Fire Prop Room (Bedroom) Area	480
Vent Shaft Area	30
Circulation Areas	220
Porch Area	30
TOTAL SECOND FLOOR AREA	1,700
Training Area	310
Circulation Areas	140
Balcony Area	60
Vent Shaft Area	30
Attic Area	590
TOTAL THIRD FLOOR AREA	1,130
TOTAL AREA	4,500

The three-story, 32-ft high Burn Structure Prop will be constructed of colored/textured load-bearing exterior CMU walls, interior non-bearing CMU walls, steel doors and frames, steel window shutters and frames, cast-in-place concrete floors, and a cast-in-place concrete roof system with a 2-in. concrete topping over a waterproof membrane. All interior concrete surfaces will be sealed. The three fire prop areas will be lined with 1/4-in. steel plate which will be designed and attached to protect the concrete substrates from thermal shock. Window shutters will be designed to operate from the interior or exterior, and will not distort substantially when exposed to design temperatures. Exterior finishes will be chosen to match the other structures at the HAMMER Training Center, and will consider concrete masonry

textures, tint colors, and stacking patterns. The exterior walls and interior ceilings of the control room and storage room will be furred and painted gypsum board on insulation batts; the interior walls of these two rooms will be painted CMU with insulated cores. All construction materials will be selected for durability, fire-resistance, low maintenance, and economy of construction.

The Burn Structure is a three-story structure, framed with reinforced CMU walls, and conventionally reinforced cast-in-place concrete floors and roofs. The floors are cast over the top of the walls and exposed to the outside, forming a 16-in.-high band at each level. A center concrete beam/column framing system spans the long direction of the building, creating a two-span condition for the slabs. Interior walls are non-bearing CMU.

Lateral loads from wind or seismic forces will be distributed through concrete diaphragms to exterior shear walls, which will transfer loads to the foundations. Foundations are continuous wall and spread footings.

The main purpose of this facility is to provide an enclosed area in which to stage a computer-controlled fire for training. Design temperature for the steel plates will be 1000°F. Surface of the burn room walls and ceilings will be designed for temperatures up to 600°F. Thermal shock occurs when these walls are sprayed with fire fighting water. The structural system consists of light-weight CMU walls, and light-weight cast-in-place concrete floors and roofs. Walls and ceilings in fire prop rooms are protected from flame impingement and thermal shock by a 1/4-in. steel plate immediately around the fireplace.

The Burn Structure Prop will be oriented with the long axis running north-south and the two-story residence elevation facing south. This will provide solar exposure of the scuppers and downspouts which will be located on the east, south, and west elevations, mitigating winter ice buildup of firewater and melting snow at these drain locations.

4.3.3.2 Mechanical Systems. Heating and ventilation will be provided for the storage room, which will house the fire water valves and electrical equipment. Heating and air conditioning will be provided for the control room. The remaining areas of the structure will not be heated.

The control room will be provided with a ceiling mounted air handling unit with DX cooling and electric heating. The air cooled condenser will be located outdoors.

The storage room will be provided with an electric unit heater for heating and an exhaust fan for ventilation.

LPG will be provided for each of the three fire prop rooms. The LPG supply system is discussed in Section 4.4.8. For each of the fire props, the rate of the burn will be computer controlled through several modulating gas valves.

A separate smoke exhaust system will be provided for each fire prop. Each smoke exhaust system will be sized to provide one air change every 60 seconds in the fire prop

room. One 8 in. recirculating fire water main will be provided for this structure. Five dry pipe standpipe stations will be provided. The garage will be provided with a dry pipe sprinkler system.

Drain lines will be provided to return the recirculated training water to the artificial pond by gravity.

4.3.3.3 Electrical. A small control room and storage room will be provided. The storage room will house a dry type stepdown transformer, incoming service panelboard, an outlet/lighting panelboard and a telephone/communication panelboard. The control room will be provided to accommodate an operator and associated control equipment, which will be utilized to run and monitor the burn prop-related programs.

Waterproof interior lighting and power outlets will be provided in the stairwell located in the southeast corner of the facility and in the fire prop equipment room. Heating and lighting capability will also be provided in the control/equipment room and storage room. Three rooms within the Burn Structure Prop will contain fire props fueled by LPG. Each of these rooms will be equipped with at least one emergency shutoff switch located near the main exit for the room. A manual LPG shutoff valve will be located at the entrance to the Burn Structure Prop. Burn props and computer controlled programs and supporting equipment will be designed and supplied by specialists in this field.

Electrical system will meet the requirements discussed in Section 4.2.1.3.

4.3.3.4 Communications. The controls required to operate the fire levels on the Burn Structure Prop will be provided as discussed in Section 4.3.3.7. The control room will be provided with a telephone as discussed in Section 4.2.1.4.

4.3.3.5 Fire Protection. Fire protection is inherently provided by the CMU and cast-in-place concrete construction. No other fire protection is provided.

4.3.3.6 Equipment Requirements. The following equipment is anticipated to be provided:

- Ventilation and exhaust equipment.
- Fire props and associated equipment in the three fire prop rooms and the computer and associated equipment that operates the fire props located in the control room.
- Props and furnishings which may include, but not be limited to, furnishings for setting up the Burn Structure Prop as a residence, office, warehouse, or apartment.

4.3.3.7 Fire Training Systems. The features discussed in this section will be provided in the burn system.

4.3.3.7.1 Fire Prop Systems. The three fire prop systems will be provided with the following variable operator control parameters:

- Flame height
- Flame growth
- Flame spread
- Time/temperature based
- Extinguish time
- Extinguish temperature
- Reflash temperature
- Soak time
- Reflash delay
- Smoke mode
- Flashover enable.

4.3.3.7.2 Burner Control System for Fire Props. The burner control system will consist of two basic components: the burner control assembly, which will house the regulators, ignition monitoring system and control valves; and the burner head, which will contain the ignition system and main burner elements. These components will control the flame size and spread within the training compartment. Each burn prop is independently programmed into the main control panel.

4.3.3.7.3 Agent Detection System for Fire Props. Agent will be detected with a thermal mass technology for temperature-based extinguishment. In this mode, the fire is extinguished when sufficient agent has been applied to adequately cool the sensors below an operator selected temperature.

4.3.3.7.4 Smoke Generation System for Fire Props. The smoke generation system will be provided for each fire prop which will produce non-toxic, non-explosive simulated smoke. The obscuration effectiveness of the smoke will be less than 1 ft of visibility at 3 ft level when the flame is at full height. The fluid reservoir will hold enough smoke generation agent for a typical eight-hour training day.

4.3.3.7.5 Safety System for Fire Props. Each of the three fire props will be provided with the following safety features:

- Gas sensing system
- Pilot confirmation system
- Temperature monitor
- Smoke exhaust system
- Emergency stop system

4.3.3.7.6 Smoke Exhaust System for Fire Props. The smoke exhaust system will be provided and sized to exhaust one air change in less than 60 seconds.

4.3.3.7.7 LPG Piping. There will be three fire props requiring 6,240,000 British Thermal Unit per hour (BTU/hr) for each prop. The props will be controlled as discussed in Section 4.3.5.7.2. This calculation is based on the assumption that all three fire props may occasionally be required to operate simultaneously.

- Peak gas load = 3 props x 6,240,000 BTU/hr = 18,720,000 BTU/hr
- Gas pipe size = 3 in.

4.3.3.7.8 Instructor/Operator Station, (IOS). The fire training exercises will be controlled by an IOS located in the control room.

4.3.3.7.9 Local Control Panel (LCP). The IOS will control the training exercises through the LCPs. There will be three LCPs, one for each prop.

4.3.4 Training Pads

All concrete training pads will be of reinforced concrete with a drainage system to collect water for recycling. Pads with fire simulation will have fire hydrants located on two sides of the pad. All pads will be designed to accommodate a minimum of an AASHTO HS-20 axle load. Pads where burn activities will occur will be designed to withstand temperatures of up to 1,800°F.

4.3.4.1 Architectural/Structural Systems. Pads are reinforced concrete slabs on grade. Pads will be approximately 6-in. thick, with one layer of reinforcement in each direction located 2 in. clear of the top surface. Joints will be spaced a maximum of 75 ft located as much as possible away from fire props and high water usage areas. Joints will be doweled and filled with sealant.

The 90-Day Storage Pad Prop will support a prefabricated steel building enclosed on three sides. Anchor bolts will be provided in the pads to adequately transfer lateral loads to foundations. The pads will be thickened and reinforced under wall locations to support these loads.

Concrete for the pads will be air entrained, and sufficient cement content to provide a minimum modulus of rupture of 600 lb/in². Temperatures at burn props are not a consideration in concrete design, with the exception of the Flammable Liquids Burn Pad. This is due to the fact that the burn props are located sufficiently above the slab surface, so as to have a negligible temperature affect. The Flammable Liquids Burn Prop is expected to heat concrete surfaces up to 1800°F immediately adjacent to the burn pit. A fire resistant concrete will be used to cast the walls of the pit and a 3-ft wide strip around the pit perimeter.

Structure and pad designs will meet the requirements of Section 4.2.1.1. Pads will also be designed in accordance with *Pavement Design for Roads, Streets, Walks, and Open Storage Areas*, TM 5-822-5.

4.3.4.2 Mechanical Systems. The LPG Burn Pad, Railroad/Truck Tank Burn Pad and the Flammable Liquids Burn Pad will be provided with burn props fueled by LPG. For outdoor conditions, LPG fired burn systems provide a more visual fire in comparison to natural gas fired systems, which provide a more transparent fire. The transparent fire is not desirable for the purpose of outdoor fire training.

The Railroad/Truck Tank Burn Pad, and Above Ground Pipeline Pad will also be provided with smoke and/or leak props. Smoke generation systems will create obscuration and simulate gas leaks. Liquid leak systems will be connected to the potable water system as discussed in Section 4.4.6.

4.3.4.2.1 LPG Requirements. LPG at a pressure of 150 lb/in² will be used to fuel larger fires. Vapor propane at 1 lb/in² will be used for smaller fires and pilot ignition (initial ignition) as it is difficult to ignite LPG in the liquid form. The LPG supply system is discussed in Section 4.4.8.

The LPG requirements for the fire props are shown in Table 8.

Table 8. LPG Requirements.

Prop Type	LPG in BTU/hr	Supply Pipe Size
Christmas tree (low fire)	6,240,000	1 in. (vapor)
Christmas tree (high fire)	13,262,000	1 in. (liquid) and 1 in. (vapor)
LPG tank with relief valve	10,920,000	1 in. (liquid) and 1 in. (vapor)
Railroad car with relief valve	13,262,000	1 in. (liquid) and 1 in. (vapor)
Tank truck with relief	10,920,000	1 in. (liquid) and 1 in. (vapor)
24 ft by 24 ft flammable liquid	187,200,000	2 in. (liquid)

4.3.4.2.2 Manual Control Stations. For all the fire props, manual control stations will be provided approximately 50 ft from two training pads and 100 ft from the Flammable Liquids Burn Pad, as measured from the prop. Manual control stations will be operated as follows:

- Ensure that the manual ball valve at the base of the prop is open.
- Insert the power key and turn on the control station power.
- Select either liquid or vapor as the fuel source for the main burner (for Christmas tree only).
- Turn on the pilot and wait for the confirmation indicator to light up.

- Turn on the main burner.
- For the Flammable Liquids Burn Pad, turn on the main burner zones adjacent to the confirmed pilot source. The fire will be made to spread by igniting additional zones.
- Shut off the main burner control after the trainees have properly secured the manual valve.
- For the Flammable Liquids Burn Pad, fire extinguishment will be controlled by turning off zones as the trainees apply proper agent coverage.
- Shut off the pilot.
- Shut off the manual ball valve at the base of the prop.

4.3.4.2.3 Safety Systems. If the operator attempts to initiate the main burner before the pilot confirmation indicator lights up, the system will not respond. If the operator hits the emergency stop switch, all fires will be extinguished and the pilot and main switches must be reset in order to start another training drill. An alternative emergency stop switch, available to the instructor will be considered.

For the props with relief valves, the trainees can extinguish the relief valve fire once it has been initiated by adequately cooling the LPG tank below an established temperature. The operator can monitor tank temperature on the temperature display and shut off the relief valve when the tank cools off, or at any other point during the exercise.

4.3.4.2.4 Potable Water. Water will be supplied to each training pad through a 1 in. yard hydrant bib in a utility station near each pad. The potable water system is discussed in Section 4.4.6.

4.3.4.2.5 Training Water. Two fire hydrants will be provided for all the training pads having fire props. The fire hydrants will be connected to the training water supply system. Each fire hydrant will be served by a minimum of 6-in. diameter pipe. Training water requirements are discussed in Section 4.4.7.

4.3.4.2.6 Drain Lines. Drain lines from the training props will collect the water used for training exercises from the training pads. The flow in the drain lines will be by gravity to the artificial pond. The training water collection system is discussed in Section 4.4.7.

4.3.4.3 Electrical. A weatherproof electrical outlet will be provided near each pad in a utility station. The 90-Day Storage Pad Prop will also be provided with outlets spaced as discussed in Section 4.2.1.3.

4.3.4.4 Communications. Conduit for possible future communication needs will be extended to each training pad. However, no communications will be provided. Eight telephones will be distributed on the training field to meet current communications needs.

4.3.4.5 Fire Protection. No fire protection or detection systems, other than training fire water, will be provided for the training pads. The LPG storage will comply with NFPA 58.

4.3.4.6 Specific Pad Requirements. Training pads will consist of six concrete pads, constructed on grade, with props to simulate fires, leaks, spills, and materials handling. Burn props will be designed and built by a vendor specializing in this type of work. LPG will be used for the burn fuel. Burn pads are provided with two fire hydrants connected to the training water supply system located on opposite sides of the pad. A grated drainage system will be designed to collect the fire hose runoff. Pads will be provided with a 1 in. yard hydrant connected to the potable water supply system for cleanup and maintenance. Primary controls for each of the burn pads will be located on a control platform near each pad. Control platforms will be placed on a berm to provide an adequate view of training operations. The training pads will meet the requirements discussed below.

4.3.4.6.1 Flammable Liquids Burn Pad. This pad will be used for flammable liquids fire fighting practice. A burn pit will be constructed in the pad that can be filled with water. Gas piping, valves, and nozzles will be designed to operate so that, when burning, they will simulate a flammable liquid. LPG will be used to accomplish the fire simulation.

This prop will simulate the conditions encountered in the approach and proper extinguishment of a hydrocarbon fuel spill fire situation. The burn pit, which is centered on the pad, will be divided into nine independently controllable zones of fire. The appearance of the totally engulfed area will be continuous. The pit will be covered with steel grating, designed to support the weight of a light truck. The pit will be filled with water, to just below the level of the top of the grating. A concrete weir will maintain the water level during training. The training scenario would allow the controller to ignite one zone at a time, simulating a spreading fire. The trainees would then apply a non-polluting simulated foam or water. As the fire is progressively extinguished, zones would be disabled.

4.3.4.6.2 Liquid Petroleum Gas Burn Pad. The LPG Burn Pad will be used for LPG fire fighting practice. An LPG tank and a Christmas tree will be situated on the pad. The tank will be plumbed to a Christmas-tree type burn nozzle and LPG tank arrangement. The LPG tank arrangement will be used to simulate a burning LPG tank with flame impingement to the liquid and/or vapor spaces with a manually-controlled gas jet to simulate relief valve operation. Adherence to the requirements of NFPA 58, *Storage and Handling of Liquid Petroleum Gas*, is required.

The Christmas tree prop will provide training in the safe approach and securement of a leaking gas fire through the efforts of a team of fire fighters. The prop is 8 ft in height, and has 14 branches, the longest of which is 2 ft-8 in. at the base. The prop may either be operated with vapor fuel, making it much easier for newer trainees to approach and extinguish the fire, or liquid fuel for more advanced trainees.

The 500 gallon LPG tank prop with vent will provide training in the safe approach, cooling, and extinguishment of a fire which is impinging on the tank. The impingement burner will be positioned along the length of the base of the tank, and the vent barrier will be mounted to protrude from the top of the tank. A ball valve will be provided at the supply end of the impingement burner. The training scenario will first operate the impingement burner, and allow trainees to perform proper extinguishment. If improper techniques are used, and tank temperatures exceed 250°F, the operator may activate the vent burner.

4.3.4.6.3 Railroad/Truck Tank Burn Pad. The Railroad/Truck Tank Burn Pad will be used for simulating three different types of tanker truck spills for both railroad and highway. Water will be used to simulate leaks. Carriers will be complete with normal valving. Other features for training purposes include a smoke prop and fire simulation.

The burn prop and the smoke props are upright tank cars/trucks. The leak props are an overturned railroad tank car and tanker truck. All tank cars/trucks will be excess government equipment.

The burn prop is intended to provide training in the safe approach, cooling, and extinguishment of a fire, which is impinging on a tank carrying flammable liquids. The mock-up will be manufactured from a used tank modified to accommodate all burners, ignition systems, and sensors to produce the required scenarios. The impingement burners will be positioned along the base of the tanker, with a manual ball valve at the supply end. A vent burner will be mounted at the top of the tank. The training scenario will be the same as for the 500 gallon tank on the LPG Burn Pad (Section 4.3.4.6.2).

4.3.4.6.4 HAZMAT Training Pad. The HAZMAT Training Pad will consist of a spill/leak area, a drum and cylinder area and a hot waste area. The spill/leak training area will be used to train for the cleaning of HAZMAT spills and leaks. The area provides enough space to simulate cold, warm, and hot zones, as well as decontamination areas. The drum and cylinder area will be used to simulate an open storage area for a number of 55 gallon drums, several 150 to 250 pound pressurized tanks, and some 1 ton cylinders. This prop will be used to train personnel in the techniques of patching, plugging, and transferring materials from leaking containers. The hot waste area will be used for training on the proper handling of radioactive wastes. Simulated means will be used in place of actual radioactive materials for training exercises. Props will simulate containers normally used to store radioactive waste.

4.3.4.6.5 90-Day Storage Pad Prop. The function of this pad will be to simulate a 90-day storage area for hazardous waste containers. It will be used for instructing students in the methods of management, monitoring, taking inventory, and handling and segregating stored materials. The pad will require a roof structure, and will be enclosed on three sides with a chain-link fence with a gated front. A perimeter curb will also be required. See Section 4.3.4.1 for a discussion of structural requirements.

4.3.4.6.6 Above Ground Pipeline Pad. This pad includes equipment to simulate a leak in an above ground pressurized pipe or to simulate a petroleum pipeline rupture. The material in the pipe will be water or air under pressure used to simulate HAZMAT leaks.

This pad will provide two horizontal pipelines at a height of 3 ft to 4 ft. One will simulate a gas leak (compressed air), and the other a petroleum leak (water). Air and water will be controlled by a panel mounted just off the edge of the pad.

4.3.5 Training Props and Areas

Systems and design will be similar to that discussed in Section 4.3.4 except as discussed in the following paragraphs.

4.3.5.1 Artificial Stream and Pond. The artificial stream and pond was located to take advantage of existing topography. The pond water elevation will be approximately 432.5 ft msl providing 1 ft minimum of freeboard. The pond has an irregular shape, but is approximately 200 ft across. The pond capacity will be approximately 1.3 million gallons. Side slopes will be one vertical on three horizontal with a 5-ft water depth. The pond will slope 0.007 ft per ft (ft/ft) from north to south. The pond will be lined with 2 in. of asphaltic concrete pavement over 13.5 in. of base course. A ramp will be provided on the east side near the filter and pump house. The ramp design is in accordance with EM-1110-2-410, *Design of Recreation Areas and Facilities-Access and Circulation*. Water flows and recirculation are discussed in Section 4.4.7.

The artificial stream will be approximately 250 ft in length. A trapezoidal shape, 1-ft wide at the base, and 3-ft deep with 1 vertical to 1 horizontal side slopes will be used. The channel will be lined with 4 in. of shotcrete. A flow of 4 ft per second (slow moving stream flow rate) will provide approximately 6.5 in. of water in the channel. The channel slope will be 0.0104 ft/ft.

4.3.5.2 Pumper Test Platform. The function of the Pumper Test Platform will be to accommodate fire department pumps so that two suction hoses can be used when drafting. Drafting may be done from either side of the platform.

The Pumper Test Platform consists of an elevated platform sized to accommodate a fire pumper truck and extends into the artificial pond. The platform will be confined on three sides by retaining walls and will be surfaced with 2 in. of asphaltic concrete pavement over 13.5 in. of base course. The platform will extend 25 to 30 ft into the pond and be approximately 2.5 ft above the pond water surface. The platform retaining walls will be reinforced concrete construction. Handrails will be provided along the top of the retaining walls for fall protection. The handrails will be the removable type to provide a clear working area when pumper testing is in progress. Concrete barriers will be provided to keep the fire pumper truck from backing into the pond. Structural design will be in accordance with Section 4.2.1.1.

4.3.5.3 Emergency Response Vehicle Staging Area. A staging area for emergency vehicles will be required. This area (between the Training Tower and the Burn Structure Prop) will be paved with 2 in. of asphaltic concrete over 13.5 in. of base course. The staging area will be sized to accommodate maneuvering and positioning of a full complement of emergency vehicles. The civil/structural design will be in accordance with Section 4.2.1.1.

4.3.5.4 Characterization/Remediation Site. A 4-acre area will be needed for training exercises involving hazard characterization and remediation of a simulated contaminated site. A 30 ft by 100 ft staging area will be provided and will be paved with 2 in. of asphalt concrete over 13.5 in. of base course.

Access by excavation equipment, drill rigs, dump trucks, and other similar equipment will be from the staging areas. Soil sampling, chemical/radiation monitoring, and other training activities are also expected to occur at this site.

4.3.5.5 Craft Specific Props and Buried Simulated Waste. A 4-acre area will be needed for training exercises involving the hazard characterization and remediation of a simulated waste burial ground. The function of this area will consider the following geotechnical and geophysical exploration techniques: ground penetrating radar; drilling and test pit excavation; trench excavation techniques, including trench shoring, tunneling, and dust control; and the removal of buried solid wastes, including debris, drums, pipelines, large wood, concrete, and metal boxes utilized in the training. Simulated wastes will be buried in several configurations that represent those commonly found at the Hanford Site. Specific activities will involve both manual and remotely-controlled equipment. A 30 ft by 100 ft staging area will be provided and will be paved with 2 in. of asphalt concrete over 13.5 in. of base course.

4.3.5.6 Junction/Diversion Box (J-Box) with Tank Prop. The J-Box prop will be designed to recreate the type of liquid transfer switching station encountered within tank farms. A typical J-Box has a series of lines that can be interconnected, using jumper lines for liquid transfers between tanks. The box is typically covered with blocks of concrete that require a crane and riggers for removal. Activities such as jumper change or head tightening could be scheduled at this prop. Typically, this would involve the use of a remotely-controlled, electric-impact wrench that is positioned by the crane operator and actuated by the tank farm operator.

The tank will be a simulation of a tank of the sort typically found at the Hanford Site. The simulation will include a buried support slab with riser pipes, valves, pumps, wiring, and instrumentation, extending above grade to give the appearance of the typical tank farm tank. The simulation will consider sampling activities, which require a small underground water storage reservoir. Tank core sampling will also be provided using a small simulated-sludge storage reservoir.

The J-Box with Tank Prop will simulate (above grade) two tanks normally found at the Hanford Site. A concrete pit with associated piping will model the pump pit above each tank. Adjacent sampling and monitoring riser piping will be supported by a below-grade slab or footing. A fan will simulate those normally used to vent the interstitial space.

The J-Box Prop will consist of three below grade concrete vaults. Walls will be designed as two-way slabs with at-rest soil pressures.

4.3.5.7 Railroad Tank Cars with Rail Prop. The function of the Railroad Tank Cars with Rail Prop is to simulate railroad accidents with HAZMAT transport rail cars for spill containment training. This prop will consist of one set of rails, a minimum of 200 ft in length, and be designed in accordance with the American Railway Engineering Association (AREA), *Manual for Railway Engineering*. A one vertical to two horizontal downslope will be provided on one side of the rail. This prop will include one pressurized tank car and one non-pressurized tank car. Tank car leakage will be simulated by using water.

4.3.5.8 Buried and Above Ground Tanks Prop. This prop will consist of one above ground and one underground fuel storage tank. Their function will consider training on underground storage tank location, dismantling, and removal exercises. The above ground tank will be designed for training on hydrocarbon fuel removal (simulated with water) and leakage control. Access to this prop by excavation equipment will be required.

The Buried and Above Ground Tanks Prop uses two steel tanks. The below grade tank will have 2 ft of soil covering the tank, and will rest on a crushed aggregate bed. The exercise will empty, excavate, remove, and replace the tank.

The above ground tank will be supported by a concrete slab. The slab will have a 2 ft high curb at the perimeter for leak containment. The exercise will involve draining and filling the tank.

Structural design will be in accordance with Section 4.2.1.1. The above ground tank prop will be supported by a concrete slab on grade, using the same design as the training pads (Section 4.3.4.1). The curb will be designed as a cantilever member, with alternate soil/water loads on the outside/inside, respectively.

A drain line will be provided for gravity flow to the artificial pond.

4.3.5.9 Confined Space/Fall Protection Prop. The Confined Space/Fall Protection Prop will be an existing relocated structure, that will provide training for workers in a confined space and/or a raised area. Screw-type ground anchors will provide lateral support for this structure.

4.3.5.10 Well Sampling Stations. The function of the well sampling stations will be to allow for environmental sampling training using a mobile sampling truck.

Two well sampling stations will be constructed. Both wells will be designed in accordance with the Washington State Administrative Code (WAC) 173-160, *Minimum Standards for Construction and Maintenance of Wells*. Design of one well will also be in accordance with the WHC-S-014. Each well will be designed to allow for 2 to 4 well volumes plus samples to be extracted from the well. This will be accomplished by increasing the well casing length so that adequate water volume can be stored in the well. The well volume is calculated by multiplying the height of screened area times the casing cross sectional area. Potable water will be supplied to the wells using a 1-in. diameter line with a valve near each Well Sampling Station.

4.3.5.11 Trench Site Training Prop. The Trench Site Training Prop will simulate a liquid disposal crib. Its function will include training for low-angle rescue operations, drum recovery, crib remediation, and other similar activities. Access by excavation equipment, drill rigs, dump trucks, and other similar equipment will be considered in the design.

A liquid disposal crib will be placed in the trench site. The crib will be 7-ft high and 12-ft square with crushed aggregate placed to within 1 ft of the top of the crib. Gravel will also be placed 4 ft below the crib invert. The crib will be constructed of 6-in. by 6-in., 12-ft. long timbers. Two 4-in. diameter, schedule 40 steel pipes will extend from the base of the crib to the existing ground surface. The crib will be placed 10 ft below the existing groundline. Slopes around the crib will be one vertical to four horizontal. The design will simulate Hanford Site drawings of liquid disposal cribs.

4.4 UTILITIES

Basic utility services (except communications) will be provided by connections to the City of Richland systems that will be installed along Kingsgate Way. Communications systems will be connected to existing Hanford Site systems. The water used for training will be collected and recirculated. Freeze protection will be considered where appropriate.

4.4.1 Communication Systems

The Communications Systems to be employed at the HAMMER Training Center are to provide safety and support to the trainers, trainees, administrative and maintenance staff. Training personnel safety is provided primarily by the Safety Officers that are in constant radio contact with the Trainers. Other important safety features include a fire training equipment monitoring system in the Burn Structure Prop, a fire alarm system and the ability to quickly notify 911 or other agencies if needed.

Support for the HAMMER Training Center activities includes both voice communications and data communications. Voice communications include intercom, radio and telephone. Data communications will consist of a fiber optic link from the training center to the HLAN.

The Communications Systems design will conform to DOE Order 6430.1A, EIA/TIA 568 and 569 standards, and NFPA 70.

4.4.1.1 Hanford Local Area Network. The HLAN fiber optic cable inter-area distribution system will be extended from the 300 Area to the HAMMER Training Center. A new fiber optic cable will extend from buildings 3719 and 3220 to the HAMMER Training Center facility and into the Administration Building. The new fiber optic cable will be rated for underground use and be direct buried.

The 300 Area origination point of the fiber optic cable will consist of two connections. One will be the HLAN computer system which has the computerized communications and site databases. The other is the telephone central office which will have a telephone communications link to the HAMMER Training Center. The HLAN and telephone will be connected to the fiber optic cable, through the appropriate converters. At the HAMMER Training Center end of the fiber optic cable, the signals will be reconverted into data and voice signals (HLAN and telephone).

The HLAN at the HAMMER training facilities will be configured as a 10-BASE T network. The local network will have both training computers and administration office computers. The local network is an extension of the HLAN, and will have access to the training sessions and to the hazardous materials reference database located at the Hanford facility computers. Additionally, the administration offices will have access to other HLAN services for schedules, memorandums, inventory, and other word processing and spreadsheet documents.

4.4.1.2 Telecommunications. Telephone service within the Administration Building will consist of features described in Section 4.2.2.4. The HAMMER Training Center will have a multi-channel paging system (intercom) within the Administration Building. A channel will also be provided for the Training Support Building.

Telephone service provided in the prop areas will follow the guidelines listed in Section 4.2.1.4.

4.4.1.3 Radio Communications. The radio system will use portable hand held radio transceivers that communicate through an existing repeater radio located on Rattlesnake Mountain. Radio coverage will extend beyond the area of the HAMMER Training Center. The training supervisors, training instructors, and maintenance personnel will have radio communications to the Administrative Building.

The radios will be multi-channel for the safety officer/trainer channel, and single-channel for a maintenance channel. A touch tone pad for telephone dialing (trunking) will be on the radios selected to have access to the telephone patch. The radio-to-telephone patch connection will allow access to the Administration Building telephone system.

4.4.2 Electric Transmission and Distribution Systems

Primary power provided by the City of Richland will be at 12,470 V, 3-phase, 60 Hertz (Hz). The service extension will be run underground from an existing feeder, with a proposed termination north of the Administration Building. A reinforced concrete pad will be provided on the HAMMER Training Center for the switch gear and the power feed connection to the site. At this location, switch gear will consist of medium voltage fused interrupters. A revenue metering section will be provided at a location recommended or approved by the power utility. Additional metering will be provided at the Administration Building and Training Support Building.

The main circuit breaker will be a power vacuum breaker, 15 kilovolt (kV) Class, 250 mega-volt-amperes (MVA) rated. The main breaker will provide power to switching center bus from which medium voltage fused interrupters will draw power. Secondary power will be supplied at 277/480V, 3-phase, 4-wire. The total anticipated power demand is 1,000 KVA.

Substations will be provided as follows:

◦ Substation No. 1 (SS-1) Administration Building	500 KVA
◦ Substation No. 2 (SS-2) Burn Prop Area	500 KVA
◦ Substation No. 3 (SS-3) Remediation/Characterization Site	300 KVA
◦ Substation No. 4 (SS-4) Buried and Above Ground Tanks Prop area	300 KVA
◦ Substation No. 5 (SS-5) Training Support Building	750 KVA
◦ Substation No. 6 (SS-6) Pump House Area	750 KVA

Four metal-clad pad-mounted substations will be provided for the props and training area. These substations will be connected in loop-primary and bank-secondary radial. These substations will provide power to the general area lights and other miscellaneous loads that will be required in the use of the facility. Dikes and drainage provisions will be built for all substations as required by the local specification in conformance with 40 CFR 112.

Distribution of the electrical service will be through an underground system consisting of ducts and manholes. Electrical cables will be run in separate ducts. Branching of electrical service to the various structures onsite will be achieved using pad-mounted, ground-level,

primary voltage switches. Primary voltage switches will be selected to accomplish the desired switching with minimal interruption to the rest of the distribution system.

New permanent transformers will be totally enclosed, pad-mounted units. All equipment will be protected from, or resistant to, environmental conditions that would cause damage to it or its operation. Local conditions may include humidity from 5 to 100 percent, ambient temperature from -30°F to +115°F, lightning, blowing dust, rain, or snow. Wind-loading will be in accordance with ANSI C2, Grade 8 construction.

All vehicle and personnel gates in substation fences will be bonded to the substation ground mat using flexible braided conductors.

Lights will be provided to illuminate training exercise areas, footpaths, and parking areas. The illumination level in the training area will be approximately 5 to 10 foot-candles. Controls for all outdoor lights will be selective and will be located at the Administration Building. Exterior lighting system will comply with Illumination Engineering Society (*IES Lighting Handbook*) and 10 CFR 435. Electrical design will be in accordance with DOE Order 6430.1A *General Design Criteria*.

4.4.3 Alarm Systems

A local energy fire alarm system will be installed within each building requiring fire protection. This system will be comprised of a FACP, with standby battery power, and auxiliary relays to activate radio fire alarm signals that will be received at the 200 Area Hanford Fire Department. Each fire suppression system will individually enunciate.

Alarm devices will be installed in accordance with NFPA 70, NFPA 72, and SDC 7.8.

4.4.4 Irrigation Systems

An irrigation system will be installed for landscaping around the Administration Building and a small system will be installed for the Training Support Building and Comfort Station. An automatic sprinkling system with automatic drains will be required. The irrigation system will be installed in accordance with DOE Order 6430.1A, Division 15.

4.4.5 Sanitary Wastewater

Sanitary wastewater will be generated from the Administration Building, the Training Support Building, Training Tower, and Comfort Station. This wastewater will be collected and discharged to the City of Richland sewer system.

4.4.5.1 Project Requirements. A study was conducted that compared the feasibility of an on site disposal system versus connecting to the City of Richland sewage system. The study recommended that the HAMMER Training Center discharge sanitary wastewater to the City of Richland sewage system (see Appendix H - Economic Analysis and Lifecycle Cost Analysis).

The facilities with sewer connections are shown in Table 1. All the sewers will be gravity flow and will be 8-in. diameter pipe, except the service line from the Comfort Station will be 6-in. diameter pipe.

A sewer sized for the HAMMER Training Center sanitary wastewater flows running down Horn Rapids Road to the intersection of Kingsgate Way should be 8-in. diameter. The portion of the sewer on Horn Rapids Road will be approximately 1,200 lineal ft.

4.4.5.2 Codes, Regulations, and DOE Order Requirements. The sewage system will be designed in accordance with the following:

- DOE Order 6430.1A, Sections 0273-99 and 0275-99
- WAC 173-240
- Washington State Department of Ecology (WSDOE) 78-5, *Criteria for Sewage Works Design*.

4.4.6 Water Supply and Distribution Systems

Two types of water will be utilized at the HAMMER Training Center. Potable (sanitary) water will be used for all sanitary uses such as drinking water, showers, toilets, and sinks. The potable water will also provide a fire protection loop. Recirculated training water will be utilized for fire fighting training exercises and leak simulation. Potable and training water will be supplied as indicated on Table 1.

Potable water for the HAMMER Training Center will be supplied from the City of Richland. A life-cycle cost analysis was performed and connection to the City of Richland supply was selected. The non-potable recirculated training water used for training exercises and irrigation will be obtained from the artificial pond.

4.4.6.1 Project Requirements. The project requirements for the HAMMER Training Center water system are discussed in this section.

4.4.6.1.1 Domestic Water Demands. The population of the HAMMER Training Center Facility was estimated in the FDC as follows:

Average (students and staff):	108 people
Maximum (students and staff):	184 people
Maximum Visitors:	100 people

Based on an average population of 108 people and a per capita water demand of 30 gallons per day (gpd), the average daily water demand is estimated to be approximately 3,500 gpd.

Maximum daily water demand can be estimated using a maximum day to average day multiplier. This multiplier can range from 1.5 to 5 from community to community. The service population at this facility will vary, but the per capita water usage should not. Since

this is a new facility, the maximum daily population is difficult to establish. The maximum capacity for the facility is approximately 280 people. It is reasonable to assume that the maximum daily population would be 75% of the maximum capacity, or 200 people. This equates to a maximum to average daily flow multiplier of approximately 1.9 (assuming no increase in per capita use). Using 1.9 as the multiplier, the maximum day demand is estimated to be 6,650 gpd.

Peak domestic demand, also referred to as peak hourly demand, for the HAMMER Training Center will be estimated using a multiplier of peak demand to average day demand of 2.5, as established in DOE Order 6430.1A, Section 0266-4. Peak domestic demand is approximately 8,750 gpd. Instantaneous peak domestic flowrate can be estimated using a flow per fixture-unit method. This is described in several texts and in the Uniform Plumbing Code (UPC). The UPC lists equivalent fixture-units for different types of plumbing fixtures. From the total number of fixture-units an estimate of domestic peak flow can be made from charts in the UPC, Appendix A. It is estimated that there will be a total of 360 fixture-units at the HAMMER Training Center. The estimated peak domestic flowrate from the charts in the UPC, Appendix A, is 100 gallons per minute (gpm).

The domestic water supply under non-fire conditions, will be designed to provide the peak flow at a pressure ranging from 60 to 100 pound-force per square in. gauge (psig).

4.4.6.1.2 Fire Flow Requirements. The domestic water system will be designed to provide necessary flow for fire protection. Fire flow requirements have been determined using the Insurance Service Office (ISO) formula for structures. The maximum fire flow requirement for a structure is estimated to be 3,000 gpm for the Administration Building. Fire flow will be provided at a minimum pressure of 20 psig.

According to the RL Implementing Procedure (RLIP) 5480.7, the minimum duration of fire flow required at the Hanford Site is 2 hours. For large buildings, the minimum duration is 4 hours. RLIP 5480.7 does not indicate what defines a large building, therefore, for the HAMMER Training Center it is assumed a 2-hour fire flow duration is required. This equates to total water usage for fire protection of 360,000 gallons.

4.4.6.1.3 Irrigation Demands. Irrigation demand is estimated based on the largest irrigation water user, which would be impact sprinkler heads. The flowrate for an impact head is a maximum of about 5 gpm. The number of impact heads on a zone would be ten. The peak irrigation water demand will be approximately 50 gpm. The pressure requirement for larger impact heads is approximately 60 psig. The irrigation system will automatically shut off in the event of a fire.

4.4.6.1.4 Artificial Pond Recharge. The artificial pond will be recharged by the domestic water supply. It is assumed that the only losses from the artificial pond will be from evaporation and losses during training exercises.

4.4.6.1.4.1 Evaporation Losses. The maximum evaporation rate (provided by the Cooperative Extension office in Yakima) was 11.28 in. per month, which equates to 0.39 in.

per day, for July, 1990. Using this value, the maximum loss for the artificial pond with a 1 acre surface area is approximately 10,600 gpd.

4.4.6.1.4.2 Training Losses. The FDC establishes that there will be a minimum of two fire hydrants at each burn pad/prop for training purposes. Each of these hydrants will provide a flowrate of 1,000 gpm. The following assumptions have been made:

- The maximum flowrate will be 4,000 gpm (2,000 gpm from drafting plus 2,000 gpm from fire hydrants) for the Railroad/Truck Tank Burn Pad.
- The fire fighting training will last 20 minutes per exercise.
- A maximum of 16 fire training exercises could occur in one day.

Using these assumptions, the peak volume of water used is approximately 640,000 gallons. The pond water system will be recycled and a drainage system will be provided at each prop to collect the training water and return it to the artificial pond. In order to estimate artificial pond recharge requirements, it is assumed that 35 percent of the training water will be lost. Therefore, it is estimated that the peak training losses will be 224,000 gallons.

4.4.6.1.4.3 Total Pond Recharge Requirements. If the pond was recharged during off-hours of the HAMMER Training Center (7:00 p.m. to 7:00 a.m.), the flowrate required to recharge the pond for the peak losses within one 12-hour period would be approximately 326 gpm. To recharge the pond for the peak losses in 24 hours would require a flowrate of 163 gpm. Combined with the domestic peak flowrate of 100 gpm, the peak daytime flowrate would be 263 gpm.

4.4.6.1.5 Total Peak Flow Requirements. The total peak flow requirements for the domestic water supply system including all needs are listed in Table 9.

Table 9. Peak Flow Requirements.

Demand	Flow Rate	Minimum Pressure
Peak Daytime Non-fire Demand (peak domestic and peak pond recharge)	263 gpm	60 psig
Peak Fire Daytime Demand (50 percent average domestic and a fire flow)	3,005 gpm	20 psig
Peak Nighttime Non-fire Demand (irrigation and peak pond recharge)	213 gpm	60 psig

4.4.6.1.6 Domestic Water Distribution System. DOE Order 6430.1A requires that distribution system mains that include fire protection be sized for the required fire flow plus

50 percent of average domestic demand plus any special flow requirements. In a fire event, it will be assumed that artificial pond recharge and any irrigation flows would be discontinued. Based on these requirements, the distribution mains will be sized for 3,005 gpm. Maximum velocity allowed will be 8 ft per second. Using this criteria, the minimum main size for the HAMMER Training Center will be 12-in. in diameter. RLIP 5480.7 requires that systems supplying domestic water, process water, and fire protection have minimum main sizes of 12-in. in diameter.

The City of Richland is presently designing the proposed Kingsgate Way road which will intersect Horn Rapids Road just east of the HAMMER Training Center site. A 20-in. diameter water main on Kingsgate Way is included in their design. This will connect to a 16-in. upgraded water main on Horn Rapids Road. The City of Richland is currently planning to upgrade this line from the existing 12-in. water main. The design also includes a short length of 16-in. diameter pipe running to the west from the intersection of Horn Rapids Road and the proposed Kingsgate Way. A 14-in. diameter pipe from this location would be adequate to meet the domestic water requirements, fire flow requirements, and other special flow requirements of the HAMMER Training Center. The distance from the intersection of Horn Rapids Road and Kingsgate Way to the entry road onto the HAMMER Training Center site is approximately 1,200 lineal ft.

4.4.6.2 Codes, Regulations, and DOE Order Requirements. The following codes and standards are applicable to water supply, pumping, treatment, and distribution systems at the HAMMER Training Center:

- WAC 246-290
 - Section 040 requires plans and specifications to be prepared by a licensed Professional Engineer and a construction report be submitted.
 - Sections 200 through 250 covers design issues that will be included in final design.
 - Section 490 sets the requirements for backflow prevention if cross connections cannot be eliminated.
- DOE/RL Order 5480.4C.
- DOE Order 5480.7A, requires the use of 8 in. minimum mains. Other impacts of this code are that the design must meet NFPA.
- DOE Order 6430.1A, Section 0260, provides information on installation of piped utility materials, Section 0266 covers "water distribution systems", Section 1530 covers "fire protection criteria", and Section 1540 covers "plumbing/service piping".

- DOE/RL Order 5480.7A, requires the use of 12 in. diameter mains. It also defines the locations of valves and redundancy.
- Hanford Plant Standards
 - SDC-3.2 (HPSDCM)
 - SDC-7.8 (HPSDCM)
 - Mechanical HPS-112-M (HPSMSM).
- WHC-CM-4-41 defines fire protection guidelines and discusses water system for each area.
- The American Water Works Association (AWWA), Pacific Northwest Section, *Accepted Procedure and Practice in Cross Connection Control Manual*.
- NFPA 13.
- NFPA 24.
- NFPA 101.
- NFPA 801.
- Factory Mutual (FM), Loss Prevention Data Sheets.
- The FDC requires that the automatic fire protection system meets the requirements of Safety Class 3. Safety Classifications of systems, components, and structures are identified and defined in *WHC-CM-1-3, Management Requirements and Procedures Manual (MRP) 5-46*.

4.4.7 Training Water Supply, Recirculation, and Treatment System

Water used for training purposes (primarily the burn pads) will be collected, filtered, and recirculated to an artificial stream and pond.

4.4.7.1 Project Requirements. The project requirements for the HAMMER Training Center water supply system are discussed in this section.

4.4.7.1.1 Training Water Supply. Any two pads/props can be operated at the same time except the Railroad/Truck Tank Burn Pad. Tank car pads must be operated one at a time. Anticipated water flow requirements for fire training props are listed in Table 10.

Table 10. Water Flow Requirements.

PROP/PAD	FLOW
LPG Burn Pad	750 gpm
Flammable Liquids Burn Pad	500 - 700 gpm
Railroad/Truck Tank Burn Pad	1,500 - 4,000 gpm
Burn Structure Prop	750 gpm
Training Tower	750 gpm

To meet the maximum water flow requirement, 2,000 gpm will be provided by the Training Water Supply System and 2,000 gpm will be provided by drafting out of the artificial pond with hoses and fire pumper trucks. Therefore, the maximum pumped flow rate for the Training Water Supply System is approximately 2,000 gpm and the minimum is approximately 500 gpm.

Training water will be provided by vertical turbine pumps. Water will flow from the pond through a screened intake and into a pump house wet well where four primary vertical turbine pumps will provide training water. Each pump will be rated at approximately 750 gpm at a total dynamic head (TDH) of 272 ft. The motor size necessary for each pump will be approximately 75 horsepower. Up to three pumps will operate to provide the maximum flow requirement of 2,000 gpm. One of the pumps will always be in standby.

Fire training water will be provided at the hydrants at a maximum pressure of 100 psig. The distribution main will be looped around the fire fighting props. The main distribution pipe from the pump house and the loop will be 12 in. in diameter.

Training water in the artificial pond may contain dyes and simulated fire fighting foam. Assumptions for treatment of the water in the pond are as follows:

- All dyes and fire fighting foams (if any) are assumed to be harmless and biodegradable, and, therefore, do not require treatment for removal.
- The only treatment required is for algae control and some debris, such as leaves, sticks, etc.

4.4.7.1.2 Recirculation System. The assumptions for the recirculation system for the training prop water supply are as follows:

- A collection system will be extended to all training props requiring water.
- Maximum flow into the collection piping will be approximately 4,000 to 4,500 gpm.

- The collection system will be gravity flow. The collection system will flow back to the artificial pond.

The training water collection system transmits flows from the props by gravity along the roadways. Manholes are provided at a maximum of 400 ft apart to allow for cleaning. The collection pipe necessary to carry the maximum flow of 4,500 gpm is 24 in. The preliminary slope of the piping used to size the pipe is 0.003 ft/ft.

4.4.7.1.3 Treatment. It is recommended that the water in the pond be screened, pumped, chlorinated and circulated to the artificial stream. The chlorination facility and circulation pumps would be housed in the training prop water supply pumping station.

The chlorine could be provided by either of two forms:

- chlorine gas or
- sodium hypochlorite solution.

Because this treatment facility will be so small, it is recommended that sodium hypochlorite solution be used for algae control. The equipment required would include two mechanical diaphragm metering pumps, a storage tank, and associated controls.

4.4.7.1.3.1 Pump Requirements. The volume of water in the pond will normally vary from approximately 1 million gallons to 1.3 million gallons. To keep this mixed and provide adequate chlorine concentration, pumps rated at 400 gpm will recirculate the water out of the pond (via the pumping station wet well) and into the artificial stream, which flows back into the pond. This will recirculate the entire pond volume every 60 hours. The intake for the recirculation pump will be piped from the west end of the pond to ensure all water gets adequate circulation and treatment.

Two vertical pumps, each rated at a capacity of 400 gpm at a TDH of 14 ft, will be provided. All process water pumps/motors will be premium efficient type.

4.4.7.1.3.2 Sodium Hypochlorite Facilities. In order to minimize algae growth, an average chlorine residual of about 0.8 pounds per million gallons (lb/mg) to 4.2 lb/mg will be maintained in the pond. Hypochlorite will have to be fed into the 400 gpm flowrate at a dosage range of 2.5 lb/mg to 12 lb/mg to provide this residual.

A ten percent sodium hypochlorite solution will be fed into the pump discharge pipe by metering pumps. Two metering pumps will be provided, sized to provide up to a maximum of 5 milligrams per liter (mg/l) into the 400 gpm recirculation flow. Each metering pump will be rated for about 1.2 gallons per hour (gph), which equates to the maximum dosage (using the 10% solution) of 42 lb/mg in the recirculation flow.

Normally, one metering pump will be operated. However, if there was an extreme algae growth problem, both metering pumps could be operated. This would provide up to

83.4 lb/mg in the recirculation water. This equates to a chlorine residual of approximately 33.4 lb/mg in the total pond volume.

The hypochlorite feed facilities include a hypochlorite solution storage tank. The volume of this tank will be 100 gallons. This will provide about 12.5 days of storage at a feedrate of 0.3 gph, and about 3.5 days at the maximum feedrate of 1.2 gph.

4.4.7.2 Codes, Regulations, and DOE Order Requirements. Code requirements are as discussed in Section 4.4.6.2.

4.4.8 LPG Supply System

Three pads and the Burn Structure Prop use fuel fired flames as a part of the basic training exercise. LPG is recommended as the fuel for the pads (see Section 4.3.4.2). LPG fired boilers and/or forced air furnaces will be used to heat the Administration Building and Training Support Building.

4.4.8.1 Project Requirements. Instantaneous demands for the three pads and the burn structure are identified in Table 11. The anticipated frequency of use is not determined at this time. However, one use of each prop per day would equate to approximately 600 gallons of LPG per day. Five days at such a rate could approach 3,000 gallons per week. In addition, peak winter building heating consumption could require 3,000 to 4,000 gallons per week based on usage listed in Table 12.

Table 11. LPG Pad/Prop Usage Requirements.

Pad	Demand Rate (gallon)	Estimated Gallons Per Use
Railroad/Truck Tank Burn Pad (railroad car prop)	13.3 x 10 ⁶ (2.5 gpm)	23 - 35
Railroad/Truck Tank Burn Pad (tank truck prop)	10.9 x 10 ⁶ (2.0 gpm)	20 - 30
Flammable Liquids Burn Pad	187.2 x 10 ⁶ (35 gpm)	500 +
LPG Burn Pad (Low Fire)	6.24 x 10 ⁶ (1.2 gpm)	10 - 15
LPG Burn Pad (High Fire)	13.3 x 10 ⁶ (2.5 gpm)	25 - 35
Burn Structure (3 props)	18.7 x 10 ⁶ (3.5 gpm)	40 - 50

Table 12. LPG Building Usage Requirements.

Building/Prop Name	Annual Consumption(BTU/Yr)
Administration Building	1,760 x 10 ⁶ (20,000 gal/yr)
Training Support Building	1,600 x 10 ⁶ (18,000 gal/yr)
Training Tower	18.0 x 10 ⁶ (18,000 gal/yr)

4.4.8.2 LPG Storage Requirements. Where there are rather large units of consumption (several thousand gallons per month), LPG is purchased most economically in bulk quantities of greater than 4,000 gallons per delivery. LPG tanks are typically not filled to more than 80 percent of gross capacity to provide for vapor accumulation. Assuming that deliveries would be provided on a 4,000 to 5,000 gallon basis, a 12,000 to 15,000 gallon tank would provide a reserve for 2 or 3 weeks. A 15,000 gallon LPG storage tank with a net working capacity of 12,000 gallons is recommended and proposed.

LPG is heavier than air. As a safety precaution, the LPG storage tank will be located where any escaping gas would migrate away from structures and occupied areas.

4.4.8.3 LPG Distribution. LPG fuel utilization will be as a liquid at 150 lb/in² for the main prop burners with secondary ignition from a 1 lb/in² vapor line. There are two ways to obtain the service pressure. One is to heat and maintain the primary storage vessel to approximately 95°F on a year round basis. The second is to mechanically boost (pump) the liquid service line to 150 lb/in², either at the main tank, or at each individual prop. To avoid vaporization in the liquid line, it must be designed for 200 lb/in² for periods of high summer temperatures.

Vapor for ignition burners will be taken as a line separate from the liquid line directly off of the vapor cushion of the storage tank. Pressure reduction to below 5 lb/in² will preclude condensation to above -30°F.

Vapor for building heating systems will require a vaporizer at the tank with an independent distribution system.

The net LPG distribution system will consist of the storage tank with all appurtenances, a pumping station capable of responding to the various probable flow rates, liquid piping for 200 lb/in² distribution pressure tested to at least 300 lb/in², vapor piping at 5 lb/in² to each prop, and vapor piping to and from the building heating systems.

Piping will be Schedule 40 black steel with forged steel fittings and welded joints. The piping will be buried and wrapped with a polyethylene jacket per code requirements. A high density polyethylene system with fused joints may be considered.

4.4.8.4 Codes. All gas systems will be in compliance with NFPA 30, *Flammable and Combustible Liquids Code*, and NFPA 70, *National Electrical Code*.

4.5 EQUIPMENT

Equipment as discussed below will be purchased and/or installed as discussed below.

4.5.1 Special Equipment

Special equipment will include portable personnel decontamination facilities and an above ground confined space/fall apparatus, and a smoke generation system.

4.5.1.1 Confined Space/Fall Protection Apparatus. A structure will be provided to simulate confined space, as well as for training fall protection methods. An existing structure will be relocated from the Richland airport. This prop will require a compacted crushed aggregate area.

4.5.1.2 Personnel Decontamination Units. Two vans will be provided by this project to provide mobile personnel decontamination capabilities.

4.5.1.3 Smoke Generation System. A cold smoke generation system will be provided which will create obscuration of less than 1 ft visibility at the 3 ft level.

4.5.1.4 SCBA Fill Equipment. A compressor and three fill stations will be provided by this project.

4.5.2 Standard Equipment

Standard equipment provided by this project will include operational computers for burn props, drum over-packs, drum venting and purging equipment, portable gas monitoring equipment, portable work coverings (greenhouse construction materials), protective clothing, portable hazards sensors, scaffolding, fork lift, and portable bleachers. Additional equipment will include work benches, work chairs, and storage shelving. Standard equipment provided by the project that will be obtained from Hanford excess equipment will include personal office computers, glove boxes, air hoses, specialized pallets, transport vehicles and/or flatbed trailers, waste drums, and waste compactors.

4.5.3 Office Furniture and Equipment

Required furniture, storage equipment, workstations, desks, chairs, etc. for the Administration Building and other support buildings will be provided by this project. A minimum of ten file cabinets will be contained in the records area. This area will be capable of being locked and will have a minimum one-hour fire rating.

Furniture, equipment, etc. required as training props will be provided by this project.

4.5.4 Process Equipment

Process equipment is described under either building description or special and standard equipment. No other process equipment will be provided.

4.5.5 Shop Equipment

Shop equipment required for efficient maintenance of SCBA equipment at the HAMMER Training Center will be provided by this project.

5.0 METHODS OF PERFORMANCE

5.1 OFFSITE ARCHITECT-ENGINEER WORK (WBS 1.0, 1.1 AND 1.2)

Definitive Design will be performed by the USACE. The USACE may choose to use an architect-engineer for a portion of the design as selected by the USACE. The USACE will perform construction engineering and acceptance inspection.

5.2 ONSITE ARCHITECT-ENGINEER WORK

Not Applicable.

5.3 PROCUREMENT STRATEGY (WBS 2.0)

Office and classroom furnishings and miscellaneous equipment to support field training will be purchased by USACE.

5.4 OFFSITE CONSTRUCTION CONTRACTOR (WBS 3.0)

Construction will be performed by fixed price construction contracts awarded on the basis of competitive bidding through the USACE. Two contracts are planned, one for below grade work and basic training pads and the other one for remaining work. Strategy will be evaluated during Definitive Design to determine if it is beneficial to modify the combinations of contracts. The method most beneficial to the project will be used.

5.5 ONSITE CONSTRUCTION CONTRACTOR

Not Applicable.

5.6 WORK PLANNED FOR THE OPERATING CONTRACTOR (WBS 4.0)

WHC will be the Project Integrator and be responsible for overall project management during design, procurement and construction.

6.0 REQUIREMENTS AND ASSESSMENTS

The HAMMER Training Center will provide a high degree of safety and environmental protection. This section discusses the requirements and assessments associated with design, procurement, construction, testing, operation, maintenance, and modifications.

6.1 SAFEGUARDS AND SECURITY

The proposed work will be located in the 600 Area Property Protection Area. Existing safeguards and security measures for a property protected area will be implemented during construction of a fence around the site. A security plan will be prepared to permit site construction activities to proceed without badging after the fence is completed. This plan will be implemented subject to approval by Safeguards and Security.

6.2 HEALTH AND SAFETY

The HAMMER Training Center (Project T-100) supports environmental restoration by providing a facility for systematic training for hazardous materials workers involved with the handling and cleanup of toxic substance and emergency response.

The project is designated as a general use facility. Formal safety analysis and evaluation is not required. Safety reviews performed during the normal planning, design, and execution of the project will mitigate identified hazards associated with design and construction.

The construction contractor will comply with State of Washington and USACE, *Safety and Health Requirements Manual*, EM 385-1-1. The USACE will assure construction work is in conformance with the Interagency Agreement between the DOE/RL, and the USACE, which implements DOE/RL Order 5480.4C, *Environmental Protection, Safety and Health Protection Standards For RL*. The contractor will prepare an accident prevention plan prior to starting work.

At all times the construction contractor will ensure that the construction area is accessible to emergency vehicles or personnel and that routes for emergency evacuation of personnel are not obstructed. There will be no radiation or other hazardous material encountered during construction. The 80-acre site will be subject to blowing dust during construction, and measures will be taken to control the dust.

Operational procedures will be prepared, as required, to accommodate this work following construction. The procedures will be based on an assessment of the hazards which may be encountered during the operation of the facility and the controls necessary to manage the hazards to acceptable levels consistent with the requirements of DOE orders. Simulated materials will be used for training.

6.3 DECONTAMINATION AND DECOMMISSIONING

This project will not create any conditions or requirements for Hanford Site decontamination and decommissioning.

6.4 PROVISIONS FOR FALLOUT SHELTERS

No provisions for fallout shelters will be made as part of this project.

6.5 MAINTENANCE AND OPERATIONS REQUIREMENTS

Annually, the HAMMER Training Center is estimated to require 7,120 hours (~4 full time employees [FTEs]) of craft support and 5,475 hours (~3 FTEs) of engineering and administrative support to maintain the 80-acre facility. The total FY 1998 maintenance and support services costs are estimated at \$2,028,000 and the operating costs are estimated at \$1,932,000. The maintenance of this facility is incremental.

6.6 AUTOMATED DATA PROCESSING EQUIPMENT

The extent of automatic data processing (ADP) will include existing PCs connected to the HLAN in the administrative offices and the EOC. Existing stand-alone PC's that can access hazardous material databases will also be required in the EOC and one classroom. The Resource Center will house 16 existing stand-alone PC's with compacts discs. These machines are learning tools and are not connected to HLAN.

The infrastructure for teleconferencing capability will be provided. A communications system designed to receive microwave/satellite distance learning from other academic and training facilities will be provided. This system will down link only but be designed not to preclude installing up link capability.

Automated data processing and control equipment for the HAMMER Training Center will be designed to meet the basic goals of:

- increased safety
- more complete and consistent documentation
- increased productivity (throughput)
- energy conservation
- minimize operations personnel for cost and safety reasons

- increased reliability
- reduced cost.

6.7 QUALITY ASSURANCE

Quality Assurance (QA) activities for all contractors involved with the design, construction, testing, and inspection of the facility will be formulated and executed through the use of the project-specific QA Project Plan (QAPP). The QAPP will establish QA program requirements that provide a format to verify inspection, testing, adequacy of design, and the quality of construction and manufactured components. Additional requirements may be added to appropriate controlling documents. The specific technical and quality programmatic requirements, material certifications, qualification/certification of personnel, inspections, examinations/testing and applicable quality records will be established during definitive design and included in the definitive design documents. The QA program requirements will be in accordance with DOE Order 5700.6C, *Quality Assurance*.

6.8 SAFETY CLASSIFICATION

Safety classifications are identified for those systems, components, and structures important to safety or environmental protection so that appropriate efforts will be placed on design, procurement, construction, testing, operation, maintenance, and modifications.

Safety classification criteria and methodology are defined in *WHC Management Requirements and Procedures Manual*, WHC-CM-1-3, MRP 5.46. Safety classifications are determined through analysis and consequences of failure based on information contained in the project FDC. The resulting safety classifications form the basis for the design and quality assurance requirements applied to the project.

The failure of equipment and systems provided by this project would not adversely effect the environment or health and safety of the public, or groups of personnel within the 600 Area and/or the Hanford Site boundaries. This project is not within the analyzed bounds of an applicable Safety Analysis Report (SAR), since none is required for these types of systems.

Safety Class 3 is the highest level applied to any element of the proposed facility. Safety classification of systems, component, and/or structures are provided below.

6.8.1 Administration Building

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
All piping systems except fire protection and gas	4	No Significant Risk Expected
Heating, ventilating and air conditioning	4	No Significant Risk Expected
Electrical	4	No Significant Risk Expected
Gas piping for heating system	3	No Significant Risk Expected
Fire protection/detection	3	No Significant Risk Expected

6.8.2 Training Support Building

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
All piping systems except fire protection and gas	4	No Significant Risk Expected
Heating, ventilating and air conditioning	4	No Significant Risk Expected
Electrical	4	No Significant Risk Expected
Gas piping for heating system	3	No Significant Risk Expected
Fire protection/detection	3	No Significant Risk Expected
Gas Bottle fill equipment	3	No Significant Risk Expected

6.8.3 Comfort Station

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
Electrical	4	No Significant Risk Expected
Piping	4	No Significant Risk Expected

6.8.4 Training Tower

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
All piping systems except gas	4	No Significant Risk Expected
Electrical	3	No Significant Risk Expected
Gas piping	3	No Significant Risk Expected

6.8.5 SCBA Search and Rescue Prop

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
Electrical	4	No Significant Risk Expected

6.8.6 Burn Structure Prop

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
Piping systems except gas	4	No Significant Risk Expected
Gas piping system	3	No Significant Risk Expected
Electrical including Burn Control/Safety Circuits	3	No Significant Risk Expected
Artificial Smoke Exhaust System	3	No Significant Risk Expected

6.8.7 Flammable Liquids Burn Pad

System/Component	Safety Class	Remarks
Concrete Pad	4	No Significant Risk Expected
Electrical including Burn Control/Safety Circuits	3	No Significant Risk Expected
Piping systems except gas	4	No Significant Risk Expected
Gas piping system	3	No Significant Risk Expected

6.8.8 Liquid Petroleum Gas Burn Pad

System/Component	Safety Class	Remarks
Concrete Pad	4	No Significant Risk Expected
Electrical including Burn Control/Safety Circuits	3	No Significant Risk Expected
Piping systems except gas	4	No Significant Risk Expected
Gas piping system	3	No Significant Risk Expected

6.8.9 Railroad/Truck Tank Burn Pad

System/Component	Safety Class	Remarks
Concrete Pad	4	No Significant Risk Expected
Electrical including Burn Control/Safety Circuits	3	No Significant Risk Expected
Piping systems except gas	4	No Significant Risk Expected
Gas piping system	3	No Significant Risk Expected

6.8.10 90-Day Storage Pad Prop

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
Concrete Pad	4	No Significant Risk Expected
Electrical	3	No Significant Risk Expected

6.8.11 Above Ground Pipeline/Pad

System/Component	Safety Class	Remarks
Building Structure, including Foundation and Roof	4	No Significant Risk Expected
Piping systems	4	No Significant Risk Expected
Electrical	3	No Significant Risk Expected

6.8.12 Burn Pad Control Platforms

System/Component	Safety Class	Remarks
Platform Structure	4	No Significant Risk Expected
Electrical Control Circuits	3	No Significant Risk Expected

6.8.13 Miscellaneous Props/Pads

System/Component	Safety Class	Remarks
Pond/Stream	4	No Significant Risk Expected
Fire Pumper Test Platform	4	No Significant Risk Expected
Emergency Response Staging Area	4	No Significant Risk Expected
Characterization/Remediation Training Area	4	No Significant Risk Expected
Craft Specific Props and Buried Simulated Waste	4	No Significant Risk Expected
Junction/Diversion Box (J Box) with Tank Training Prop Electrical	3	No Significant Risk Expected
Railroad Tank Cars with Rail Prop	4	No Significant Risk Expected
Buried and Above Ground Tanks Prop	4	No Significant Risk Expected
Confined Space/Fall Protection Apparatus	4	No Significant Risk Expected
Well Sampling Stations	4	No Significant Risk Expected
Trench Site Training Prop	4	No Significant Risk Expected

6.8.14 Site Systems/Utilities

System/Component	Safety Class	Remarks
Site Phones	4	No Significant Risk Expected
HLAN Systems	4	No Significant Risk Expected
Intercommunications	4	No Significant Risk Expected
Fire Water Distribution	3	No Significant Risk Expected
Sewer Piping	4	No Significant Risk Expected
LPG Piping	3	No Significant Risk Expected
Safety Shutdown Systems for Burn Props	3	No Significant Risk Expected
Training Water Supply Systems including Main, Hydrants, Risers, and Alarms	4	No Significant Risk Expected
Training Water Collection System	4	No Significant Risk Expected
Electrical Supply and Power Distribution Systems (outdoors and buried)	3	No Significant Risk Expected
Backup Lighting	3	No Significant Risk Expected

6.9 ENVIRONMENTAL REQUIREMENTS

The environmental requirements for the HAMMER Training Center are discussed below.

6.9.1 Categorical Exclusion

This project will be designed to minimize the impact on the environment per the requirements of DOE Order 5400.1, *General Environmental Protection Program*, and the requirements of Washington State Department of Health, WAC 246-272, for sanitary systems.

An environmental requirements checklist has been prepared to determine the applicable permits and approvals for this project. Site evaluations required under the National Historical Preservation Act and the Endangered Species Act, which also support the documentation required for National Environmental Policy Act (NEPA), have been completed. An Information Bulletin and Categorical Exclusion (WHC-CX-9360983) was transmitted to DOE, Richland Operations Office on January 12, 1994. The DOE has determined that construction and operation of the facility is categorically excluded under DOE's NEPA regulations.

6.9.2 Liquid Effluent

The water used for training exercises, prop cleanup, etc. will be recycled to the artificial pond. The system is described in Section 4.4.7.

Surface runoff will be controlled to ensure it is always diverted from facility roadways, parking areas, buildings, training props, and walkways.

6.9.3 Airborne Emissions

Dust control will be accomplished by the use of appropriate landscaping, irrigation, and roadway surfacing. Dust emissions from construction activities will be kept to a minimum. Burning activities will generally be performed with LPG being used in a manner that simulates an actual burn scenario. Smoke will be produced using artificial methods that are non-polluting.

7.0 IDENTIFICATION AND ANALYSIS OF UNCERTAINTIES

The uncertainties associated with the HAMMER Training Center are considered low. The project is considered to be standard industrial construction, with standard environmental health and safety issues.

7.1 TECHNICAL

The technical uncertainties associated with the HAMMER Training Center project are considered to be low. The project is considered standard industrial construction and no new technology development is required to accomplish the project objectives. Standard off-the-shelf equipment and proven technology will be used.

7.2 SCHEDULE

The overall schedule uncertainties associated with the HAMMER Training Center project are considered low. Time for permitting and/or interfacing with state, U.S. Environmental Protection Agency, U.S. Department of Health, and Fish and Wildlife Agencies have been incorporated into the HAMMER Training Center plan and schedule. Some construction takes place outdoors during winter months and construction delays due to inclement weather are possible.

7.3 COST

The cost uncertainties for the HAMMER Training Center project are considered low. The project is a standard industrial construction which is well understood. Cost growth will be controlled by controlling project scope and maintaining the schedule.

Horn Rapids Road is assumed to be upgraded by the City of Richland. Water/sewer and electricity are assumed to be provided to the HAMMER Training Center by the City of Richland, but are contingent upon successful negotiations with the City.

LPG is assumed to be supplied to the HAMMER Training Center by the local gas distributor, but is contingent upon successful negotiation with the gas supplier.

If materials and equipment assumed to be available from excess government material lists are unavailable, additional costs will be incurred.

7.4 ENVIRONMENTAL, HEALTH, AND SAFETY

The environmental, health, and safety uncertainties associated with the HAMMER Training Center project are considered low. There is no radiation-zone work. Construction and operation of the facilities and systems provided by the HAMMER Training Center project will comply with OSHA regulations.

All permits, waivers, and NEPA documentation will conform to standard protocol outlined in WHC-CM-7-5, Section 5, for new projects.

8.0 APPLICABLE CODES AND REGULATIONS

The document editions/revisions listed will be utilized during design, fabrication, and construction of the HAMMER Training Center.

8.1 DEPARTMENT OF ENERGY ORDERS

Number	Title
5400.1 Chg. 1	General Environmental Protection Program, June 29, 1990
5480.7A	Fire Protection (Errata Sheet), February 17, 1993
5480.9	Construction Project Safety and Health Management, April 14, 1994
5480.28	Natural Phenomena Hazards Mitigation, January 15, 1993
5632.6 Chg. 1	Physical Protection of DOE Property and Unclassified Facilities, February 9, 1988
5632.9A	Issuance and Control of Security Badges, Credentials, and Shields, September 23, 1992
5700.6C	Quality Assurance, August 21, 1991
6430.1A	General Design Criteria, April 6, 1989

8.2 DOE/RL ORDERS AND DOE/RL IMPLEMENTING PROCEDURES

Number	Title
5400.1	General Environmental Protection Program, November 9, 1988
5480.4C	Environmental Protection, Safety and Health Protection Standard for RL, November 6, 1992
5480.7	Fire Protection, July 30, 1990
12074-34 Rev 0	Geotechnical Investigation Report, Hazardous Materials Management and Emergency Response (HAMMER) Training Center, Project 95L-EWT-100, May 1994.

8.3 WASHINGTON ADMINISTRATIVE CODES

Number	Title
173-240	Submission of Plans and Reports for Construction of Wastewater, 1990
173-160	Minimum Standards for Construction and Maintenance of Wells, 1991
246-290	Public Water Supplies, 1992
S1-11	Washington State Energy Code, 1994
S1-13	Ventilation and Indoor Air Quality, 1993

8.4 CODE OF FEDERAL REGULATIONS

Number	Title
CFR 10 §830.120	Nuclear Safety Management
CFR 10 §435	Subpart A, Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings
CFR 10 §436	Federal Energy Management and Planning Programs
CFR 29 §830.120	Nuclear Safety Management
CFR 29 §1910	Occupational Safety and Health Administration, Department of Labor, January 1, 1993
CFR 29 §1926	Safety and Health Regulation for Construction, January 1, 1993
CFR 36 §1190 (ADA)	ADA Accessibility Guidelines for Building and Facilities, July 1, 1993
CFR 36 §1191	Architectural and Transportation Barriers Compliance Board (ATBCB), September 6, 1991
CFR 40 §112	Oil Pollution Prevention, July 1, 1993

8.5 HANFORD PLANT STANDARDS AND GUIDANCE

Number	Title
DOE/EP-0108	Standard for Fire Protection of AEC Electric Computer/Data Processing Systems, January 1, 1994
HPSAC	Hanford Plant Standards Architectural/Civil, March 28, 1992
HPSDC (SDC)	Hanford Plant Standards Design Criteria (includes SDCs 1.3, 3.2, 4.1, 4.2, 5.1, 5.2, and 7.8), February 17, 1994
HPSM	Hanford Plant Standards Mechanical, September 9, 1991

8.6 WESTINGHOUSE HANFORD COMPANY DOCUMENTS

Number	Title
WHC-CM-1-3	Management Requirements and procedures, June 29, 1994
WHC-CM-4-33	Security Manual, May 24, 1994
WHC-CM-4-41	Fire Protection Program Manual, July 12, 1994
WHC-CM-7-5	Environmental Compliance Manual, June 1, 1994
WHC-CX-9360983	Categorical Exclusion for Hazardous Materials Management and Emergency Response Training Center, 600 Area, Hanford Site, Richland, WA., January 12, 1994
WHC-EP-0319	WHC, 1990 Hazardous Materials Management and Emergency Response (HAMMER) Training Center Feasibility Study, Rev. 0, 1990
WHC-EP-0682	WHC, 1992 Hazardous Materials and Emergency Response Training Center Needs Assessment, September 1993
WHC-SD-L094-ES-001	Dohrer, C. H., 1992, Fire Station/Fire Ground Training Facility
WHC-SD-T100-FDC-001	Function Design Criteria - HAMMER Training Center, January, 1994

8.7 OTHER DOCUMENTS

Number	Title
AA-33-86	Aluminum Association Engineering Data For Aluminum Structure, December 1986
AASHTO-HB-14	American Association of Standard Highway Transportation Officials - Standard Specification for Highway Bridges 13th Edition, 1989
ACI	Design Handbooks Vol. 1, 2, and 3 (includes 301, 318, 318R, and 530.1), 1992
AEI	USACE - Architectural and Engineering Instructions Design Criteria, July 8, 1992
AGA	American Gas Association Standards as adopted by Cascade Gas, 1989
AISC 1989	Manual of Steel Construction Allowable Stress Design 9th Edition, 1989
AISC S326	Specification for the Design, Fabrication, and Erection of Structural Steel Buildings, November 1, 1978
AISI	American Iron and Steel Institute Specifications for the Design of Cold Formed Steel Structural Members, February 3, 1990
ANSI 7-88	Minimum Design Loads for Buildings and Other Structures, 1988
ANSI A117.1	Providing Accessibility and Useability for Physically Handicapped People, 1992
ANSI D6.1E	Manual of Uniform Traffic Control Devices for Streets and Highways, 1989
API	American Petroleum Institution Standards, Specifications and Recommended Practices
AREA	American Railway Engineering Association Manual for Railway Engineering, Volumes I and II, 1993
ASCE Manual 37	Design and Construction of Sanitary and Storm Sewers
ASCE 6-88	Specifications for Masonry Structures
ASCE 7-93	Minimum Design Loads for Buildings and Other Structures, 1993

Number	Title
ASHRAE	Handbook of Fundamentals, 1993
ASHRAE 62	Indoor Air Quality
ASHRAE 90-1	1989
ASME	Standards, Boiler and Pressure Vessel Codes, 1969
ASTM	American Society for Testing and Materials (includes A36, A53, A58-1, A307, A325, A490, A500, A501, A615 and C90,)
AWS Standard D1.1	Structural Welding Code, 1994
AWS-D1.3	Specifications for Welding Sheet Steel in Structure, 1989
AWWA	Pacific Northwest Section Accepted Procedure and Practice in Cross Connection Control Manual, May 1990
BICS	Building Industry Consulting Service International Guidelines
CAST	M-Strudel-A Structural Analytical Program by Computer Aided Structural Technology (CAST)
CEQAPP 1.1 Rev. 2	Quality Assurance Program Plan for the Support of the US Department of Energy, Richland Operations Office, September 16, 1991
CRSI	Concrete Reinforcing Steel Institute Hardback, 1984
DSHS Guideline	Design Guidelines for Larger On Site Sewage Systems with Design Flows of Greater than 3,500 Gallons per Day, 1987
DSHS Guideline	Guidelines for Sandfilters, August 2, 1989
EIA/TIA 568A/258A	Commercial Building Telecommunications Wiring Standards, July 1, 1991
EIA/TIA 569	Commercial Building Standards for Telecommunications Pathways and Spaces, October 15, 1990

Number	Title
EPA/625/1-80-012	Design Manual: On Site Wastewater Treatment and Disposal Systems, 1980
FM	Factory Mutual Loss Prevention Data Sheets, September 1, 1986
IEEE 142	Grounding of Industrial and Commercial Power, 1982
IEEE 802.3	Institute of Electrical and Electronics Engineers Standard Guide, March 20, 1992
IES	Illustrating Engineering Society Lighting Handbook, 1983
NEMA	National Electric Manufacturers Association
NEPA GUIDE	National Environmental Policy Act Compliance Guide I and II, July 9, 1975
NFPA 13	Installation of Sprinkler Systems, February 11, 1989
NFPA 24	Installation of Private Fire Service Mains and their Appurtenances, February 10, 1992
NFPA 30	Flammable and Combustible Liquids, August 20, 1993
NFPA 58	Standards for Liquid Petroleum Gas Storage, 1992
NFPA 70	The National Electrical Code, 1993 edition
NFPA 72	National Fire Alarm Code
NFPA 78	Lightning Protection Code, 1992
NFPA 90A	Standard for the Installation of Air Conditioning and Ventilation Systems, January 15, 1993
NFPA 101	Life Safety Code, February 11, 1991
NFPA 472	Professional Competence of Responding to HAZMAT Incidents, 1992
NFPA 801	Facilities Handling Radioactive Materials, February 8, 1991
NFPA 1402	Building Fire Service Training Centers, 1992

Number	Title
NFPA 1403	Standard on Live Fire Training Evolutions in Structures, 1992
NFPA 1500	Fire Department Occupational Safety and Health Program, 1992
NHPA	National Historical Preservation Act
OT, BPHA	Office of Technology, Background Paper Hazards Ahead: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex, Washington, DC
PNL-4219	Flood Analysis of Cold Creek Near the Hanford Site, Skaggs and Walters, 1981
PNL-4622	Climatological Summary for the Hanford Area, September, 1983.
SARA	Superfund Amendments and Reauthorization Act Title II rules, 1986
SJI-1990	Steel Joist Institution Standard Specification for Open Web, Long Span, and Deep Long Span Steel Joists and Joists Girders, 1990
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association Standards, Guide, and Manuals, 1987
TM 5-809-3	Masonry Design for Buildings
TM 5-809-10	Seismic Design for Buildings, February, 1982
TM 5-809-12	Concrete Floor Slabs on Grade Subjected to Heavy Loads, September, 1987
TM 5-822-5	Pavement Design for Roads, Streets, Walks, and Open Storage Areas
UBC	Uniform Building Code, 1994
UCRL 15910	Design and Evaluation Guidelines for Department of Energy Facilities Subject to Natural Phenomena Hazards, 1988
UL	Underwriters Laboratory Fire Resistance Manual Volume 1 and 2, 1993

Number	Title
UPC	Uniform Plumbing Code, 1994
USACE-EM-385-1-1	Safety and Health Requirements Manual, October 1992
USACE-EM-1110-2-410	Design of Recreational Areas and Facilities - Access and Circulation, December 31, 1982
WSDOE 78-5	Washington State Department of Ecology, Criteria for Sewage Works Design, October, 1985
WSDOT M 41-10	Washington State Department of Transportation Manual

APPENDIX A

WORK BREAKDOWN STRUCTURE

WORK BREAKDOWN STRUCTURE

- 1.0 ENGINEERING
 - 1.1 Definitive Design (USACE)
 - 1.2 Engineering and Inspection (USACE)
- 2.0 PROCUREMENT (USACE)
- 3.0 CONSTRUCTION
 - 3.1 Phase I Construction (Offsite Construction Contractor)
 - 3.2 Phase II Construction (Offsite Construction Contractor)
- 4.0 PROJECT MANAGEMENT (Operating Contractor)
- 5.0 OTHER PROJECT COSTS

APPENDIX B

BUDGET AUTHORIZED/BUDGET OUTLAY SCHEDULE

**BA/BO SCHEDULE
T-100
HAZARDOUS MATERIALS MANAGEMENT & EMERGENCY RESPONSE TRAINING CENTER**

WBS ELEMENTS	TOTAL COST	FY 1995				FY 1996				FY 1997			
		1	2	3	4	1	2	3	4	1	2	3	4
1.0 ENGINEERING													
1.1 DEFINITIVE DESIGN (USACE)	2120				2120/2120								
1.2 ENG/INSPECTION (USACE)	1080				160/120			480/480				440/480	
2.0 PROCUREMENT (USACE)	660											360/460	
3.0 CONSTRUCTION													
3.1 PHASE I FIXED PRICE	7890				3490/1260			4400/6630					
3.2 PHASE II FIXED PRICE	17130				800/0			9420/7630				6910/9500	
4.0 PROJECT MANAGEMENT (OC)	1020				430/330			400/340				190/360	
TOTALS BA/BO DOLLARS IN THOUSANDS	29900				7000/3830			15000/15280				7900/10790	

APPENDIX C

COST ESTIMATE SUMMARY

PROJECT 95L-EWT-100
HAMMER TRAINING CENTER
COST ESTIMATE SUMMARY – CONCEPTUAL DESIGN REPORT

9/21/94

	Estimated Direct Cost	Escalation %	Escalation	Total Escalated Dollars	Contingency %	Contingency	Total Dollars
<u>ENGINEERING, DESIGN AND INSPECTION</u>							
<u>(Capital Cost)</u>							
Category 1 – Total	\$1,230,000		\$20,000	\$1,250,000		\$190,000	\$1,440,000
Phase I	\$280,000	1.3%	\$0	\$280,000	15.0%	\$40,000	\$320,000
Phase II	\$950,000	1.7%	\$20,000	\$970,000	15.0%	\$150,000	\$1,120,000
Category 2 – Total	\$580,000		\$10,000	\$590,000		\$90,000	\$680,000
Phase I	\$130,000	1.3%	\$0	\$130,000	15.0%	\$20,000	\$150,000
Phase II	\$450,000	1.7%	\$10,000	\$460,000	15.0%	\$70,000	\$530,000
Engineering and Inspection During Construction – Total	\$880,000		\$60,000	\$940,000		\$140,000	\$1,080,000
Phase I	\$180,000	4.5%	\$10,000	\$190,000	15.0%	\$30,000	\$220,000
Phase II	\$700,000	7.3%	\$50,000	\$750,000	15.0%	\$110,000	\$860,000
Total	\$2,690,000		\$90,000	\$2,780,000		\$420,000	\$3,200,000
<u>CONSTRUCTION MANAGEMENT COSTS (USACE)</u>							
Phase I	\$430,000	4.5%	\$20,000	\$450,000	15.0%	\$70,000	\$520,000
Phase II	\$1,020,000	7.3%	\$70,000	\$1,090,000	15.0%	\$160,000	\$1,250,000
Total	\$1,450,000		\$90,000	\$1,540,000		\$230,000	\$1,770,000
PROJECT MANAGEMENT COSTS (WHC)	\$810,000	3.0%	\$20,000	\$830,000	12.0%	\$100,000	\$930,000
<u>CONSTRUCTION COSTS</u>							
Improvements to Lands – Total	\$2,300,000		\$140,000	\$2,440,000		\$370,000	\$2,810,000
Phase I	\$1,570,000	5.5%	\$80,000	\$1,650,000	15.0%	\$250,000	\$1,900,000
Phase II	\$730,000	7.9%	\$60,000	\$790,000	15.0%	\$120,000	\$910,000
Buildings – Total	\$9,180,000		\$710,000	\$9,900,000		\$1,540,000	\$11,440,000
Phase I	\$450,000	5.5%	\$30,000	\$480,000	15.0%	\$70,000	\$550,000
Phase II	\$8,730,000	7.9%	\$680,000	\$9,420,000	15.6%	\$1,470,000	\$10,890,000
Utilities – Total	\$5,030,000		\$310,000	\$5,340,000		\$800,000	\$6,140,000
Phase I	\$3,360,000	5.5%	\$180,000	\$3,540,000	15.0%	\$530,000	\$4,070,000
Phase II	\$1,670,000	7.9%	\$130,000	\$1,800,000	15.0%	\$270,000	\$2,070,000
Special Equipment/Process System – Total	\$2,220,000		\$160,000	\$2,380,000		\$360,000	\$2,740,000
Phase I	\$700,000	5.5%	\$40,000	\$740,000	15.0%	\$110,000	\$850,000
Phase II	\$1,520,000	7.9%	\$120,000	\$1,640,000	15.0%	\$250,000	\$1,890,000
Total	\$18,730,000		\$1,320,000	\$20,050,000		\$3,070,000	\$23,130,000
STANDARD EQUIPMENT	\$520,000	9.1%	\$50,000	\$570,000	15.0%	\$90,000	\$660,000
<u>DESIGN AND PROJECT LIASON, TESTING, CHECKOUT & ACCEPTANCE</u>							
USACE	\$90,000	10.9%	\$10,000	\$100,000	15.0%	\$20,000	\$120,000
WHC	\$70,000	10.9%	\$10,000	\$80,000	15.0%	\$10,000	\$90,000
Total	\$160,000		\$20,000	\$180,000		\$30,000	\$210,000
TOTAL ESTIMATED CONSTRUCTION COST (TEC)	\$24,360,000		\$1,590,000	\$25,950,000		\$3,940,000	\$29,900,000
OTHER PROJECT COSTS	\$5,290,000	3.2%	\$170,000	\$5,460,000		\$40,000	\$5,500,000
PROJECT TOTAL (TPC)	\$29,650,000		\$1,760,000	\$31,420,000		\$3,980,000	\$35,400,000

NOTE: Cost totals are rounded to the nearest \$10,000 and grand totals are rounded to the nearest \$100,000 per DOE 5100.4

TIME 17:33:34
TITLE PAGE 1

U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - IIAHFORO 64-Acre Layout
PROJECT IIAH094: Hammer CDR - VE+ Estimate, 9/21/94

Wed 21 Sep 1994
Eff. Date 08/09/94

Hammer Est 1994, 30% Design CDR
DOE - IIAHFORO 64-Acre Layout
near Horn Rapids Dam
Richland Washington
--- for Official Use Only ---

Designed By: Montgomery Watson & W Corps Eng
Estimated By: HW & COE-NPW

Prepared By: Cost Engineering Branch
COE - Walla Walla District (NPW)

Preparation Date: 09/29/94
Effective Date of Pricing: 08/09/94
Est Construction Time: 600 Days

Sales Tax: 7.80%

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Currency in DOLLARS

CREW ID: HAH94A UPB ID: HA192A

LABOR ID: IIAH194 EQUIP ID: HA193A

Wed 21 Sep 1994
 Eff. Date 08/09/94
 PROJECT NOTES

PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
 Hammer CDR - VE+ Estimate, 9/21/94

TIME 17:33:34
 TITLE PAGE 2

This cost estimate is for the 80-acre Hazardous Materials Management and Emergency Response Training Center (HAMMER TC) VE+ option. New federal laws required extensive and specific personnel training for emergency response to hazardous materials incidents. Washington - Federal and State Legislators support this initiative as a potential business opportunity for the Hanford Site.

The proposed HAMMER facility will provide a centralized site for providing training dedicated especially to HAZMAT emergency response personnel. As its key function, the center will combine realistic field training with thorough and consistent classroom HAZMAT Response Training. Realism will be obtained via simulated HAZMAT incident sites. The incident scenarios will include appropriate training props, hazardous materials transport and storage equipment mockups, and emergency response equipment simulate various potential incidents under varying conditions.

This estimate incorporates VE recommendations and further scope reductions (with revised building SF's per MW), quotes from vendors for burn props and metal buildings, and corrections to the estimate detail items.

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HANF94A UPB ID: NAT92A

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LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

Detailed Estimate not included in CDR.
It is available under seperate cover.

WHC-SD-T100-CDR-001 Rev. 0

TIME 17:33:34
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U.S. Army Corps of Engineers
Hammer Est 1994, 30X Design CDR - DOE - HANFORD 64-Acre Layout
PROJECT HANF94: Hammer CDR - VE+ Estimate, 9/21/94

Wed 21 Sep 1994
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SUMMARY PAGE 1

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A HAMMER Training Center, Phase 1										
A.460 Improvements to Land										
A.460.401- Site Grading & Preparation	64.00	ACR	747,510	97,180	33,790	52,710	4,470	8,780	944,430	14756.76
A.460.402- Perimeter & Access Roads & Parkg	25300.00	SY	396,930	51,600	17,940	27,990	2,370	4,660	501,490	19.82
A.460.403- Fencing	9600.00	LF	89,960	11,700	4,070	6,340	540	1,060	113,660	11.84
TOTAL Improvements to Land	64.00	ACR	1,234,400	160,470	55,800	87,040	7,380	14,490	1,559,590	24368.53
A.501 Buildings										
A.501.501- Training Water Pump House	450.00	SF	321,020	41,730	14,510	22,640	1,920	3,770	405,590	901.31
A.501.502- 90 Day Storage Pad Prop	900.00	SF	38,760	5,040	1,750	2,730	230	460	48,970	54.42
TOTAL Buildings	450.00	SF	359,780	46,770	16,260	25,370	2,150	4,220	454,560	1010.14
A.600 Utilities										
A.600.601- Water Supply to Hammer Site	1600.00	LF	121,010	12,480	4,340	6,770	570	1,130	146,300	91.44
A.600.602- Water Supply System	10355.00	LF	565,650	73,530	25,570	39,890	3,380	6,840	714,660	69.02
A.600.603- Training Water Supply System	3935.00	LF	182,660	23,750	8,260	12,880	1,090	2,140	230,780	58.65
A.600.604- Training Water Recycle System	3369.00	LF	215,040	27,960	9,720	15,160	1,290	2,530	271,690	80.65
A.600.605- Handmade Stream & Pond	5700.00	SY	266,340	34,620	12,040	18,780	1,590	3,130	336,510	59.04
A.600.606- Sewer System to Hammer Site	244.00	SY	244,900	28,590	9,940	15,510	1,310	2,580	302,840	19.99
A.600.607- Sewer System	5850.00	LF	92,570	12,030	4,180	6,530	550	1,090	116,950	19.99
A.600.609- Electrical On-Site System	64.00	ACR	678,900	88,260	30,690	47,870	4,060	7,970	857,750	13402.28
A.600.610- Telecom. System - Off-Site	6300.00	LF	240,370	31,250	10,860	16,950	1,440	2,820	303,690	48.04
A.600.614- LPG Gas On-site System			66,900	8,700	3,020	4,720	400	790	84,520	13.42
TOTAL Utilities	64.00	ACR	2,674,350	341,170	118,620	185,050	15,690	30,810	3,365,690	52588.91
A.700 Special Equipment/Process System										
A.700.702- Hazmat Training Pad	2.00	EA	277,630	36,090	12,550	19,580	1,660	3,260	350,770	13873.12
A.700.704- Well Sampling Stations			21,960	2,850	990	1,550	130	260	27,750	56.500
A.700.705- Railroad Tank Cars w/ Rail Prop			44,720	5,810	2,020	3,150	270	530	56,500	5.300
A.700.706- Craft Spec Prop & Buried SimWaste			4,200	550	190	300	30	50	5,300	5.300
A.700.707- Characterization /Remediatn Site			4,200	550	190	300	30	50	5,300	5.300
A.700.708- Trench Site Prop			66,220	8,610	2,990	4,670	400	780	83,670	44.740
A.700.709- Confined Space/Fall Protectn Prp			35,410	4,600	1,600	2,500	210	420	44,740	60.350
A.700.710- Above Ground Pipeline Pad			47,760	6,210	2,160	3,370	290	560	60,350	65.590
A.700.711- Buried & Above Ground Tanks Prop			51,920	6,750	2,350	3,660	310	610	65,590	77773.21
TOTAL Special Equipment/Process System	9.00	EA	554,010	72,020	25,040	39,060	3,310	6,510	699,960	77773.21
TOTAL HAMMER Training Center, Phase 1	64.00	ACR	4,822,550	620,430	215,720	336,520	28,540	56,040	6,079,800	94996.86

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SUMMARY PAGE 2

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BEO Tax	BOND	TOTAL COST	UNIT COST
B HAMMER Training Center, Phase 2										
B.460 Improvements to Land										
B.460.401- Site Finish Grading	46116.00	SY	22,210	2,670	930	1,290	130	250	27,480	0.60
B.460.402- Paved Driveway Roads & Walkways	37070.00	SY	417,740	50,130	17,550	24,270	2,450	4,610	516,740	13.94
B.460.403- Landscaping	32.00	ACR	151,780	18,210	6,370	8,820	890	1,670	187,750	5867.30
TOTAL Improvements to Land	64.00	ACR	591,730	71,010	24,850	34,380	3,470	6,530	731,970	11437.00
B.501 Buildings										
B.501.501- Administration Building	33180.00	SF	3,010,350	361,240	126,430	174,900	17,630	33,210	3,723,770	112.23
B.501.503- Training Support Building	33800.00	SF	1,991,770	239,010	83,650	115,720	11,660	21,970	2,463,790	72.89
B.501.504- Comfort Station	2050.00	SF	178,360	21,400	7,490	10,360	1,040	1,970	220,630	107.62
B.501.507- Burn Structure Prop	4500.00	SF	1,170,050	140,410	49,140	67,980	6,850	12,910	1,447,340	321.63
B.501.508- Training Tower	5850.00	SF	396,000	47,520	16,630	23,010	2,320	4,370	489,850	83.73
B.501.509- SCBA Search and Rescue Prop	5010.00	SF	310,320	37,240	13,030	18,030	1,820	3,420	383,870	76.62
TOTAL Buildings	85290.00	SF	7,056,860	846,820	296,390	410,000	41,330	77,840	8,729,240	102.35
B.600 Utilities										
B.600.601- Site Electrical & Lighting	64.00	ACR	1,348,690	161,840	56,650	78,360	7,900	14,880	1,668,310	26067.42
TOTAL Utilities	64.00	ACR	1,348,690	161,840	56,650	78,360	7,900	14,880	1,668,310	26067.42
B.700 Special Equipment/Process System										
B.700.701- Flammable Liquids Burn Pad	327,550		39,400	13,790	19,140	1,920	3,620	405,420		
B.700.702- Liquid Petroleum Gas(LPG)Burn Pad	277,900		33,350	11,670	16,150	1,630	3,070	343,750		
B.700.703- Railroad / Truck Tank Burn Pad	557,820		66,940	23,430	32,410	3,270	6,150	690,020		
B.700.705- Junction/Diversion Box w/Tank Prop	69,210		8,310	2,910	4,020	410	760	85,610		
TOTAL Special Equipment/Process System	5.00	EA	1,232,480	147,990	51,790	71,720	7,220	13,600	1,524,800	304960.09
TOTAL HAMMER Training Center, Phase 2	64.00	ACR	10,229,770	1,227,660	429,680	594,460	59,910	112,840	12,656,320	197723.82
GS HAMMER Training Center, G.F.S. 2										
GS.710 Standard Equipment										
GS.710.701- Administration Building	386,700		0	0	0	0	0	0	386,700	
GS.710.703- Training Support Building	128,690		0	0	0	0	0	0	128,690	
GS.710.705- Comfort Station	5,900		0	0	0	0	0	0	5,900	
TOTAL Standard Equipment	521,290		0	0	0	0	0	0	521,290	

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST

GS.900 ENGINEERING & OTHER COST										
GS.900.900 ENGINEERING, DESIGN & INSPECT			2,690,000	0	0	0	0	0	2,690,000	
GS.900.1000 CONST. MANAGEMENT COSTS (USACE)			1,450,000	0	0	0	0	0	1,450,000	
GS.900.1100 DESIGN/LIAISON/TEST/CHECK&ACCEPT			160,000	0	0	0	0	0	160,000	
GS.900.1200 PROJECT MANAGEMENT COSTS (WHC)			807,000	0	0	0	0	0	807,000	
			-----	-----	-----	-----	-----	-----	-----	-----
TOTAL ENGINEERING & OTHER COST			5,107,000	0	0	0	0	0	5,107,000	
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TOTAL HAMMER Training Center, G.F.S. 2			5,628,290	0	0	0	0	0	5,628,290	

OC OTHER PROJECT COSTS										
OC.800 OTHER PROJECT COSTS										
OC.800.801 FY - 1994			2,500,000	0	0	0	0	0	2,500,000	
OC.800.802 FY - 1995			790,000	0	0	0	0	0	790,000	
OC.800.803 FY - 1996			640,000	0	0	0	0	0	640,000	
OC.800.804 FY - 1997			1,360,000	0	0	0	0	0	1,360,000	
			-----	-----	-----	-----	-----	-----	-----	-----
TOTAL OTHER PROJECT COSTS			5,290,000	0	0	0	0	0	5,290,000	
			-----	-----	-----	-----	-----	-----	-----	-----
TOTAL OTHER PROJECT COSTS			5,290,000	0	0	0	0	0	5,290,000	
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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A HAMMER Training Center, Phase 1										
A.460 Improvements to Land										
A.460.401- Site Grading & Preparation										
A.460.401-.02 Overall Site Clearing & Grubbing										
A.460.401-.02.02A Overall Site Clearing & Grubbing	554040.50	SY	262,470	34,120	11,860	18,510	1,570	3,080	331,610	0.60
TOTAL Overall Site Clearing & Grubbing	554040.50	SY	262,470	34,120	11,860	18,510	1,570	3,080	331,610	0.60
A.460.401-.A2 Grading,Roads and Pavement Areas										
A.460.401-.A2.021 Roads, Excavation										
A.460.401-.A2.022 Roads, Backfill	11020.00	BCY	38,000	4,940	1,720	2,680	230	450	48,010	4.36
A.460.401-.A2.023 Roads, Grading & Prep	4065.00	CCY	32,880	4,270	1,490	2,320	200	390	41,540	10.22
TOTAL Grading,Roads and Pavement Areas	76140.00	SY	30,210	3,930	1,370	2,130	180	350	38,170	0.50
A.460.401-.B2 Grading,Building										
A.460.401-.B2.021 Building Site, Excavation	12550.00	BCY	43,270	5,630	1,960	3,050	260	510	54,670	4.36
A.460.401-.B2.022 Building Site, Backfill	7210.00	CCY	59,080	7,680	2,670	4,170	350	690	74,640	10.35
A.460.401-.B2.023 Building Site, Grading & Prep	120500.00	SY	47,860	6,220	2,160	3,370	290	560	60,470	0.50
TOTAL Grading,Building	120500.00	SY	150,210	19,530	6,790	10,590	900	1,760	189,780	1.57
A.460.401-.C2 Grading,Special Equipment Pads										
A.460.401-.C2.021 Special Equip, Site Excavation	13230.00	BCY	45,620	5,930	2,060	3,220	270	540	57,640	4.36
A.460.401-.C2.022 Special Equip, Site Backfill	5770.00	CCY	46,070	5,990	2,080	3,250	280	540	58,210	10.09
A.460.401-.C2.023 Special Equip, Site Grading	357400.50	SY	142,050	18,470	6,420	10,020	850	1,670	179,470	0.50
TOTAL Grading,Special Equipment Pads	357400.50	SY	233,750	30,390	10,570	16,480	1,400	2,740	295,320	0.83
TOTAL Site Grading & Preparation	64.00	ACR	747,510	97,180	33,790	52,710	4,470	8,780	944,430	14756.76
A.460.402- Perimeter & Access Roads & Parkg										
A.460.402-.02 Perimeter and Access Roads 1->4										
A.460.402-.02.021 2" Roadways Bituminous Conc Road	21580.00	SY	276,400	35,930	12,490	19,490	1,650	3,250	349,210	16.18
A.460.402-.02.022 Stripping Roadways	64970.00	LF	17,550	2,280	790	1,240	100	210	22,180	0.34
TOTAL Perimeter and Access Roads 1->4	21580.00	SY	293,950	38,210	13,290	20,730	1,760	3,450	371,390	17.21

LABOR ID: HAM94 EQUIP ID: NAT93A

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** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 6

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.501.501-.03 Exterior Closure										
A.501.501-.03. 3 Ext Wall 10" Masonry, Insulated	907.18	SF	12,510	1,630	570	880	70	150	15,800	17.42
A.501.501-.03. 5 Painting All Exterior Doors And	39.47	SF	150	20	10	10	0	0	190	4.73
A.501.501-.03. 7 Exterior Double Leaf Insulated H	2.00	EA	2,020	260	90	140	10	20	2,560	1279.10
A.501.501-.03. 9 Exterior Louvers, Including Caul	15.48	SF	480	60	20	30	0	10	600	38.79
TOTAL Exterior Closure	450.00	SF	15,150	1,970	680	1,070	90	180	19,150	42.55
A.501.501-.04 Roofing										
A.501.501-.04. 2 Inverted EPDM Roof Including Mem	450.00	SF	1,500	200	70	110	10	20	1,900	4.22
A.501.501-.04. 3 Roofing Insulation Including 1-1	450.00	SF	1,270	160	60	90	10	10	1,600	3.55
A.501.501-.04. 4 Sheet Metal Work Including Flash	197.37	FT	770	100	30	50	0	10	970	4.91
TOTAL Roofing	450.00	SF	3,540	460	160	250	20	40	4,470	9.93
A.501.501-.09 Heating, Ventilation & Air Condit										
A.501.501-.09. 1 Electric Unit Heater	2.00	EA	900	120	40	60	10	10	1,140	570.12
A.501.501-.09. 2 Wall Mounted Exhaust Fan	1.00	EA	1,080	140	50	80	10	10	1,370	1368.94
A.501.501-.09. 3 Test And Balance For The Exhaust	1.00	EA	120	20	10	10	0	0	150	147.96
TOTAL Heating, Ventilation & Air Condit	450.00	SF	2,100	270	100	150	10	20	2,660	5.90
A.501.501-.11 Interior Electrical	450.00	SF	2,270	300	100	160	10	30	2,870	6.38
A.501.501-.12 Other Electrical Systems	450.00	SF	115,500	15,010	5,220	8,140	690	1,360	145,920	324.27
A.501.501-.13 Special Mechanical Systems										
A.501.501-.13. 1 Water Pumps	6.00	EA	96,630	12,560	4,370	6,810	580	1,130	122,090	20348.18
A.501.501-.13. 2 Interconnecting Piping To Pumps	100.00	LF	37,580	4,890	1,700	2,650	220	440	47,480	474.84
A.501.501-.13. 3 Sodium Hydrochlorite Solutn Tank	1.00	EA	5,110	660	230	360	30	60	6,460	6458.47
TOTAL Special Mechanical Systems	450.00	SF	139,330	18,110	6,300	9,820	830	1,640	176,030	391.18
A.501.501-.14 Specialties										
A.501.501-.14. 1 Building Identification Sign.	1.00	EA	70	10	0	10	0	0	90	93.85
TOTAL Specialties	450.00	SF	70	10	0	10	0	0	90	0.21
TOTAL Training Water Pump House	450.00	SF	321,020	41,730	14,510	22,640	1,920	3,770	405,590	901.31
A.501.502- 90 Day Storage Pad Prop	900.00	SF	9,730	1,260	440	690	60	110	12,290	13.65
A.501.502-.01 Foundation										

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency In DOLLARS

CREW ID: HANF94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT HANF94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.501.502-.02 Substructure	900.00	SF	3,840	500	170	270	20	50	4,860	5.39
A.501.502-.03 Superstructure	450.00	SF	1,890	250	90	130	10	20	2,390	5.32
A.501.502-.04 Exterior Closure	450.00	SF	3,410	440	150	240	20	40	4,310	9.58
A.501.502-.05 Roofing	450.00	SF	6,540	850	300	460	40	80	8,260	18.35
A.501.502-.06 Interior Construction	450.00	SF	470	60	20	30	0	10	600	1.33
A.501.502-.13 Special Construction	450.00	SF	7,680	1,000	350	540	50	90	9,700	21.55
A.501.502-.15 Mechanical	450.00	SF	1,310	170	60	90	10	20	1,660	3.68
A.501.502-.16 Electrical	900.00	SF	3,890	510	180	270	20	50	4,910	5.46
TOTAL 90 Day Storage Pad Prop	900.00	SF	38,760	5,040	1,750	2,730	230	460	48,970	54.42
TOTAL Buildings	450.00	SF	359,780	46,770	16,260	25,370	2,150	4,220	454,560	1010.14
A.600 Utilities										
A.600.601- Water Supply to Hammer Site										
A.600.601-.02 Water Supply Hook Up-Fee			25,000	0	0	0	0	0	25,000	
TOTAL Water Supply Hook Up-Fee			25,000	0	0	0	0	0	25,000	
A.600.601-.A2 16" Water Line										
A.600.601-.A2.02A Excavation Trench (5'-6" deep)	1200.00	BCY	980	130	40	70	10	10	1,230	1.03
A.600.601-.A2.02B Pipe Bedding	368.00	BCY	8,210	1,070	370	580	50	100	10,380	28.20
A.600.601-.A2.02C Trench Zone Backfill	832.00	BCY	3,380	440	150	240	20	40	4,270	5.14
A.600.601-.A2.15A 16" Dia Water Supply Main	1600.00	LF	83,440	10,850	3,770	5,880	500	980	105,420	65.89
TOTAL 16" Water Line	1600.00	LF	96,010	12,480	4,340	6,770	570	1,130	121,300	75.81
TOTAL Water Supply to Hammer Site	1600.00	LF	121,010	12,480	4,340	6,770	570	1,130	146,300	91.44
A.600.602- Water Supply System										
A.600.602-.02 12" Water Line										
A.600.602-.02.02A Excavation Trench (5'-6" deep)	6141.00	BCY	4,990	650	230	350	30	60	6,310	1.03
A.600.602-.02.02B Pipe Bedding	1691.00	BCY	38,470	5,000	1,740	2,710	230	450	48,600	28.74
A.600.602-.02.02C Trench Zone Backfill	4450.00	BCY	22,940	2,980	1,040	1,620	140	270	28,980	6.51
A.600.602-.02.15A 12" Dia Water Supply Main	8900.00	LF	327,550	42,580	14,810	23,100	1,960	3,850	413,840	46.30
TOTAL 12" Water Line	8900.00	LF	393,950	51,210	17,810	27,780	2,360	4,630	497,730	55.92
A.600.602-.A2 16" Water Line										
A.600.602-.A2.02A Excavation Trench (5'-6" deep)	1091.25	BCY	890	120	40	60	10	10	1,120	1.03
A.600.602-.A2.02B Pipe Bedding	334.65	BCY	7,830	1,020	350	550	50	90	9,900	29.58

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAM94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT HANF94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 8

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BEO Tax	BOND	TOTAL COST	UNIT COST
A.600.602-.A2.02C Trench Zone Backfill	756.60	BCY	3,900	510	180	270	20	50	4,930	6.51
A.600.602-.A2.15A 16" Dia Water Supply Main	1455.00	LF	77,060	10,020	3,480	5,430	460	900	97,360	66.91
TOTAL 16" Water Line	1455.00	LF	89,680	11,660	4,050	6,320	540	1,050	113,310	77.87
A.600.602-.B2 8" D, Fire Hydrants										
A.600.602-.B2.02A Excavation Trench (5'-6" deep)	217.35	BCY	180	20	10	10	0	0	220	1.03
A.600.602-.B2.02B Pipe Bedding	59.85	BCY	1,400	180	60	100	10	20	1,770	29.58
A.600.602-.B2.02C Trench Zone Backfill	157.50	BCY	810	110	40	60	0	10	1,030	6.51
A.600.602-.B2.15A 8" Cast Iron Hydrant	21.00	EA	79,630	10,350	3,600	5,620	480	940	100,610	4791.04
TOTAL 8" D, Fire Hydrants	21.00	EA	82,020	10,660	3,710	5,780	490	960	103,630	4934.81
TOTAL Water Supply System	10355.00	LF	565,650	73,530	25,570	39,890	3,380	6,640	714,660	69.02
A.600.603- Training Water Supply System										
A.600.603-.02 16" Water Line										
A.600.603-.02.02A Excavation Trench (5'-6" deep)	571.55	BCY	460	60	20	30	0	10	590	1.03
A.600.603-.02.02B Pipe Bedding	161.00	BCY	3,660	480	170	260	20	40	4,630	28.74
A.600.603-.02.02C Trench Zone Backfill	410.55	BCY	2,120	280	100	150	10	20	2,670	6.51
A.600.603-.02.15A 16" Dia Water Supply Main	805.00	LF	47,260	6,140	2,140	3,330	280	550	59,710	74.17
TOTAL 16" Water Line	805.00	LF	53,500	6,960	2,420	3,770	320	630	67,600	83.97
A.600.603-.A2 12" Water Line										
A.600.603-.A2.02A Excavation Trench (5'-6" deep)	1587.00	BCY	1,290	170	60	90	10	20	1,630	1.03
A.600.603-.A2.02B Pipe Bedding	437.00	BCY	9,940	1,290	450	700	60	120	12,560	28.74
A.600.603-.A2.02C Trench Zone Backfill	1150.00	BCY	5,930	770	270	420	40	70	7,490	6.51
A.600.603-.A2.15A 12" Dia Water Supply Main	2300.00	LF	81,730	10,620	3,690	5,760	490	960	103,250	44.89
TOTAL 12" Water Line	2300.00	LF	98,880	12,850	4,470	6,970	590	1,160	124,930	54.32
A.600.603-.C2 10" Water Line (Stream Pipe)										
A.600.603-.C2.02A Excavation Trench (5'-6" deep)	227.70	BCY	190	20	10	10	0	0	230	1.03
A.600.603-.C2.02B Pipe Bedding	62.70	BCY	1,430	190	60	100	10	20	1,800	28.74
A.600.603-.C2.02C Trench Zone Backfill	165.00	BCY	850	110	40	60	10	10	1,070	6.51
A.600.603-.C2.15A 10" Dia Water Supply Main	330.00	LF	11,750	1,530	530	830	70	140	14,850	44.99
TOTAL 10" Water Line (Stream Pipe)	330.00	LF	14,210	1,850	640	1,000	80	170	17,960	54.41
A.600.603-.D2 8" Water Line										

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

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Wed 21 Sep 1994
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PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME	OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.600.603-.D2.02A Excavation Trench (5'-6" deep)	345.00	BCY	280	40	10	10	20	0	0	350	1.03
A.600.603-.D2.02B Pipe Bedding	95.00	BCY	2,160	280	100	100	150	10	30	2,730	28.74
A.600.603-.D2.02C Trench Zone Backfill	250.00	BCY	1,290	60	170	60	90	10	20	1,630	6.51
A.600.603-.D2.15A 8" Dia Water Supply Main	500.00	LF	12,330	1,600	560	560	870	70	140	15,580	31.16
TOTAL 8" Water Line	500.00	LF	16,060	2,090	730	730	1,130	100	190	20,290	40.58
TOTAL Training Water Supply System	3935.00	LF	182,660	23,750	8,260	8,260	12,880	1,090	2,140	230,780	58.65
A.600.604- Training Water Recycle System											
A.600.604-.02 24" Sewer Line											
A.600.604-.02.02A Excavation Trench (7'avg deep)	1946.80	BCY	1,580	210	70	70	110	10	20	2,000	1.03
A.600.604-.02.02B Pipe Bedding	409.20	BCY	9,310	1,210	420	420	660	60	110	11,760	28.74
A.600.604-.02.02C Trench Zone Backfill	1537.60	BCY	7,930	1,030	360	360	560	50	90	10,010	6.51
A.600.604-.02.15A 24" Dia Sewer Main	1240.00	LF	35,450	4,610	1,600	1,600	2,500	210	420	44,780	36.12
TOTAL 24" Sewer Line	1240.00	LF	54,260	7,050	2,450	2,450	3,830	320	640	68,560	55.29
A.600.604-.A2 12" Sewer Line											
A.600.604-.A2.02A Excavation Trench(10.5'avg deep)	4900.35	BCY	3,980	520	180	180	280	20	50	5,030	1.03
A.600.604-.A2.02B Pipe Bedding	341.05	BCY	7,760	1,010	350	350	550	50	90	9,800	28.74
A.600.604-.A2.02C Trench Zone Backfill	4559.30	BCY	23,500	3,060	1,060	1,060	1,660	140	280	29,690	6.51
A.600.604-.A2.15A 12" Dia Sewer Main	1795.00	LF	26,840	3,490	1,210	1,210	1,890	160	320	33,910	18.89
TOTAL 12" Sewer Line	1795.00	LF	62,080	8,070	2,810	2,810	4,380	370	730	78,430	43.70
A.600.604-.B2 10" Sewer Line											
A.600.604-.B2.02A Excavation Trench(4.5'avg deep)	36.72	BCY	30	0	0	0	0	0	0	40	1.03
A.600.604-.B2.02B Pipe Bedding	12.24	BCY	280	40	10	10	20	0	0	350	28.74
A.600.604-.B2.02C Trench Zone Backfill	24.48	BCY	130	20	10	10	10	0	0	160	6.51
A.600.604-.B2.15A 10" Dia Sewer Main	72.00	LF	890	120	40	40	60	10	10	1,120	15.56
TOTAL 10" Sewer Line	72.00	LF	1,320	170	60	60	90	10	20	1,670	23.19
A.600.604-.C2 8" Sewer Line											
A.600.604-.C2.02A Excavation Trench(4.5'avg deep)	2000.22	BCY	1,630	210	70	70	110	10	20	2,050	1.03
A.600.604-.C2.02B Pipe Bedding	666.74	BCY	15,170	1,970	690	690	1,070	90	180	19,160	28.74
A.600.604-.C2.02C Trench Zone Backfill	1333.48	BCY	6,870	890	310	310	480	40	80	8,680	6.51
A.600.604-.C2.15A 8" Dia Sewer Main	3922.00	LF	34,510	4,490	1,560	1,560	2,430	210	410	43,610	11.12
TOTAL 8" Sewer Line	3922.00	LF	58,180	7,560	2,630	2,630	4,100	350	680	73,510	18.74

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.600.604-.D2 Sewer Manholes										
A.600.604-.D2.02A Excavation Trench (7'avg deep)	660.00	BCY	540	70	20	40	0	10	680	1.03
A.600.604-.D2.02B Pipe Bedding	11.00	BCY	250	30	10	20	0	0	320	28.74
A.600.604-.D2.02C Trench Zone Backfill	583.00	BCY	30,790	4,000	1,390	2,170	180	360	38,910	66.73
A.600.604-.D2.02D Precast Manhole 4'-0" Dia. 8'-0" H	11.00	EA	19,690	2,560	890	1,390	120	230	24,870	2261.28
TOTAL Sewer Manholes	11.00	EA	51,270	6,660	2,320	3,610	310	600	64,770	5888.50
A.600.604-.E2 16" Sewer Line										
A.600.604-.E2.02A Excavation Trench(10.5'avg deep)	633.36	BCY	510	70	20	40	0	10	650	1.03
A.600.604-.E2.02B Pipe Bedding	44.08	BCY	1,000	130	50	70	10	10	1,270	28.74
A.600.604-.E2.02C Trench Zone Backfill	589.28	BCY	3,040	390	140	210	20	40	3,840	6.51
A.600.604-.E2.15A 16" Dia Sewer Main	232.00	LF	6,000	780	270	420	40	70	7,580	32.66
TOTAL 16" Sewer Line	232.00	LF	10,550	1,370	480	740	60	120	13,330	57.47
A.600.604-.F2 24" (Between Pond & Pump House)										
A.600.604-.F2.02A Excavation Trench (7'avg deep)	47.10	BCY	40	0	0	0	0	0	50	1.03
A.600.604-.F2.02B Pipe Bedding	9.90	BCY	230	30	10	20	0	0	280	28.74
A.600.604-.F2.02C Trench Zone Backfill	37.20	BCY	190	20	10	10	0	0	240	6.51
A.600.604-.F2.15A 24" Dia Sewer Main	30.00	LF	920	120	40	70	10	10	1,170	38.93
TOTAL 24" (Between Pond & Pump House)	30.00	LF	1,380	180	60	100	10	20	1,740	58.11
A.600.604-.VE VE Reduction of 10% f/ re-siting			-23,990	-3,110	-1,070	-1,680	-130	-270	-30,310	
TOTAL Training Water Recycle System	3369.00	LF	215,040	27,960	9,720	15,160	1,290	2,530	271,690	80.65
A.600.605- Manmade Stream & Pond										
A.600.605-.02 Pond										
A.600.605-.02.02A Pond Excavation	7800.00	BCY	33,730	4,390	1,520	2,380	200	400	42,620	5.46
A.600.605-.02.02B Pond 2" Bituminous Conc	5700.00	SY	171,280	22,270	7,740	12,080	1,020	2,010	216,400	37.97
TOTAL Pond	5700.00	SY	205,010	26,650	9,270	14,460	1,230	2,410	259,020	45.44
A.600.605-.A1 Pumper Truck Pad	18.00	CY	4,500	590	200	320	30	50	5,690	315.86
A.600.605-.A2 Pumper Pit										
A.600.605-.A2.02A Pumper Pit Excavation	360.00	BCY	540	70	20	40	0	10	680	1.90
A.600.605-.A2.02B Pumper Pit Gravel Backfill	80.00	BCY	1,840	240	80	130	10	20	2,330	29.08
A.600.605-.A2.02C Pumper Pit Backfill	320.00	BCY	1,740	230	80	120	10	20	2,190	6.86
A.600.605-.A2.03A Pumper Pit Conc Retaining Slab	30.00	CY	5,830	760	260	410	30	70	7,360	245.39

LABOR ID: HANF94 EQUIP ID: NAT93A CURRENCY IN DOLLARS CREW ID: HANF94A UPB ID: NAT92A

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Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.600.605-.A2.03B Pumper Pit Conc Retaining Wall	50.00	CY	30,710	3,990	1,390	2,170	180	360	38,800	775.96
A.600.605-.A2.05A Pumper Pit Metal Handrail	100.00	LF	3,760	490	170	270	20	40	4,760	47.56
A.600.605-.A2.07A Pumper Pit Cold Hestic Sealer	100.00	LF	1,290	170	60	90	10	20	1,650	16.27
TOTAL Pumper Pit	260.00	SY	45,710	5,940	2,070	3,220	270	540	57,750	222.11
A.600.605-.B2 Artificial Stream										
A.600.605-.B2.02A Art Stream Excavation	120.00	BCY	200	30	10	10	0	0	250	2.06
A.600.605-.B2.02B Art Stream Gravel Under Shotcret	40.00	BCY	1,110	140	50	80	10	10	1,400	35.08
A.600.605-.B2.02C Art Stream 24" Dia Culvert/Backf	160.00	LF	3,880	500	180	270	20	50	4,910	30.66
A.600.605-.B2.03A Art Stream 4"Shotcrete Conc Slab	30.00	CY	5,930	770	270	420	40	70	7,500	249.86
TOTAL Artificial Stream	250.00	LF	11,120	1,450	500	780	70	130	14,050	56.21
TOTAL Hamade Stream & Pond	5700.00	SY	266,340	34,620	12,040	18,780	1,590	3,130	336,510	59.04
A.600.606- Sewer System to Hammer Site										
A.600.606-.02 8" Sewer Line										
A.600.606-.02.02A Excavation Trench (7'avg deep)	11760.00	BCY	9,560	1,240	430	670	60	110	12,080	1.03
A.600.606-.02.02B Pipe Bedding	2380.00	BCY	54,140	7,040	2,450	3,820	320	640	68,400	28.74
A.600.606-.02.02C Trench Zone Backfill	9380.00	BCY	48,350	6,290	2,190	3,410	290	570	61,080	6.51
A.600.606-.02.15A 8" D, Sewer Main	14000.00	LF	107,860	14,020	4,880	7,610	640	1,270	136,270	9.73
TOTAL 8" Sewer Line	14000.00	LF	219,900	28,590	9,940	15,510	1,310	2,580	277,840	19.85
A.600.606-.A2 Sewer System Hook Up-fee			25,000	0	0	0	0	0	25,000	
TOTAL Sewer System to Hammer Site			244,900	28,590	9,940	15,510	1,310	2,580	302,840	
A.600.607- Sewer System										
A.600.607-.02 6" Sewer Line										
A.600.607-.02.02A Excavation Trench (7'avg deep)	3037.50	BCY	2,470	320	110	170	10	30	3,120	1.03
A.600.607-.02.02B Pipe Bedding	600.00	BCY	13,650	1,770	620	960	80	160	17,240	28.74
A.600.607-.02.02C Trench Zone Backfill	2437.50	BCY	12,560	1,630	570	890	80	150	15,870	6.51
A.600.607-.02.15A 6" Dia Sewer Main	3750.00	LF	18,200	2,370	820	1,280	110	210	22,990	6.13
TOTAL 6" Sewer Line	3750.00	LF	46,880	6,090	2,120	3,310	280	550	59,230	15.79
A.600.607-.A2 4" Sewer Line										
A.600.607-.A2.02A Excavation Trench (7'avg deep)	648.00	BCY	530	70	20	40	0	10	670	1.03
A.600.607-.A2.02B Pipe Bedding	128.00	BCY	2,910	380	130	210	20	30	3,680	28.74

LABOR ID: HANF94 EQUIP ID: NAT93A

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PROJECT HAN94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

TIME 17:33:34
SUMMARY PAGE 12

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BEO Tax	BOND	TOTAL COST	UNIT COST
A.600.607-.A2.02C Trench Zone Backfill	520.00	BCY	2,680	350	120	190	20	30	3,390	6.51
A.600.607-.A2.15A 4" Dia Sewer Main	800.00	LF	2,780	360	130	200	20	30	3,520	4.39
TOTAL 4" Sewer Line	800.00	LF	8,900	1,160	400	630	50	100	11,250	14.06
A.600.607-.B2 2" Sewer Line										
A.600.607-.B2.02A Excavation Trench (7'avg deep)	195.00	BCY	160	20	10	10	0	0	200	1.03
A.600.607-.B2.02B Pipe Bedding	65.00	BCY	1,480	190	70	100	10	20	1,870	28.74
A.600.607-.B2.02C Trench Zone Backfill	130.00	BCY	670	90	30	50	0	10	850	6.51
A.600.607-.B2.15A 2" Dia Sewer Main	1300.00	LF	1,980	260	90	140	10	20	2,500	1.92
TOTAL 2" Sewer Line	1300.00	LF	4,280	560	190	300	30	50	5,410	4.16
A.600.607-.C2 Sewer Manholes										
A.600.607-.C2.02A Excavation Trench (7'avg deep)	420.00	BCY	340	40	20	20	0	0	430	1.03
A.600.607-.C2.02B Pipe Bedding	7.00	BCY	160	20	10	10	0	0	200	28.74
A.600.607-.C2.02C Trench Zone Backfill	371.00	BCY	19,600	2,550	890	1,380	120	230	24,760	66.73
A.600.607-.C2.02D Precast Manhole 4'-0"dia. 8'-0"hd	7.00	EA	12,530	1,630	570	880	70	150	15,830	2261.28
TOTAL Sewer Manholes	7.00	EA	32,630	4,240	1,470	2,300	200	380	41,220	5888.50
A.600.607-.D2 2" Sewer Line Pump Station										
A.600.607-.D2.02A Excavation Trench (7'avg deep)	60.00	BCY	50	10	0	0	0	0	60	1.03
A.600.607-.D2.02B Pipe Bedding	1.00	BCY	20	0	0	0	0	0	30	28.74
A.600.607-.D2.02C Trench Zone Backfill	53.00	BCY	260	30	10	20	0	0	330	6.30
A.600.607-.D2.02D Precast Manhole 4'-0"dia. 8'-0"hd	1.00	EA	1,790	230	80	130	10	20	2,260	2261.28
A.600.607-.D2.15A Lift Station Pumps	2.00	EA	7,750	1,010	350	550	50	90	9,790	4896.68
TOTAL 2" Sewer Line Pump Station	1.00	EA	9,880	1,280	450	700	60	120	12,480	12478.90
A.600.607-.VE VE reduction of 10% f/ re-siting	5850.00	LF	-9,990	-1,290	-440	-700	-50	-110	-12,620	19.99
TOTAL Sewer System			92,570	12,030	4,180	6,530	550	1,090	116,950	
A.600.609- Electrical On-Site System										
A.600.609-.01 SWITCHING CENTER	80.00	60	80,060	10,410	3,620	5,650	480	940	101,150	
A.600.609-.02 SUBSTATION NO. 1	51.00	60	51,000	6,630	2,310	3,600	300	600	64,440	
A.600.609-.03 SUBSTATION NO. 2	59.00	60	59,140	7,690	2,670	4,170	350	690	74,710	
A.600.609-.04 SUBSTATION NO. 3	52.00	60	52,830	6,870	2,390	3,720	320	620	66,740	
A.600.609-.05 SUBSTATION NO. 4	48.00	60	48,760	6,340	2,200	3,440	290	570	61,600	
A.600.609-.06 SUBSTATION NO. 5	56.00	60	56,890	7,400	2,570	4,010	340	670	71,880	
A.600.609-.07 SUBSTATION NO. 6	52.00	60	52,830	6,870	2,390	3,720	320	620	66,740	
A.600.609-.08 DUCT BANK SYSTEM	374.00	40	374,440	48,680	16,920	26,400	2,240	4,400	473,080	

LABOR ID: HAN94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

Wed 21 Sep 1994
Eff. Date 08/09/94

PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.600.609-.VE VE reduction of 10% f/ re-siting			-97,030	-12,610	-4,380	-6,830	-570	-1,130	-122,600	
TOTAL Electrical On-Site System	64.00	ACR	678,900	88,260	30,690	47,870	4,060	7,970	857,750	13402.28
A.600.610- Telecomm. System - Off-Site										
A.600.610-.EA Fiber Optic-3719 to Hammer Site			20,000	2,600	900	1,410	120	230	25,270	
A.600.610-.EB Bldg 3220 Equipment			148,140	19,260	6,700	10,450	890	1,740	187,160	
A.600.610-.EC Bldg 3719 Equipment			82,030	10,660	3,710	5,780	490	960	103,640	
A.600.610-.ER Eliminate HLAN to outbuildings			-9,780	-1,260	-430	-680	-50	-110	-12,360	
TOTAL Telecomm. System - Off-Site			240,370	31,250	10,860	16,950	1,440	2,820	303,690	
A.600.614- LPG Gas On-site System										
A.600.614-.02 LPG Gas Pipe Lines Both Types	6300.00	LF	25,200	3,280	1,140	1,780	150	300	31,840	5.05
A.600.614-.A2 LPG Gas Tank 15,000 Gal Tank	1.00	EA	41,700	5,420	1,880	2,940	250	490	52,690	52685.17
TOTAL LPG Gas On-site System	6300.00	LF	66,900	8,700	3,020	4,720	400	790	84,520	13.42
TOTAL Utilities	64.00	ACR	2,674,350	341,170	118,620	185,050	15,690	30,810	3,365,690	52588.91
A.700 Special Equipment/Process System										
A.700.702- Hazmat Training Pad										
A.700.702-.02 Site Work										
A.700.702-.02.023 Gravel Paved Area	1000.00	CY	15,510	2,020	700	1,090	90	180	19,600	19.60
A.700.702-.02.024 Water Excavation Trench (4' deep)	96.80	BCY	80	10	0	10	0	0	100	1.03
A.700.702-.02.028 Water Pipe Bedding	11.00	BCY	250	30	10	20	0	0	320	28.74
A.700.702-.02.02C Water Pipe Trench Zone Backfill	85.80	BCY	440	60	20	30	0	10	560	6.51
A.700.702-.02.15A Water Supply 1" Dia	220.00	LF	1,850	240	80	130	10	20	2,340	10.63
A.700.702-.02.32A SS Excavation Trench (4' deep)	352.00	BCY	290	40	10	20	0	0	360	1.03
A.700.702-.02.32B SS Pipe Bedding	40.00	BCY	910	120	40	60	10	10	1,150	28.74
A.700.702-.02.32C SS Trench Zone Backfill	312.00	BCY	1,610	210	70	110	10	20	2,030	6.51
A.700.702-.02.35A SS 4" Dia Drain Line	800.00	LF	7,820	1,020	350	550	50	90	9,880	12.35
TOTAL Site Work			28,760	3,740	1,300	2,030	170	340	36,330	
A.700.702-.03 Concrete										
A.700.702-.03.02A Excavate for Slab	1111.11	BCY	1,520	200	70	110	10	20	1,920	1.73
A.700.702-.03.02B Gravel Fill Under Slab	740.74	CY	17,050	2,220	770	1,200	100	200	21,540	29.08
A.700.702-.03.03A Concrete Slab	832.07	CY	225,460	29,310	10,190	15,900	1,350	2,650	284,850	342.34
TOTAL Concrete	4000.00	SF	244,030	31,720	11,030	17,210	1,460	2,870	308,310	7.71

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HANF94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT HANG94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

U.S. Army Corps of Engineers
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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BEO Tax	BOND	TOTAL COST	UNIT COST
A.700.702-.10 Specialties										
A.700.702-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.702-.10.108 Pipe Bollards Filled W/ Concrete	4.00	EA	1,510	200	70	110	10	20	1,910	477.48
TOTAL Specialties			3,510	460	160	250	20	40	4,440	
A.700.702-.15 Electrical			1,340	170	60	90	10	20	1,690	
TOTAL Hazmat Training Pad			277,630	36,090	12,550	19,580	1,660	3,260	350,770	
A.700.704- Well Sampling Stations										
A.700.704-.02 Site Work										
A.700.704-.02.02A Drill 8" Well, Casing & Bentonite	64.00	LF	8,960	1,160	400	630	50	110	11,320	176.88
A.700.704-.02.02B Drill 6" Well, Casing & Bentonite	56.00	LF	7,000	910	320	490	40	80	8,840	157.93
TOTAL Site Work	120.00	CY	15,960	2,070	720	1,130	100	190	20,160	168.04
A.700.704-.03 Concrete										
A.700.704-.03.02A Concrete Encasement & Pad	10.00	CY	1,280	170	60	90	10	20	1,620	161.79
TOTAL Concrete	10.00	CY	1,280	170	60	90	10	20	1,620	161.79
A.700.704-.10 Specialties										
A.700.704-.10.050 Signs	2.00	EA	1,000	130	50	70	10	10	1,260	631.72
A.700.704-.10.10A Locks	2.00	EA	50	10	0	0	0	0	60	31.59
A.700.704-.10.10B Pipe Bollards Filled W/ Concrete	8.00	EA	3,020	390	140	210	20	40	3,820	477.48
TOTAL Specialties	8.00	EA	4,070	530	180	290	20	50	5,150	643.31
A.700.704-.15 Electrical			650	80	30	50	0	10	820	
TOTAL Well Sampling Stations	2.00	EA	21,960	2,850	990	1,550	130	260	27,750	13873.12
A.700.705- Railroad Tank Cars w/ Rail Prop										
A.700.705-.10 Specialties										
A.700.705-.10.02A Railroad Track & Ballast	200.00	LF	37,830	4,920	1,710	2,670	230	440	47,790	238.97
A.700.705-.10.02B Pickup Railroad Tank Cars	2.00	EA	2,690	350	120	190	20	30	3,400	1700.52
A.700.705-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.705-.10.10B Pipe Bollards Filled W/ Concrete	4.00	EA	1,510	200	70	110	10	20	1,910	477.48

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT HANF94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 15

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
TOTAL Specialties	120.00	LF	44,030	5,720	1,990	3,100	260	520	55,630	463.60
A.700.705-.15 Electrical			680	90	30	50	0	10	860	
TOTAL Railroad Tank Cars w/ Rail Prop			44,720	5,810	2,020	3,150	270	530	56,500	
A.700.706- Craft Spec Prop & Buried SimWaste										
A.700.706-.10 Specialties										
A.700.706-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.706-.10.108 Pipe Bollards Filled w/ Concrete	4.00	EA	1,510	200	70	110	10	20	1,910	477.48
TOTAL Specialties			3,510	460	160	250	20	40	4,440	
A.700.706-.15 Electrical			680	90	30	50	0	10	860	
TOTAL Craft Spec Prop & Buried SimWaste			4,200	550	190	300	30	50	5,300	
A.700.707- Characterization /Remediatn Site										
A.700.707-.10 Specialties										
A.700.707-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.707-.10.108 Pipe Bollards Filled w/ Concrete	4.00	EA	1,510	200	70	110	10	20	1,910	477.48
TOTAL Specialties			3,510	460	160	250	20	40	4,440	
A.700.707-.15 Electrical			680	90	30	50	0	10	860	
TOTAL Characterization /Remediatn Site			4,200	550	190	300	30	50	5,300	
A.700.708- Trench Site Prop										
A.700.708-.02 Excavation and Backfill										
A.700.708-.02.02A Trench, Excavation	9630.00	BCY	26,340	3,420	1,190	1,860	160	310	33,280	3.46
A.700.708-.02.02B Trench, Gravel Backfill	965.00	BCY	22,210	2,890	1,000	1,570	130	260	28,060	29.08
A.700.708-.02.02C Trench, Backfill	600.00	BCY	3,260	420	150	230	20	40	4,110	6.86
TOTAL Excavation and Backfill			51,810	6,740	2,340	3,650	310	610	65,460	
A.700.708-.06 Wood and Plastic										
A.700.708-.06.07A Timber Crib Structure	102.00	EA	9,080	1,180	410	640	50	110	11,470	112.46
TOTAL Wood and Plastic			9,080	1,180	410	640	50	110	11,470	

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HANF94A UPB ID: NAT92A

Wed 21 Sep 1994
 Eff. Date 08/09/94
 U.S. Army Corps of Engineers
 PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
 Hammer CDR - VE+ Estimate, 9/21/94
 ** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **
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 SUMMARY PAGE 16

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.700.708-.10 Specialties										
A.700.708-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.708-.10.108 Pipe Bollards Filled W/ Concrete	7.00	EA	2,650	340	120	190	20	30	3,340	477.48
TOTAL Specialties			4,650	600	210	330	30	50	5,870	
A.700.708-.15 Electrical			680	90	30	50	0	10	860	
TOTAL Trench Site Prop			66,220	8,610	2,990	4,670	400	780	83,670	
A.700.709- Confined Space/Fall Protectn Prp										
A.700.709-.02 Site Work										
A.700.709-.02.023 Gravel Paved Area	60.00	CY	930	120	40	70	10	10	1,180	19.60
A.700.709-.02.024 Excavation Trench (4' deep)	33.00	BCY	30	0	0	0	0	0	30	1.03
A.700.709-.02.028 Pipe Bedding	3.75	BCY	90	10	0	10	0	0	110	28.74
A.700.709-.02.02C Trench Zone Backfill	29.25	BCY	150	20	10	10	0	0	190	6.51
A.700.709-.02.15A 1" Dia Water Supply Main	75.00	LF	880	110	40	60	10	10	1,110	14.74
TOTAL Site Work			2,070	270	90	150	10	20	2,610	
A.700.709-.10 Specialties										
A.700.709-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.709-.10.06A Pack-up Wood Confined Space Str			14,050	1,830	640	990	80	170	17,750	
A.700.709-.10.06B Set-up Wood Confined Space Str.			14,940	1,940	680	1,050	90	180	18,870	
A.700.709-.10.108 Pipe Bollards Filled W/ Concrete	5.00	EA	1,890	250	90	130	10	20	2,390	477.48
TOTAL Specialties			32,880	4,270	1,490	2,320	200	390	41,540	
A.700.709-.15 Electrical			470	60	20	30	0	10	590	
TOTAL Confined Space/Fall Protectn Prp			35,410	4,600	1,600	2,500	210	420	44,740	
A.700.710- Above Ground Pipeline Pad										
A.700.710-.02 Site Work										
A.700.710-.02.023 Gravel Paved Area	62.00	CY	960	130	40	70	10	10	1,210	19.60
A.700.710-.02.02A Water Excavation Trench (4' deep)	101.20	BCY	80	10	0	10	0	0	100	1.03
A.700.710-.02.02B Water Pipe Bedding	11.50	BCY	260	30	10	20	0	0	330	28.74
A.700.710-.02.02C Water Pipe Trench Zone Backfill	89.70	BCY	460	60	20	30	0	10	580	6.51
A.700.710-.02.15A Water Supply 1" Dia	230.00	LF	2,010	260	90	140	10	20	2,540	11.06
A.700.710-.02.32A SS Excavation Trench (4' deep)	79.20	BCY	60	10	0	0	0	0	80	1.03
A.700.710-.02.32B SS Pipe Bedding	9.00	BCY	200	30	10	10	0	0	260	28.74
A.700.710-.02.32C SS Trench Zone Backfill	70.20	BCY	360	50	20	30	0	0	460	6.51

LABOR ID: HANF94 EQUIP ID: NAT93A CURRENCY IN DOLLARS CREW ID: HANF94A UPB ID: NAT92A

Wed 21 Sep 1994
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PROJECT IIAIG94; Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 17

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O TAX	BOND	TOTAL COST	UNIT COST
A.700.710-.02.35A SS 4" Dia Drain Line	180.00	LF	1,970	260	90	140	10	20	2,490	13.81
TOTAL Site Work			6,380	830	290	450	40	70	8,060	
A.700.710-.03 Concrete										
A.700.710-.03.02A Excavate for Slab	69.44	BCY	90	10	0	10	0	0	120	1.73
A.700.710-.03.02B Gravel Fill Under Slab	46.30	CY	1,070	140	50	80	10	10	1,350	29.08
A.700.710-.03.03A Concrete Slab	46.30	CY	13,190	1,710	600	930	80	150	16,660	359.87
TOTAL Concrete	2500.00	SF	14,350	1,870	650	1,010	90	170	18,130	7.25
A.700.710-.10 Specialties										
A.700.710-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.710-.10.10B Pipe Ballards Filled W/ Concrete	7.00	EA	2,650	340	120	190	20	30	3,340	477.48
TOTAL Specialties			4,650	600	210	330	30	50	5,870	
A.700.710-.14 Mechanical										
A.700.710-.14.15A Natural Gas Prop.4"dia Pipe Line	20.00	LF	14,000	1,820	630	990	80	160	17,690	884.31
A.700.710-.14.15B Petroleum Prop, 6"dia Pipe Line	30.00	LF	7,320	950	330	520	40	90	9,250	308.40
TOTAL Mechanical			21,320	2,770	960	1,500	130	250	26,940	
A.700.710-.15 Electrical										
TOTAL Above Ground Pipeline Pad			1,070	140	50	80	10	10	1,350	
			47,760	6,210	2,160	3,370	290	560	60,350	
A.700.711- Buried & Above Ground Tanks Prop										
A.700.711-.02 Site Work										
A.700.711-.02.023 Gravel Paved Area	660.00	CY	10,240	1,330	460	720	60	120	12,930	19.60
A.700.711-.02.02A Water Excavation Trench (4'deep)	101.20	BCY	80	10	0	10	0	0	100	1.03
A.700.711-.02.02B Water Pipe Bedding	11.50	BCY	260	30	20	20	0	0	330	28.74
A.700.711-.02.02C Water Pipe Trench Zone Backfill	89.70	BCY	460	60	10	30	0	10	580	6.51
A.700.711-.02.15A Water Supply 1" Dia	230.00	LF	2,660	350	120	190	20	30	3,360	14.59
A.700.711-.02.32A SS Excavation Trench (4' deep)	101.20	BCY	80	10	0	10	0	0	100	1.03
A.700.711-.02.32B SS Pipe Bedding	11.50	BCY	260	30	10	20	0	0	330	28.74
A.700.711-.02.32C SS Trench Zone Backfill	89.70	BCY	260	60	20	30	0	10	580	6.51
A.700.711-.02.35A SS 4" Dia Drain Line	230.00	LF	2,260	290	100	160	10	20	2,850	12.41
A.700.711-.02.42A Buried Tank Trench Exc (15'deep)	600.00	BCY	490	60	20	30	0	10	620	1.03
A.700.711-.02.42B Buried Tank Bedding	1,500	70	1,500	200	70	110	10	20	1,900	28.74
A.700.711-.02.42C Buried Tank Trench Zone Backfill	530.00	BCY	2,730	360	120	190	20	30	3,450	6.51

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAM94A UPB ID: NAY92A

Wed 21 Sep 1994
Eff. Date 08/09/94

U.S. Army Corps of Engineers
PROJECT HANG94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
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SUMMARY PAGE 18

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
A.700.711-.02.45A Buried Tank 10,000 Gal	1.00	EA	7,620	990	340	540	50	90	9,620	9621.85
TOTAL Site Work			29,100	3,780	1,320	2,050	170	340	36,770	
A.700.711-.03 Concrete										
A.700.711-.03.02A Excavate for Tank Slab	28.44	8CY	40	10	0	0	0	0	50	1.73
A.700.711-.03.02B Gravel Fill Under Tank Slab	18.96	CY	440	60	20	30	0	10	550	29.08
A.700.711-.03.03A Concrete Tank Slab & Curb	34.77	CY	10,150	1,320	460	720	60	120	12,820	368.87
A.700.711-.03.05A Above Ground Tank 10,000 Gal	1.00	EA	7,620	990	340	540	50	90	9,620	9621.85
TOTAL Concrete	1024.00	SF	18,240	2,370	820	1,290	110	210	23,050	22.51
A.700.711-.10 Specialties										
A.700.711-.10.050 Signs	4.00	EA	2,000	260	90	140	10	20	2,530	631.72
A.700.711-.10.10B Pipe Bollards Filled W/ Concrete	5.00	EA	1,890	250	90	130	10	20	2,390	477.48
TOTAL Specialties			3,890	510	180	270	20	50	4,910	
A.700.711-.15 Electrical										
TOTAL Buried & Above Ground Tanks Prop			51,920	6,750	2,350	3,660	310	610	65,590	
TOTAL Special Equipment/Process System	9.00	EA	554,010	72,020	25,040	39,060	3,310	6,510	699,960	77773.21
TOTAL HAMMER Training Center, Phase 1	64.00	ACR	4,822,550	620,430	215,720	336,520	28,540	56,040	6,079,800	94996.86
B HAMMER Training Center, Phase 2										
B.460 Improvements to Land										
B.460.401- Site Finish Grading										
B.460.401-.02 Site Finish Grading Walkways										
B.460.401-.02.02A Walkways: Grubbing	3390.00	SY	2,080	250	90	120	10	20	2,570	0.76
B.460.401-.02.02B Walkways: Excavation	1010.00	CY	3,010	360	130	180	20	30	3,750	3.69
TOTAL Site Finish Grading Walkways	3390.00	SY	5,090	610	210	300	30	60	6,300	1.86
B.460.401-.A2 Grading Roads and Pavement Areas										
B.460.401-.A2.023 Roads Grading around Buildings	18170.00	SY	7,360	880	310	430	40	80	9,110	0.50
TOTAL Grading Roads and Pavement Areas	18170.00	SY	7,360	880	310	430	40	80	9,110	0.50

LABOR ID: HANF94 EQUIP ID: NAT93A

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PROJECT HAN94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
B.460.401-.B2										
B.460.401-.B2.023	11489.00	SY	4,560	550	190	270	30	50	5,640	0.49
TOTAL Regrade Building Sites	11489.00	SY	4,560	550	190	270	30	50	5,640	0.49
B.460.401-.C3	13067.00	SY	5,190	620	220	300	30	60	6,420	0.49
TOTAL Site Finish Grading	46116.00	SY	22,210	2,670	930	1,290	130	250	27,480	0.60
B.460.402- Paved Driveway Roads & Walkways										
B.460.402-.02										
B.460.402-.02.021	33680.00	SY	320,600	38,470	13,470	18,630	1,880	3,540	396,570	11.77
B.460.402-.02.022	238.00	EA	32,860	3,940	1,380	1,910	190	360	40,840	170.78
B.460.402-.02.023	5843.00	SY	32,730	3,930	1,370	1,900	190	360	40,480	6.93
TOTAL Paved Areas - Around Building	33680.00	SY	386,180	46,340	16,220	22,440	2,260	4,260	477,700	14.18
B.460.402-.B2										
B.460.402-.B2.021	3390.00	SY	31,560	3,790	1,330	1,830	180	350	39,040	11.52
TOTAL Paved Areas - Walkways	3390.00	SY	31,560	3,790	1,330	1,830	180	350	39,040	11.52
TOTAL Paved Driveway Roads & Walkways	37070.00	SY	417,740	50,130	17,550	24,270	2,450	4,610	516,740	13.94
B.460.403- Landscaping										
B.460.403-.02										
B.460.403-.02.020	10.00	MSY	3,940	470	170	230	20	40	4,870	487.32
B.460.403-.02.02A			25,410	3,050	1,070	1,480	150	280	31,430	
B.460.403-.02.02B			5,370	640	230	310	30	60	6,640	
B.460.403-.02.02C	4.00	ACR	25,040	3,000	1,050	1,450	150	280	30,970	7743.51
B.460.403-.02.02D	29.00	ACR	73,330	8,800	3,080	4,260	430	810	90,710	3127.81
B.460.403-.02.02E	3.00	ACR	18,700	2,240	790	1,090	110	210	23,130	7711.38
TOTAL Landscaping	32.00	ACR	151,780	18,210	6,370	8,820	890	1,670	187,750	5867.30
TOTAL Landscaping	32.00	ACR	151,780	18,210	6,370	8,820	890	1,670	187,750	5867.30
TOTAL Improvements to Land	64.00	ACR	591,730	71,010	24,850	34,380	3,470	6,530	731,970	11437.00

B.501 Buildings

LABOR ID: HANF94 EQUIP ID: NAT93A

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	8&O Tax	BOND	TOTAL COST	UNIT COST
B.501.501- Administration Building										
B.501.501-.01 Foundation	33180.00	SF	152,020	18,240	6,380	8,830	890	1,680	188,040	5.67
B.501.501-.02 Substructure	33180.00	SF	155,130	18,620	6,520	9,010	910	1,710	191,900	5.78
B.501.501-.03 Superstructure	33180.00	SF	163,640	19,640	6,870	9,510	960	1,800	202,420	6.10
B.501.501-.04 Exterior Closure	33180.00	SF	373,540	44,820	15,690	21,700	2,190	4,120	462,060	13.93
B.501.501-.05 Roofing	33180.00	SF	810,680	97,280	34,050	47,100	4,750	8,940	1,002,810	30.22
B.501.501-.06 Interior Construction	33180.00	SF	436,290	52,350	18,320	25,350	2,540	4,810	539,690	16.27
B.501.501-.15 Mechanical	33180.00	SF	547,580	65,710	23,000	31,810	3,210	6,040	677,350	20.41
B.501.501-.16 Electrical										
B.501.501-.16.16A Electrical	33180.00	SF	371,470	44,580	15,600	21,580	2,180	4,100	459,500	13.85
TOTAL Electrical	33180.00	SF	371,470	44,580	15,600	21,580	2,180	4,100	459,500	13.85
TOTAL Administration Building	33180.00	SF	3,010,350	361,240	126,430	174,900	17,630	33,210	3,723,770	112.23
B.501.503- Training Support Building										
B.501.503-.01 Foundation	33800.00	SF	81,470	9,780	3,420	4,730	480	900	100,780	2.98
B.501.503-.02 Substructure	33800.00	SF	153,120	18,370	6,430	8,900	900	1,690	189,400	5.60
B.501.503-.03 Superstructure	33800.00	SF	505,140	60,620	21,220	29,350	2,960	5,570	624,850	18.49
B.501.503-.04 Exterior Closure	33800.00	SF	50,080	6,010	2,100	2,910	290	550	61,950	1.83
B.501.503-.05 Roofing	33800.00	SF	85,980	10,320	3,610	5,000	500	950	106,350	3.15
B.501.503-.06 Interior Construction	33800.00	SF	137,470	16,500	5,770	7,990	810	1,520	170,050	5.03
B.501.503-.13 Special Construction	33800.00	SF	36,860	4,420	1,550	2,140	220	410	45,600	1.35
B.501.503-.15 Mechanical	33800.00	SF	688,680	82,640	28,920	40,010	4,030	7,600	851,890	25.20
B.501.503-.16 Electrical										
B.501.503-.16.16A Electrical	33800.00	SF	252,970	30,360	10,620	14,700	1,480	2,790	312,920	9.26
TOTAL Electrical	33800.00	SF	252,970	30,360	10,620	14,700	1,480	2,790	312,920	9.26
TOTAL Training Support Building	33800.00	SF	1,991,770	239,010	83,650	115,720	11,660	21,970	2,463,790	72.89
B.501.504- Comfort Station										
B.501.504-.01 Foundation	2050.00	SF	11,570	1,390	490	670	70	130	14,310	6.98
B.501.504-.02 Substructure	2050.00	SF	8,800	1,060	370	510	50	100	10,880	5.31
B.501.504-.03 Superstructure	2050.00	SF	13,290	1,590	560	770	80	150	16,440	8.02
B.501.504-.04 Exterior Closure	2050.00	SF	28,430	3,410	1,190	1,650	170	310	35,170	17.15
B.501.504-.05 Roofing	2050.00	SF	48,140	5,780	2,020	2,800	280	530	59,540	29.05
B.501.504-.06 Interior Construction	2050.00	SF	19,170	2,300	810	1,110	110	210	23,720	11.57
B.501.504-.15 Mechanical	2050.00	SF	35,780	4,290	1,500	2,080	210	390	44,260	21.59
B.501.504-.16 Electrical										

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
8.501.504-.16.16A Electrical	2050.00	SF	13,190	1,580	550	770	80	150	16,310	7.96
TOTAL Electrical	2050.00	SF	13,190	1,580	550	770	80	150	16,310	7.96
TOTAL Comfort Station	2050.00	SF	178,360	21,400	7,490	10,360	1,040	1,970	220,630	107.62
8.501.507- Burn Structure Prop										
8.501.507-.03 Superstructure	4500.00	SF	336,640	40,400	14,140	19,560	1,970	3,710	416,410	92.54
8.501.507-.13 Special Construction	4500.00	SF	767,550	92,110	32,260	44,590	4,500	8,470	949,450	7.65
8.501.507-.15 Mechanical	4500.00	SF	27,840	3,340	1,170	1,620	160	310	34,430	10.45
8.501.507-.16 Electrical	4500.00	SF	38,030	4,560	1,600	2,210	220	420	47,050	321.63
TOTAL Burn Structure Prop	4500.00	SF	1,170,050	140,410	49,140	67,980	6,850	12,910	1,447,340	
8.501.508- Training Tower										
8.501.508-.01 Foundation	5850.00	SF	11,790	1,410	500	690	70	130	14,590	2.49
8.501.508-.02 Substructure	5850.00	SF	57,740	6,930	2,430	3,350	340	640	71,430	12.21
8.501.508-.03 Superstructure	5850.00	SF	51,790	6,210	2,180	3,010	300	570	64,060	10.95
8.501.508-.04 Exterior Closure	5850.00	SF	221,020	26,520	9,280	12,840	1,290	2,440	273,400	46.74
8.501.508-.05 Roofing	5850.00	SF	2,030	240	90	120	10	20	2,510	0.43
8.501.508-.13 Special Construction	840.00	SF	34,910	4,190	1,470	2,030	200	390	43,180	51.41
8.501.508-.15 Mechanical	5850.00	SF	9,480	1,140	400	550	60	100	11,730	2.01
8.501.508-.16 Electrical										
8.501.508-.16.16A Electrical	5850.00	SF	7,240	870	300	420	40	80	8,950	1.53
TOTAL Electrical	5850.00	SF	7,240	870	300	420	40	80	8,950	1.53
TOTAL Training Tower	5850.00	SF	396,000	47,520	16,630	23,010	2,320	4,370	489,850	83.73
8.501.509- SCBA Search and Rescue Prop										
8.501.509-.01 Foundation	5010.00	SF	13,950	1,670	590	810	80	150	17,260	3.44
8.501.509-.02 Substructure	5010.00	SF	7,500	900	310	440	40	80	9,270	1.85
8.501.509-.03 Superstructure	5010.00	SF	38,000	4,560	1,600	2,210	220	420	47,000	9.38
8.501.509-.04 Exterior Closure	5010.00	SF	107,350	12,880	4,510	6,240	630	1,180	132,790	26.51
8.501.509-.05 Roofing	5010.00	SF	36,200	4,340	1,520	2,100	210	400	44,770	8.94
8.501.509-.06 Interior Construction	5010.00	SF	31,400	3,770	1,320	1,820	180	350	38,850	7.75
8.501.509-.13 Special Construction	5010.00	SF	10,720	1,290	450	620	60	120	13,260	2.65
8.501.509-.15 Mechanical	5010.00	SF	15,620	1,870	660	910	90	170	19,320	3.86
8.501.509-.16 Electrical										
8.501.509-.16.16A Electrical	5010.00	SF	49,580	5,950	2,080	2,880	290	550	61,340	12.24

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
TOTAL Electrical	5010.00	SF	49,580	5,950	2,080	2,880	290	550	61,340	12.24
TOTAL SCBA Search and Rescue Prop	5010.00	SF	310,320	37,240	13,030	18,030	1,820	3,420	383,870	76.62
TOTAL Buildings	85290.00	SF	7,056,860	846,820	296,390	410,000	41,330	77,840	8,729,240	102.35
B.600 Utilities										
B.600.601- Site Electrical & Lighting										
B.600.601-.01 Area Lighting	64.00	ACR	246,810	29,620	10,370	14,340	1,450	2,720	305,300	4770.35
B.600.601-.02 Telecomm. System - On-Site	64.00	ACR	164,320	19,720	6,900	9,550	960	1,810	203,260	3175.89
B.600.601-.03 Comm. System - On-Site	64.00	ACR	956,620	114,790	40,180	55,580	5,600	10,550	1,183,320	18489.40
B.600.601-.04 Eliminate PLC from burn props			-19,040	-2,280	-790	-1,100	-100	-200	-23,560	
TOTAL Site Electrical & Lighting	64.00	ACR	1,348,690	161,840	56,650	78,360	7,900	14,880	1,668,310	26067.42
TOTAL Utilities	64.00	ACR	1,348,690	161,840	56,650	78,360	7,900	14,880	1,668,310	26067.42
B.700 Special Equipment/Process System										
B.700.701- Flammable Liquids Burn Pad										
B.700.701-.02 Site Work										
B.700.701-.02.023 Gravel Paved Area	140.00	CY	2,170	260	90	130	10	20	2,690	19.19
B.700.701-.02.024 Water Excavation Trench (4' deep)	44.00	BCY	40	0	0	0	0	0	40	1.01
B.700.701-.02.028 Water Pipe Bedding	5.00	BCY	110	10	0	10	0	0	140	28.14
B.700.701-.02.02C Water Pipe Trench Zone Backfill	39.00	BCY	200	20	10	10	0	0	250	6.38
B.700.701-.02.15A Water Supply 1" Dia	100.00	LF	1,040	130	40	60	10	10	1,290	12.91
B.700.701-.02.42A 8" Excavation Trench (5'-6" deep	136.00	BCY	110	10	0	10	0	0	140	1.01
B.700.701-.02.42B 8" Pipe Bedding	38.00	BCY	860	100	40	50	10	10	1,070	28.14
B.700.701-.02.42C 8" Trench Zone Backfill	100.00	BCY	520	60	20	30	0	10	640	6.38
B.700.701-.02.45A 8" 8" Dia Recir Water Supply Main	200.00	LF	7,360	880	310	430	40	80	9,100	45.51
B.700.701-.02.45C 8" 8" Cast Iron Hydrant	2.00	EA	7,420	890	310	430	40	80	9,180	4588.25
B.700.701-.02.62A 16" Excavation Trench (5' avg deep	273.00	BCY	220	30	10	10	0	0	270	1.01
B.700.701-.02.62B 16" Pipe Bedding	19.00	BCY	430	50	20	30	0	0	530	28.14
B.700.701-.02.62C 16" Trench Zone Backfill	254.00	BCY	1,310	160	50	80	10	10	1,620	6.38
B.700.701-.02.65A 16" Dia Recir Drain Line	100.00	LF	2,590	310	110	150	20	30	3,200	31.98
B.700.701-.02.72A 16" Excavation Trench (5' avg deep	204.75	BCY	170	20	10	10	0	0	210	1.01
B.700.701-.02.72B 16" Pipe Bedding	14.25	BCY	320	40	10	20	0	0	400	28.14
B.700.701-.02.72C 16" Trench Zone Backfill	190.50	BCY	980	120	40	60	10	10	1,210	6.38
B.700.701-.02.75A 16" Dia Recir CCP Drain Line	75.00	LF	3,300	400	140	190	20	40	4,080	54.40
B.700.701-.02.90A LPG Gas Pipe Lines Both Types	100.00	LF	400	50	20	20	0	0	500	4.97
TOTAL Site Work			29,560	3,550	1,240	1,720	170	330	36,560	

B.700.701-.03 Concrete

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U.S. Army Corps of Engineers										
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Hammer CDR - VE+ Estimate, 9/21/94										
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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
B.700.701-.03.02A Outer Excavate for Slab	131.25	BCY	180	20	10	10	0	0	220	1.69
B.700.701-.03.02B Outer Gravel Fill Under Slab	87.50	CY	2,010	240	80	120	10	20	2,490	28.47
B.700.701-.03.03A Outer Concrete Slab	3.34	CY	9,080	1,090	380	530	50	100	11,230	3359.16
B.700.701-.03.12A Refraction Excavate for Slab	12.00	BCY	20	0	0	0	0	0	20	1.69
B.700.701-.03.12B Refraction Gravel Fill Under Slab	8.00	CY	180	20	10	10	0	0	230	28.47
B.700.701-.03.13A Refraction Concrete Slab	8.00	CY	16,190	1,940	680	940	90	180	20,030	2503.32
B.700.701-.03.22A Burn Zone Excavate for Slab	18.75	BCY	30	0	0	0	0	0	30	1.69
B.700.701-.03.22B Burn Zone Gravel Fill Under Slab	6.94	CY	160	20	10	10	0	0	200	28.47
B.700.701-.03.23A Burn Zone Concrete Slab	12.22	CY	3,360	400	140	200	20	40	4,160	339.99
B.700.701-.03.A2A Weir Vault Excavate	180.50	BCY	2,250	30	10	10	0	0	310	1.69
B.700.701-.03.A2B Weir Vault Gravel Fill Under Slab	1.67	CY	40	0	0	0	0	0	50	28.47
B.700.701-.03.A2C Weir Vault Backfill	145.13	BCY	850	100	40	50	0	10	1,050	6.38
B.700.701-.03.A3A Weir Vault Lower Concrete Slab	3.34	CY	800	100	30	50	0	10	990	294.76
B.700.701-.03.A3B Weir Vault Upper Concrete Slab	1.12	CY	660	80	30	40	0	10	810	727.26
B.700.701-.03.A3C Weir Vault Lower Concrete Wall	2.93	CY	1,320	160	60	80	10	10	1,630	558.17
TOTAL Concrete	35,120		4,210	1,470	210	2,040	390	43,440		
B.700.701-.05 Metals										
B.700.701-.05.05A Metals 1-1/2" Riveted Steel Grad	576.00	SF	8,430	1,100	380	590	50	100	10,650	18.49
B.700.701-.05.05B Metals 1/4" Galv Grading	91.00	SF	590	80	30	40	0	10	740	8.15
TOTAL Metals	9,020		1,170	410	50	640	110	11,390		
B.700.701-.10 Specialties										
B.700.701-.10.050 Signs	4.00	EA	2,000	240	80	120	10	20	2,470	618.49
B.700.701-.10.108 Pipe Bollards Filled w/ Concrete	3.00	EA	1,130	140	50	70	10	10	1,400	467.49
B.700.701-.10.13A Flammable Liquid Equipment	250.00		30,000	10,500	14,530	1,460	2,760	309,250		
TOTAL Specialties	253,130		30,380	10,630	14,710	1,480	2,790	313,120		
B.700.701-.15 Electrical	730		90	30	40	0	10	910		
TOTAL Flammable Liquids Burn Pad	327,550		39,400	13,790	19,140	1,920	3,620	405,420		
B.700.702- Liquid Petroleum Gas(LPG)Burn Pad										
B.700.702-.02 Site Work										
B.700.702-.02.023 Gravel Paved Area	250.00	CY	3,880	470	160	230	20	40	4,800	19.19
B.700.702-.02.02A Water Excavation Trench (4' deep)	44.00	BCY	40	0	0	0	0	0	40	1.01
B.700.702-.02.02B Water Pipe Bedding Trench	110		10	0	0	10	0	0	140	28.14
B.700.702-.02.02C Water Pipe Trench Zone Backfill	39.00	BCY	200	20	10	10	0	0	250	6.38
B.700.702-.02.15A Water Supply 1" Dia	100.00	LF	1,040	130	40	60	10	10	1,290	12.91
B.700.702-.02.42A 8" Excavation Trench (5'-6" deep	138.00	BCY	110	10	0	10	0	0	140	1.01
B.700.702-.02.42B 8" Pipe Bedding	38.00	BCY	860	100	40	50	10	10	1,070	28.14

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HANF94A UPB ID: NAT92A

Wed 21 Sep 1994
Eff. Date 08/09/94

PROJECT HAN94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
8.700.702-.02.42C 8T Trench Zone Backfill	100.00	BCY	520	60	20	30	0	10	640	6.38
8.700.702-.02.45A 8T 8" Dia Recir Water Supply Main	200.00	LF	7,360	880	310	430	40	80	9,100	45.51
8.700.702-.02.45C 8T 8" Cast Iron Hydrant	2.00	EA	7,420	890	310	430	40	80	9,180	4588.25
8.700.702-.02.62A 16 Excavation Trench(5'avg deep	477.75	BCY	390	50	20	20	0	0	480	1.01
8.700.702-.02.62B 16 Pipe Bedding	33.25	BCY	760	90	30	40	0	10	940	28.14
8.700.702-.02.62C 16 Trench Zone Backfill	444.50	BCY	2,290	270	100	130	10	30	2,830	6.38
8.700.702-.02.65A 16" Dia Recir Drain Line	175.00	LF	4,520	540	190	260	30	50	5,600	31.98
8.700.702-.02.90A LPG Gas Pipe Lines Both Types	400.00	LF	1,610	190	70	90	10	20	1,990	4.97
TOTAL Site Work			31,110	3,730	1,310	1,810	180	340	38,480	
8.700.702-.03 Concrete										
8.700.702-.03.02A Excavate for Slab	277.78	BCY	380	50	20	20	0	0	470	1.69
8.700.702-.03.02B Gravel Fill Under Slab	185.19	CY	4,260	510	180	250	20	50	5,270	28.47
8.700.702-.03.03A Concrete Slab	222.22	CY	88,300	10,600	3,710	5,130	520	970	109,230	491.52
TOTAL Concrete	1000.00	SF	92,940	11,150	3,900	5,400	540	1,030	114,970	11.50
8.700.702-.10 Specialties										
8.700.702-.10.050 Signs	4.00	EA	2,000	240	80	120	10	20	2,470	618.49
8.700.702-.10.108 Pipe Bollards Filled W/ Concrete	3.00	EA	1,130	140	50	70	10	10	1,400	467.49
8.700.702-.10.13A LCP Equipment			150,000	18,000	6,300	8,720	880	1,650	185,550	
TOTAL Specialties			153,130	18,380	6,430	8,900	900	1,690	189,420	
8.700.702-.15 Electrical			710	90	30	40	0	10	880	
TOTAL Liquid Petroleum Gas(LPG)Burn Pad			277,900	33,350	11,670	16,150	1,630	3,070	343,750	
8.700.703- Railroad / Truck Tank Burn Pad										
8.700.703-.02 Site Work										
8.700.703-.02.023 Gravel Paved Area	970.00	CY	15,040	1,810	630	870	90	170	18,610	19.19
8.700.703-.02.02A Water Excavation Trench (4'deep)	70.40	BCY	60	10	0	0	0	0	70	1.01
8.700.703-.02.02B Water Pipe Bedding	180	BCY	180	20	10	10	0	0	230	28.14
8.700.703-.02.02C Water Pipe Trench Zone Backfill	62.40	BCY	320	40	10	20	0	0	400	6.38
8.700.703-.02.15A Water Supply 2" Dia	160.00	LF	2,630	320	110	150	20	30	3,260	20.36
8.700.703-.02.42A 12T Excavation Trench (5'-6"deep	142.00	BCY	120	10	0	10	0	0	140	1.01
8.700.703-.02.42B 12T Pipe Bedding	40.00	BCY	910	110	40	50	10	10	1,130	28.14
8.700.703-.02.42C 12T Trench Zone Backfill	102.00	BCY	530	60	20	30	0	10	650	6.38
8.700.703-.02.45A 12T 12" Recir Water Supply Main	200.00	LF	12,720	1,530	530	740	70	140	15,730	78.67
8.700.703-.02.45C 12T 12" Cast Iron Hydrant	2.00	EA	12,430	1,490	520	720	70	140	15,380	7687.98
8.700.703-.02.72A 24 Excavation Trench (7'avg deep	832.10	BCY	680	80	30	40	0	10	840	1.01
8.700.703-.02.72B 24 Pipe Bedding	174.90	BCY	3,980	480	170	230	20	40	4,920	28.14
8.700.703-.02.72C 24 Trench Zone Backfill	657.20	BCY	3,390	410	140	200	20	40	4,190	6.38

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

Wed 21 Sep 1994
Eff. Date 08/09/94

PROJECT HANF94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 25

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
B.700.703-.02.75A 24" Dia Drain Main	530.00	LF	15,190	1,820	640	880	90	170	18,790	35.45
B.700.703-.02.90A LPG Gas Pipe Lines Both Types	310.00	LF	1,250	150	50	70	10	10	1,540	4.97
TOTAL Site Work			69,420	8,330	2,920	4,030	410	770	85,870	
B.700.703-.03 Concrete										
B.700.703-.03.02A Excavate for Slab	1083.33	BCY	1,480	180	60	90	10	20	1,830	1.69
B.700.703-.03.02B Gravel Fill Under Slab	722.22	CY	16,620	1,990	700	970	100	180	20,560	28.47
B.700.703-.03.03A Concrete Slab	996.67	CY	278,120	33,370	11,680	16,160	1,630	3,070	346,030	345.18
TOTAL Concrete	39000.00	SF	296,220	35,550	12,440	17,210	1,730	3,270	366,430	9.40
B.700.703-.10 Specialties										
B.700.703-.10.050 Signs	4.00	EA	2,000	240	80	120	10	20	2,470	618.49
B.700.703-.10.108 Pipe Bollards Filled W/ Concrete	6.00	EA	2,270	270	100	130	10	30	2,800	467.49
B.700.703-.10.13A LPG Equipment			150,000	18,000	6,300	8,720	880	1,650	185,550	
B.700.703-.10.13B Smoke Generator Equipment	0.00	EA	0	0	0	0	0	0	0	2511.08
TOTAL Specialties			154,270	18,510	6,480	8,960	900	1,700	190,830	
B.700.703-.11 Equipment										
B.700.703-.11.025 Truck Trailer	3.00	EA	3,000	360	130	170	20	30	3,710	1236.99
B.700.703-.11.02A Railroad Track	200.00	LF	28,390	3,410	1,190	1,650	170	310	35,110	175.56
B.700.703-.11.02B Pickup Railroad Tank Cars	3.00	EA	4,040	480	170	230	20	40	4,990	1664.92
TOTAL Equipment			35,420	4,250	1,490	2,060	210	390	43,820	
B.700.703-.15 Electrical			2,490	300	100	140	10	30	3,080	
TOTAL Railroad / Truck Tank Burn Pad			557,820	66,940	23,430	32,410	3,270	6,150	690,020	
B.700.705- Junction/Diverslon Box w/Tank Prop										
B.700.705-.02 Site Work										
B.700.705-.02.020 Drill 12" Well, Casing & Bentonite	40.00	LF	6,400	770	270	370	40	70	7,920	197.92
B.700.705-.02.023 Gravel Paved Area	1160.00	CY	17,990	2,160	760	1,050	110	200	22,260	19.19
B.700.705-.02.02A Water Excavation Trench (4' deep)	68.00	BCY	50	10	0	0	0	0	70	1.01
B.700.705-.02.02B Water Pipe Bedding	7.50	BCY	170	20	10	10	0	0	210	28.14
B.700.705-.02.02C Water Pipe Trench Zone Backfill	58.50	BCY	300	40	10	20	0	0	370	6.38
B.700.705-.02.15A Water Supply 1" Dia	150.00	LF	1,380	170	60	80	10	20	1,710	11.38
TOTAL Site Work			26,300	3,160	1,100	1,530	150	290	32,530	

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HANF94 UPB ID: NAT92A

Wed 21 Sep 1994
Eff. Date 08/09/94

PROJECT HAM94: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE* Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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PROJECT HAN694: U.S. Army Corps of Engineers
Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

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SUMMARY PAGE 27

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST
TOTAL Administration Building			386,700	0	0	0	0	0	386,700	
GS.710.703- Training Support Building										
GS.710.703-.08 Misc Furniture	1.00	EA	4,160	0	0	0	0	0	4,160	4157.85
GS.710.703-.09 Misc Equipment	1.00	EA	122,670	0	0	0	0	0	122,670	122668.58
GS.710.703-.10 Installing and Unpacking	1.00	EA	1,860	0	0	0	0	0	1,860	1862.00
TOTAL Training Support Building			128,690	0	0	0	0	0	128,690	
GS.710.705- Comfort Station										
GS.710.705-.08 Misc Furniture	1.00	EA	4,040	0	0	0	0	0	4,040	4042.50
GS.710.705-.10 Installing and Unpacking	1.00	EA	1,860	0	0	0	0	0	1,860	1862.00
TOTAL Comfort Station			5,900	0	0	0	0	0	5,900	
TOTAL Standard Equipment			521,290	0	0	0	0	0	521,290	
GS.900 ENGINEERING & OTHER COST										
GS.900. 900 ENGINEERING, DESIGN & INSPECT										
GS.900. 900.01 Capital Cost - Category 1										
GS.900. 900.01. 01 Phase I			280,000	0	0	0	0	0	280,000	
GS.900. 900.01. 02 Phase II			950,000	0	0	0	0	0	950,000	
TOTAL Capital Cost - Category 1			1,230,000	0	0	0	0	0	1,230,000	
GS.900. 900.02 Capital Cost - Category 2										
GS.900. 900.02. 01 Phase I			130,000	0	0	0	0	0	130,000	
GS.900. 900.02. 02 Phase II			450,000	0	0	0	0	0	450,000	
TOTAL Capital Cost - Category 2			580,000	0	0	0	0	0	580,000	
GS.900. 900.03 Engineer & Inspect During Const										
GS.900. 900.03. 01 Phase I			180,000	0	0	0	0	0	180,000	
GS.900. 900.03. 02 Phase II			700,000	0	0	0	0	0	700,000	
TOTAL Engineer & Inspect During Const			880,000	0	0	0	0	0	880,000	
TOTAL ENGINEERING, DESIGN & INSPECT			2,690,000	0	0	0	0	0	2,690,000	

LABOR ID: HANF94 EQUIP ID: MAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: MAT92A

WHC-SD-T100-CDR-001 Rev. 0

Wed 21 Sep 1994
Eff. Date 08/08/94

U.S. Army Corps of Engineers
PROJECT HANF94: Hammer Est 1994, 30% Design CDR - DOE - HANFORD 64-Acre Layout
Hammer CDR - VE+ Estimate, 9/21/94
** PROJECT INDIRECT SUMMARY - Assembly (Rounded to 10's) **

TIME 17:33:34
SUMMARY PAGE 28

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	B&O Tax	BOND	TOTAL COST	UNIT COST

GS.900.1000	CONST.	MANAGEMENT COSTS (USACE)								
GS.900.1000. 1	Phase I		430,000	0	0	0	0	0	430,000	
GS.900.1000. 2	Phase II		1,020,000	0	0	0	0	0	1,020,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL CONST.	MANAGEMENT COSTS (USACE)	1,450,000	0	0	0	0	0	1,450,000	

GS.900.1100	DESIGN/LIAISON/TEST/CHECK&ACCEPT									
GS.900.1100. U	USACE		90,000	0	0	0	0	0	90,000	
GS.900.1100. W	WHC		70,000	0	0	0	0	0	70,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL DESIGN/LIAISON/TEST/CHECK&ACCEPT		160,000	0	0	0	0	0	160,000	

GS.900.1200	PROJECT MANAGEMENT COSTS (WHC)									
GS.900.1200. W	PROJECT MANAGEMENT COSTS (WHC)		807,000	0	0	0	0	0	807,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL PROJECT MANAGEMENT COSTS (WHC)		807,000	0	0	0	0	0	807,000	

	TOTAL ENGINEERING & OTHER COST		5,107,000	0	0	0	0	0	5,107,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL HAMMER Training Center, G.F.S. 2		5,628,290	0	0	0	0	0	5,628,290	

OC. OTHER PROJECT COSTS										
OC.800	OTHER PROJECT COSTS									
OC.800. 801	FY - 1994		2,500,000	0	0	0	0	0	2,500,000	
OC.800. 802	FY - 1995		790,000	0	0	0	0	0	790,000	
OC.800. 803	FY - 1996		640,000	0	0	0	0	0	640,000	
OC.800. 804	FY - 1997		1,360,000	0	0	0	0	0	1,360,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL OTHER PROJECT COSTS		5,290,000	0	0	0	0	0	5,290,000	
			-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL OTHER PROJECT COSTS		5,290,000	0	0	0	0	0	5,290,000	

LABOR ID: HANF94 EQUIP ID: NAT93A

Currency in DOLLARS

CREW ID: HAN94A UPB ID: NAT92A

CONTINGENCY ANALYSIS

Using a weighted analysis, the contingency for this project was calculated at 18%. RLID 5700.3 indicates that a range of 15% to 25% is appropriate for Conceptual Design (Standard Construction). Corps of Engineers Engineering Regulation (ER) 1110-2-1302 gives a range of 15% to 20% for a Feature Design Memorandum, which is comparable to a Conceptual Design Report. The level of detail provided by the Conceptual Design Report supports the 15% contingency used for this estimate.

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Contingency Analysis - Calculation Sheet

PROJECT TITLE: HAMMER TRAINING FACILITY, 30% VE ESTIMATE

WBS ELEMENT:

ELEMENT DESCRIPTION: CONSTRUCTION, E&D, PM, & OTHER COST

PREPARED BY: NPW-EN-CB

Date: 6-Sep-94

REVIEWED BY: NPW-EN-DB

Date: 6-Sep-94

APPROVED BY: NPW-EN-CB

Date: 6-Sep-94

NORMAL MAXIMUM CONTINGENCY

Determine the Normal Maximum Contingency from the table below. Enter the appropriate percentage(s) based on estimate type(s) in the space(s) provided.

Remedial Actions (See note f. below)			Construction Projects (See note g. below)	
Estimate Type	Normal Max. Contingency		Estimate Type	Normal Max. Contingency
	Assessment	Remediation		
Planning	N/A	100%	Study	50%
Preliminary	70%	60%	Conceptual	40%
Detailed	55%	25%	Definitive	25%

Normal Maximum Contingency used for this estimate: 40%

DELIVERABLE	BASE COST (a)	SCORE RATIO (b)	CONTINGENCY	
			PERCENT (c)	DOLLARS (d)
ENGINEERING, DESIGN & INSPECTION	\$2,690,000	0.3727	14.91%	\$401,100
CONST. MANAGEMENT COSTS	\$1,450,000	0.3000	12.00%	\$174,000
PHASE I	\$6,040,000	0.4654	18.62%	\$1,124,400
PHASE II	\$12,700,000	0.4852	19.41%	\$2,464,800
STANDARD EQUIPMENT	\$480,000	0.3000	12.00%	\$57,600
DESIGN AND PROJECT LIAISON,	\$160,000	0.3500	14.00%	\$22,400
	\$23,520,000		18.0%	\$4,244,300

Notes:

- a - Base cost = estimated cost excluding contingency.
- b - Score ratio is brought forward from scoring sheet(s).
- c - Contingency percentage = score ratio x normal maximum contingency.
- d - Contingency dollars = contingency percentage x base cost.
- e - The total contingency percentage is a weighted average for each phase = total contingency dollars / total base cost
- f - See EM-40 CAT Handbook for descriptions of estimate types and expected contingency ranges, and for more information about ranges for detailed estimates of remedial actions and equipment.
- g - See RL 5700.3 for descriptions of estimate types and expected contingency ranges, and for more information about ranges for detailed estimates of construction and equipment procurement.

WHC-SD-T100-CDR-001 Rev. 0
Contingency Analysis - Scoring Sheet

PROJECT TITLE: HAMMER TRAINING FACILITY, 30% VE ESTIMATE

WBS ELEMENT:

ELEMENT DESCRIPTION: CONSTRUCTION, E&D, PM, & OTHER COST

PREPARED BY: NPW-EN-CB

RISK FACTORS BY DELIVERABLE	RELATIVE WEIGHT	PROBABILITY SCORE	WEIGHTED SCORE	SCORE RATIO
ENGINEERING, DESIGN & INSPECTION				
Category 1	6	0.3	1.8	
Category 2	8	0.3	2.4	
EDC	8	0.5	4	
			0	
			0	
Totals	22		8.2	0.37273
CONST. MANAGEMENT COSTS				
Phase I	6	0.3	1.8	
Phase II	6	0.3	1.8	
			0	
			0	
			0	
Totals	12		3.6	0.3
PHASE I				
Improvements to Lands	5	0.4	2	
Buildings	6	0.3	1.8	
Utilities	7	0.5	3.5	
Special Equipment/Process System	8	0.6	4.8	
			0	
Totals	26		12.1	0.46538
PHASE II				
Improvements to Lands	4	0.2	0.8	
Buildings	9	0.5	4.5	
Utilities	6	0.5	3	
Special Equipment/Process System	8	0.6	4.8	
			0	
Totals	27		13.1	0.48519
STANDARD EQUIPMENT				
GFP Standard Equipment	8	0.3	2.4	
			0	
			0	
			0	
			0	
Totals	8		2.4	0.3
DESIGN AND PROJECT LIAISON, TESTING, CHECKOUT & ACCEPTANCE				
USACE	6	0.4	2.4	
WHC	6	0.3	1.8	
			0	
			0	
Totals	12		4.2	0.35

- Relative Weight = Importance of risk factor to successful completion of the deliverable. 0=Factor is not applicable, 10=Factor is important.
- Probability Score = Probability that the risk factor will change. 0=No risk, 1.0=High risk.
- Weighted Score = Relative Weight x Probability Score.
- Score Ratio = Total Weighted Score / Total Relative Weight.

d. *Use of quotes.* The Cost Engineer may utilize quotes for the expected subcontracted work in preparing the estimate or to verify the reasonableness of independently estimated subcontract work. Subcontractor quotes will be treated as proprietary information and should only be revealed to those who have a need to know.

7. Contingencies

a. *General.* The goal in contingency development is to identify the uncertainty associated with an item of work or task, forecast the risk/cost relationship, and assign a value to this task that will limit the cost risk to an acceptable degree of confidence. Consideration must be given to the details available at each stage of planning, design, or construction for which a cost estimate is being prepared. During development of the project cost estimate, sufficient contingencies should be added at the lowest MCACES title or detail level where the risks or uncertainties have been identified. Contingencies may vary throughout the cost estimate and could have a significant impact on overall costs being high when the lack of investigation data or design detail is associated with critical/high cost elements. The reasons for final contingency development and assignment, that describes the potential for cost growth must be included in the cost estimate as a part of the project narrative. When the contingency factors shown are applied to any portion of the cost estimate up to the feature level, the statement "Normal design variances are expected - normal contingency values used" is acceptable in addressing that specific portion.

b. The following contingency factors (%) represent a reasonable guide for the construction features of the cost estimate:

Phase of Project	Total Project Construction Cost	
	> \$10,000,000	< \$10,000,000
Development	20%	25%
Reconnaissance/Feasibility	15%	20%
Project/Feature Design Memorandum	10%	10%
Plans and Specifications	10%	10%

c. The table provides a guide for contingency development and is not intended to restrict or limit contingencies to these values. If the overall contingency value developed through a detailed analysis as described above exceeds these guidelines, the district or MSC management team should consider further investigation and/or design be accomplished in order to reduce the uncertainties.

8. Overhead

a. Overhead costs are those costs which cannot be attributed to a single task of construction work. Costs which can be applied to a particular item of work should be considered a direct cost to that item and not be included in overhead costs. The overhead costs are customarily divided into two categories:

(1) Job Overhead, also referred to as General Conditions or Field Office Overhead.

(2) General Home Office Overhead, commonly referred to as G&A, General and Administrative costs.

b. The Cost Engineer must be sure that costs are not duplicated between the two categories. Because of the nature of overhead costs, it is not practical to discuss all overhead items. Specific considerations must be evaluated for each project. The Cost Engineer must use considerable care and judgement in estimating overhead costs.

c. The application of a previously determined overhead rate may be used for early design stages, but it is not an accurate or reliable method of forecasting costs. Overhead will vary from project to project and may even vary from month to month within any given project. Job overhead items for the prime contractor should be estimated in detail for all projects of final design requiring a Government estimate. Detailing of overhead costs for subcontract work is recommended when the impact of these costs is significant.

d. *Job overhead (JOH).* Job overhead costs are those costs at the project site which occur specifically as a result of a particular project. Some examples of job overhead costs are:

(1) Job supervision and office personnel.

(2) Engineering and shop drawings.

TITLE: PROJECT COST ESTIMATING, ANALYSIS,
AND STANDARDIZATION

Number: RLID 5700.3
Effective Date: 04-25-94
Attachment: 8.1 - sht 21 of 28
Page: 28 of 95

- Project Cost Estimating Guidelines (Cont'd) -

- (3) Uncertainties (risks)
- (4) Evolving market conditions--prices and competition.
- c. Exclusions. Contingency is not intended to cover the following, if they can be estimated at the time of the estimate.
 - (1) Cost to date
 - (2) Increases in the scope from the data sheet or other DOE-approved document
 - (3) Alternatives in scope or method of accomplishment
- d. Contingency by Type of Estimate.
 - (1) Figure 7-1, Contingency Guide by Type of Estimate, and Figure 7-2, Contingency For Current Working Estimates, present guidelines for the standard DOE estimate types.
 - (2) Types a through d (Figure 7-1) are primarily an indication of the degree of completeness of design. Current working estimates (Figure 7-2), depend on the contingency estimated on the basis of remaining costs not incurred. The independent estimate, may occur at any time and the corresponding contingency used (i.e., a, b, etc.)

FIGURE 7-1

CONTINGENCY GUIDE BY TYPE OF ESTIMATE

<u>Estimate Type</u>	<u>Overall Contingency (1)</u>
a. Study (Prior to CDR)	
Standard	20% - 30%
Experimental/Special Conditions (2)	Up to 50%
b. Conceptual (Based on FDC, CDR)	
Standard	15% - 25%
Experimental/Special Conditions (2)	Up to 40%
c. Preliminary Design	10% - 20%
d. Definitive Design	5% - 15%
e. Government Cost Estimate	0%
f. Current Working Estimate	See Figure 7-2
(1) Ranges as % of estimated cost to complete. Individual elements may be higher or lower. Refer to paragraph 7.4.	

HAMMER TRAINING CENTER

9/22/94

D. Street

THE FOLLOWING COMPARISONS ARE PROVIDED FOR THE PURPOSE OF BENCHMARKING
THE COSTS USED IN THESE COMPARISONS ARE ESCALATED DOLLARS (NO CONTINGENCY).

TOTAL CATEGORY 1 DEFINITIVE DESIGN COST AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$1,250,000/\$20,060,000)	6.2%
TOTAL CATEGORY 2 DEFINITIVE DESIGN COST AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$590,000/\$20,060,000)	2.9%
TOTAL DEFINITIVE DESIGN COST AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$1,840,000/\$20,060,000)	9.2%
TOTAL ENGINEERING/INSPECTION AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$940,000/\$20,060,000)	4.7%
TOTAL ED&I AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$2,780,000/\$20,060,000)	13.9%
TOTAL PROJECT MANAGEMENT AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$830,000/\$20,060,000)	4.1%
TOTAL OTHER PROJECT COST AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (\$5,460,000/\$20,060,000)	27.2%
TOTAL CONSTRUCTION FORCES CONSTRUCTION MANAGEMENT AS A PERCENTAGE OF TOTAL CONSTRUCTION COSTS	N/A
TOTAL CONSTRUCTION CONTRACT MANAGEMENT OF FIXED PRICE CONSTRUCTION AS A PERCENTAGE OF TOTAL FIXED PRICE CONSTRUCTION COSTS (\$1,540,000/\$20,060,000)	7.7%
TOTAL PROJECT CONTINGENCY AS A PERCENTAGE OF TOTAL PROJECT COST (\$3,980,000/\$31,420,000)	12.7%

STATEMENT OF WORK
ARCHITECT/ENGINEERING AND CONSTRUCTION SERVICES
PROJECT 95L-EWT-100
HAZARDOUS MATERIALS MANAGEMENT
AND EMERGENCY RESPONSE TRAINING CENTER

1.0 INTRODUCTION

The U. S. Department of Energy, Richland Operations Office (RL) requires the service of the United States Army Corps of Engineers (USACE). The services include detailed design, procurement and construction for a Hazardous Materials Management and Emergency Response Training Center (HAMMER) Project at the U.S. Department of Energy Hanford site (DOE-RL).

HAMMER is a centralized regional training and education center dedicated to hazardous materials workers and emergency responders that creates a partnership among Department of Energy (DOE), DOE contractors, labor, the state, tribal governments, and selected institutions of higher education. HAMMER's 80-acre facility will include training equipment and various simulated job site conditions that create a state of the art learning environment. The HAMMER facility will be versatile enough to meet the training needs of the Hanford Site as cleanup evolves and as new technologies are developed.

2.0 SCOPE OF WORK

Support is to be provided to DOE-RL and their Operations Contractor (OC), Westinghouse Hanford Company (WHC). USACE shall be responsible for the professional quality, technical accuracy, and coordination of designs, drawings, specifications, narratives, estimates, schedules, and construction to include project and technical management of the assigned tasks. The tasks shall include reports and other special services as required.

The significant subtasks for this project are:

1. Support of Project Validation.
2. Provide Phase I (below grade) definitive design, construction procurement, field engineering and inspection of the HAMMER training facility.
3. Provide Phase II (above grade) definitive design, construction, procurement, and field engineering and inspection of the HAMMER facility.

The design and construction will be completed in accordance with the Hazardous Materials Management and Emergency Response Training Center Functional Design Criteria (FDC) WHC-SD-T100-FDC-001, Revision 0 (and any subsequent revisions), and the Hazardous Materials Management and Emergency Response Training Center Conceptual Design Report (CDR), WHC-SD-T100-CDR-001, Revision 0 (and any subsequent revisions).

2.1 LOCATION

The HAMMER training center site is located adjacent to the city limits of Richland, Washington, near the Hanford Patrol Academy, and on the North side of Horn Rapids Road. The site is 1.5 miles west of the 300 Area and a mile west of Siemens Power Corporation.

2.2 SCOPE OF DESIGN

The USACE prepared the FDC and CDR for this project. The design shall be based on the scope and requirements of the FDC and CDR.

2.3 SCHEDULE

The USACE shall accomplish the design, construction and procurement in accordance with the project schedule. This schedule is based on their receipt of funding and authorization to proceed by the start dates on the project schedule.

2.4 GENERAL REQUIREMENTS, CODES, AND STANDARDS

The latest edition, or amendment of applicable codes and standards, in effect at the start of design shall apply to the design and construction of this project. These codes are detailed in the project FDC and CDR. For situations not covered by these references, the USACE shall use appropriate USACE Standards, appropriate DOE Orders, appropriate national standards, where they exist, or where not covered by these references, good engineering practice.

2.4.1 DRAWINGS AND SPECIFICATIONS GENERAL REQUIREMENTS

The design media and items shall be prepared in accordance with the following documents:

- a. Drawings - Hanford Plant Standards, Standard Design Criteria (SDC) 1.3, "Preparation and Control of Engineering and Fabrication Drawings," prepare drawings on Autocad¹ Version 11, or compatible ASCII code, Data Exchange Format (DXF) file and furnish to buyer on magnetic media. Provide hard copies for review and project closeout, OC will furnish drawing numbers.

2.4.2 CONSTRUCTION REQUIREMENTS

The USACE shall perform construction work in conformance with the Interagency Agreement between the U.S. Department of Energy, Richland Operations Office and the U.S. Army Corps of Engineers. More specific requirements for this task will be developed, if required, during detail design and issued prior to the start of construction bid package preparation.

¹Trademark of AutoDesk, Inc., Mill Valley, California.

3.0 PROJECT MANAGEMENT

DOE-RL will have overall project management responsibility and will administer the USACE contract. Technical project management is assigned to the OC. The USACE will be responsible for detailed design and construction management. The OC will confirm the USACE design is performed within established costs and schedules, and is consistent with the FDC and CDR

4.0 DESCRIPTION OF REQUIRED USACE SERVICES

4.1 GENERAL REQUIREMENTS

- a. Consult and collaborate with RL and the OC to determine the requirements which govern design, procurement and construction and inspection of the project.
- b. Prepare, as applicable, layout drawings, plans, specifications, and reports showing features and characteristics of the design proposed to meet FDC requirements. Prepare construction acceptance test plans, if required.
- c. Make site visits as necessary to verify actual site conditions.
- d. Provide for kick-off meetings for design and for each construction contract.
- e. Provide all site survey required to support design and construction activities.
- f. Provide design and construction schedules.
- g. Support project validation.
- h. Perform design reviews which include RL and the OC. Document design review comments.
- i. Participate in peer reviews of design and cost estimate.
- j. Coordinate with RL and the OC on resolution to design review comments and comment incorporation.
- k. Prepare construction contract documents and procurement documents.
- l. Prepare project cost estimates and government fair cost estimates.

- m. Provide Title III inspection requirements.
- n. Provide field inspection (Title III) during construction.
- o. Provide field engineering during construction.
- p. Provide as-constructed drawings.
- q. Provide Operations and Maintenance manuals.
- r. Provide construction test reports.
- s. Sign Official Acceptance of Construction.
- t. Provide turnover of project files at project completion.
- u. Coordinate with RL and the OC on partial turnover of systems/facilities over the life of the project.

4.2 DESIGN REVIEWS

Design reviews shall be held to assure that design objectives and completeness are being achieved. Two weeks prior to the design review meeting, thirty (30) copies of the up-to-date design media shall be sent to the OC and five (5) copies sent to RL for review. All comments shall be documented.

Following each design review the comments shall be resolved and the USACE shall incorporate the review comments into the design as required by the resolution. Activities include, but are not limited to:

- a. Undertake restudy and redesign work limited to minor design review changes and deviations within the scope of the project.
- b. Identify any changes that impact the FDC requirements.

5.0 PERFORMANCE OF WORK

The USACE shall prepare a project management plan for this work and obtain approval by the OC and RL, the project management plan shall be detailed for the portion of the task being authorized with funds and may be changed to include additional task work when notice to proceed is provided for additional task activities.

5.1 CONFIGURATION CONTROL

The USACE shall conduct and control design in accordance with the approved project management plan, consistent with the USACE established policies, practices, and procedures.

5.2 SCHEDULE

A schedule shall be prepared showing the sequence of planned tasks, constraints and inter-dependencies for all tasks and control milestones for each task established. The design reviews shall be indicated on the design schedule. A graphical forecast of actual and scheduled progress shall be shown.

5.3 QUALITY ASSURANCE

Using a documented USACE Quality Assurance Program (QAP), develop inspection requirements that will assure construction activities meet design requirements, including minimum codes and standards and Critical Characteristics as outlined in the OC project specific Quality Assurance Plan to be provided at the start of detailed design. Inspection points and tests as required for inspection, shall be outlined in written procedures or instructions, and documented in accordance with the USACE QAP.

6.0 PROJECT CONTROL REQUIREMENTS

6.1 CHANGE CONTROL

The USACE has the responsibility for ensuring that the design produced is compatible with project baselines. Changes in design scope, schedule, or funding must be submitted to RL/WHC for change control action.

7.0 REPORTS

Progress and status shall be measured and documented to assure adherence to project requirements and the approved work plan. The USACE shall provide monthly activity reports for Task I and II. The report shall be submitted to RL and WHC by the close of business on the 15th working day of the month for the prior month. Data provided shall be based on project status as of the last working day of the month reported. The following information shall be included:

7.1 MONTHLY NARRATIVE

A discussion of the following items shall be included:

- a. Overall project status
- b. Major achievements during the period, including milestones accomplished, and end items submitted
- c. Any stoppage, accident, or unusual occurrence involving the work
- d. Critical path items, their potential effect on scope, schedules, or costs, and action being taken
- e. Anticipated progress and milestones to be accomplished during next reporting period

- f. Status of all agreements and commitments coming out of meetings
- g. Problems affecting cost and schedule with recommendations for resolution.

7.2 MONTHLY PERFORMANCE

The work plan schedule for USACE services shall be updated and submitted monthly to show progress and current schedule. This shall include a comparison of the percent actual against the percent scheduled complete to date. Original control milestone dates shall be retained on the schedule to provide a reference of performance.

Deviations from the schedule shall be explained, and, if late or behind schedule, appropriate corrective measures identified. If the schedule cannot be regained, an impact statement shall be provided along with a request for schedule change.

8.0 MEETINGS

The USACE will be responsible for keeping meeting minutes, obtaining approvals of WHC and RL, and making distribution.

8.1 KICK-OFF MEETINGS

Kick-off meetings will be held for each phase of design and for each construction contract. An agenda shall be prepared for each meeting. The participants of the meetings will include RL, the OC, and the USACE. The purpose of the design kick-off meetings is to provide the USACE with any additional information as required to accomplish the respective design task and to assure a complete understanding of deliverables. The construction kick-off meetings shall include contractor orientation for working on the Hanford Site and include emphasis on safety.

8.2 PROGRESS MEETINGS

Progress meetings will be held as required between the OC and the USACE and RL to review project business. These meetings will be informal and can be called by any of the parties. Agreements and commitments must be signed, implementing necessary changes or corrective actions within assigned responsibility and authority. The agreements and commitments, made at these progress meetings, are not a basis for scope, cost, schedule, or baseline changes.

8.3 DESIGN REVIEW MEETINGS

The Design Review(s) will be at a location mutually agreed to between RL, USACE and OC. As a minimum, the USACE project engineer and the lead design engineer shall attend the design review meetings.

9.0 DOCUMENTS

9.1 DOCUMENT CONTROL

Oral communications having an impact on the work shall be confirmed in writing by the responsible participant at the earliest opportunity. All direction shall be in writing. Distribution of record documents shall be controlled.

Preparation, identification, format, approval, transmittal, and final disposition for new and revised record documents shall conform with the USACE's established procedures or special instructions. A project records checklist will be provided.

9.2 DOCUMENT INDEX

The drawing list shall be kept. Where information is not sufficient to determine title, proposed documents shall be described by type and number. The index shall be maintained as the work progresses, and for each document it shall identify the effective issue and applicable control information, i.e.:

- a. Document identification number
- b. Document descriptive title
- c. Latest revision number
- d. Status (i.e., in checking, approved with comment, etc.)

The drawing list developed during conceptual design shall be included with the conceptual design package.

9.3 RECORD FILES AND OBJECTIVE EVIDENCE

Project files shall be maintained for all end item documents and objective evidence. Objective evidence is test material and unreduced data supporting record documents. Objective evidence includes, but is not limited to, material samples used in examinations and test, instrument records, radiographs, and photographs. At the conclusion of each task, the OC will advise the USACE of their disposition. The USACE shall keep redundant copies of data needed to meet code or legal requirements. Unless needed for evaluation of a non-conformance or other special use, objective evidence will not normally be distributed, but will be retained with the project files.

9.4 RECORDS TURNOVER RESPONSIBILITIES

The project records checklist identifies records required to support the project. The indicated originating organization will have custodial responsibilities for each record until submitted to the OC. Files transferred to the OC at project completion shall include electronic copies of AutoCad drawings and WordPerfect file of specifications.

10.0 DELIVERABLES

The services outlined above will result in the following deliverables:

10.1 Drawings

PHASE I

GENERAL DRAWINGS

- G-1 Title Page
- G-2 Location and Vicinity Map
- G-3 Drawing Index
- G-4 Symbols
- G-5 Abbreviations
- G-6 Construction Schedule

CIVIL DRAWINGS

General Civil

- C-1 Site Plan
- C-2 Clearing and Grubbing
- C-3 Fencing Plan and Survey Control
- C-4 Fencing Details
- C-5 Sign Plan

Grading Plans

- C-6 Partial Grading Plan 1 (90-Day Storage Pad, and Above Ground Pipeline Pad)
- C-7 Partial Grading Plan 2 (HAZMAT Training Pad, Railroad Tank Cars with Rail Prop, and Junction/Diversion Box [J-Box] with Tank Prop)
- C-8 Partial Grading Plan 3 (Railroad/Truck Tank Burn Pad, and Flammable Liquids Burn Pad)
- C-9 Partial Grading Plan 4 (Buried and Above Ground Tanks Prop, Staging Areas, and Comfort Station)
- C-10 Partial Grading Plan 5 (SCBA Search and Rescue Prop, Liquid Petroleum Gas Burn Pad, and Confined Space/Fall Protection Prop)
- C-11 Partial Grading Plan 6 (Training Tower, Burn Structure Prop)
- C-12 Partial Grading Plan 7 (Training Support Building)
- C-13 Partial Grading Plan 8 (Administration Building)
- C-14 Partial Grading Plan 9 (Trench and Confined Space Prop)
- C-15 Partial Grading Plan 10 (Staff and Student Parking, Overflow Parking)

Roads and Footpaths

- C-16 Footpaths - Plan
- C-17 Footpaths - Plans and Profiles
- C-18 Footpaths - Plans and Profiles
- C-19 Perimeter Road - Plan
- C-20 Perimeter Road - Profile
- C-21 Access Road 1 - Plan and Profile

- C-22 Access Road 2 - Plan and Profile
- C-23 Access Roads 3 and 4 - Plan and Profiles

Miscellaneous Civil Details

- C-24 Miscellaneous Civil Details I
- C-25 Miscellaneous Civil Details II
- C-26 Reserved

Utility Systems

- C-27 Water/Sewer/Training Water Supply/Training Water Collection Key Plan
- C-28 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Perimeter Road I
- C-29 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Perimeter Road II
- C-30 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Access Road 1
- C-31 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Access Road 2
- C-32 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Access Road 3
- C-33 Water/Sewer/Training Water Supply/Training Water Collection Plan and Profile - Artificial Pond and Stream
- C-34 Water/Sewer/Training Water Supply/Training Water Collection Details
- C-35 Liquid Petroleum Gas (LPG) Distribution Plan
- C-36 Liquid Petroleum Gas (LPG) Plan and Profiles
- C-37 Liquid Petroleum Gas (LPG) Tank Elevations and Details
- C-38 Reserved

Training Pad And Prop Drawings

- 10C-1 HAZMAT Training Pad
- 11C-1 90-Day Storage Pad Prop
- 12C-1 Above Ground Pipeline Pad
- 13C-1 Artificial Pond - Plans, Sections, and Details
- 13C-2 Artificial Stream - Plans, Sections, and Details
- 14C-1 Artificial Pond, Ramp, and Pumper Test Platform - Plans, Sections, and Details
- 19C-1 Railroad Tank Cars with Rail Prop
- 20C-1 Buried and Above Ground Tanks Prop
- 21C-1 Confined Space/Fall Protection Prop
- 22C-1 Well Sampling Station
- 23C-1 Trench Site Training Prop

ARCHITECTURAL DRAWINGS

General Architectural Drawings

- A-1 Architectural Abbreviations, Symbols, and Details Training Pad And Prop Drawings
- 11A-1 90-Day Storage Pad Prop Floor, Ceiling and Roof Plan
- 11A-2 90-Day Storage Pad Prop Exterior Elevations and Building Sections

- 11A-3 90-Day Storage Pad Prop Finish Schedule and Details
Pump House Drawings
- 24A-1 Pump House Floor, Ceiling, and Roof Plans and Details
- 24A-2 Pump House Interior/Exterior Elevations
- 24A-3 Pump House Building Sections
- 24A-4 Pump House Finish Schedule and Door, Frame, Window and
Louver Schedule
- 24A-5 Pump House Door, Louver and Window Details and Wall
Sections

STRUCTURAL DRAWINGS

Training Pad And Prop Drawings

- S-1 Structural Abbreviations and Symbols
- S-2 Standard Structural Details

Training Pad And Prop Drawings

- 10S-1 HAZMAT Training Pad Reinforcement Plan, Sections and
Details
- 11S-1 90-Day Storage Pad Prop Reinforcement and Foundation
Plan, Elevations, Sections and Details
- 11S-2 90-Day Storage Pad Prop Framing Plan, Sections and
Details
- 12S-1 Above Ground Pipeline Pad Reinforcement Plan, Sections
and Details
- 21S-1 Confined Space/Fall Protection Prop Foundation Plan,
Sections and Details

Pump House Drawings

- 24S-1 Pump House Foundation Plan, Elevations, Sections and
Details
- 24S-2 Pump House Framing Plan, Sections and Details

MECHANICAL DRAWINGS

General Mechanical Drawings

- M-1 Standard Details and Piping Schedule

Pump House Drawings

- 12M-1 Above Ground Pipeline Pad Plumbing Plan and Details
- 13M-1 Artificial Pond Plans, Sections, and Details
- 18M-1 J-Box with Tank Prop Plumbing Plan and Details
- 20M-1 Buried and Above Ground Tanks Prop Plumbing Details
- 24M-1 Pump House Plan and Sections
- 24M-2 Pump House Details

ELECTRICAL DRAWINGS

General and Site Electrical Drawings

- E-1 Electrical Symbols & Abbreviations
- E-2 Electrical Distribution Plan
- E-3 Electrical Exterior Lighting Plan
- E-4 Distribution Block Diagram
- E-5 Electrical Equipment Elevations

- E-6 Panel Schedules I
- E-7 Panel Schedules II
- E-8 Panel Schedules III
- E-9 Panel Schedules IV
- E-10 Lighting Fixture Schedule
- E-11 Lighting Fixture Manufacturing Details I
- E-12 Lighting Fixture Manufacturing Details II
- E-13 Lighting Control Schematics I
- E-14 Lighting Control Schematics II
- E-15 Substation Plan I
- E-16 Substation Plan II
- E-17 Duct Bank Schedule
- E-18 Electrical and Communication Underground Plan
- E-19 Miscellaneous Details

Training Pad And Prop Drawings

- 11E-1 90-Day Storage Pad Prop Power Plan and Details
- 20E-1 Buried and Above Ground Tanks Prop Power Plan and Details

Pump House Drawings

- 24E-1 Pump House Single Line Diagram
- 24E-2 Pump House Electrical Schematic
- 24E-3 Pump House Power and Lighting Plans
- 24E-4 Pump House Miscellaneous Details

INSTRUMENTATION/COMMUNICATION DRAWINGS

General/Site Drawings

- I-1 Instrumentation Symbols & Abbreviations
- I-2 Fiber Optics to Site
- I-3 Communication System Block Diagram

Pump House Drawings

- 24I-1 Pump House P & ID

PHASE II

GENERAL DRAWINGS

- G-1 Title Page
- G-2 Location and Vicinity Map
- G-3 Drawing Index
- G-4 Symbols
- G-5 Abbreviations
- G-6 Construction Schedule

CIVIL DRAWINGS

General Civil

- C-1 Site Plan
- C-2 Partial Grading Plan 1 (90-Day Storage Pad, and Above Ground Pipeline Pad)

- C-3 Partial Grading Plan 2 (HAZMAT Training Pad, Railroad Tank Cars with Rail Prop, and Junction/Diversion Box [J-Box] with Tank Prop)
- C-4 Partial Grading Plan 3 (Railroad/Truck Tank Burn Pad, and Flammable Liquids Burn Pad)
- C-5 Partial Grading Plan 4 (Buried and Above Ground Tanks Prop, Staging Areas, and Comfort Station)
- C-6 Partial Grading Plan 5 (SCBA Search and Rescue Prop, Liquid Petroleum Gas Burn Pad, and Confined Space/Fall Protection Prop)
- C-7 Partial Grading Plan 6 (Training Tower, Burn Structure Prop)
- C-8 Partial Grading Plan 7 (Training Support Building)
- C-9 Partial Grading Plan 8 (Administration Building)
- C-10 Partial Grading Plan 9 (Trench and Confined Space Prop)
- C-11 Partial Grading Plan 10 (Staff and Student Parking, Overflow Parking)

Training Pad And Prop Drawings

- 7C-1 Flammable Liquids Burn Pad
- 8C-1 LPG Burn Pad
- 9C-1 Railroad/Truck Tank Burn Pad
- 18C-1 J-Box with Tank Prop

GENERAL LANDSCAPING DRAWINGS

- L-1 Planting Plan, Administration Building
- L-2 Planting Plan, Training Field
- L-3 Planting Plan Details
- L-4 Irrigation Plan, Administration Building
- L-5 Irrigation Plan, Training Field
- L-6 Landscaping Irrigation Details

ARCHITECTURAL DRAWINGS

- A-1 Architectural Abbreviations
- A-2 Architectural Symbols
- A-3 Finish Schedule
- A-4 Door Schedule
- A-5 Door Schedule and Types (Doors and Frames)
- A-6 Window Schedule and Types
- A-7 Door Details I
- A-8 Door Details II
- A-9 Window Details
- A-10 Window Wall/Storefront Details
- A-11 Movable Partition and Miscellaneous Details
- A-12 Ceiling and Soffit Details
- A-13 Cabinet Sections and Details
- A-14 Wall Types
- A-15 Typical Wall Sections
- A-16 Exterior Wall Sections
- A-17 Light Metal Framing Details
- A-18 Roof Details I
- A-19 Roof Details II

- A-20 Miscellaneous Architectural Details
- A-21 Site and Miscellaneous Architectural Details

Administration Complex Drawings

- 1A-1 Administration Building Key Plan
- 1A-2 Administration Building Partial Floor Plans I
- 1A-3 Administration Building Partial Floor Plans II
- 1A-4 Administration Building Partial Floor Plans III
- 1A-5 Administration Building Partial Floor Plans IV
- 1A-6 Administration Building Partial Floor Plans V
- 1A-7 Administration Building Partial Floor Plans VI
- 1A-8 Administration Building Exterior Elevations
- 1A-9 Administration Building Large Scale Partial Elevations
- 1A-10 Administration Building Sections
- 1A-11 Administration Building Partial Sections
- 1A-12 Administration Building Roof Plan I
- 1A-13 Administration Building Roof Plan II
- 1A-14 Administration Building Reflected Ceiling Plan I
- 1A-15 Administration Building Reflected Ceiling Plan II
- 1A-16 Administration Building Interior Elevations - Toilets
- 1A-17 Administration Building Interior Elevations - Cafeteria and Kitchen
- 1A-18 Administration Building Interior Elevations - Lobby and Reception Areas
- 1A-19 Administration Building Interior Elevations - Classroom
- 1A-20 Administration Building Miscellaneous Interior Elevations

Training Support Building Drawings

- 2A-1 Training Support Building Key Plan
- 2A-2 Training Support Building Partial Floor Plan I
- 2A-3 Training Support Building Partial Floor Plan II
- 2A-4 Training Support Building Partial Floor Plan III
- 2A-5 Training Support Building Partial Floor Plan IV
- 2A-6 Training Support Building Exterior Elevations
- 2A-7 Training Support Building Exterior Elevations and Details
- 2A-8 Training Support Building Sections
- 2A-9 Training Support Building Partial Sections
- 2A-10 Training Support Building Roof Plan
- 2A-11 Training Support Building Reflected Ceiling Plan
- 2A-12 Training Support Building Interior Elevations I
- 2A-13 Training Support Building Interior Elevations II
- 2A-14 Training Support Building Dock Equipment and Warehouse Equipment Details
- 2A-10 Training Support Building Interior Elevations - Miscellaneous and Work Benches

Comfort Station Drawings

- 3A-1 Comfort Station Floor Plan
- 3A-2 Comfort Station Exterior Elevations
- 3A-3 Comfort Station Roof Plan and Reflected Ceiling Plan
- 3A-4 Comfort Station Building Sections

Training Tower Drawings

- 4A-1 Training Tower Floor Plans
- 4A-2 Training Tower Exterior Elevations
- 4A-3 Training Tower Partial Exterior Elevations
- 4A-4 Training Tower Sections
- 4A-5 Training Tower Roof Plan and Reflected Ceiling Plan
- 4A-6 Training Tower Special Details and Sections
- 4A-7 Training Tower Miscellaneous Sections
- 4A-8 Training Tower Stair and Miscellaneous Details

SCBA Search and Rescue Prop

- 5A-1 SCBA Search and Rescue Prop First and Second Floor Plans
- 5A-2 SCBA Search and Rescue Prop Third Floor and Roof Plans
- 5A-3 SCBA Search and Rescue Prop Exterior Elevations
- 5A-4 SCBA Search and Rescue Prop Sections
- 5A-5 SCBA Search and Rescue Prop Reflected Ceiling Plan
- 5A-6 SCBA Search and Rescue Prop Stair Sections and Details
- 5A-7 SCBA Search and Rescue Prop Special Details I
- 5A-8 SCBA Search and Rescue Prop Special Details II

Burn Structure Prop Drawings

- 6A-1 Burn Structure Prop Floor Plan
- 6A-2 Burn Structure Prop Floor and Roof Plans
- 6A-3 Burn Structure Prop Exterior Elevations
- 6A-4 Burn Structure Prop Building Sections
- 6A-5 Burn Structure Prop Exterior Wall Sections
- 6A-6 Burn Structure Prop Exterior Wall Details I
- 6A-7 Burn Structure Prop Roof Details I
- 6A-8 Burn Structure Prop Reflected Ceiling Plan
- 6A-9 Burn Structure Prop Door/Window/Louver Schedules
- 6A-10 Burn Structure Prop Large Scale Burn Prop Room 1 Plans
- 6A-11 Burn Structure Prop Large Scale Burn Prop Room 2 Plans
- 6A-12 Burn Structure Prop Large Scale Burn Prop Room 3 Plans
- 6A-13 Burn Structure Prop Finish Schedule
- 6A-14 Burn Structure Prop Interior Elevations

STRUCTURAL DRAWINGS

- S-1 General Structural Notes and Details
- S-2 Standard Structural Details I
- S-3 Standard Structural Details II
- S-4 Standard Structural Connection Details

Administration Complex Drawings

- 1S-1 Administration Building Key Plan
- 1S-2 Administration Building Foundation Plans I
- 1S-3 Administration Building Foundation Plans II
- 1S-4 Administration Building Foundation Plans III
- 1S-5 Administration Building Foundation Plans IV
- 1S-6 Administration Building Roof Framing Plans I
- 1S-7 Administration Building Roof Framing Plans II
- 1S-8 Administration Building Roof Framing Plans III
- 1S-9 Administration Building Roof Framing Plans IV
- 1S-10 Administration Building Framing Elevations I

- 1S-11 Administration Building Framing Elevations II
- 1S-12 Administration Building Structural Sections I
- 1S-13 Administration Building Structural Sections II
- 1S-14 Administration Building Structural Sections III
- 1S-15 Administration Building Structural Sections IV
- 1S-16 Administration Building Structural Details I
- 1S-17 Administration Building Structural Details II
- 1S-18 Administration Building Structural Details III
- 1S-19 Administration Building Structural Details III

Training Support Building Drawings

- 2S-1 Training Support Building Foundation Plan and Sections
- 2S-2 Training Support Building Foundation, Elevations, Sections and Details
- 2S-3 Training Support Building Foundation, Sections and Details
- 2S-4 Training Support Building Roof Framing Plan, Sections, and Details
- 2S-5 Training Support Building Structural Framing Plan
- 2S-6 Training Support Building Structural Sections and Details
- 2S-7 Training Support Building North and South Wall Elevations Reinforcing
- 2S-8 Training Support Building East and West Wall Elevations Reinforcing
- 2S-9 Training Support Building Interior Wall Elevations, Sections, and Details
- 2S-10 Training Support Building Typical Wall Details
- 2S-11 Training Support Building Miscellaneous Structural Details

Comfort Station Drawings

- 3S-1 Comfort Station Foundation Plan and Sections
- 3S-2 Comfort Station Roof Framing Plan, Sections and Details
- 3S-3 Comfort Station Wall Elevations Reinforcing
- 3S-4 Comfort Station Interior Wall Elevations, Sections, and Details
- 3S-5 Comfort Station Miscellaneous Structural Details

Training Tower Drawings

- 4S-1 Training Tower Foundation Plan and Sections
- 4S-2 Training Tower Foundation, Elevations, Sections and Details
- 4S-3 Training Tower Foundation, Sections and Details
- 4S-4 Training Tower Roof Framing Plan, Sections and Details
- 4S-5 Training Tower North and South Wall Elevations Reinforcing
- 4S-6 Training Tower East and West Wall Elevations Reinforcing
- 4S-7 Training Tower Interior Wall Elevations, Sections, and Details
- 4S-8 Training Tower Typical Wall Details
- 4S-9 Training Tower Miscellaneous Structural Details

SCBA Search and Rescue Prop

- 5S-1 SCBA Search and Rescue Prop Foundation Plan and Sections
- 5S-2 SCBA Search and Rescue Prop Foundation, Elevations, Sections and Details
- 5S-3 SCBA Search and Rescue Prop Foundation, Sections and Details
- 5S-4 SCBA Search and Rescue Prop Roof Framing Plan, Sections and Details
- 5S-5 SCBA Search and Rescue Prop North and South Wall Elevations Reinforcing
- 5S-6 SCBA Search and Rescue Prop East and West Wall Elevations Reinforcing
- 5S-7 SCBA Search and Rescue Prop Interior Wall Elevations, Sections, and Details
- 5S-8 SCBA Search and Rescue Prop Typical Wall Details
- 5S-9 SCBA Search and Rescue Prop Miscellaneous Structural Details

Burn Structure Prop Drawings

- 6S-1 Burn Structure Prop Foundation Plan and Sections
- 6S-2 Burn Structure Prop Second Floor Plan, Sections and Details
- 6S-3 Burn Structure Prop Third Floor/Roof Plan, Sections and Details
- 6S-4 Burn Structure Prop Roof Plan, Sections and Details
- 6S-5 Burn Structure Prop North and South Wall Elevation Reinforcing
- 6S-6 Burn Structure Prop East and West Wall Elevations Reinforcing
- 6S-7 Burn Structure Prop Typical Wall Details
- 6S-8 Burn Structure Prop Miscellaneous Structural Details

Training Pad And Prop Drawings

- 7S-1 Flammable Liquids Burn Pad Reinforcement Plan
- 7S-2 Flammable Liquids Burn Pad Sections and Details
- 8S-1 LPG Burn Pad Reinforcement Plan, Sections and Details
- 9S-1 Railroad/Truck Tank Burn Pad Reinforcement Plan, Sections and Details
- 18S-1 J-Box with Tank Prop Foundation Plan, Sections and Details

MECHANICAL DRAWINGS

- M-1 Legends for HVAC, Plumbing, and Fire Protection
- M-2 Standard HVAC Details I
- M-3 Standard HVAC Details II
- M-4 Standard Plumbing Details I
- M-5 Standard Plumbing Details II
- M-6 Standard Fire Protection Details
- M-7 Mechanical Seismic Restraint Details

Administration Complex Drawings

- 1M-1 Administration Building Equipment Schedules
- 1M-2 Administration Building HVAC Key Plan

- 1M-3 Administration Building HVAC Plan I
- 1M-4 Administration Building HVAC Plan II
- 1M-5 Administration Building HVAC Plan III
- 1M-6 Administration Building HVAC Plan IV
- 1M-7 Administration Building HVAC Plan V
- 1M-8 Administration Building HVAC Plan VI
- 1M-9 Administration Building HVAC Sections I
- 1M-10 Administration Building HVAC Sections II
- 1M-11 Administration Building HVAC Details I
- 1M-12 Administration Building HVAC Details II
- 1M-13 Administration Building Mechanical Room Plan and Sections I
- 1M-14 Administration Building Mechanical Room Plan and Sections II
- 1M-15 Administration Building HVAC Flow Diagrams
- 1M-16 Administration Building HVAC Control Diagrams and Sequences
- 1P-1 Administration Building Plumbing Plan
- 1P-2 Administration Building Large Scale Plumbing Plans I
- 1P-3 Administration Building Large Scale Plumbing Plans II
- 1P-4 Administration Building Plumbing Isometrics I
- 1P-5 Administration Building Plumbing Isometrics II
- 1P-6 Administration Building Plumbing Details/Fixture Schedule
- 1F-1 Administration Building Fire Protection Plan

Training Support Building Drawings

- 2M-1 Training Support Building Equipment Schedule
- 2M-2 Training Support Building HVAC Key Plan
- 2M-3 Training Support Building HVAC Plan I
- 2M-4 Training Support Building HVAC Plan II
- 2M-5 Training Support Building HVAC Plan III
- 2M-6 Training Support Building HVAC Plan IV
- 2M-7 Training Support Building HVAC Sections and Details
- 2M-8 Training Support Building Flow Diagrams
- 2M-9 Training Support Building HVAC Control Diagram and Sequence Operation
- 2P-1 Training Support Building Plumbing Key Plan
- 2P-2 Training Support Building Plumbing Plan I
- 2P-3 Training Support Building Plumbing Plan II
- 2P-4 Training Support Building Plumbing Plan III
- 2P-5 Training Support Building Plumbing Plan IV
- 2P-6 Training Support Building Plumbing Isometrics
- 2P-7 Training Support Building Plumbing Details and Schedule
- 2F-1 Training Support Building Fire Protection Plan

Comfort Station Drawings

- 3M-1 Comfort Station Equipment Schedule and Details
- 3M-2 Comfort Station HVAC Plan
- 3M-3 Comfort Station HVAC Details
- 3P-1 Comfort Station Plumbing Plan and Isometrics
- 3P-2 Comfort Station Plumbing Details

Training Tower Drawings

- 4M-1 Training Tower Equipment Schedule
- 4M-2 Training Tower Mechanical Room Plan and Sections
- 4M-3 Training Tower Plumbing Plan
- 4M-4 Training Tower Plumbing Details

SCBA Search and Rescue Prop

- 5M-1 SCBA Search and Rescue Prop Equipment Schedule
- 5M-2 SCBA Search and Rescue Prop Ventilation Control Diagram and Sequence Operation
- 5M-3 SCBA Search and Rescue Prop Ventilation Plan
- 5M-4 SCBA Search and Rescue Prop Ventilation Sections
- 5M-5 SCBA Search and Rescue Prop Ventilation Details
- 5M-6 SCBA Search and Rescue Prop Mechanical Room Plan and Sections

Burn Structure Prop Drawings

- 6M-1 Burn Structure Prop Equipment Schedule
- 6M-2 Burn Structure Prop Ventilation Plan
- 6M-3 Burn Structure Prop Ventilation Sections
- 6M-4 Burn Structure Prop Plumbing Plan
- 6M-5 Burn Structure Prop Detail Plumbing Plan I
- 6M-6 Burn Structure Prop Plumbing Details

Training Pad And Prop Drawings

- 7M-1 Flammable Liquids Burn Pad Plumbing Plan
- 8M-1 LPG Burn Pad Plumbing Plan
- 9M-1 Railroad/Truck Tank Burn Pad Plumbing Plan

ELECTRICAL DRAWINGS

General and Site Electrical Drawings

- E-1 Electrical Symbols & Abbreviations
- E-2 Single Line Diagram
- E-3 Electrical Panel Schedule I
- E-4 Electrical Panel Schedule II
- E-5 Electrical Fixture Schedule
- E-6 Electrical Conduit Schedule
- E-7 Electrical Details I
- E-8 Electrical Details II
- E-9 Electrical Details III

Administration Complex Drawings

- 1E-1 Administration Building Key Electrical Plan
- 1E-2 Administration Building Power Plan I
- 1E-3 Administration Building Power Plan II
- 1E-4 Administration Building Power Plan III
- 1E-5 Administration Building Power Plan IV
- 1E-6 Administration Building Power Plan V
- 1E-7 Administration Building Power Plan VI
- 1E-8 Administration Building Lighting Plan I
- 1E-9 Administration Building Lighting Plan II
- 1E-10 Administration Building Lighting Plan III
- 1E-11 Administration Building Lighting Plan IV

- 1E-12 Administration Building Lighting Plan V
- 1E-13 Administration Building Lighting Plan VI
- 1E-14 Administration Building Receptacle Plan I
- 1E-15 Administration Building Receptacle Plan II
- 1E-16 Administration Building Receptacle Plan III
- 1E-17 Administration Building Receptacle Plan IV
- 1E-18 Administration Building Receptacle Plan V
- 1E-19 Administration Building Receptacle Plan VI
- 1E-20 Administration Building Single Line Diagram
- 1E-21 Administration Building Control Diagram
- 1E-22 Administration Building Electrical Details I
- 1E-23 Administration Building Electrical Details II

Training Support Building Drawings

- 2E-1 Training Support Building Key Plan
- 2E-2 Training Support Building Power Plan I
- 2E-3 Training Support Building Power Plan II
- 2E-4 Training Support Building Power Plan III
- 2E-5 Training Support Building Power Plan IV
- 2E-6 Training Support Building Lighting Plan I
- 2E-7 Training Support Building Lighting Plan II
- 2E-8 Training Support Building Lighting Plan III
- 2E-9 Training Support Building Lighting Plan IV
- 2E-10 Training Support Building Receptacle Plan I
- 2E-11 Training Support Building Receptacle Plan II
- 2E-12 Training Support Building Receptacle Plan III
- 2E-13 Training Support Building Receptacle Plan IV
- 2E-14 Training Support Building Electrical Details

Comfort Station Drawings

- 3E-1 Comfort Station Electrical Plan
- 3E-2 Comfort Station Electrical Details

Training Tower Drawings

- 4E-1 Training Tower Power Plan
- 4E-2 Training Tower Lighting Plan
- 4E-3 Training Tower Receptacle Plan
- 4E-4 Training Tower Electrical Details I
- 4E-5 Training Tower Electrical Details II

SCBA Search and Rescue Prop

- 5E-1 SCBA Search and Rescue Prop First and Second Floor Power Plans
- 5E-2 SCBA Search and Rescue Prop Third Floor and Roof Power Plans
- 5E-3 SCBA Search and Rescue Prop First and Second Floor Lighting Plans
- 5E-4 SCBA Search and Rescue Prop Third Floor and Roof Lighting Plans

- 5E-5 SCBA Search and Rescue Prop First and Second Floor
Receptacle Plans
- 5E-6 SCBA Search and Rescue Prop Third Floor and Roof
Receptacle Plans
- 5E-7 SCBA Search and Rescue Prop Electrical Details

Burn Structure Prop Drawings

- 6E-1 Burn Structure Prop First Floor Power Plan
- 6E-2 Burn Structure Prop Third Floor Power Plan
- 6E-3 Burn Structure Prop First Floor Lighting Plan
- 6E-4 Burn Structure Prop Electrical Details

Training Pad And Prop Drawings

- 7E-1 Flammable Liquids Burn Pad Power Plan and Details
- 8E-1 LPG Burn Pad Power Plan and Details
- 9E-1 Railroad/Truck Tank Burn Pad Power Plan and Details
- 18E-1 J-Box with Tank Prop Power Plan and Details

INSTRUMENTATION/COMMUNICATION DRAWINGS

General/Site Drawings

- I-1 Instrumentation Symbols & Abbreviations
- I-2 Communication System Block Diagram
- I-3 HLAN Computer System
- I-4 Radio/Telephone Systems Diagram

Administration Complex Drawings

- 1I-1 Administration Building Key Communications Plan
- 1I-2 Administration Building Communications Plan I
- 1I-3 Administration Building Communications Plan II
- 1I-4 Administration Building Communications Plan III
- 1I-5 Administration Building Communications Plan IV
- 1I-6 Administration Building Communications Details
- 1I-7 Administration Building HLAN/Computer System Diagram 1
- 1I-8 Administration Building Riser Diagram (Telephone &
Fire Alarm)

Training Support Building Drawings

- 2I-1 Training Support Building Communications Plan and
Details
- 2I-2 Training Support Building Riser Diagram (Telephone &
Fire Alarm)

Comfort Station Drawings

- 3I-1 Comfort Station Communications Plan and Details

Training Tower Drawings

- 4I-1 Training Tower Communications Plan and Details

SCBA Search and Rescue Prop

- 5I-1 SCBA Search and Rescue Prop Communications Plan and
Details

Burn Structure Prop Drawings

- 6I-1 Burn Structure Prop First Floor Communications Plan
- 6I-2 Burn Structure Prop Second Floor Communications Plan
- 6I-3 Burn Structure Prop Third Floor Communications Plan
and Details
- 6I-4 Burn Structure Prop Fire Control Diagram
- 6I-5 Burn Structure Prop Riser Diagram (Telephone &
Training Alarms)

10.2 Specifications - Construction Specification for Fixed Price
Contractor Work for Phase I and II.

10.3 Acceptance Test Procedures

Mechanical (HVAC, etc.)
Electrical
Gas Systems

10.4 Supporting Calculations

10.5 Constructability Review Comments

10.6 Estimates

PHASE I

90% Cost Estimate
Fair Government Cost Estimate

PHASE II

60% Cost Estimate
90% Cost Estimate
Fair Government Cost Estimate

- 10.7 Energy Conservation Report
- 10.8 Inspection Plan
- 10.9 Monthly Design and Construction Reports

**ARCHITECT/ENGINEERING AND CONSTRUCTION SERVICES
PROJECT 95L-EWT-100**

COST ESTIMATE SUMMARY

ENGINEERING, DESIGN AND INSPECTION Rounded

Category 1 and 2

USACE Review Team	\$ 274,923
USACE Technical Management	41,354
USACE A/E (Montgomery Watson)	1,390,037
USACE Project Management	106,632
 Subtotal Category 1 and 2	 \$1,809,946
Rounded Category 1 and 2	\$1,810,000

Engineering and Inspection During Construction

USACE Review Team	\$ 71,435
USACE Technical Management	18,716
USACE A/E (Montgomery Watson)	792,314

Subtotal Engineering and Inspection During Construction	\$ 882,465
Rounded Engineering and Inspection During Construction	\$ 880,000

Total Engineering, Design and Inspection	\$2,692,411
Rounded Total Engineering, Design and Inspection	\$2,690,000

Category 1	\$1,230,763
Rounded Category 1	\$1,230,000
Category 2	\$ 579,183
Rounded Category 2	\$ 580,000

(NOTE: Historically, category 1 costs are 68% and category 2 are 32% of total engineering and design exclusive of the engineering and inspection during construction.)

CONSTRUCTION MANAGEMENT

Contract Administration	\$ 311,103
Quality Assurance Inspection	767,972
Project Management	360,931

Total	\$1,440,006
Rounded Total Construction Management	\$1,440,000

STATEMENT OF WORK
OPERATING CONTRACTOR - PROJECT MANAGEMENT
PROJECT 95L-EWT-100
HAZARDOUS MATERIALS MANAGEMENT-
AND EMERGENCY RESPONSE TRAINING CENTER

PREPARED BY: M. E. BORGESON
DATE: MAY 1994

I. OBJECTIVES

The Operating Contractor shall provide project management services to the U.S. Department of Energy-Richland Operation Office (RL) from definitive design through the completion of construction and project closeout. Project management will include, but is not limited to, overall planning, daily management and technical direction, coordination, control and status reporting for all phases of the project. Before the start of definitive design, the Operating Contractor responsibility and authority will be formally documented in a RL approved Project Management Plan.

II. TASKS

A. General

Provide liaison with the cognizant RL office during the life of the project. Furnish the project information necessary to facilitate surveillance and evaluation of project execution.

1. Provide copies of all project associated correspondence, reports, design drawings, Nonconformance Reports (NCRs), plans and schedules, cost estimates, Quality Assurance (QA) programs and related audits, Engineering Change Notices (ECNs), subcontracts, work orders and supplements, minutes of meetings, test procedures, photographs, etc. All items shall be identified with the project number T-100.
2. Provide timely notification of meetings, acceptance tests, and final inspections (with agenda when applicable).
3. Provide immediate notification of accidents, incidents, significant problems, work stoppages, etc.
4. Provide data for the Management Review Meeting.
5. Provide responsibility and authority for daily management of the project as provided in the Project Management Plan (PMP).

B. Design

1. Establish project files responsibilities and requirements and disseminate these to project participants.

2. Provide technical direction and assistance for design accomplished by the U.S. Army Corps of Engineers (USACE).

3. The Project Engineer coordinates and takes the lead technical role in the design review process, involves the user, site services, site planning, operations, maintenance engineering, and other organizations as necessary, in design reviews. Approves Definitive Design for compliance with the Functional Design Criteria (FDC), project baseline, safety, operability, reliability, energy conservation, and cost effectiveness. Assure optimum design in terms of cost, safety, reliability, maintainability, accuracy, and compliance with applicable codes, standards, criteria, regulations, and Department of Energy (DOE) Management Directives.

4. Approve design schedules consistent with project requirements.

5. Provide and/or concur with engineering reports as required.

6. Coordinate and integrate environmental, NEPA, permitting and safety assessment activities into the project.

7. Update all project documents, control media, reports, schedules, and cost summaries as new information becomes available.

8. Assure that cost effectiveness is stressed in the project design and construction, and that Life Cycle Cost Analysis (LCCA), as appropriate, is a basis for design selections and decisions.

9. Participates in the team effort of developing and implementing a comprehensive, integrated project QA and/or Quality Control (QC) and/or inspection plan.

10. Provide information, data, records, and guidelines for the special conditions or requirements that may impact project cost, e.i., escort requirements, etc.

11. Assure preparation of Fair Cost Estimate.

12. Coordinate with the USACE to assure constructability.

C. Construction

1. Provide technical direction and assistance, as applicable, on construction accomplished by the Fixed Price Contractor managed by the USACE.

2. Approve construction schedules consistent with project requirements.

3. Approve and/or concur with construction reports as required.

4. Assure industrial safety at the construction site.

5. Update all project documents, control media, reports, schedules, and cost summaries as new information becomes available.
6. Provide coordination between operational user and the USACE to minimize interference and facilitate the construction work. Assure user submittal review as appropriate.
7. Issue excavation and/or drilling and/or tie-in-permits and welding and/or cutting permits to the USACE.
8. Review vendor submittal as required and provide comments to the USACE.
9. Participate and concur in final inspection, testing and acceptance of completed facilities for operation.
10. Support project startup readiness review as required.
11. Assure accurate completion of as-built drawings.
12. Prepare the project close-out documents, and obtain the required approvals.
13. Arrange for disposition and/or storage of project records.

PROJECT 95L-EWT-100

PROJECT MANAGEMENT COST ESTIMATE SUMMARY

<u>PHASE</u>		<u>MANHOURS</u>	<u>RATES</u>	<u>TOTAL</u>
Design	Project Engineer	3700	\$49.40	\$ 182,780
	Project Manager	634	49.42	31,332
	Clerical Support	906	19.34	17,522
	Value Engineering	200	49.40	9,880
Const.	Project Engineer	8190	\$51.69	\$ 423,341
	Project Manager	1268	51.61	65,441
	Clerical Support	1812	20.20	36,602
	SUBTOTAL	<u>16,710</u>		<u>\$ 766,899</u>
Travel				\$ 17,600
Reproduction/Drawing Release				<u>\$ 16,425</u>
	SUBTOTAL			<u>\$ 800,924</u>
GA/CSP @ 13.7%				\$ 109,727
	SUBTOTAL			<u>\$ 910,651</u>
Contingency @ 12%				<u>\$ 109,278</u>
TOTAL PROJECT MANAGEMENT				<u>\$1,019,929</u>
	ROUNDED			<u>\$1,020,000</u>

**STATEMENT OF WORK
OTHER PROJECT COSTS
PROJECT 95L-EWT-100
HAZARDOUS MATERIALS MANAGEMENT
AND EMERGENCY RESPONSE TRAINING CENTER**

PREPARED BY: M.E. BORGESON
DATE: APRIL 21, 1994

I. PROJECT SCOPE

Project T-100 provides a centralized regional training and education center dedicated to training hazardous materials workers and emergency responders in classrooms and with hands-on realistic training aids representing actual field conditions. The project is located on an 80 acre Hanford site adjacent to the city limits of Richland approximately 1.5 miles west of the 300 Area. This 80 acre site will include training equipment and various simulated job site conditions that create a state of the art learning environment. The HAMMER facility will be versatile enough to meet the training needs of the Hanford site as cleanup evolves and as new technologies are developed.

II. STATEMENT OF WORK

This Statement of Work (SOW) identifies expense funded activities that will be incurred and/or managed under the direction of the Operating Contractor (OC). These types of expense activities are identified as other Project Costs (OPC). These expense funded activities are directly associated with the implementation of Project T-100 that are not capital costs included in the Total Estimated Construction Cost (TECC). This SOW is broken out by the performing organization.

III. DELIVERABLES - OTHER PROJECT COSTS

The deliverables for this section are identified by the performing organizations. Many of the items listed deal with the reviews associated with design. These reviews are necessary to assure that the design properly interfaces with existing plant equipment, operating contractor procedures, and to assure that the user will be satisfied with the end product.

A. United States Army Corps of Engineers (USACE)

1. Prepare Functional Design Criteria and revisions
2. Prepare Conceptual Design Report and revisions
3. Perform site surveys and mapping
4. Perform geotechnical investigations
5. Support project validation
6. Conduct Value Engineering and provide report
7. Support operational testing
8. Recommend spare parts lists
9. Prepare and issue progress reports
10. Provide Project Work Plan

- B. Westinghouse Hanford Company (WHC) - Programs
 - 1. Participate in Value Engineering sessions
 - 2. Support document review of Conceptual and Definitive Design Media
 - 3. Prepare programs/budget plans
- C. Westinghouse Hanford Company (WHC) - Projects
 - 1. Review Functional Design Criteria
 - 2. Manage Conceptual Design Report preparation
 - 3. Prepare Construction Project Data Sheet
 - 4. Participate in Value Engineering sessions
 - 5. Prepare Letters of Instruction
 - 6. Coordinate site preparation, site planning
 - 7. Contribute text and appendices for Conceptual Design as required.
 - 8. Coordinate review and approval of project documents
 - 9. Prepare Project Plan, Project Management Plan and Request for Project Authorization
 - 10. Provide Project Management and Other Project Costs Statement of Work for estimate
 - 11. Support for project validation
 - a. Validation reports
 - b. Validation package preparation
 - c. Presentations
 - 12. Coordinate activities prior to authorization
- D. Westinghouse Hanford Company (WHC) - Operations
 - 1. Provide input for document review
 - a. Conceptual Design Report
 - b. Value engineering sessions
 - c. Definitive Design
 - d. Operational Test Procedures
 - 2. Support project activities
 - a. Equipment tagouts as required
 - b. Support/Witness acceptance test procedures
 - c. Perform Operational Test Procedures
 - 3. Prepare operations procedures
 - 4. Operator training for new systems as required
 - 5. Provide initial inventories for new systems.
- E. Westinghouse Hanford Company (WHC/IRM)
 - 1. Provide input for document preparation/review
 - a. Functional Design Criteria
 - b. Conceptual Design Report
 - c. Definitive Design
 - 2. Provide general support of the project

F. Westinghouse Hanford Company (WHC) - Quality Assurance

1. Provide input for document review
 - a. Functional Design Criteria
 - b. Conceptual Design Report
 - c. Definitive Design
 - d. Letters of Instruction and work orders
 - e. Project Management Plan
 - f. Engineering Change Notices
 - g. Acceptance Test Procedures, Operation Test Procedures, and Official Acceptance of Construction
2. Generate the Quality Assurance Project Plan (QAPP)
3. Participate in closeout of Nonconformance and Surveillance Reports

G. Westinghouse Hanford Company (WHC) - Environmental

1. Provide input for document review
 - a. Functional Design Criteria
 - b. Conceptual Design Report
 - c. Definitive Design
2. Perform regulatory analysis
3. Develop permitting plan
4. Coordinate permitting activities as required
5. Support development and approval of the National Environmental Policy Act (NEPA) documentation

H. Westinghouse Hanford Company (WHC) - Safety Organizations

1. Provide input for document review
 - a. Functional Design Criteria
 - b. Conceptual Design Report
 - c. Value Engineering sessions
 - d. Definitive Design
 - e. Engineering Change Notices
 - f. Acceptance and Operational Test Procedures
 - g. Deviations and waivers
2. Conduct job walks
3. Prepare construction site surveillance
4. Prepare safety analysis documentation.

I. Battelle Human Affairs Resource Center (BATTELLE HARC)

1. Perform functional validation on Functional Design Criteria

IV. ASSUMPTIONS/RISKS

A. All work will be performed in areas free of radiological and chemical contamination. There are presently no known areas of surface or sub-surface contamination within the proposed construction areas.

B. There will be no significant environmental restrictions or controls placed on construction activities by the final categorical exclusion.

C. The project is out of the normal budget cycle and the management approach requires a high degree of flexibility. However, the cost risk is considered low. The project is of standard industrial construction which is well understood.

PROJECT 95L-EWT-100

OTHER PROJECT COSTS

Project Definition

Functional Design Criteria	\$ 120,000

Conceptual

Conceptual Design Report	1,437,000
Advanced Conceptual Design	994,000
Environmental Documentation	25,000
Quality Assurance Project Plan (QAPP)	3,000
Project Management	262,000
Other Support	10,000

Multi-Phase Activities

Design Review	180,000
Safety Support	173,000
QA Support	127,000
BCSR Support	195,000
Administrative Support	151,000
Environmental	44,000

Operational Preparedness and Startup

Start-up Plan	22,000
Operational Test Procedures (USACE)	156,000
Operating Procedures	179,000
Maintenance Procedures	242,000
NEC Inspections	15,000
Readiness Review	59,000
Operating Staff	706,000
Staff Training	150,000
Utility Costs	59,000
Inventories	<u>150,000</u>

TOTAL	\$5,459,000

ROUNDED	\$5,460,000

APPENDIX D

CONCEPTUAL PROJECT SCHEDULE



APPENDIX E

OUTLINE SPECIFICATION

OUTLINE SPECIFICATION

DIVISION 2 - SITEWORK

Section 02050 Demolition, Decontamination, and Decommissioning

- 1.0 Relocate existing minor facilities and obstructions.
- 2.0 Remove existing asphalt concrete roadways.
- 3.0 Remove existing fence and replace after utility installation.

Section 02100 Site Preparation

- 1.0 Site drainage complying with the American Society of Civil Engineers (ASCE) manual in Engineering Practice No. 37, *Design and Construction of Sanitary and Storm Sewers*.
- 2.0 Vehicle parking, sidewalks, and road requirements complying with USACE Engineering Manual (EM) - 1110-2-410, *Design of Recreation Areas and Facilities - Access and Circulation* and WSDOT Design Manual.
- 3.0 Landscaping complying with USACE Architect and Engineers Instructions (AEI), Chapter 3, Paragraph 8, Landscape Design And Planting.
- 4.0 Site grading complying with USACE EM - 1110-2-410.
- 5.0 Site power and lighting complying with DOE ORDER 6430.1A, Section 0278, "Power and Lighting."
- 6.0 Site security in accordance with requirements set forth in DOE 5632 series. See AEI Section 0283, Physical Protection, for additional requirements.

Section 02150 Shoring and Underpinning

- 1.0 All Shoring and underpinning complying with the safety requirements of 29 CFR 1926, Subpart P.

Section 02200 Earthwork

- 1.0 Excavate in accordance with 10 CFR 1910 and line in accordance with 40 CFR 260-281.
- 2.0 Grading, excavation, and embankment work to establish sub-grade for HAMMER support facilities.
- 3.0 Sub-grade and drainage grading for roads and parking facilities.
- 4.0 Excavation for buried utility pipe, electrical cables, communication cables, and conduits.

- 5.0 General site grading, design, and erosion control conforming to the *Hanford Plant Standards General Design Criteria*; AEI Chapters 3 and 4, and WHC-CM-7-5.
- 6.0 Design, construction practices, and construction materials associated with grading, embankment and excavation for roadways, parking lots, and prop areas shall conform to the *Washington State Department of Transportation Manual*, M 41-10 (WSDOT).
- 7.0 Minimum depth of water lines shall be in accordance with *Hanford Standard Design Criteria*, SDC-3.2.
- 8.0 Survey control and record keeping will be done in accordance with AEI Section 0202 and 40 CFR 264.309.
- 9.0 Structural backfill compacted in accordance with WSDOT, Section 2-03.3(14)c, Method B or C.
- 10.0 Common backfill: each layer compacted with one pass of vibratory roller.
- 11.0 Sandbedding for underground pipe, cables, and conduits in accordance with ASTM D 663.
- 12.0 Plastic sheet marker for buried pipe.
- 13.0 Plastic sheet marker and board covering for buried cables and conduits.
- 14.0 Finished grade to slope away from structures and drain to ponds and tanks.
- 15.0 Crushed gravel stabilization.
- 16.0 Compaction control test: WSDOT, Section 2-03.3(14)d.
- 17.0 Herbicide application to disturbed areas.

Section 02235 Road Subgrade and Granular Base

- 1.0 Granular base: WSDOT, Section 9-03.9(3).
- 2.0 Leveling course: WSDOT, Section 9-03.9(3).
- 3.0 Backfill: WSDOT, Section 2-03.3(14)c, Method B.
- 4.0 Subgrade: WSDOT, Section 2-06.3.
- 5.0 Place and spread base materials in accordance with WSDOT, Section 4-04.3(4).
- 6.0 Compact base materials to 95 percent of maximum density determined by WSDOT Test Method No. 606.
- 7.0 Compaction control test: WSDOT, Section 2-03.3(14)d.

Section 02350 Building Foundations

- 1.0 Building foundations in accordance with the requirements of the UBC and ACI 318.

Section 02506 Traffic Control

- 1.0 Signs, pavement markings, and channelization in accordance with ANSI D6.1.

Section 02512 Hot-Laid Asphaltic Concrete Paving

- 1.0 Paving asphalt: WSDOT, Section 9-02.1(4), viscosity grade AR-4000-W.
- 2.0 Prime coat: WSDOT, Section 9-02.1(2), medium curing liquid asphalt MC-250.
- 3.0 Aggregate: Class B, WSDOT, Section 9-03.8.
- 4.0 Blending sand: WSDOT, Section 9-03.8(4).
- 5.0 Mineral filler: WSDOT, Section 9-03.8(5).
- 6.0 Proportion of asphalt concrete materials: WSDOT, Section 9-03.8(6), Class B.
- 7.0 Construction: WSDOT, Section 5-04.3.
- 8.0 Permanent signing: ANSI D6.1, Section II and WSDOT, Section 8-21.
- 9.0 Permanent marking: WSDOT, Section 8-22.
- 10.0 Traffic control: WSDOT, Section 1-07.23.

Section 02580 Pavement Marking

- 1.0 Permanent signage: ANSI D6.1, Section II and WSDOT M 41-10, Section 8-21
- 2.0 Permanent signage: ANSI D6.1, Section III and WSDOT M 41-10, Section 8-22 for paint and/or reflectorized glass beading.

Section 02650 Piped Utility Materials

- 1.0 Sanitary sewer pipe: ASTM D 3034 for SDR 35 PVC pipe.
- 2.0 Sanitary water pipe: AWWA C900.
- 3.0 Install pipe in accordance with ASTM D3839.
- 4.0 Flush pipe for 1 minute at 5 feet per second.
- 5.0 Hydrostatic test pipe for 30 minutes.
- 6.0 Disinfect sanitary water lines.
- 7.0 LPG pipe: Steel pipe, ASTM A106 (seamless carbon steel for high-temperature service). Fittings for pipe and tubing: Steel. System installed in accordance with NFPA 54 "National Fuel Gas Code".
- 8.0 PVC pipe: AWWA C900 for 4-inch through 12-inch, Class 100 Fittings: Ductile-iron (AWWA C110), cement-lined, with rubber gaskets (AWWA C111).

Section 02668 Fire Water Systems

- 1.0 Cement lined ductile iron pipe: 6 inch, 8 inch and 12 inch.
- 2.0 Post-indicator valve: valve with supervisory switch and 6-inch diameter grout-filled Schedule 40 carbon steel barrier posts: 6, 8, and 12 inch.
- 3.0 Gate valves: 4, 6, 8, and 12 inch.
- 4.0 Cement lined fittings.
- 5.0 Thrust restraints in accordance with NFPA 24.
- 6.0 Flush and test in accordance with NFPA 24.
- 7.0 Fire Hydrants: 6-inch gate valve and 6-inch diameter grout-filled Schedule 40 carbon steel barrier posts.
- 8.0 Hydrostatic testing in accordance with NFPA 24.
- 9.0 Barrier posts: 6-inch diameter grout filled Schedule 40 carbon steel barrier posts for each fire hydrant and PIV.
- 10.0 Tapping sleeves: Cast iron, compatible with valves.
- 11.0 Materials and workmanship: Components to be UL listed or FM approved for the intended application and installed in accordance with NFPA 24.

Section 02730 Sanitary Sewers

- 1.0 Sanitary sewer: PVC plastic pipe or cement-mortar lined ductile iron pipe.
- 2.0 Manholes; Concrete, 48-inch inside diameter.
- 3.0 Install sanitary sewer in accordance with WSDOT M41-10.
- 4.0 Flush and test in accordance with WSDOT M41-10.

Section 02750 Industrial Wastewater Treatment

- 1.0 Structural requirements for spill or overflow prevention devices complying with 40 CFR 280.30 and 40 CFR 264.194.
- 2.0 Petrochemical tank systems complying with 40 CFR 280 and 40 CFR 281.

Section 02810 Irrigation Systems

- 1.0 Pipe: WSDOT, Section 9-15.1(2) PVC pipe.
- 2.0 Automatic controller: Solid state electronics capable of repeating a 1-week program indefinitely.
- 3.0 Automatic control valve: Compatible with controller.

- 4.0 Sprinkler heads: WSDOT M41-10, Section 9-15.4.
- 5.0 Drip heads: Compatible with system.
- 6.0 Install system in accordance with WSDOT M41-10, Section 8.03.
- 7.0 Equipment: WSDOT M 41-10, Section 9-15, except automatic controller specified in 2.0.
- 8.0 Vacuum breakers: Approved air gap or pressure reducing type.
- 9.0 Excavate, to install piping with minimum cover of 12 inches, in accordance with WSDOT M 41-10, Section 8-03.3(2).
- 10.0 Test system for leaks for ten minutes at normal operation pressure before backfilling.

Section 02831 Chain Link Fences and Gates

- 1.0 Fabric: FS RR-F-191/1, Type I, 2-inch mesh, 9 gage, 84-inches high.
- 2.0 Posts, top rails, and braces: FS RR-F-191/3, Class I, Grade A or B.
- 3.0 Accessories: FS RR-F-191/4.
- 4.0 Gates: Braced frames constructed of specified fabric and pipe.

Section 02900 Landscaping

- 1.0 Sod: 100 percent blue grass or as required by local climate.
- 2.0 Top Soil: Fertile friable soil containing normal amount of organic matter.
- 3.0 Fertilizer: Nonburning, slow release, Formula 16-16-16.
- 4.0 Plantings: Nursery grown container stock; trees grown under local conditions for at least 2 years.

DIVISION 3 - CONCRETE

Section 03300 Cast-In-Place Concrete

- 1.0 Cement: ASTM C 150, Type II.
- 2.0 Aggregate: ASTM C 33.
- 3.0 Air entraining admixture: ASTM C 260.
- 4.0 Concrete Properties:
 - a. Minimum compressive strength: 3,000 or 4,000 psi at 28 days.
 - b. Slump: 4 inch maximum.
 - c. Aggregate: 3/4 inch minimum size.

- 5.0 Reinforcing steel bars: ASTM A 615, deformed, Grade 60.
- 6.0 Mix and deliver in accordance with ASTM C 94.
- 7.0 Concrete forms: Wood, steel, plywood, or pressed fiberboard.
- 8.0 Nonshrink grout: Nonmetallic.
- 9.0 Expansion joint: Preformed bituminous type material.
- 10.0 Place, finish, cure, and test in accordance with ACI 301.

DIVISION 4 - MASONRY

Section 04220 Concrete Unit Masonry

- 1.0 Hollow concrete masonry units, 8 x 8 x 16 inches, per ASTM C 90, Grade N, Type I.
- 2.0 Mortar: ASTM C 270, Type M.
- 3.0 Coarse grout: ASTM C 476.
- 4.0 Reinforcement: Horizontal, truss type, vertical: ASTM C 615, deformed, Grade 60.
- 5.0 Anchor bolts: ASTM A 307.

DIVISION 5 - METALS

Section 05120 Structural Steel

- 1.0 Rolled steel shapes and plates: ASTM A 36.
- 2.0 Steel tubing: ASTM A 500 or ASTM A 501.
- 3.0 Steel pipe: ASTM A 53.
- 4.0 Bolts; ASTM A 325, Type 1 or 2 or ASTM A 490, Type 1 or 2.
- 5.0 Nuts: ASTM A 563, Grade C, heavy hex.
- 6.0 Washers: ASTM F 436.
- 7.0 Expansion anchors: Hanford specification HS-V-S-4020.
- 8.0 Electrodes for welding: E 70XX.
- 9.0 Fabricate and erect structural steel in accordance with AISC.
- 10.0 Welding in accordance with AWS D1.1.

Section 05210 Steel Joists

- 1.0 Open web steel joints: Meet the requirements of SJI Standard Specifications for open web steel joints.
- 2.0 Joist girders: Meet the requirements of SJI Standard Specifications for joist girders.

Section 05300 Metal Decking

- 1.0 Standard wide rib deck, meeting the requirements of SDI. Design manual for composite decks, form decks, and roof decks; manufactured from zinc-coated steel sheets.
- 2.0 Design and install metal deck in accordance with SDI.
- 3.0 Steel for painted metal decking: ASTM A 611, Grade C
- 4.0 Miscellaneous steel shapes: ASTM A 36
- 5.0 Sheet metal accessories: ASTM A 526, galvanized commercial quality/
- 6.0 Galvanizing: ASTM A 525, G 60.
- 7.0 Accessories (manufacturer's standard or approved by manufacturer): Flexible closure strips, weld washers, etc.
- 8.0 Fastening deck units: Comply with AWS D1.1 to fasten to steel supporting members. Weld or mechanically fasten side laps of adjacent deck units.

Section 05500 Metal Fabrications

- 1.0 Rolled steel shapes: ASTM A 36.
- 2.0 Steel plate: ASTM A 36 or ASTM A 283.
- 3.0 Steel bars and rods: ASTM A 36
- 4.0 Weld studs: Nelson Stud Welding Co., Type No. H4L².
- 5.0 Metal grating: Hot dip galvanized in accordance with FS RR-G-661, Type I, pressure locked with end bars.
- 6.0 Steel pipe railings: ASTM A 53 or ASTM 120 welded, galvanized.
- 7.0 Steel tubing: ASTM A 500, Grade B.
- 8.0 Bolts: ASTM A 307.
- 9.0 Nuts: ASTM A 563, Grade A.
- 10.0 Steel tanks.

² Trademark of Nelson Stud Welding Co., Walnut Creek, California

- 11.0 Steel ladders and handhold.
- 12.0 Stair nosings.
- 13.0 Metal louvers.
- 14.0 Wrought iron ornamental planter grating.
- 15.0 Welding in accordance with AWS D1.1.

Section 05720 Ornamental Handrails and Railings

- 1.0 Stainless steel cap rail: 2 1/2-inch outside diameter.
- 2.0 Ornamental fencing: 6-foot high in front of site.

DIVISION 6 - WOOD AND PLASTICS

Section 06100 Rough Carpentry

- 1.0 Plywood.
- 2.0 Framing lumber.
- 3.0 Nailers, blocking, stripping.
- 4.0 Moisture barrier.
- 5.0 Rough hardware: Bolts, nuts, lag screws, toggle bolts, wood screws, wire nails, and staples.

Section 06200 Finish Carpentry

- 1.0 Oak handrail: Red oak with eased edges.
- 2.0 Laminated plastic sheet: 0.050-inch thick.
- 3.0 Window sills: Medium density particleboard covered with plastic laminate.
- 4.0 Contact adhesive: Solvent release type.

Section 06410 Custom Casework

- 1.0 Particleboard: Density Grade B, Class 2, medium density.
- 2.0 Laminated plastic sheet: 0.050-inch thick.
- 3.0 Laminated plastic backing sheet.
- 4.0 Hardware: Extension drawer slides, hinges, standards and shelf clips, bar-type pulls, latches, fasteners, and locks.

- 5.0 Sound deadener.
- 6.0 Type of construction: Flush overlay.
- 7.0 Cabinet doors: Flush type, 3/4-inch thick.
- 8.0 Drawers and doors: Flush overlay.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07150 Dampproofing

- 1.0 Primer: ASTM D 41.
- 2.0 Asphalt: ASTM D 449, Type II.
- 3.0 Asphalt saturated felt: ASTM D 226, Type I.

Section 07200 Insulation

- 1.0 Exterior wall: Glass fiber, foil faced, blanket type, R-19 thermal resistance.
- 2.0 Acoustical: 3 1/2-inch thick sound attenuation batts, unfaced.
- 3.0 Perimeter insulation (below grade at foundation wall): Continuation of Exterior Insulation Finish System (EIFS). See Section 07240.
- 4.0 Walls: Glass fiber batts, maximum thickness possible for stud size, un-faced, conforming to ASTM C 665, Type I, R = 3 per inch nominal.
- 5.0 Roof (metal roof area): rigid board insulation. Stablished R-value = 7 per inch minimum. Approved by manufacturer of Metal Roof System (MRS) for installation under MRS (include density for span over metal deck flutes). Mechanical fasten for Factory Mutual (FM) I-90 uplift. Use impermeable facer sheet attached to both sides of insulation.
- 6.0 Fire-protection: Semi-rigid boards for use as fire stop at openings edge of slab and exterior wall panels, mineral fiber with resin binders, complying with ASTM C 612, Class 1 and 2; nominal density of 4 pounds per cubic foot; passing ASTM E 136 for combustion characteristics; R-value of 4.0 at 75 degrees of Fahrenheit.
- 7.0 Mechanically anchor for type of application and condition of substrate as recommended by manufacturer.

Section 07212 Rigid Insulation

- 1.0 Polystyrene foam board: 2-inch thick at perimeter foundation below grade, FS HH-I-524, Type II, Class B.
- 2.0 Roof insulation board: Closed cell phenolic foam core, R-38 thermal resistance.

Section 07410 Manufactured Roof Panels

- 1.0 Panels: Prefinished (interior and exterior faces) 24-gage galvanized steel ASTM A 446, Grade C, G-90 coating (ASTM A 525).
- 2.0 Roof: Standing seam.
- 3.0 Fasteners: Type, spacing, and size as approved by panels manufacturer.
- 4.0 Accessories: All trim, closures, caps, and terminations.
- 5.0 Fire hazard classifications: Panel test results by Underwriters Laboratories (UL) in accordance with ASTM E 84 will not exceed:
 - a. Flame spread: 25
 - b. Fuel contributed: 0
 - c. Smoke developed: 20

Section 07460 Cladding/Siding

- 1.0 Siding Panels: Vertical, ribbed 24 gage metal wall panels.
- 2.0 Subgirts: Prefinished, cold formed metal, standard product from siding manufacturer.
- 3.0 Accessories: Prefinished metal trim, metal flashing, neoprene closures.

Section 07530 Metal Roofing

- 1.0 Roofing system: Factory Mutual Class I, over insulation board over metal deck with crickets to drains.
- 2.0 Insulation stops: Treated 2 by lumber.

Section 07620 Sheet Metal Flashing and Trim

- 1.0 24-gage galvanized metal flashing, trim reglets, and scuppers.

Section 07700 Roof Specialties and Accessories

- 1.0 Prefabricated curbs.
- 2.0 Expansion joints.
- 3.0 Relief vents.

Section 07800 Skylights

- 1.0 Tubular anodized aluminum frames and crossbars.
- 2.0 Concealed glazing fasteners.

Section 07920 Sealants and Caulking

- 1.0 Polysulfide sealant with nonstaining primer.
- 2.0 Closed-cell polyethylene foam backer rod.
- 3.0 Premolded bituminous expansion joint filler.
- 4.0 Fire-barrier sealant: UL listed or FM approved.

DIVISION 8 - DOORS AND WINDOWS

Section 08100 Metal Doors and Frames

- 1.0 Exterior doors: Hollow metal, flush type with 18-gage face sheets, insulated for exterior installation, weatherstripped, acoustical, and/or fire rated as required.
- 2.0 Interior doors (shop areas): Hollow metal, flush type with 18-gage face sheets, insulated as required for acoustical and/or fire rated installation.
- 3.0 Sliding fire doors and tracks, fire rated as required.
- 4.0 Frames: Hollow metal, 16 gage, fire rated as required.
- 5.0 Louvers, metal, fire rated as required.

Section 08210 Wood Doors

- 1.0 Solid core, solid stave, flush type for office areas, fire rated as required.
- 2.0 Louvers, metal, fire rated as required.

Section 08305 Access Doors

- 1.0 Flush panel access door for drywall.

Section 08330 Overhead Coiling Doors

- 1.0 Insulated type, face mounted, fully weather-stripped, power operated with auxiliary chain drive.
- 2.0 Form curtain of interlocking steel slats. Galvanize in accordance with ASTM A 526 and phosphatize.
- 3.0 Curtain bottom: 2 rolled steel angles fastened, back to back, to slats. Equip bottom with continuous rubber seal.
- 4.0 Cover coiled door with hood formed from 24-gage steel sheet and galvanize (ASTM A 576).
- 5.0 Prime metal surfaces with one coat of manufacturer's standard rust inhibiting primer.

- 6.0 Provide for padlock locking.
- 7.0 Emergency Response Vehicle Doors: includes a flashing light visible to the driver that goes out when the door is fully open.

Section 08360 Sectional Overhead Doors

- 1.0 Insulated type, face mounted, power operated with auxiliary chain drive complying with ANSI A216.1.
- 2.0 Design and reinforce doors to withstand a 20 psf wind load.
- 3.0 Steel door sections
 - a. Hot dipped galvanized structural quality, high tensile strength carbon steel sheets (ASTM A 446, Grade D, average yield strength of 60,000 psi and a minimum G 90 zinc coating complying with ASTM A 525).
 - b. Sections will be flash, 16 gage face with 26 gage back cover, fabricated from a single sheet to provide units not more than 24 inches high. Provide square corner insulating glass panels. Fabricate and reinforce in accordance with manufacturer's standards.
- 4.0 Tracks, supports, hardware, counter balance mechanisms and accessories in accordance with manufacturer's recommendations.
- 5.0 Door(s) operators and controls.
 - a. Chain hoist: Gear reduction 15-1/2:1, heavy-duty unit for heavy doors for emergency operation.
 - b. Electric door operation: All doors.
 - c. Control stations: Three-button, open-close-stop, on at each door.
 - d. Rapid Control: VHF, 3-channel units for each door (individually controlled). Two rapid controllers per door. All doors on separate frequencies.
- 6.0 Emergency Response Vehicle Doors: includes a flashing light visible to the driver that goes out when the door is fully open.

Section 08410 Aluminum Entrances and Storefronts

- 1.0 Anodized aluminum mullion, sill and head sections. Glazing channels to accept insulated double pane glazing.
- 2.0 Medium stile doors, 1-3/4 inch thick.

Section 08520 Aluminum Windows

- 1.0 Tubular anodized aluminum frames.

Section 08710 Door Hardware

- 1.0 Panic hardware for exterior doors.
- 2.0 Door closers, stops, holders, latch sets, push/pull plates, kick plates, smoke seal weather-stripping, and air seals.
- 3.0 Locksets for managerial offices, conference rooms, storage rooms, mechanical rooms, file rooms, copy rooms, janitorial closets, and telecommunication rooms, exits, and entries.
- 4.0 Fire door hardware: UL listed or FM approved.

Section 08810 Glazing

- 1.0 Exterior window glazing: Insulated glass, low emissivity, Class 40, NFRC tested U-value 0.40 or less, shading coefficient 1.0 or less.
- 2.0 Tempered glass: Light reducing.
- 3.0 Single pane glazing: Wire glass for interior door lights.
- 4.0 Preformed elastomeric glazing gasket.

DIVISION 9 - FINISHES

Section 09250 Gypsum Board

- 1.0 Fire-retardant board: 5/8-inch thick, Type X.
- 2.0 Water-resistant board: 5/8-inch thick, Type W-R board on walls in restrooms.
- 3.0 Metal studs, 6 inch and 3 1/2 inch, 18 to 25 gage, galvanized.
- 4.0 Ceiling framing: Cold-rolled channels and metal-furring channels.
- 5.0 Hangers: Galvanized, annealed wire.

Section 09310 Ceramic Tile

- 1.0 Standard tile for shower walls, dry off, and restroom area.
- 2.0 Glazed wall tile wainscot with bullnose top.
- 3.0 Thin set installation.

Section 09500 Acoustical Treatment

- 1.0 Acoustical ceiling tiles: 2 by 4 foot and 2 by 2 foot, lay in mineral board, UL 1-hour fire rated where required, Class A.
- 2.0 Water-resistant ceiling tiles: 2 by 4, plastic surface coating, Class A.

- 3.0 Suspension system: Exposed 2-way metal tee grid with wall moldings as directed, fire rated and nonfire-rated as required.
- 4.0 Hanger wire: 12 gage, galvanized soft steel.

Section 09650 Resilient Flooring

- 1.0 Vinyl composition tile.
- 2.0 Sheet vinyl flooring.
- 3.0 Rubber base, 4 inch.
- 4.0 Edge strips.
- 5.0 Primer.
- 6.0 Adhesives.

Section 09680 Carpet

- 1.0 Tufted, textured loop, anti-static, Class I critical radiant flux of 0.45 watts per square centimeter with polypropylene backing.

Section 09900 Painting

- 1.0 Fillers: Wood paste, plastic wood, concrete.
- 2.0 Sealers: Quick drying, emulsion type.
- 3.0 Primers: Enamel undercoat alkyd type zinc/chromate (not yellow) for ferrous metals. Alkyd zinc oxide for galvanized metals.
- 4.0 Paints: Gloss enamel, latex flat, latex semi-gloss.
- 5.0 Stains and varnishes: Urethane varnish on exposed wood.

DIVISION 10 - SPECIALTIES

Section 10115 Markerboards

- 1.0 Markerboards: White, dry markerboards, unit size 42-inches high by 72-inches long.

Section 10160 Metal Toilet Compartments

- 1.0 Doors, partitions, screens: 1-inch thick steel face panels.

Section 10260 Wall and Corner Guards

- 1.0 Wall guards.
- 2.0 Corner guards.

Section 10270 Access Flooring

- 1.0 Floor system: 24 by 24 inch removable interchangeable panels, resilient tile finish, adjustable pedestal support, UL Class A.

Section 10350 Flagpoles

- 1.0 Flag: 4-feet high by 6-feet long.
- 2.0 Pole: Aluminum, cone, 30-feet high, 6-inch diameter at base.
- 3.0 Self-storing electric switch operation.

Section 10400 Identifying Devices

- 1.0 Site sign with ground lights.
- 2.0 Building directories.
- 3.0 Lighted company logo signs.
- 4.0 Building numbers: Adhesive vinyl lettering.
- 5.0 Room title signs.
- 6.0 Exit signs: Self powered, wall mounted.

Section 10410 Directories

- 1.0 Provide and install a surface wall mounted glass enclosed black background with white copy directory to be located in the main entry.

Section 10505 Metal Lockers

- 1.0 Lockers: Single-tiered, 15 by 18 by 72 inch metal lockers.
- 2.0 Locker benches: Heavy-duty aluminum legs, hardwood tops.

Section 10522 Fire Extinguishers, Cabinets and Accessories

- 1.0 Fire extinguisher cabinets: Bubble front, semi-recessed wall mounting.
- 2.0 Fire extinguishers

Section 10650 Operable Partitions

- 1.0 Accordion folding partitions: Vinyl-clad cold rolled steel panels connected to full length steel hinges, STC 44 minimum, UL Class A flame spread.

Section 10670 Storage Shelving

- 1.0 Metal storage shelving.
- 2.0 Metal span shelving.

Section 10800 Toilet and Bath Accessories

- 1.0 Papertowel dispensers.
- 2.0 Waste receptacles.
- 3.0 Toilet paper holders.
- 4.0 Mirrors.
- 5.0 Soap dispensers.
- 6.0 Sanitary napkin dispensers.
- 7.0 Sanitary napkin disposal.
- 8.0 Electric hand dryers.
- 9.0 Grab bars for handicap stalls.
- 10.0 Coat hooks.
- 11.0 Anchor devices.
- 12.0 Toilet seat cover holders.
- 13.0 Mop and broom holders.
- 14.0 Curtain rods.

DIVISION 11 - EQUIPMENT

Section 11132 Projection Screens

- 1.0 Conference Rooms:
 - a. Viewing Surface, 6 feet by 6 feet matte white.
 - b. Flame retardant and mildew resistant seamless fabric.
 - c. Extension wall brackets, 6 inch.
 - d. Heavy gauge steel case.
 - e. Concealed roller ends.

Section 11160 Loading Dock Equipment

- 1.0 Bumper dock.

Section 11212 Vertical Turbine Pumps

- 1.0 Recirculation Pumps: vertical turbine, 750 gpm at 272 ft total dynamic head (TDH).
- 2.0 Treatment Pumps: vertical turbine, 400 gpm at 14 ft TDH.

Section 11242 Chemical Feed Systems

- 1.0 Hypochlorite Metering Pump: 1.2 gallon/hour
- 2.0 Hypochlorite Storage Tank: 100 gallon

Section 11400 Food Service Equipment

- 1.0 Range: Drop-in, self-cleaning, industrial grade.
- 2.0 Grill: Large industrial grade.
- 3.0 Exhaust hood: Industrial grade
- 4.0 Refrigerator: Industrial grade, walk-in
- 5.0 Refrigerator: Industrial grade, approximately 21 cubic foot capacity
- 6.0 Freezer: Industrial grade, walk-in
- 7.0 Freezer: Industrial grade, top opening, service type
- 8.0 Dishwasher: Industrial grade, quiet wash, extra large capacity
- 9.0 Microwave oven: Convection microwave oven, approximately 1.0 cubic foot capacity.

Section 11452 Residential Appliances (for breakrooms)

- 1.0 Range: Drop-in, self cleaning.
- 2.0 Exhaust hood.
- 3.0 Microwave oven: Convection microwave oven, approximately 1.0 cubic foot capacity.
- 4.0 Refrigerator: Residential grade, approximately 21 cubic feet capacity with top freezer and ice maker.
- 5.0 Dishwasher: Residential grade, quiet wash, extra large capacity.

DIVISION 12 - FURNISHINGS

Section 12301 Metal Casework

- 1.0 Casework for shops.
- 2.0 Base cabinets: Metal with wood work tops, 34 inches high.
- 3.0 Wall cabinets: Metal with adjustable shelves, 30 inches high.
- 4.0 Bin storage: Metal with adjustable sliding shelves and dividers.

Section 12302 Wood Casework

- 1.0 Casework for conference/lunchroom and administrative areas.
- 2.0 Base cabinets: Stained oak with plastic laminate covered counter top and splash, 36 inches high.
- 3.0 Wall cabinets: Stained oak with adjustable shelving, 30 inches high.

Section 12510 Blinds

- 1.0 Horizontal blinds: One unit required for each window in offices, conferences rooms, copy center, and lunchrooms.
- 2.0 Typical unit: One-inch wide aluminum slats, approximately 5-foot wide by 6-foot high.

Section 12600 Furniture and Accessories

- 1.0 Metal desks, file cabinets, tables, and bookshelves for operational offices.
- 2.0 Wood with plastic laminate: desks, file cabinets, tables, and bookshelves for administrative offices.
- 3.0 Office chairs: ergonomically designed.
- 4.0 Lobby furniture.
- 5.0 Wood conference table.
- 6.0 Interlocking/stackable chairs: Ergonomically designed metal frame, cushion seat and back.

Section 12690 Floor Mats and Frames

- 1.0 Entrance mat: Composed of selected aircraft and truck tires, 1-1/2 pounds per square foot.
- 2.0 Recessed aluminum frame, 3/8-inch thickness.
- 3.0 Adhesive.

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13120 Preengineered Structures

- 1.0 Submit fabrication drawing with certificate signed by a-registered structural engineer stating structure meets the design criteria. Include design reactions for foundations.
- 2.0 Design Criteria:
 - a. SDC 4.1, Noncategory I: All structures except 90-Day Storage Pad.
 - b. SDC 4.1, Category I: 90-Day Storage Pad.
- 3.0 Submit erection instruction and diagrams.

Section 13440 Instrumentation

- 1.0 Specification to be prepared in detail during definitive design.

DIVISION 15 - MECHANICAL

Section 15300 Fire Protection

- 1.0 Ordinary hazard pipe sizing wet sprinkler systems designed and installed in accordance with NFPA 13.
- 2.0 Alarm check valves: at each building entry
- 3.0 Backflow prevention assembly: double-check assembly with OS&Y isolation valves and supervisory switches.
- 4.0 OS&Y control valves with supervisory switch.
- 5.0 Fire department connections; 4 inch by 2-1/2 inch by 2-1/2 inch.
- 6.0 Acceptance testing in accordance with NFPA 13.
- 7.0 Portable fire extinguisher cabinets installed in accordance with NFPA 10.
- 8.0 Waterflow alarm switches: Tamper resistant with retard.
- 9.0 Kitchen hood fire suppression system: packaged piped soda powder spray deluge.
- 10.0 Pipe:
 - a. Inside building: Schedule 40 steel with grooved or threaded fittings: ASTM A 135, A 53, ANSI B 36.10M. Acceptance testing in accordance with NFPA 13.
 - b. Underground buried: ductile iron, hubbed with elastomeric seals and thrust blocks at changes in direction.

11.0 Portable fire extinguisher cabinets installed in accordance with NFPA 10.

12.0 Materials and workmanship: Components to be UL listed or FM approved for the intended application and installed in accordance with NFPA 13.

Section 15400 Plumbing

A. Plumbing Fixtures

1.0 Water Closet

- a. Bowl: Wall hung siphon jet vitreous china closet bowl with elongated rim.
- b. Flush valve: Exposed chrome plated, diaphragm type with oscillating handle, escutcheon, bumper, integral screwdriver stop and vacuum breaker.
- c. Seat: Five-ply, solid white plastic, open front extended back, less cover, complete with self-sustaining hinge.

2.0 Urinal: Vitreous china wall hung, wash-out urinal with shields, integral trap, integral flushing rim, removable stainless steel strainer.

3.0 Lavatory

- a. Lavatory: Self-rimming counter top 19 x 16 inches minimum porcelain on stainless steel lavatory with drillings on 34 inch centers, overflow, seal of putty, caulking, or concealed vinyl gasket.
- b. Trim: Chrome-plated combination supply fitting with indirect lift waste, aerator, lever handles, handicap accessible.

4.0 Showers: In accordance with plan and having single handle mixing valve and 110° temperature range maximum.

5.0 Kitchen sink

- a. Sink: Double-bowl self rimming. Stainless steel with tilting ledge.
- b. Trim: Chrome plated.

6.0 Fountain: Surface-mounted electric water cooler with stainless steel top, elevated antisquirt bubbler with stream guard automatic stream regulator, mounting brackets.

7.0 Service or mop sinks:

- a. Bowl: 36 by 24 by 10 inch deep, white molded stone, floor mounted sink with 1-inch wide shoulders, stainless steel strainer.
- b. Trim: Exposed wall-type supply with cross handles, spout wall brace, vacuum breaker, hose and spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges, 5 feet of 1/2 inch plain end reinforced rubber hose clamp, and mop hanger.

8.0 Floor drains:

- a. Toilet rooms: 2-inch with polished bronze strainer.
- b. Equipment rooms: cast iron floor sink type.
- c. Kitchen: porcelain coated.

B. Potable water systems: For potable cold water, domestic hot water (DHW) and DHW recirculation systems. Service temperature 40°F to 200°F, service pressure 115 psig maximum.

1.0 Piping

- a. Inside building: Type K hard copper with copper alloy solder fittings. Solder, lead free, ASTM B 32, alloy Grade 95TA.
- b. Underground, buried: Type K soft copper dielectric fittings when connecting to dissimilar metals.
- c. Valves, strainers, and unions: Brass, screwed connections with unions.
- d. All flanged connections of equipment, glass filled Teflon gasket, 1/16 inch thick and flange with face to match equipment flange.
- e. DHW and DHW recirculation piping insulation: 2-inch thick glass, fiber piping insulation,.
- f. Wall hydrants: chromed brass, freeze proof.

2.0 Water heaters

- a. Under-counter electric: high efficiency 15 gallon capacity (at remote toilet rooms).
- b. LPG fired storage type: high efficiency forced draft packaged with safety devices, recirculation pump and insulation protecting jacket.
- c. High efficiency electric booster heater for 180° water in kitchen rinses - provided with kitchen equipment.

C. LPG fuel system

1.0 LPG lines buried underground, 2" and smaller: Yellow polypropylene plastic per LPG Company specifications.

2.0 LPG lines buried underground, 2-1/2" and larger:

- a. Piping: Carbon steel Schedule 40, galvanized steel, ASTM A 53 or A 106, Grade B, seamless, with polyethylene plastic jacket.
- b. Joints: Welded with hot bitumen tape wrap.

3.0 LPG lines above ground, 1-1/4" and smaller:

- a. Piping: Carbon steel Schedule 40, galvanized steel, ASTM A 53 or A 106, Grade B
- b. Joints: threaded

4.0 LPG lines above ground, 1-1/2" and larger:

- a. Piping: Carbon steel Schedule 40, galvanized steel, ASTM A 53 or A 106, Grade B
- b. Joints: welded

5.0 Valves for LPG lines: lubricated plug type except at end user; 2" and smaller threaded, 2-1/1" and larger flanged.

D. Sanitary Sewer and Sewer Vent

1.0 Above ground 2 inch and smaller

- a. Pipe: Schedule 40, galvanized steel, ASTM A 53, Type E or S, Grade B.
- b. Joints: Threaded, sealed with sealant tape.
- c. Fittings:
 - 1) Waste piping: Ductile iron and PVC.
 - 2) Vent piping: Class 125, cast iron threaded in accordance with ANSI B16.4.

2.0 Above ground 2-1/2 inch and larger

- a. Piping: Hubless cast iron sanitary system in accordance with CISPI 301.
- b. Joints: Sealing sleeve with shield and clamp in accordance with CISPI 301.

3.0 Underground all sizes

- a. Piping: Service weight cast iron soil pipe in accordance with ASTM A 74.
- b. Joints: Hubless cast iron in accordance with UPC, Section 802.
- c. Fittings: Service weight cast iron soil fittings in accordance with ASTM A 74.

Section 15500 Heating, Ventilating, and Air Conditioning

A. Support building supply systems

- 1.0 Air handling unit: Horizontal draw through unit consisting of mixing box, 30 percent ASHRAE prefilter section, 85 percent ASHRAE final filter section,

preheating coil, chilled water coil section, and fan section with variable speed drive, 460 volts, 3 phase, 60 Hz.

Return - exhaust fan, airfoil, belt drive, variable inlet vanes, 460 volts, 3 phase, 60 Hz.

- 2.0 Exhaust fan: Roof exhaust fan with motorized shut-off damper and prefabricated curb, 208 volts, 1 phase, 60 Hz.
- 3.0 LPG fired unit heater: Horizontal propeller fan type with unit mounted thermostat, 208 volts, 3 phase, 60 Hz.
- 4.0 Terminal units: Pressure independent fan powered parallel flow electrically controlled variable air volume boxes with hot water heating coil.
- 5.0 LPG fired makeup air unit: Horizontal blow through type indirect fired with evaporative cooling section.
- 6.0 Air curtain: Propeller fan down discharge.
- 7.0 LPG fired radiant heating system: suspended fire-in-tube type with reflectors and standard components.

B. Miscellaneous: The following components and requirements apply to all HVAC systems located in the building.

- 1.0 Return Grilles: Steel, one set of blades parallel to the long dimensions with opposed blade damper.
- 2.0 Supply diffusers: Heavy gauge steel back pan, steel perforated face with standard white finish.
- 3.0 Supply and return air ductwork: ASTM A 527 galvanized steel, fabricated in accordance with SMACNA HVAC Duct Construction: Standard Metal and Flexible.
- 4.0 Flexible duct: Class I air duct in accordance with UL 181.
- 5.0 Duct thermal insulation: For outside air duct, supply air, return air, semirigid insulation. For indoor duct, glass fiber, two-inch minimum thickness, 3 lbs/ft² density with foil reinforced craft facing vapor barrier.
- 6.0 Duct acoustic insulation: Supply air ductwork down stream of the fan will be lined with rigid glass acoustic duct insulation, 1-inch thick with vinyl face on the air stream, for a distance of 25 feet.
- 7.0 Fire damper: 1-1/2 hour fire resistance rating, UL listed, factory sleeve.
- 8.0 Penetration seals: For all ductwork and piping penetrations through walls, fire barriers, floors, and roof; seal with semirigid sealant and maintain the same fire rating as the barrier penetration with semi-rigid sealant.

C. Chilled Water Cooling and Hot Water Heating Systems

1.0 Piping:

- a. Pipe 1/2 inch and larger: Carbon steel, Schedule 40, ASTM A 53, Type E or S, Grade B or ASTM A 106, Grade B, seamless.
- b. Fittings for pipe 1-1/2 inches and smaller: Class 150, malleable iron, threaded, ANSI B16.3.
- c. Fittings for pipe 2 inches and larger: Wrought steel, ASTM A 234, Grade WPB, wall thickness to match pipe butt welding, ANSI B16.9.
- d. Flanges 2 inches and larger: Class 150, ASTM A 105; raised face, welding neck or slip on ANSI B16.5; bore to match pipe interior diameter.
- e. Valves 1-1/2 inches and smaller: Class 150, bronze body threaded ends.
- f. Valves 2 inches and larger: Class 150, bronze or cast iron body, flanged ends.
- g. Insulation for indoor piping: 2 inches thick, glass fiber pipe insulation with AP jacket.
- h. Insulation for outdoor piping: 2 inch thick, glass fiber pipe insulation with metal jacket.

2.0 Piping Specialties:

- a. Air separator: Suitably located and connected with expansion tank.
- b. Backflow preventers: Comply with WAC-248-54-285.
- c. Circulating pumps: Horizontal, centrifugal, end suction, direct drive, 460 volts, 3 phase, 60 Hz, premium efficient motors.
- d. Compression tank: Captive air charge type
- e. Suction diffuser: Provided at pump inlets
- f. Chemical treatment pot feeder:

3.0 Water Chiller: Air cooled condenser type packaged unit for outdoor mounting to cool water from 55° to 45°F, provided complete with automatic and safety controls and control panel.

4.0 Hot Water Boiler: Bent water tube, LPG fired forced draft type with relief valves, low water switches and all control components in panel for automatic and safe operation. Heating water from 150° to 180°F.

D. Automatic Temperature Control System.

- 1.0 A system of control will be provided which provides the most cost effective and reliable means of regulating temperatures in the various rooms and zones while permitting central monitoring and start-stop of equipment in an energy conserving

manner. This is anticipated as entailing actuated direct digital electronic typemaster panels sensing control devices, either with electrically actuated valves and dampers or with pneumatically actuated valves and dampers interfaced with an electronic

E. Commissioning:

- 1.0 Final testing and adjustment of the air and water systems together with checkout of controls shall be provided for in the commissioning phase of finalizing the Heating, Ventilating and Air Conditioning work. This will provide the owner and A/E with the O & M manuals, balancing reports, guarantees and certifications to assure a system operating as designed and ready for owner's takeover.

DIVISION 16 - ELECTRICAL

Section 16300 High Voltage Distribution (Above 600 Volts)

- 1.0 13.8 kV aerial line conductors: 3-#4 ACSR.
- 2.0 Lightning arresters: Distribution, valve type, rated 15 kV, 95% BIL.
- 3.0 Distribution cutouts: Open, fused, heavy duty.
- 4.0 Poles: Class 2, butt-treated western red cedar.
- 5.0 Underground duct: Concrete-encased rigid steel conduit, 24 inch minimum burying depth under street.
- 6.0 Underground cable: 15 kV-rated, shielded, EPR-insulated copper conductors.
- 7.0 Transformers: Outdoor, pad-mounted, dry-type, 13.8 kV, 480Y/277V ac, amorphous core, fusible load break switch on primary, surge arresters on primary, provisions for adding fan cooling package.

Section 16300 Medium Voltage Distribution

- 1.0 Cable: 15 kilovolt underground single conductor, annealed copper, Class B compressed strand, 220 mil ethylene-propylene-rubber, copper concentric neutral embedded in a thermosetting jacket.
- 2.0 Conduit for encasement into duct banks: PVC Schedule 80.
- 3.0 Pad-mounted sectionalizing cabinet: Metal enclosure with separable insulated connector cable junction.
- 4.0 Pad-mounted transformer: Less-flammable liquid insulated self-cooled, compartmental-type, for use with separable high voltage connectors, bayonet-type fault and overload sensing primary fuses for use on loop feed systems and with provision for secondary busway connection.
- 5.0 Pad-mounted transformer and sectionalizing cabinet lightning arrester: Premolded rubber elbow, metal oxide varistor type, 10.2 kilovolt rated.

Section 16400 Service and Distribution

- 1.0 Conduit for encasement into duct banks: PVC Schedule 40.
- 2.0 Conduit for encasement into duct banks under roadway: Rigid steel.
- 3.0 Exposed conduit: Rigid steel.
- 4.0 Buried conduit: PVC.
- 5.0 Concealed conduit: Electrical metallic tubing.
- 6.0 Power conductors: 600 volt, Type XHHW, or THWN/THHN copper.
- 7.0 Transformer: Dry type, single phase, meeting the requirements of NEMA ST 20.
- 8.0 Panelboards: Surface mounting, circuit breaker type full rated, conforming to FS -P-115W and NEMA PB 1, 25,000 AIC minimum for 40 volt panelboards. A 22,000 AIC minimum for all 240 and 208 volt panelboards will be used as a design basis.
- 9.0 Interior Lighting Fixtures:
 - a. Fluorescent, recessed, 2 by 4 foot, parabolic, 18 cells, with two or three T-8 lamps.
 - b. Fluorescent, recessed, 2 by 4 foot, refractive grid, with two, three, or four T-8 lamps.
 - c. Halogen flood lamps, recessed, 75 watt PAR flood lamp.
 - d. Halogen flood lamps, wall mounted, 100 watt lamp with diffuser.
 - e. Fluorescent fixture electronic ballasts.
 - f. Fixture fittings and parts for installation.
 - g. Fluorescent, industrial type, ceiling hung.
 - h. Occupancy sensors/switches for offices and administrative type room systems.
- 10.0 Exterior Lighting Fixtures:
 - a. Halogen flood, recessed soffit mounted, 75 watt lamp, photocell control.
 - b. Low-pressure sodium light, wall and pole mounted, photocell control.
 - c. Halogen, ground lighting for complex sign, 75 watt lamps, photocell control.
- 11.0 Grounding:
 - a. Grounded service and derived systems neutrals.
 - b. Building ground grid system.

12.0 Receptacles:

- a. Convenience, 120 Vac NEMA configuration 5-20R.
- b. Special purpose, 250 Vac NEMA configuration 13-15R.
- c. Special purpose, 125/250 Vac NEMA configuration 14-15R.

13.0 Toggle switch: 20 A, 277 Vac.

14.0 Manholes

- a. Power: Prefabricated 9 ft by 5 ft by 6 ft deep.
- b. Communications: Prefabricated 9 ft by 5 ft by 6 ft deep.

15.0 Distribution switchboards: Free standing metal enclosed, for front access only, conforming to UL 891, and will be US labeled "Suitable for use as Service Equipment." The main breaker will be an insulated frame breaker with solid state trip device with long time, short time, instantaneous, and ground fault trips. There will be current and potential transformers ahead of the main breaker for remote energy metering. The distribution section will consist of panel mounted molded case circuit breakers. The bus rating and number and size of breakers are shown on the one-line diagrams. The switchboards will have minimum bus bracing and interrupting rating of all circuit breakers of 30,000 A.

16.0 Motor control centers: Totally enclosed, dead front, free-standing, front access only, conforming to NEMA ICS-2 and UL 845. The bus and device ratings are shown on the one-line diagrams. The minimum bus bracing and interrupting rating of the circuit breakers will be 30,000 A.

17.0 Distribution panelboard: Surface mounting, circuit breaker type, conforming to FS W-P-115 and NEMA PB 1, 14,000 AIC minimum.

18.0 Starters: Full voltage, non-reversing, 600 Vac, enclosed combination type with magnetic breaker. Breaker size, and starter size are shown on one-line diagram.

19.0 Installation and equipment: NFPA 70.

Section 16720 Alarm and Detection System

- 1.0 Local Energy Alarm Control Panel: Alarm control panel will have programmable modules, auxiliary relays, and 60 hours of standby power.
- 2.0 Radio Fire Alarm Reporter: Project supplied.
- 3.0 Manual Pull Stations: Double action.
- 4.0 Alarm Devices: Must be compatible with fire alarm control panel.
- 5.0 Fire Alarm Strobe/Chimes: Single stroke.
- 6.0 Water Flow Alarm Switch: Tamper resistant with retard.

- 7.0 Post Indicator Valve Switch: Tamper resistant with 2 sets of SPDT contacts.
- 8.0 HEPA filter water spray system control panel: System with modules as required, 120 hours standby battery power supply, approximately 40 ampere hours.
- 9.0 Materials and workmanship: Components to be UL listed or FM approved for the intended application and installed in accordance with NFPA 72, 101, and 1221.
- 10.0 Acceptance testing in accordance with NFPA 72.

Section 16740 Voice and Data Systems

NOTE: Brand names and part numbers in items 2 through 5 are to match existing equipment brand names and part numbers. All other items are typical products.

1.0 General

- a. Exposed conduit: Rigid galvanized steel, Schedule 40, ANSI C 80.1.
- b. Conduits below grade: PVC Schedule 40 runs and 1/8 bends or less. Fiber glass or PVC coated rigid steel for 1/4 bends. All bend radius to be not less than 4 feet. Inner duct: FoDuct No. PE-5004 by Aeroquip Corporation³.
- c. Conduit concealed in ceilings or walls: Electrical metallic tubing (EMT), UL 797. Inner duct: FoDuct No. PE-5004 by Aeroquip Corporation³.

2.0 Signal Distribution

- a. Backboard: 4 foot by 8 foot by 3/4 inch fire retardant plywood.
- b. Cross connect with protectors: AT&T⁴ 189ECSI-7 gas tube protected. For telephones and HLAN use 110 blocks for station wiring and equipment connection.
- c. Panel: Fiber optic distribution panel, Telect No. 15-2330-0100 and Telect No. 15-0949-M619. Use level 5 (category 5) patch cord to Cabletron⁵ Electronics.
- d. Equipment rack: Electrorack⁶ No. 115-069 Rev. C.

3.0 HLAN System

- a. Fiber optic transceiver: Canoga Perkins⁷ 8804 and 8805.
- b. Cabletron equipment is used on Hanford Site.

³ Trademark of Aeroquip Corp., Maumee, Ohio

⁴ Trademark of AT&T.

⁵ Trademark of Cabletron Systems, Rochester, New Hampshire

⁶ Trademark of Electrorack, Anaheim, California

⁷ Trademark of Canoga Perkins, Chatsworth, California

- c. Fiber optic jumper cables: Telect No. 504-0909-003.
- d. Fiber optic splices: fusion (direct) splicing.

4.0 Cables

- a. Fiber optic exterior: 24 multimode gel filled; kelvar strength members for aerial and underground 62.5/125 micron, Anixter⁸ No. 370-047-62125WP-02.
- b. Fiber optic interior: 2 multimode; tight buffered plenum cable, 62.2/125 micron.
- c. Telephone external: 25 pair, 24 AWG, PIC, gel filled with corrugated copper shield, solid conductor.
- d. Telephone and HLAN Interior: category 5, plenum rated, 4 pair, 24 AWG, CMP.
- e. Other: Use structured wiring with possible consideration of "siamese cable" for data lines.

5.0 Terminations AMP Universal Wiring System

- a. Use AMP ACO outlets.

If "dry wall" -- recessed box PN# 556598-1 with following parts assembly -- faceplate cover (556599-1), 2 each gang faceplate (555670-1), 2 installation kits (555600-1), 2 each RJ-45 Cat 5 T568A Inserts (557248-1), RJ-11 insert (555611-1), and ST-SC F.O. Insert (P93-1290-82) or SC-SC F.O. Insert (994-1290-10).

If "concrete wall" (1 inch conduit inside wall) -- surface mount PN# 557366-1 with following parts assembly -- 3 each ACO Adapter plate (557364-1), 3 each installation kit (556682-1), 2 each RJ-45 Cat 5 T568A insert (557248-1), RJ-11 insert (555611-1), ST-SC F.O. Insert (P93-1800-14-4) opr SC-SC F.O. insert (558318-1).

- b. Commonly used jacks at Hanford Site are RJ-11 and RJ-45.

⁸ Trademark of Anixter, Tempe, Arizona

APPENDIX F

ENERGY CONSERVATION REPORT

Energy Conservation Certification Report

Form ECM-1 Cover Sheet - - Project Overview

Project No.: 95L-EWT-100

ECR No.: WHC-SD-T100-CDR-001

REV.: .0

Project Title: HAMMER Training Center		Project Description: See Attachment	
Project Location: Hanford 600 Area		Start Date: 3/95	End Date: 5/97
Category Types(s) Category Description(s): New Buildings			
Projected Base Case Annual Energy Usage(Btu/ft.2yr.):		Projected Modified Energy Usage (Btu/ft./yr.)	
Total Floor Area (ft.2): See Attachment		Total Energy Usage (million Btu/yr.):	
Estimated Project Budget (thousand \$): \$29,900 (thousand)			
Report Approach:			
☐ Direct		☒ Short form, Complete Form ECM-S-1	
☐ Integrated, Complete Form ECM-1-1		☐ Phase _____ (See table 1 for compliance form descriptions.)	
Prescriptive Method: (See table 2 for checklist and worksheet descriptions.)			
☒ Interior Lighting 3.3.4		☒ Exterior Lighting 3.3.4	
☒ Building Envelope 3.5.4		☒ HVAC Systems 3.7.4	
☒ Service Water Heating 3.9.4		☒ Other Energy-Using Systems 3.13.4	
System Performance Method: (See table 2 for checklist and worksheet descriptions.)			
☐ Interior Lighting 3.3.4		☐ Exterior Lighting 3.3.5	
☐ Building Envelope 3.5.5		☐ Other Energy-Using Systems 3.13.4	
Compliance Alternative Method: (See table 1 for compliance form descriptions.)			
☐ Building Energy Cost Complete Form ECM-BEC-3.11		☐ Building Energy Use Complete Form ECM-BEC-3.	
		☐ Life-Cycle Cost Analysis Complete Form ECM-BEC-3.14	
Computer Software Used/Version: ☐ ENVSTD Version _____ ☐ LTGSTD Version _____			
Building Simulation Program (DOE, BLAST, ASEAM, etc.): _____ Version _____			
Life-Cycle Cost Analysis Program Used: ☐ BLCC Version _____ ☐ Other _____ Version _____			
Applications for Variance Required		☐ Yes ☐ No If yes, attach Form ECM-V-1 for each.	
Commissioning of HVAC equipment required?		☐ Yes ☐ No If yes, attach commissioning report.	
Acceptance tests been performed?		☐ Yes ☐ No If yes, attach Form ECM-AT.	
Winter Performance tests been performed?		☐ Yes ☐ No If yes, attach Form ECM-PT-W.	
Summer performance tests been performed?		☐ Yes ☐ No If yes, attach Form ECM-PT-S.	
Private Sector Energy Experts Design Review Required?		☐ Yes ☐ No If yes, attach Form ECM-R-1.	
Existing Building Energy Survey Required?		☐ Yes ☐ No If yes, attach Form ECM-ES-3.15	

Energy Conservation Certification Report
Form ECM-1 Cover Sheet - - Project Overview

Project No.: 95L-EWT-100	ECR No.: WHC-SD-T100-CDR-001	REV.: 0

Documentation Author(s):	Telephone(s):

I have reviewed the information on attached forms and certify ECM compliance is met.

[illegible]

I have reviewed the information on attached forms and certify ECM compliance is met

Designated Certifier

Date _____

Comments

**ENERGY CONSERVATION REPORT
HAMMER TRAINING CENTER
PROJECT 95L-EWT-100**

1.0 SUMMARY:

This portion of the Energy Conservation Report is prepared as an attachment to the ECM-1 form provided in the Energy Conservation Manual (ECM) (WHC 1993). The ECM combines the energy conservation compliance requirements of the Code of Federal Regulations (CFR) 10 CFR 435, Subpart A, the project management procedures of Department of Energy (DOE) Order 4700.1, and the general design criteria of DOE Order 6430.1A. The purpose of the Energy Conservation Report is to show compliance with applicable codes and orders, and to investigate, identify major energy conservation alternatives which have a high initial cost, but may be justified through a Life Cycle Cost Analysis (LCCA).

2.0 PROJECT DESCRIPTION:

An 80-acre site near the southern edge of the Hanford Site, along Horn Rapids road, has been set aside for HAMMER Training Center. The project provides facilities for classroom lectures, and hands-on practical training in realistic situations for workers and emergency responders who are tasked with handling and clean-up of toxic substances. Realism for hands-on training will be obtained via simulated hazardous material handling and incident sites. The scenarios will include props, hazardous materials transport and storage equipment mockups, and emergency response equipment to simulate potential incidents given various conditions. The field training laboratories and props will be multipurpose and flexible. However, no actual radioactive or hazardous materials will be used in any of the training exercises. Hazardous materials props and facilities include the following:

1. Simulated flammable liquids and gases training facilities, and props for fire response training.
2. Radiological training props for handling radiological materials (training will include radioactive material and laboratory procedures).
3. Generic hazardous materials handling and transportation props (i.e., petroleum tanks, tank trucks, rail cars, and pipelines) for emergency response to mock accidents and for leak containment exercises.
4. Spill containment simulation area for leak containment activities.
5. Laboratory emergency response.

6. Rescue training facilities for response to fires, HAZMAT transport vehicle accidents, and laboratory accidents.
7. Respiratory equipment training facilities.
8. Equipment and personnel decontamination facilities for procedural training.
9. Equipment familiarization and operation area.
10. Confined space rescue techniques.
11. High and low angle rescue techniques.
12. Hands-on fire extinguisher training.
13. Fire department pumper testing.
14. Support facilities, including offices, classrooms, lavatories, cafeteria/lunchroom, shower rooms, run-off containment and separation facilities, student and staff parking areas, and appropriate storage areas.

2.1 Buildings With HVAC Systems:

There are four buildings/props which have significant HVAC requirements with related energy conservation issues.

	<u>Building</u>	<u>Area (ft²)</u>
1.	Administration Building	33,180
2.	Training Support Building	33,800
3.	Comfort Station	2,050 (1110 enclosed)
4.	Training Tower	5,850 (1110 conditioned)

2.1.1 Administration Building:

The Administration Building houses managerial and administrative support personnel and provides functional and flexible classroom space for proposed classes. This building also provides a reception area for students and visitors, an Emergency Operations Center (EOC) training area, and storage. The Administrative Building will be a one story concrete block veneer metal framed building containing approximately 33,180 ft² of floor area.

Main functional areas are identified in Table F1. The administration area will consist of a lobby and reception area, offices, restrooms, work areas, and conference rooms. The classroom area will consist of various sizes of classrooms, the EOC, a resource center, restrooms, a cafeteria, and miscellaneous storage rooms.

Table F1. Administration Building Areas.

Administration Building Area	Size (ft²)
Classroom Area (includes restrooms and EOC)	10,020
Kitchen Area	1,520
Cafeteria Area	3,670
Visitors Offices	500
Resource Center Area	920
Lobby/Reception Area	1,680
Conference Area	920
Administrative Area	5,160
Storage Area	1,390
Circulation Area	5,470
Building Equipment Rooms	1,930
TOTAL AREA	33,180

The Administration Building classrooms are sized to accommodate 25 to 35 students with partitions between three classrooms to provide an expanded classroom for 100 students. The office area will provide space for approximately 25 permanent staff and 6 temporary staff (turn-around offices).

Heating, Ventilating and Air Conditioning:

- Focus on occupant comfort with systems designed to minimize energy use, to minimize operating cost, to be constructed with optimized initial cost/life cycle cost.
- Design Conditions - Outside

Winter Dry Bulb:	9°F
Summer Dry Bulb:	97°F
Summer Wet Bulb:	67°F
Summer Degree Days:	1286 (Base 65°F)
Summer Degree Hours:	6888 (Base 80°F)

- Proposed Cooling Source is as follows. Final selection will be based on life cycle cost analysis.

Estimate 80-90 tons peak cooling requirement. Propose to use an air cooled water chiller circulating a 30% propylene glycol solution as the primary cooling unit.

Recommend chiller over DX refrigeration for purposes of adequate temperature control, quality of factory assembly over field assembly, and ease of operation and maintenance.

Propose to use one unit, mounted on the ground, utilizing dual compressors with unloading capability, and independent refrigerant circuits (R-22).

The package unit has the additional advantage of minimizing liability in a refrigerant release.

- Design Conditions - Indoor

Summer	75-78° (or as req'd)
Winter	70°F

- Proposed Heating Source

LPG fired forced draft, flexible water tube heating boiler sized for 20-40°F water temperature differential. 150-180°F setpoint range. Estimated capacity 1,500 mbh.

Circulate heating water to points of use; heating coils, radiation, unit heaters, etc.

Size two boilers for 60% of the maximum anticipated heating load. Control boilers to run only below 65°F outside.

Use base mounted, end suction centrifugal pumps. Fit with integral strainer suction diffusers.

Include captive air type, expansion tank, shot type chemical feeder and air elimination in the system.

Propose to use 25% glycol solution with oxygen scavenger and corrosion inhibitor in heating system. This implies a glycol solution feed unit for filling and maintaining pressure in the system.

- Building Construction

Designs are sensitive to energy conservation via the building envelope, and to issues of moisture control in the cold winter climate. Features discussed include: double glazed window, R-19 or better wall construction and R-20 to R-30 roof construction. Slab on grade design implies an insulation board at the perimeter of the foundation.

The proposed sloped roof design renders rooftop air handlers and major equipment impractical, but does offer an attic where fan room space can be developed, and where ample room for ducts and air control boxes is available.

A ground level room for boilers and other primary mechanical equipment is suggested. A location to the outside offers easy access for equipment maintenance and replacement.

Conflict between mechanical ducts and pipes, and electrical rooms must be avoided to satisfy the requirements of the National Electric Code (NFPA 70).

- HVAC System for Space Conditioning

The Administration Building is primarily an office type use which requires a system of year around circulated air (ventilation) summer air conditioning, and winter time heating for perimeter rooms with maintained air circulation.

A typical cost effective system for a building of this size is a variable air volume system (VAV), with minimum air flow in the occupied period to meet indoor air quality criteria. Final selection will be based on a life cycle cost analysis. Heating can be provided in several ways including: baseboard radiation, ceiling panel radiation, heating coils in fan powered VAV boxes, or heating coils in conventional VAV boxes. But comments that best space conditions have been obtained with the fan powered VAV box concept.

Both the radiation and the fan powered box concepts allow night set back heating without use of the central fan.

This building can be easily served by a single central fan (approximately 40,000 cfm) supported by a cooling coil, heating coil, filter bank, and a full function mixing outdoor air economizer.

Primary ductwork between fan and VAV box will be spiral duct of medium pressure design (SMACNA Class 6"). Low pressure ductwork downstream of the VAV boxes would be a combination of rectangular and round duct (SMACNA Class 2")

All supply duct will be insulated.

It is intended to use the incombustible ceiling space as a return air path and plenum to avoid the cost of ducting the return air.

Building HVAC Controls:

The well developed state of the art control systems for building HVAC fall into the category of Direct Digital Control (DDC). These systems include all and more of the functions of earlier pneumatic and electronic systems, and give better service and central monitoring capability. There is some hybridization back to pneumatics for some vendors for actuation of valves and dampers.

While the industry is moving to standardization and interchangeability of DDC products, the one current drawback is the somewhat proprietary nature between vendors of the devices and controlling software.

We anticipate a generic specification which will attract several vendors, but the end result for now will be a system committed to its primary vendor.

Control sequences will be developed for each HVAC system.

Kitchen Related HVAC Systems:

A cooking kitchen with an exhaust hood over the primary cooking surfaces is anticipated. This implies a companion rooftop make-up air unit. A dishwasher exhaust hood and fan is anticipated, as is an air curtain at the outside personnel door.

Miscellaneous HVAC Systems:

Exhaust fan(s) for each toilet room and custodial closet are anticipated. Make-up air (unconditioned) from the return air plenum will be transferred to each exhausted space.

The boiler room will require a unit heater to maintain temperature in the face of open combustion air louvers.

Vestibules at entry ways will be unheated.

Corridors will be treated as occupied spaces. Combination fire/smoke dampers are required at duct penetrations of the rated exit corridors.

Relief air will be accommodated in the overall ventilation scheme.

2.1.2 Training Support Building:

The Training Support Building will combine storage of fire fighting equipment; storage of training materials, supplies, and equipment including large and heavy equipment required to support field training exercises envisioned for the higher case scenarios; and SCBA maintenance and fill area. Space is provided for indoor training activities during inclement weather, as well as for craft-specific training activities, (i.e., scaffolding erection, overhead ductwork, piping, etc.) and for mock-up of craft-specific props (i.e. confined space, greenhouse construction, etc.). It will be a one story metal building containing approximately 33,800 ft² of floor area.

Storage bays for one Hazardous Materials (HAZMAT) vehicle, one fire truck, and an ambulance will be provided in the garage portion of the building. The warehouse area will consist of an open area for indoor training, secured areas for each trade, a loading dock and covered parking.

Main functional areas are identified in Table F2. The SCBA maintenance and fill area will consist of a compressor room, an SCBA fill area, and an SCBA repair/disinfecting/drying area. The vehicle parking and training area will consist of an open area for indoor training, an open area with roll-up doors for parking vehicles, and fold-out bleachers. The Training Support Building will also contain a miscellaneous prop storage area, personnel decontamination, lockers, change rooms and break room.

Table F2. Training Support Building Areas.

Training Support Building Area	Size (ft²)
Vehicle Parking Training Area	6,070
SCBA and Fill Area	1,650
Storage Areas	2,460
Training/Equipment/Storage Area	13,790
Classroom Area (includes breakroom)	2,470
Personnel Decontamination Training Area	1,180
Restrooms/Locker Rooms/Suit Drying Rooms Area	3,900
Loading Dock Area	500
Circulation Areas	1,780
TOTAL AREA	33,800

The Training Support Building is sized to accommodate a class of 50 students. The SCBA area is sized to maintain approximately 250 SCBA tanks and masks, and the fill area is designed to handle up to 300 tanks per day. The personnel decontamination and change room area is sized to accommodate approximately 100 students of each gender. The indoor parking area is designed to accommodate a fire truck, an ambulance, and a HAZMAT vehicle.

Heating, Ventilating and Air Conditioning:

- Design Conditions - Outside

Winter Dry Bulb:	9°F
Summer Dry Bulb:	97°F
Summer Wet Bulb:	67°F
Summer Degree Days:	1286 (Base 65°F)
Summer Degree Hours:	6888 (Base 80°F)

- Design Conditions - Inside

Occupied/Unoccupied	75°/60°F
Warehouse	50° min.

- Proposed Systems

Serve the occupied work spaces with a residential style forced air furnace(s) with ducting to diffusers to distribute the air. Mate the furnace with a condensing unit and cooling coil for summer temperature control.

Treat the compressor room with a unit heater for off-hours keep-warm duty (50°F) and with an exhaust fan/louver set to exhaust the room when the temperature rises above 85°.

Treat the central storage room with a unit heater only.

Treat the parking bay(s) and equipment storage areas with a propane fired radiant tube system (85% + efficiency). Provide a ventilating fan to blow filtered but uncooled air in the vicinity of the bleachers. Provide exhaust capability for engine exhaust with dedicated drop hoses for use when engines are run for extended periods inside. Assume leakage is adequate to allow make-up air to infiltrate the space.

Provide a heating only service for the Training/Equipment Storage Areas using a propane fired radiant tube system.

Provide exhaust only for the Janitor Closet and the Electrical Room.

Provide an air conditioning unit mounted in the equipment loft to serve the classrooms breakroom and the restrooms with individually controlled air conditioning capability.

Use the room marked HVAC to house miscellaneous equipment and a single zone air handling unit with propane fired heat to treat all of the south side spaces as one large zone. Duct supply air along the outside with diffusers to each space, return duct along the north wall back to the fan. Include outside air compatibility for make-up and ventilation. Option to include a condensing unit and cooling coil for air conditioning.

Provide roof mounted exhaust fans for each restroom/locker room.

- Building Envelope

Minimal windows
Insulated walls and roof (R-19)

- Energy Conservation

Unoccupied setback

2.1.3 Comfort Station:

Restrooms and/or a comfort station are to be located such that service is provided within a maximum of 600-foot radius from any point on the HAMMER Training Center site. Restrooms are provided in the Administration Building and the Training Support Building. A comfort station is located on the HAMMER Training Center facility grounds so that the minimum radius requirement is met. All restrooms and the comfort station are furnished with hot and cold running water and flush toilets.

The comfort station provides a group shelter area, a vending area, a first aid station, and restroom facilities. The Comfort Station provides a rest area during training exercises and an area for field discussions/classes. The Comfort Station is a one story concrete block building containing approximately 1,110 ft² of enclosed floor area.

Main functional areas are identified in Table F3. The restroom area consists of restrooms, a janitor's closet, a utility room, a first aid station and a seating area for donning and doffing personnel protective equipment. The vending area provides two drinking fountains, three vending machines, four telephones, and a first aid closet.

Table F3. Comfort Station Areas.

Comfort Station Area	Size (ft ²)
Covered Open Area	940
Restroom Area	700
Vending Area	270
Equipment Area	140
TOTAL AREA	2,050

The group shelter area is sized to accommodate five 8-person picnic tables, with adequate circulation between tables. The restrooms are sized for 40 students based on an industrial type of use.

Heating, Ventilating and Air Conditioning:

- The comfort station is of such a nature that a very simple HVAC system is desired. The system must be small and uncomplicated, be durable, and above all, protect water pipes and fixtures from freezing. The character of the duty is very much like that of a highway rest stop.

- **Proposed Systems**

Provide exhaust for summer heat and/or odor control for each of the spaces.

Provide a small residential size forced air furnace involving all spaces, returning only from the vending area. The building is small and will utilize either electric or LPG heat as determined during further cost analysis. Temperatures will be maintained at 60°F.

Exhaust warm air from the toilet rooms through the double wall cavity to protect piping.

- **Building Construction**

Insulate the outside walls and roof to R-19 or better.

2.2 Prop Structures with HVAC Systems:

2.2.1 Training Tower:

The Training Tower will provide realistic fire fighting training for structural and laboratory fires. However, live fire exercises will not be conducted in this structure. Ladder exercises, repelling, and high-angle rescue training will be performed at this

prop. The lower two levels will provide a simulated laboratory setting for mock accidents (i.e., chemical spills, smoke release, and vapor releases using simulated hazardous substances).

Exterior and interior stairs will be constructed from ground level and will extend to the tower roof. The Training Tower will be a six story CMU and cast-in-place concrete building containing approximately 5,850 ft² of floor area.

The building will have a self-draining dry-riser stand pipe in the exterior stairway. The pipe will rely on a pumper truck for water supply and will not be connected to the water system. Two training water fire hydrants will be provided near the structure. Floors will be sloped to drains that will drain to the recirculation system. One room will be supplied with a sprinkler system connected to the riser pipe for training on wet pipe work. The laboratory rooms will include non-functional laboratory equipment, sinks, and emergency eye wash showers. Building systems will include potable cold water, lighting, and heating. Laboratory sinks and simulated emergency eye wash showers will be connected to the sanitary sewer system.

Main functional areas are identified in Table F4. The Training Tower will include laboratory prop rooms, training rooms, interior stairs, and exterior stairs.

Table F4. Training Tower Areas.

Training Tower Area	Size (ft²)
Laboratory Prop Area	900
Training Area	1,600
Equipment Room	210
Enclosed Vertical Circulation Areas (Stairs)	1,330
Horizontal Circulation	640
TOTAL ENCLOSED AREA	4,680
Exterior Stair Area	1,170
TOTAL AREA	5,850

Heating, Ventilating and Air Conditioning:

- Design Conditions - Outside

Winter Dry Bulb:	9°F
Summer Dry Bulb:	97°F
Summer Wet Bulb:	67°F

Summer Degree Days:	1286 (Base 65°F)
Summer Degree Hours:	6888 (Base 80°F)

- Design Conditions - Inside

Occupied/Unoccupied	50°F

- Proposed Systems

The building will be maintained in a comfort range with a forced air furnace.

HVAC Mechanical Systems: A heating and ventilation system will be provided in the laboratory areas only. Due to the small size of the heated area, a direct LPG fired, forced air furnace will be selected. The laboratory rooms will be heated to approximately 50°F. No heating or plumbing will be provided in the remaining parts of Training Tower. Drain lines will be provided to return the recirculated water to the artificial pond by gravity.

3.0 ENERGY CONSERVATION FEATURES:

3.1 General Cooling Issues:

Cooling mechanisms include a proposed air cooled chiller for the Administration Building and air cooled DX refrigeration systems for the smaller cooling systems in the other facilities.

At the Administration Building, alternatives to the air cooled chiller include a cooling tower related water cooled chiller and/or a direct/indirect evaporative cooling system. Both of these are rejected in behalf of the future maintenance crew as difficult to maintain, particularly in the spring and fall seasons of warm days intermingled with sub-freezing weather.

DX refrigeration related to smaller "light commercial" type applications is simple and relatively low in cost to operate, particularly if turned off during unoccupied periods.

3.2 HVAC Control and Monitoring Systems:

Control systems are expected to help the HVAC systems follow the two steps of operating energy conservation:

1. Turn it off! (When not needed)
2. Turn it down! (When less than maximum demand is acceptable)

Control systems are proposed which relate to the complexity of each system. The Administration Building with central plant equipment, a central fan system, and multiple zones of control needs, and a central control system with programming capability to operate the building on a schedule and to allow operator adjustment and supervision of system and zone controls from a central point.

Nearly all other building systems and single zone systems can be handled by a local programmable thermostat and package unit controls. The added sophistication of bringing all of the controls back to a central point at the Administration Building is a nice touch, helpful to the operators, but little related to energy conservation.

Operation of heating related systems will be configured to outside temperatures below 65°. Operation of cooling related systems will generally be held to outside temperatures above 65°.

3.3 Plumbing Systems:

Resource conservation with plumbing systems related to minimizing use of water, both hot and cold. Features include heating water only to the minimum temperature which satisfies the service, and restricting lavatory faucet and shower heat flow rates. "Low Flow" toilets will be utilized.

Laboratory hoods etc. are not active.

- Energy Conservation issues
 - Temperature setbacks
 - Switch exhausts with occupancy
- Building HVAC Controls

The HVAC systems for the Training Tower are much less sophisticated than those of the Administration Building and suggest very simple control schemes. Where residential scale equipment is involved, a programmable, night-setback type of thermostat with switching sub-base can be entirely adequate. Such control will work for furnaces, unit heaters, radiant heat, ventilation, unit cooling, etc.

If alarm and reporting back to the Administration Building is desired, it can be incorporated into a building fire alarm system.

4.0 ENERGY CONSERVING CONSIDERATIONS:

The following energy conserving features are presented as a base case for this project in the context of "current good practice".

4.1 Heating, Ventilating and Air Conditioning:

- System selection is related to size of area served and to function of space.

The Administration Building with many zones is programmed for a variable air volume system for cooling with alternative heating approaches using hot water in convectors, unit heaters, duct heating coils, radiation panels, etc.

Other spaces and buildings depending on size are programmed for forced air furnaces, unit heaters, fuel fired radiant tube systems, etc. In each case, the simplest system which will serve the need is proposed.

Special use areas such as computer rooms, kitchens, laboratories, etc., which have defined needs are programmed for systems which directly meet those needs.

HVAC systems utilize outside air for cooling in temperate weather.

- Natural gas is focused on as a heating fuel of choice for its lower relative unit cost and for its nearby universal ease of application. Where line extension is costly, relative to a specific minor application, local electric heat is proposed for the comfort stations and other small users.
- In the Administration Building, a gas fired boiler making circulated hot water is proposed. In other applications, indirect firing schemes are presented. Furnaces and radiant tube systems may exceed 90% combustion efficiency.

4.2 Lighting Systems:

Typical current lighting designs yield office type light levels with an energy expenditure of 1.5-2.0 watts per square foot or less. The design may consider 3 lamp switching in areas with significant fenestration.

Designers may want to consider occupancy sensors for individual rooms as an energy conserving feature.

The current designs do not include "light shelves" to enhance daylighting. Use of such would significantly affect the building facade and might require increased ceiling heights.

Lighting for ancillary support and equipment spaces with periodic occupancy is best focussed on fluorescent systems with occupant education to turn off when not in use, or motion sensors to automatically turn off when not in use.

4.3 Building Envelope:

The proposed building envelopes are inherently modest in energy impact. Wall and roof constructions of R-19 or better, fenestrations of less than 25% of exterior wall and glazing of double pane construction with tinted and/or reflective surfaces all combine to meet or exceed energy conservation guidelines.

In the occupied buildings other than Administration, the insulated wall combined with a masonry skin has the effect of averaging and minimizing the energy demands in any given season. Vestibules at main entries are assumed.

4.4 Energy Budget:

The probable highest energy consuming building in the project is the Administration Building. Predicated on office/classroom use only with a 9 hour per day, five days per week occupancy, this building could be expected to meet a 55,000 Btu/square foot per year energy budget. In reality, with other functions in the building (kitchen, etc.) measured use may be higher, but the base condition can be real, broken down as follows based on experience with other similar buildings:

<u>Function</u>	<u>Btu/ft²/yr</u>
Heating (boiler and pumps)	5,000-10,000
Fans	8,000-10,000
Cooling (chiller and pumps)	10,000-12,000
Lights	20,000-25,000
TOTAL	43,000-57,000

4.5 Other Features to Consider:

- Landscape to the south and west of all structures with deciduous trees. Plant windbreaks to the north and northwest.
- Select indoor window treatments to allow occupant control of direct sun.
- Utilize higher reflectivity in east/west/south glazing.
- Consider a task lighting system on top of a low level indirect background lighting system.
- Look at heat recovery on the kitchen hood exhaust system. Note short hours of use of a grease hood in this application.
- Package heat pump systems in specific applications.

4.6 Other Features Considered but Not Incorporated:

- Active solar heating.
- Geothermal heating, on site hydropower, wind power.
- Ground source heat pump systems.

The Administration Building is a potential candidate, but the complexity of the heat pump system and the higher initial cost are deterrents.

5.0 FUEL SELECTION ISSUES:

5.1 General:

Energy applications for this project include:

- Lighting (electrical)
- Fans and pumps (electrical)
- Air Conditioning (electrical)
- Heating boilers and furnaces (fuel-fired)
- Office equipment and devices (electrical or as required)
- Hot water heaters (electric or fuel fired)
- Dual source heat pumps

5.2 Energy Source Alternatives:

- Electricity derived from a variety of sources including hydropower, nuclear power, fuel fired power (natural gas, oil, coal, Refuse Derived Fuel (RDF), etc.).

Electricity by definition is the energy resource for lighting, office equipment motors for fans and pumps and other miscellaneous uses. Electricity may be the resource for heating on a small scale, but generally will not be used for heating on a large scale, for reasons related to cost, and to resource conservation.

- Natural gas consisting of mostly methane (CH₄) is identified as a fuel of choice for heating and other purposes, preferred over propane (LPG) and other liquid petroleum fuels, where available at reasonable cost. Federal regulation even dictates use of natural gas rather than the petroleum where possible to reduce dependence on foreign resources.

There is little degradation of the environment in the firing of natural gas for heating applications. The products of combustion are primarily water vapor

(H₂O) and carbon dioxide (CO₂). Most delivered gas has been stripped of any sulfur bearing compounds and the low temperatures of combustion for heating purposes avoids the heavy production of nitrous oxides encountered in internal combustion engines and industrial boilers.

For the time being, as desirable as it may be, natural gas is available only at a distance from the HAMMER site, with a cost of line extension so great as to preclude its cost effectiveness at this time.

- Fuel Oil(s) are available at currently reasonable cost in the HAMMER service area. Fuel oil is generally utilized in heating boilers or forced air furnaces with a local storage tank. Storage of oil is complicated to some extent by requirements for secondary containment and monitoring of the primary storage, but use of oil for heating purposes is feasible.

Fuel oil does not burn quite as cleanly as natural gas. It may be purchased in a low sulfur category, but it contains a higher percentage of carbon. Combustion from a liquid state typically leads to something less than 100% complete combustion which is observed by a small amount of carbon monoxide (CO) and even some unburned carbon in the flue gas.

The volume of oil projected to be consumed by the HAMMER project would not comprise an environmental hazard, but there is a scientifically measurable difference in the effluent between combustion of natural gas and fuel oil.

The recently issued Executive Order 12902 in Section 305 dictates where possible a reduction in use of petroleum fuels. This dictum is unrelated to relative current cost of fuels, but to the longer term national interest.

- LPG (Liquified Petroleum Gas), in this case propane (C₃H₈) is an intermediate fuel between natural gas and the fuel oils in both character of combustion and in resource impact.

Much propane is derived as a crude oil fraction in the refining process and as such has a petroleum related impact. But some propane is also derived from natural gas sources and can be considered in that light as a domestic fuel.

Propane is separated from raw gas or crude oil by condensation from a vapor state and is stored as a liquid in pressure rated vessels. It can be fired as a liquid, but is commonly vaporized and distributed as a gas. In combustion, it behaves similarly to natural gas although the higher heating value per unit volume of propane requires smaller orifices than is the case for natural gas.

The products of combustion of propane are similar to those of natural gas, ie., water vapor and carbon dioxide, with little or no presence of sulfur or nitrogen compounds in the heating boiler applications.

In being heavier than air, undiffused propane will flow by gravity to the low region of a confinement. A release of propane is potentially more hazardous than a release of natural gas. Rules for siting of storage and handling/distribution/utilization of propane leave it in a category which allows general use above grade except for some hazardous environments.

Where propane is already in use in many commercial/industrial applications in the Tri Cities area, an application for the HAMMER project is considered feasible.

Energy Conservation Certification Report

Project No.: 95L-EWT-100

ECR No.: WHC-SD-T100-CDR-001

Rev.: 0

Form ECM-S-1 SHORT FORM

Page 1 of 2

This form should be used when applying the minimum and prescriptive or system performance requirements without a detailed analysis.

Check and attach the applicable checklists. See section 4.4 for ECM checklists

☒ FORM ECM-CL-3.2	Principles of Effective Energy Building Design
☒ FORM ECM-CL-3.3.2	Lighting - Principles of Design
☒ FORM ECM-WS-3.3-1	Lighting Summary
☒ FORM ECM-WS-3.3-2	Exterior Lighting Power Worksheet
☒ FORM ECM-WS-3.3-3	Prescriptive Interior Lighting Power Worksheet
☒ FORM ECM-WS-3.3-4	System Performance Interior Power Worksheet
☒ FORM ECM-WS-3.3-5	Lighting Control Points Worksheet
☒ FORM ECM-CL-3.4	Auxiliary Systems and Equipment
☒ FORM ECM-CL-3.5.2	Building Envelope - Principles of Design
☒ FORM ECM-WS-3.5-1	Building Envelope Summary
☒ FORM ECM-WS-3.5-2	Fenestration Worksheet
☒ FORM ECM-WS-3.5-3	Opaque Surface Worksheet
☒ FORM ECM-WS-3.5-4	Skylight Exemption Worksheet
☒ FORM ECM-CL-3.6.2	Power and Distribution Systems - Principles of Design
☒ FORM ECM-WS-3.6-1	Electrical Summary
☒ FORM ECM-WS-3.6.3-1	Transformer Loss Worksheet
☒ FORM ECM-CL-3.7.2	HVAC Systems - Principles of Design
☒ FORM ECM-WS-3.7-1	HVAC Systems Summary
☒ FORM ECM-WS-3.7-2	HVAC Systems Prescriptive Worksheet
☒ FORM ECM-WS-3.7-3	Fan Power Worksheet
☒ FORM ECM-CL-3.8.2	HVAC Equipment - Principles of Design
☒ FORM ECM-WS-3.8-1	HVAC Equipment Summary
☒ FORM ECM-WS-3.8-2	HVAC Equipment Efficiency Worksheet
☒ FORM ECM-CL-3.9-2	Service Water Heating - Principles of Design
☒ FORM ECM-WS-3.9-1	Water Heating Summary
☒ FORM ECM-WS-3.9-2	SWH Equipment Efficiency Worksheet
☒ FORM ECM-CL-3.10.2	Energy Management Systems - Principles of Design
☒ FORM ECM-CL-3.10.3	Energy Management Systems - Minimum Requirements
☒ FORM ECM-CL-3.13	Other Energy - Using Systems

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Rev.: 0

Form ECM-S-1 SHORT FORM

Page 2 of 2

Has a energy file system numbering system for all energy conservation calculation been created? Attach the calculation number index as described in subsection 2.1.1.1.2, Other Energy-Using Systems.

List the minimum requirements that have been incorporated into the project. List the prescriptive requirements that have been incorporated into the project.

Explain the reasons for the decision not to analyze this system or component any further.

For category 2 (building and building systems alterations), complete and attach Form ECM-ES-3.15, Existing Building Energy Survey. See section 2.5 for category 2 requirements and section 3.15 for existing building survey requirements.

For projects over 10,00 ft², have all cost-effective energy conservation features listed in the private sector energy experts design review been incorporated into the final design? Attach the completed Form ECM-R-1 if required.

In phase 4, have all acceptance tests been performed? Complete and attach Form ECM-AT-1.

In phase 4, has all energy conservation compliance documentation been turned over tot he building facility manager? Complete and attach Form ECM-D-1.

Has commissioning of HVAC systems been conducted? Attach commissioning report.

Has the winter performance test been conducted? Complete Form ECM-PT-W. See section 2.9 for energy testing requirements.

Has the summer performance test been conducted? Complete Form ECM-PT-W. See section 2.9 for energy testing requirements.

The forms indicated on Form ECM-S-1 will be completed and submitted during preliminary design as required in the Energy Conservation Manual (WHC 1993).

APPENDIX G

PRELIMINARY SAFETY EVALUATION

PRELIMINARY SAFETY EVALUATION

A Hazards Classification was completed. Project is classified as a general use facility; therefore, a Preliminary Safety Analysis is not required.

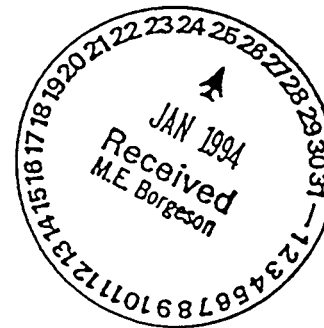
Westinghouse
Hanford Company

Internal
Memo

From: Restoration and Remediation Safety Analysis . . . FHB-29540-94-001
Phone: 376-8564 H4-68
Date: January 11, 1994
Subject: Hazard Classification for the Hazardous Materials Management and
Emergency Response Training Center (HAMMER)

To: M. E. Borgeson N1-23

cc: B. G. Baker N1-80
E. E. Leitz H4-68
K. A. McGinnis B5-30
J. L. Monko R3-35
J. L. Rathbun R3-09
P. J. Vandervert H6-30
J. J. Zimmer H4-67
FHB File/LB



- Reference 1) Two Internal Memo's, From M.E. Borgeson to E.E. Leitz, "Hazard Classification for the Hazardous Materials Management and Emergency Response Training Center (HAMMER Project)" dated, December 1, 1993 and January 5, 1993
- 2) WHC-CM-4-46, "Nonreactor Facility Safety Analysis Manual".
- 3) DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports".

A hazard classification has been performed for the Hazardous Materials Management and Emergency Response Training Center (HAMMER) based on the cited references. This evaluation assumes the facility will not 1) handle or store radioactive material and 2) use or store hazardous chemicals. As defined in reference 1, propane or natural gas may be used for live fire training, however, these inventories are not considered in defining hazard classification.

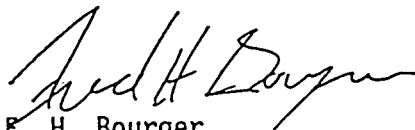
Two methods for determination of hazard classification have been assessed (DOE-STD-1027-92 and WHC-CM-4-46) for the HAMMER Project. Based on the criteria outlined in DOE-STD-1027-92, this facility would be categorized as a less than category 3 facility, therefore, not requiring a safety analysis report in accordance with DOE Order 5480.23

M. E. Borgeson
Page 2
January 11, 1994

FHB-29540-94-001

requirements. As defined in WHC-CM-4-46, the hazard classification establishes 1) the review and authorization level of the safety analysis and 2) provides a basis for applying a graded approach to the level of analysis and documentation of the safety analysis reports.

Based on this evaluation, potential consequences associated with the hazards of this facility would be considered minor and localized and are only of a type and magnitude routinely encountered and/or accepted by the general public, therefore, this facility is classified as a "general use facility". If the scope of the facility and its operations change or radioactive/hazardous material is introduced, this determination should be re-evaluated.

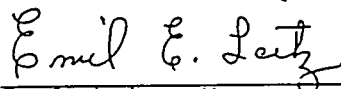


F. H. Bourger
Engineer

siw

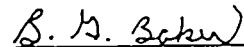
Attachment - Reference 1)

CONCURRENCE:



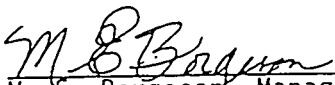
E. E. Leitz, Manager
Restoration & Remediation Safety Analysis

Date: 1-11-94



B. G. Baker, Manager
Industrial Safety Programs

Date: 1/11/94



M. E. Borgeson, Manager
Nuclear Energy Projects

Date: 1-14-94



Westinghouse
Hanford Company

Internal
Memo

From: Nuclear Energy Projects
Phone: 376-8184 NI-23
Date: December 1, 1993
Subject: HAZARDS CLASSIFICATION FOR THE HAZARDOUS MATERIALS MANAGEMENT AND
EMERGENCY RESPONSE TRAINING CENTER (HAMMER PROJECT)

To: E. E. Leitz H4-68

cc: K. A. McGinnis B5-30
J. L. Monko R3-35
P. J. Vandervert H6-30
MEB File/LB

- Reference: 1) "Hazardous Materials Management and Emergency
Response (HAMMER) Training Center Needs
Assessment", WHC-EP-0682, dated September, 1993.
- 2) "Hazardous Materials Management and Emergency
Response Training Center Feasibility Study",
WHC-EP-0318, dated March, 1990.

It is requested that you provide a hazards classification for the subject project. The reference documents are attached. This work shall be charged to Work Order #E22167.

The HAMMER facility will provide hands-on, practical training using props suitable to provide realistic situations. Realism for hands-on training will be obtained via simulated hazardous material handling. A more detailed description is provided in the reference documents.

Live fire training props will be provided with a water source for fire hose connections. A wetting agent may be used, AFFF foam, and Class A, B and C fire extinguishers will be used. The fire prop in the training tower may use LP or natural gas for the live fire or wood pallets may be burned in the tower.

The chemical laboratory would be equipped and may contain a small amount of chemicals. To maintain the buildings and grounds, it is planned that pest and weed control chemicals and fertilizers will be used. Normal janitorial supplies will be used and stored at the facility. Some automotive supplies, such as oil and lubricants, are expected to be stored for use on support equipment. Gasoline and/or diesel fuel storage, of less than 1000 gallons each, may be required.

If you need more information, please contact M. E. Borgeson on 376-8184.

M. E. Borgeson



Westinghouse
Hanford Company

Internal
Memo

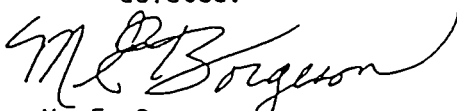
From: Nuclear Energy Projects
Phone: 376-8184 N1-23
Date: January 5, 1994
Subject: HAZARDS CLASSIFICATION FOR THE HAZARDOUS MATERIALS MANAGEMENT AND
EMERGENCY RESPONSE TRAINING CENTER (HAMMER PROJECT)

To: E. E. Leitz H4-68
cc: F. H. Bourger H4-68
K. A. McGinnis B5-30
J. L. Monko R3-35
P. J. Vandervert H6-30
MEB File/LB

Reference: 1) Internal Memo, M. E. Borgeson, to E. E. Leitz,
same subject, dated December 1, 1993.

The referenced memo requested that you provide a hazards classification for the subject project. Based on discussion with Fred Bourger, some clarification or change on selected information is needed. This memo provides the clarification/change as follows:

1. If propane is used for live fire training, two propane storage tanks with capacities of 1,500 gallons each will be required, for a total of 3,000 gallons.
2. If natural gas is used for live fire training, it will be piped in and no storage tank will be required.
3. It is intended to use non-hazardous stand-in materials in the chemical laboratory and the requirement for small amounts of chemicals is deleted.


M. E. Borgeson

kje

Westinghouse
Hanford Company

Internal
Memo

From: Transition Project & Spent Fuel Safety Engineering 8D143-94-019
Phone: 376-5116 H4-68
Date: September 12, 1994
Subject: SAFETY DOCUMENTATION FOR PROPANE USE AT THE HAMMER FACILITY

To: M. E. Borgeson H0-57
cc: G. C. Strickland H4-68
ALR File/LB

- Reference 1) Internal Memo, From E.E. Leitz to M.E. Borgeson, "Hazard Classification for the Hazardous Materials Management and Emergency Response Training Center (HAMMER)" dated, January 11, 1994.
- Reference 2) WHC-CM-4-46, "Nonreactor Facility Safety Analysis Manual".
- Reference 3) DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports".

The HAMMER facility will provide hands-on training using props to simulate real situations. Realistic fire training will use live fire provided by combustion of propane gas which will be provided from a 15,000 to 20,000 gallon tank located near the facility.

Reference 1) transmitted the results of a hazard categorization for the HAMMER Center which was based on References 2) and 3) using assumptions that the center will not store or use either radioactive or hazardous materials and that the inventory of propane would be limited to two 1,500 gallon tanks of propane.

Current plans for the HAMMER Center call for the use of up to 20,000 gallons of propane. The revised quantity of propane was compared with requirements in References 2) and 3) to determine if there would be a change in the conclusion drawn in Reference 1).

Potential consequences associated with the hazards of this facility are still of a type and magnitude routinely encountered and/or accepted by the general public, therefore, this facility is still classified as a "general use facility". If the scope of the facility and its operations change or radioactive/hazardous materials are introduced, this determination should be re-evaluated.



A. L. Ramble, Manager
Transition Project & Spent Fuel Safety Engineering

ajg

APPENDIX H

ECONOMIC ANALYSIS AND LIFE CYCLE COST ANALYSIS

LIFE CYCLE COST ANALYSIS

Site selection was determined for the requirements of DOE document RL4320.2C, "Site Selection". The site evaluation process used to select the Hazardous Materials Management and Emergency Response (HAMMER) Training Center site is documented in Supporting Document No. WHC-SD-GN-SE-30003, entitled *Site Evaluation Report for the Hazardous Materials Management and Emergency Response (HAMMER) Training Center*. The Conceptual Design is based on siting the facility in accordance with the recommendations made in the Site Evaluation Report, which included considerations for construction costs, operational efficiencies and DOE long range development plans.

A life cycle cost analysis was not performed for the water and sewer; however, installation costs were evaluated in the attached memos. The long range plans for this area of the site include possible annexation to the City of Richland. For this reason, it is recommended that utilities for HAMMER Training Center be obtained from the City of Richland. In addition, this will eliminate the requirement to drill a well possibly encroaching on a contaminated plume near the Siemens Power Corporation facility and eliminate the maintenance concerns of a septic tank and leach field as well as obtaining and maintaining a disposal permit from the State of Washington.

WHC Energy Conservation Manual (no number yet) indicates that the life cycle cost analysis for the HVAC systems can be completed during preliminary design work. The analysis for HAMMER Training Center will be completed during this time. Please refer to the Energy Conservation Report in Appendix F for further information on this subject.

MEMORANDUM



MONTGOMERY WATSON

To:	Distribution	Date:	July 15, 1994
From:	Gary Carroll	Reference:	1202.0538/6.2.6
Subject:	HAMMER Training Center Water Supply		

PURPOSE

The purpose of this memo is to establish the water demands for the HAMMER Training Center, evaluate whether a well should be constructed for water supply or whether the HAMMER Training Center should connect to the City of Richland water distribution system, and how fire protection should be provided.

ASSUMPTIONS

In order to establish the water demands for the HAMMER Facility, several assumptions were initially made. These are as follows:

1. Domestic water, fire protection and irrigation water will be supplied by the domestic water system.
2. The primary use of the HAMMER Facility will be from 7:00 a.m. to 7:00 p.m., Monday through Friday.
3. Recharge to the artificial pond will be provided by the domestic water system (with suitable cross connection control).
4. All training water (including fire training) will be provided from the artificial pond.
5. There will be no cross connections from the domestic water system to the training water supply system, except at the artificial pond (see assumption 3. above).

WATER DEMANDS

Summary

Domestic water use demands are as follows:

Average Daily Domestic Use	=	3,500 gpd
Maximum Daily Domestic Use	=	5,950 gpd
Peak Hourly Domestic Use	=	8,750 gpd

Water Supply, July 15, 1994

Peak domestic flowrate is estimated to be 100 gpm for the period 7:00 a.m. to 7:00 p.m. The minimum pressure allowed will be 40 psig. Normally operating pressure will range from 40 to 100 psig.

For fire protection a flowrate of 3,000 gpm for a two hour duration is required. Minimum pressure must be 20 psi.

Irrigation water peak demands are 50 gpm at 60 psig. This is during the off-peak time of approximately 7:00 p.m. to 7:00 a.m.

Peak artificial pond recharge flow requirements are 163 gpm over a 48 hour period. Pressure is not an issue for recharge of the artificial pond.

The total peak flow demands for the domestic water supply system including all needs are as follows:

	<u>Flow Rate</u>	<u>Minimum Pressure</u>
Peak Daytime Non-fire Demand (peak domestic & peak pond recharge)	263 gpm	60 psig
Peak Fire Daytime Demand (50% of avg domestic demand & fire & pond recharge)	3,005 gpm	20 psig
Peak Nighttime Non-fire Demand (peak irrigation & peak pond recharge)	213 gpm	60 psig

These demands are discussed in detail in the following subsections.

Domestic Water Demands

Since there are no "historical records" to use for determining daily water demands, another method is to use per capita water use values from available literature. The type of use category most resembling the HAMMER Facility would be a school with showers and cafeteria, or an office. The literature values for these two uses range from about 12 to 22 gallons per capita per day (gpcd). For HAMMER a value of 30 gpcd was selected. This made more allowance for the use of showers, etc. in the changing rooms.

The population of the HAMMER Facility was estimated in the Functional Design Criteria (FDC) as follows:

Average	=	108 people
Maximum	=	184 people

Based on an average population of 108 people and a per capita water demand of 30 gpd, the average daily water demand is estimated to be approximately 3,500 gpd.

Maximum daily water demand can be estimated using a maximum day to average day multiplier. This multiplier can range from 1.7 to 5 from community to community. For this estimate a multiplier of 1.7 will be used. Therefore, the maximum day demand is estimated to be 5,950 gpd.

Peak domestic demand, also referred to as peak hourly demand, for the HAMMER Facility will be estimated using a multiplier of peak demand to average day demand of 2.5, as established in Section 0266-4 of DOE 6430.1A. Peak domestic demand is approximately 8,750 gpd.

Peak domestic flowrate can also be estimated using a flow per fixture-unit method. This is described in several texts and in the Uniform Plumbing Code (UPC). The UPC lists "equivalent fixture-units" for different types of plumbing fixtures. From the total number of fixture-units an estimate of domestic peak flow can be made from charts in Appendix A of the UPC. It is estimated that there will be a total of 360 fixture-units at the HAMMER Training Center. The estimated peak domestic flowrate from the charts in Appendix A of the UPC is 100 gpm.

The domestic water supply under non-fire conditions, will be designed to provide the peak flow at a pressure ranging from 60 to 100 psig.

Fire Flow Requirements

The domestic water system will be designed to provide necessary flow for fire protection. Fire flow requirements have been determined using the Insurance Service Office (ISO) formula for structures. The maximum fire flow requirement for a structure is estimated to be 3,000 gpm for the Administration Building Complex. Fire flow will be provided at a minimum pressure of 20 psig.

According to the RLIP 5480.7 the minimum duration of fire flow required at the Hanford Site is 2 hours. For large buildings the minimum duration is 4 hours. RLIP 5480.7 does not indicate what defines a large building, therefore, for the HAMMER Training Center it is assumed a 2 hour fire flow duration is required. This equates to total water usage for fire protection of 360,000 gallons.

Irrigation Demands

The following assumptions have been made regarding the supply of irrigation water:

1. Irrigation water will be provided by the domestic water supply system.
2. Suitable cross connection control will be provided.
3. Irrigation will normally be performed during the HAMMER Facility's off-hours, i.e., from approximately 7:00 p.m. to 7:00 a.m.
4. Irrigation systems will be divided into zones, and only one zone will be operated at a time.

Based on these assumptions the peak irrigation water demand will be approximately 50 gpm. The pressure requirement is approximately 60 psig.

Artificial Pond Recharge

The artificial pond will be recharged by the domestic water supply. The water in the pond will be used for training purposes by pumping the water to the props. This water could be used for fire fighting training or to simulate leaks of hazardous materials. It is assumed that the only losses from the artificial pond will be from evaporation and losses during training exercises.

Evaporation Losses. The maximum evaporation rate (provided by the Cooperative Extension office) was 11.28 inches per month, which equates to 0.39 inches per day, for July, 1990. Using this value, the maximum loss for the artificial pond with a 1 acre surface area is approximately 10,600 gpd.

Training Losses. The FDC establishes that there will be two fire hydrants at each prop for training purposes. Each of these hydrants will provide a flowrate of 1000 gpm. The following assumptions have been made:

1. The maximum flowrate will be 4,000 gpm (for the Railroad/Truck Tank Car Burn Pad).
2. The fire fighting training will last 20 minutes per exercise.
3. A maximum of sixteen fire training exercises could occur in one day.

Using these assumptions, the peak volume of water used is approximately 640,000 gallons. The pond water system will be recycled and a drainage system will be provided at each prop to collect the training water and return it to the artificial pond. In order to estimate artificial pond recharge requirements, it is assumed that 35 percent of the training water will be lost. Therefore, it is estimated that the peak training losses will be 224,000 gallons.

Total Pond Recharge Requirements. If the pond was recharged during off-hours of the HAMMER Training Center (7:00 p.m. to 7:00 a.m.), the flowrate required to recharge the pond for the peak losses within one 12 hour period would be approximately 326 gpm. To recharge the pond for the peak losses in 24 hours would require a flowrate of 163 gpm. Both of these flowrates are excessive. However, if the pond was recharged 24 hours a day, and two days were allowed to recharge the peak losses, the peak pond recharge flowrate required is approximately 100 gpm, which is an acceptable flowrate. Combined with the domestic peak demand, the peak daytime demand would be 263 gpm.

DOMESTIC WATER DISTRIBUTION SYSTEM

DOE 6430.1A requires that distribution system mains that include fire protection be sized for the required fire flow plus 50% of average domestic demand plus any special flow requirements. In a fire event it will be assumed that artificial pond recharge would be discontinued. Based on these requirements the distribution mains will be sized for 3,005 gpm. Maximum velocity allowed will be 8 fps. Using this criteria, the minimum main size for the HAMMER Facility will be 12-inches in diameter. RLIP 5480.7 requires that systems supplying domestic water, process water, and fire protection have minimum main sizes of 12 inches in diameter.

WATER SOURCE

The domestic water supply for the HAMMER Training Center will come from either the City of Richland Water Supply System or a well (or wells) drilled solely for the use of the HAMMER Facility.

Well Source

A preliminary site Hydrogeology and Feasibility of a Domestic Well Memo was prepared by the USACE. This memo concludes that it may be possible to drill a well and supply approximately 150 to 200 gpm to the HAMMER Facility. This well would not be able to provide fire flow requirements. The memo did not address multiple wells that would provide enough flow for fire flow requirements. It is unlikely that a well (wells) could provide enough flow to the HAMMER Facility without providing storage for fire flow. Also, the cost of providing multiple wells is quite expensive. The memo estimates the cost of one well at approximately \$95,000.

To provide fire flow storage would require a 500,000 gallon elevated storage tank. (Elevated tanks come in incremental sizes and 500,000 gallons would be the smallest size that would provide adequate fire flow storage). The construction cost of a new 500,000 gallon elevated storage tank is approximately \$650,000.

City of Richland as the Water Source

In the initial preliminary analysis of the fire flow requirements, it was estimated that the fire flow requirements would be 4,250 gpm. The City of Richland water system could not guarantee providing that flow without adding an emergency power generator at the City's proposed pumping station on Horn Rapids Road. An evaluation was undertaken to determine if it would be more cost effective to use the training water supply system from the artificial pond for fire protection. This would require extending the training water distribution system around the entire HAMMER Site, rather than just to the fire training props, and providing emergency power to the training water supply pumps.

Figure 1 shows the water distribution systems with the domestic water supply system (i.e., the City of Richland water supply) providing fire protection. The domestic water system would consist of a 12 inch distribution main, looped around the entire HAMMER Site. The training water supply distribution system would be limited to providing water to the fire training props as shown in the figure.

Figure 2 shows an alternative water supply system with fire protection provided by the training water supply distribution system. The training water supply distribution system would be looped over the entire HAMMER Site and the main would consist of 12 inch diameter pipe. The domestic water would be provided by the City of Richland and the distribution piping would be looped around the entire HAMMER Site. The main size for the domestic water supply in this alternative could be reduced from 12 inch diameter pipe to 4 inch diameter pipe.

The estimated construction costs for these two alternate systems are as follows:

Domestic Water Supply System Providing Fire Protection (Figure 1):

• Domestic water distribution system	\$425,000
• Emergency Power Generator (for City of Richland pumping station)	\$50,000
• Training water distribution system	<u>\$314,000</u>
TOTAL	\$789,000

The above costs include adequately spaced fire hydrants and gate valves as shown on Figure 1. It also includes an emergency power generator installed at the City of Richland's proposed pumping station on Horn Rapids Road to guarantee adequate fire flow .

Training Water Supply System Providing Fire Protection (Figure 2):

• Domestic water distribution system	\$266,000
• Training water distribution system	<u>\$680,000</u>
TOTAL	\$946,000

The above costs include additional fire hydrants for fire protection on the training water supply distribution system and adequately spaced gate valves as shown on Figure 2. It also includes the construction cost of an emergency power generator for the training water supply pumps to guarantee adequate fire protection.

Providing storage for fire protection was also evaluated. It was assumed that the domestic water supply system would provide fire protection as shown on Figure 1. The estimated construction costs for this alternative are as follows:

• Domestic water distribution system	\$425,000
• 500,000 gallon elevated storage tank	\$650,000
• Additional 18 inch diameter pipe	\$18,000
• Training water distribution system	<u>\$314,000</u>
TOTAL	\$1,093,000

This evaluation shows that using the domestic water supply distribution system for fire protection with an emergency power generator at the City of Richland's pumping station is the most cost effective alternative.

The fire flow requirement for HAMMER was re-evaluated using the ISO formula because of design changes in the building size and inclusion of allowances for sprinklers in the buildings. The new fire flow requirement was determined to be 3,000 gpm. The City of Richland's pumping station located on SR240 has this capacity and has provisions for emergency power. Therefore, the City of Richland water supply system can provide adequate fire protection without making modifications to the City's system.

RECOMMENDATIONS

It is recommended that the HAMMER Training Facility utilize the City of Richland water system for domestic water supply and fire protection.

The estimated construction cost of the domestic water system for the HAMMER Training Facility, including fire protection requirements, is approximately \$425,000. This consists of a looped 12 inch diameter water main over the entire HAMMER Site, as shown in Figure 1. The estimated cost for a new well, fire flow storage, and a looped 12 inch diameter main distribution system is \$1,170,000.

WHC-SD-T100-CDR-001 Rev. 0
Water Supply, July 15, 1994

The City of Richland is presently planning to provide a short length of 16 inch diameter pipe running to the west from the intersection of Horn Rapids Road and the proposed King's Gate Way. A 14 inch diameter pipe from this location would be adequate to meet the needs of the HAMMER Training Center. The distance from the intersection of Horn Rapids Road and King's Gate Way to the entry onto the HAMMER Training Center is approximately 1,200 lineal feet.

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Project File

M E M O R A N D U M**MONTGOMERY WATSON**

To:	Distribution	Date:	July 15, 1994
From:	Gary Carroll	Reference:	1202.0538/6.2.6
Subject:	HAMMER Training Center Sewage System Requirements		

PURPOSE

The purpose of this memo is to establish the sanitary wastewater flowrates for the HAMMER Facility and to evaluate the feasibility of on-site disposal versus connecting to the City of Richland's sewage system.

SANITARY WASTEWATER FLOWS

Section 0270-1.3 of DOE 6430.1A states that for preliminary design domestic water consumption rate should be used to approximate sanitary wastewater flows. Therefore, the following are the estimated wastewater flowrates:

Average Daily Flow	=	3,500 gpd
Maximum Daily Flow	=	5,950 gpd
Peak Hourly Flow	=	8,750 gpd
Peak Flow (instantaneous)	=	100 gpm

DISPOSAL TO CITY OF RICHLAND

For this alternative a collection system would be required on the HAMMER site to collect sanitary wastes from outlying facilities, including the Warehouse Building, Garage, and the comfort stations, and combine them with the higher waste flows from the Administration Building Complex for disposal to Richland's sewage system.

Flows from the Comfort Station, the Administration Building Complex, and the Training Support Building would flow by gravity.

The sewers on the HAMMER Site should be 8-inch diameter. The service pipes from the Comfort Station should be 6 inch diameter pipe. This alternative is shown on a site plan in Figure 1.

The City of Richland is planning to include sewer service on the proposed King's Gate Way road up to Horn Rapids Road. A sewer from the HAMMER Training Center could be run from the HAMMER Site, down Horn Rapids Road to King's Gate Way and connect to the City sewer. The wastewater would flow south on King's Gate Way to a temporary sewage pumping station and be pumped to an existing pumping station south of the Seimens Power Corporation.

A sewer sized for the HAMMER Training Center sanitary wastewater flows running down Horn Rapids Road to the intersection of King's Gate Way should be 8 inch diameter. The portion of the sewer on Horn Rapids Road would be approximately 1,200 lineal feet.

ON-SITE DISPOSAL

Due to the rolling terrain of the site, locating on-site disposal sites would be difficult. However, a disposal site could be located west of the Administration Building Complex. Sanitary wastes for all the facilities would flow by gravity to this location, except for the Comfort Station located in the northwest portion of the Site. These flows would have to be pumped as described previously.

For an on-site disposal site a 4,000 gallon septic tank would be required with a leach field area of about 3,500 sq. ft. The leach field would consist of a distribution box, 6 inch distribution piping, and 4 inch perforated pipe for disposing of the septic tank effluent. The leach field sizing is based on the average day flow and an application rate of wastewater of 1.0 gpd/sq.ft. This application criteria is for a medium to fine sand. The on-site disposal alternative is shown on the site plan in Figure 2.

COMPARISON OF ALTERNATIVES

The estimated construction costs of the two alternatives are presented below :

• On-Site Disposal System	\$123,000
• Disposal to the City of Richland Sewer System	\$165,000

These estimated costs are based on a conceptual level of engineering. The costs are within a range of 25% less to 35% greater than the actual construction costs.

One of the disadvantages of on-site disposal is that it has a shorter life than discharge to the city sewer. The leach field of any on-site disposal system will eventually clog with the wastes and the leach field will have to be expanded or a new field constructed.

In order to account for eventual clogging of the leach field, the leach field could be doubled in size and designed and valved to utilize half the field until it becomes clogged and then utilize the other half. The estimated additional cost to double the size of each leach field alternative is approximately \$18,000. This would make the total estimated cost of the on-site disposal system alternative \$141,000.

On-site disposal systems do not require very much routine maintenance, however, it would be more than that required by disposal to the city sewer, which requires almost no routine maintenance by HAMMER staff.

RECOMMENDED ALTERNATIVE

Since the City of Richland has indicated that the estimated wastewater flows generated by the HAMMER Training Center can be accommodated by city sewers (see Attachment 1, a letter from the City of Richland), it is recommended that sanitary wastewater be discharged to the City sewer system.

The cost of this alternative is estimated to be \$42,000 greater than the on-site disposal alternative. However, disposing of the sanitary wastes to the city sewer eliminates maintenance concerns of a septic tank and leach field and does not require obtaining and maintaining a disposal system permit from the State of Washington.

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Project File

APPENDIX I

PHYSICALLY HANDICAPPED ASSESSMENT

ACCOMMODATIONS OF PHYSICALLY HANDICAPPED

PROJECT NO. 95L-EWT-100

PROJECT TITLE Hazardous Material Management and Emergency Response Training Center

LOCATION 600 Area
(area)

BUILDING _____

Prepared By M. E. Borgeson

Title Manager, HAMMER Project

Date 04/22/94

Type of Project:

- ☒ New Building (or Building Addition)
- ☐ Building Alteration
- ☒ Site Development (Grading, Walks, Parking Lots)
- ☒ Other Training Props

Application of Regulations:

DOE Order 6430.1A, "General Design Criteria," General Requirements 0101-4, "Handicapped Provisions."

CFR, Public Contracts and Property Management, Subtitle C, 101-19.6, "Accommodations for the Physically Handicapped."

- ☐ All Regulations
- ☒ Limited Application (indicate in comments section)

Exceptions:

DOE Order 6430.1A, "General Design Criteria," General Requirements 0101-4, "Handicapped Provisions."

- ☐ a. Not intended for occupancy or use by the handicapped
- ☐ b. Alteration not involving existing stairs, doors, elevators, toilets, etc.
- ☐ c. Not structurally possible

General Comments:

The Americans with Disabilities Act applies to the design of this facility. The design agency will interpret the extent of application to the design of this facility and document any decision for exclusion.

I-1

Signature

M E Borgeson

5-17-94
Date

**ATTACHMENT
TO THE
PHYSICALLY HANDICAPPED ASSESSMENT**

All areas of the Administration Building, Training Support Building, Comfort Station, control rooms in prop structures, pad controls, roads, walks and paved areas will be accessible to the physically disabled. Buildings, training props, and training pads will comply with the requirements of the Americans with Disabilities Act (ADA) as indicated on Table I-1.

Training pads and props are designed for training purposes and are not intended to meet the requirements of ADA. Obstacles are intentionally included to challenge the able-bodied and these facilities are not open to the public. Training pads and props would not be safe for untrained, unsupervised or physically disabled persons. Adequate signage and security measures will be utilized to prevent unauthorized access to the training facilities.

Areas within training pads and props that could be utilized by physically disabled persons (such as control rooms, control platforms, or observation areas) will be made accessible.

TABLE I-1. AMERICANS WITH DISABILITIES ACT REQUIREMENTS

AREA #	SECTION #	BUILDING/PROP	PARKING	CURBING	ENTRANCES	ELEVATORS AND PLATFORM LIFTS	RAMPS	WATER FOUNTAINS AND COOLERS	PUBLIC PHONES	RESTROOMS /SHOWERS
1	4.2.2	ADMINISTRATION BUILDING				NA				
2	4.2.3	TRAINING SUPPORT BUILDING	NA			NA				
3	4.2.4	COMFORT STATION	NA			NA				
4	4.3.1	TRAINING TOWER				NOTE 1				
5	4.3.2	SCBA SEARCH AND RESCUE PROP				NOTE 1				
6	4.3.3	BURN STRUCTURE PROP				NOTE 1				
7	4.3.4.6.1	FLAMMABLE LIQUIDS BURN PAD				NOTE 1				
8	4.3.4.6.2	LIQUID PETROLEUM GAS (LPG) BURN PAD				NOTE 1				
9	4.3.4.6.3	RAILROAD/TRUCK TANK BURN PAD				NOTE 1				
10	4.3.4.6.4	HAZMAT TRAINING PAD				NOTE 1				
11	4.3.4.6.5	90-DAY STORAGE PAD PROP				NOTE 1				
12	4.3.4.6.6	ABOVE GROUND PIPELINE PAD				NOTE 1				
13	4.3.5.1	ARTIFICIAL STREAM AND POND				NOTE 1				
14	4.3.5.2	FIRE PUMPER TEST PLATFORM				NOTE 1				
15	4.3.5.3	EMERGENCY RESPONSE VEHICLE STAGING AREA				NOTE 1				
16	4.3.5.4	CHARACTERIZATION/REMEDIATION SITE				NOTE 1				
17	4.3.5.5	CRAFT SPECIFIC PROPS AND BURIED SIMULATED WASTE				NOTE 1				
18	4.3.5.6	JUNCTION/DIVERSION BOX (J-BOX) WITH TANK PROP				NOTE 1				
19	4.3.5.7	RAILROAD TANK CARS WITH RAIL PROP				NOTE 1				
20	4.3.5.8	BURIED AND ABOVE GROUND TANKS PROP				NOTE 1				
21	4.3.5.9	CONFINED SPACE/FALL PROTECTION PROP				NOTE 1				
22	4.3.5.10	WELL SAMPLING STATIONS				NOTE 1				
23	4.3.5.11	TRENCH SITE PROP				NOTE 1				
Shading indicates compliance with ADA requirements										
NA Not applicable to this area.										
Note 1 This structure is a training prop and is not intended for public access. It is designed for training of emergency response personnel whose essential function cannot be performed by the physically or mentally disabled. Control rooms in structures and pad controls will meet the requirements of ADA.										

APPENDIX J

PLANT FORCES WORK REVIEW

PLANT FORCES WORK REVIEW

No plant forces are required during the construction of the HAMMER Training Center; therefore, no plant forces work review is required.

APPENDIX K

LANDSCAPING

**USACE - HAMMER
FINAL 30% CONCEPTUAL LANDSCAPE DESIGN**

LANDSCAPING - PLANT DESCRIPTIONS

OBJECTIVE

The objective of the landscaping for the HAMMER facility is to create a campus-like setting using plant materials to create outdoor spaces, provide climate control, screens, buffers, and an aesthetically pleasing atmosphere for facility staff, students, and visitors.

The landscape design will provide a phased approach. The most critical areas such as the entrance to the site and the administration complex would be landscaped first with other areas being landscaped as future funding becomes available.

A brief description of the preliminary plant species list for soil stabilization and landscaping is presented in this conceptual design memorandum. The preliminary list of plants is described in a narrative format and arranged by alphabetical order according to scientific name within the categories of: trees, shrubs, groundcovers, wildflowers and grasses.

CONCEPTUAL DESIGN

In general intensive landscaping will be limited to areas situated around the administration building, parking areas, pond, shelters, and site perimeter. The interior of the site will be planted with drought tolerant, low growing indigenous grasses and wildflowers with some scattered shrubs.

EVERGREEN TREES

Abies concolor - White Fir

White fir is a very symmetrical evergreen tree with a conical form. It reaches a height of 50 feet in 30-50 years, and matures to a height of 100 feet. The foliage is characterized by bluish green aromatic, soft-textured needles approximately 2-inches long. It tolerates almost any well drained soil, requires periodic irrigation, but withstands dry conditions well. White fir will be used as a specimen, accent and screening plant.

Picea pungens 'Hoopsii' - Hoops Blue Spruce

Hoops blue spruce is a rapid growing, broadly conical, evergreen tree, characterized by rigid branches and stiff needles. The needle coloration is an intense silver blue. The tree reaches a height of approximately 5-10 feet within 10 years and matures to a height of 50-80 feet. It tolerates wind and rarely needs pruning. This tree is often used as a specimen or accent plant as it requires space to spread. This tree would be used as an evergreen

accent at the administration building as it will require irrigation. It would be specified approximately 5-6 feet tall at time of planting and is available locally.

Pinus nigra - Austrian Pine

Austrian Pine is a rapid growing densely branched evergreen reaching a height of 10 to 15 feet in 15 years, and maturing to a height of 50-100 feet. It exhibits a symmetrical conical shape when young, turning to a more umbrella shaped configuration with age. Long needles grow in pairs appearing very dark green which contrast with the yellow-green of new growth each spring. This pine tolerates almost any soil including: poor, rocky, sandy, alkaline, and clay conditions. Austrian pine is often used for screens, windbreaks, and specimen or accent plantings. This plant would be considered along the site boundaries for screening and as an evergreen accent at other locations around the site. It would be specified approximately 8-10 feet tall at the time of planting for accent plantings and 6-8 feet tall at the time of planting for screening plantings. It is available locally.

DECIDUOUS TREES

Betula jacquemontii - White Barked Himalayan Birch

This European white birch is characterized by a pyramidal shape, fast growing reaching 25 feet tall and 18-20 feet wide, with upright branches which hold bright green, wedge-shaped leaves. The tree displays dark green leaves and exhibits the brightest white bark of any tree. The smooth bark undergoes periodic shedding and renewal. The fall color of the birch is generally golden yellow. This tree is resistant to bronze birch bore and tolerates urban pollution. The birch is useful as an accent tree or group planting. This tree will be considered for planting around the administration building and pond area. It would be specified at 3-inch caliper size.

Fraxinus americana 'Autumn Purple' - Autumn Purple Ash

Autumn purple ash is a fast growing, oval or round topped tree. It reaches a mature height of 80-120 feet. Male trees should be planted if possible to avoid fruits. Leaves are pinnate with leaflets about 6-inches long. Fall color is purple. This tree tolerates almost any well-drained soil. It has a deep root system and is useful as a shade tree, accent or street tree. This tree will be considered for planting around the administration building and in the parking planters. This ash would be specified at 3-inch caliper size.

Gleditsia triacanthos var. inermis 'Shademaster' - Shademaster Honey Locust

The 'Shademaster' honey locust is a spreading, open headed, fast growing deciduous tree. It grows to a height of 25 feet in 10-12 years and at maturity reaches 50-60 feet with a spread equal to the height. It is easily established and tolerates heat, drought and urban pollution. The foliage consists of leaves 6-8 inches long, pinnate and fern-like, which unfold in the spring. The foliage of the 'Shademaster' persists longer into the fall than

other locusts. Fall color is usually pale yellow. Fallen leaves quickly disintegrate and raking is seldom necessary. The 'Shademaster' honey locust is used as a shade tree, accent, street, or specimen tree. It would be considered for planting in parking lot planters to provide shade. The tree would be specified as 2 1/2-inch caliper size and is available locally.

Gleditsia triacanthos var. inermis 'Sunburst' - Sunburst Honey Locust

The 'Sunburst' honey locust is a pyramidal, fast growing deciduous tree. It grows to a height of 25 feet in 10-12 years and at maturity reaches 35-70 feet with a spread equal to approximately half of its height. It is easily established and tolerates heat, drought and urban pollution. The foliage consist of leaves 6-8 inches long, pinnate and fern-like, which unfold in the spring. Fall color is usually pale yellow. Fallen leaves quickly disintegrate and raking is seldom necessary. The 'Sunburst' honey locust is used as a shade tree, accent or specimen and as street trees. This tree would be considered for planting in parking lot planters to provide shade. The tree would be specified as 2 1/2-inch caliper size and is available locally.

Liquidambar styraciflua - Sweet Gum

The sweet gum is a cone-shaped, upright deciduous tree. Young trees grow 25-30 feet in height in 10-15 years in dry soil, or 8-12 years in moist soil, maturing to 60-70 feet. It spreads approximately 15 feet. The tree exhibits attractive furrowed silver-brown bark. Star-shaped leaves open in late spring and hold late in fall. Fall colors of varying oranges, yellows and reds remain late into the fall. The sweet gum has a deep root system and tolerates wet conditions. This tree is an important species for uses as a shade tree, accent or specimen planting. The sweet gum will be considered for planting around the perimeter of the pond as an accent and shade tree. The sweet gum would be specified 2 1/2 caliper size and is available locally.

Pyrus calleryana 'Bradford' - Bradford Ornamental Pear

Bradford ornamental pear is a semi-deciduous tree which loses some leaves in the fall but usually does not lose all of its leaves. It has a broad oval crown, ultimately 40 feet high with a 20 to 25 feet spread. It is one of the earliest trees to bloom in the spring. Its profusion of white flowers appears like a cloud on the branches. This species bears no fruit. The pear would be planted in the areas surrounding the administration complex. This tree would be specified at 3-inch caliper size and is available locally.

Quercus palustris - Pin Oak

Pin oak is a symmetrical pyramidal, fast growing deciduous tree. It reaches a height of 20-25 feet in 8-10 years and matures to about 75 feet with a spread of 25-40 feet. Slender branches are spreading or pendulous, and lower branches are retained on tree when it is planted in the open. Lower branches can be pruned if desired. This oak is easily established, tolerating dry, rocky and sandy soil conditions. It is useful as a shade tree,

accent or street tree. This tree would be planted for shade around the shelter areas and pond grounds. It would be specified at 3-inch caliper size. It is available locally.

SHRUBS

Berberis thunbergii 'Atropurpurea Nana' - Dwarf Crimson Pygmy Barberry

Dwarf crimson barberry is a small deciduous shrub growing to a height of 6-24 inches with a spread of 12-36 inches. The leaves are 1/2-inch long with spines displaying brilliant red all summer. Fall color is an intensified red, especially if planted in full sun. The barberry tolerates heat and drought. Pruning is rarely required. This shrub would be planted as a foundation planting around buildings and as an understory planting in the parking lot planters. It would be planted in 2 to 5 gallon container sizes.

Berberis thunbergii 'Aurea' - Golden Barberry

Golden barberry is a medium size deciduous shrub with arching branches. If it is left unpruned it will reach 8 feet in height and spread 5-8 feet. Branches are lined with single spines. This shrub flowers in the spring showing profuse yellow blossoms along the branches. Red fruits follow the flowers persisting into winter if not eaten by birds. The leaves are 1/2-1 1/2-inches long displaying golden yellow all summer. It can be pruned several times per year to maintain a dense formal appearance if desired. This shrub would be planted as a foundation planting around buildings and as an understory planting in the parking lot planters. It would be planted in 2 to 5 gallon container sizes.

Euonymus alata 'Compacta' - Dwarf Burning Bush

Dwarf burning bush is a densely branched flat-topped deciduous slow-growing shrub. At mature height and spread it reaches 4-6 feet. Branches have bark with cork-like ridges. The dark green foliage turns brilliant scarlet in the fall making a sensational hedge, specimen or accent plant. Pruning is rarely needed. It grows in almost any well-drained soil in full sun or light shade. This shrub would be planted as an accent planting in the around the administration complex. It would be specified in 5 gallon container size.

Juniperus squamata 'Blue Star' - Blue Star Juniper

Blue star juniper displays an irregular growth mounding to 2 feet in height and spreading 4 feet wide. Its branches exhibit steel-blue needles that suggest twinkling stars. It is a very attractive juniper useful for accents and bed planting. This juniper would be considered for accent and planter plantings and would be specified in 2 to 5 gallon container size.

Juniperus scopulorum 'Moonglow' - Moonglow Juniper

Moonglow juniper is a symmetrical, pyramidal juniper with a moderate growth rate. It reaches a height of 6-8 feet in 10-15 years, maturing to 15-20 feet tall. It grows in almost any well-drained soil and tolerates dry, rocky, acid and alkaline conditions. It does best in full sun. It is useful as a specimen, accent, hedge or screen planting. It can be sheared during to growing season to achieve the desired form. This upright juniper would be specified as 5 gallon container stock.

Mahonia Aquifolium 'Compacta' - Compact Oregon Grape

Compact Oregon grape is a low growing evergreen shrub reaching a height of 18-30 inches. This plant is characterized by masses of erect, irregular stems with glossy deep green holly-like leaves. New growth has a bronzy-red coloring and winter foliage color is purplish-red. Terminal clusters of yellow flowers appear in late spring followed by icy-blue grape-like berries. Compact Oregon grape tolerates heat, drought and cold as well as shade. This shrub would be used as a foundation planting around buildings. It would be specified as 2 or 5 gallon container stock.

Potentilla fruticosa - Shrubby Cinquefoil

Shrubby cinquefoil is a low to medium deciduous shrub, characterized by semi-prostrate or spreading habit, depending on the variety chosen. Varieties which display yellow, white, gold or orange flowers are available. It requires very low maintenance other than occasional pruning to shape. It thrives in almost any soil. Cinquefoil is useful as a foundation or accent plant in combination with other plantings. This plant would be used around the administration complex and would be specified as a 2 or 5 gallon container size.

Spiraea nipponica 'Snowmound' - Snowmound Spirea

Snowmound spirea is a low growing mound shaped deciduous shrub which retains its compact habit at maturity. It reaches 3 feet in height and spreads 4-5 feet. The leaves are small and dark blue green in color. White flower clusters appear in spring. It is used as a accent, foundation, or hedge plant. It would be planted in 2 to 5 gallon container size.

Viburnum opulus 'Nanum' - Dwarf European Cranberry Bush Viburnum

Dwarf European cranberry bush is a deciduous shrub exhibiting a mounding form reaching 2-2 1/2 feet high with a 3-4 foot spread. The foliage appears as small, glossy tri-lobed leaves. It rarely produces flowers. This plant is a good filler for mass plantings or is used as a hedge.

GROUNDCOVERS

Iberis sempervirens 'Snowflake' - Snowflake Candytuft

Snowflake candytuft is an evergreen groundcover which forms 2-foot wide mounds of 10-inch high stems that display a profusion of sparkling white blooms in spring. It will be used as an accent and groundcover planting in beds around the administration complex. It will be specified in one gallon container size.

Juniperus horizontalis 'Blue Chip' - Blue Chip Juniper

Blue chip juniper is a low spreading juniper which creates a superior ground cover. It grows to one foot height and spreads 6-8 feet in width. This evergreen groundcover has silver-blue fine-textured foliage. This juniper would be considered for groundcover plantings and would be specified in 2 to 5 gallon container size.

Juniperus horizontalis 'Wiltonii' - Blue Rug Juniper

Blue rug juniper is a very low spreading juniper reaching a height of 6-inches and spreading to eight feet. It exhibits a very dense plush carpet of intense silver-blue foliage to enhance the landscape. This juniper would be considered for groundcover plantings and would be specified in 2 to 5 gallon container size.

Mahonia repens - Creeping Mahonia

Creeping mahonia is a small evergreen, native spreading shrub which grows 1-3 feet high, with leathery, dull green foliage. Leaves are divided into 3-7 leaflets, which have spines on the margins. Small clusters of yellow flowers emerge in the spring, followed by blue-black berries. This species is very useful as an excellent groundcover. New leaf growth is red to bronze. This plant will be specified in the 2 gallon container size.

PERENNIALS

Armeria martina 'Bloodstone' - 'Bloodstone' Sea Pink

'Bloodstone' sea pink is perennial flowering plant, exhibiting a clumping form. It is characterized by glossy, dark green grass-like semi-evergreen foliage forming neat round mounds to 12 inches in diameter. Round heads of rosy-red flowers top stiff 8-10 inch stems in spring; reblooms if old flowers are removed. It does best in sun and well-drained soils. The sea pink will be used as an accent plant in planter beds.

Armeria martina 'Cotton Tail' - 'Cotton' Tail' Sea Pink

'Cotton Tail' sea pink is a perennial flowering plant, exhibiting a clumping form. It is characterized by glossy, dark green grass-like semi-evergreen foliage forming neat round mounds to 12 inches in diameter. Round heads of pure white flowers top stiff 8-inch

stems in spring; reblooms if old flowers are removed. It does best in sun and well-drained soils. The sea pink will be used as an accent plant in planter beds and as a edging plant for small borders.

Astilbe x Arendsii 'Fanal' - 'Fanal' Astilbe

'Fanal' astilbe is characterized by attractive graceful mounds of deciduous leaves having deeply cut leaflets. Showy deep garnet red blooms flower above bronzy-green 2-foot high foliage. It does best in semi-shady to shady conditions. It is used as an accent plant or planted in mass border plantings. It will be considered for planting in shady planters around the administration building.

WILDFLOWERS

Achillea millefolium - Yarrow

Yarrow is a native, rhizomatous, moderately drought-tolerant, perennial, growing 1-2 feet tall, and is very aromatic. Small clusters of white flowers bloom late spring through late summer. It grows throughout most of North America from valley bottoms to subalpine elevations. Yarrow is a valuable ornamental in wildflower mixes and for revegetation and stabilization of disturbed sites. Yarrow will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Balsamorhiza sagittata - Arrowleaf Balsamroot

Arrowleaf balsamroot is a native, perennial, growing 1-1/2 to 2-1/2 feet tall. It displays sunflower-like yellow flowers that bloom in spring. It is distributed throughout the Intermountain and Northwest regions from 1,000 to 9,000 feet elevations. It is very drought tolerant and winter hardy. Arrowleaf balsamroot is used for range and wildlife habitat improvement, reclamation and roadside and related beautification. This wildflower species will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Linum perenne var. Lewisii - Lewis Blue Flax

Lewis blue flax is a native, perennial, 1-2 feet tall. It blooms in late spring producing sky-blue flowers. This wildflower species is a short-lived, drought-tolerant, semi-evergreen wildflower. It provides good palatable forage in spring, late fall and winter. Lewis blue flax is used for beautification, range and wildlife habitat improvement and revegetation of disturbed sites. This wildflower will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Lupinus argenteus - Silvery Lupine

Silvery Lupine displays light to dark blue pea-like blossoms which cover a one foot flowering stalk. The silvery green leaves radiate out from a central point. Silvery lupine blooms in late spring to early summer. It thrives in dry to moist soils. Silvery lupine will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Penstemon deustus - Hotrock Penstemon

Hotrock penstemon is a native perennial, low, many-stemmed plant which produces sharply and deeply toothed leaves. Hotrock penstemon blooms in late spring/early summer with white tubular flowers, approximately one-half inch long which usually have lavender stripes. It grows wild from low to mid elevation, often on steep, rocky, dry slopes and disturbed areas. It is drought tolerant and thrives in full sun. Hotrock penstemon is a valuable species in wildflower mixtures and for revegetation of dry harsh sites. Hotrock penstemon will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Sphaeralcea munroana - Munro Globemallow

Munro or desert orange globemallow is a drought tolerant wildflower growing 2 to 3 feet tall. It is an extremely adaptable and widely distributed species. The widely branched plants arise from a very deep and strong root system. It grows in many different soils types but does best in moderately sandy or rocky sites. Bright orange-red flowers bloom from May to August. This species prefers full sun. Munro globemallow is useful for revegetation of disturbed sites where sandy or rocky soils are dominant. The desert globemallow will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

GRASSES

Agropyron riparium var. 'Sodar' - Sodar Streambank Wheatgrass

Sodar streambank wheatgrass is a native, short to medium height, drought-tolerant, long-lived, rhizomatous, sod forming, cool season grass. It is adapted to a variety of well drained soil types. It is an excellent species for erosion control on roadsides, ditch banks, slopes and disturbed area reclamation. Streambank wheatgrass is also used for low maintenance turf. Streambank wheatgrass will be used in the seed mixture for the native grass and wildflower seeding for the interior of the site.

Agropyron spicatum var. 'Secar' - Bluebunch Wheatgrass

Bluebunch wheatgrass is a native, medium height, long-lived, drought-tolerant, cool season bunchgrass. It is adapted to a wide range of soils. Bluebunch wheatgrass is a very valuable native grass for watershed, range, reclamation revegetation, and wildlife

improvement. Bluebunch wheatgrass will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Oryzopsis hymenoides - Indian Ricegrass

Indian ricegrass is a densely tufted, cool season, very drought tolerant, perennial bunchgrass adapted to deep, well-drained soils. Indian ricegrass is an excellent species for land reclamation and revegetation of disturbed sites. Indian ricegrass will be used in the seed mixture for the grass and wildflower seeding for the interior of the site.

Poa sandbergii - Sandberg Bluegrass

Sandberg bluegrass is a short, cool season, drought tolerant, sod-forming, perennial bunchgrass. It is very drought tolerant and is very productive on disturbed sites. It is adapted to both shallow and deep soils and all soil textures. Sandberg bluegrass will be used in the seed mixture for the interior of the site.

Sitanion hystrix - Bottlebrush Squirreltail

Bottlebrush squirreltail is a native, medium height, short-lived, very drought-tolerant, cool season bunchgrass. It is adapted to all soil textures, deep to shallow, and very dry to moist. Bottlebrush squirreltail grows on desert flats to steep mountain slopes. It is a very valuable native species for reclamation of disturbed areas, and range and wildlife habitat improvement on very dry, harsh sites. Bottlebrush Squirreltail will be used in the seed mixture for the grass and wildflower seeding.

Sporobolus cryptandrus - Sand Dropseed

Sand dropseed is a warm season, drought tolerant, perennial bunchgrass adapted to most soils but thrives on sandy sites. It provides good palatability to wildlife. Sand dropseed establishes easily and is widely used for controlling erosion on a wide variety of sites. Sand dropseed will be used in the seed mixture for the native grass and wildflower seeding.

SUMMARY

The plant materials selected for the conceptual landscape design for the HAMMER facility have been chosen for their adaptability to the site and to add a diversity of plant types, textures, colors, and forms. These species will be integrated into a low maintenance landscape design to enhance the setting of the HAMMER facility and to provide a campus-like atmosphere.

USACE HAMMER PROJECT
30% CONCEPTUAL DESIGN - PLANT LIST

COMMON NAME	SCIENTIFIC NAME	TYPE	COMMENTS
EVERGREEN TREES			
White Fir	<u>Abies Concolor</u>	E	
Atlas Blue Cedar	<u>Cedrus atlantica var. glauca</u>	E	Formal appearance, blue-green needles
Hoops Blue Spruce	<u>Picea pungens 'Hoopsii'</u>	E	Slow growing
Austrian Pine	<u>Pinus nigra</u>	E	Fast growing, good windbreak planting
DECIDUOUS TREES			
White Barked Birch	<u>Betula pendula</u>	D	Resistant to Bronze Birch Bore
Autumn Purple Ash	<u>Fraxinus americana 'Autumn Purple'</u>	D	Fast growing, beautiful fall color
Shademaster Honey Locust	<u>Gleditsia triacanthos var. inermis</u>	D	Good shade tree
Sunburst Honey Locust	<u>Gleditsia triacanthos var. inermis</u>	D	Good shade tree
Sweet Gum	<u>Liquidamnar styraciflua</u>	D	Terrific tree and leaf shape
Bradford Ornamental Pear	<u>Pyrus calleryana 'Bradford'</u>	D	Redspire' also is a very nice variety
Pin Oak	<u>Quercus palustris</u>	D	Fast growing, fall crimson color.
SHRUBS			
Crimson Pygmy Barberry	<u>Berberis thunbergii 'Crimson Pygmy'</u>	D	Red foliage with spines
Golden Barberry	<u>Berberis thunbergii 'Aurea'</u>	D	Golden foliage with spines
Dwarf Burning Bush	<u>Eunonymus alata 'Compacta'</u>	D	Bright crimson foliage in fall
Moonglow Juniper	<u>Juniperus scopulorum 'Moonglow'</u>	E	Upright juniper with silver-blue foliage
Blue Star Juniper	<u>Juniperus squamata 'Blue Star'</u>	E	Low juniper with silver-blue foliage
Compact Oregon Grape	<u>Mahonia aquifolium 'Compacta'</u>	E	Leathery dark green foliage with spines
Shrubby Cinquefoil	<u>Potentilla fruticosa</u>	D	Orange, yellow, and white flowers available
Snowmound Spirea	<u>Spiraea nipponica 'Snowmound'</u>	D	Many other varieties & flower colors available
Dwarf European Cranberry Bush Viburnum	<u>Viburnum opulus 'Nanum'</u>	D	Used as a filler for mass plantings
GROUND COVER			
Powder Blue Festuca	<u>Festuca ovina glauca</u>		Ornamental grass
Blue Chip Juniper	<u>Juniperus horizontalis 'Blue Chip'</u>	E	
Blue Rug Juniper	<u>Juniperus horizontalis 'Wiltonii'</u>	E	
Creeping Mahonia	<u>Mahonia repens</u>	E	Spines deter trespassers

E=Evergreen D=Deciduous

USACE HAMMER PROJECT
30% CONCEPTUAL DESIGN - PLANT LIST

COMMON NAME	SCIENTIFIC NAME	TYPE	COMMENTS
WILDFLOWERS			
Yarrow	<u>Achillea millefolium</u>	P	White flowers
Bloodstone' Sea Pink	<u>Armeria maritima 'Bloodstone'</u>	P	Rosy-red flowers
Cotton Tail' Sea Pink	<u>Armeria maritima 'Cotton Tail'</u>	P	White Flowers
Astilbe	<u>Astilbe x Arendsii 'Fanal'</u>	P	Garnet-red flowers
Arrowleaf Balsamroot	<u>Balsamorhiza sagittata</u>	P	Yellow flowers
Lewis Blue Flax	<u>Linum perenne var. Lewisii</u>	P	Blue flowers
Silvery Lupine	<u>Lupinus argenteus</u>	P	Dark Blue flowers
Hotrock Penstemon	<u>Penstemon deustus</u>	P	White flowers w/ lavender stripes
Munro globemallow	<u>Sphaeralcea munroana</u>	P	Orange flowers
GRASSES			
Sodar Streambank Wheatgrass	<u>Agropyron riparium var. 'Sodar'</u>	C	Rhizomatous, sod forming,
Bluebunch Wheatgrass	<u>Agropyron spicatum var. 'Secar'</u>	C	Bunchgrass
Indian Ricegrass	<u>Oryzopsis hymenoides</u>	C	Bunchgrass
Sandberg Bluegrass	<u>Poa sandbergii</u>	C	Sod forming bunchgrass
Bottlebrush Squirreltail	<u>Sitanion hystrix</u>	C	Bunchgrass
Sand Dropseed	<u>Sporobolus cryptandrus</u>	W	Bunchgrass

P = Perennial C = Cool Season W = Warm Season

APPENDIX L

SKETCHES

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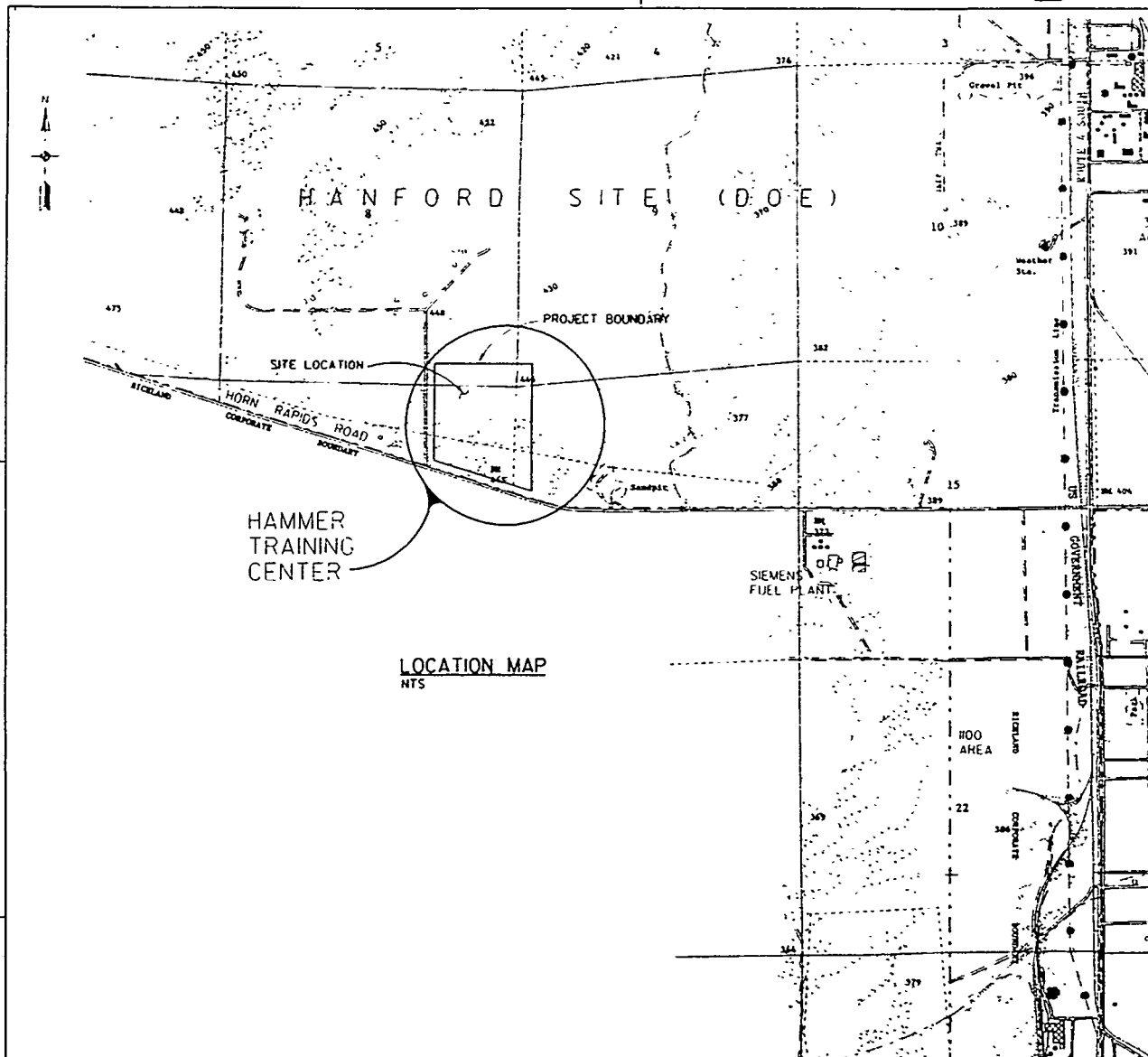
BURN STRUCTURE PROP DRAWINGS

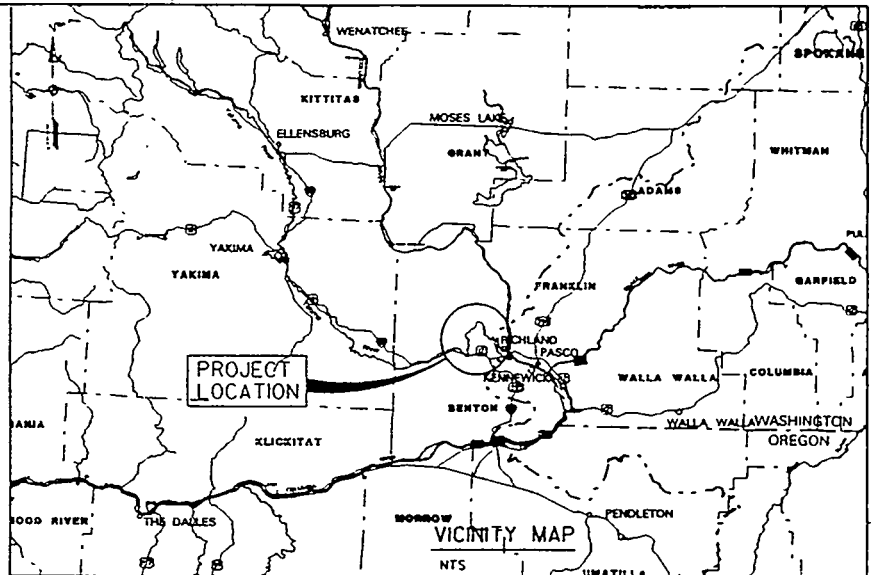
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HAMMER TRAINING CENTER
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SECONDARY ENTRANCE

HANFORD PATROL TRAINING ACADEMY ROAD

J-BOX WITH
TANKS PROPRAILROAD TANK CARS
WITH RAIL PROPTRENCH SITE
TRAINING PROPCRAFT SPECIFIC PROPS AND
BURIED SIMULATED WASTE
4 ACRES

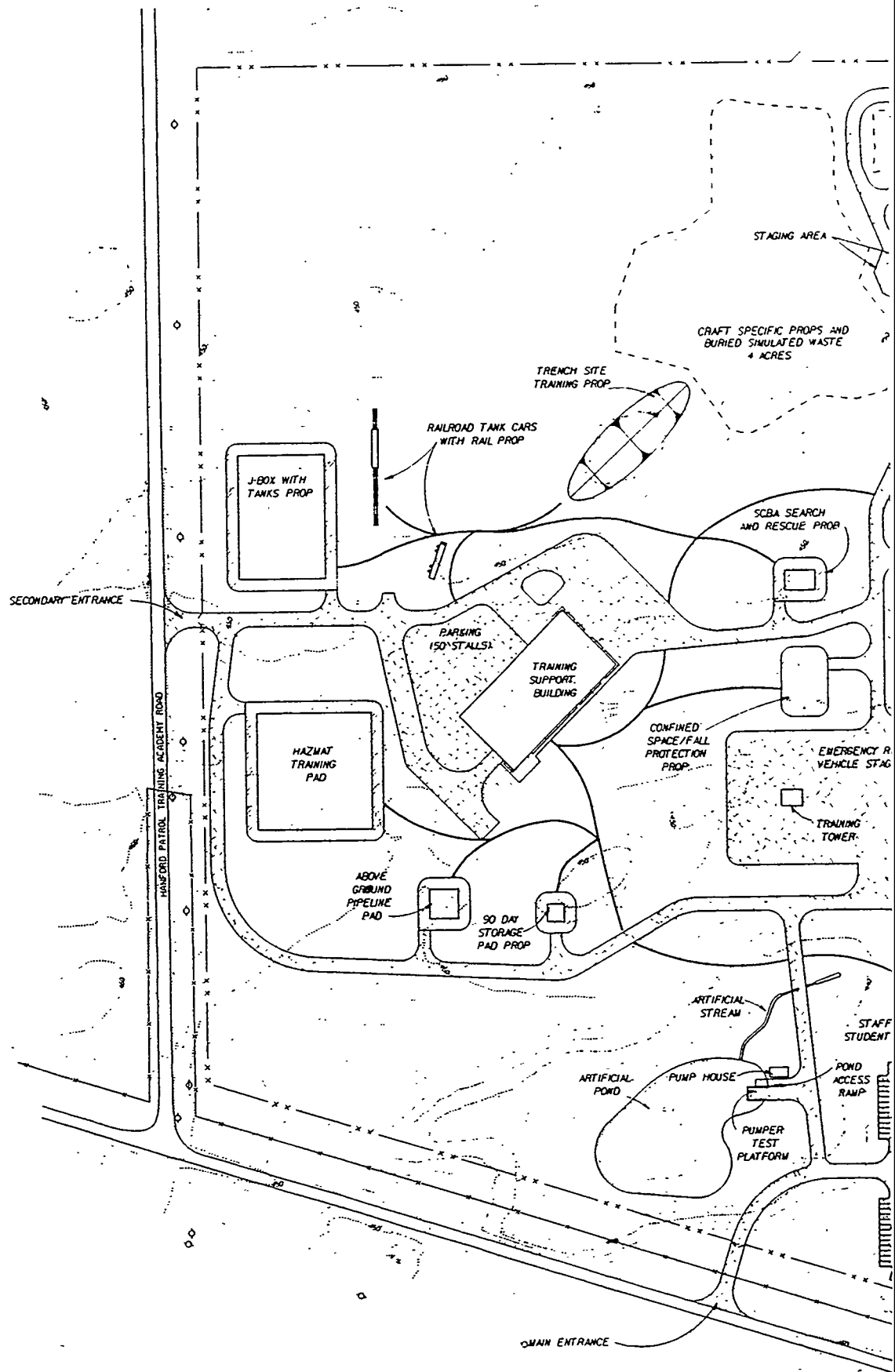
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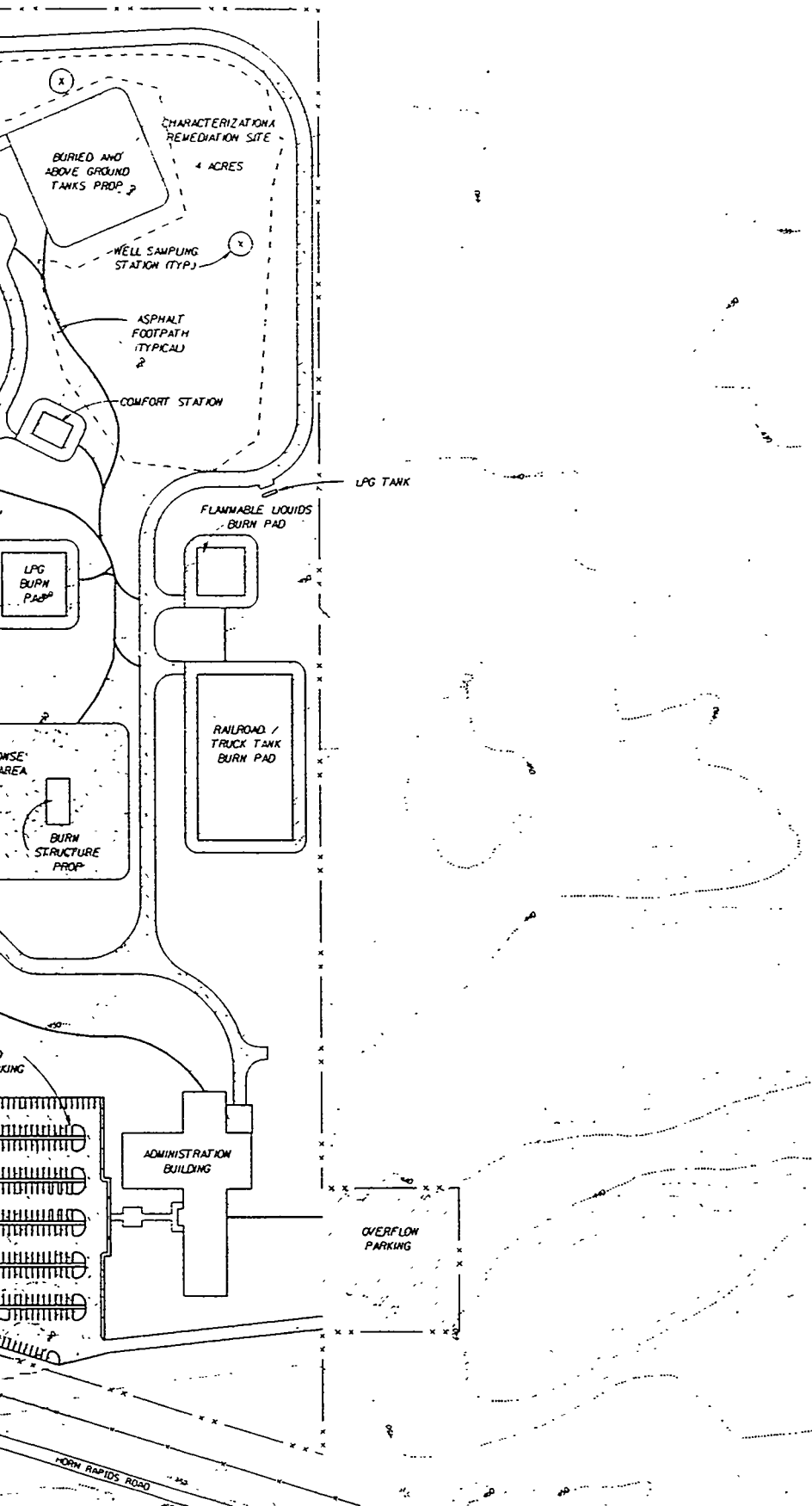
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SUPPORT
BUILDINGHAZWAT
TRAINING
PADCONFINED
SPACE/FALL
PROTECTION
PROP.EMERGENCY R
VEHICLE STAGTRAINING
TOWERABOVE
GROUND
PIPELINE
PAD90 DAY
STORAGE
PAD PROPARTIFICIAL
STREAMARTIFICIAL
POND

PUMP HOUSE

PUMPER
TEST
PLATFORMSTAFF
STUDENTPOND
ACCESS
RAMP

MAIN ENTRANCE

SCALE IN FEET
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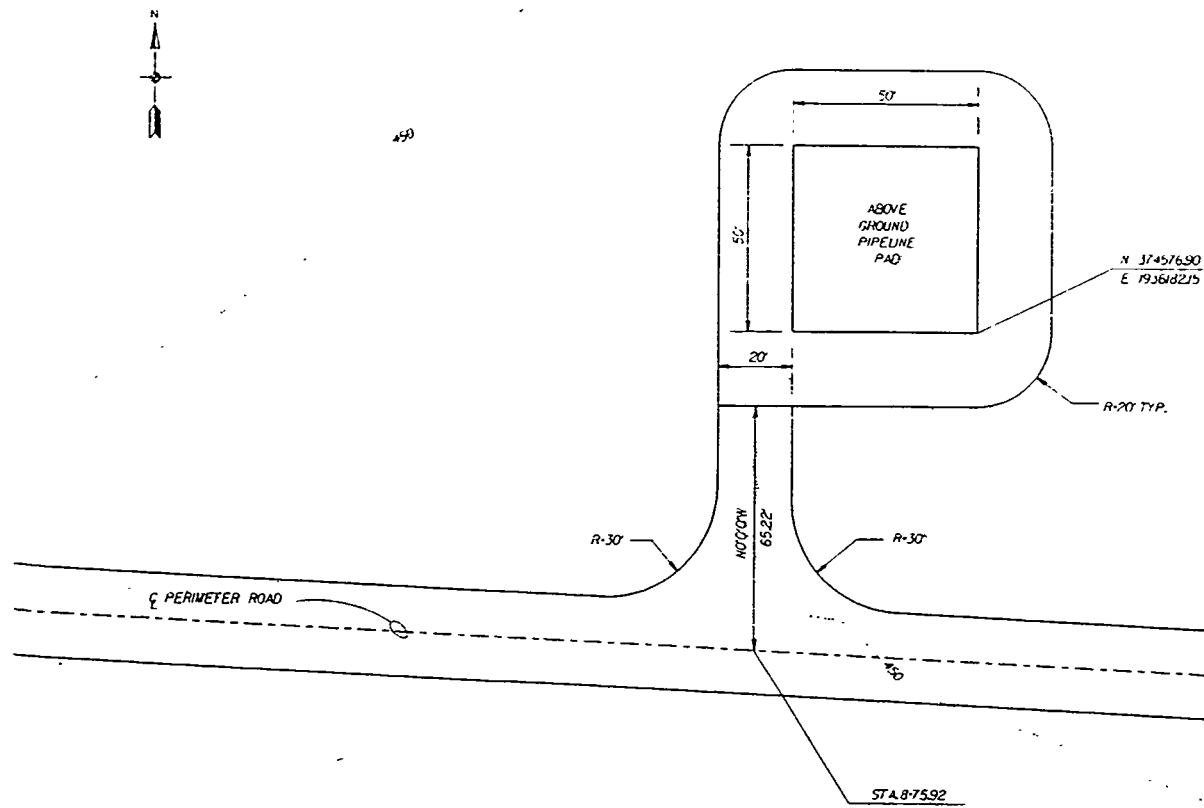
LEGEND:

-  AGGREGATE SURFACING
 ASPHALT SURFACING
 ASPHALT FOOTPATH
 EXISTING PAVED ROAD
 EXISTING BARBED WIRE FENCE
 NEW 7-FOOT HIGH PERIMETER FENCE
 EXISTING UTILITY POLE
 EXISTING ELECTRICAL JUNCTION BOX
 EXISTING CARSONITE POST GTE CABLE
 EXISTING CARSONITE POST FIBER OPTIC CABLE

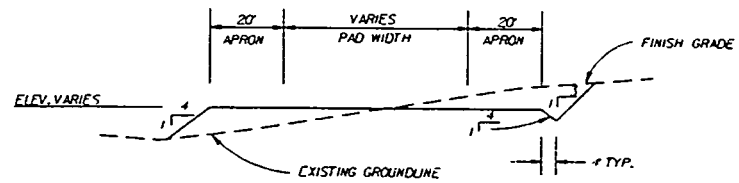
NOTES:

1. MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.
2. TOPOGRAPHY MAPPED BY JOHN E. CHANCE & ASSOC., GEODETIC, MARCH 1994. CONTOUR INTERVAL, 2 FOOT.
3. SURVEY DATUM: VERTICAL NGVD 88, HORIZONTAL NAD 83 19N, WASHINGTON STATE PLANE, ZONE 4602.

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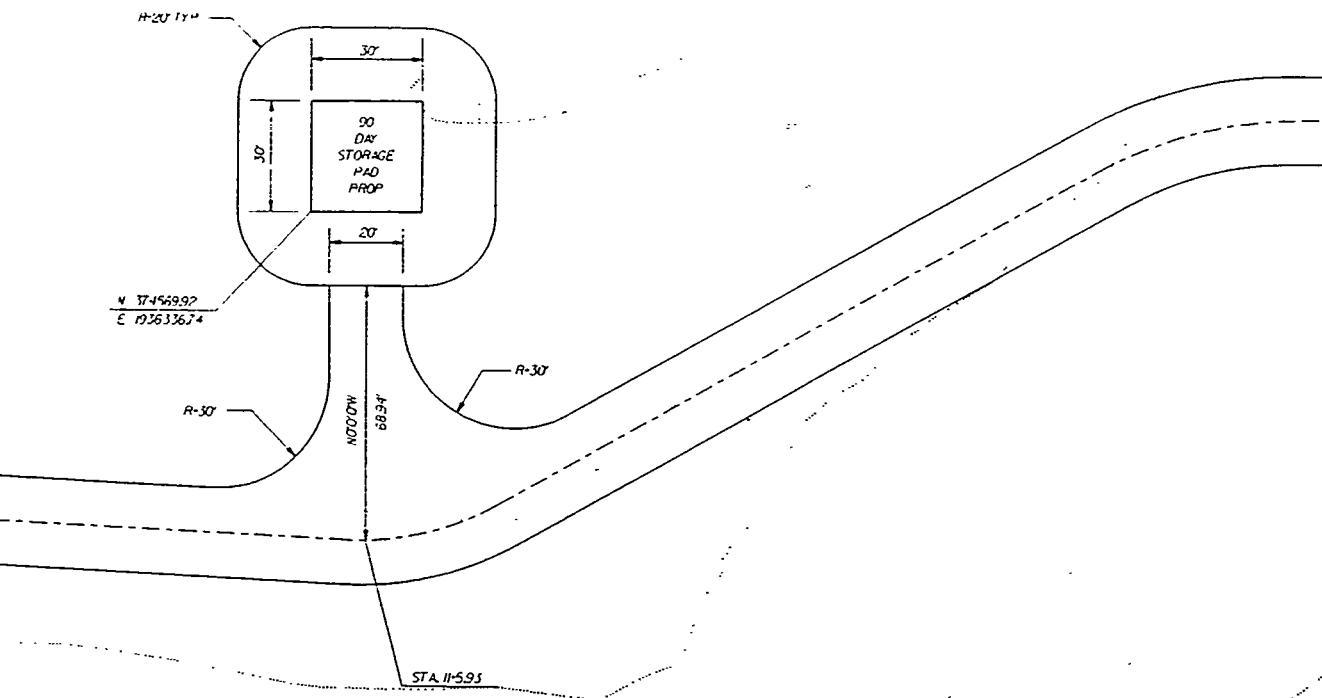


PLAN

SCA
20'

TYPICAL SECTION

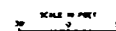
NTS



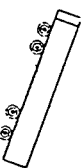
PARTIAL

FEET
20'

REVISION		DATE	BY	CHKD.	APPD.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
DESIGNED BY DITH		HAMMER TRAINING CENTER			
CHECKED BY DITH		HANFORD RESERVATION, WASHINGTON			
IN CHARGE N		ABOVE GROUND PIPELINE PAD AND 90 DAY STORAGE PAD			
SUPERVISOR DITH		PARTIAL PLAN I			
DATE 10/1/84		SCALE AS SHOWN		INV. NO.	
PROJECT NO. 10-SEP-84 15/5		SHEET NO. C-3		FILE NO.	

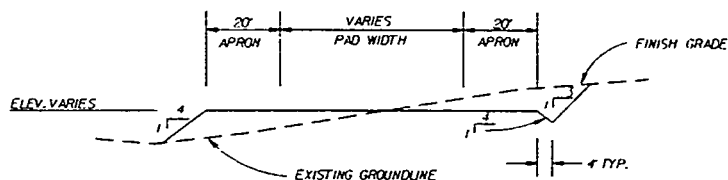


RAILROAD TANK CARS
WITH RAIL PROP



350

E ACCESS ROAD 1

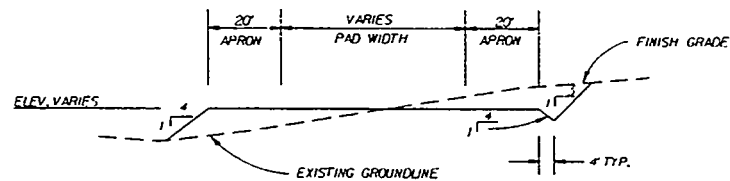


TYPICAL SECTION

HTS

REVISION		DATE	BY	CHKD.	APPD.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
DESIGNED BY DORTH		DRAWN BY DORTH			
CHECKED BY DORTH		APPROVED BY DORTH			
DATE 10/1/78		SCALE AS SHOWN			
PROJECT HAMMER TRAINING CENTER		SHEET NO. C-4			
DRAWING NO. WHC-SD-T100-CDR-001		INVENTORY NO. FILE NO.			

COMPUTER
AIDED
DESIGN &
DRAWING



TYPICAL SECTION

NTS

PLAN - PARTIAL

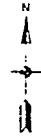
30' SCALE IN FEET 30'



COMPUTER
AIDED
DESIGN &
DRAFTING

DESIGN FILENAME: FILE 1/000/0001.DWG
PLOTTER FILE: TO-VP-444.DWG
PLOTTER METHOD: HPGL/HP

[illegible]



CRAFT SPECIFIC PROPS AND
BURIED SIMULATED WASTE

STA. 12+31.72

STA. 14+51.82

STAGING AREA

40'

E ACCESS ROAD 2

STA. 7+91.31

PLAN - PARTIAL

SCALE IN FEET
30' 0 30'

BURIED AND ABOVE
GROUND TANKS PROP

R-20 TYP.

CHARACTERIZATION/RE

R-20 TYP.

COMFORT STATION

R-30'

N66°52'31" E

107.6'

R-30'

127.6'

R-488'

R-30'

R-30'

163°23'22" E

12.94'

35.57'

52'

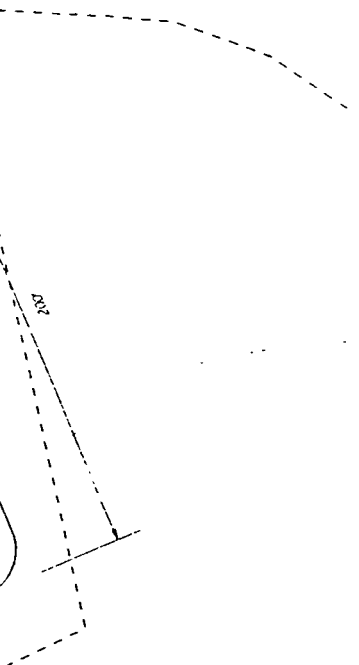
8'

X

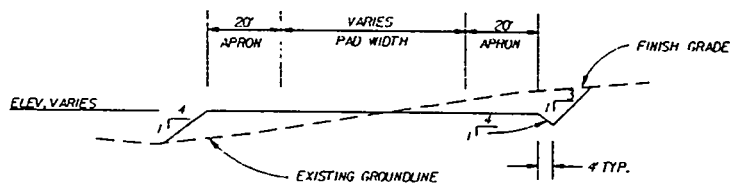
200'

40

40



X



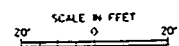
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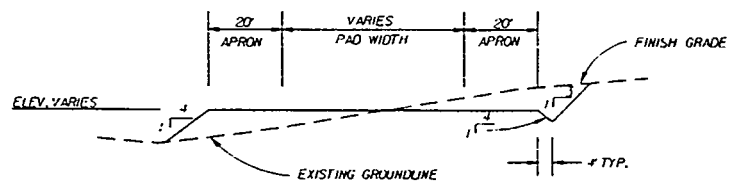
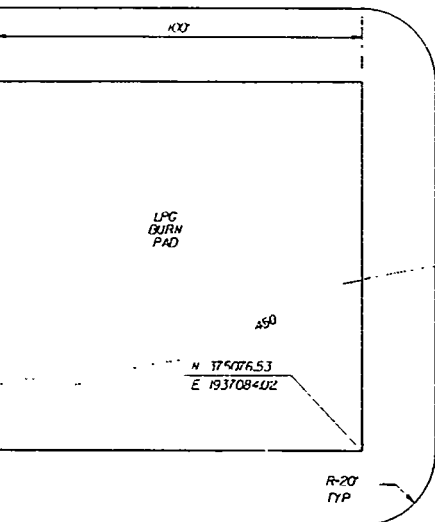
NIS

[illegible]

**COMPUTER
AIDED
DESIGN &
DRAFTING**

DESIGN PROVIDED: 1 and 3/4 inch/ hour/ production
PARTIAL PAID: 20-SEP-1994 CUP
PARTIAL RETIRE: 20-SEP-1994





TYPICAL SECTION

NTS

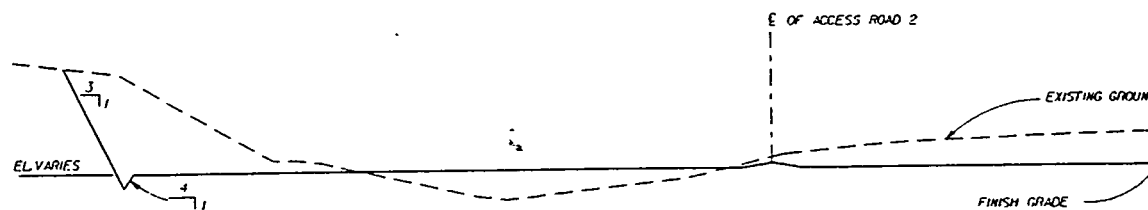
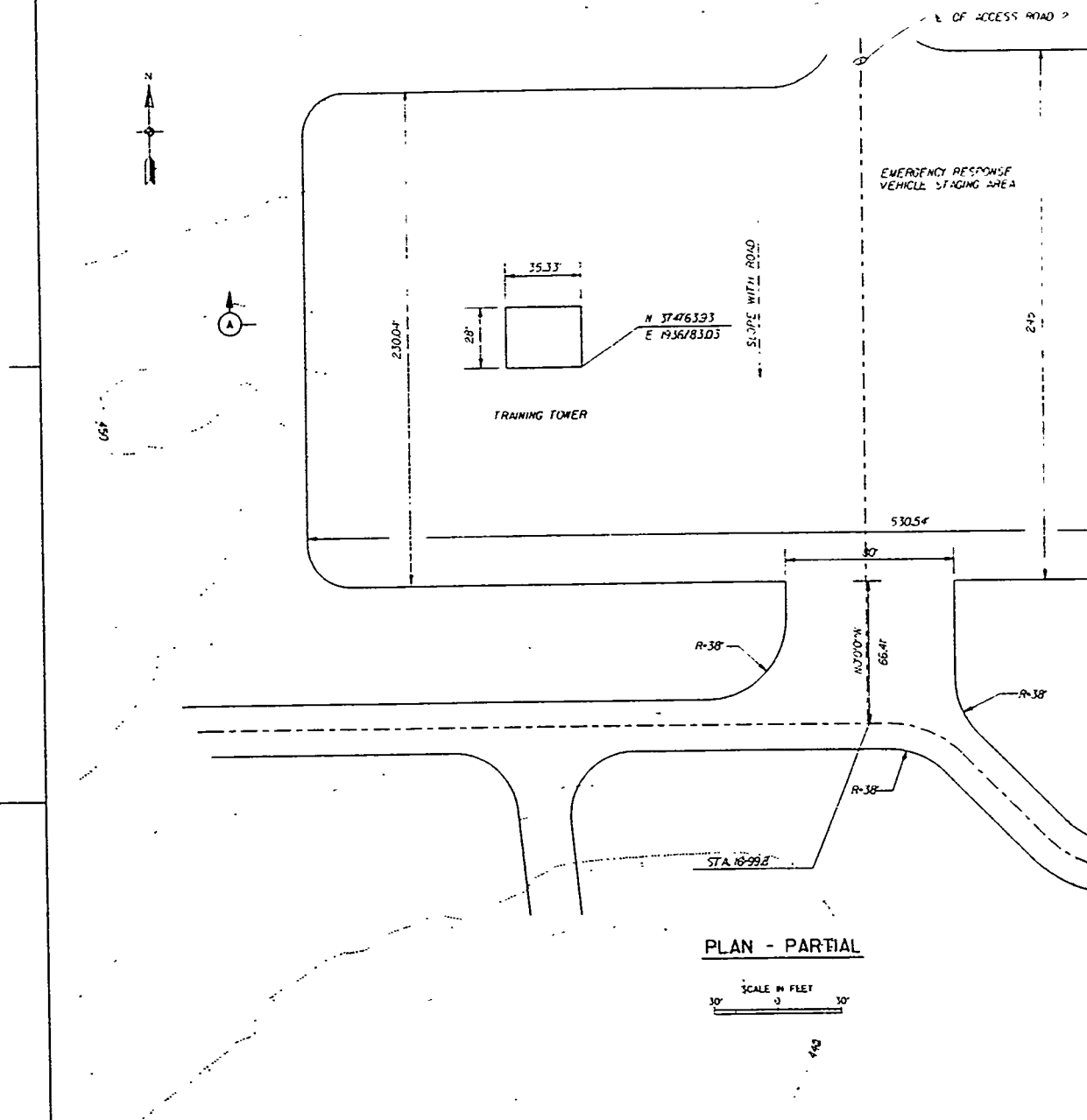
REVISION	DATE	DESCRIPTION	DATE	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON SCBA SEARCH AND RESCUE PROP, LPG BURN PAD, AND CONFINED SPACE/FALL PROTECTION PROP				
PARTIAL PLAN 5				
ORTH. DESIGNED BY			DATE	
ORTH. CHECKED BY			DATE	
N. CHECKED BY			DATE	
DATE			DATE	
SCALE AS SHOWN			REV. NO.	
C-7			FILE NO.	

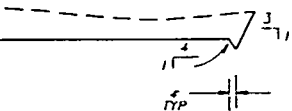
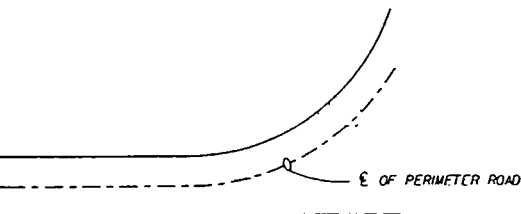
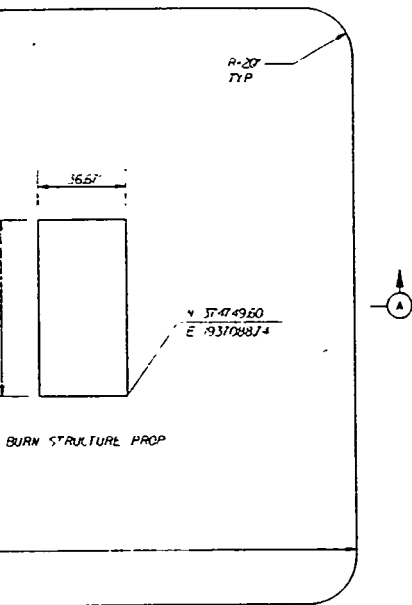
**COMPUTER
AIDED
DESIGN &
DRAFTING**

DESIGN FILED: 11/15/84/WHC/WHC/WHC/WHC
PLOTTER: 11/15/84/WHC/WHC/WHC/WHC
PLOTTER: 11/15/84/WHC/WHC/WHC/WHC

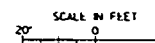
CONT. NO.

L-10

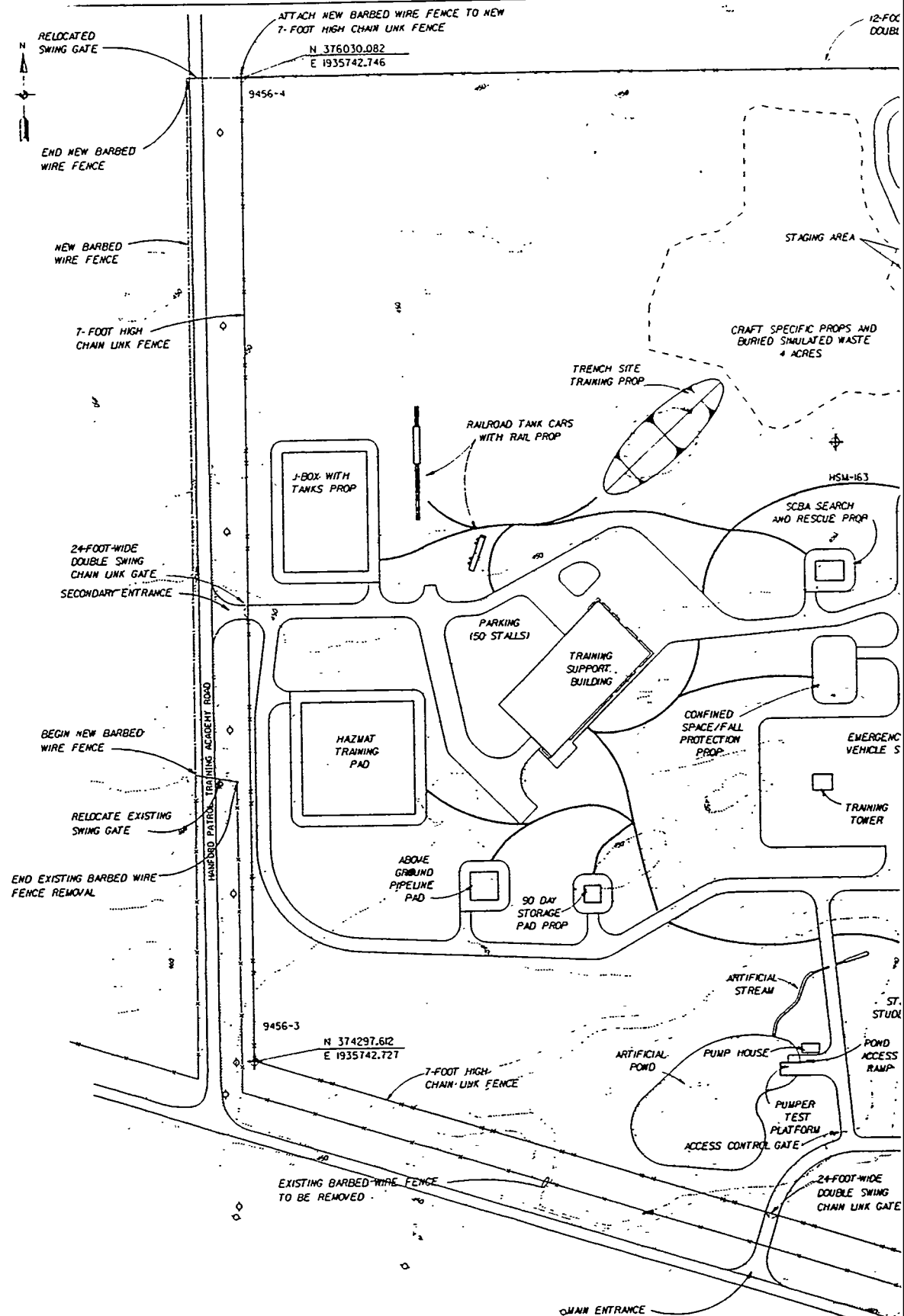


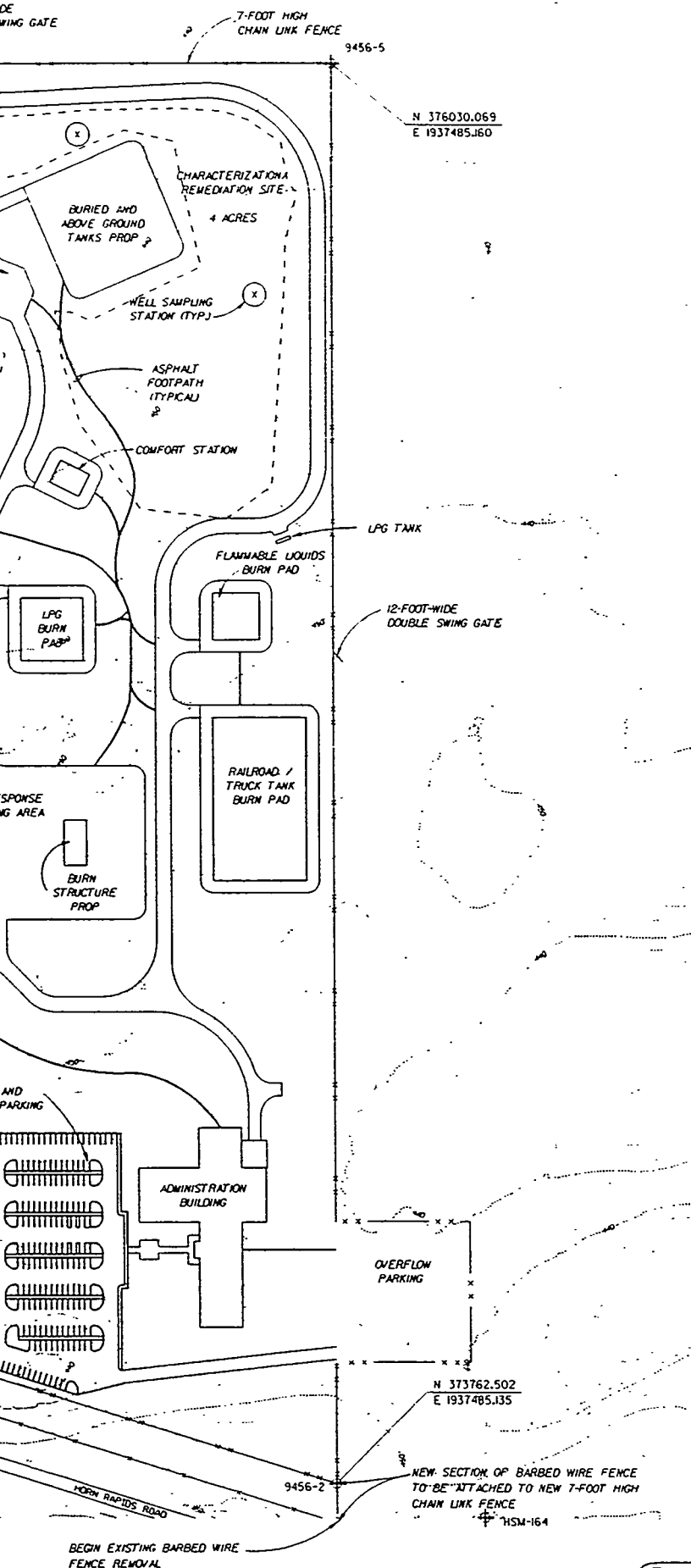


U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING TOWER AND BURN STRUCTURE PROP	
PARTIAL PLAN 6	
ORTH DRAWN BY N CHECKED BY DATE	SCALE AS SHOWN (REV. NO.) C-8



[illegible]



DE
WING GATE

SURVEY CONTROL STATIONS

DESIGNATION	NORTHING	EASTING	ELEV. (MSL)	MONUMENT TYPE
C324	373371.382	1942467.353	376.029	CONCRETE MON. W/BRASS CAP
D324	373934.894	1936720.766	447.830	CONCRETE MON. W/BRASS CAP
E324	375431.778	193845.528	481.793	CONCRETE MON. W/BRASS CAP
H324	380917.958	1917349.700	438.283	CONCRETE MON. W/BRASS CAP
CUE 18	365036.661	1947027.058	442.502	CONCRETE MON. W/BRASS CAP
HSM-63	375376.040	1936795.392	461.114	30" REBAR 2 1/2" ALUM. CAP
HSM-64	373708.202	1937724.511	461.258	30" REBAR 2 1/2" ALUM. CAP
9456-6	376029.667	1938252.499	432.758	30" REBAR 2 1/2" ALUM. CAP
9456-5	376029.713	1937485.184	439.067	30" REBAR 2 1/2" ALUM. CAP
9456-4	376029.788	1935742.921	453.417	30" REBAR 2 1/2" ALUM. CAP
9456-3	374297.453	1935742.835	447.558	30" REBAR 2 1/2" ALUM. CAP
9456-2	373762.329	1937485.060	454.470	30" REBAR 2 1/2" ALUM. CAP
9456-1	373762.313	1938252.364	453.040	30" REBAR 2 1/2" ALUM. CAP

LEGEND:

- ASPHALT FOOTPATH
- EXISTING PAVED ROAD
- EXISTING BARBED WIRE FENCE
- NEW BARBED WIRE FENCE
- x x — NEW 7-FOOT HIGH PERMETER FENCE
- o EXISTING UTILITY POLE
- o EXISTING ELECTRICAL JUNCTION BOX
- EXISTING CARSONITE POST GTE CABLE
- EXISTING CARSONITE POST FIBER OPTIC CABLE
- EXISTING CONCRETE MONUMENT WITH BRASS CAP
- ⊕ EXISTING 30" REBAR WITH 2 1/2" ALUMINUM CAP

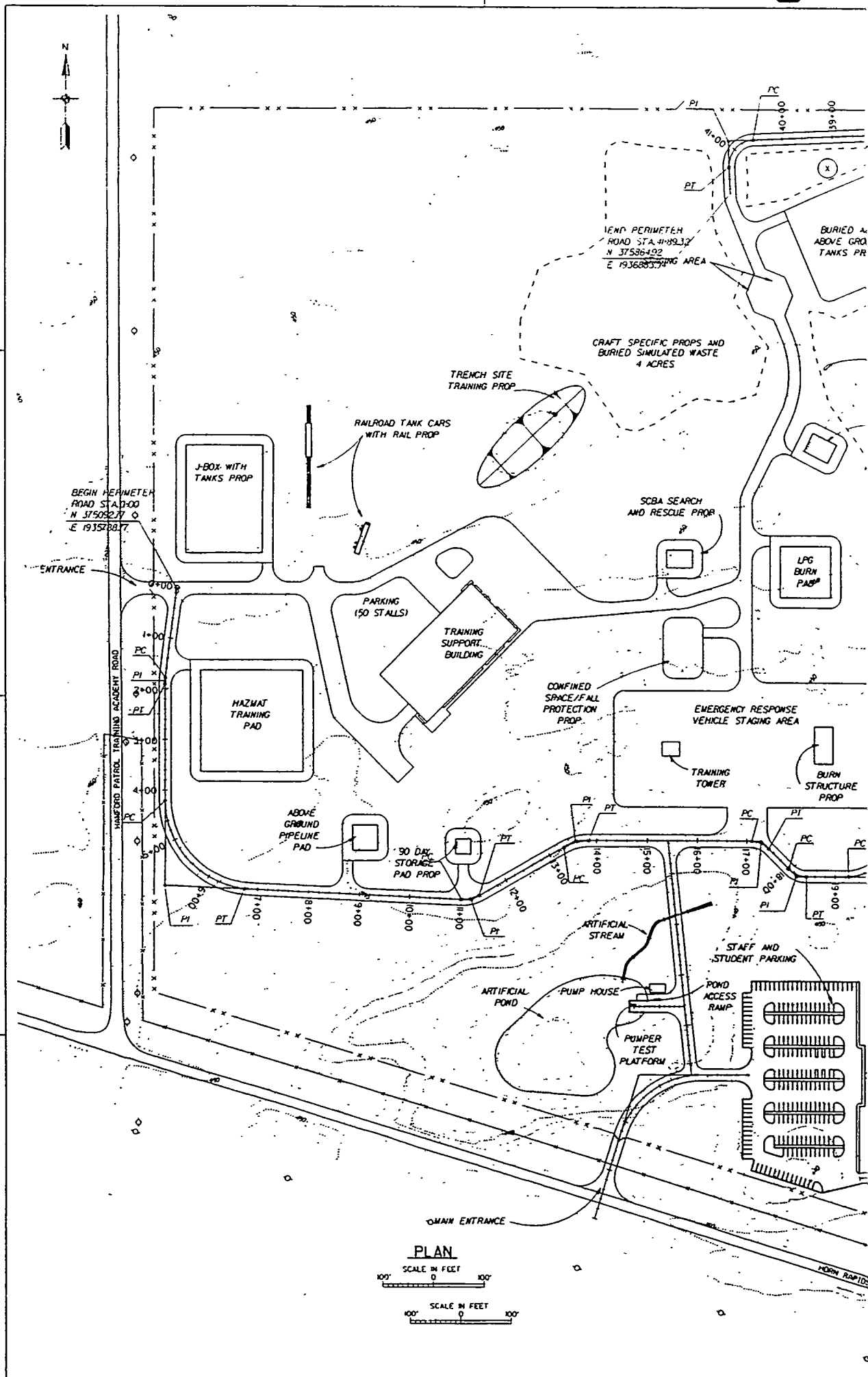
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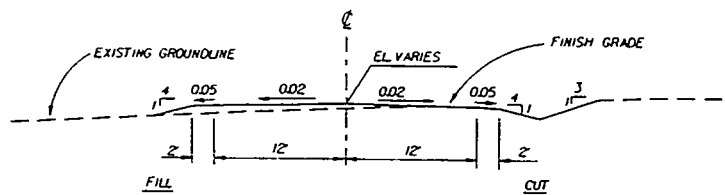
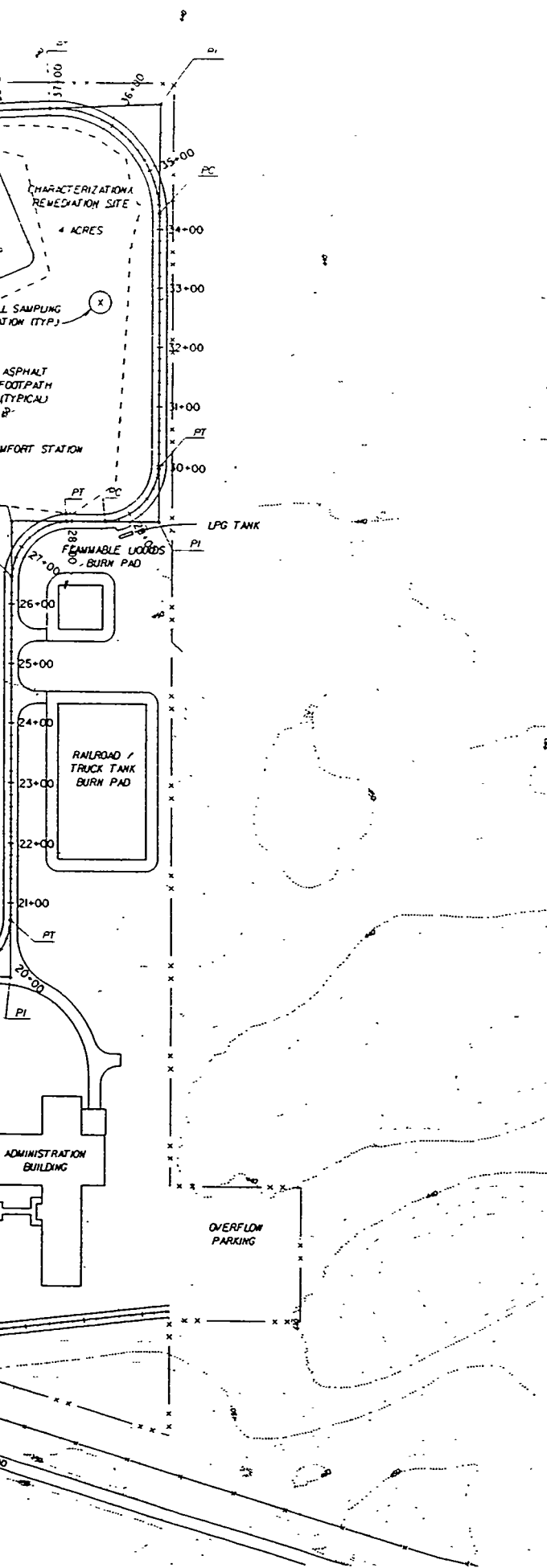
1. MAP COMPLES WITH NATIONAL MAP ACCURACY STANDARDS.
2. TOPOGRAPHY MAPPED BY JOHN E. CHANCE & ASSOC., GEODETIC, MARCH 1994. CONTOUR INTERVAL 2 FOOT.
3. SURVEY DATUM: VERTICAL NVD 88, HORIZONTAL NAD 83 (90). WASHINGTON STATE PLANE, ZONE 4602.
4. SURVEY CONTROL STATIONS C234, D324, E324, H324, AND CUE 18 ARE BEYOND FENCING PLAN VIEW.

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
CORPS/MN DESIGNED BY JHH CHECKED BY JHH DATE SUBMITTED DATE	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
FENCING PLAN AND SURVEY CONTROL	
SCALE AS SHOWN INV. NO. GC-1	

COMPUTER
AIDED
DESIGN &
DRAWING

DESIGN PLANNING: 7/10/94
DRAWING: 7/10/94
CHECKED: 7/10/94
DATE: 7/10/94





TYPICAL ROAD SECTION

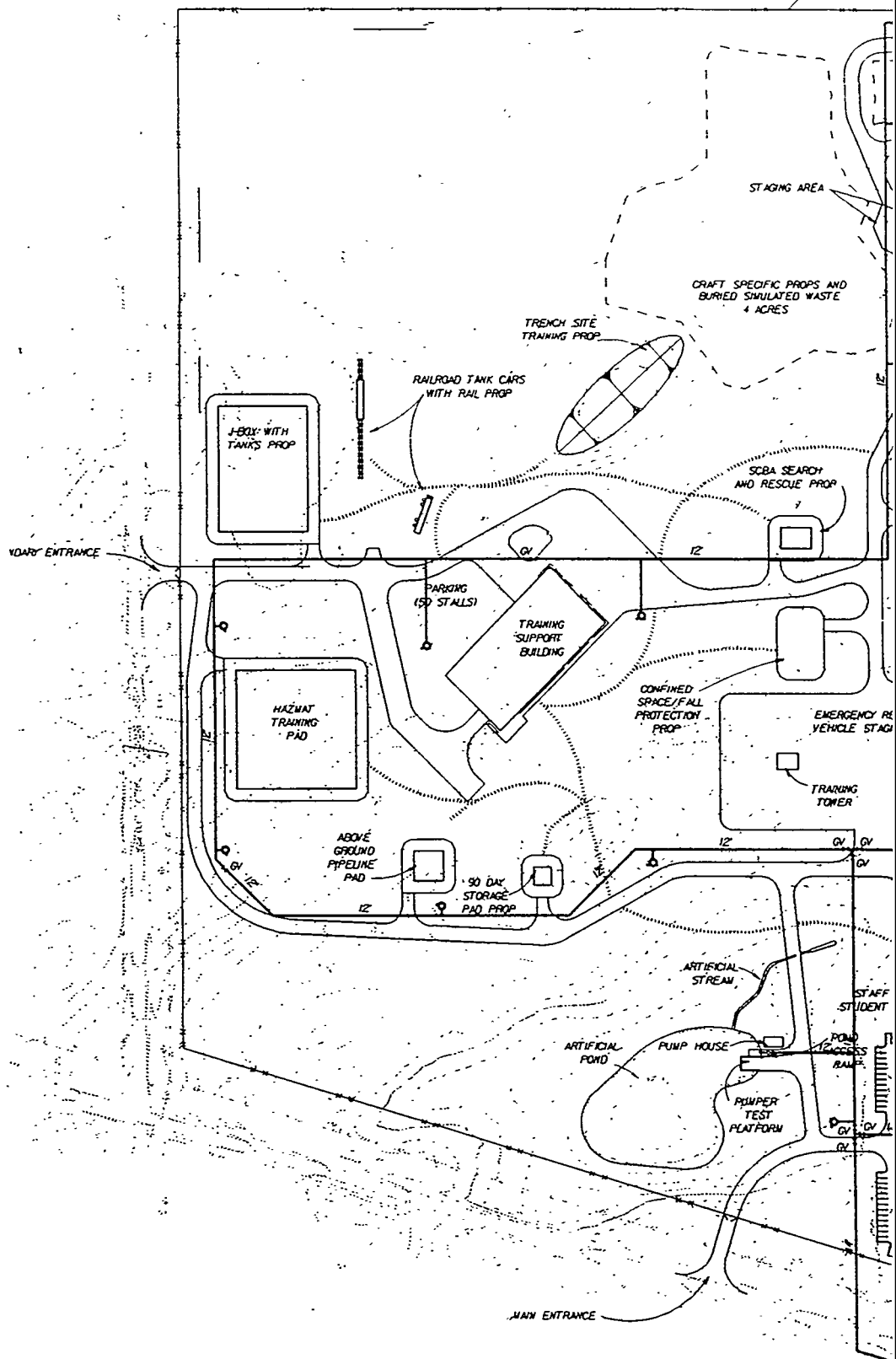
[illegible]

COMPUTER
AIDED
DESIGN &
DRAWING

[illegible]

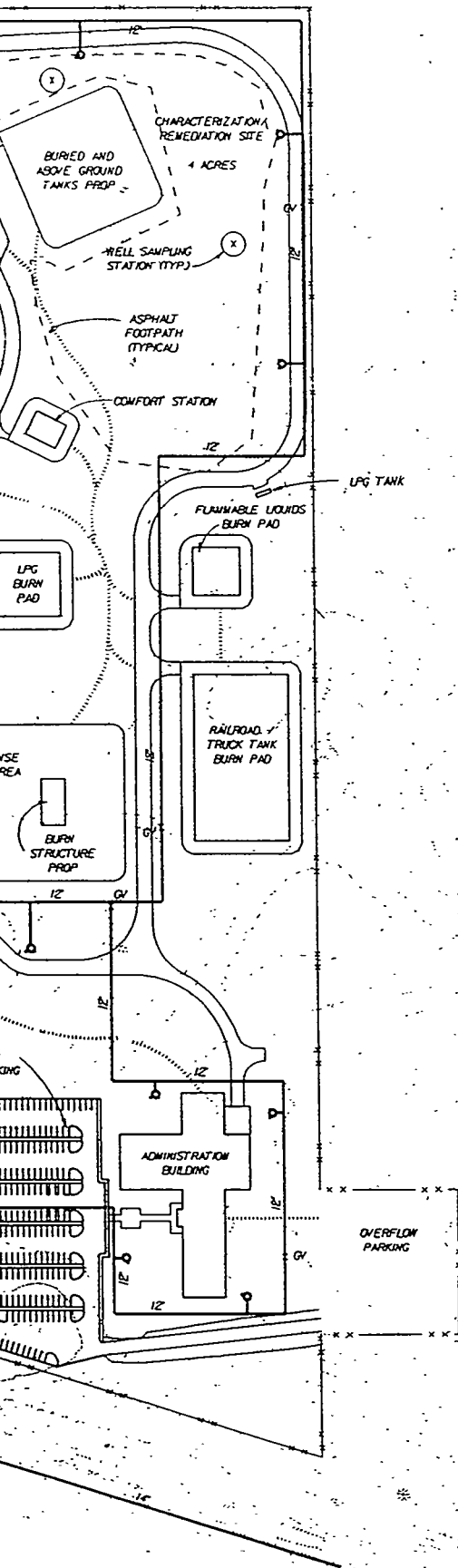
CONT. NO.

L-14



SAFETY PAYS

U. S. ARMY



LEGEND:

- R FIRE HYDRANT
 GV (GATE VALVE)
 — DOMESTIC WATER SUPPLY



SCALE IN FEET
 0 100 200

COMPUTER
 AIDED
 DESIGN &
 DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
WATER SUPPLY SYSTEM	
DESIGNED BY	APPROVED
CHECKED BY	SITE
SCALE AS SHOWN	REV. NO.
CC-3	FILE NO.

VALUE ENGINEERING PAYS

CONT. NO.

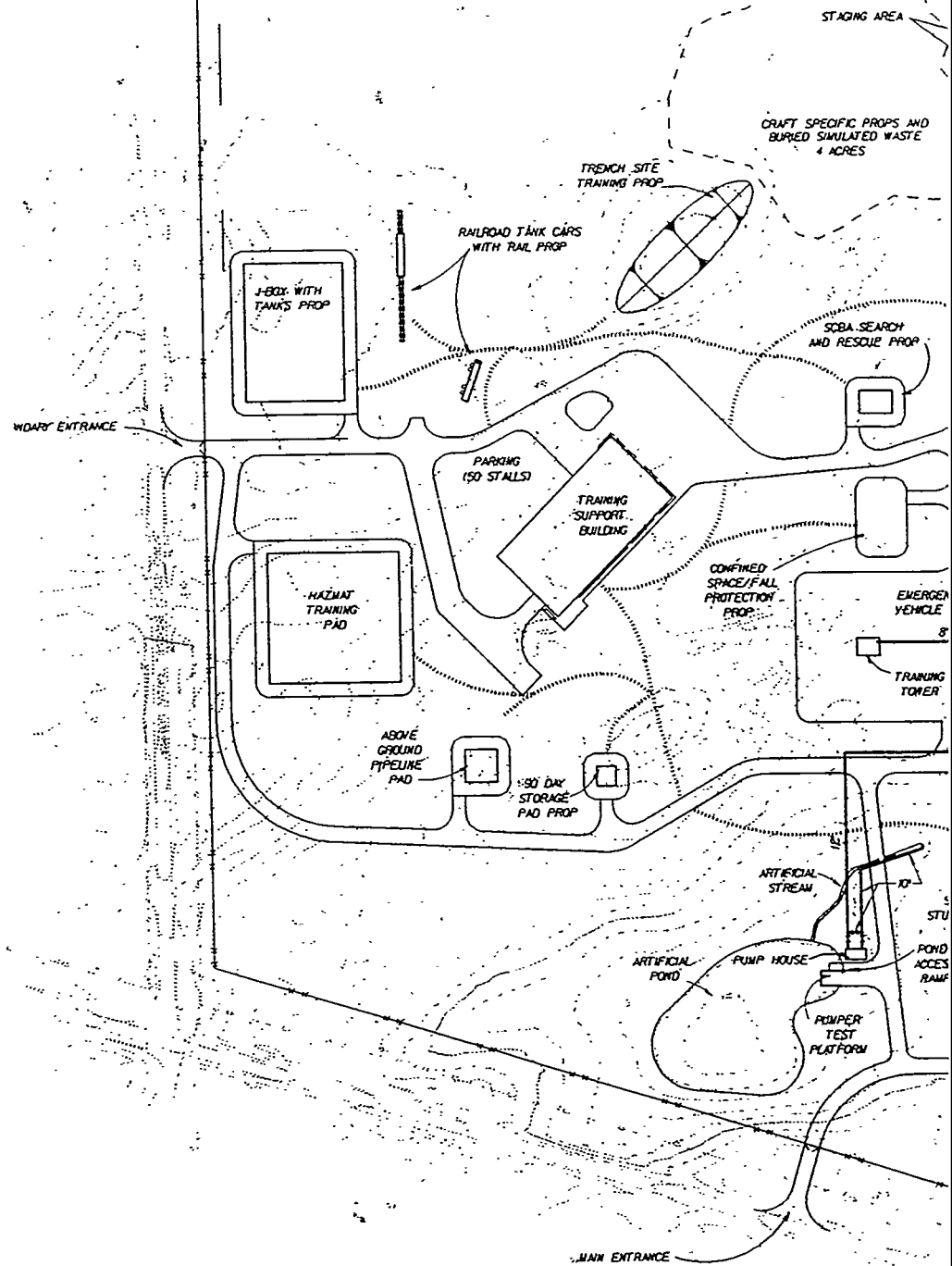
L-15

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWS

SCALE

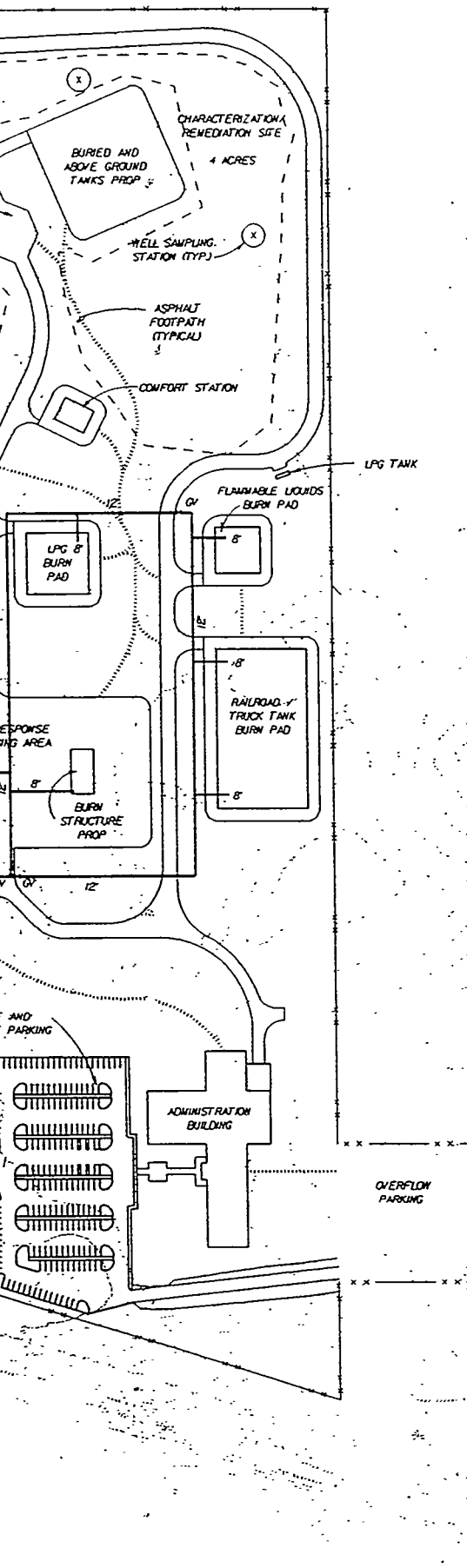
USRS\PRJ\HAMMER\ARC\HAM



SAFETY PAYS



U. S. ARMY



LEGEND:

GV (GATE VALVE)
 TRAINING WATER SUPPLY

SCALE IN FEET
 100' 0 100' 200'

COMPUTER
 AIDED
 DESIGN &
 DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING WATER SUPPLY SYSTEM	
DESIGNED BY	APPROVED
DRAWN BY	DATE
CHECKED BY	SCALE AS SHOWN INV. NO.
DATE	CC-4

VALUE ENGINEERING PAYS

/usr2/proj/hamr/clv/hamgc04.dgn

CONT. NO.

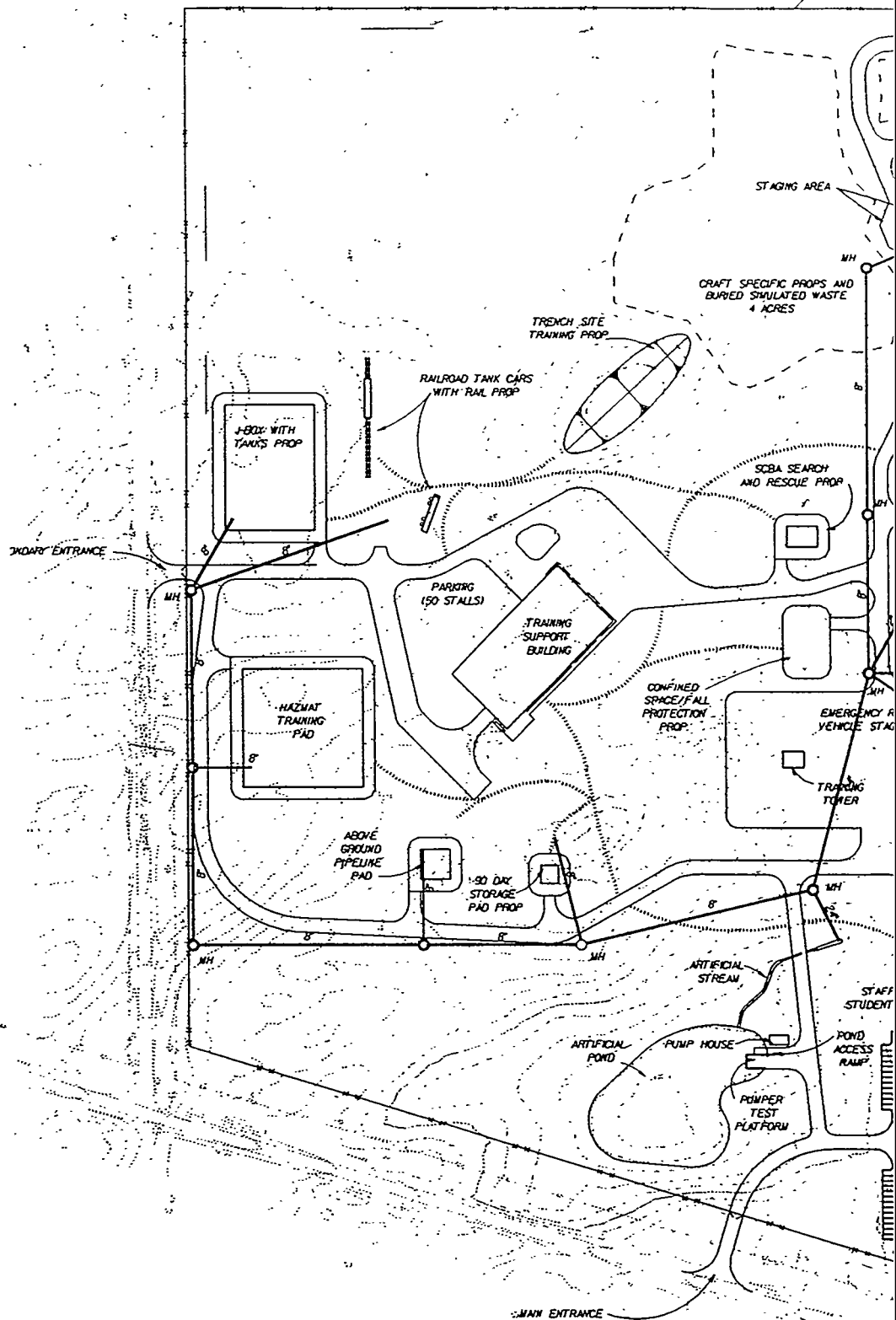
L-16

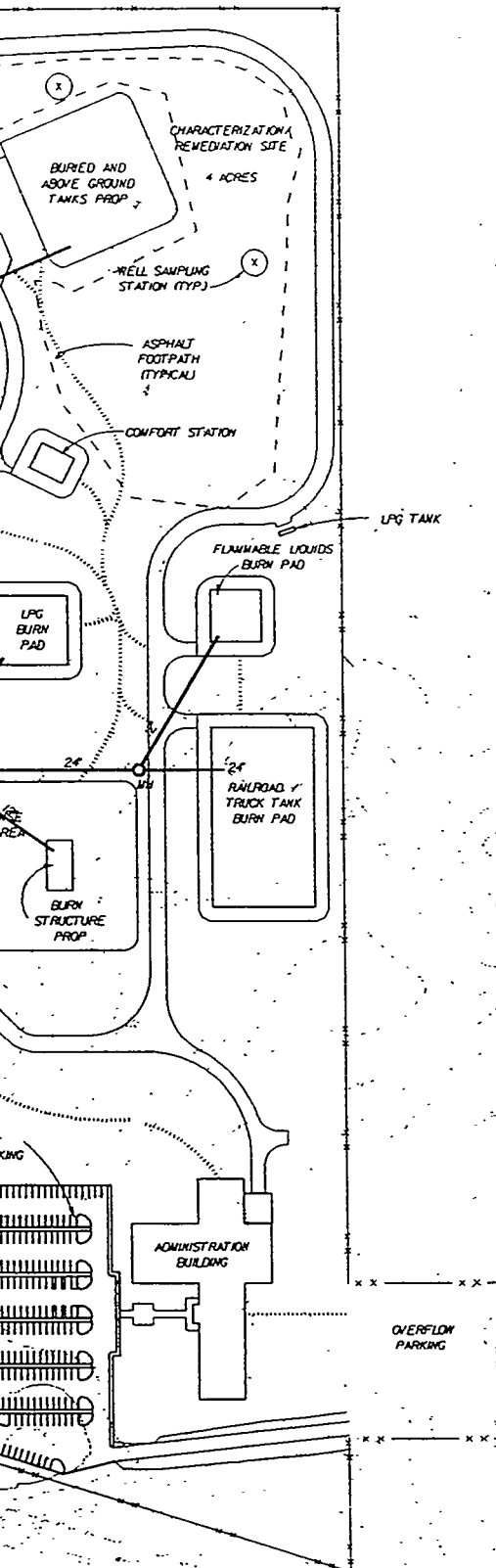
REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

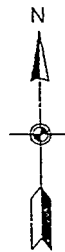
USR5\PRJ\HAMMER\ARC\HAM





LEGEND:

○ MH (MANHOLE)
 _____ TRAINING WATER RECYCLE

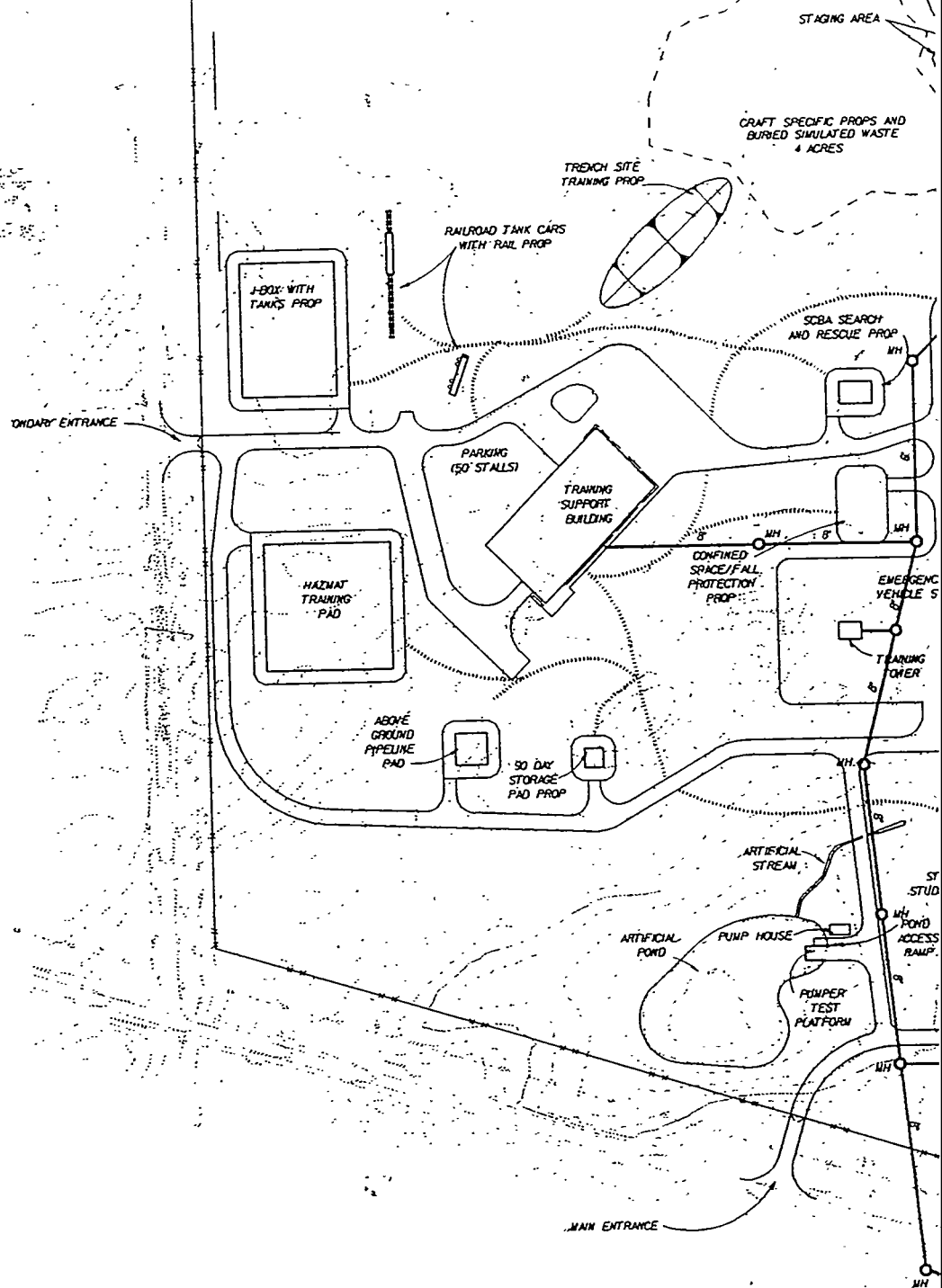


SCALE IN FEET

100' 0 100 200

COMPUTER
AIDED
DESIGN &
DRAFTING

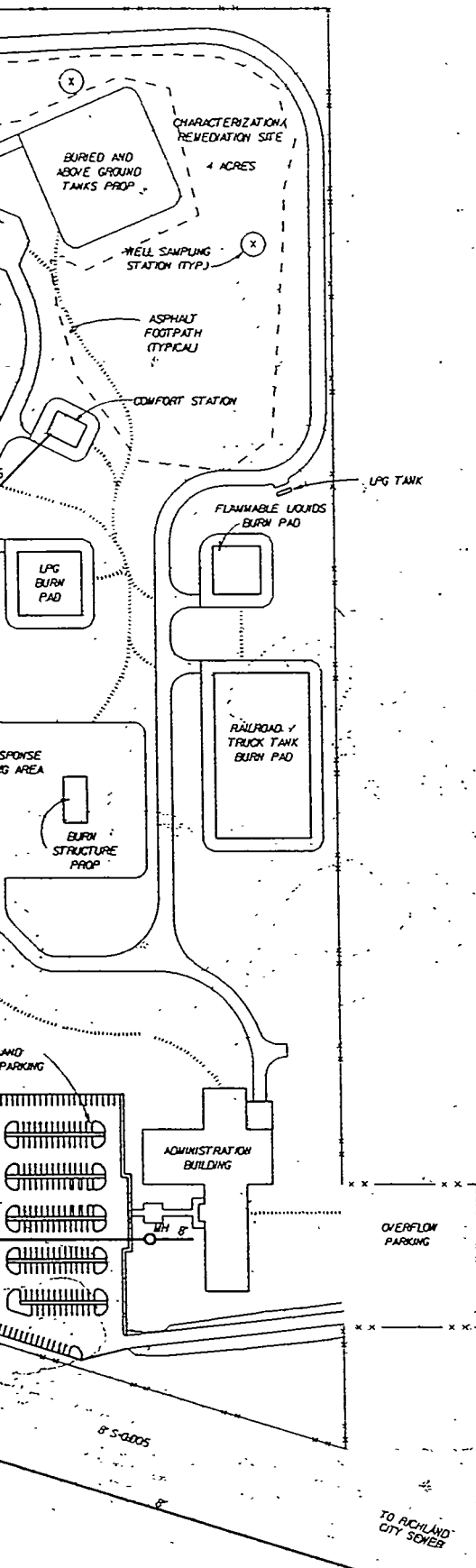
[illegible]



SAFETY PAYS



U. S. ARMY



LEGEND:

○ MH (MANHOLE)
— SEWER

NO.	DATE	DESCRIPTION	DES.	APP.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON				
SANITARY SEWER SYSTEM				
DESIGNED BY				
DRAWN BY				
CHECKED BY				
DATE				
APPROVED				
DATE				
SCALE AS SHOWN INV. NO.				
CC-6				

VALUE ENGINEERING PAYS

/usr2/proj/hamr/civ/hamgc06.dgn

CONT. NO.

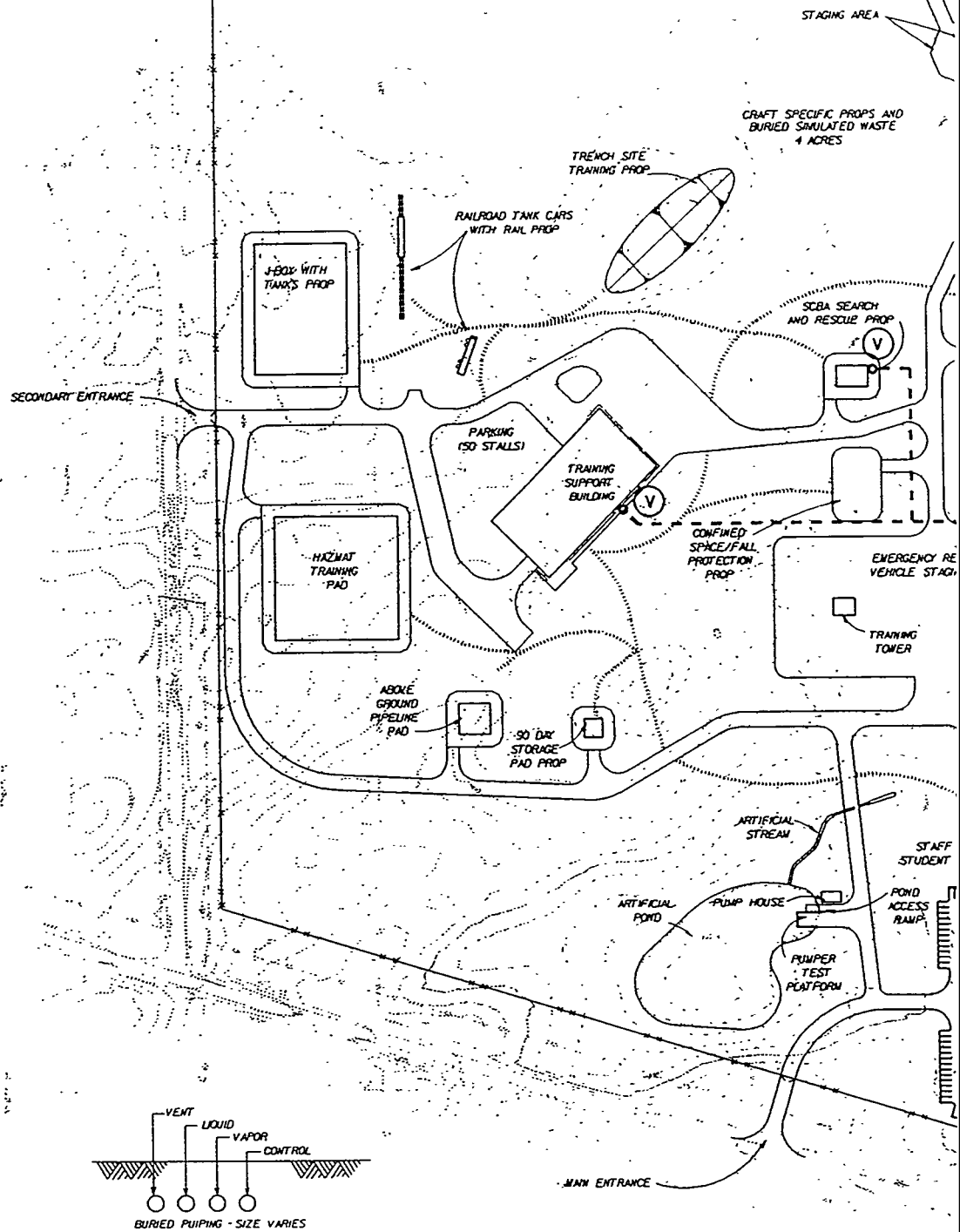
L-18

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

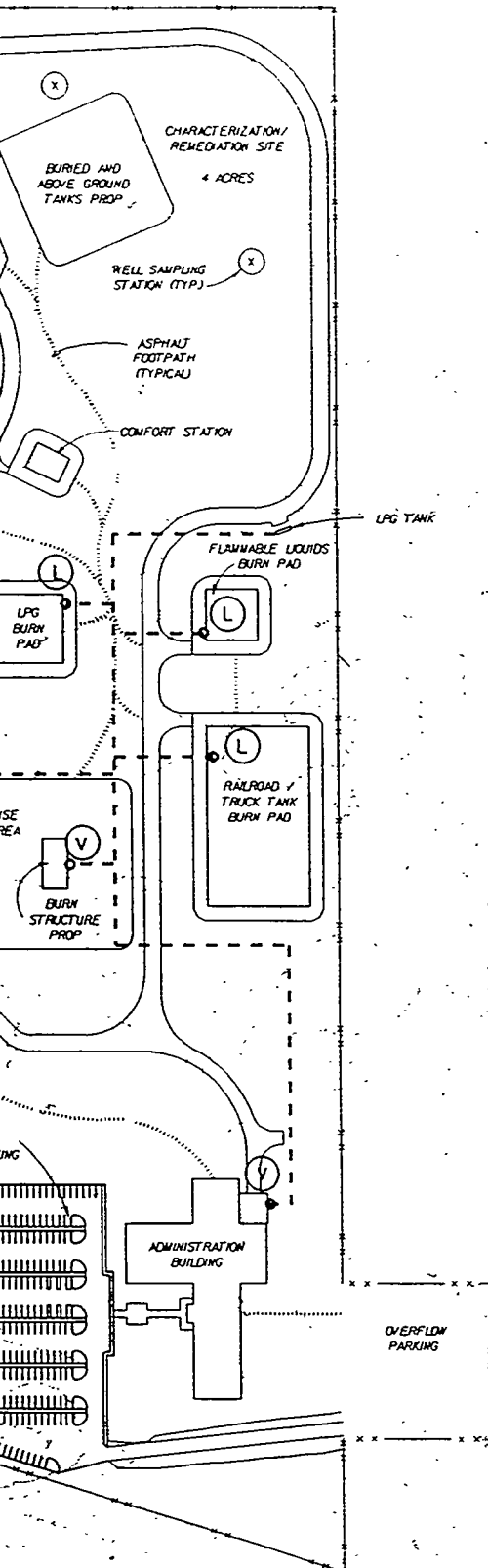
USRS\PRJ\HAMMER\ARC\HAM



SCALE IN FEET
0 100

SAFETY PAYS

U. S. ARMY

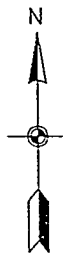


LEGEND:

LPG - PROPANE

L LIQUID

V VAPOR



PRELIMINARY - NOT FOR CONSTRUCTION
22-SEP-1994 15:47

REVISION		DATE	DESCRIPTION	DES.	APP.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
PUNTER		HAMMER TRAINING CENTER			
PUNTER		HANFORD RESERVATION, WASHINGTON			
PUNTER		LIQUID PETROLEUM GAS DISTRIBUTION			
DESIGNED BY		APPROVED			
CHECKED BY		DATE			
DRAWN BY		SCALE AS SHOWN INV. NO.			
CUT		SHEET NO.			
SUBMIT		GC-7			

COMPUTER
AIDED
DESIGN &
DRAFTING

VALUE ENGINEERING PAYS

/usr2/proj/hamr/clv/hamgc07.dgn

CONT. NO.

L-19

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

PLAN

	GROUND BUS
	EXPOSED CONDUIT
	CONDUIT CONCEALED ABOVE FLOOR
	CONDUIT RUN UNDERGROUND OR IN CONCRETE
	EXPOSED CONDUIT RUN BEHIND OBSTRUCTION
	BARE COPPER GROUND TO GROUND WIRE IN SLAB OR UNDERGROUND GROUND GRID, SIZE AS NOTED
	UNDERGROUND TELEMETRY CONDUIT
	HOME RUN TO PANEL "LP", CIRCUITS N, S, T. CROSS MARKS INDICATE NUMBER OF CONDUCTORS. LOWER MARK INDICATES NEUTRAL CONDUCTORS SHALL BE NO. 12 UNLESS OTHERWISE NOTED. CONDUIT SHALL BE 3/4" UNLESS OTHERWISE NOTED. CONDUIT SIZES NOT IDENTIFIED SHALL BE 3/4" MINIMUM WITH 2#2. G INDICATES GROUND WIRE NOTED.
	TELEPHONE CONDUIT ONLY, UNLESS OTHERWISE NOTED.
	CONDUIT RUN - CHANGE IN ELEVATION
	CONDUIT BENDS TOWARD OBSERVER
	CONDUIT BENDS AWAY FROM OBSERVER
	CONDUIT CAPPED, OR SEALED
	FLEXIBLE LIQUID - TIGHT CONDUIT CONNECTION
	INDICATES CONDUIT NUMBER FROM NO. 7# "I" INDICATES FEEDER NO.
	CEILING OR PENDANT INCANDESCENT, MERCURY VAPOR, OR SIMILAR LAMP FIXTURE. "2" INDICATES CIRCUIT NUMBER. "4" INDICATES FIXTURE CONTROLLED BY SWITCH "4".
	WALL BRACKET INCANDESCENT, MERCURY VAPOR, OR SIMILAR LAMP FIXTURE WITH EXPOSED BACK BOX AND CONDUIT.
	WALL BRACKET FLOOD OR SPOTLIGHT WITH CONCEALED BACK BOX AND CONDUIT.
	POLE MOUNTED FIXTURE DISTRIBUTION TYPE AS INDICATED ON PLAN
	PARKING LIGHT
	STADIUM FLOODLIGHT
	FIXTURE TYPE A, 2-40 WATT LAMPS 3 - NUMBER OF TYPE "A" FIXTURES
	FLUORESCENT LIGHTING FIXTURE, UNSWITCHED (SWITCHED AT LIGHTING PANEL ONLY)
	FLUORESCENT LIGHTING FIXTURE ON EMERGENCY CIRCUIT
	FLUORESCENT LIGHTING FIXTURE
	BATTERY EMERGENCY LIGHT FIXTURE
	SINGLE POLE SWITCH, "4" INDICATES CIRCUIT CONTROLLED
	DOUBLE POLE SWITCH
	THREE-WAY SWITCH
	FOUR-WAY SWITCH
	KEY-OPERATED SWITCH
	SWITCH AND PILOT LIGHT
	MANUAL MOTOR STARTER
	WEATHERPROOF SWITCH

WALL FLOOR

	120V SINGLE RECEPTACLE, NEMA CONFIGURATION 5-20.
	120V DUPLEX RECEPTACLE, NEMA CONFIGURATION 5-20
	120V DOUBLE DUPLEX RECEPTACLE, NEMA CONFIGURATION 5-20
	240V DUPLEX RECEPTACLE, NEMA CONFIGURATION 6-20
	SINGLE SPECIAL-PURPOSE RECEPTACLE. ASTERISK INDICATES NUMBER, SUCH AS AMPERAGE, TO DIFFERENTIATE BETWEEN TWO OR MORE DIFFERENT TYPES. 120 OR 240 V.A.C.
	WELDING RECEPTACLE
	SINGLE SPECIAL PURPOSE RECEPTACLE 480 V.A.C.
	CLOCK HANGER RECEPTACLE
	LIGHTING PANEL
	POWER PANEL
	MOTOR CONTROL CENTER
	FLOOR TYPE TELEPHONE OUTLET
	SOUND OR PAGING SYSTEM DEVICE. DEMOTE NUMBER TO DIFFERENTIATE BETWEEN DIFFERENT DEVICES.
	PUBLIC TELEPHONE SYSTEM DEVICE
	PRIVATE TELEPHONE (ANY TYPE) SYSTEM DEVICE

	GROUND ROD AND GROUND WELL
	GROUND CONNECTION BOLTED TYPE
	DISCONNECT SWITCH
	MOTOR STARTER
	MOTOR
	PUSHBUTTON STATION OR SELECTOR SWITCH
	"SS" - START-STOP
	"LOS" - LOCKOUT-STOP
	"SLOS" - START-LOCKOUT-STOP
	"H-HAND, M-MANUAL, R-REMOTE, L-LOCAL, A-AUTOMATIC, O-OFF
	RACEWAY BOX "JB" JUNCTION BOX
	"MB" MANHOLE
	"TB" TERMINAL BOX
	JUNCTION BOX OR FITTING
	FIELD INSTRUMENT I.E. "PSL" PRESSURE SWITCH
	"LSM" LEVEL SWITCH
	"SV" SOLENOID VALVE
	SOLENOID VALVE
	THERMOSTAT
	HEATER
	HORN
	DEMOTES REFERENCE TO NOTE 1 I.E. - "SEE NOTE 1"
	GROUND ROD 3/4" x 10' - 0" UNLESS OTHERWISE NOTED
	GROUND CONNECTION - EXOTHERMIC TYPE
	MOTOR OPERATED VALVE
	CCTV CAMERA

	AMMETER SWITCH
	VOLTMETER SWITCH
	CONTROL RELAY
	EXAMPLE: FOR TIME C, CR CONTROL IN STARTER
	N.O. CONTACT
	N.C. CONTACT
	TORQUE SWITCH ISP
	NORMALLY OPEN LIA
	NORMALLY CLOSED L
	FLOAT TYPE LIQUID CLOSING ON RISING
	FLOAT TYPE LIQUID OPENING ON RISING
	VACUUM OR PRESSURE CLOSING ON RISING
	VACUUM OR PRESSURE OPENING ON RISING
	TEMPERATURE ACT. CLOSING ON RISING
	TEMPERATURE ACT. OPENING ON RISING
	FLOW SWITCH LAIR, CLOSING ON FLOW
	FLOW SWITCH LAIR, OPENING ON FLOW
	NORMALLY OPEN PU, MOMENTARY CLOSE
	NORMALLY CLOSED, MOMENTARY OPEN
	NO/NC MAINTAIN

SINGLE LINE DIAGRAM

	BUS
	ACROSS-THE-LINE, NON-REVERSING NEMA SIZE 2 MAGNETIC STARTER
	NEMA SIZE 4 MAGNETIC STARTER
	RV - PART WINDING, REV - REVERSING
	RV - REDUCED VOLTAGE, AUTO-AUTO TRANSFORMER
	2SP - TWO SPEED, TWO WINDING
	CONTACTOR, SIZE AS NOTED
	MOLDED CASE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED: 50A - TRIP RATING IN AMPERE
	NA - NON-AUTOMATIC
	MCP - MOTOR CIRCUIT PROTECTOR
	AF - FRAME SIZE (225 AMPS NOTED)
	AT - TRIP RATING (125 AMPS NOTED)
	VACUUM CONTACTOR
	MEDIUM OR HIGH VOLTAGE DRAWOUT BREAKER
	DRAWOUT BREAKER, SIZE AS NOTED
	EO - DEMOTES ELECTRICALLY OPERATED
	MEDIUM OR HIGH VOLTAGE STARTER
	SURGE ARRESTOR
	MOTOR 10 HP NOTED
	TRANSFORMER WITH GROUNDED SECONDARY, RYA SIZE & VOLTAGE RATIO AS NOTED
	PT - 480/120V
	POTENTIAL TRANSFORMER, RATIO AND NUMBER OF PT'S AS NOTED
	CT - 100/5
	CURRENT TRANSFORMER, RATIO AND NUMBER OF CT'S AS NOTED
	ELECTRICAL INTERLOCK
	ELECTRICAL ENCLOSURE OUTLINE
	ELECTRICAL MOTOR OPERATED VALVE, WITH INTEGRAL REVERSING STARTER
	DISCONNECT SWITCH, SIZE AS NOTED
	FUSED DISCONNECT SWITCH
	CAPACITOR, KVAR AS NOTED
	KILOWATT-HOUR METER WITH DEMAND REGISTER
	AMMETER
	VOLTMETER
	POWER FACTOR METER
	VARMETER

	TWO-POSITION SEL
	H-HAND, M-MANU, A-AUTOMATIC, O-OFF
	THREE-POSITION S (SAME AS ABOVE)
	THREE-POSITION S, MOMENTARY CONTACT "ON-OFF," ETC.
	SINGLE POLE TOGGLE
	GROUND CONNECTOR
	OVERLOAD RELAY
	TIMED CONTACTS - CONTACT AFTER 1
	ENERG
	NORMALLY OPEN
	NORMALLY CLOSED
	DE-ENERG
	NORMALLY OPEN AND TIME DELAY
	NORMALLY CLOSED AND TIME DELAY
	MANUAL MOTOR PROTECTION
	FUSE
	RESISTOR IF THE
	POTENTIAL METER RESISTOR (COM)
	PUSH-TO-TEST I
	ELAPSED TIME
	HEATER
	CROSSING OF CONNECTION OF REQUIRED
	DISCONNECT SWITCH
	TERMINATION IN
	FIELD TERMINATION
	TERMINATION IN
	ELECTRODE PRO
	PANEL MOUNTED
	FIELD OR REMO

A R R R F V I A T I O N S

GENERAL NOTES:

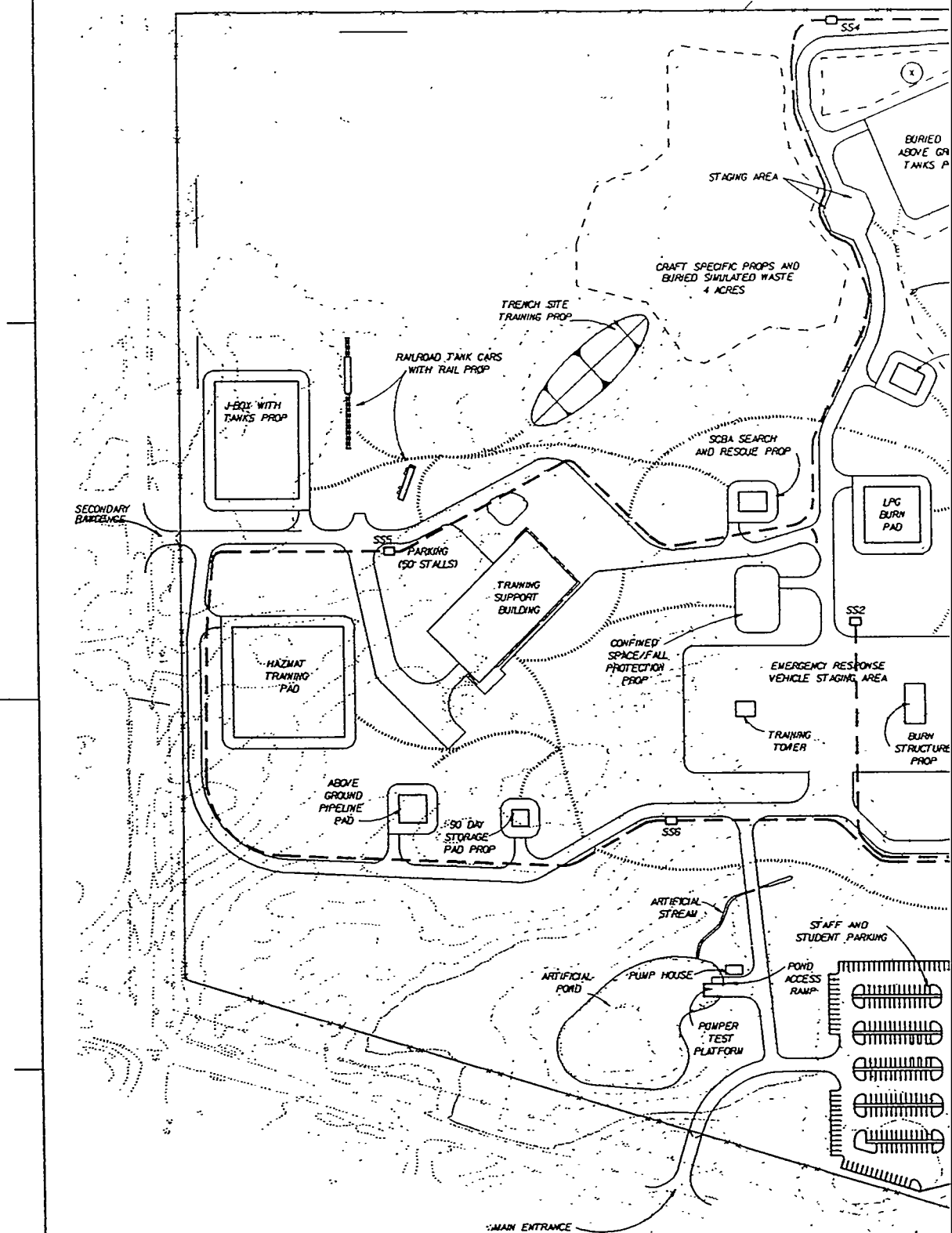
J A G R A M

ALARM	ALARM ANNUNCIATOR
AF	AMPERE FRAME SIZE OF CKT. BRKS.
AMP	AMPERES, AMPERAGE
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUT	AUTO-TRANSFORMER
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BCSD	BARE COPPER SOFT DRAWN
BKR	BREAKER
BP	B-PASS
C	CONDUIT
CAB	CABINET
CHLOR	CHLORINE, CHLORINATION
CKT	CIRCUIT
CMD	COMMAND
CO	CONDUIT ONLY
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER (IN INDIVIDUAL STARTER CUBICLE)
CR	CONTROL RELAY (MAGNETICALLY HELD)
CT	CURRENT TRANSFORMER
DISC	DISCONNECT
DWG	DRAWING
ENCLOS	ENCLOSURE
EXH	EXHAUST
EXIST	EXISTING
FS	FLOW SWITCH
FUT	FUTURE
FLUOR	FLOUORESCENT
GFI	GROUND FAULT INTERRUPTER
GRD	GROUND
HQA	HAND - OFF - AUTOMATIC
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HTR	HEATER
HZ	HERTZ
J.B	INSTR. J BOX
JB	JUNCTION BOX
KAIC	KILOAMPERE WITH STAND AND INTERRUPTING CAPACITY
KVA	KILOVOLTAMPERE
LCB	LOCAL CONTROL BOARD ISCOB
LOC	LOCAL
LOS	PUSHBUTTON W/LOCK-OUT-STOP
LS	LIMIT SWITCH
LT, LTS	LIGHT, LIGHTS
LTO	LIGHTING
LTMG	LIGHTNING
MAN	MANUAL
MAG	MAGNETIC
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MCP	MAIN CONTROL PANEL
MOV	MOTOR OPERATED VALVE
MT, MTD	MOUNT, MOUNTED
N	NEUTRAL
NO, NOS	NUMBER, NUMBERS
NTS	NOT TO SCALE
OL	OVERLOAD RELAY
PB	PUSHBUTTON
PLCS	PLACES
PNL	PANEL
PNLBO	PANELBOARD
PS	PRESSURE SWITCH
PVC	POLYVINYL CHLORIDE
PW	PART WINDING
REQD	REQUIRED
RTU	REMOTE TERMINAL UNIT
SCH	SCHEDULE
SEC	SECONDS, SECONDARY
SEL SW	SELECTOR SWITCH
SHLD	SHIELDED
SHT	SHEET
SP HTR	SPACE HEATER
STA	STATION
STD	STANDARD
SV	SOLENOID VALVE
SW	SWITCH

TC	TIMED CLOSED
TEL	TELEPHONE
TO	TIMED OPEN
TS	TIME SWITCH
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
VFD	VARIABLE FREQUENCY DRIVE
WP	WEATHERPROOF
XFW	TRANSFORMER
XWTR	TRANSMITTER

1. RACEWAY IS 1" IF NOT NOTED. RACEWAY CONTAINS TWO CONDUCTORS. IF NOT NOTED CONDUCTORS ARE NO. 12 IF NOT NOTED.
2. THE WORK ON THE ELECTRICAL DWGS. IS TO SOME EXTENT, DIAGRAMATIC. EXACT RACEWAY ROUTING AND TERMINATION MUST BE DETERMINED AT THE JOB SITE TO SUIT FIELD CONDITIONS, THE WORK OF OTHER TRADES, AND THE REQUIREMENTS OF APPROVED SHOP DRAWINGS.
3. LIQUID - TIGHT FLEXIBLE CONDUIT SHALL BE INSTALLED WITH GROUNDING FITTINGS TO DEVICES WHICH REQUIRE FLEXIBLE CONNECTION. FLEXIBLE CONDUIT LARGER THAN 2" SHALL BE INSTALLED IN LENGTHS THAT DO NOT EXCEED 30'; SMALLER CONDUITS SHALL NOT BE INSTALLED IN LENGTHS THAT EXCEED 18".
4. ALL RACEWAY PENETRATIONS TO STRUCTURES THAT ARE BELOW OR AT GRADE SHALL BE WATER TIGHT. ASIDES FROM BEING WATER TIGHT THE RACEWAYS SHALL BE ARRANGED SO THAT WATER THAT MAY FIND ITS WAY THROUGH THE RACEWAY SHALL DRAIN AWAY FROM THE INSTRUMENTS, PANELS OR ANY ELECTRICAL COMPONENTS. THAT THE RACEWAY IS INTENDED TO CONNECT, SEE SHOP SECTION 16050 FOR ADDITIONAL INFORMATION ON PENETRATIONS.
5. THE CONTRACTOR SHALL VERIFY EXACT LOCATION OF TERMINAL BOXES AND CONDUIT ENTRANCES OF ALL EQUIPMENT AGAINST SHOP DRAWINGS BEFORE STUBBING UP CONDUITS.
6. CONDUITS TERMINATING AT SWITCHBOARD, MOTOR CONTROL CENTER, POWER AND LIGHTING PANEL, CONTROL CABINET, ETC SHALL BE EQUIPPED WITH SWAGING AND GROUNDING BUSHING, AND SHALL BE GROUNDING WITH NO. 6 GROUND WIRE.
7. INSTALL EXPANSION FITTINGS EVERY 200 FEET OF STRAIGHT RUN OF CONDUITS.
8. CONDUIT CROSSING BUILDING OR STRUCTURAL EXPANSION JOINTS SHALL BE PROVIDED WITH SUITABLE EXPANSION FITTINGS. THESE FITTINGS MUST BE CONSTRUCTED IN SUCH A MANNER THAT WILL INSURE THE CONTINUITY OF THE GROUND PATH IN EACH CONDUIT OR RACEWAY.
9. ALL UNDERGROUND CONDUIT RUNS SHALL BE WITH LONG RADIUS SLEEVES. THE MINIMUM BENDING RADIUS SHALL BE 12 TIMES NOMINAL DIAMETER OF THE CONDUIT.
10. ALL UNDERGROUND CONDUITS NOT ENCASED IN CONCRETE SHALL BE RIGID STEEL, GALVANIZED.
11. THE MINIMUM SIZE OF CONDUITS INSTALLED BELOW GRADE SHALL BE 2" UNLESS OTHERWISE NOTED.
12. ALL METALLIC STRUCTURES, METALLIC ENCLOSURES, AND ELECTRICAL EQUIPMENT, SUCH AS STRUCTURAL STEEL, METALLIC RACEWAY, FENCE, STAIR HANDRAILS, LIGHTING POLE, TANK, VESSELS, SWITCHING EQUIPMENT, PANEL, EQUIPMENT ENCLOSURE, AND CABINETS GENERATOR, MOTOR, TRANSFORMER, SWITCHER, ETC. SHALL BE PERMANENTLY AND EFFECTIVELY GROUNDING AND GROUND CONNECTION SHALL BE MADE TO THE PLANT GROUND GRID. THE GROUND CONDUCTOR SHALL BE SIZED PER M.E.C. UNLESS OTHERWISE SHOWN EXCEPT THE MINIMUM SIZE.
13. ALL EQUIPMENT DIMENSIONS SHOWN ON PLANS AND ELEVATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL USE THE SHOP DRAWINGS FOR PROPER LAYOUT, FOUNDATION AND PAD, ETC. FOR FINAL INSTALLATION, WITHOUT ANY ADDITIONAL COST TO THE OWNER.
14. SWITCHBOARD, MOTOR CONTROL CENTER AND ALL FREE STANDING PANEL SHALL BE SET ON CONCRETE PAD AND LEVELING CHANNELS EMBEDDED IN THE PAD UNLESS OTHERWISE NOTED.
15. ALL DEVICES SHOWN ON MOTOR STARTER SCHEMATIC DIAGRAMS SHALL BE MOUNTED IN THE MOTOR STARTER CUBICLES UNLESS OTHERWISE NOTED.
16. IN CASE OF INTERFERENCE BETWEEN ELECTRICAL EQUIPMENT, STRUCTURAL STEEL AND OTHER EQUIPMENT, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING AND ENGINEER SHALL REVIEW THE PROPOSED CHANGES BEFORE THEY ARE MADE.
17. ALL RECEPTACLES SHALL BE MOUNTED 2'-4" ABOVE FLOOR SURFACE UNLESS OTHERWISE NOTED.
18. ALL RECEPTACLES IN OUTDOOR AND ANTICIPATED WET AREA SHALL BE GROUND FAULT INTERRUPTER RECEPTACLES.
19. ALL OUTDOOR DEVICES SHALL BE WEATHERPROOF TYPE.
20. LOCATION OF MANHOLES AND PULLBOXES ARE APPROXIMATE. CONTRACTOR SHALL COORDINATE EXACT LOCATION OF COLUMNS AND PULLBOXES WITH MECHANICAL AND CIVIL WORK.
21. CONTRACTOR SHALL PROVIDE ADDITIONAL MANHOLES OR PULLBOXES TO THOSE SHOWN WHERE THEY ARE REQUIRED TO MAKE A WORKABLE INSTALLATION.

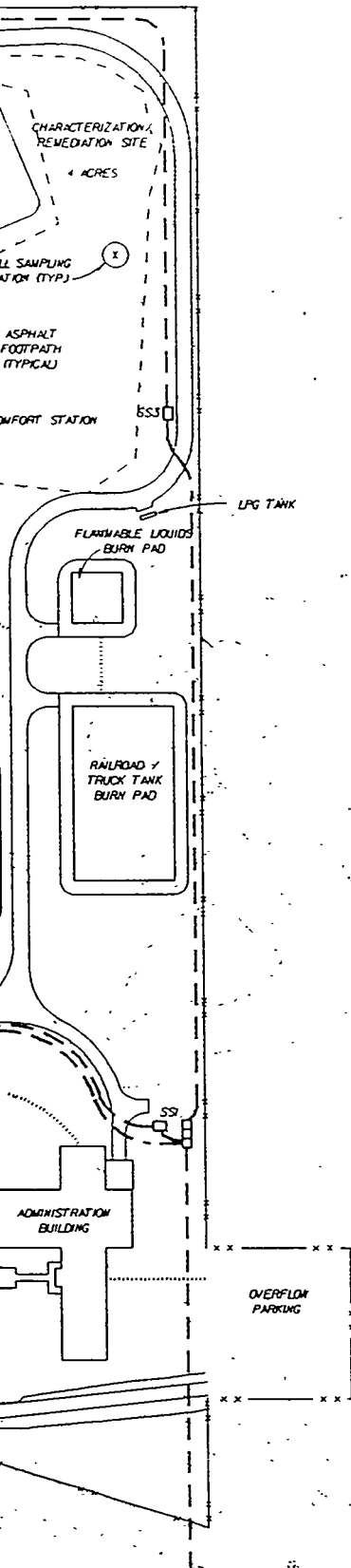
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SAFETY PAYS



U. S. ARMY



LEGEND



SUBSTATION

--- CONDUIT ROUTED UNDERGROUND

SCALE IN FEET
100' 0' 100'COMPUTER
AIDED
DESIGN &
DRAFTING

REVISION	DATE	DESCRIPTION	DATE	APPR.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON				
ELECTRICAL AND COMMUNICATION DISTRIBUTION SITE PLAN				
DESIGNED BY B. CHIBAKIAN				
CHECKED BY B. CHIBAKIAN				
DESIGNED BY M. SANTOS				
CHECKED BY				
DATE				
APPROVED				
DATE				
SCALE AS SHOWN			INV. NO.	
GE-2			FILE NO.	

VALUE ENGINEERING PAYS

/usr2/proj/hamr/gen/ham02.dgn

CONT. NO.

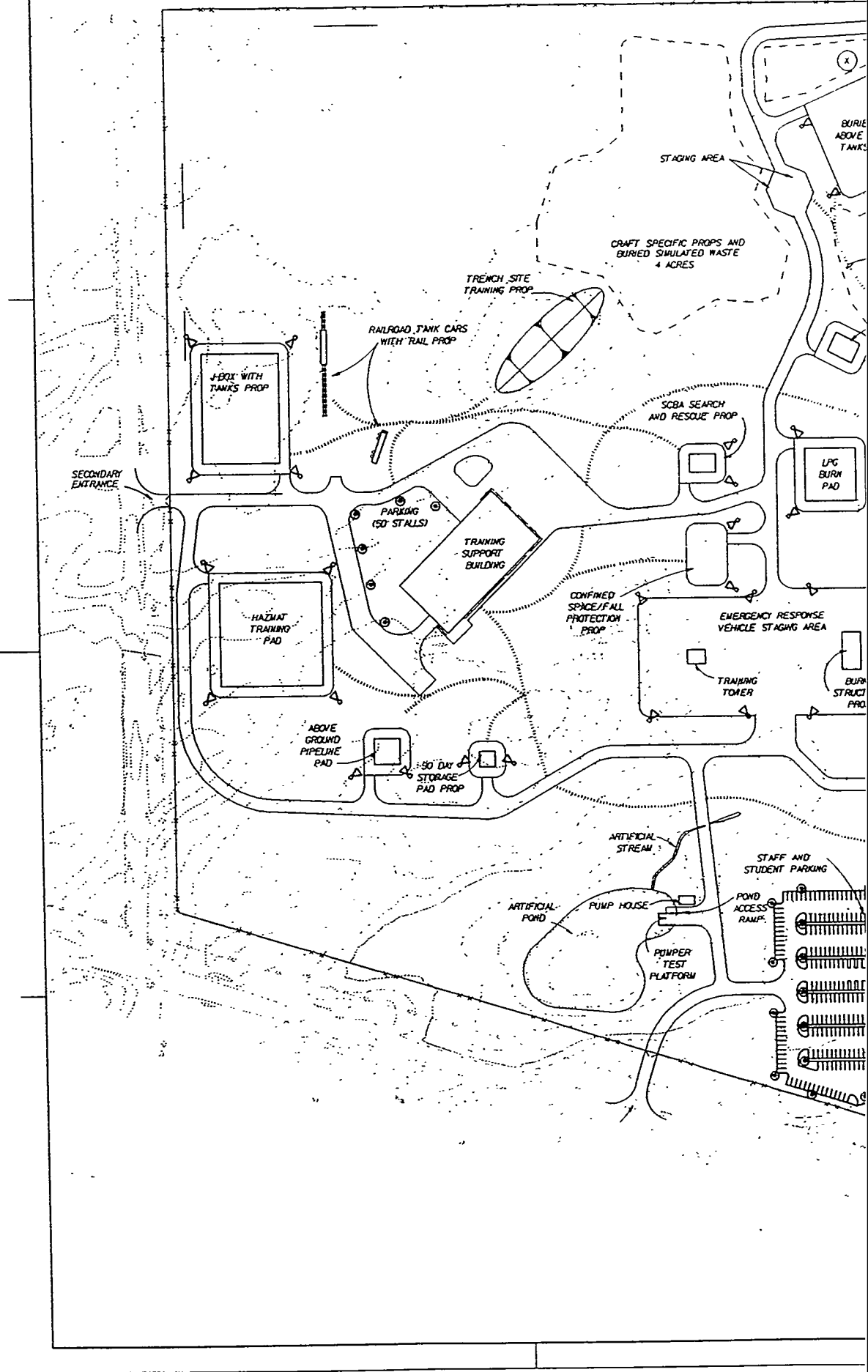
L-21

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWS

SCALE

USRS\PRJ\HAMMER\ARC\HAM

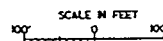




- ④ POLE MOUNTED FLOODLIGHTS,
20'-30' MOUNTING HEIGHT.
- ⑤ PARKING AREA LIGHT

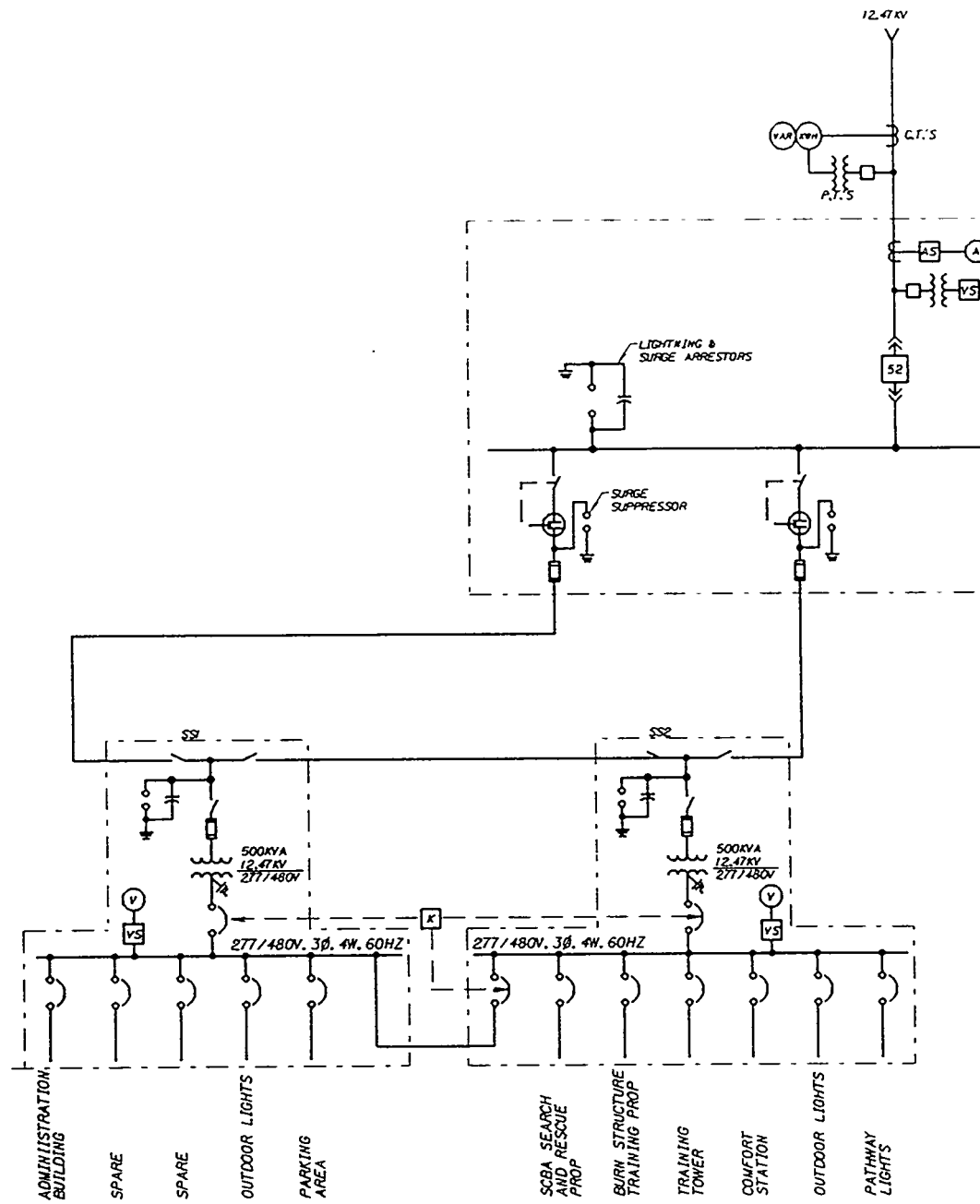
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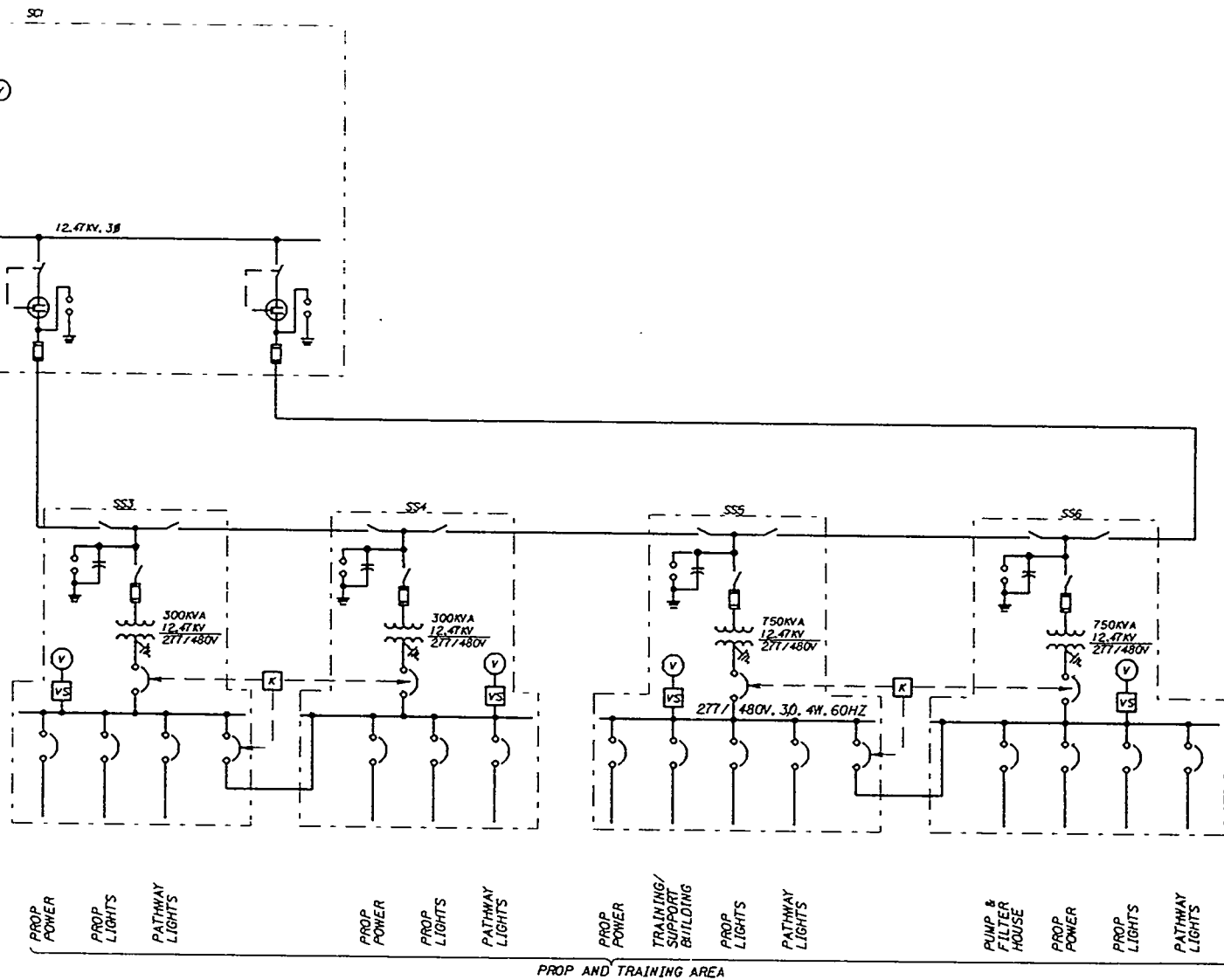
1. ALL PATHWAYS AND WALKWAYS WILL BE PROVIDED WITH WALKWAY BOLLARD TYPE, LOW PRESSURE SODIUM FIXTURE SPACED 20'-0" APART.



COMPUTER
AIDED
DESIGN &
DRAFTING

[illegible]





DISTRIBUTION DIAGRAM

COMPUTER
AIDED
DESIGN &
DRAFTING

REVISED BY	DATE	DESCRIPTION	CHKD.	APPD.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON				
DISTRIBUTION BLOCK DIAGRAM				
DESIGNED BY N. CHAKRABARTY		APPROVED BY		
CHECKED BY N. CHAKRABARTY		SCALE AS SHOWN INV. NO.		
DRAWN BY M. SANTOS		GE-4		
DATE 10/1/80		FILE NO.		

VALUE ENGINEERING PAYS

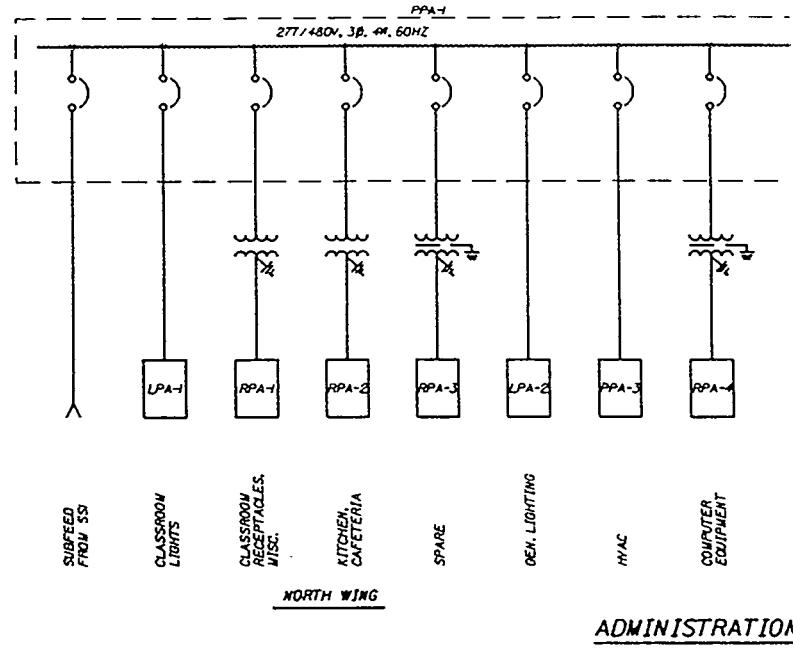
CONT. NO.

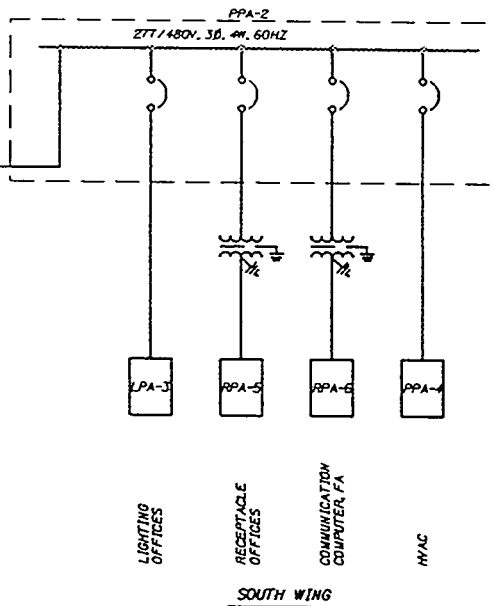
L-23

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

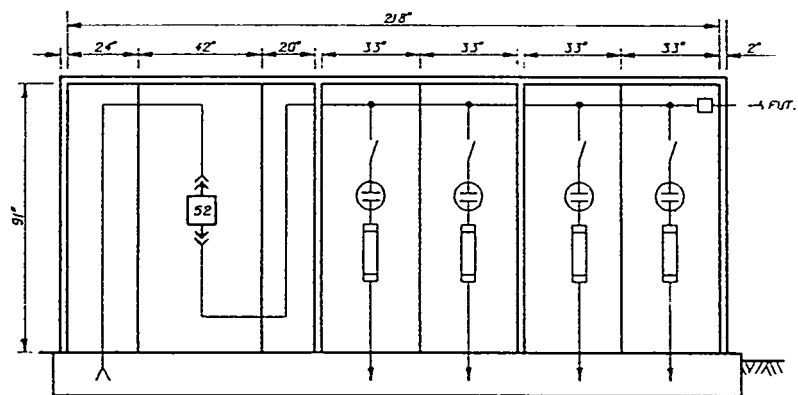


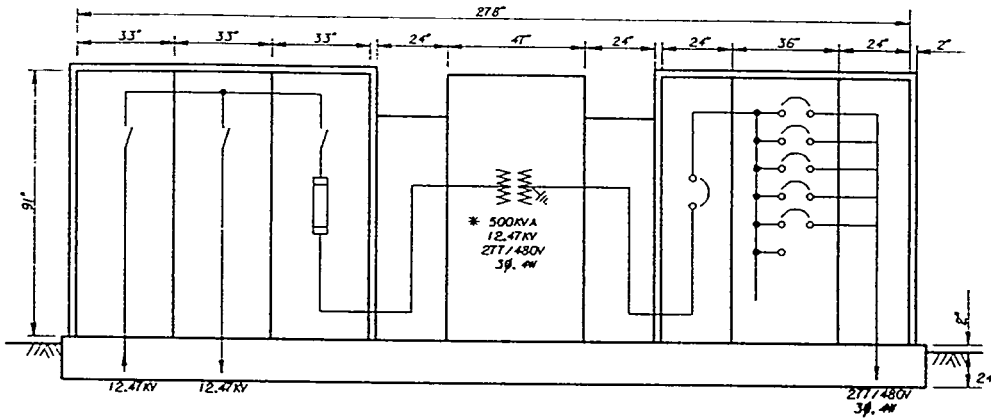


BUILDING

REVISION	DATE	DESCRIPTION	CHK	APP
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
DESIGNED BY H. CHAKRABARTY		HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON		
CHECKED BY H. CHAKRABARTY		SINGLE LINE DIAGRAM		
DRAWN BY M. SANTOS				
SUPERVISOR 				
DATE 				
SCALE AS SHOWN		INV. NO.		
GE-5				





**SUBSTATION SSI**

TYPICAL FOR ALL SUBSTATIONS

NOTE: CONCRETE PAD AS SHOWN IS REQUIRED FOR ALL OUTDOOR ELEC. EQUIPMENT

- * 750KVA FOR SSS AND SS6
- * 300KVA FOR SS3 AND SS4

REVISION	DATE	REVISION	DATE	APP.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
DESIGNED BY N. CHRAKIAN		HAMMER TRAINING CENTER		
DRAWN BY N. CHRAKIAN		HANFORD RESERVATION, WASHINGTON		
CHECKED BY N. CHRAKIAN		ELECTRICAL EQUIPMENT ELEVATION		
DATE 				
APPROVED 				
RECORDED 				
		SCALE AS SHOWN INV. NO.		
		CE-6		

COMPUTER
AIDED
DESIGN &
DRAFTING

INSTRUMENT TAG IDENTIFICATION

	PRIMARY LOCATION (NORMALLY ACCESSIBLE TO OPERATOR)	FIELD MOUNT	AUXILIARY LOCATION (NORMALLY ACCESSIBLE TO OPERATOR)
DISCRETE INSTRUMENTS	XXX(a)		
SHARED DISPLAY, SHARED CONTROL			
COMPUTER FUNCTION			
PROGRAMMABLE LOGIC CONTROL			

(a) DESIGNATIONS SUCH AS 100 (LOCAL CONTROL BOARD NO. 100), 200 (LOCAL CONTROL BOARD NO. 200), ETC., ARE USED WHEN NECESSARY TO SPECIFY INSTRUMENT OR FUNCTION LOCATION.

(b) NORMALLY INACCESSIBLE OR BEHIND-THE-PANEL DEVICES OR FUNCTIONS ARE DEPICTED BY USING THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, I.E.



SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS

(XXX) SOFTWARE OR LOGIC RESIDENT IN DISTRIBUTED CONTROL SYSTEM (DCS) AT PROGRAMMABLE LOGIC CONTROLLER (PLC) XXX, SEE ASSOCIATED LOGIC DIAGRAMS.

(XXX) PANEL MOUNTED PILOT LIGHT WITH PANEL NUMBER DESIGNATION (e.g., XXX = 100, 200, ETC.).

INSTRUMENT PANEL MOUNTED WITH COMPUTING OR CONVERTING FUNCTION

CONVERT		E - VOLTAGE	H - HYDRAULIC
		I - CURRENT	O - ELECTROMAGNETIC, SONIC
		P - PNEUMATIC	R - RESISTANCE (ELECT.)
		A - ANALOG	D - DIGITAL
		B - BINARY	
COMPUTE		SUMMING	AVERAGING
		SUBTRACTOR	RATIO
		MULTIPLYING	DIFFERENCE
		DIVIDING	HIGH SELECTING
		ROOT EXTRACTION	LOW SELECTING
		PROPORTIONAL	INTEGRAL
		DERIVATIVE	

ISA FUNCTION IDENTIFICATION TABLE			
FIRST-LETTER		SUCCEEDING-LETTERS	
MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION
A ANALYSIS		ALARM	
B BURNER, COMBUSTION			CONTROL
C CONDUCTIVITY			
D DENSITY	DIFFERENTIAL		
E VOLTAGE		SENSOR (PRIMARY ELEMENT)	
F FLOW RATE	RATIO (FRACTION)		
G GAGE		CLASSIFYING DEVICE	
H HAND			
I CURRENT (ELECTRICAL)		INDICATE	
J POWER	SCAN		
K TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION
L LEVEL		LIGHT	
M MOTOR	MOMENTARY		
N TORQUE		ISOLATE	ISOLATOR
O		ORIFICE, RESTRICTION	
P PRESSURE, VACUUM		POINT (TEST) CONNECTION	
Q QUANTITY	INTEGRATE, TOTALIZE		
R RADIATION		RECORD	
S SPEED, FREQUENCY	SAFETY		SWITCH
T TEMPERATURE			TRANSIT
U MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION
V VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER
W WEIGHT, FORCE		WELL	
X INTRUSION	X AXIS		
Y LEVEL STATE OR PRESENCE	Y AXIS		COMPUTE, CONVERTER, ACTUATOR, CONTROL ELEMENT
Z POSITION, DIMENSION	Z AXIS		

TYPICAL: TIC-1 - INSTRUMENT IDENTIFICATION FIRST LETTER OR TAG NUMBER
 FORMAT TIC - FUNCTIONAL IDENTIFICATION
 T - FIRST-LETTER
 IC - SUCCEEDING-LETTERS
 1 - LOOP NUMBER

EXPANDED: 10-PAH-1A - TAG NUMBER
 10 - OPTIONAL PREFIX
 A - OPTIONAL SUFFIX

(XXX) DESIGNATIONS OF CONTROL FUNCTIONS ASSOCIATED INSTRUMENT OR OTHER COMPONENTS.

AHC - AUTO/HOLD/CLOSE	POT - POTENTIOMETER
AM - AUTO/MANUAL	RST - RESET
DEV - DEVIATION	RL - RAISE/LOWER
HOA - HAND/OFF/AUTO	RSL - RAISE/STOP/LOWER
HOR - HAND/OFF/REMOTE	SD - SHUTDOWN
LOS - LOCKOUT STOP	SEL - SELECT
LR - LOCAL/REMOTE	SP - SET POINT
MOA - MANUAL/OFF/AUTO	SR - START/RESET
OO - ON/OFF	SS - STOP/START
OCA - OPEN/CLOSE/AUTO	WA - WARNING ALARM
OSC - OPEN/STOP/CLOSED	LOR - LOCAL/OFF/REMOTE

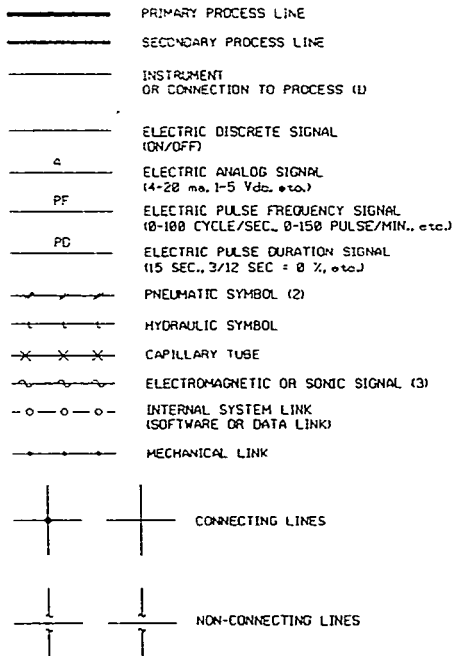
SAFETY PAYS



U. S. ARMY

INSTRUMENT OR FUNCTION SYMBOLS

LINE SYMBOLS



(1) THE FOLLOWING ABBREVIATIONS ARE USED TO DENOTE THE TYPES OF POWER SUPPLIES. THEY MAY ALSO BE USED TO DENOTE PURGE FLUID SUPPLIES.

AS - AIR SUPPLY	HS - HYDRAULIC SUPPLY
IA - INSTRUMENT AIR	NS - NITROGEN SUPPLY
PA - PLANT AIR	SS - STEAM SUPPLY
ES - ELECTRIC SUPPLY	WS - WATER SUPPLY
GS - GAS SUPPLY	

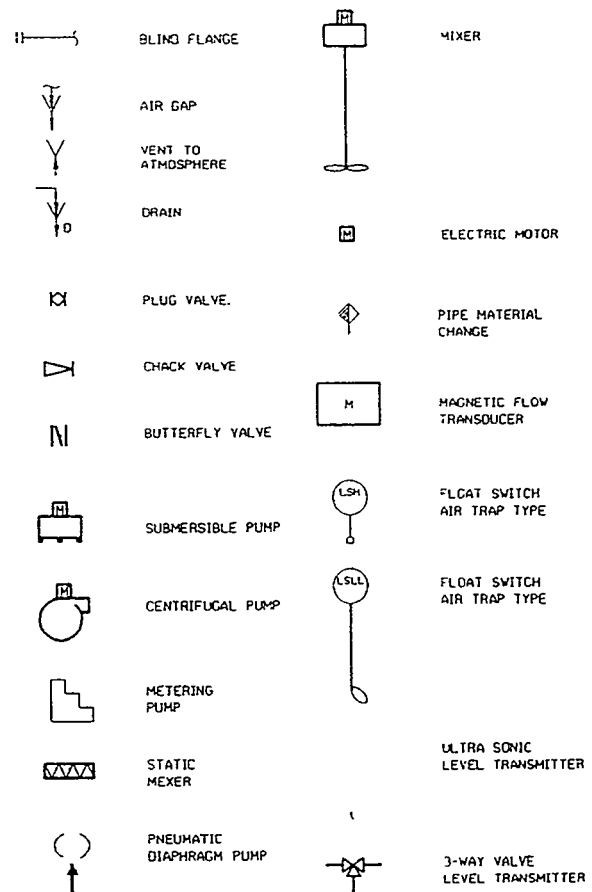
(2) THE PNEUMATIC SIGNAL SYMBOLS APPLIES TO A SIGNAL, NOT A SUPPLY SOURCE, USING ANY GAS AS A MEDIUM. IF A GAS OTHER THAN AIR IS USED, THE GAS IS IDENTIFIED BY A NOTE ON THE SIGNAL.

(3) ELECTROMAGNETIC PHENOMENA INCLUDE HEAT, RADIO WAVES, NUCLEAR RADIATION, AND LIGHT.

GENERAL NOTES

- ADDITIONAL INSTRUMENTATION AND CONTROL SYMBOLS MAY BE USED AS REQUIRED. SYMBOLS AND NOMENCLATURE ARE BASED ON ISA STANDARDS SS.1, SS.2, SS.4.
- SEE ASSOCIATED ELECTRICAL AND MECHANICAL SYMBOL SHEETS FOR ADDITIONAL SYMBOLS AND ABBREVIATIONS.
- FOR PIPE SIZES, MATERIAL, AS WELL AS DETAILS OF METER COUPLING AND OTHER MECHANICAL EQUIPMENT (E.G. VALVE, PUMP ETC.) SEE PROCESS AND INSTRUMENTATION DIAGRAMS, MECHANICAL DRAWINGS AND SPECIFICATIONS.
- POWER SUPPLIES FOR LOOPS OR SYSTEMS SHALL BE FURNISHED BY THE INSTRUMENTATION MANUFACTURER TO MEET THE PARTICULAR CHARACTERISTICS (E.G. VOLTAGE AND CURRENT REQUIREMENTS) OF COMPONENTS IN EACH LOOP OR SYSTEM.

MISCELLANEOUS SYMBOLS



COMPUTER
AIDED
DESIGN &
DRAFTING

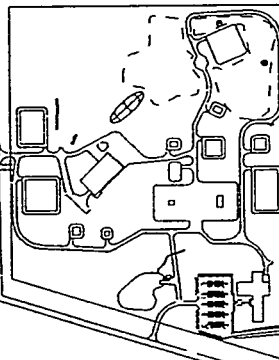
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
INSTRUMENTATION SYMBOLS & ABBREVIATIONS	
DESIGNED BY C. WAHLMEIER	DATE
DRAWN BY C. KHOUDEMAN	DATE
CHECKED BY	DATE
APPROVED BY	DATE
SCALE AS SHOWN INV. NO.	FILE NO.
SCALE	FILE NO.



PATROL ACADEMY



HAMMER TRAINING



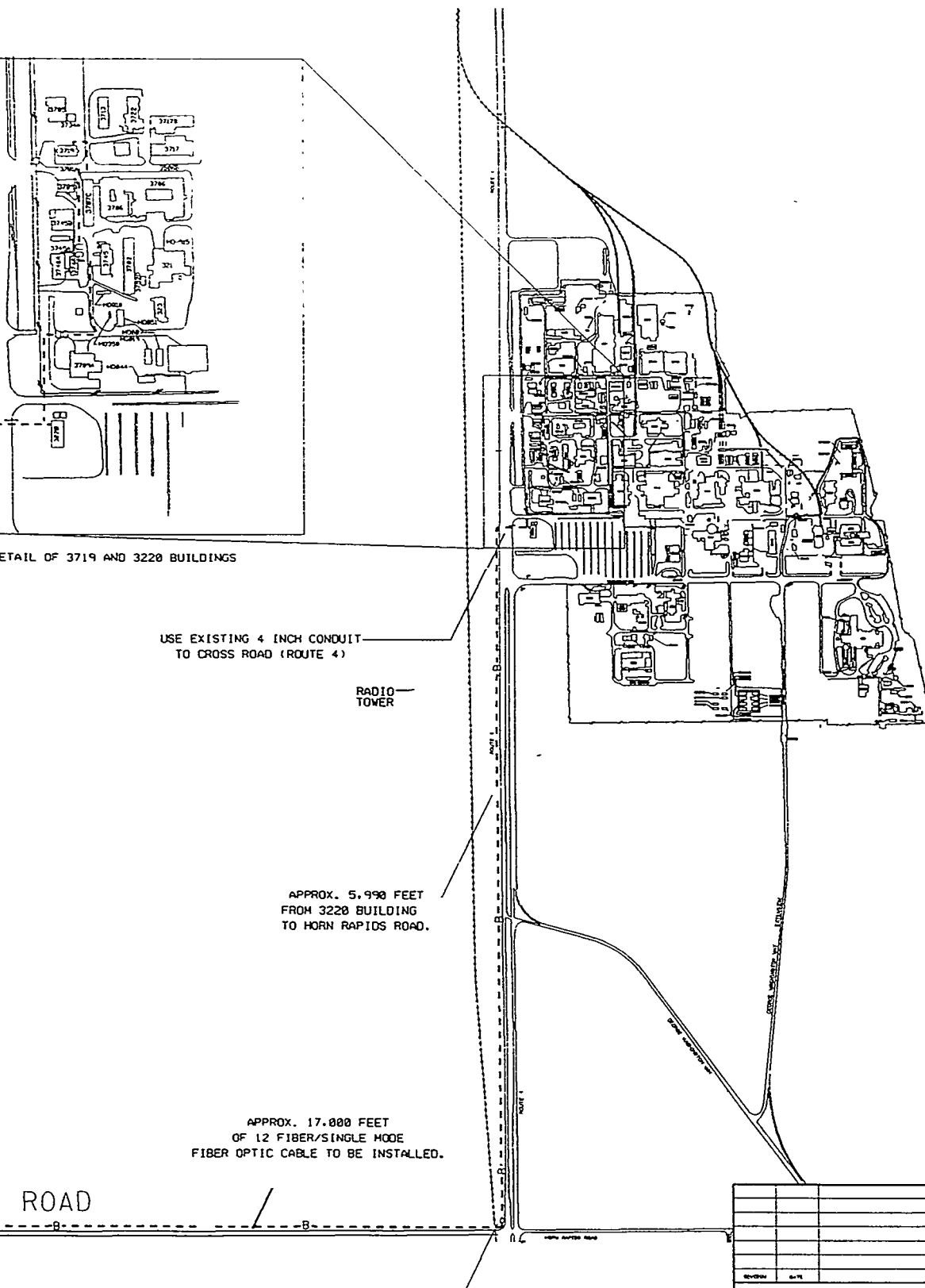
NOTE: THIS DATA IS NOT TO SCALE
AND IS NOT INTENDED FOR ENGINEERING
PURPOSES

APPROX. 800 FEET FROM PROP. LINE TO BLDG.

HORN RAPIDS

APPROX. 9800 FEET FROM VAULT TO PROP. LINE

SEIMEI



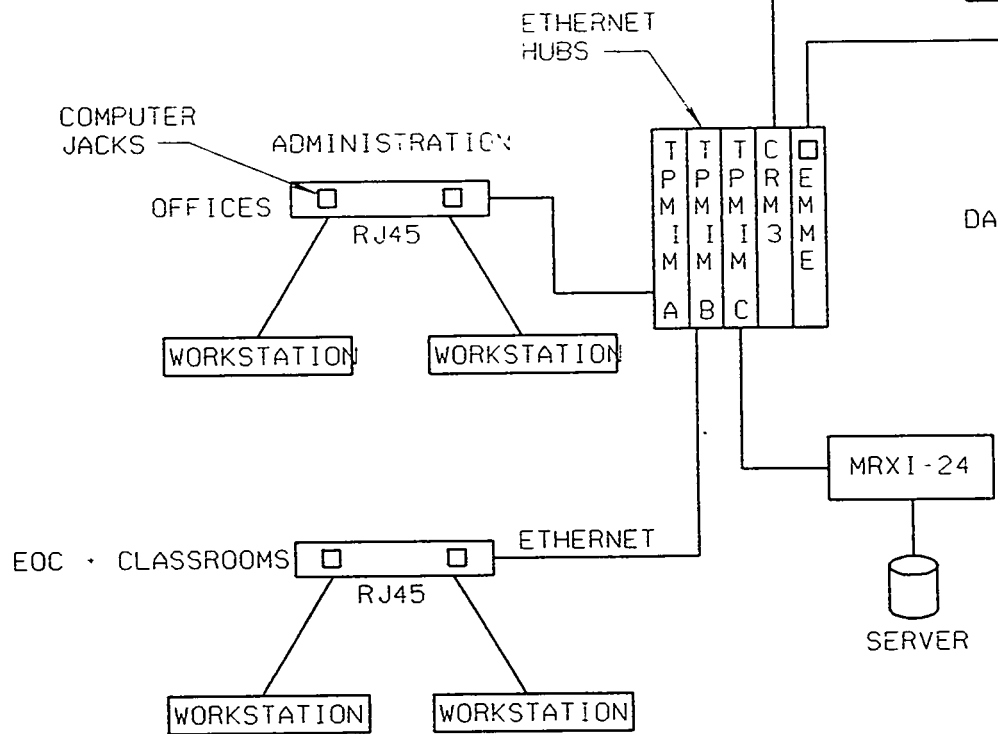
INSTALL VAULT BETWEEN RAILROAD CX AND ROUTE 4

FUEL PLANT

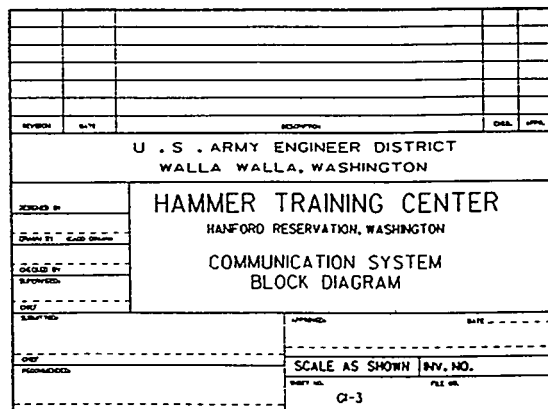
COMPUTER
AIDED
DESIGN &
DRAFTING

[illegible]

HAMMER



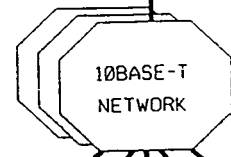
DDM -DIGITAL DATA MULTIPLEXER
 IVDTS-IINTEGRATED VOICE & DATA
 TELECOMMUNICATIONS SYSTEM
 SLC -SINGLE LINE CONCENTRATOR





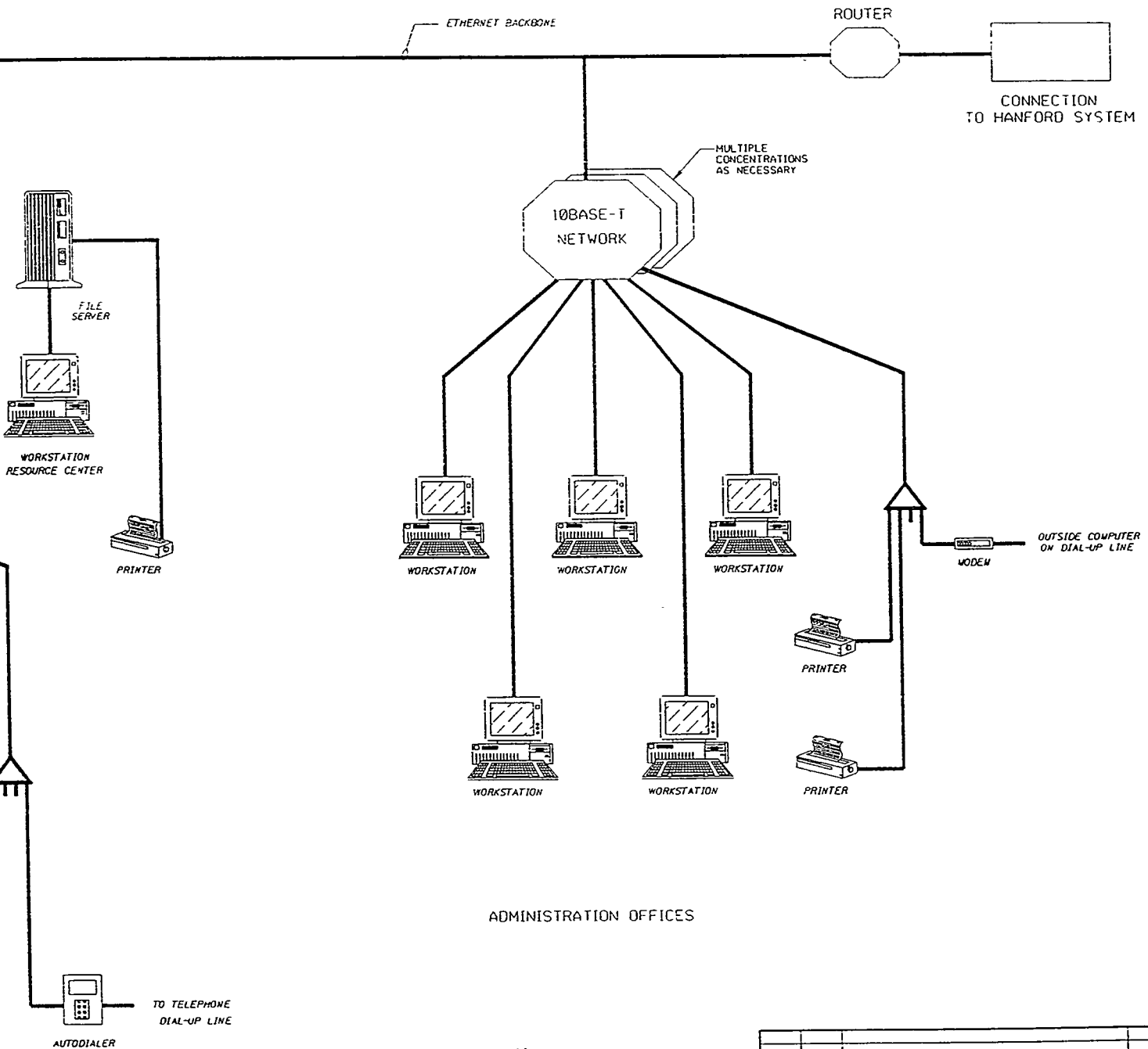
BURN STRUCTURE

PROP PLC CONTROLLERS



EMERGENCY OPERATIONS CENTER (EOC)

ER TRAINING CENTER

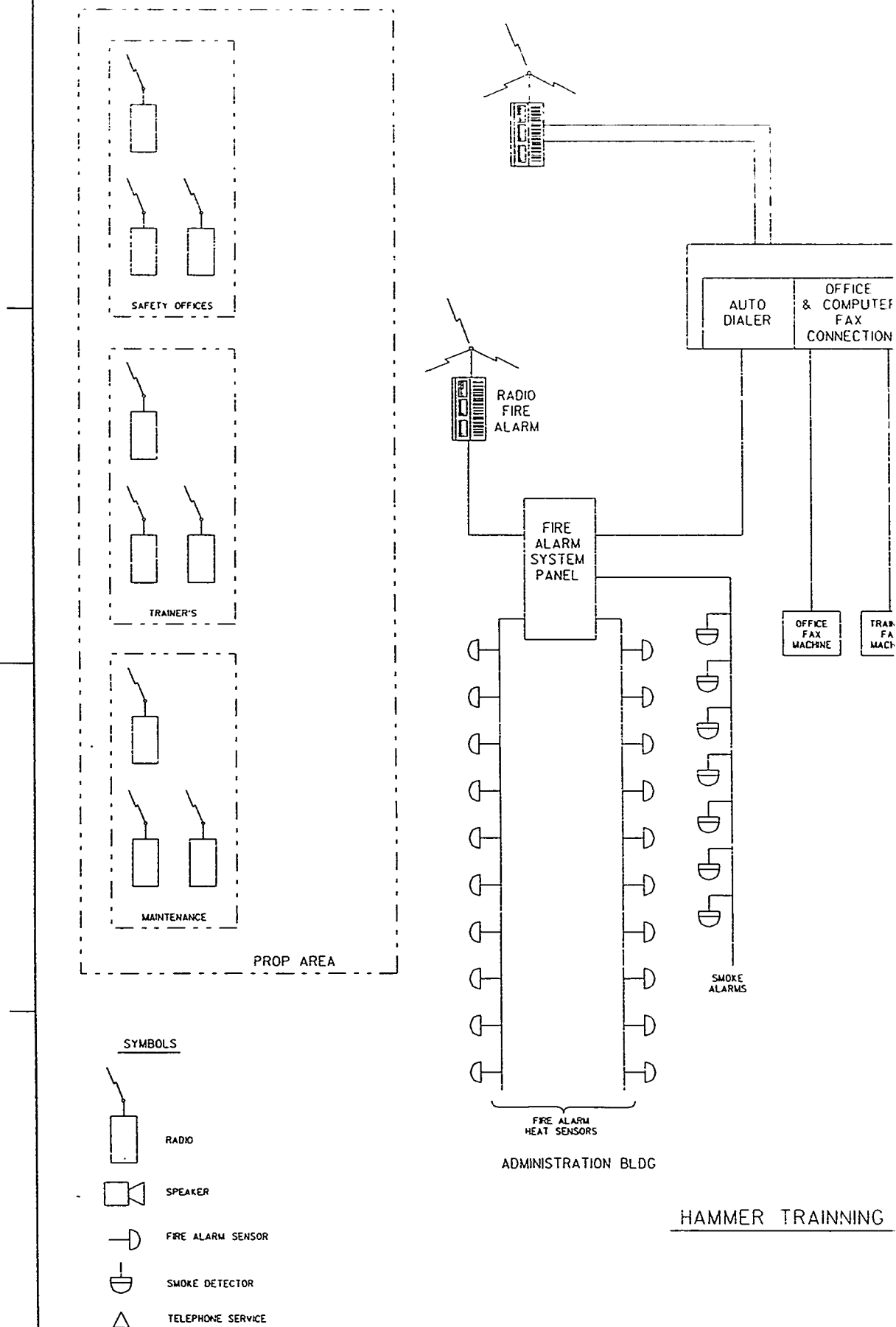


ADMINISTRATION OFFICES



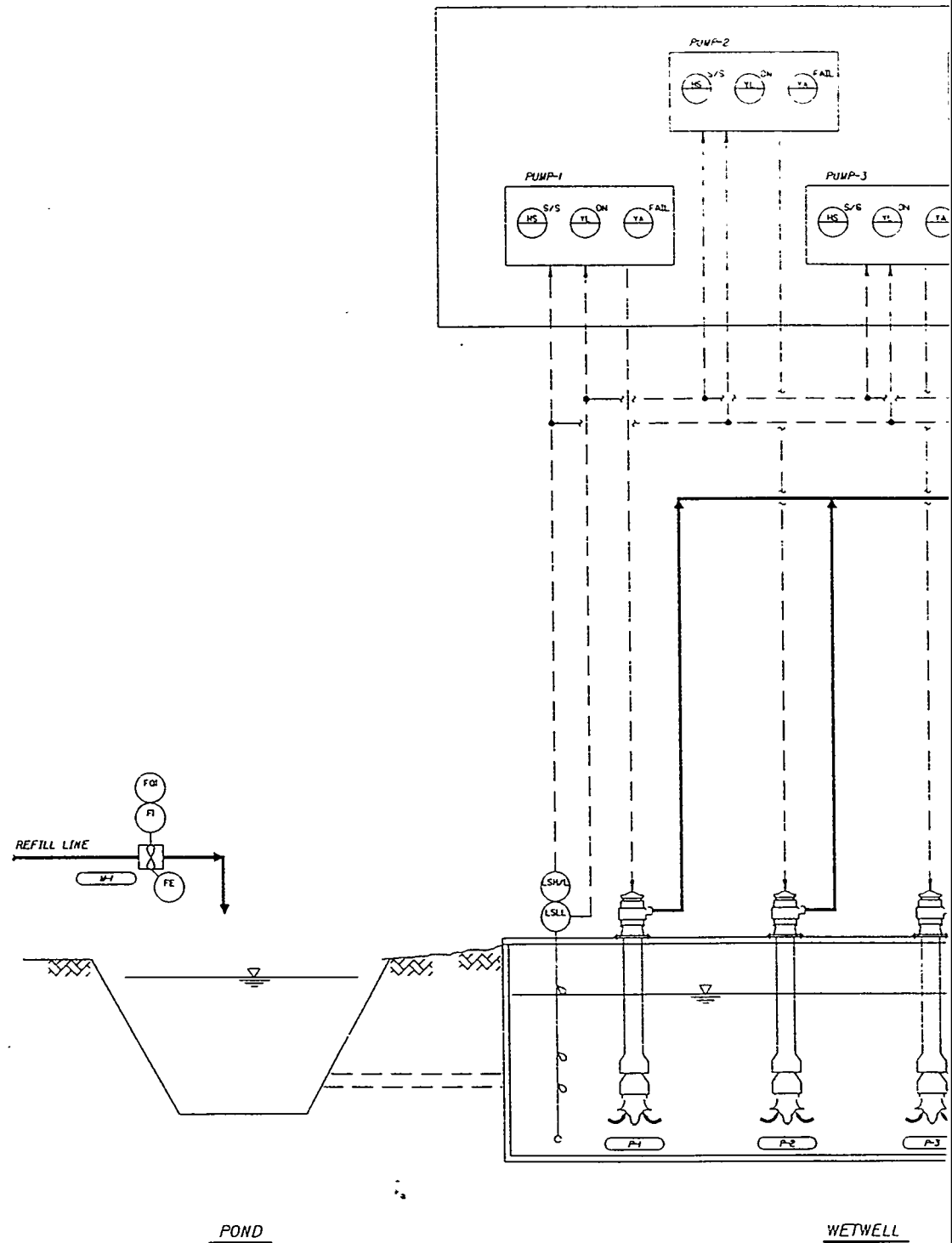
COMPUTER
AIDED
DESIGN &
DRAFTING

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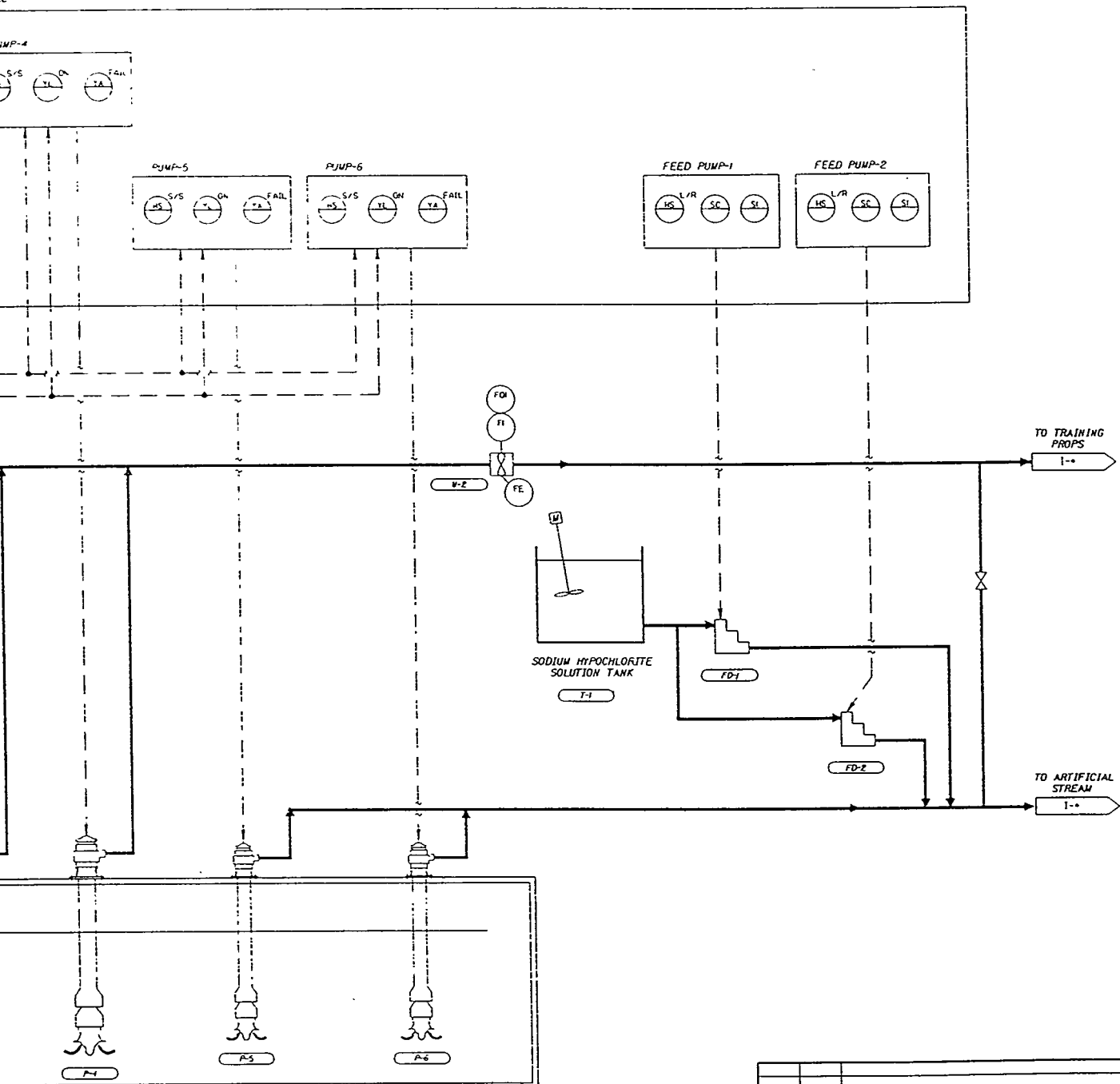
REVISION	DATE	DESCRIPTION	CHKD.	APPR.	
U . S . ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
BY C. WAHLMEIER DESIGNED BY		HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON RADIO/TELEPHONE SYSTEMS DIAGRAM			
BY C. KHOUDEMAN CHECKED BY CLAY DUBOIS					
BY CLAY DUBOIS SUPERVISED					
BY CLAY DUBOIS CHECKED					
BY CLAY DUBOIS APPROVED					
BY CLAY DUBOIS CHECKED		APPROVED _____ DATE _____			
BY CLAY DUBOIS APPROVED		SCALE AS SHOWN INV. NO. _____ SHEET NO. _____ FILE NO. _____			



SAFETY PAYS

B-2

U. S. ARMY



REVISION	DATE	DESCRIPTION	CHKD.	APPR.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
G. VAHLMEIER DESIGNED BY		HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON		
G. KHOUDANIAN CHECKED BY		PUMP STATION P & ID		
SPECIES BY		APPROVED		
DRAWN BY		DATE		
SCALE AS SHOWN INV. NO.		FILE NO.		
CI-6				

VALUE ENGINEERING PAYS

/usr2/proj/hamr/past/hamg106.dgn

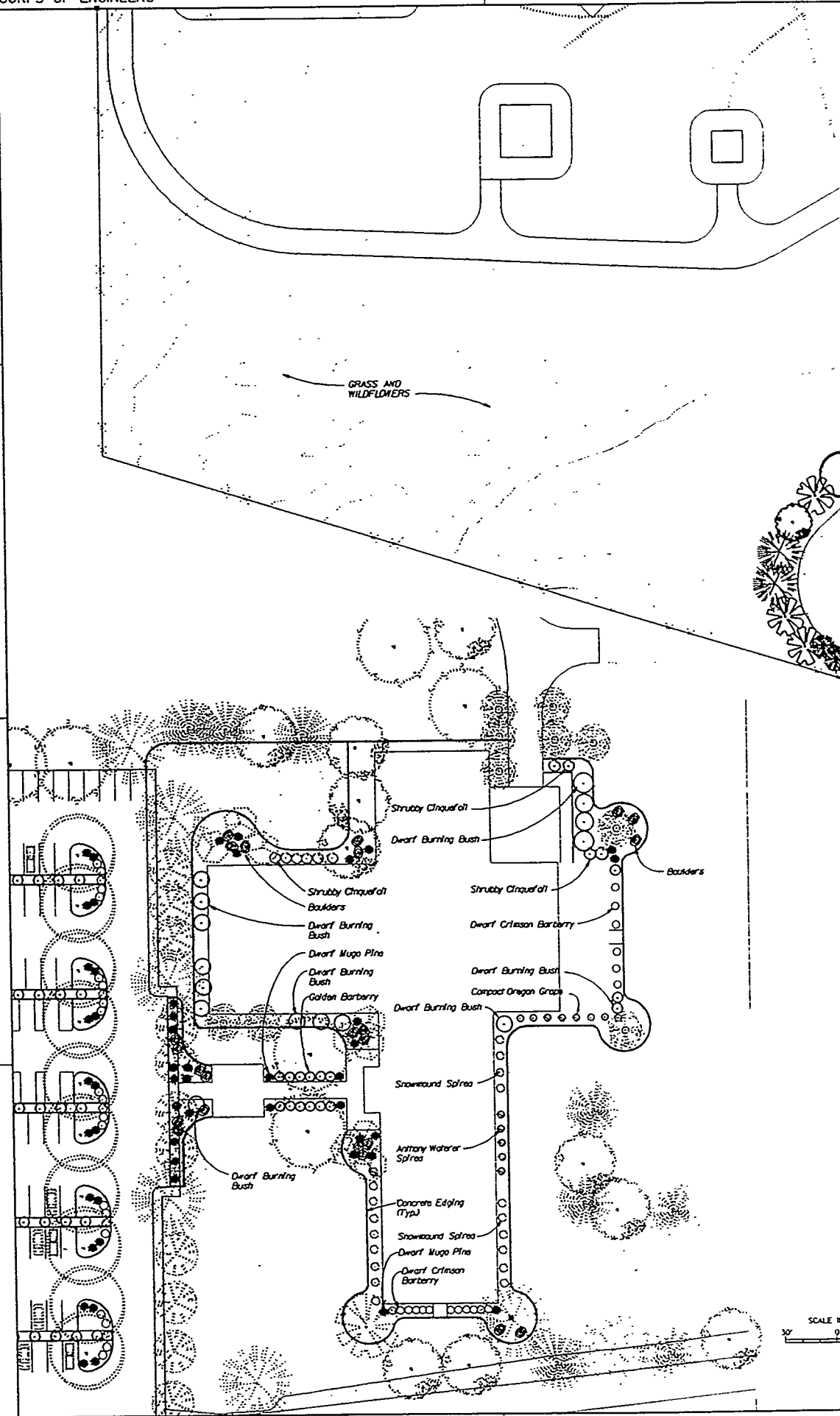
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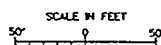
L-31

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

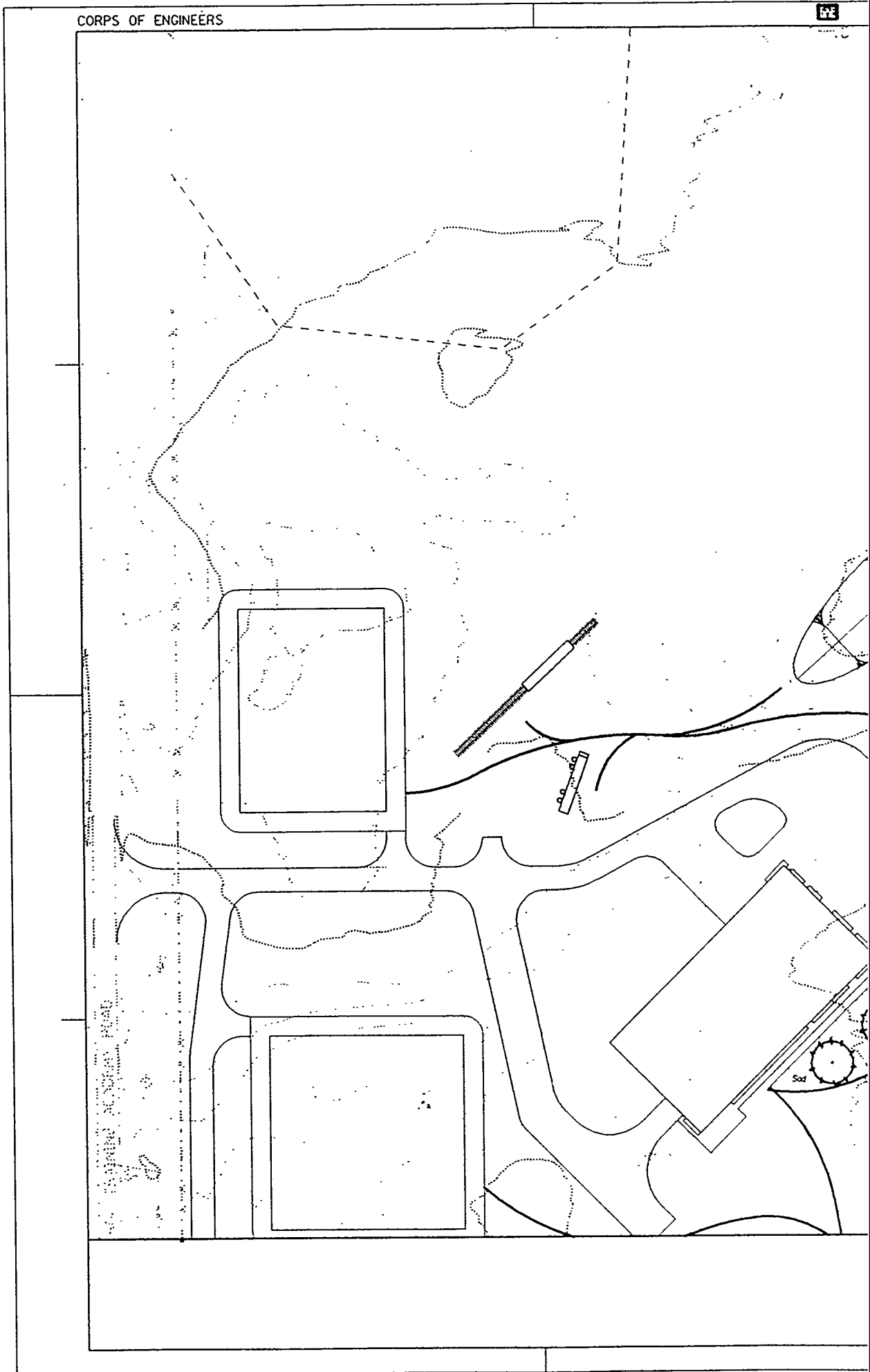
SCALE





COMPUTER
AIDED
DESIGN &
DRAFTING

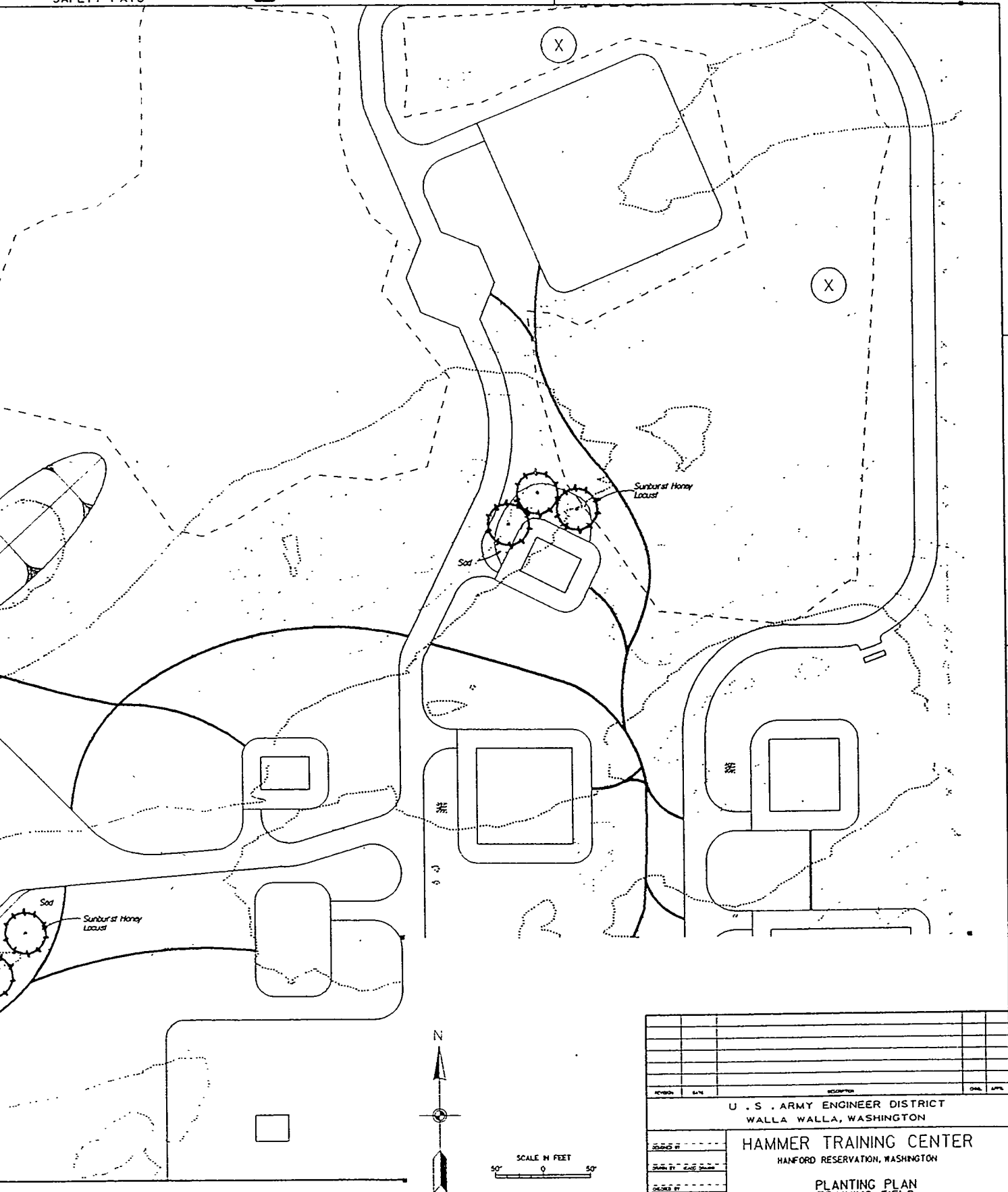
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SAFETY PAYS

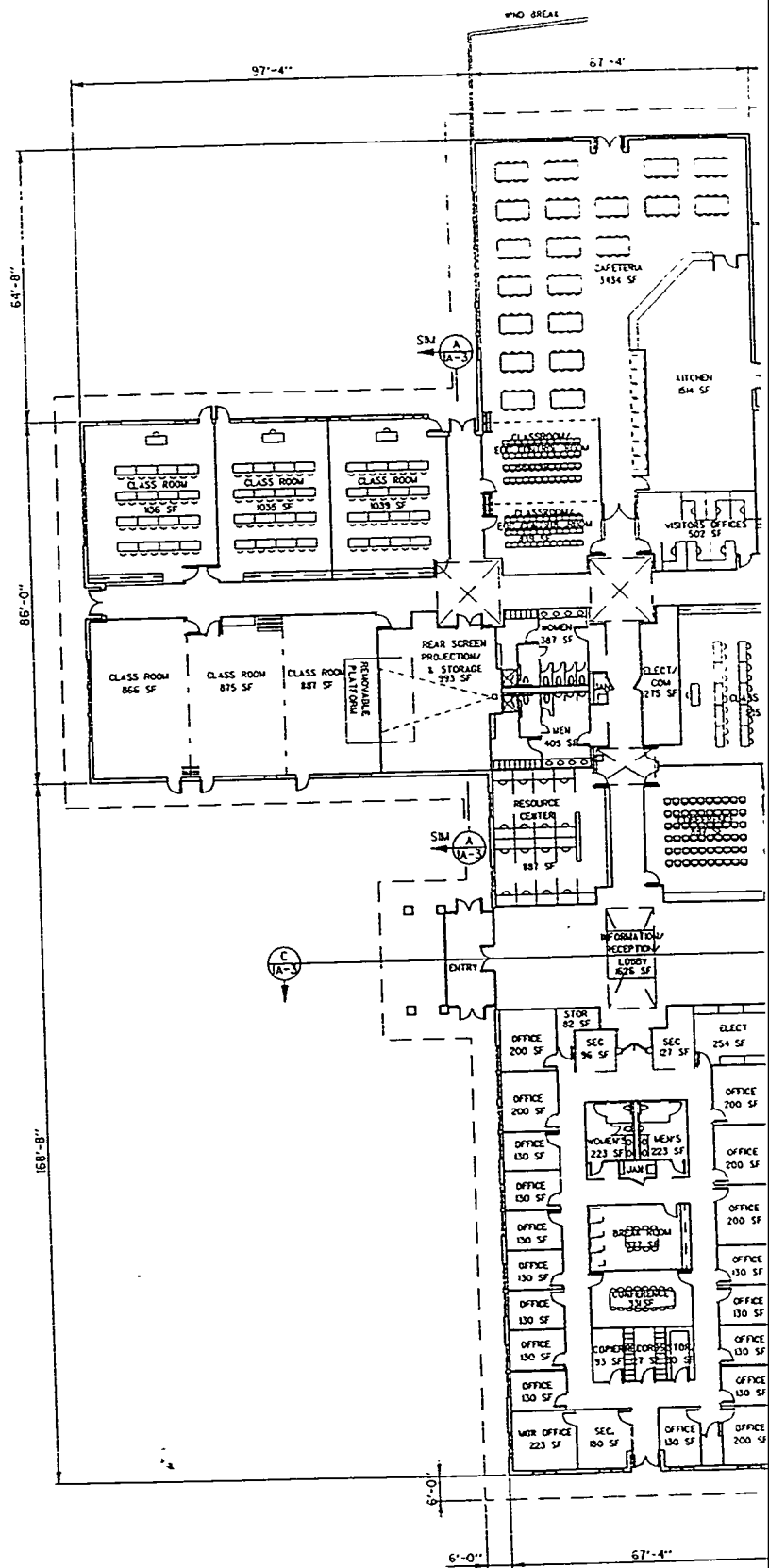
3/2

U. S. ARMY



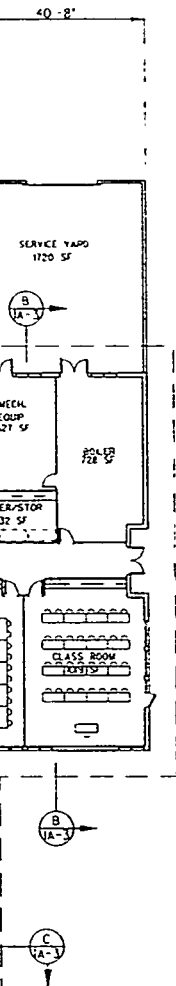
ACTION		DATE	DESCRIPTION	CHK.	APP.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON					
PLANTING PLAN TRAINING FIELD					
DESIGNED BY	DATE	SCALE	APPROVED	DATE	
DRAWN BY	DATE	SCALE			
CHECKED BY	DATE	SCALE			
RECOMMENDED	DATE	SCALE			
SCALE AS SHOWN INV. NO.					
CL-2					

COMPUTER
AIDED
DESIGN &
DRAFTING



SAFETY PAYS

U. S. ARMY



BUILDING CODE DATA

FLOOR AREA: 33,180 SQ. FT.
 OCCUPANCY GROUP (UBC): B-2
 A-3
 CONSTRUCTION TYPE (UBC): TYPE II-N
 ALLOWABLE FLOOR AREA: 12,000 SQ. FT.
 ALLOWABLE AREA INCREASE: 12,000 SQ. FT. (40' SEPERATION ALL SIDES)
 300 % INCREASE (AUTOMATIC FIRE SPRINKLERS)
 TOTAL ALLOWABLE FLOOR AREA: 72,000 SQ. FT.
 CORRIDOR CONSTRUCTION: 1HR FIRE RESISTIVE CONSTRUCTION
 CORRIDOR DOORS: 20 MIN SMOKE & DRAFT CONTROL ASSEMBLY
 OCCUPANCY SEPERATION: NONE REQUIRED
 FIRE PROTECTION: FULLY SPRINKLERED
 DISABLED ACCESS: FULL ADA COMPLIANCE



SCALE IN FEET
 12' 0" 15' 20' 30'

COMPUTER
AIDED
DESIGN &
DRAFTING

REVISION	DATE	DESCRIPTION	DESIGNED BY	CHECKED BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
DESIGNED BY: C. YOUNG CHECKED BY: P. YANG DATE: 11/11/00 SCALE: AS SHOWN SHEET NO.: 1A-1				
PROJECT: HAMMER TRAINING CENTER LOCATION: HANFORD RESERVATION, WASHINGTON DRAWING: ADMINISTRATION BUILDING FLOOR PLAN				
SCALE AS SHOWN INV. NO. SHEET NO. 1A-1				

VALUE ENGINEERING PAYS

/usr2/proj/hmr/past/hom0a01.dgn

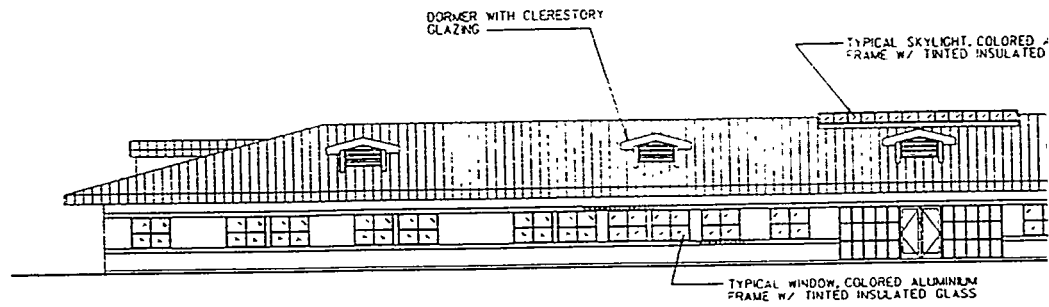
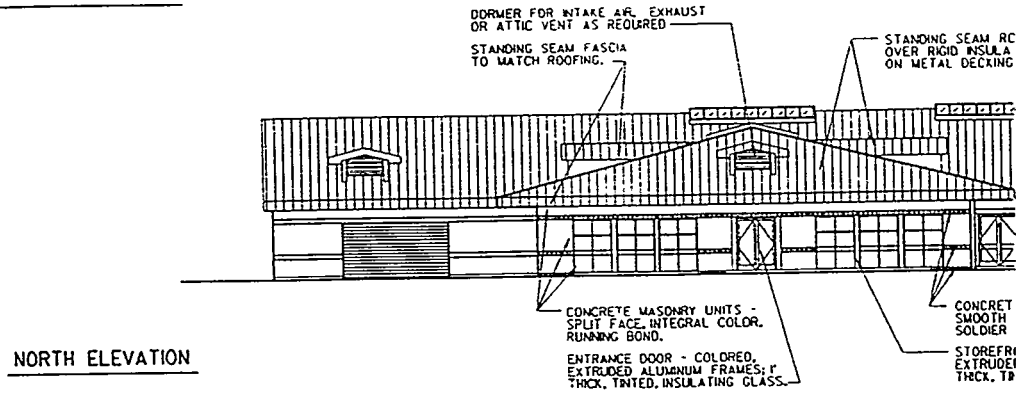
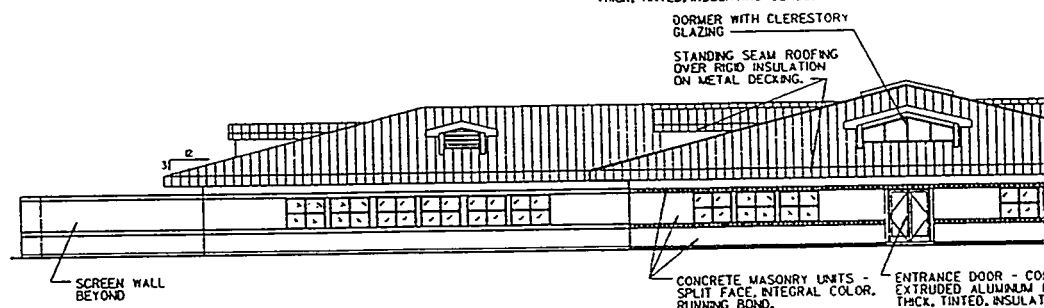
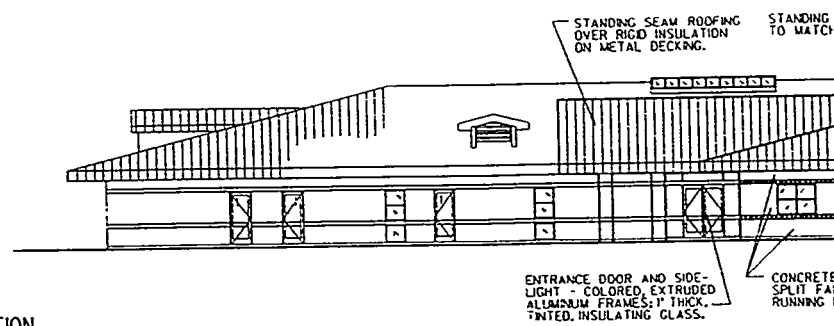
CONT. NO.

L-34

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWS

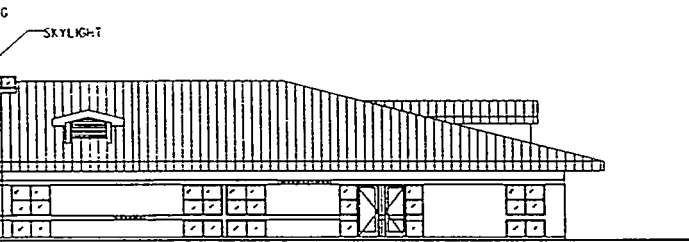
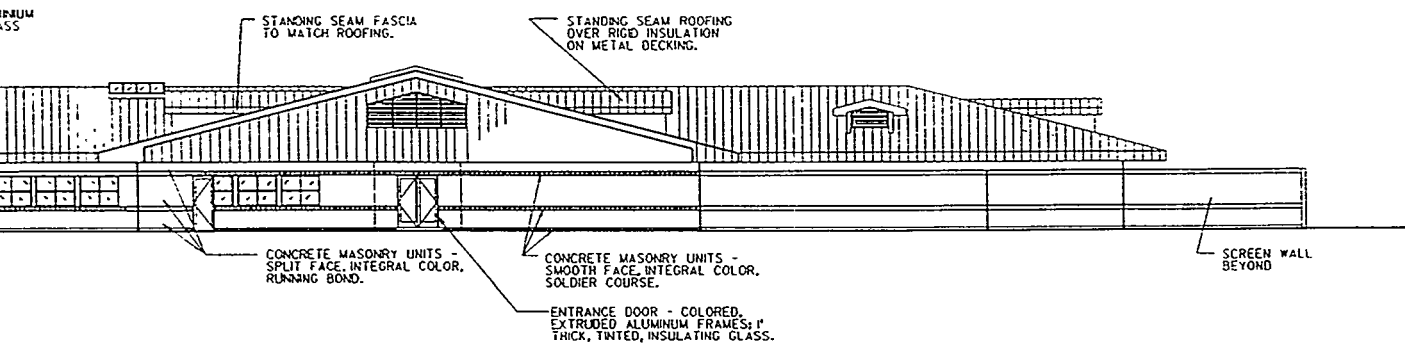
SCALE

EAST ELEVATIONNORTH ELEVATIONWEST ELEVATIONSOUTH ELEVATION

SAFETY PAYS



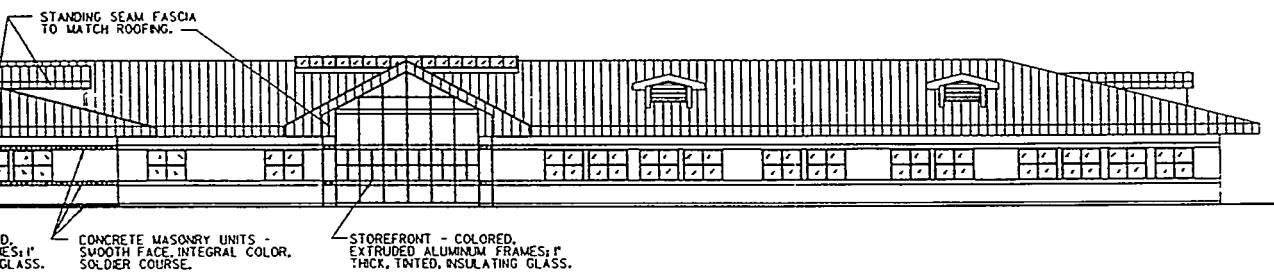
U. S. ARMY



CONCRETE MASONRY UNITS -
SPLIT FACE, INTEGRAL COLOR,
RUNNING BOND.

CONCRETE MASONRY UNITS -
SMOOTH FACE, INTEGRAL COLOR,
SOLDIER COURSE.

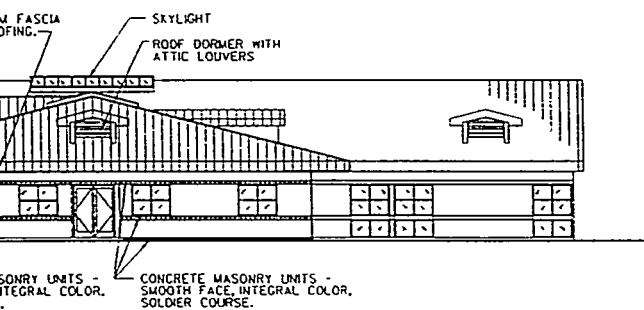
ENTRANCE DOOR - COLORED,
EXTRUDED ALUMINUM FRAMES, 1\"/>



CONCRETE MASONRY UNITS -
SPLIT FACE, INTEGRAL COLOR,
RUNNING BOND.

CONCRETE MASONRY UNITS -
SMOOTH FACE, INTEGRAL COLOR,
SOLDIER COURSE.

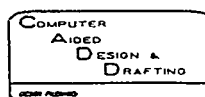
STOREFRONT - COLORED,
EXTRUDED ALUMINUM FRAMES, 1\"/>



CONCRETE MASONRY UNITS -
SPLIT FACE, INTEGRAL COLOR,
RUNNING BOND.

CONCRETE MASONRY UNITS -
SMOOTH FACE, INTEGRAL COLOR,
SOLDIER COURSE.

SCALE IN FEET
12' 0" 5' 0" 10' 0" 20' 0"



U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
ADMINISTRATION BUILDING EXTERIOR ELEVATIONS	
DESIGNED BY K. AKLIS	DATE
DRAWN BY P. WOOD	DATE
CHECKED BY	DATE
APPROVED BY	DATE
SCALE AS SHOWN INV. NO.	FILE NO.
1A-2	

VALUE ENGINEERING PAYS

/usr2/proj/hamr/past/ham0a02.dgn

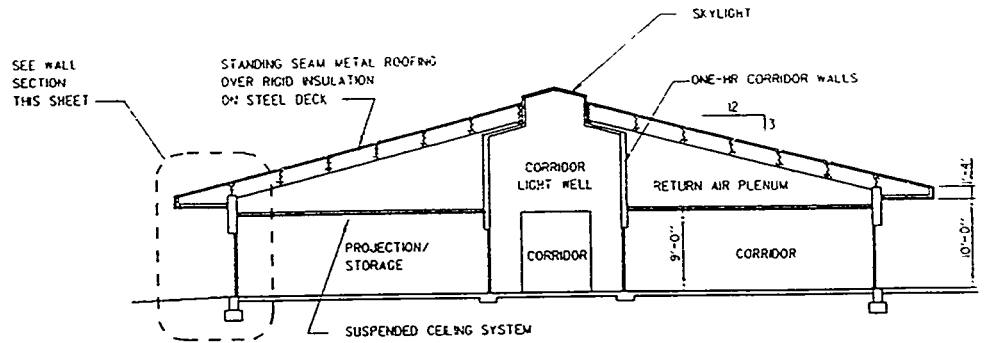
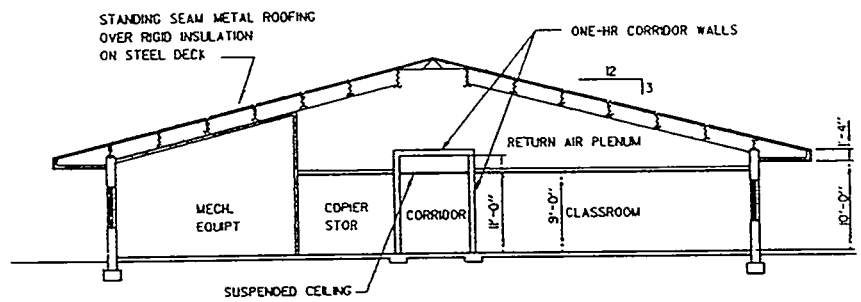
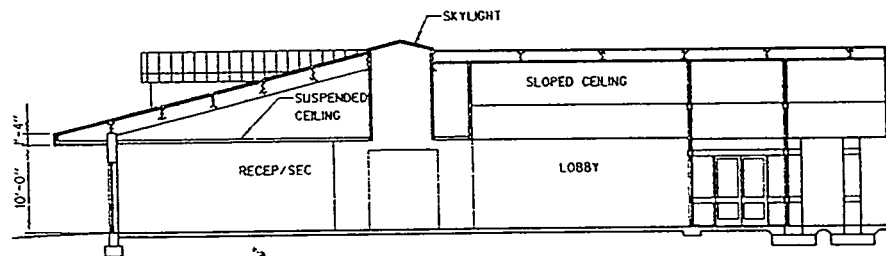
CONT. NO.

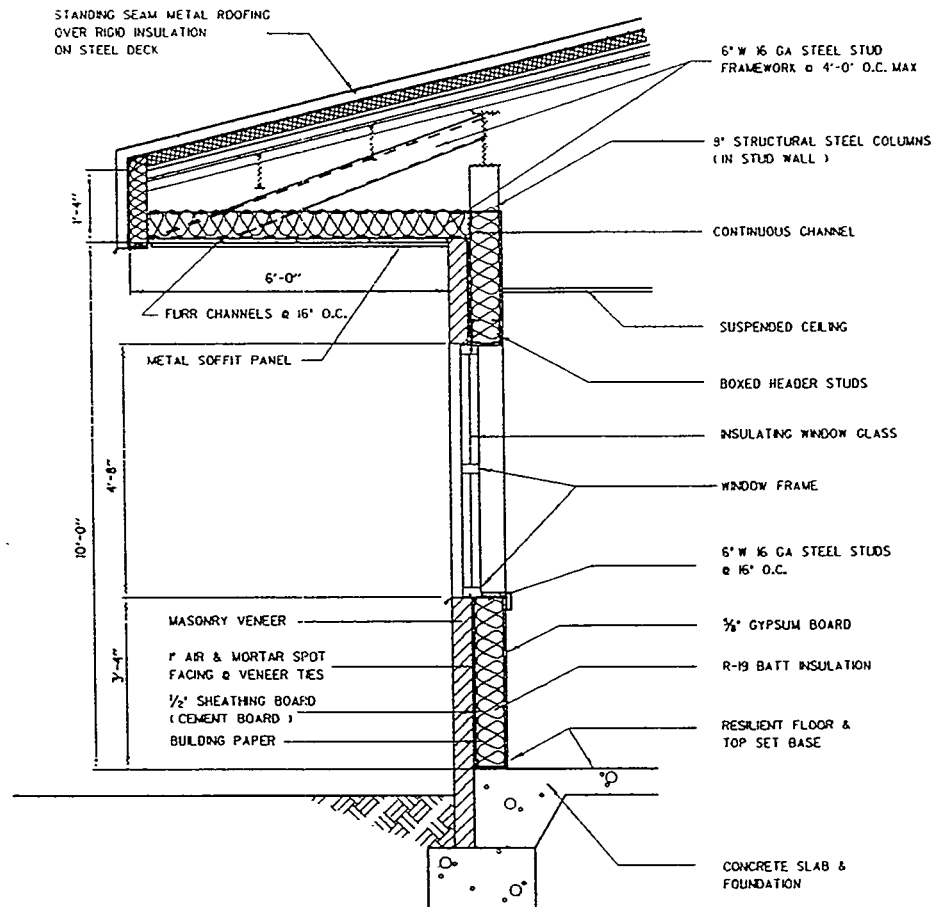
L-35

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

SECTION A-A -- CLASSROOMSSECTION B-B -- CLASSROOMSSECTION C-C -- LOBBY LOOKING SOUTH



WALL SECTION - TYPICAL

SCALE IN FEET
0 5 10 15

SCALE IN FEET
0 5 10

COMPUTER
AIDED
DESIGN &
DRAFTING

REVISION	DATE	DESCRIPTION	DRAWN	CHECKED
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON				
ADMINISTRATION BUILDING BUILDING SECTIONS AND WALL SECTION				
DESIGNED BY P. W. H. H. H.		SCALE AS SHOWN INV. NO.		
CHECKED BY P. W. H. H. H.		FILE NO.		
SUPERVISED BY P. W. H. H. H.		LA-3		

L-36

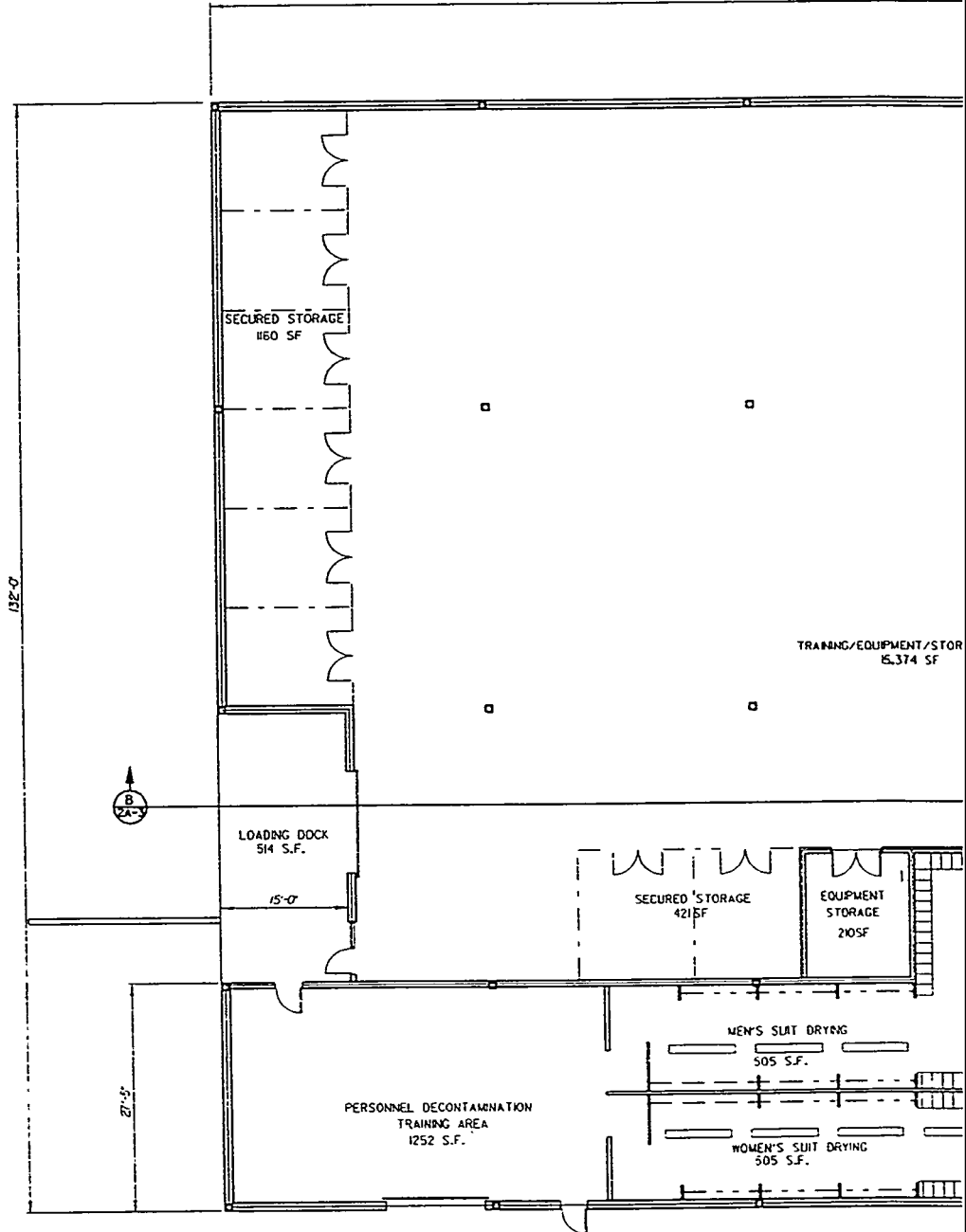
CONT. NO.

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWGS

SCALE

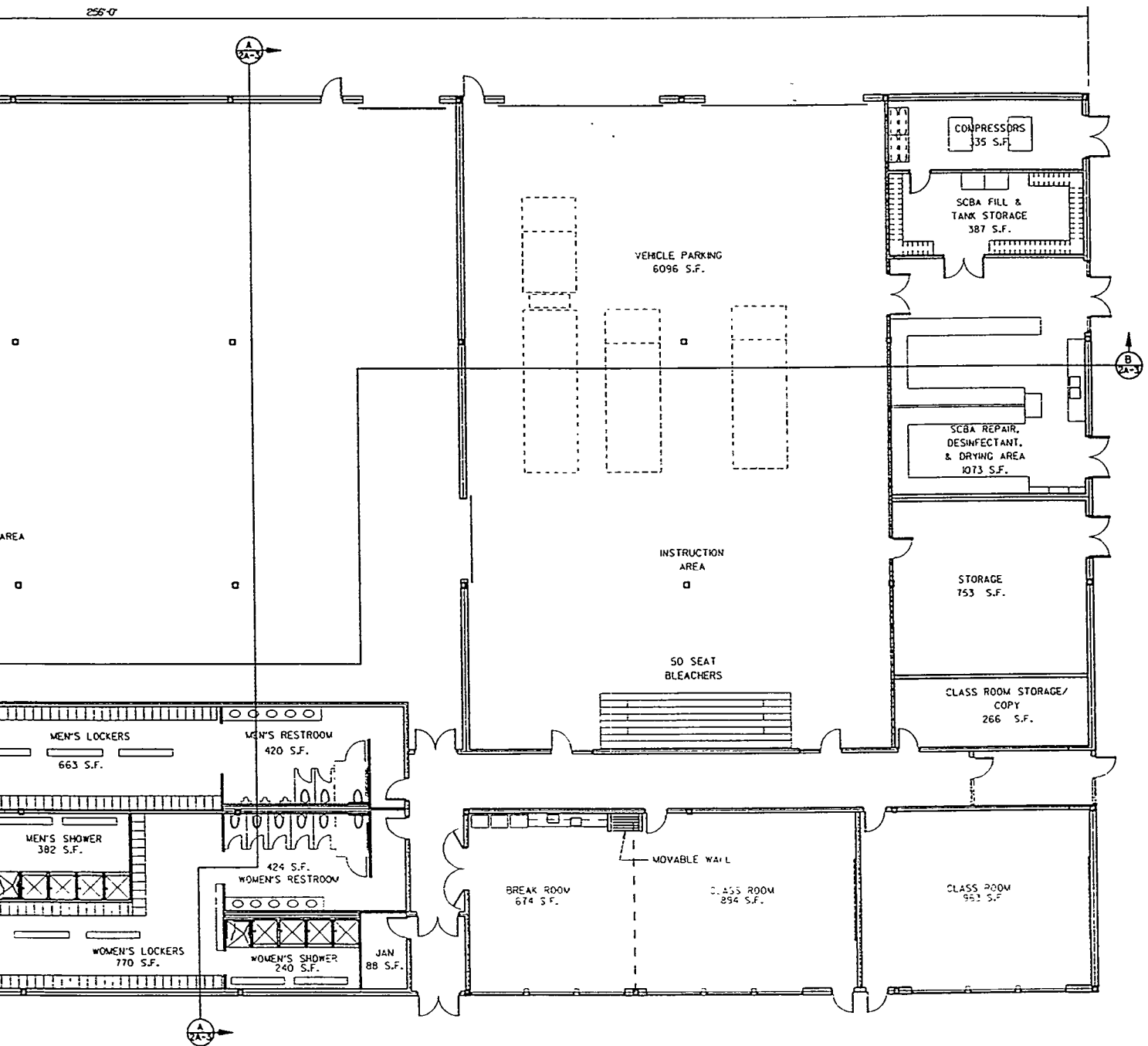
VALUE ENGINEERING PAYS

BUILDING CODE DATA

FLOOR AREA:	33,800 SQ. FT.
OCCUPANCY GROUP (UBC):	B-2, A-3
CONSTRUCTION TYPE (UBC):	TYPE II-N
ALLOWABLE FLOOR AREA:	12,000 SQ. FT.
ALLOWABLE AREA INCREASE:	100% SET BACK INCREASE 100% AUTOMATIC FIRE SPRINKLERS
TOTAL ALLOWABLE FLOOR AREA:	72,000
OCCUPANCY SEPERATION:	NONE REQUIRED
FIRE PROTECTION:	FULLY SPRINKLERED
DISABLED ACCESS:	FULL ADA COMPLIANCE

SAFETY PAYS

U. S. ARMY



FLOOR PLAN

VALUE ENGINEERING PAYS

/usr2/proj/homr/pas/hom02c01.dgn

CONT. NO.

REFERENCE FILES ATTACHED

LEVELS ON: FOR CONTRACT DRWGS

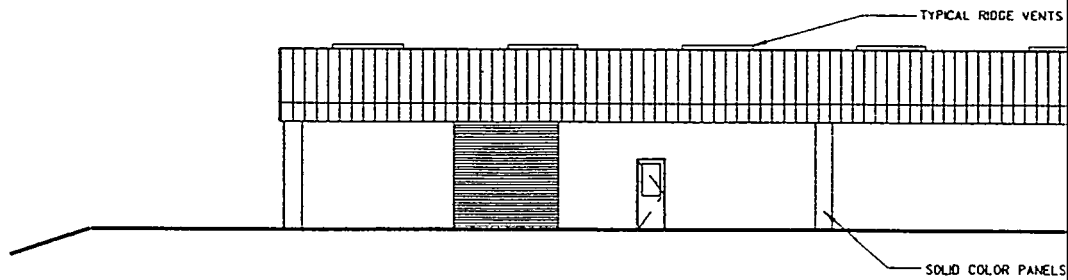
SCALE

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTONHAMMER TRAINING CENTER
HANFORD RESEPARATION, WASHINGTONTRAINING SUPPORT BUILDING
FLOOR PLAN

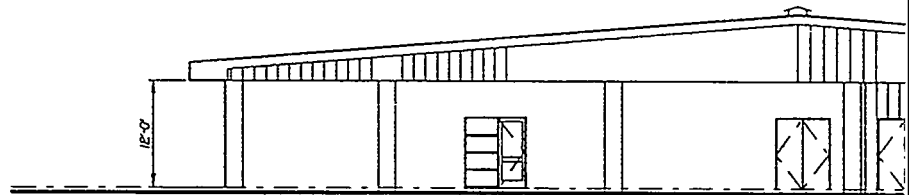
SCALE AS SHOWN INV. NO.

2A-1

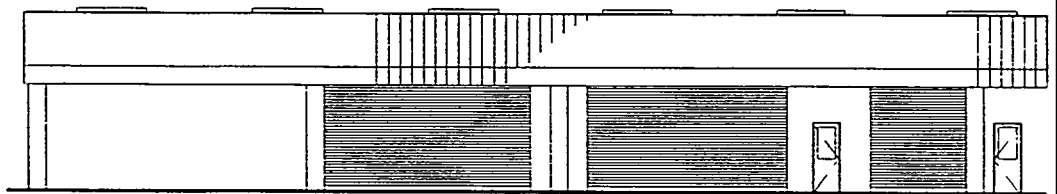
L-37



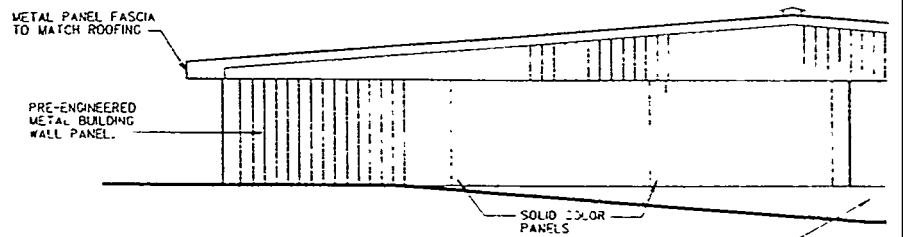
SOUTH ELEVATION



EAST ELEVATION

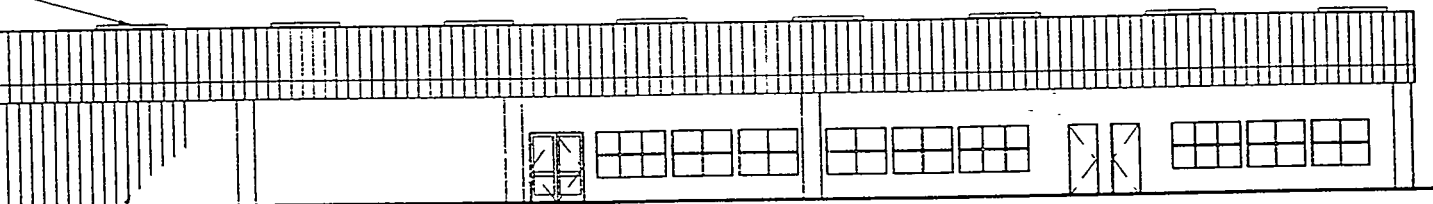


NORTH ELEVATION

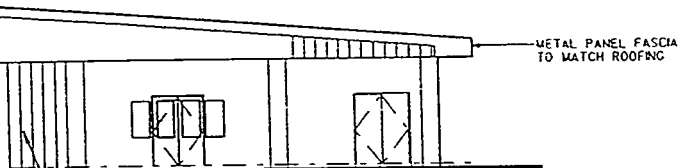


WEST ELEVATION

SAFETY PAYS

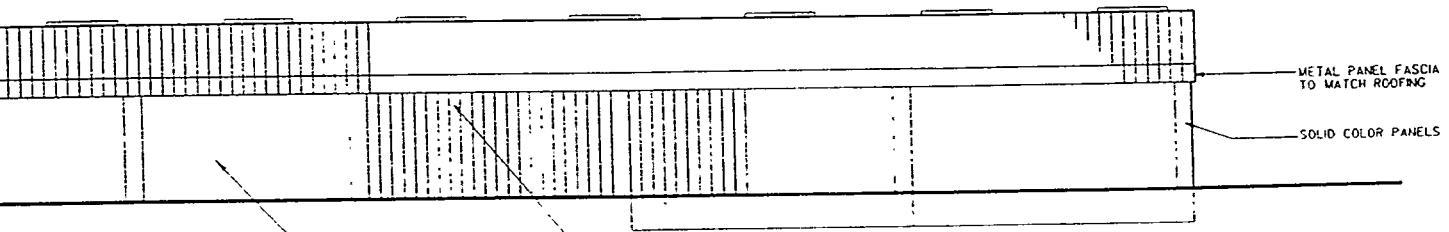


PRE-ENGINEERED
METAL BUILDING
WALL PANEL (TYP)



METAL PANEL FASCIA
TO MATCH ROOFING

PRE-ENGINEERED
METAL BUILDING
WALL PANEL.

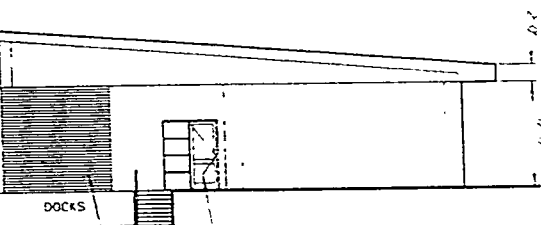


METAL PANEL FASCIA
TO MATCH ROOFING

SOLID COLOR PANELS

SOLID COLOR PANELS

PRE-ENGINEERED
METAL BUILDING
WALL PANEL.

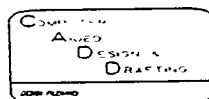


DOCKS

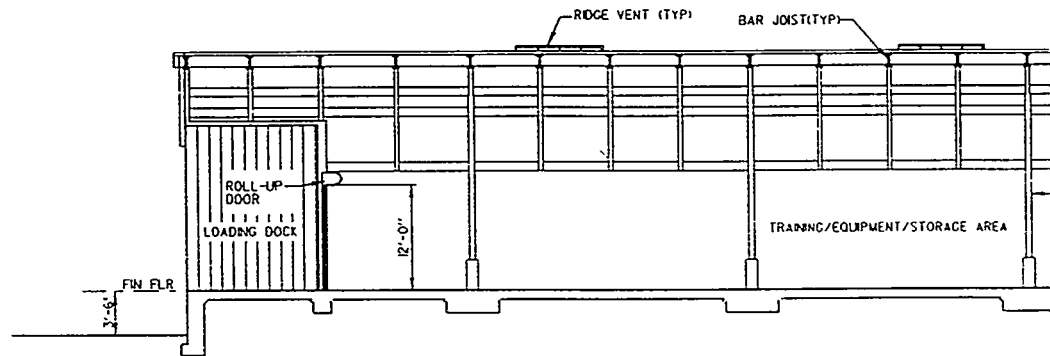
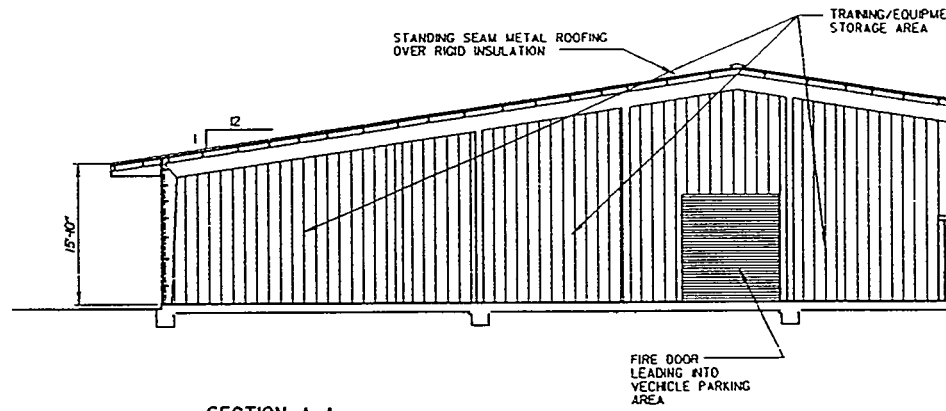
IC OVERHEAD
DOORS,
STEEL

ENTRANCE DOOR AND SIDE-
LIGHT - COLORED, EXTRUDED
ALUMINUM FRAMES, 1" THICK,
TINTED, INSULATING GLASS.

SCALE IN FEET
0 5 10 15



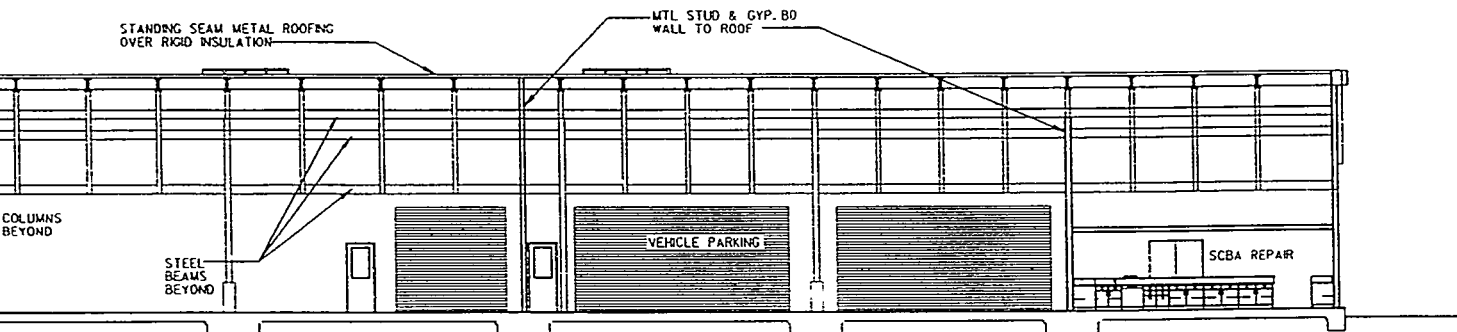
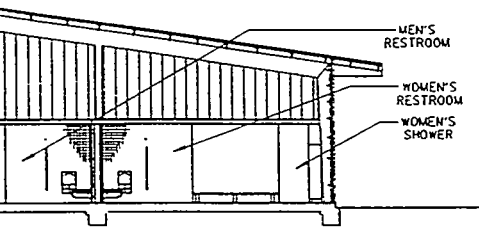
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING SUPPORT BUILDING EXTERIOR ELEVATIONS	
SCALE AS SHOWN (INV. NO.)	2A-2



SAFETY PAYS

B7E

U. S. ARMY



SCALE IN FEET

0 5 10 20

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING SUPPORT BUILDING SECTIONS	
DESIGNED BY D. WANG	DATE 10-10-88
CHECKED BY D. WANG	DATE 10-10-88
APPROVED BY D. WANG	DATE 10-10-88
SCALE AS SHOWN IN NO.	2A-3

VALUE ENGINEERING PAYS

/usr2/proj/hmr/past/hom02a03.dgn

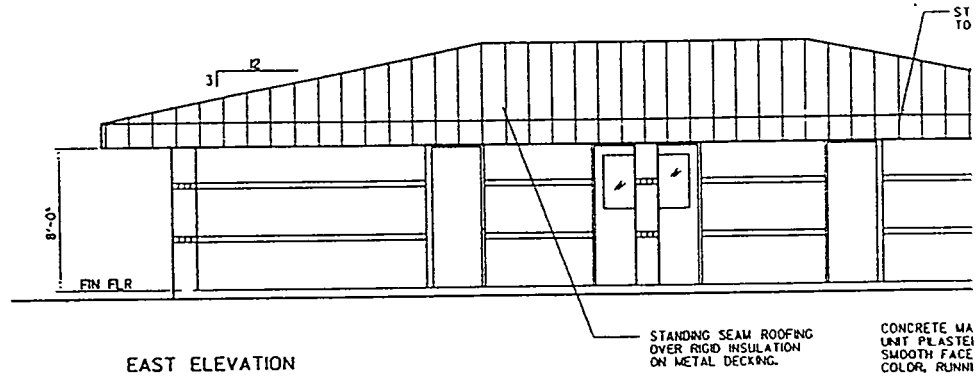
CONT. NO.

L-39

REFERENCE FILES ATTACHED

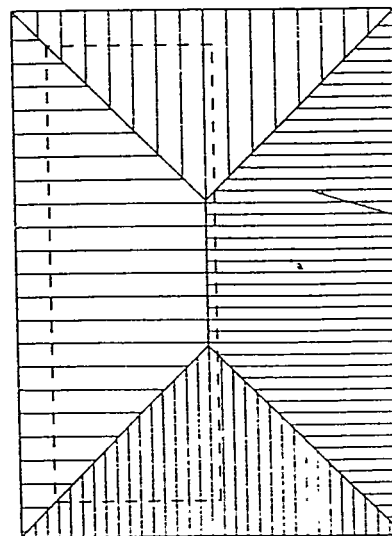
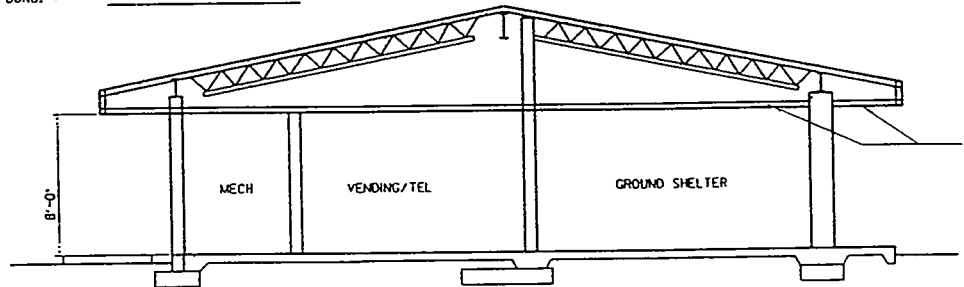
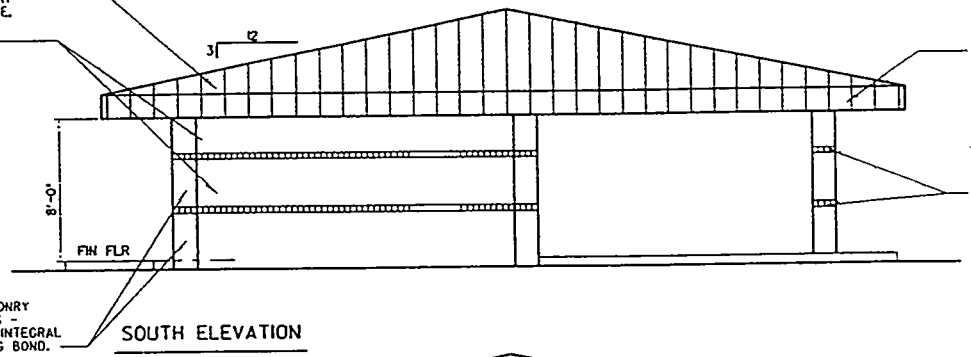
LEVELS ON FOR CONTRACT DRWG5

SCALE



STANDING SEAM ROOFING OVER RIGID INSULATION ON METAL DECKING.

CONCRETE MASONRY UNIT PLASTER SMOOTH FACE, INTEGRAL COLOR, RUNNING BOND.



SCALE IN FEET

0' 3' 5' 7' 9'

BUILDING

FLOOR A

OCCUPAN

CONSTR

ALL DIMAS

REL PR

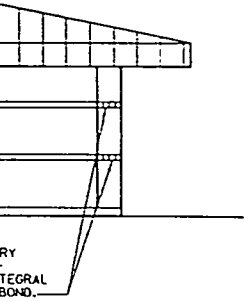
USABLE

SAFETY PAYS



U. S. ARMY

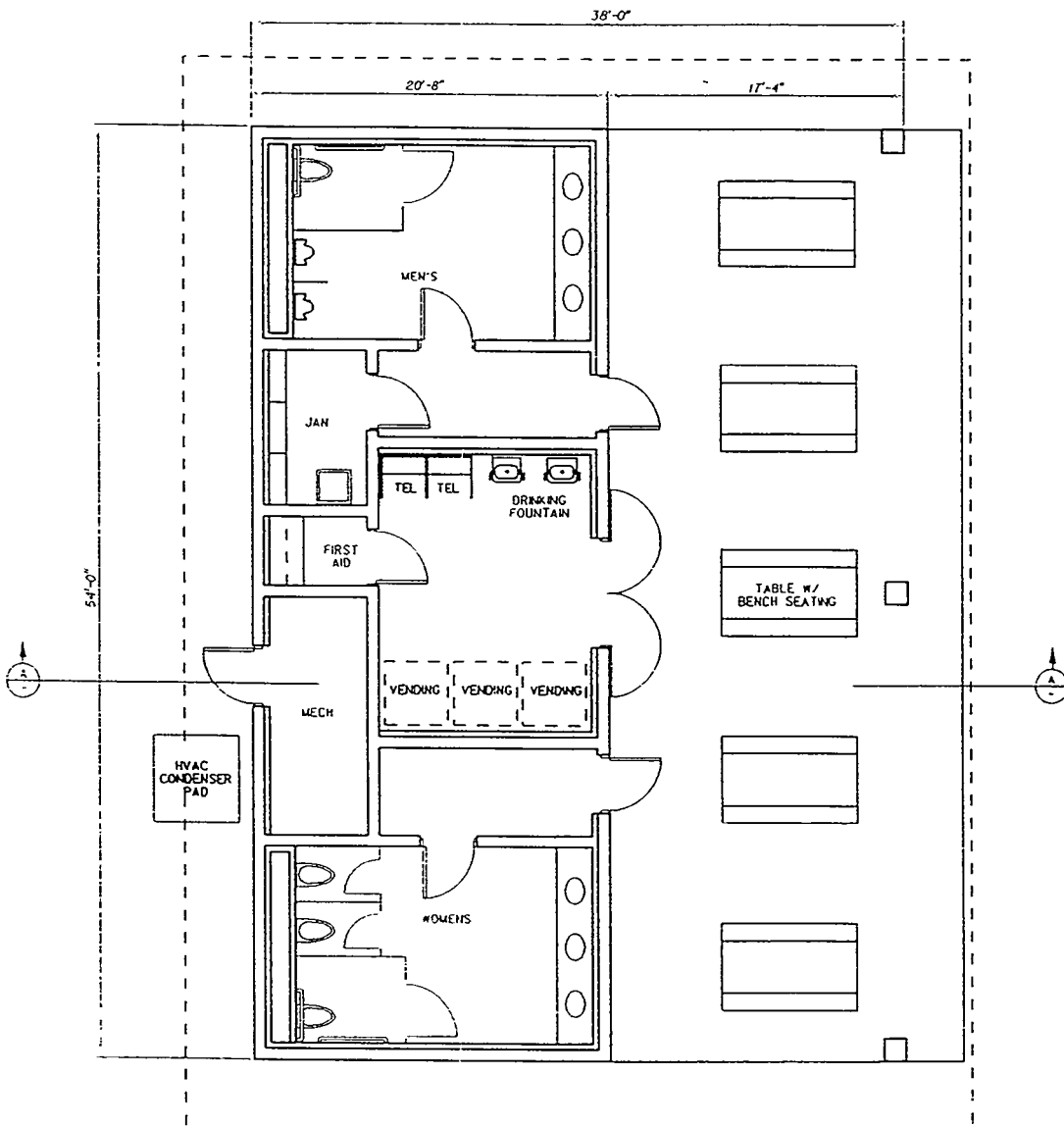
STANDING SEAM FASCIA
MATCH ROOFING.



STANDING SEAM FASCIA
MATCH ROOFING.

CONCRETE MASONRY
FINISHES - SMOOTH FACE,
INTEGRAL COLOR,
EXTERIOR COURSE.

SUSPENDED CEILING -
PORTLAND CEMENT PLASTER
ON BACKED METAL LATH.



FLOOR PLAN

E DATA

GROUP RUBCH 120 SQ. FT.
FIN TYPE RUBCH 4-1
FLOOR AREA: 1000 SQ. FT.
FINISHES: FIRE EXTINGUISHER
ACCESS: FULL ADA COMPLIANCE

SCALE IN FEET
0 10 20

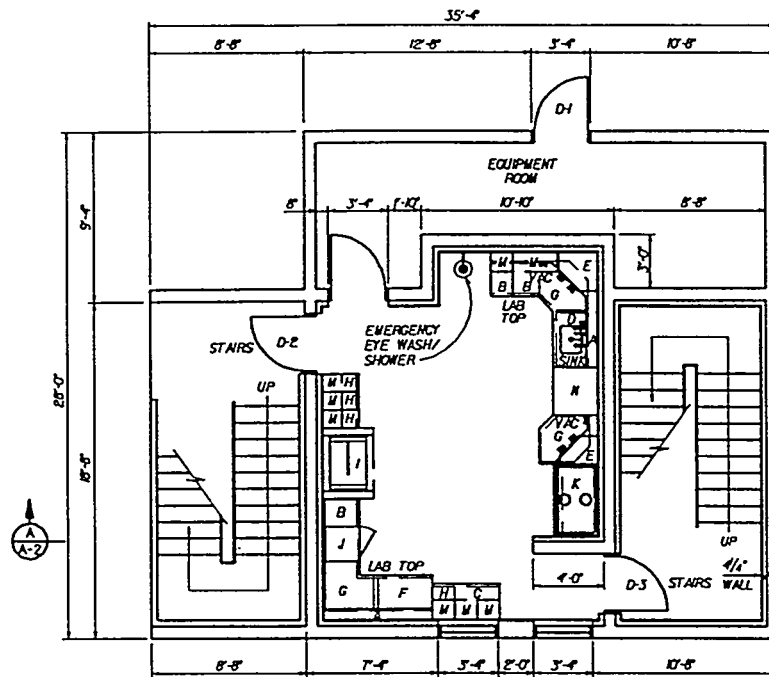
COMPUTER
AIDED
DESIGN &
DRAFTING

VALUE ENGINEERING PAYS

CONT. NO.

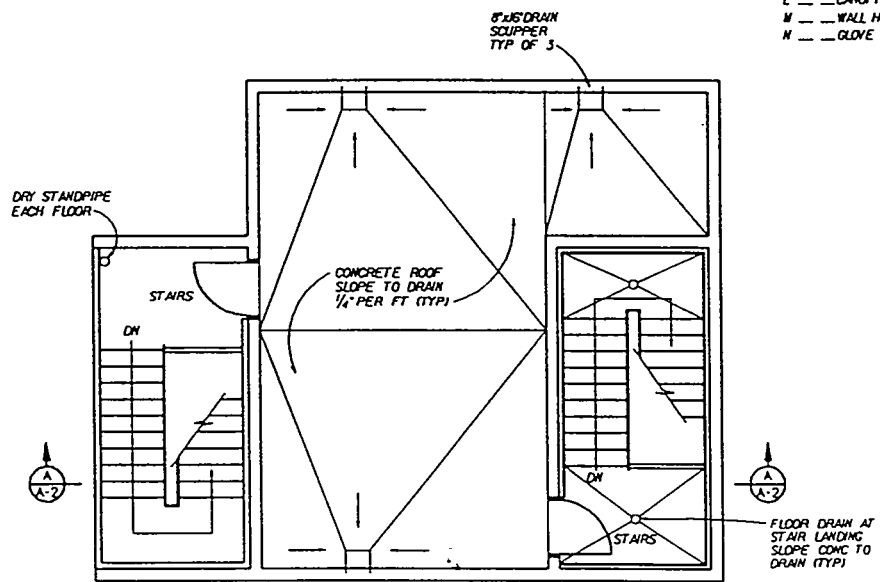
L-40

REVISION	DATE	BY	CHKD.	APP'D.
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
HAMMER TRAINING CENTER PENFORD RESERVATION, WASHINGTON				
COMFORT STATION PLANS, SECTION & ELEVATIONS				
SCALE AS SHOWN (INCHES).				
3A-1				



FIRST FLOOR PLAN

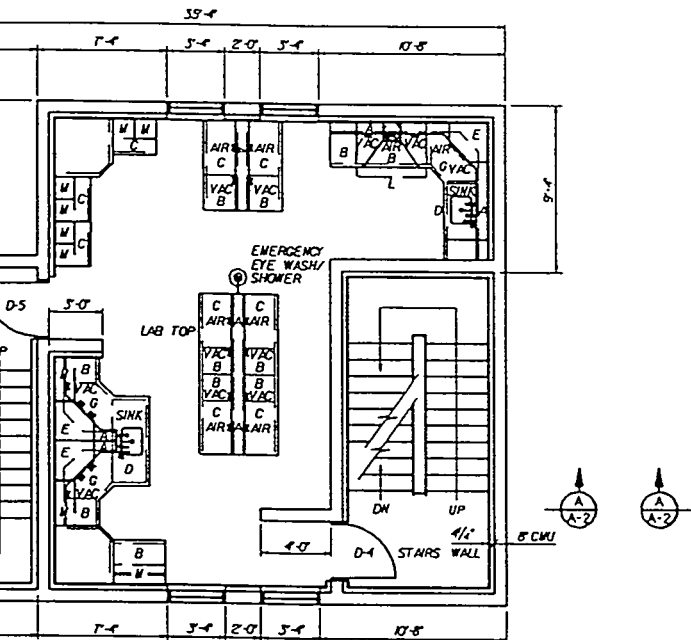
- A — REAGENT SHELF
- B — DRAWER BASE UNIT
- C — RAIL DRAWER UNIT
- D — SINK BASE UNIT
- E — CORNER WALL UNIT
- F — ACID STORAGE UNIT
- G — CORNER BASE UNIT
- H — FILE DRAWER UNIT
- I — BALANCE TABLE
- J — REFRIGERATOR
- K — FUME HOOD
- L — CANOPY HOOD
- M — WALL HUNG CASE
- N — GLOVE BOX



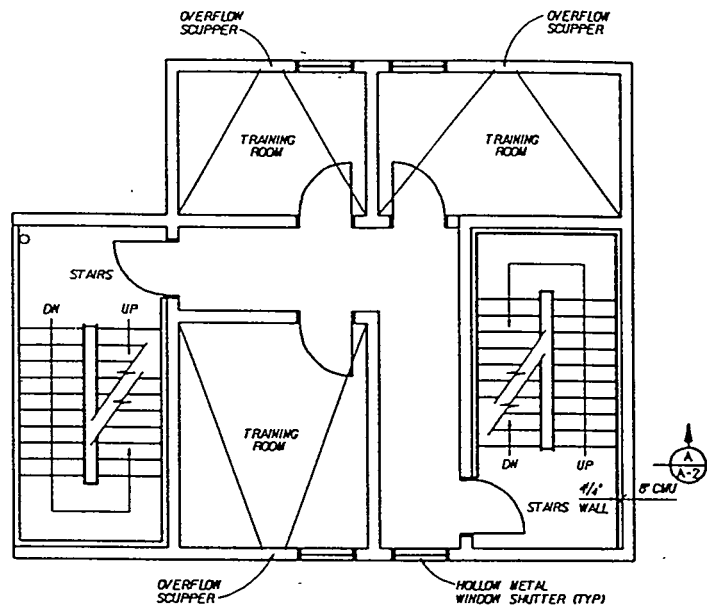
ROOF PLAN

SAFETY PAYS

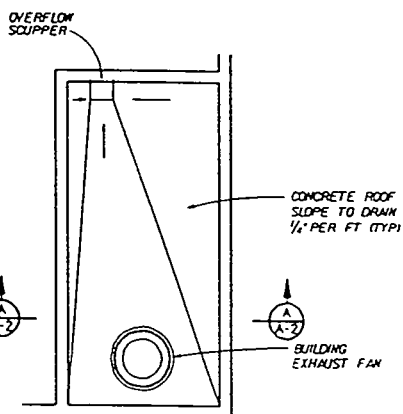
U. S. ARMY



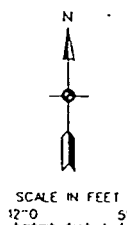
SECOND FLOOR PLAN



THIRD THRU SIXTH FLOOR PLAN



ROOF PLAN AT STAIR



COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING TOWER FLOOR PLANS	
DESIGNED BY N.E. WIEGERT	CHECKED BY R.A. FELT
DATE 10/1/80	DATE 10/1/80
SCALE AS SHOWN INV. NO. 4A-1 H1CA10.DGN	

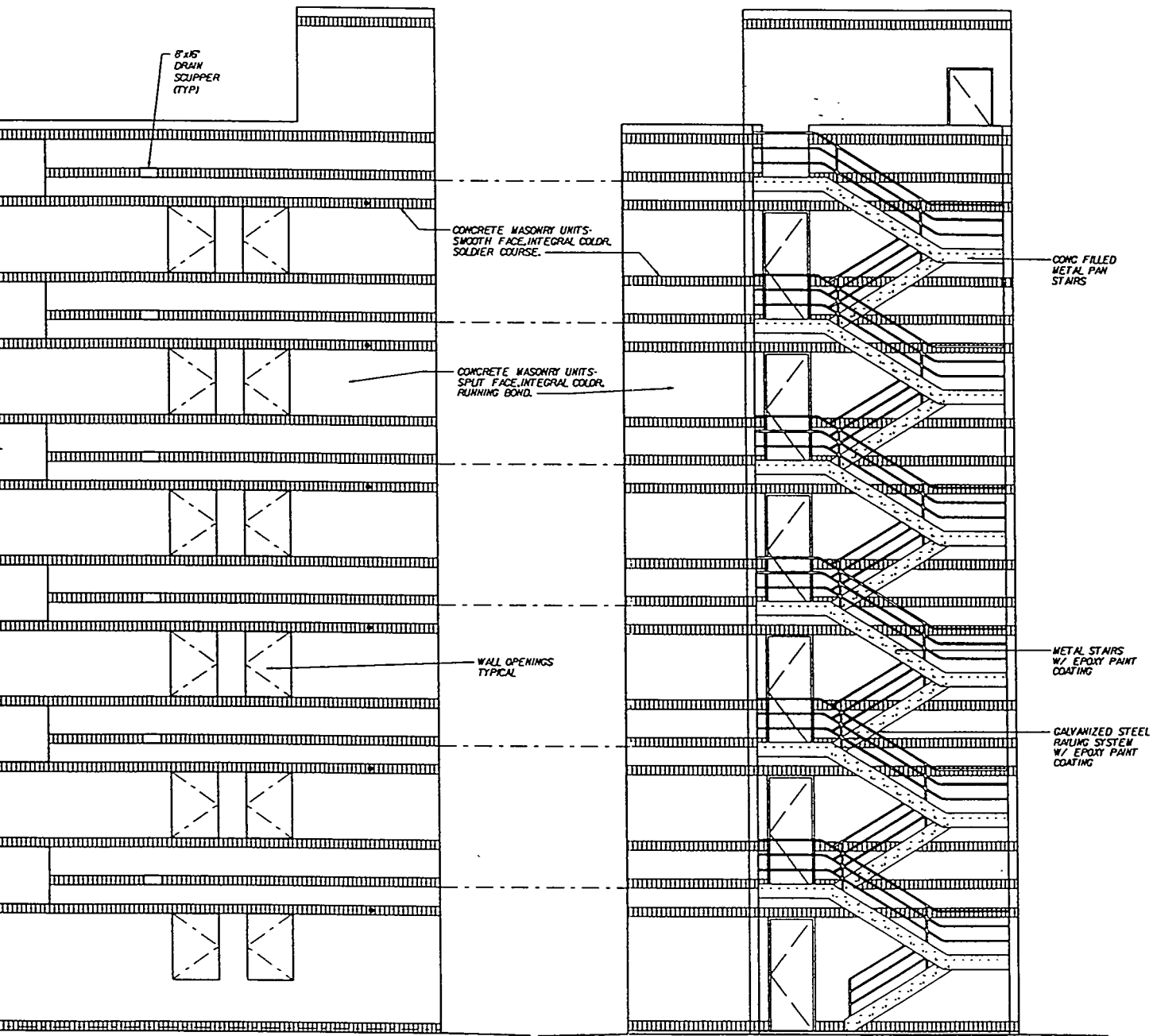


SECTION A-A

SAFETY PAYS

34

U. S. ARMY



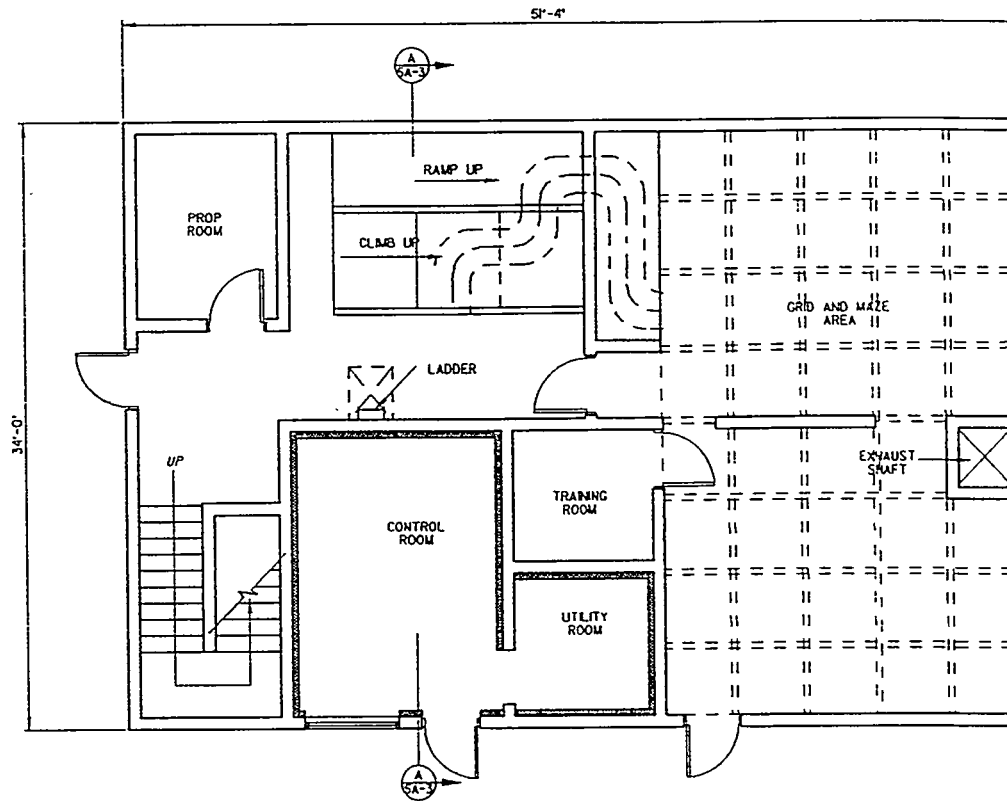
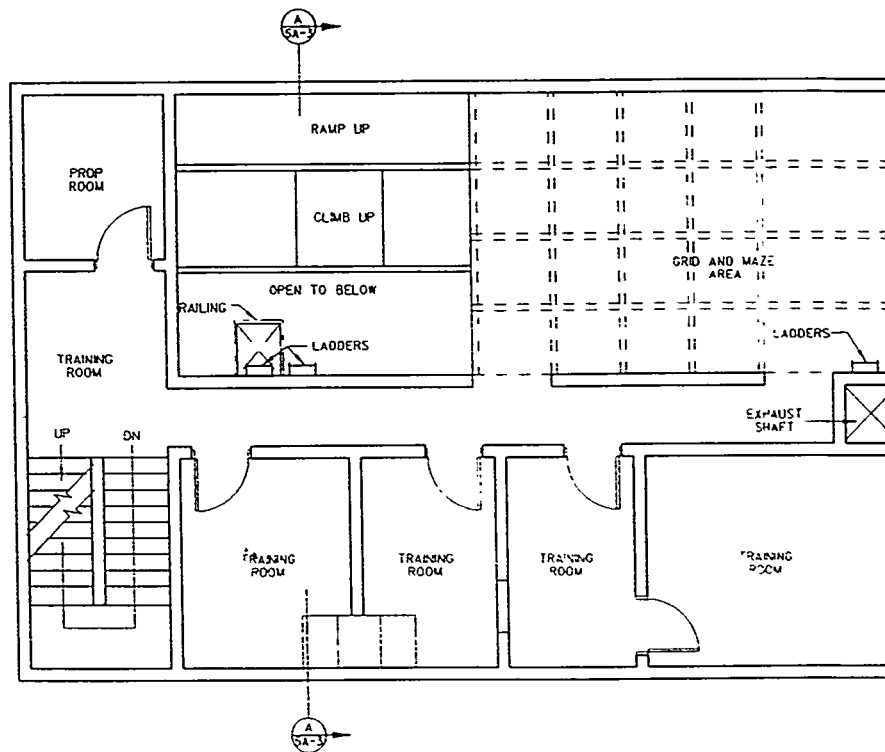
N ELEVATION

WEST ELEVATION

SCALE IN FEET
12"=0' 5'

COMPUTER
AIDED
DESIGN &
DRAFTING

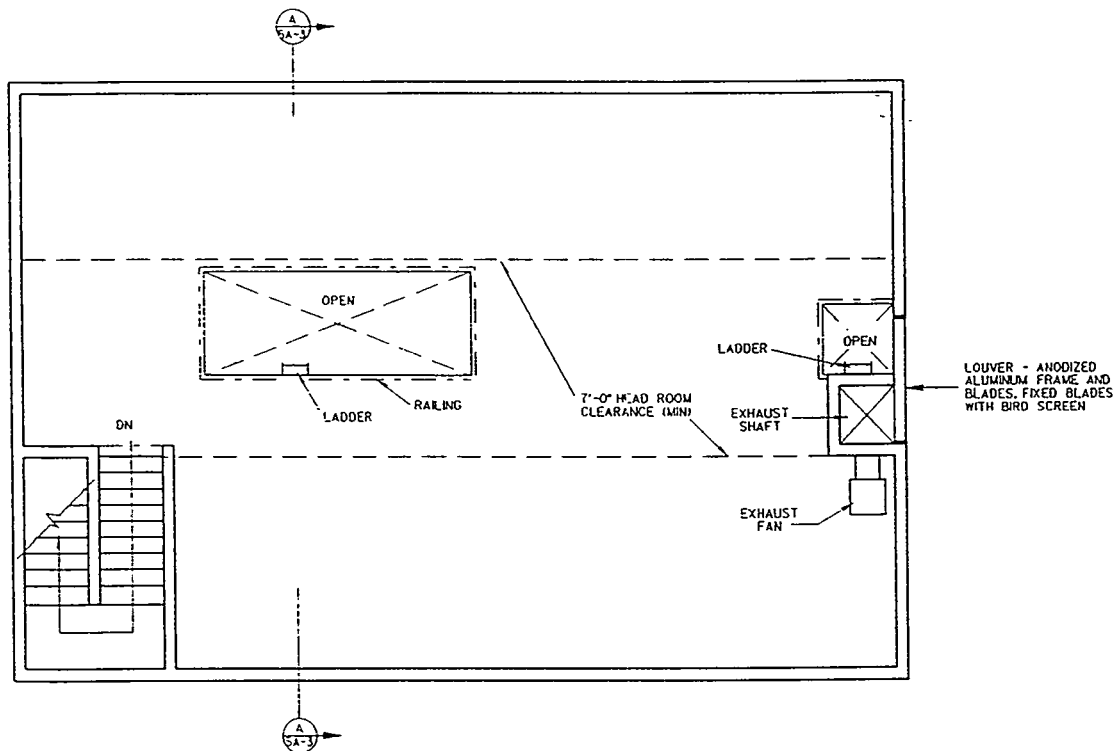
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
TRAINING TOWER SECTIONS AND ELEVATIONS	
N.E. WIEGERT DESIGNED BY	R.A. FELT CHECKED BY
N.E. WIEGERT DESIGNED BY	R.A. FELT CHECKED BY
DATE	DATE
SCALE AS SHOWN	INV. NO.
4A-2	HTCA110CN

FIRST FLOOR PLANSECOND FLOOR PLAN

SAFETY PAYS



U. S. ARMY



ATTIC FLOOR PLAN

BUILDING CODE DATA

FLOOR AREA:	FIRST FLOOR	1,750	SQ. FT.
	SECOND FLOOR	1,630	SQ. FT.
	ATTIC	1,630	SQ. FT.
	TOTAL	5,000	SQ. FT.
ALLOWABLE FLOOR AREA:	24,000	SQ. FT.	
OCCUPANCY GROUP (UBC):	B-2		
CONSTRUCTION TYPE (UBC):	TYPE 4-N		
FIRE PROTECTION:	FIRE EXTINGUISHERS		
DISABLED ACCESS:	TRAINING PROP		
	NOT INTEND FOR PUBLIC/		
	DISABLED ACCESS		

SCALE IN FEET
1" = 0' 0" 1' 2' 3' 4' 5'

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
SCBA SEARCH AND RESCUE PROP FLOOR PLANS	
DESIGNED BY P. A. W. C. D. V.	DATE
DRAWN BY P. A. W. C. D. V.	DATE
CHECKED BY	DATE
APPROVED BY	DATE
SCALE AS SHOWN - INV. NO.	FILE NO.
5A-1	

CONCRETE MASONRY
UNITS PLASTERS-
SMOOTH FACE,
INTEGRAL COLOR,
RUNNING BOND.

WINDOWS-PAINTED
HOLLOW METAL FRAMES;
W/ FIXED, 1" TINTED
INSULATING GLAZING.

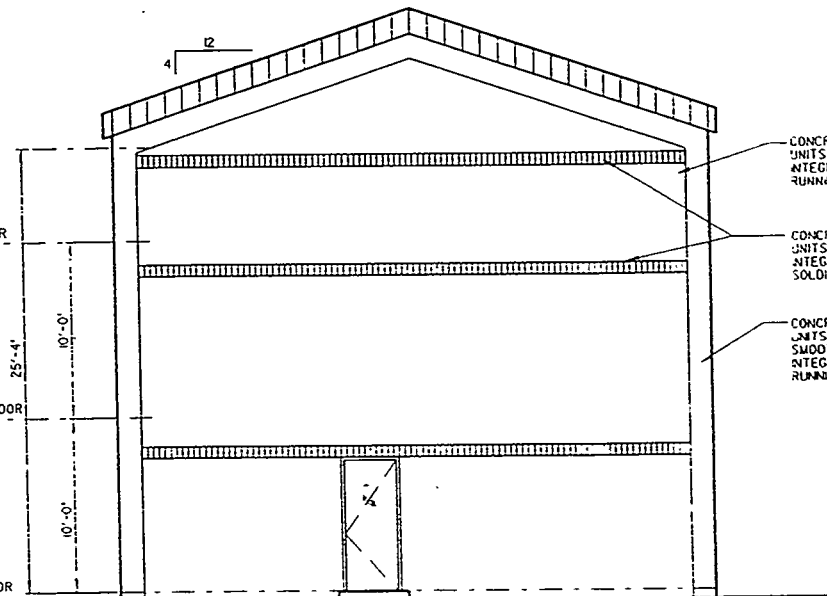
STEEL DOORS AND FRAMES, PAINTED.
DOORS GLAZED WITH TINTED GLASS.

SOUTH ELEVATION

ATTIC FLOOR

SECOND FLOOR

FIRST FLOOR



CONCRETE MASONRY
UNITS-SPLIT FACE,
INTEGRAL COLOR,
RUNNING BOND.

CONCRETE MASONRY
UNITS-SMOOTH FACE,
INTEGRAL COLOR,
SOLDIER COURSE

CONCRETE MASONRY
UNITS PLASTERS-
SMOOTH FACE,
INTEGRAL COLOR,
RUNNING BOND.

WEST ELEVATION

SAFETY PAYS



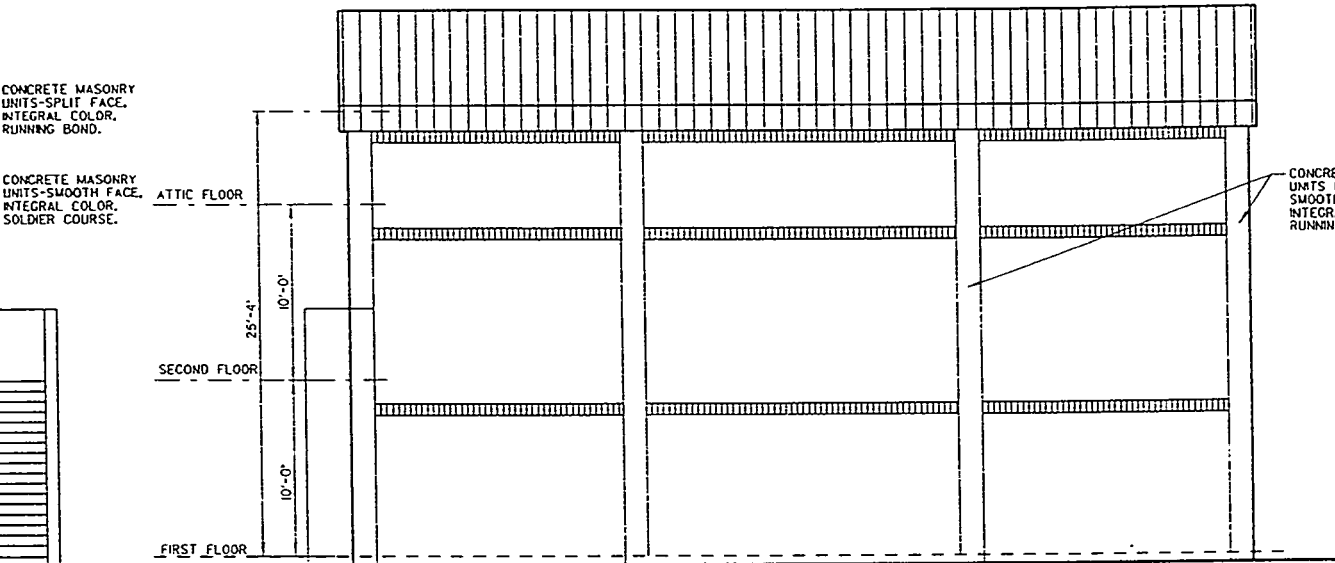
U. S. ARMY

STANDING SEAM ROOFING
OVER RIGID INSULATION
ON MTL DECKING

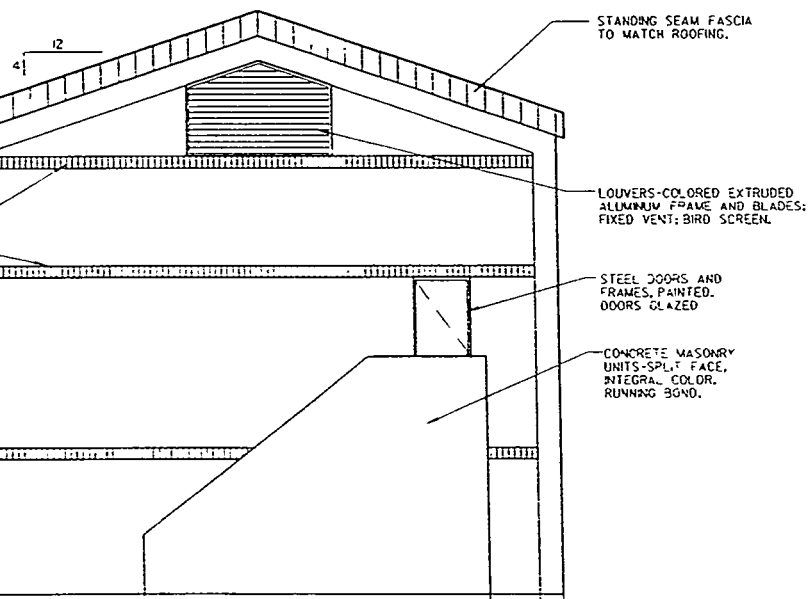
CONCRETE MASONRY
UNITS-SPLIT FACE,
INTEGRAL COLOR,
RUNNING BOND.

CONCRETE MASONRY
UNITS-SMOOTH FACE,
INTEGRAL COLOR,
SOLDER COURSE.

CONCRETE MASONRY
UNITS PLASTERS-
SMOOTH FACE,
INTEGRAL COLOR,
RUNNING BOND.



NORTH ELEVATION



EAST ELEVATION

SCALE IN FEET
1" = 0'

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
SCBA SEARCH AND RESCUE PROP ELEVATIONS	
DESIGNED BY C. YOUNG	DATE
DRAWN BY P. HAN	DATE
CHECKED BY	DATE
APPROVED BY	DATE
SCALE AS SHOWN INV. NO.	
5A-2	

VALUE ENGINEERING PAYS

/usr2/proj/hamr/dcs1/ham05a02.dgn

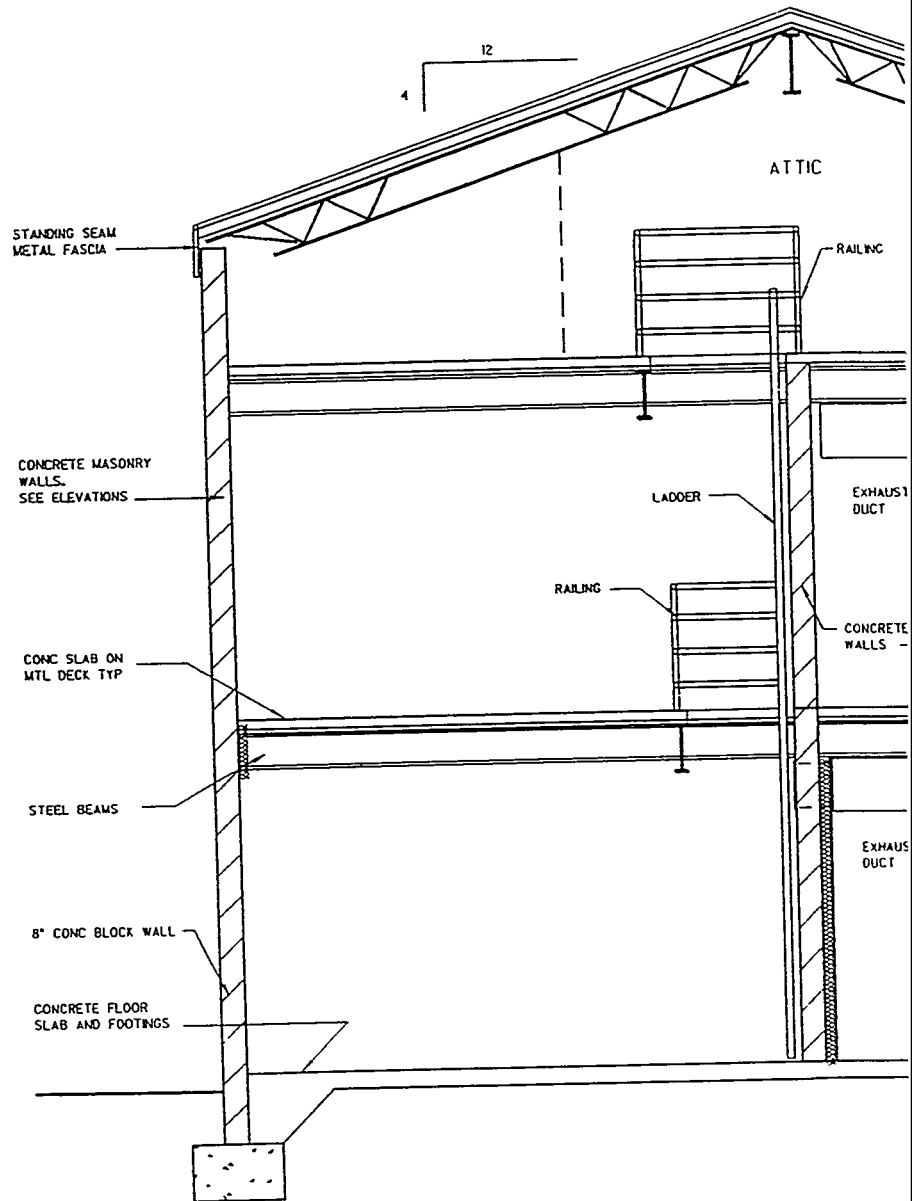
CONT. NO.

L-44

REFERENCE FILES ATTACHED

LEVELS ON FOR CONTRACT DRWS

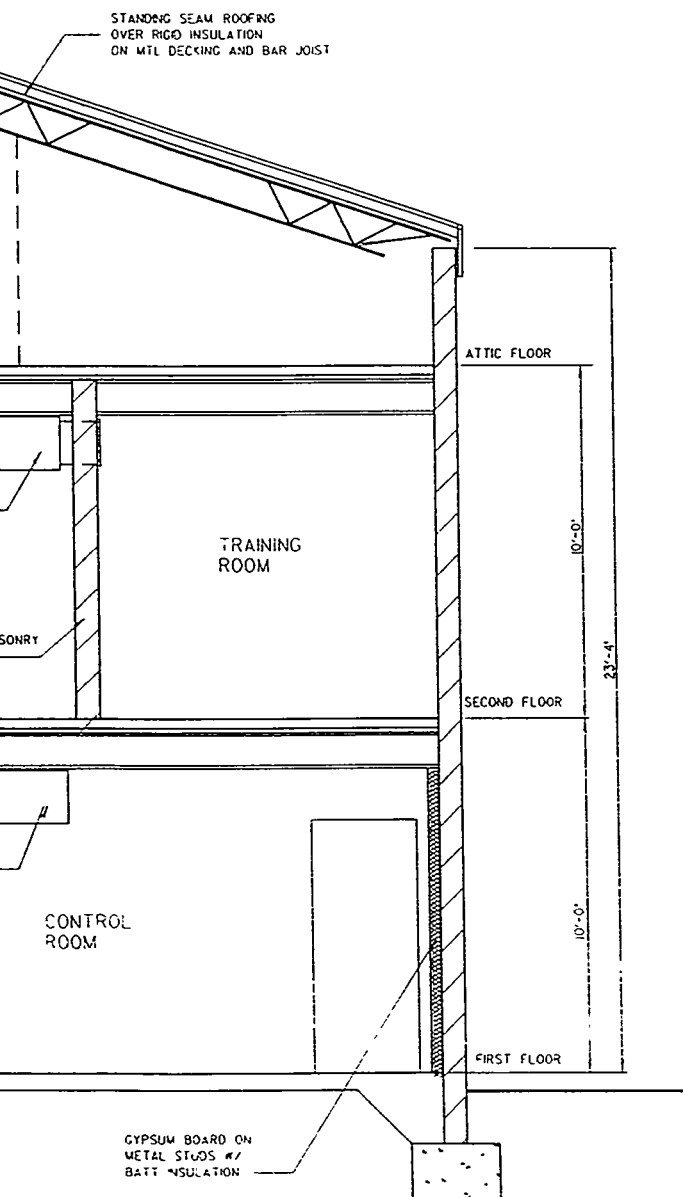
SCALE



SAFETY PAYS



U. S. ARMY

SCALE IN FEET
0 1 2 3 4

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
SCBA SEARCH AND RESCUE PROP SECTION	
SCALE AS SHOWN INV. NO.	
SA-3	

VALUE ENGINEERING PAYS

/usr2/proj/hamr/past/ham05a03.dgn

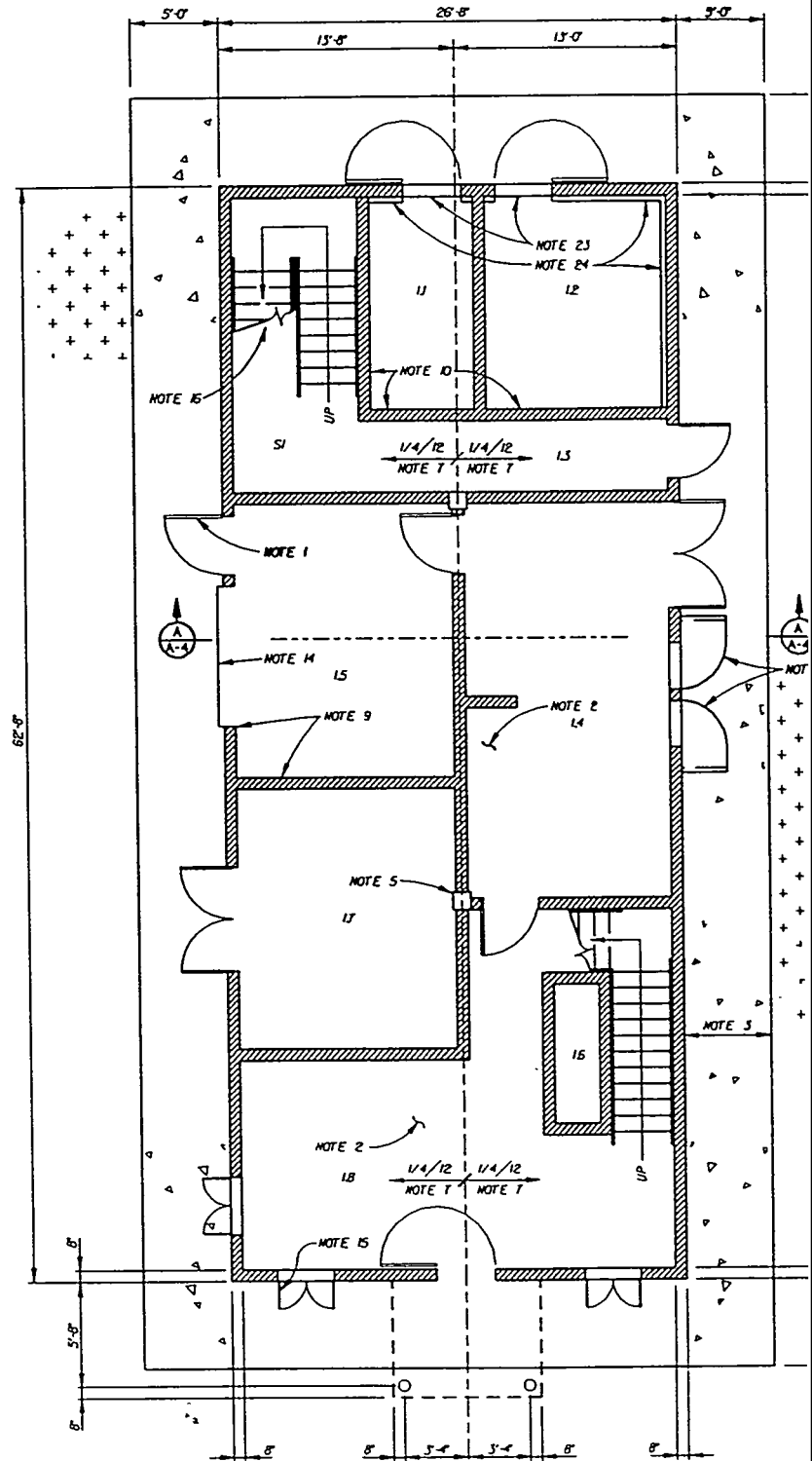
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L-45

REFERENCE FILES ATTACHED

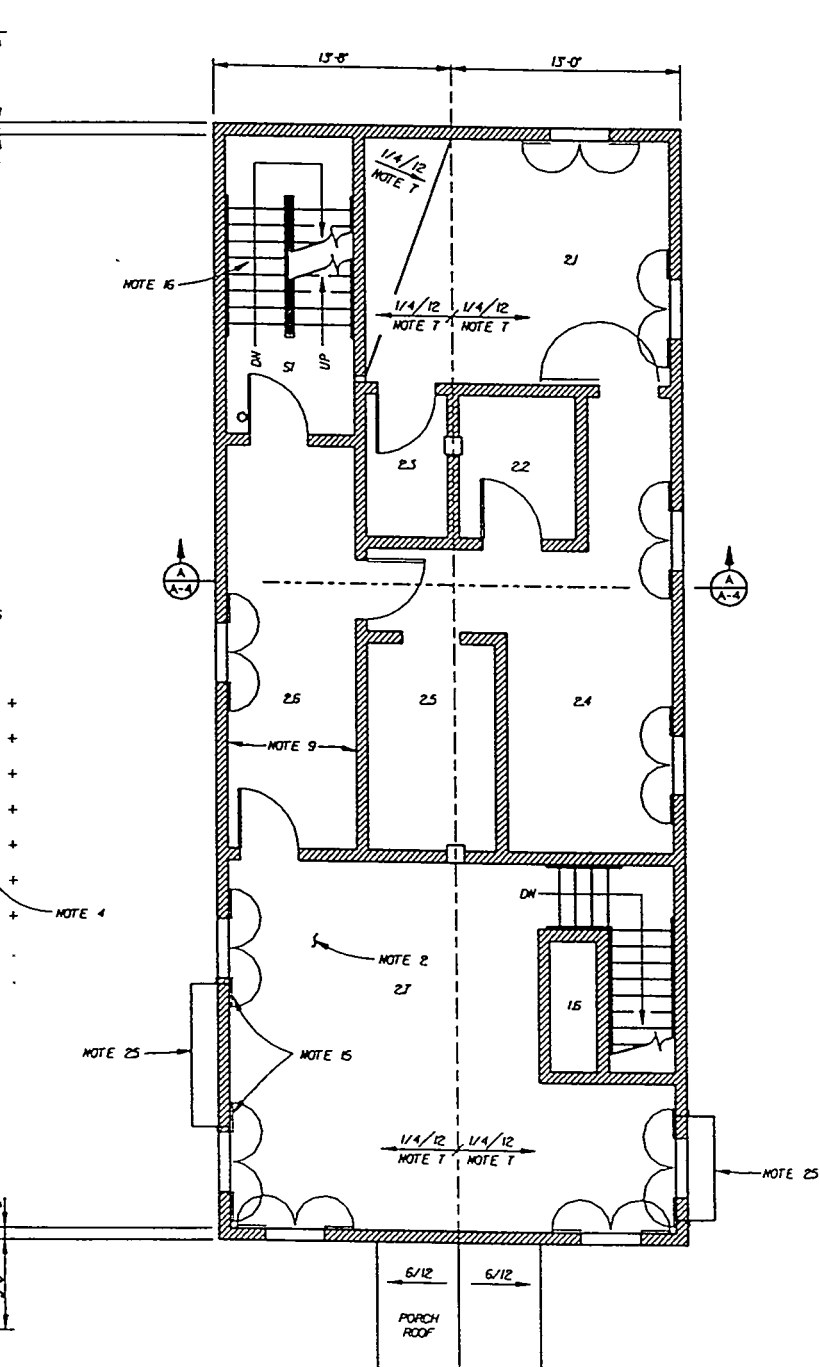
LEVELS ON FOR CONTACT DRWS

SCALE



FIRST FLOOR PLAN

RM NO	DESCRIPTION
11	CONTROL ROOM
12	STORAGE
13	CORRIDOR
14	FIRE PROP ROOM (ELECTRICAL)
15	GARAGE
16	VENT SHAFT
17	EQUIPMENT ROOM (FIRE PROPS)
18	FIRE PROP ROOM (WAREHOUSE/LIVING ROOM)
SI	STAIRWELL

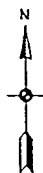


SECOND FLOOR PLAN

RM NO	DESCRIPTION
2.1	LIVING ROOM
2.2	BATH
2.3	CLOSET
2.4	FAMILY ROOM
2.5	KITCHEN
2.5	CORRIDOR
2.7	FIRE PROP ROOM (BEDROOM)
1.5	VENT SHAFT
5.1	STAIRWELL

NOTES:

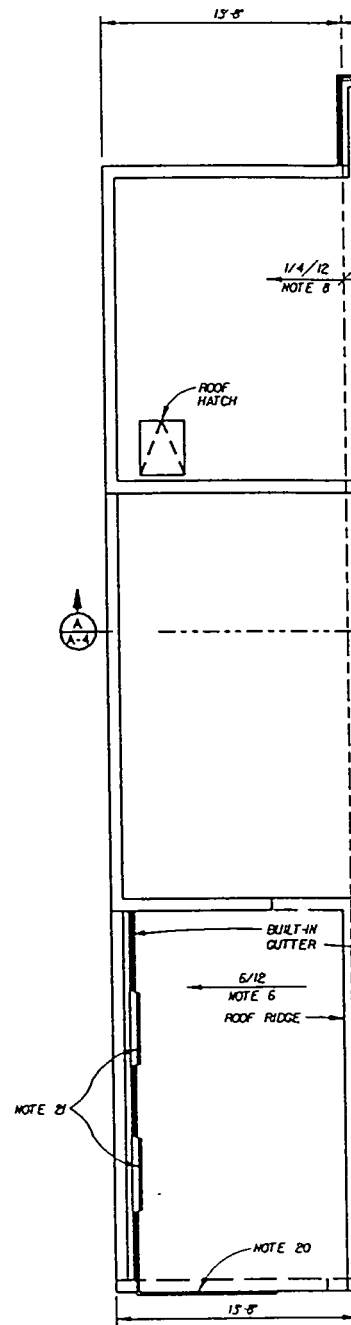
- (X INDICATES NOTES APPLICABLE TO THIS DRAWING)
- X 1. STANDARD STEEL DOOR AND FRAME (TYP. UN.)
 - X 2. FIRE PROP ROOM (3 LOCATIONS)
 - X 3. PERIMETER CONCRETE SIDEWALK ALL AROUND
 - X 4. ASPHALT CONCRETE
 - X 5. CAST-IN-PLACE CONCRETE
 - 6. 6/12 ROOF SLOPE
 - X 7. FLOOR SLOPE (1/4" PER FOOT)
 - 8. ROOF SLOPE (1/4" PER FOOT)
 - X 9. 8" CMU (INTERIOR AND EXTERIOR)
 - X 10. INSULATED CMU @ ROOM 11 AND 12
 - 11. 2" CONCRETE TOPPING OVER WP MEMBRANE OVER CONCRETE ROOF SLAB
 - 12. NOT USED
 - 13. STEEL DOOR AND FRAME @ ATTIC ACCESS DOOR
 - X 14. 8'-0" x 8'-0" EXTERIOR MOUNTED OVERHEAD ROLL-UP DOOR
 - X 15. STEEL SHUTTER WINDOWS IN STEEL FRAMES (TYP. UN.)
 - X 16. CAST IN PLACE CONCRETE STAIR
 - 17. FLOOR OPENING FOR POWER VENTILATION DUCTING FROM 15 TO ROOF TOP EXHAUST FANS
 - 18. 8" x 8" WIDE DRAIN (CMU) @ 1ST FLOOR AND CONCRETE @ BALCONIES
 - 19. SCUPPER FROM ROOFS AND INTERIOR DRAINS TO 5" DOWNSPOUT
 - 20. STEEL PIPE RAILS
 - 21. STEEL PIPE SLIDE GATES TO LATCH/LOCK (2 LOCATIONS)
 - 22. OPENING FOR VENT DUCTING TO ROOF-MOUNTED POWER VENT FANS
 - X 23. THRESHOLD
 - X 24. GYPSUM ON 3 5/8" METAL STUDS W/BATT INSULATION
 - X 25. LIGHT CONTROL HOOD @ AIR INTAKE WALL OPENINGS



SCALE IN FEET
12'-0" 5'

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
BURN STRUCTURE PROP FLOOR PLAN	
N.E. WIEGERT R.A. FELT N.E. WIEGERT S. WIEGERT	SCALE AS SHOWN IN V. NO. 6A-1 HICAS DCN



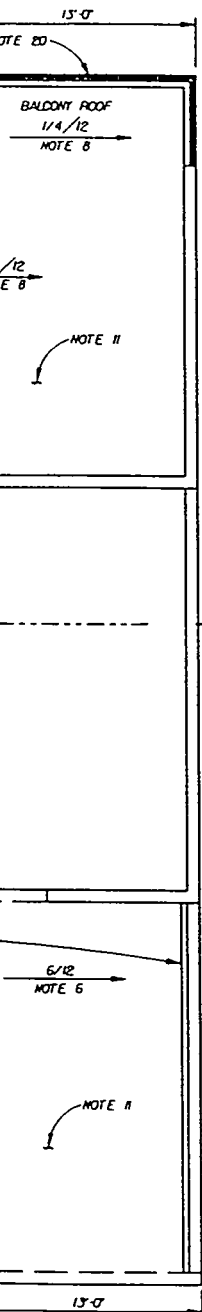
ROOF PLAN

(NOTE 11)

SAFETY PAYS

24

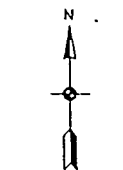
U. S. ARMY



NOTES:

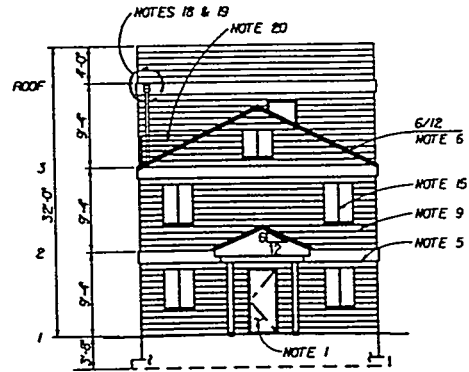
(X INDICATES NOTES APPLICABLE TO THIS DRAWING)

- X 1. STANDARD STEEL DOOR AND FRAME (TYP. UN.)
- 2. FIRE PROP ROOM (3 LOCATIONS)
- 3. PERIMETER CONCRETE SIDEWALK ALL AROUND
- 4. ASPHALT CONCRETE
- X 5. CAST-IN-PLACE CONCRETE
- X 6. 6/12 ROOF SLOPE
- X 7. FLOOR SLOPE (1/4" PER FOOT)
- X 8. ROOF SLOPE (1/4" PER FOOT)
- X 9. 8" CMU (INTERIOR AND EXTERIOR)
- X 10. INSULATED CMU @ ROOM 11 AND 12
- X 11. 2" CONCRETE TOPPING OVER WP MEMBRANE OVER CONCRETE ROOF SLAB
- 12. NOT USED
- X 13. STEEL DOOR AND FRAME @ ATTIC ACCESS DOOR
- 14. 8'-0" x 8'-0" EXTERIOR MOUNTED OVERHEAD ROLL-UP DOOR
- X 15. STEEL SHUTTER WINDOWS IN STEEL FRAMES (TYP. UN.)
- X 16. CAST IN PLACE CONCRETE STAIR
- X 17. FLOOR OPENING FOR POWER VENTILATION DUCTING FROM 16 TO ROOF TOP EXHAUST FANS
- 18. 8" x 8" WIDE DRAIN (CMU) @ 1ST FLOOR AND CONCRETE @ BALCONIES
- 19. SCUPPER FROM ROOFS AND INTERIOR DRAINS TO 3" DOWNSPOUT
- X 20. STEEL PIPE RAILS
- X 21. STEEL PIPE SLIDE GATES TO LATCH/LOCK (2 LOCATIONS)
- X 22. WALL OPENING FOR VENT DUCTING TO ROOF-MOUNTED POWER VENT FANS
- 23. THRESHOLD
- 24. GYPSUM ON 3 5/8" METAL STUDS W/BATT INSULATION
- X 25. LIGHT CONTROL HOOD @ AIR INTAKE WALL OPENINGS

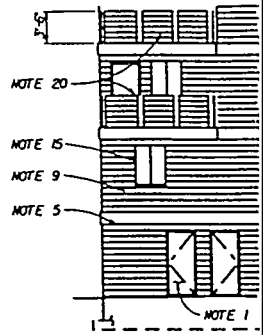
SCALE IN FEET
12"=0 5

COMPUTER
AIDED
DESIGN &
DRAFTING

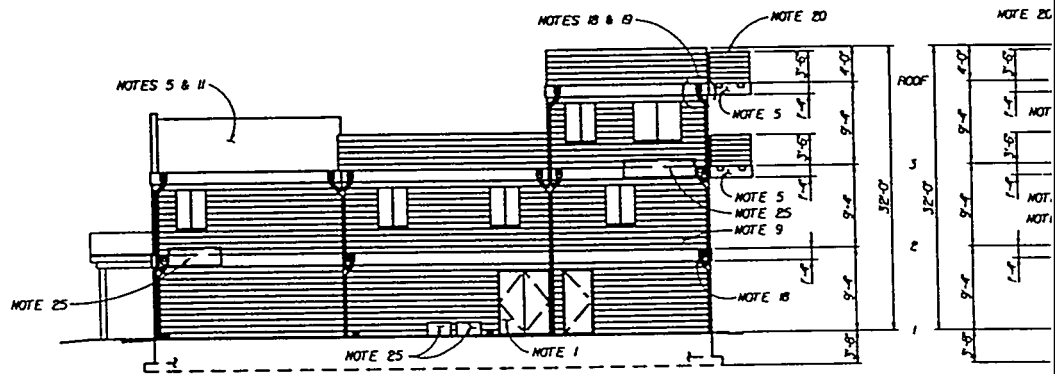
REVISION		DATE	BY	CHKD	APPD
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
N.E. WIEGERT DESIGNED BY		HAMMER TRAINING CENTER			
R.A. FELT CHECKED BY		HANFORD RESERVATION, WASHINGTON			
N.E. WIEGERT SUPERVISOR		BURN STRUCTURE PROP FLOOR AND ROOF PLANS			
SUBMITTER		APPROVED			
DATE		DATE			
SCALE AS SHOWN		INV. NO.			
SHEET NO.		FILE NO.			
5A-2		HTCA7.DCN			



SOUTH ELEVATION



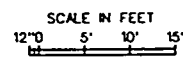
NORTH ELEVATION

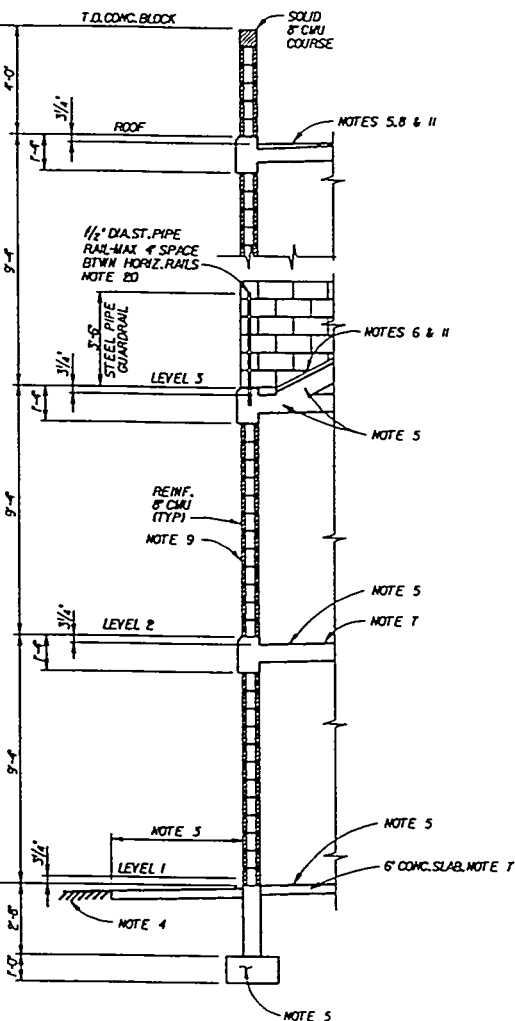


EAST ELEVATION



INTERIOR BACKGROUND ITEMS NOT SHOWN OR CALLED.
SEE 6A-1 AND 6A-2



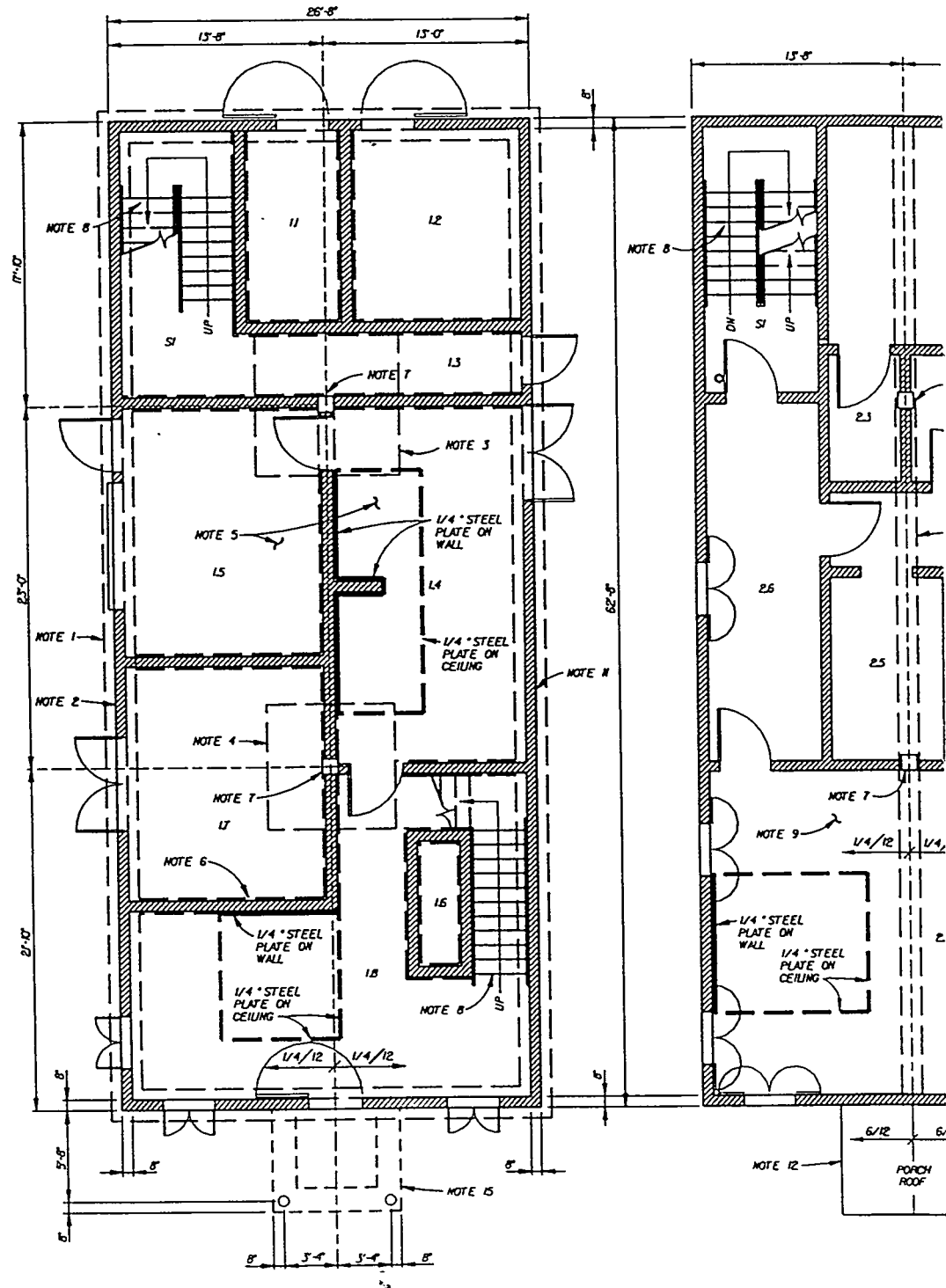


NOTES:

- (X) INDICATES NOTES APPLICABLE TO THIS DRAWING
- X 1. STANDARD STEEL DOOR AND FRAME (TYP. UN.)
 2. FIRE PROP ROOM (3 LOCATIONS)
 - X 3. PERIMETER CONCRETE SIDEWALK ALL AROUND
 - X 4. ASPHALT CONCRETE
 - X 5. CAST-IN-PLACE CONCRETE
 - X 6. 6/12 ROOF SLOPE
 - X 7. FLOOR SLOPE (1/4" PER FOOT)
 - X 8. ROOF SLOPE (1/4" PER FOOT)
 - X 9. 8" CMU (INTERIOR AND EXTERIOR)
 - X 10. INSULATED CMU @ ROOM 11 AND 12
 - X 11. 2" CONCRETE TOPPING OVER WP MEMBRANE OVER CONCRETE ROOF SLAB
 12. NOT USED
 13. STEEL DOOR AND FRAME @ ATTIC ACCESS DOOR
 14. 8'-0" x 8'-0" EXTERIOR MOUNTED OVERHEAD ROLL-UP DOOR
 15. STEEL SHUTTER WINDOWS IN STEEL FRAMES (TYP. UN.)
 16. CAST IN PLACE CONCRETE STAIR
 17. FLOOR OPENING FOR POWER VENTILATION DUCTING FROM IG TO ROOF TOP EXHAUST FANS
 - X 18. 8" x 8" WIDE DRAIN (CMU) @ 1ST FLOOR AND CONCRETE @ BALCONIES
 - X 19. SCUPPER FROM ROOFS AND INTERIOR DRAINS TO 3" DOWNSPOUT
 - X 20. STEEL PIPE RAILS
 21. STEEL PIPE SLIDE GATES TO LATCH/LOCK (4 LOCATIONS)
 22. OPENING FOR VENT DUCTING TO ROOF-MOUNTED POWER VENT FAN
 23. THRESHOLD
 24. GYPSUM ON 3 5/8" METAL STUDS W/ BATT INSULATION
 25. LIGHT CONTROL HOOD @ AIR INTAKE WALL OPENINGS

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON BURN STRUCTURE PROP BUILDING SECTIONS	
N.E. WIEGERT IN CHARGE OF R.A. FELT IN CHARGE OF "ELECT. & MECH." N.E. WIEGERT CHECKED BY SUPERVISOR DATE	SCALE AS SHOWN IN V. NO. SHEET NO. 6A-4 FILE NO. HTCA9.DGN

COMPUTER
AIDED
DESIGN &
DRAFTING

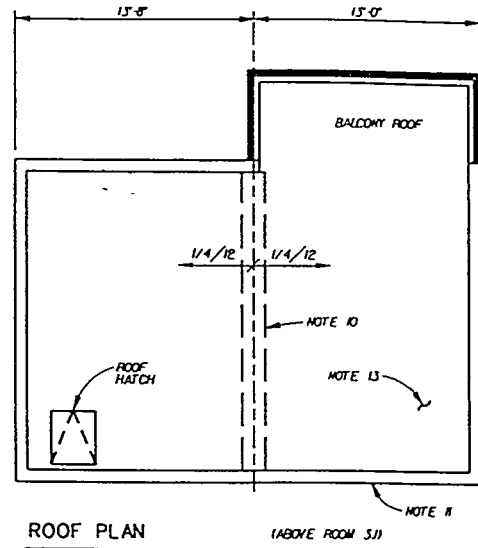
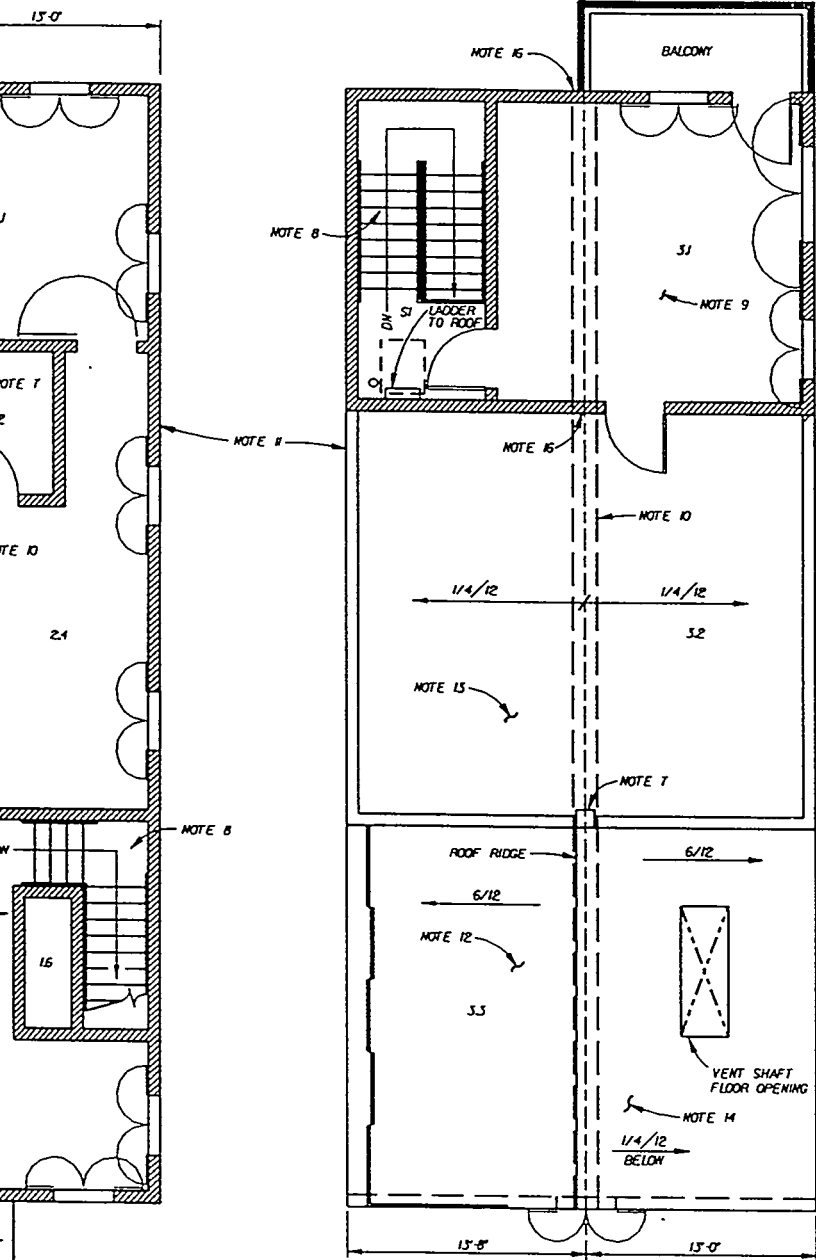


FOUNDATION/FIRST FLOOR PLAN

RM NO	DESCRIPTION
11	CONTROL ROOM
12	STORAGE
13	CORRIDOR
14	FIRE PROP ROOM (ELECTRICAL)
15	GARAGE
16	VENT SHAFT
17	EQUIPMENT ROOM (FIRE PROPS)
18	FIRE PROP ROOM (WAREHOUSE/LIVING ROOM)
SI	STAIRWELL

SECOND FLOOR PLAN

RM NO	DESCRIPTION
21	LIVING ROOM
22	BATH
23	CLOSET
24	FAMILY ROOM
25	KITCHEN
26	CORRIDOR
27	FIRE PROP ROOM (BEDROOM)
SI	VENT SHAFT
SI	STAIRWELL



NOTES:

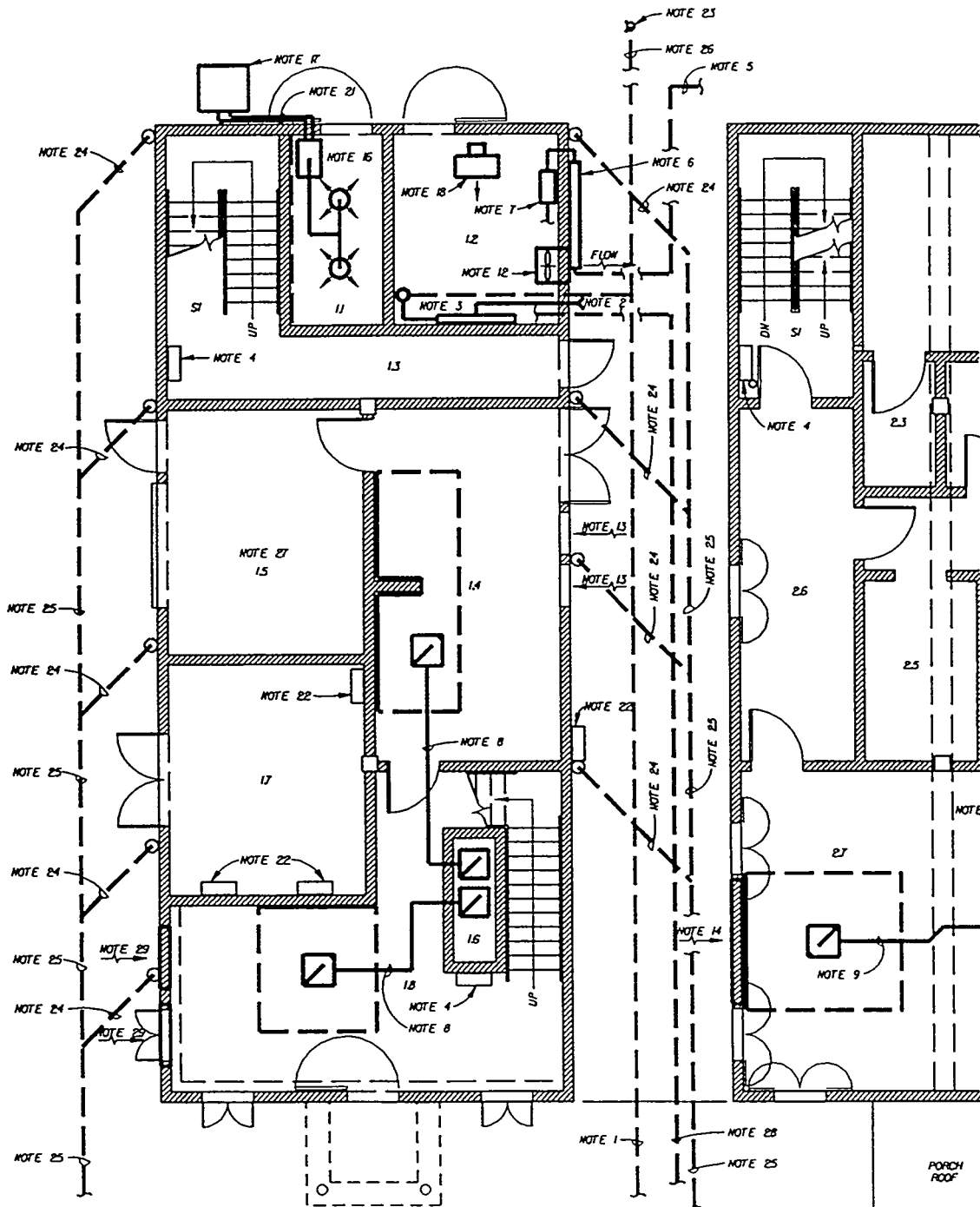
1. 2'-0" WIDE x 1'-0" THICK CONTINUOUS SPREAD FOOTING.
2. 8" WIDE x 2'-8" HIGH CAST IN PLACE CONCRETE STEINWALL.
3. FOOTING 9'-0" x 9'-0" x 1'-6".
4. FOOTING 8'-0" x 8'-0" x 1'-4".
5. 6" CONCRETE SLAB ON GRADE.
6. THICKEN SLAB TO 1'-0" UNDER INTERIOR NON-BEARING MASONRY WALLS.
7. 1'-0" x 1'-0" CAST IN PLACE CONCRETE COLUMN.
8. CAST IN PLACE CONCRETE STAIRS.
9. 8" CAST IN PLACE CONCRETE FLOOR SLAB.
10. 16" WIDE x 22" HIGH CAST IN PLACE CONCRETE BEAM.
11. 8" LIGHTWEIGHT CONCRETE MASONRY UNIT (CMU) WALLS.
12. 6" SLOPED CAST IN PLACE CONCRETE ROOF SLAB.
13. 2" CONCRETE TOPPING OVER MEMBRANE OVER 8" CONCRETE SLAB.
14. 8" CAST IN PLACE CONCRETE ATTIC FLOOR SLAB BELOW.
15. 6" CONCRETE PORCH SLAB W/THICKENED EDGE.
16. 8" x 24" CMU WALL COLUMN.



SCALE IN FEET
12" = 0' 5'

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
BURN STRUCTURE PROP FOUNDATION AND ROOF FRAMING PLAN	
W.B. SWIGERT DESIGNED BY	APPROVED
R.A. FELT CHECKED BY	DATE
W.B. SWIGERT SUPERVISOR	SCALE AS SHOWN IN NO.
DATE	FILE NO.
65-1	HTCSJ.DGN



FOUNDATION/FIRST FLOOR PLAN

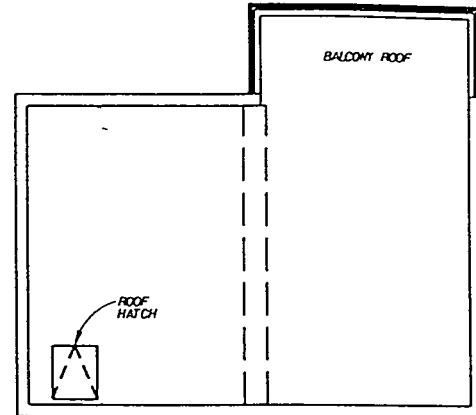
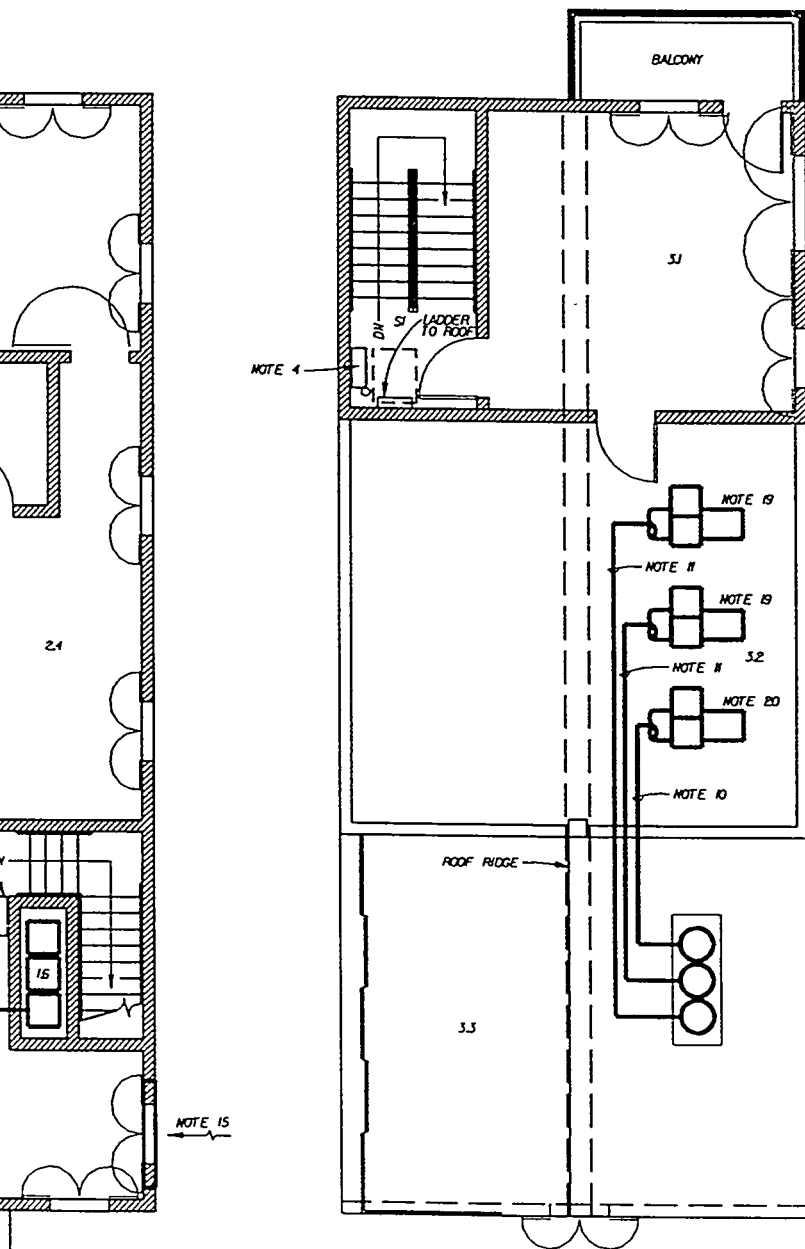
RM NO	DESCRIPTION
1.1	CONTROL ROOM
1.2	STORAGE
1.3	CORRIDOR
1.4	FIRE PROP ROOM (ELECTRICAL)
1.5	GARAGE
1.6	VENT SHAFT
1.7	EQUIPMENT ROOM (FIRE PROPS)
1.8	FIRE PROP ROOM (WAREHOUSE/LIVING ROOM)
1.9	STAIRWELL

SECOND FLOOR PLAN

RM NO	DESCRIPTION
2.1	LIVING ROOM
2.2	BATH
2.3	CLOSET
2.4	FAMILY ROOM
2.5	KITCHEN
2.6	CORRIDOR
2.7	FIRE PROP ROOM (BEDROOM)
2.8	VENT SHAFT
2.9	STAIRWELL

SAFETY PAYS

U. S. ARMY



ROOF PLAN

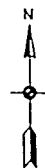
(ABOVE ROOM 3J)

NOTES:

1. 8" FIRE WATER LINE.
2. FIRE DEPARTMENT CONNECTION (2) S.
3. FIRE WATER VALVE STATIONS.
4. DRY STANDPIPE, FIRE HOSE CABINET, (15) PLACES.
5. 3" LPG LINE.
6. INLET GAS CONTROL.
7. AUTOMATIC GAS SHUTOFF VALVES.
8. 24" W x 14" H EXHAUST DUCT.
9. 30" W x 14" H EXHAUST DUCT.
10. 18" Ø EXHAUST DUCT.
11. 20" Ø EXHAUST DUCT.
12. STORAGE ROOM EXHAUST FAN.
13. 32" W x 32" H WALL OPENING WITH HOOD FOR AIR INTAKE @ FLOOR LEVEL.
14. 96" W x 16" H WALL OPENING WITH HOOD FOR AIR INTAKE @ FLOOR LEVEL.
15. 12" W x 16" H WALL OPENING WITH HOOD FOR AIR INTAKE @ FLOOR LEVEL.
16. COMPUTER ROOM AIR HANDLING UNIT.
17. COMPUTER ROOM AIR COOLED CONDENSER.
18. STORAGE ROOM ELECTRIC UNIT HEATER.
19. CENTRIFUGAL EXHAUST FAN, 6000 CFM.
20. CENTRIFUGAL EXHAUST FAN, 9000 CFM.
21. REFRIGERATION PIPING.
22. BURNER CONTROL ASSEMBLY.
23. FIRE HYDRANT.
24. 10" DRAIN FROM SCUPPER.
25. 12" DRAIN FOR FIRE WATER.
26. 6" FIRE WATER LINE.
27. DRY PIPE SPRINKLER SYSTEM (2 PLACES).
28. 4" POTABLE WATER.
29. 48" W x 16" H WALL OPENING WITH HOOD FOR AIR INTAKE @ FLOOR LEVEL.

THIRD FLOOR/ROOF PLAN

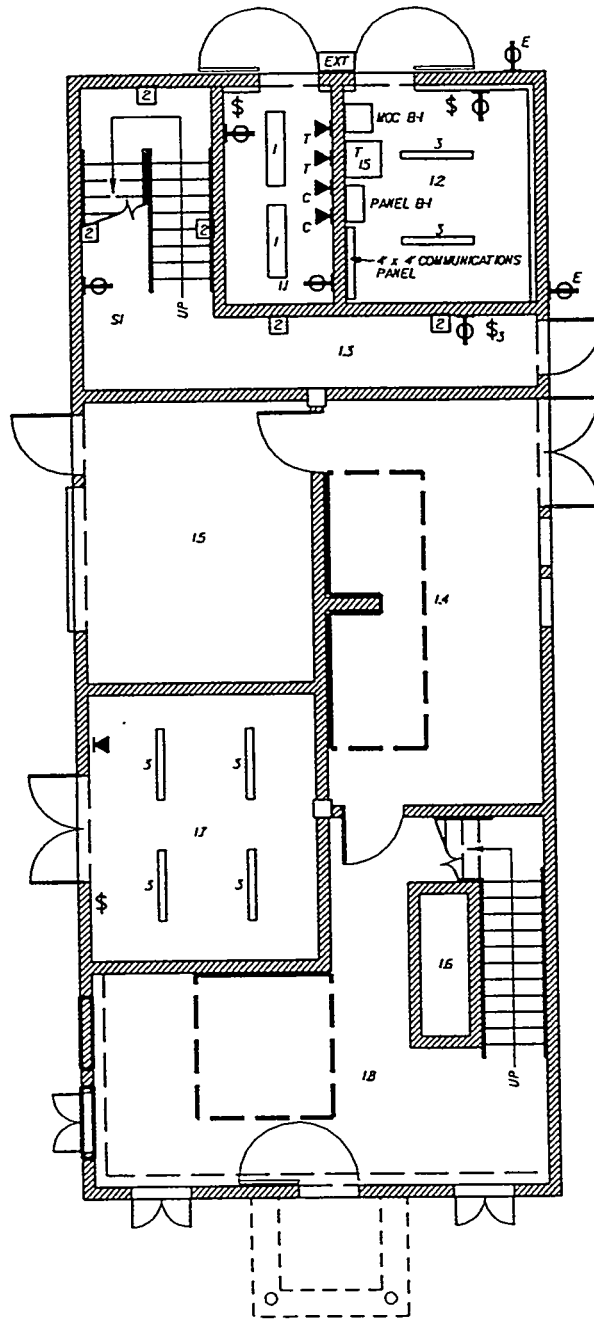
RM NO	DESCRIPTION
3J	TRAINING AREA
3.2	ROOF TOP MECHANICAL AREA
3.3	ATTIC



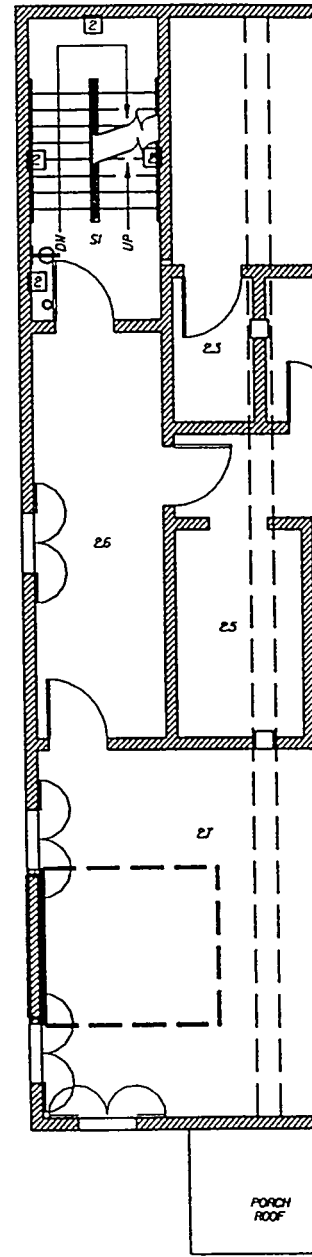
SCALE IN FEET
12" = 0' 5'

COMPUTER
AIDED
DESIGN &
DRAFTING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
K. S. SIKAND R. A. FELT K. S. SIKAND S. S. SIKAND	HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON BURN STRUCTURE PROP MECHANICAL PLAN
SCALE AS SHOWN IN NO. 6M-1	H1C42.DCW



FIRST FLOOR PLAN



SECOND FLOOR PLAN

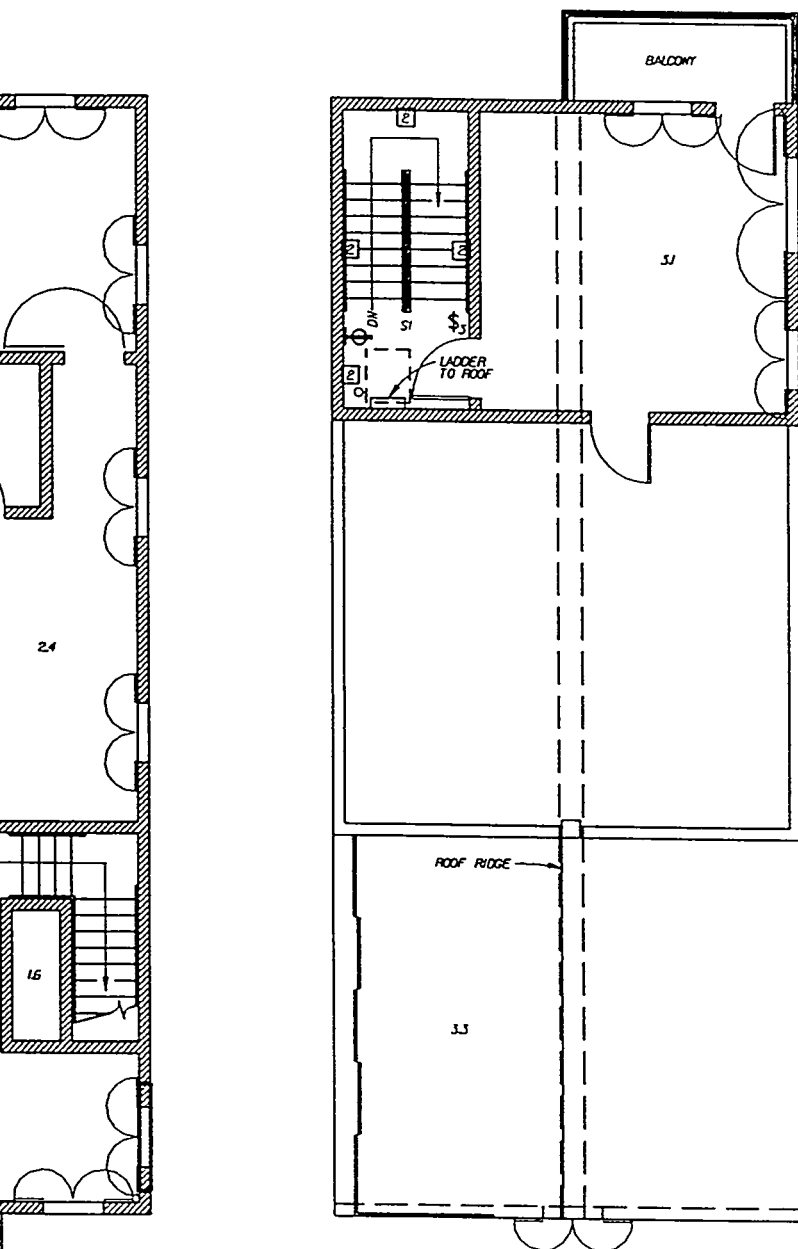
LEGEND:

1. CEILING MOUNTED FLOURESCENT LIGHT FIXTURE
NUMBER INDICATES NOTE, WHICH SPECIFIES TYPE.
2. WALL MOUNTED FLOURESCENT LIGHTING FIXTURE
NUMBER INDICATES NOTE, WHICH SPECIFIES TYPE.
3. EXTERIOR LIGHT FIXTURE (HIGH PRESSURE SODIUM)
4. DRY TYPE STEPDOWN TRANSFORMER AND SIZE (KVA)
480V 3P-208/120V 3P-4WIRE
5. GROUNDED DUPLEX OUTLET, SUBSCRIPT W-WATERPROOF
6. WALL SWITCH - SINGLE POLE OR SUBSCRIPT
INDICATES 3-WAY
7. TELEPHONE JACK-T
COMPUTER JACK-C

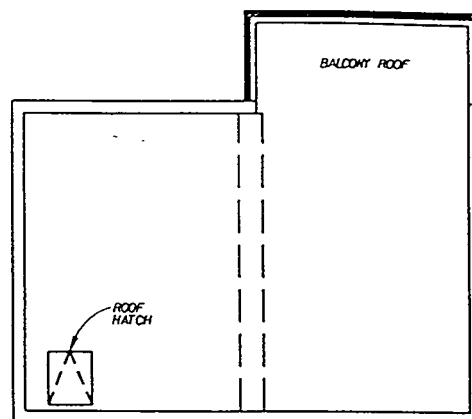
NOTES:

1. FLOURESCENT LIGHTING FIXTURE 120 VAC
1" x 4"-E LAMP RAPID START
2. INTERIOR STAIRWELL LIGHTING 120 VAC
VANDAL/WATER RESISTANT FLOURESCENT
COMMERCIAL/INDUSTRIAL FIXTURE
3. FLOURESCENT LIGHTING FIXTURE 120 VAC
4" x 4"-LAMP RAPID START
4. EXTERIOR LIGHTING OVER DOORS 120 VAC
VANDAL RESISTANT HIGH PRESSURE SODIUM
WALL MOUNT
5. DRY TRANSFORMER INDOOR MOUNTING

PANEL SCHEDULE
208/120 VOLTS, 3
A.I.C. RATING
CKT./LOAD
STAIR WELL LIGHTS
EXTERIOR DUPLEX C
STORAGE RM. DUPL
LIGHTS RM 1,7
SPARE
SPARE



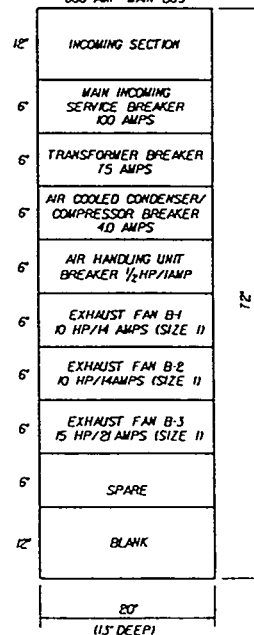
THIRD FLOOR/ROOF PLAN



ROOF PLAN

(ABOVE RM 3.1)

MCC B-1
480/277 VOLT 3 PHASE, 4 WIRE
600 AMP MAIN BUS



PANEL B-1			
E 4 WIRE			
BKR AMPS	ABC 100 AMPS	BUS AMPS	100
		BKR AMPS	CXT/LOAD
L 2 & 3 CKT A	20	20	EXTERIOR LIGHTS CKT B 150 W
ETS CKT C/1800 W	20	20	DUPLEX OUTLETS LVL 1, 2, 3 CKT D/1800 W
LTS CKT E/1800 W	20	20	CONTROL RM DUPLEX OUTLET CKT F/2400W
	20	20	SPARE
	20	20	SPARE
	20	20	SPARE

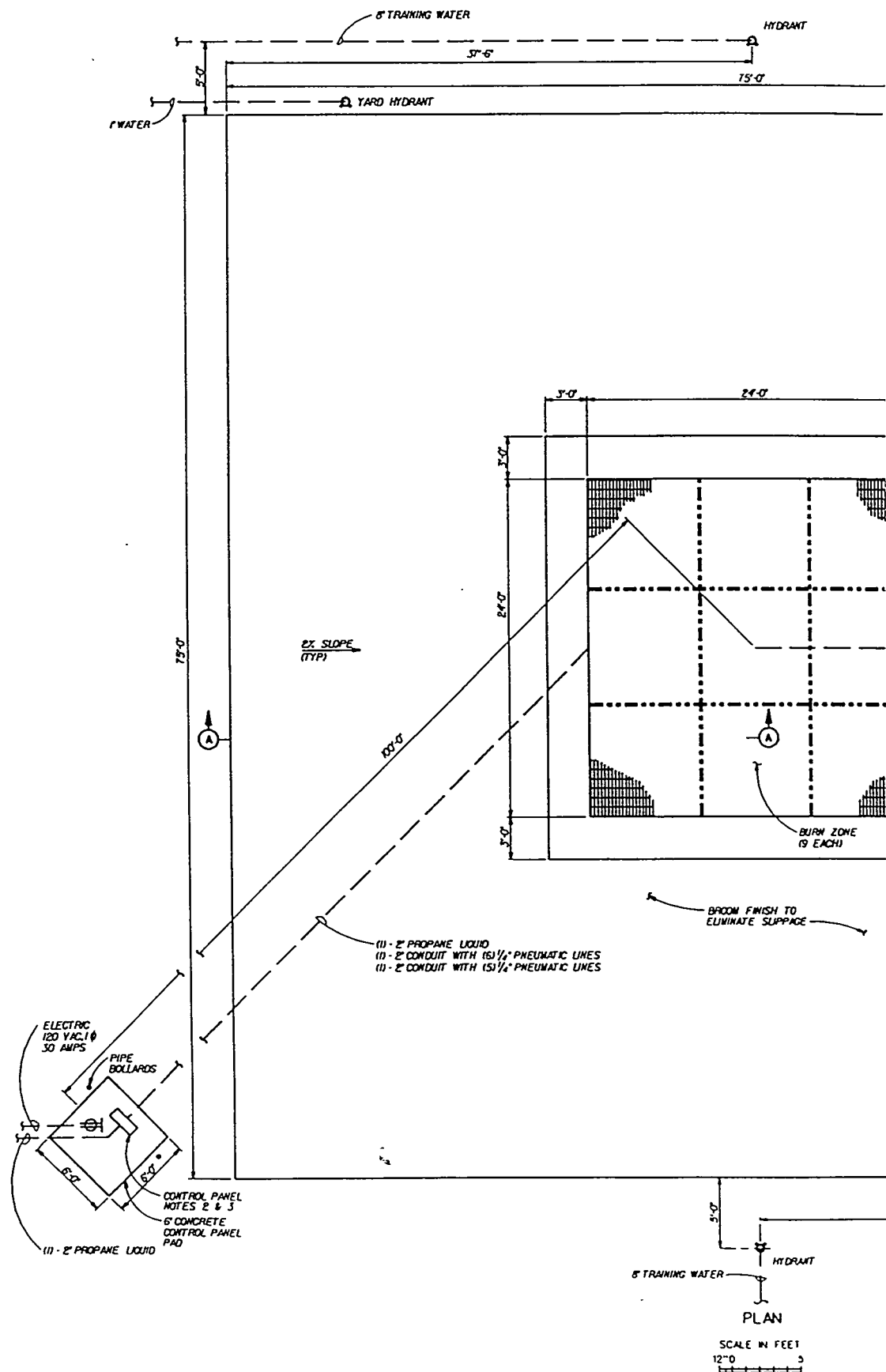


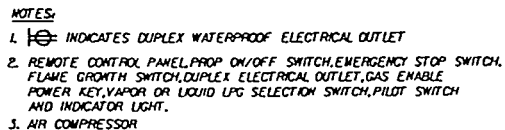
SCALE IN FEET
12" 0 5'

Computer Aided Design & Drafting

REVIEW PLANNING

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
D. A. BAILEY in Charge of R. A. FELT in Charge of D. A. BAILEY in Charge of	HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON BURN STRUCTURE PROP ELECTRICAL PLAN
DATE: 6E-1	SCALE AS SHOWN/INV. NO. HTCE2.DGN

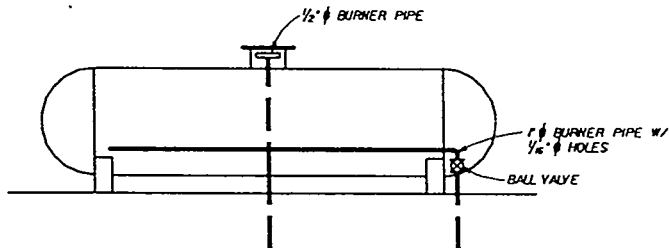
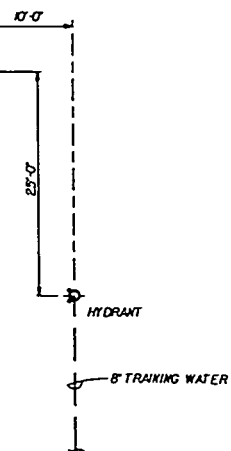


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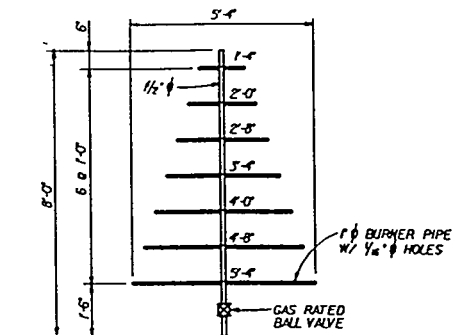
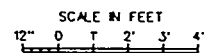


SCALE IN FEET

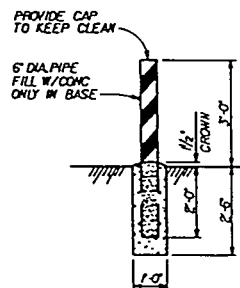
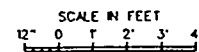
12" 0 5' 10' 15'



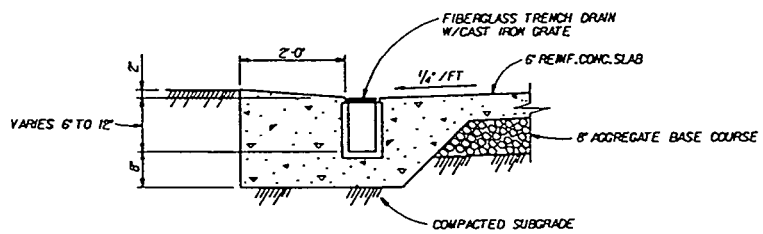
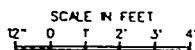
LPG TANK ELEVATION



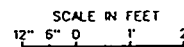
X-MAS TREE ELEVATION



DETAIL A



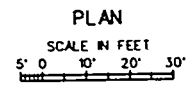
SECTION A



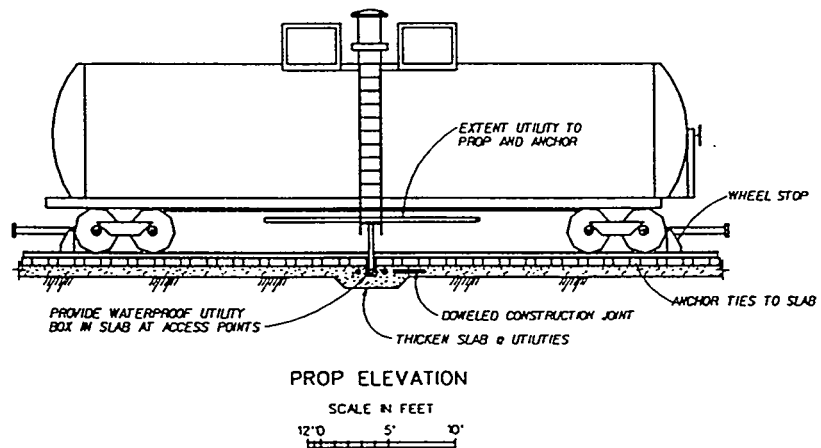
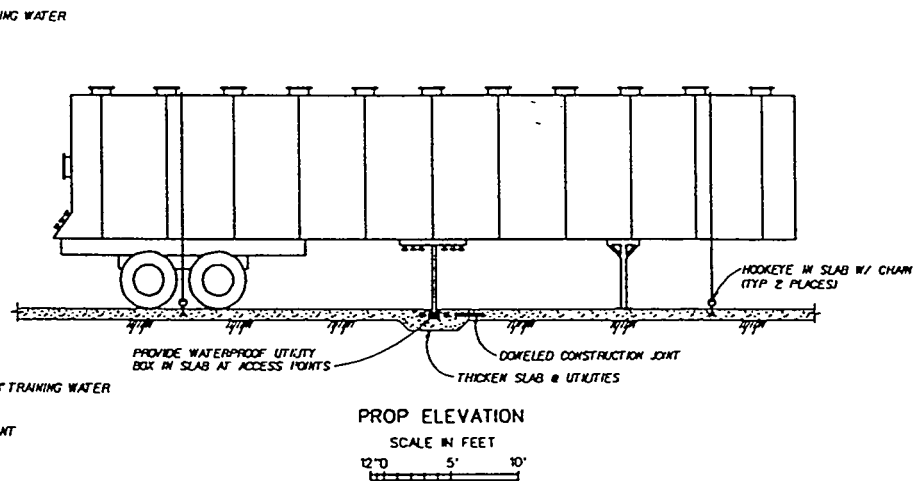
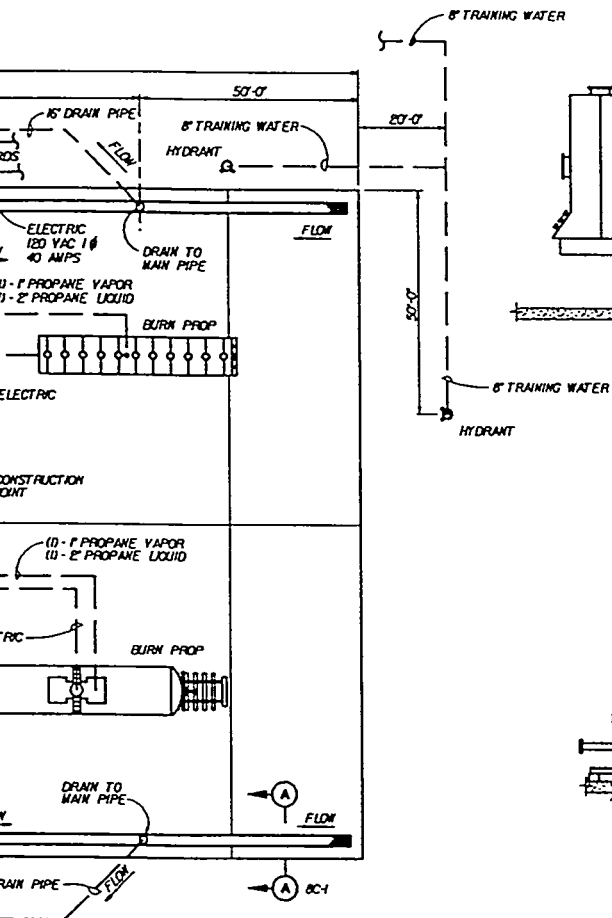
NOTES:

1. CHRISTMAS TREE PROP AND ALL GAS VALVES, PIPING, INSTRUMENTATION AND CONTROLS FOR BOTH PROPS TO BE PROVIDED BY A VENDOR SPECIALIZING IN FIRE PROP DESIGN AND MANUFACTURE.
2. ~~10~~ INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET
3. REWIRE CONTROL PANEL PROP ON/OFF SWITCH, EMERGENCY STOP SWITCH, FUSE, 60 AMP SWITCH, DUPLEX ELECTRICAL OUTLET, GAS ENABLE POWER KEY, VAPOR OR LIQUID LPG SELECTION SWITCH, PILOT SWITCH AND INDICATOR LIGHT.

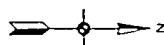
[illegible]



PLAN

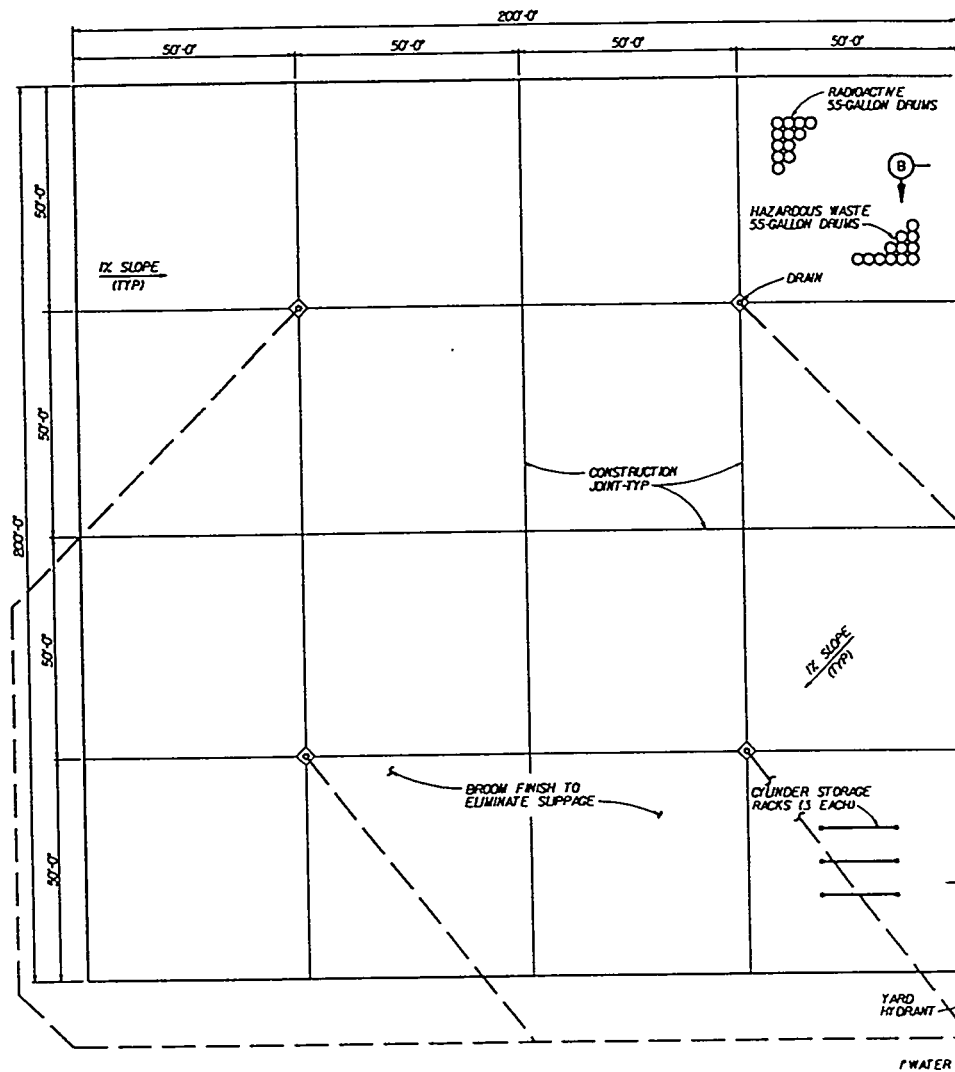


- NOTES:
1. TANK CARS AND TANK TRAILERS ARE GOVERNMENT FURNISHED EQUIPMENT.
 2. ~~W~~ INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET
 3. REMOTE CONTROL PANEL/PROP ON/OFF SWITCH, EMERGENCY STOP SWITCH, FLAME SWITCH, DUPLEX ELECTRICAL OUTLET, GAS ENABLE POWER KEY, PILOT SWITCH AND INDICATOR LIGHT.
 4. REMOTE CONTROL PANEL WITH ON/OFF SMOKE GENERATORS AND ON/OFF LEAK PROPS.



COMPUTER
AIDED
DESIGN &
DRAFTING

[illegible]

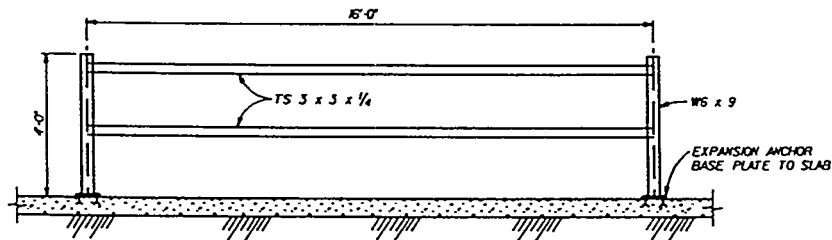


PLAN
SCALE IN FEET
12' 0" 5' 10' 15'

SAFETY PAYS

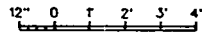
34

U. S. ARMY



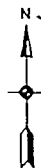
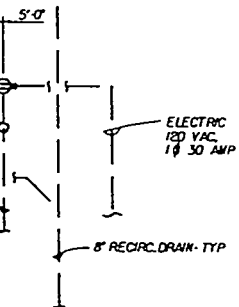
STORAGE RACK

SCALE IN FEET



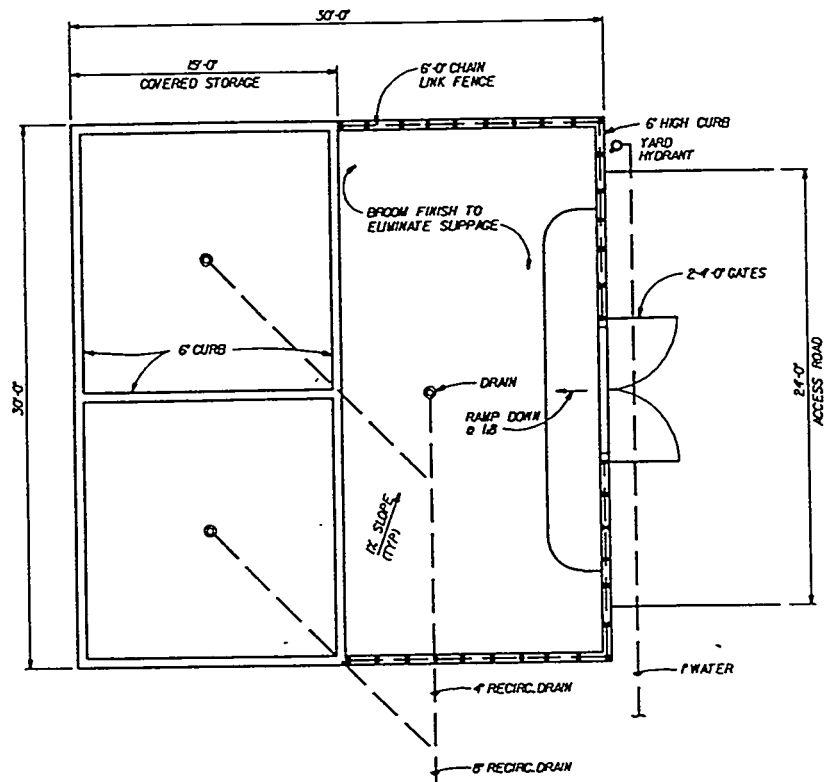
NOTES:

1. DRUM AND CYLINDER PROPS AND 55 GAL. DRUMS ARE GOVERNMENT FURNISHED EQUIPMENT.
2. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET



COMPUTER
AIDED
DESIGN &
DRAFTING

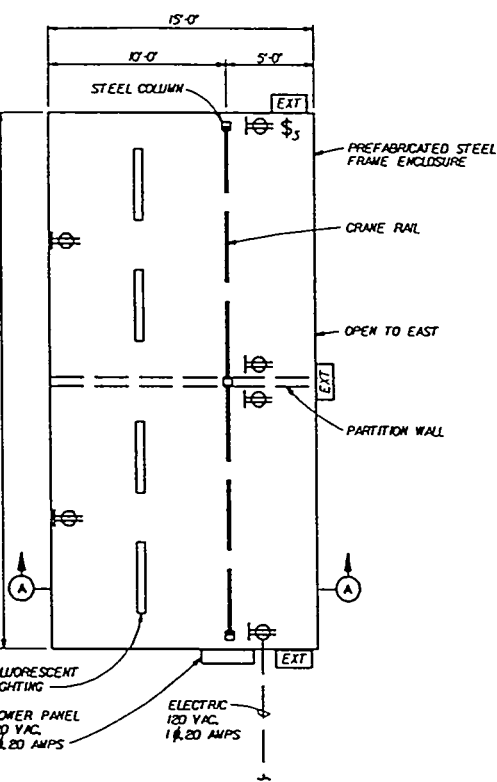
REVISION	DATE	DESCRIPTION	BY	CHECKED
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON				
W.B. SWICERT DESIGNED BY		HAMMER TRAINING CENTER		
R.A. FELT CHECKED BY		HANFORD RESERVATION, WASHINGTON		
W.B. SWICERT DRAWN BY		HAZMAT TRAINING PAD		
DATE		SCALE AS SHOWN IN V. NO.		
SHEET NO.		PROJECT NO.		
100-1		HTCC15.DGN		



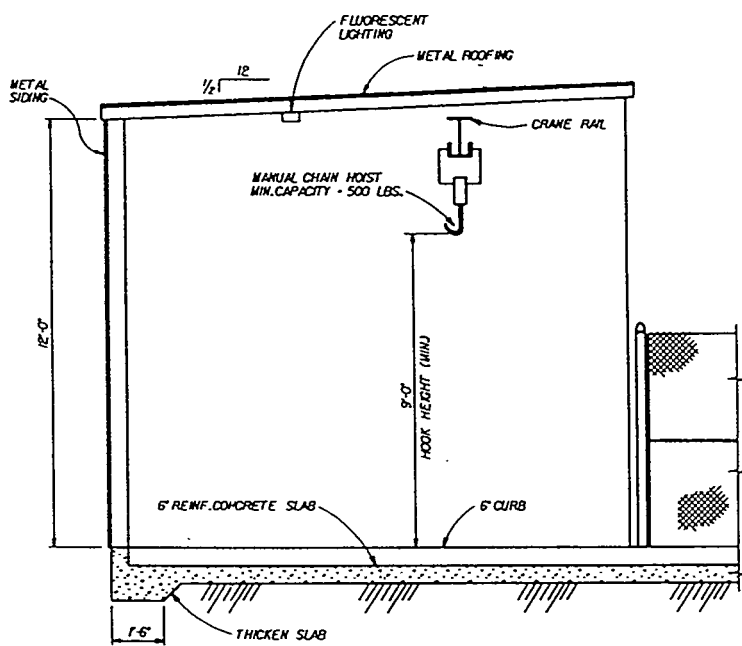
FOUNDATION PLAN

PANEL SCHEDULE
208/120 VOLTS, 3 PHASE 4 WIRE
A.I.C. RATING
CKT/LOAD
LIGHTING CKT A/200W
DUPLEX OUTLETS CKT C/1000 W
SPACE
SPACE
SPACE

SAFETY PAYS

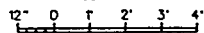


ROOF PLAN



SECTION A

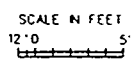
SCALE IN FEET



PANEL SP-1				
BKR AMPS	ABC	BUS AMPS	100	
20	1	20	EXT	LOAD
20	2	20	EXTERIOR LIGHTS CKT B 450 W	
20	3	20	SPARE	
20	4	20	SPARE	
20	5	20	SPACE	
20	6	20	SPACE	
20	7	20	SPACE	
20	8	20	SPACE	
20	9	20	SPACE	
20	10	20	SPACE	
20	11	20	SPACE	
20	12	20	SPACE	

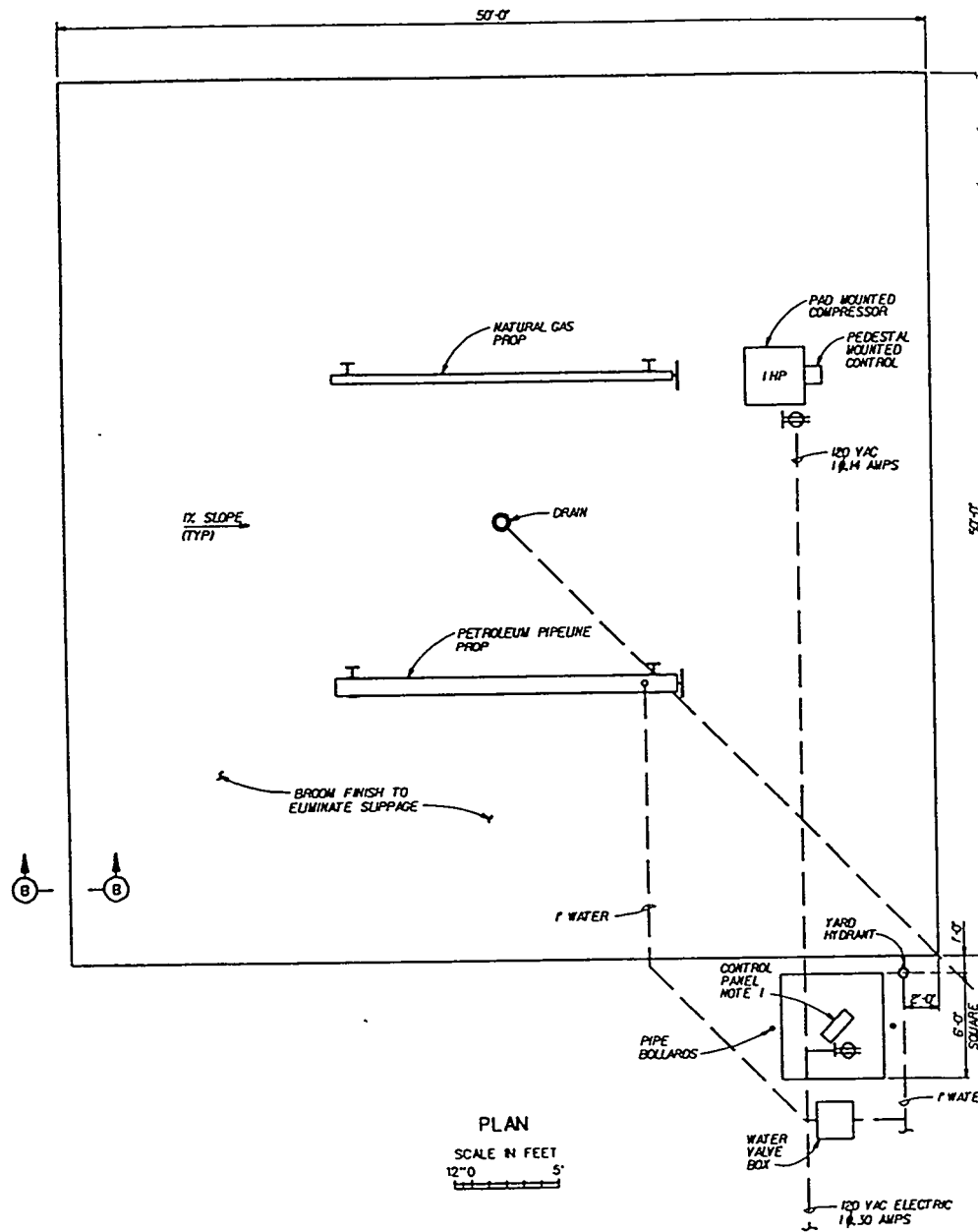
NOTES:

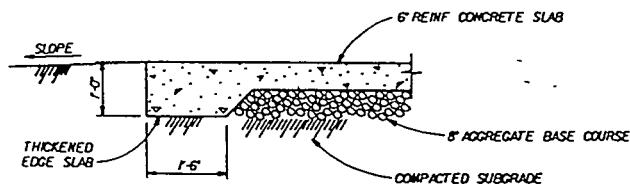
- 1. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET
- WALL SWITCH - (WATERPROOF) - SUBSCRIPT INDICATES 3-WAY
- FLOURESCENT LIGHTING FIXTURE 120 VAC 6' x 4'-LAMP RAPID START
- EXTERIOR LIGHT FIXTURE (HIGH PRESSURE SODIUM)



COMPUTER AIDED DESIGN & DRAFTING

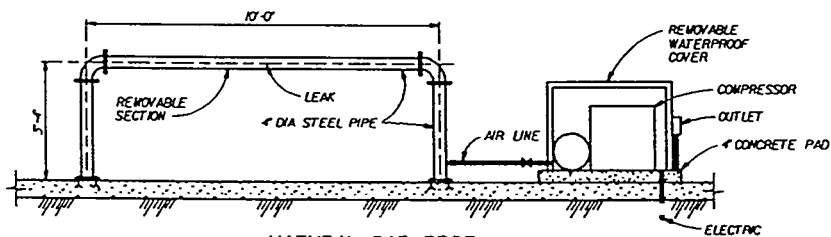
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
90-DAY STORAGE PAD PROP	
W.B. SWIGERT BY: R.A.FELT DATE: 10/1/80 W.B. SWIGERT CHECKED BY: R.A.FELT DATE: 10/1/80	APPROVED: _____ DATE: _____
SCALE AS SHOWN (IN. NO.)	
HTCC13.DCW	





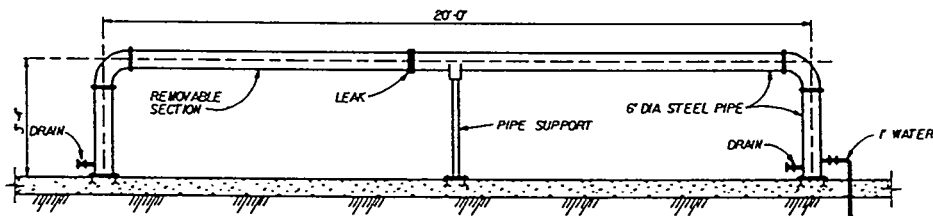
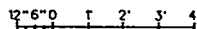
SECTION B

SCALE IN FEET



NATURAL GAS PROP

SCALE IN FEET



PETROLEUM PIPELINE PROP

SCALE IN FEET



8" REINFORCED DRAIN LINE

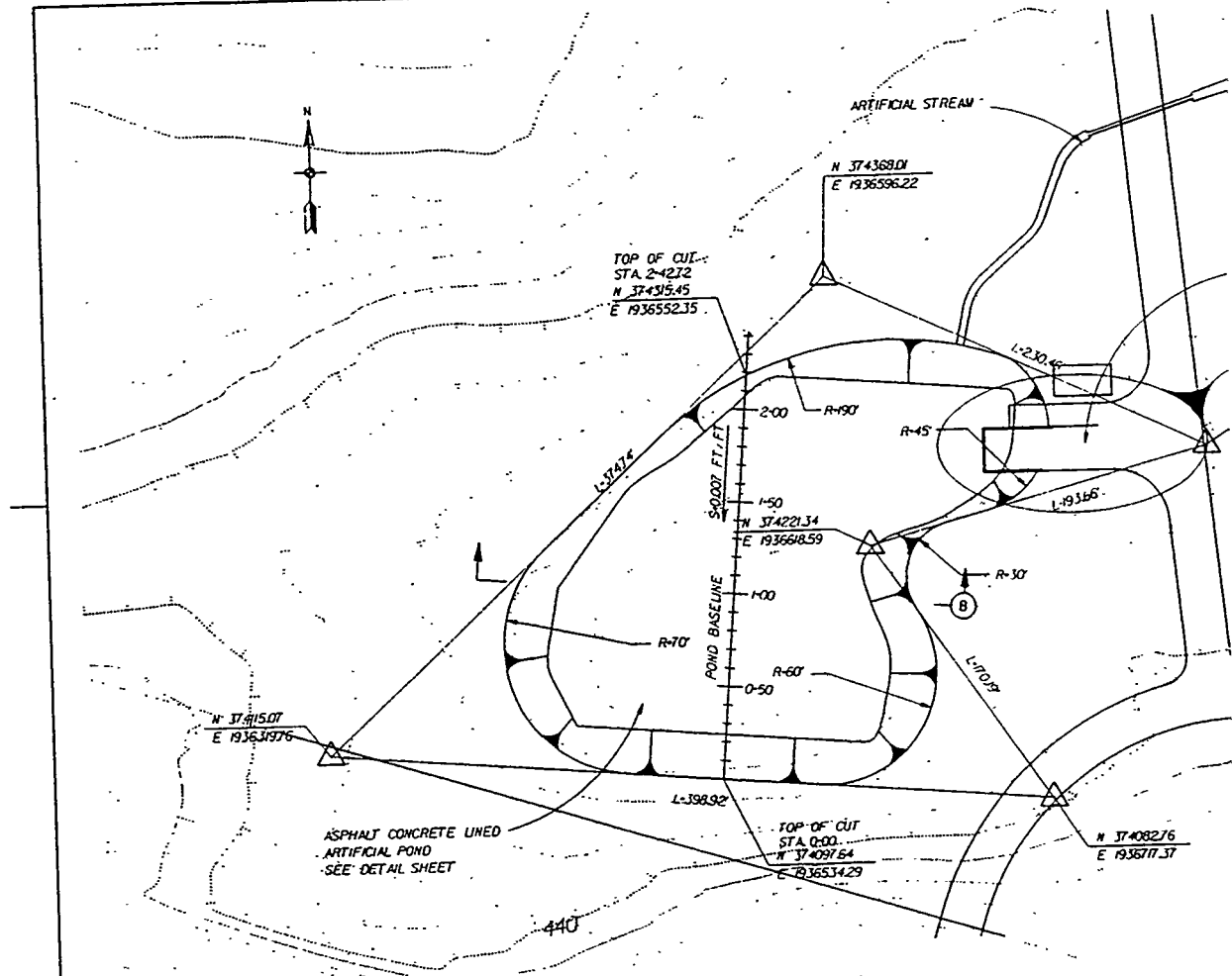
NOTES:

1. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET
2. REMOTE CONTROL PANEL/COMPRESSOR REMOTE ON/OFF SWITCH, DUPLEX ELECTRICAL OUTLET.



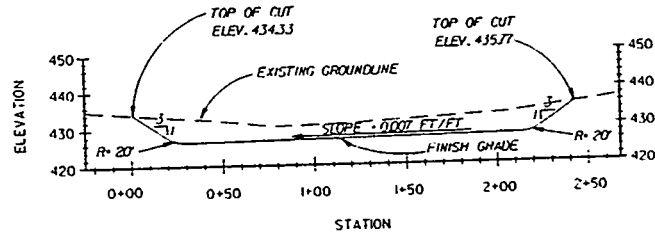
COMPUTER
AIDED
DESIGN &
DRAFTING

REVISION		DATE	BY	APPROVED	DATE
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
WB SWIGERT DESIGNED BY		HAMMER TRAINING CENTER			
R.A. FELT CHECKED BY		HANFORD RESERVATION, WASHINGTON			
W.B. SWIGERT CHECKED BY		ABOVE-GROUND PIPELINE PAD			
SUBMITTED BY		SCALE AS SHOWN			
DATE		REV. NO.			
REVISIONS		12C-1			
		HTCC4.DCH			



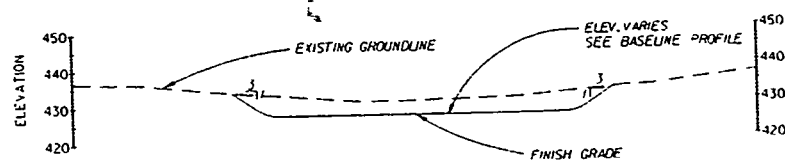
PLAN - ARTIFICIAL POND

SCALE IN FEET
40' 0 40'



POND - BASELINE PROFILE

HORIZONTAL SCALE IN FEET
40' 0 40'
VERTICAL SCALE IN FEET
20' 0 20'



POND - SECTION B

HORIZONTAL SCALE IN FEET
40' 0 40'
HORIZONTAL SCALE IN FEET
20' 0 20'



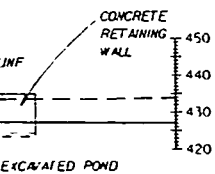
440

PUMPER TEST PLATFORM

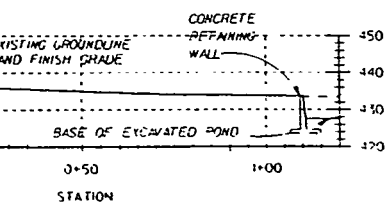
SEE DETAIL THIS SHEET

 N 374271.68
 E 1936805.59

 END STA. 1+02.00
 N 374271.30
 E 1936682.13
 ELEV. 433.50

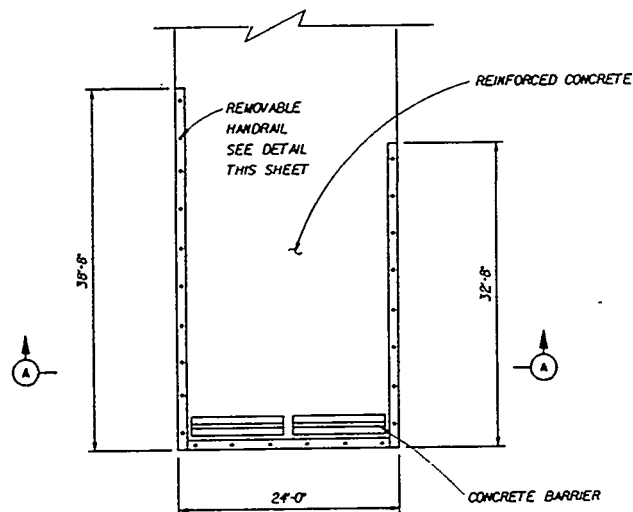
 BEGIN STA. 0+00
 N 374271.30
 E 1936792.25
 ELEV. 436.50


DETAIL - PUMPER TEST PLATFORM

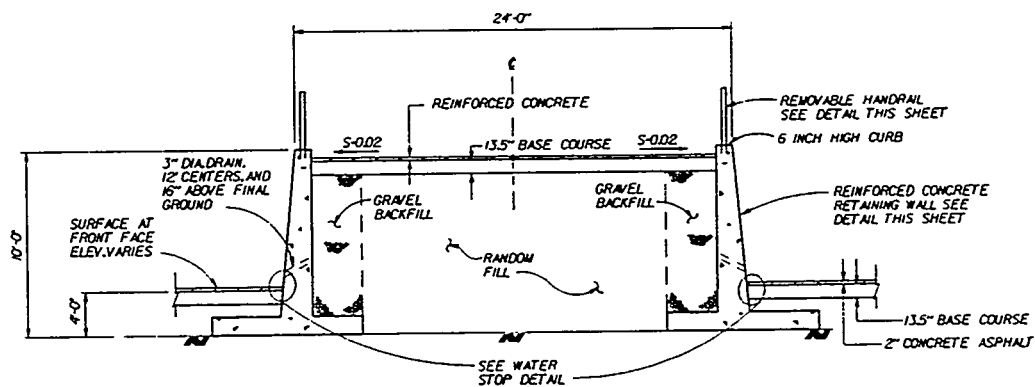
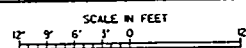
 SCALE IN FEET
 20' 0 20'

 COMPUTER
 AIDED
 DESIGN &
 DRAFTING

 DESIGNER: [Name]
 PLANNING: [Name]
 CHECKED: [Name]
 DATE: 20 SEP 1994

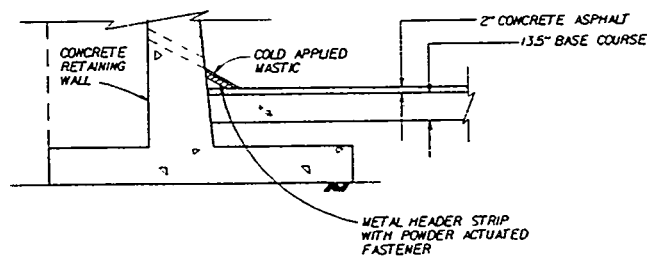
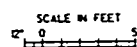
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
ARTIFICIAL POND PLANS, SECTIONS, AND DETAILS	
ORTH DESIGNED BY	DATE
ORTH CHECKED BY	DATE
N CHECKED BY	DATE
APPROVED BY	DATE
RECOMMENDED BY	DATE
SCALE AS SHOWN INV. NO.	
SHEET NO.	FILE NO.
13C-1	



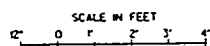
PUMPER TEST PLATFORM - DETAIL

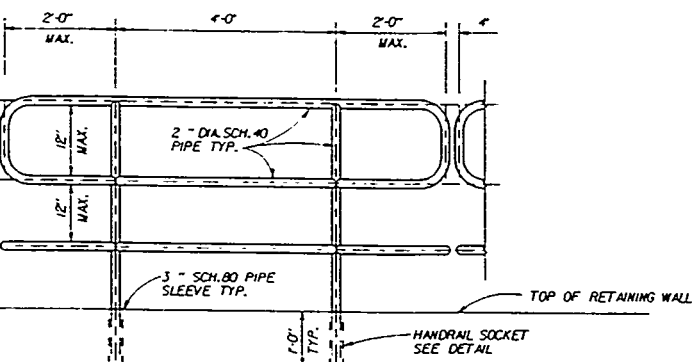


PUMPER TEST PLATFORM - SECTION A



WATER STOP - DETAIL

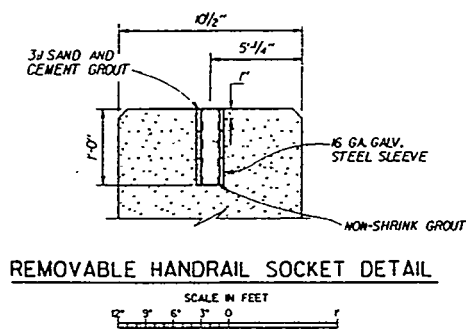




REMOVABLE HANDRAIL - DETAIL

SCALE IN FEET

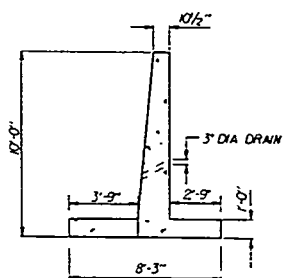
0' 6" 0' 1' 2'



REMOVABLE HANDRAIL SOCKET DETAIL

SCALE IN FEET

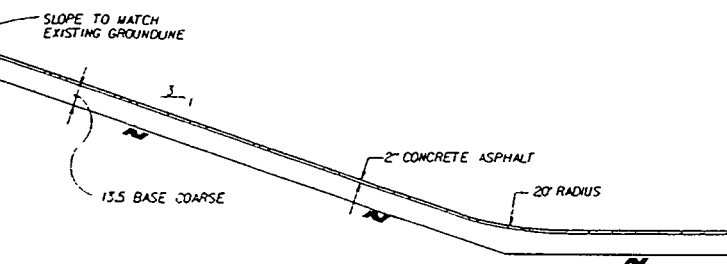
0' 6" 0' 1' 2'



FORCED CONCRETE RETAINING WALL - DETAIL

SCALE IN FEET

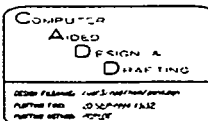
0' 5'



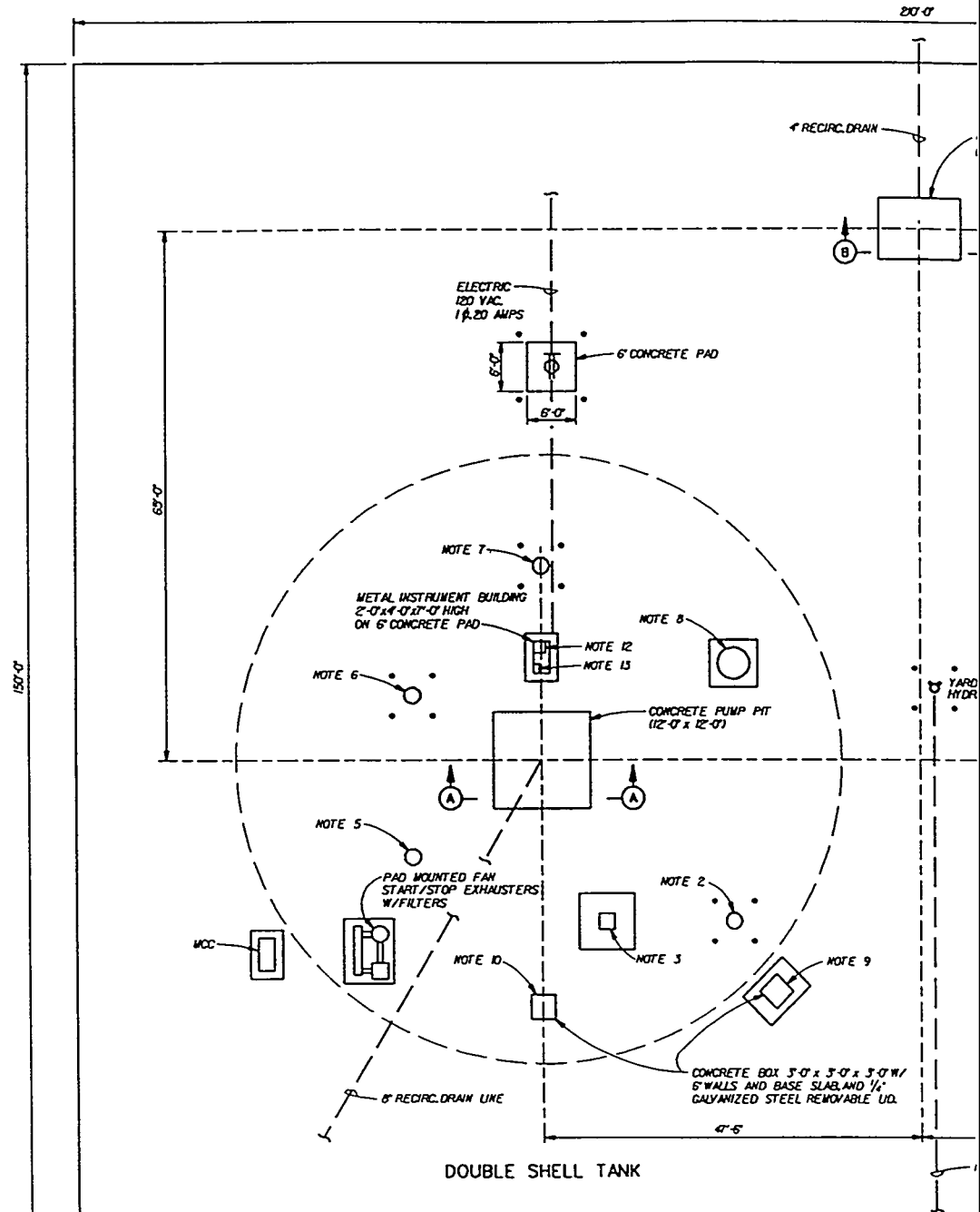
ASPHALT CONCRETE LINING DETAIL

SCALE IN FEET

0' 5'



U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON ARTIFICIAL POND AND PUMPER TEST PLATFORM DETAILS	
SHOULDERS DESIGNED BY WARRON CHECKED BY SHOULDERS CHECKED BY SUBMITTED	SCALE AS SHOWN INV. NO. 14C-1

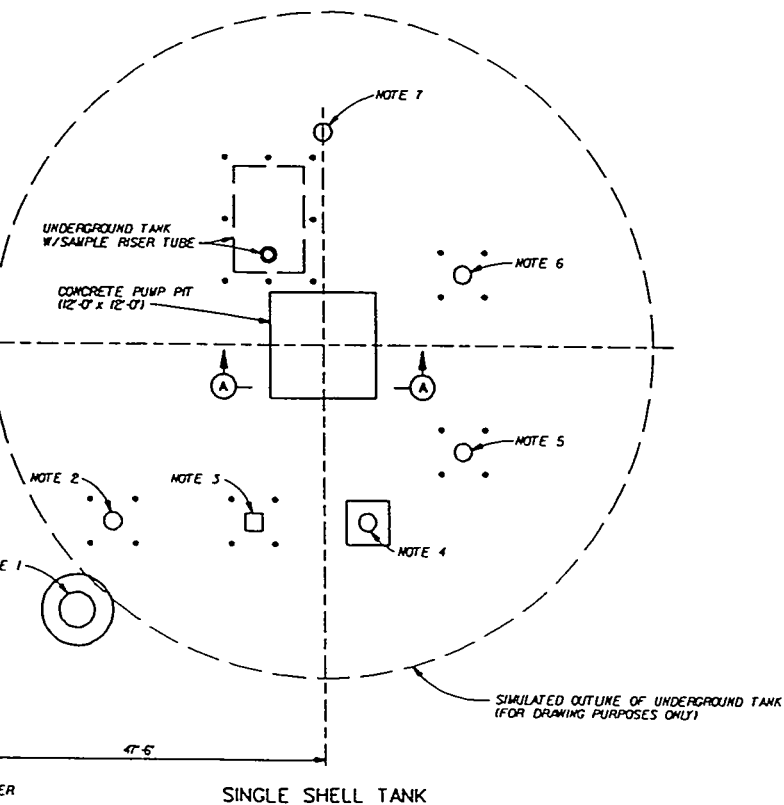


PLAN

SAFETY PAYS

CONCRETE DIVERSION BOX
(10'-0" x 10'-0")UNITS OF GRAVEL PAVING
(120'-0" x 150'-0")

GRAVEL PAVING

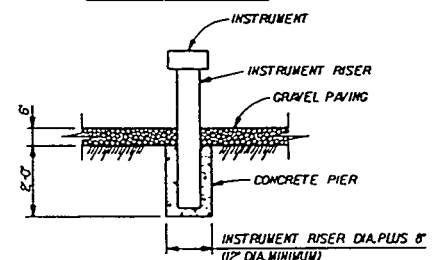
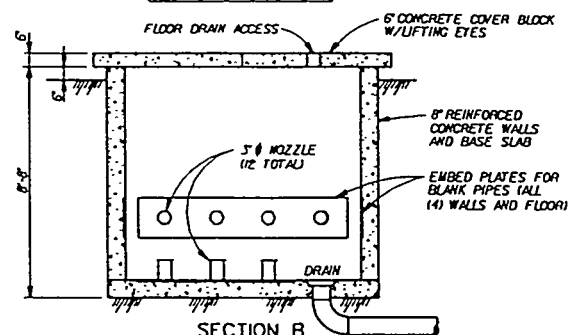
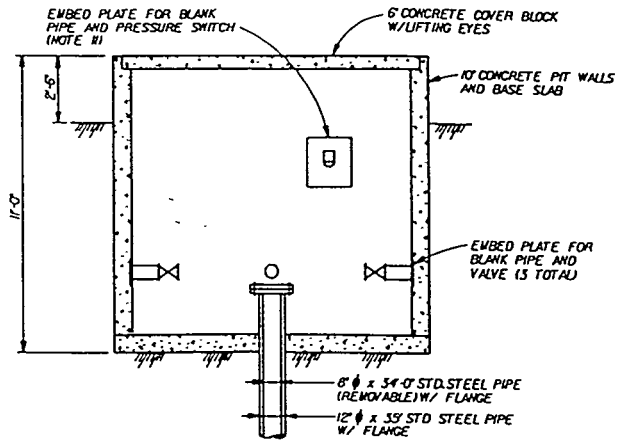


PROP. NOTES:

1. LEAK DETECTION DRYWELL
2. TEMPERATURE THERMOCOUPLE ASSEMBLY
3. SURFACE LEVEL PROBE
4. LIQUID OBSERVATION WELL
5. SOLIDS LEVEL DETECTOR
6. CAMERA OBSERVATION POINT
7. DOME ELEVATION BENCHMARK
8. EXHAUSTER STACK CONTINUOUS AIR FLOW MONITOR
9. LEAK DETECTION PIT
10. AMMUNITION PUMP PIT
11. PRESSURE SWITCH
12. SPECIFIC GRAVITY INSTRUMENTATION (SGC AND SGAS)
13. WEIGHT FACTOR INSTRUMENTATION (WFI)

SCALE IN FEET
12" 0 5 10 15'COMPUTER
AIDED
DESIGN &
DRAFTING

VALUE ENGINEERING PAYS



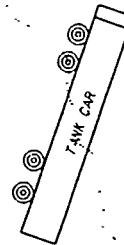
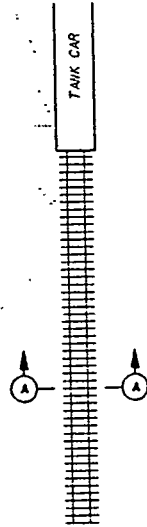
NOTES:

1. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET
 - 2" DIA. YELLOW PIPE BOLLARD
2. THE FOLLOWING SHALL BE PROVIDED BUT ARE NOT SHOWN ON THIS SHEET:
 - 3" FLEXIBLE JUMPER PIPING (2 EA)
 - 3" RIGID JUMPER PIPING (2 EA)
 - EMERGENCY PUMPING SKID

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
W.B. SWIGERT BY ORDER OF R.A. FELT W.B. SWIGERT CHECKED BY DATE	HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON J-BOX WITH TANK PROP SCALE AS SHOWN INV. NO. 18C-1 HTCC9 DCN

CONT. NO.

L-61

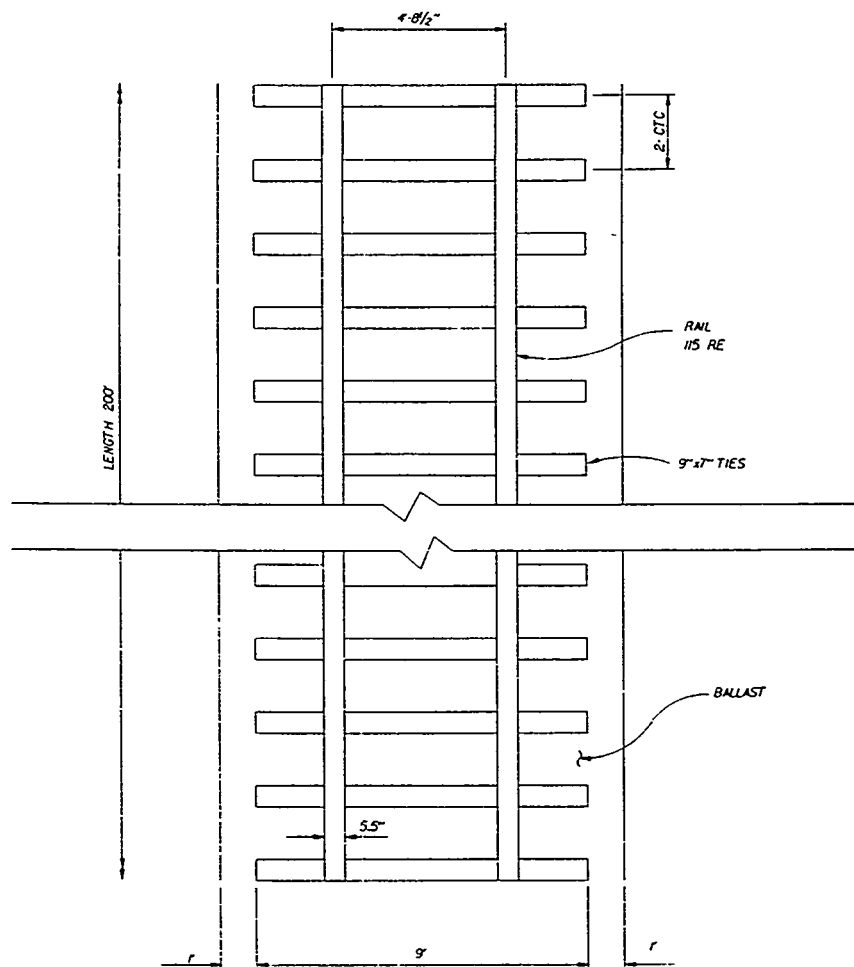


PLAN - RAILROAD TANK CARS WITH RAIL PROP

SCALE IN FEET
20' 0 20'

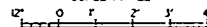
NOTES:

1. TANK CARS ARE



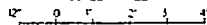
PLAN - RAIL

SCALE IN FEET

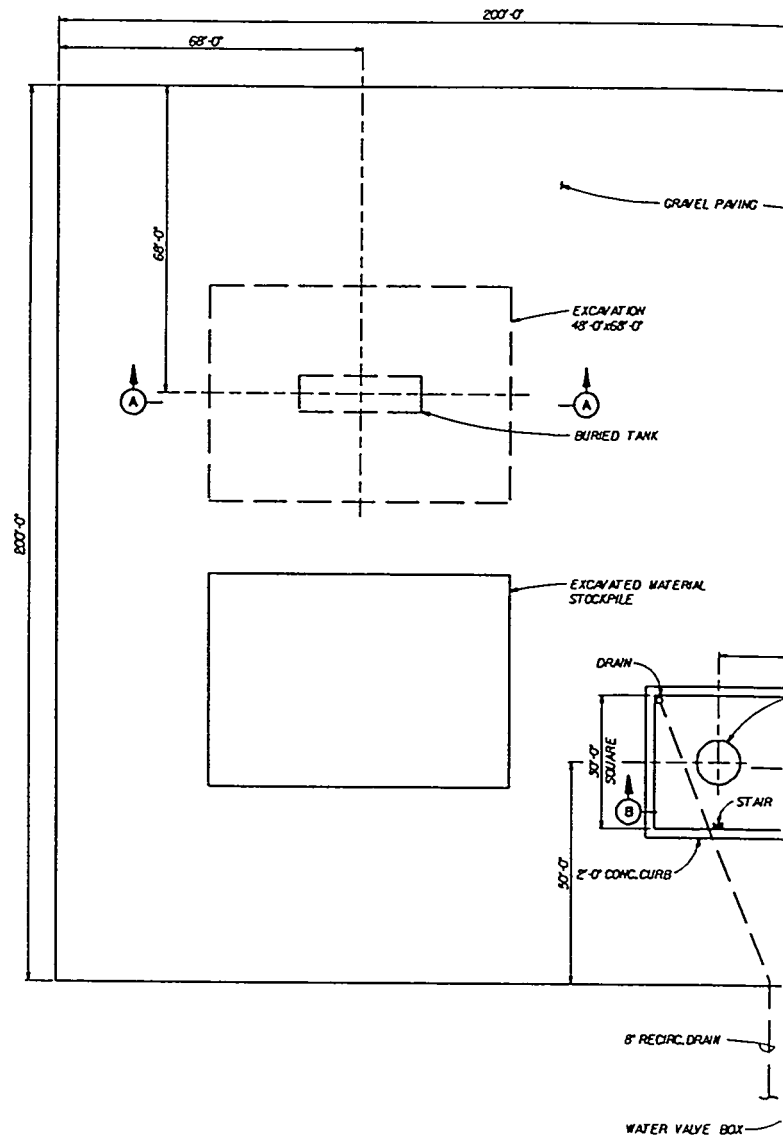


SECTION A

SCALE IN FEET



U . S . ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
SHOULDERS DESIGN BY	HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON
MORROW DRAWN BY	RAILROAD TANK CARS WITH RAIL PROP
FINK CHECKED BY	PLAN, DETAIL, AND SECTION
RUMPHOLD AS SHOWN REF.	
CROFT	
SUBMIT DATE	APPROVED DATE
GEOTECHNICAL REPORT CROFT	SCALE AS SHOWN INV. NO.
GEOTECHNICAL	SHEET NO. 19C-1

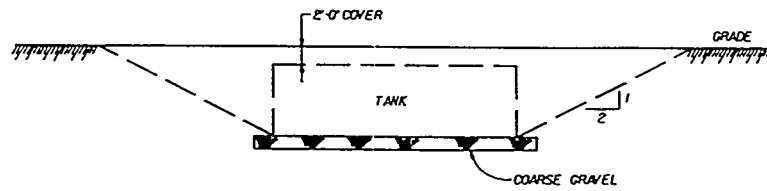


PLAN

SCALE IN FEET
24' 0" 10' 20' 30'

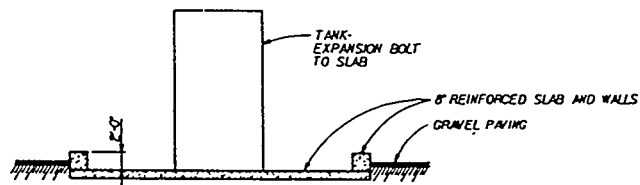
SAFETY PAYS

U. S. ARMY



SECTION A

SCALE IN FEET
12' 0" 5' 10' 15'



SECTION B

SCALE IN FEET
12' 0" 5' 10' 15'

NOTES:

1. TANK PROPS ARE GOVERNMENT FURNISHED EQUIPMENT.
2. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET

TRAINING AREA BOUNDARY

50'-0"

TANK

PIPE BOLLARDS

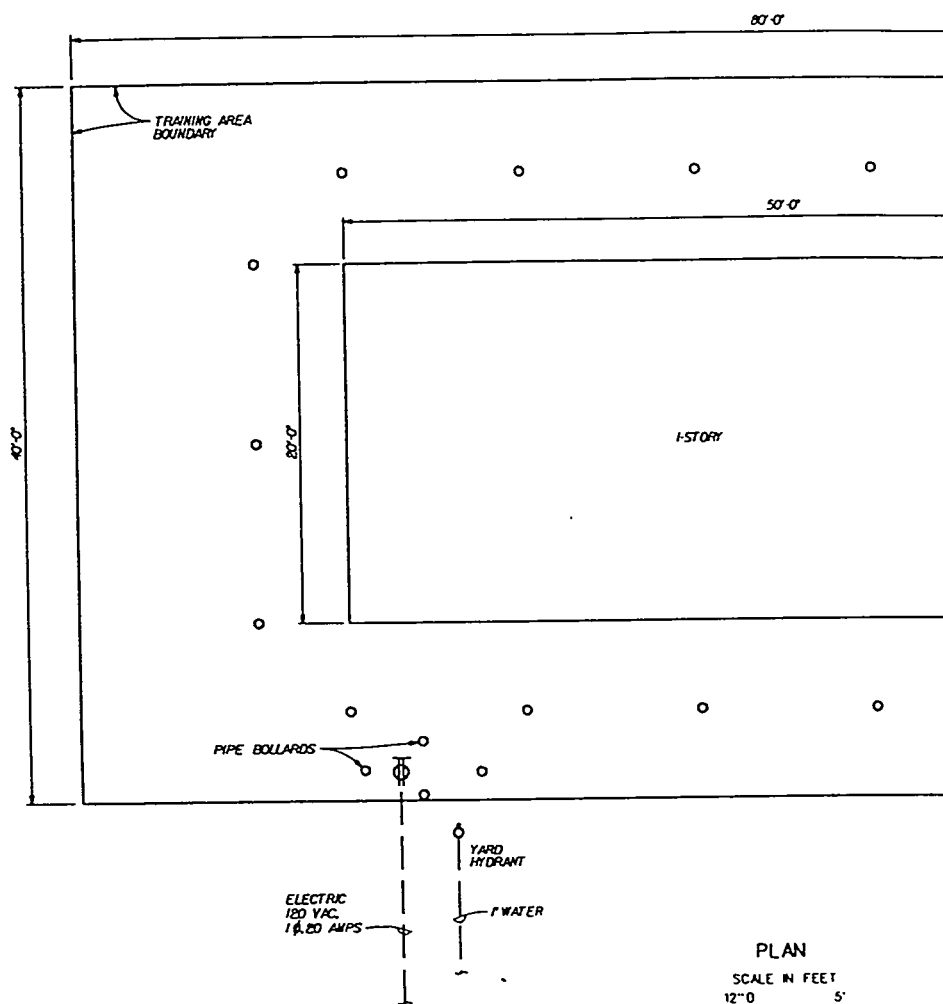
YARD HYDRANT
ELECTRICAL
120 VAC
1 ϕ 20 AMPS

1" WATER



COMPUTER
AIDED
DESIGN &
DRAFTING

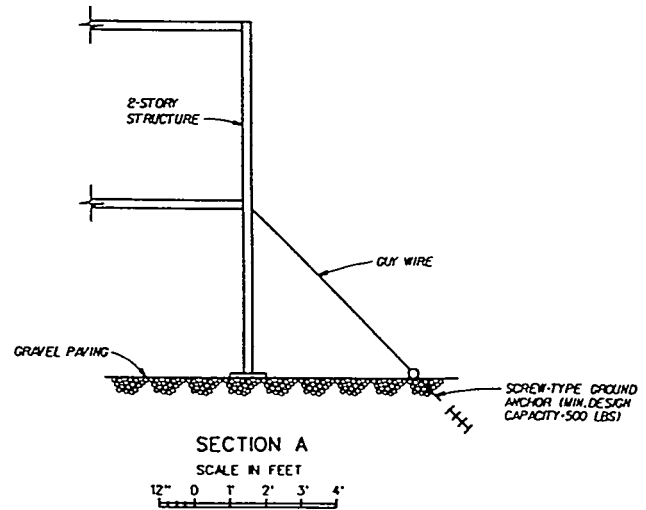
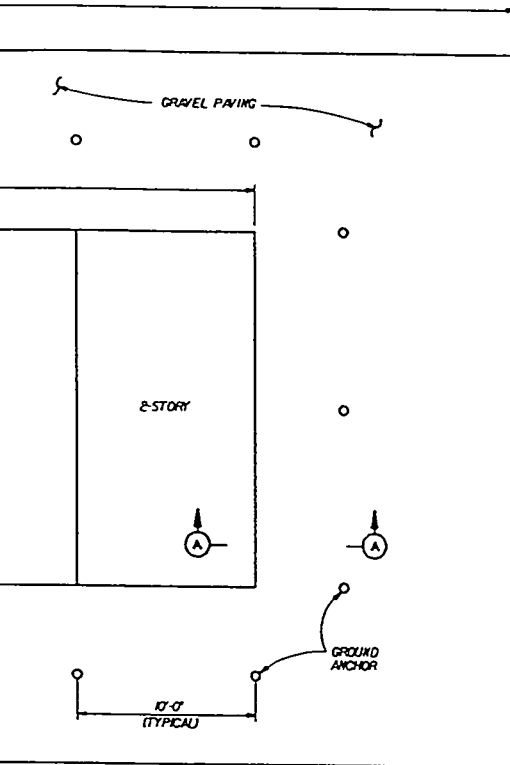
REVISION		DATE	DESCRIPTION	BY	APPV
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON					
W.B. SWICERT DESIGNED BY		HAMMER TRAINING CENTER			
R.A. FELT CHECKED BY		HANFORD RESERVATION, WASHINGTON			
W.B. SWICERT DESIGNED BY		BURIED AND ABOVE GROUND			
SPECIAL NOTES		TANKS PROP			
DATE		DATE		DATE	
SCALE AS SHOWN		INV. NO.		DATE	
20C-1		HTCCB.DGN		DATE	



SAFETY PAYS

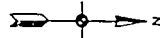


U. S. ARMY



NOTES:

1. CONFINED SPACE/FILL PROTECTION APPARATUS IS GOVERNMENT FURNISHED EQUIPMENT.
2. INDICATES DUPLEX WATERPROOF ELECTRICAL OUTLET



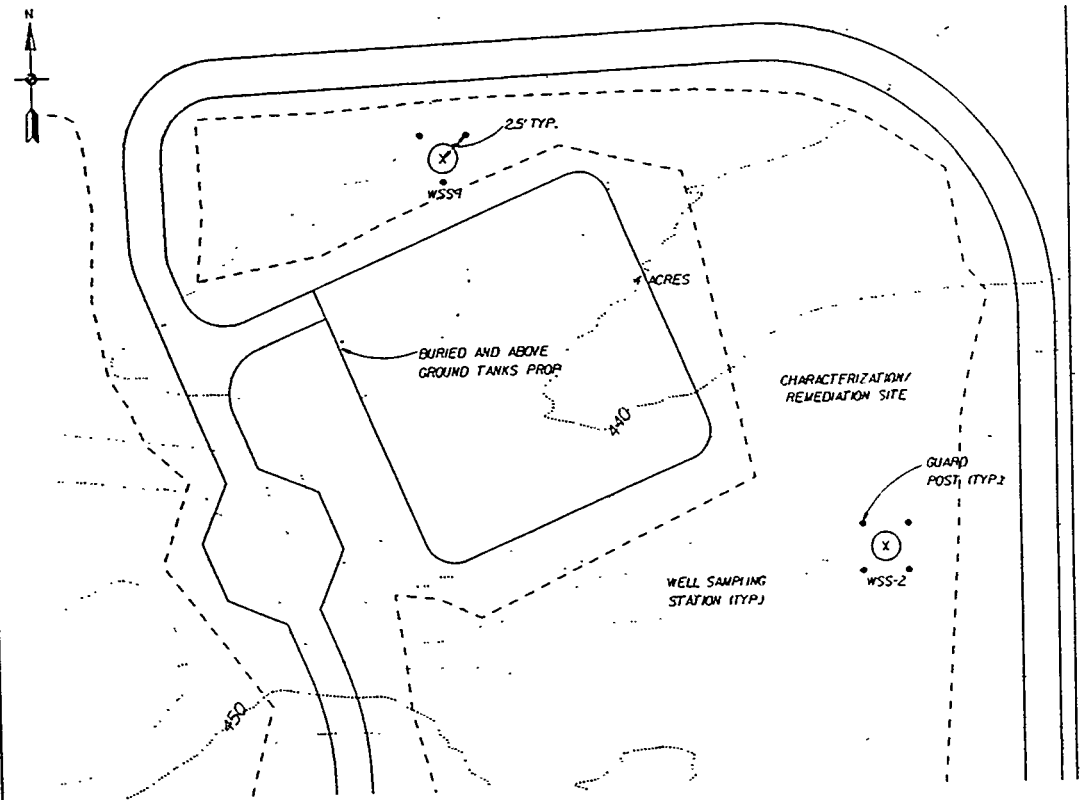
COMPUTER
AIDED
DESIGN &
DRAFTING

VALUE ENGINEERING PAYS

CONT. NO.

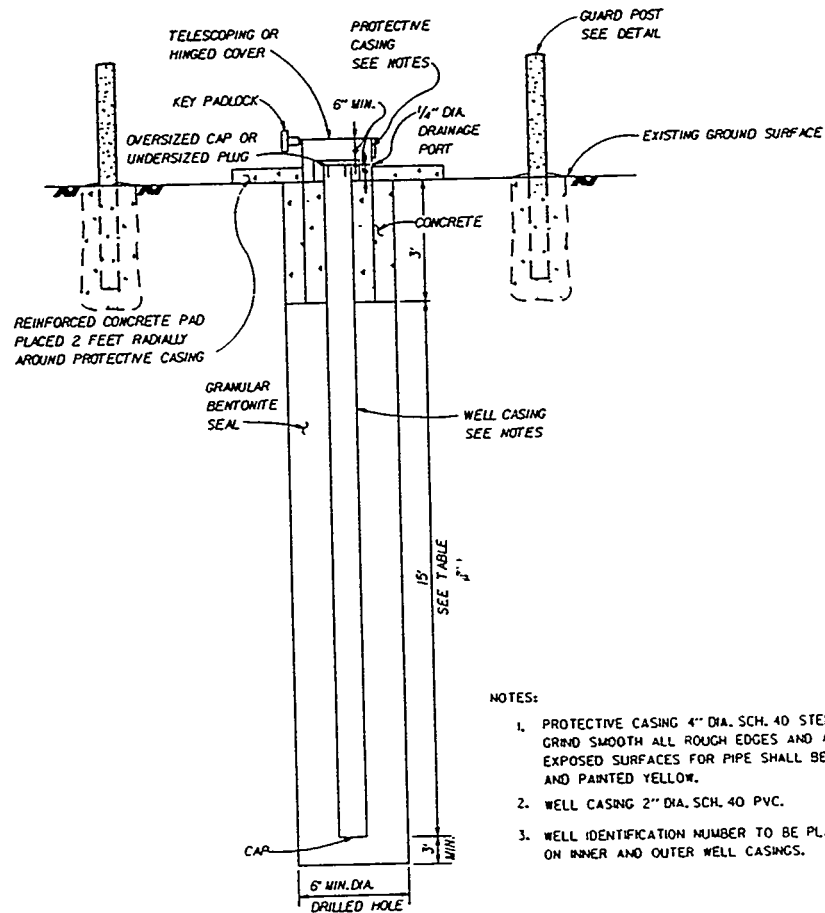
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
W.B. SWICERT DESIGNED BY R.A. FELT CHECKED BY W.B. SWICERT DESIGNED BY SUPPLIES DATE	HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON CONFINED SPACE/ FALL PROTECTION PROP
SCALE AS SHOWN 2X-1	DATE 11/10/00 HICCO DCN

L-64



PLAN - WELL SAMPLING STATION

NOT TO SCALE



DETAIL - WSS-1

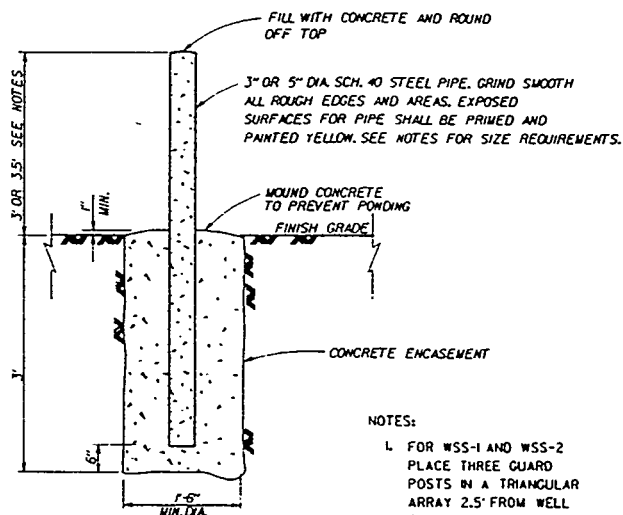
NOT TO SCALE

NOTES:

1. PROTECTIVE CASING 4" DIA. SCH. 40 STEEL PIPE. GRIND SMOOTH ALL ROUGH EDGES AND AREAS. EXPOSED SURFACES FOR PIPE SHALL BE PRIMED AND PAINTED YELLOW.
2. WELL CASING 2" DIA. SCH. 40 PVC.
3. WELL IDENTIFICATION NUMBER TO BE PLACED ON INNER AND OUTER WELL CASINGS.

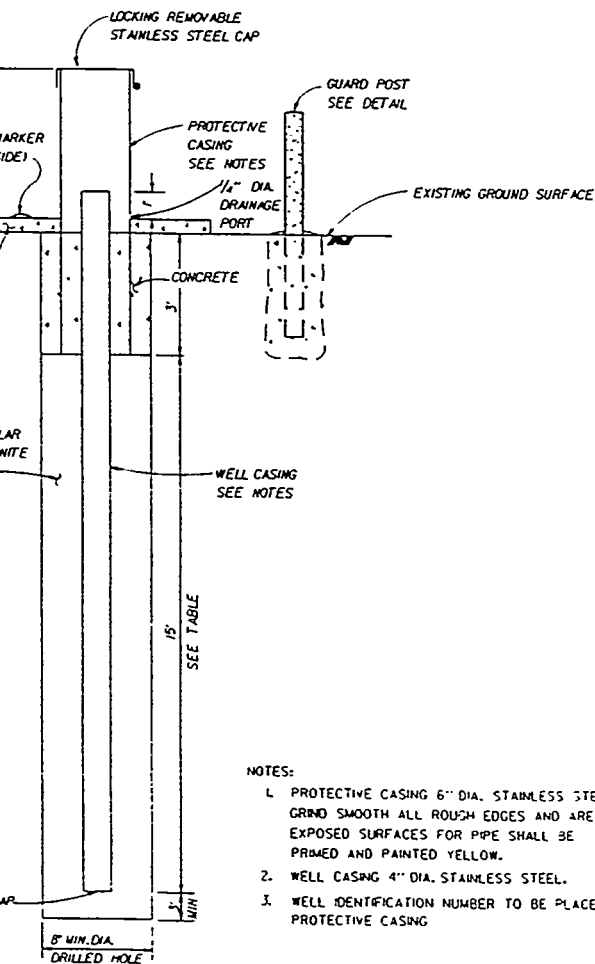
LOCATION OF WELL SAMPLING STATIONS

WELL	COORDINATE	GROUND SURFACE EL. (MSL)	BOTTOM OF WELL CASING EL. (MSL)
WSS-1	N375916.20 E1937078.09	442.45	381
WSS-2	N375661.53 E1937362.20	448.40	387

DETAIL - GUARD POST
NOT TO SCALE

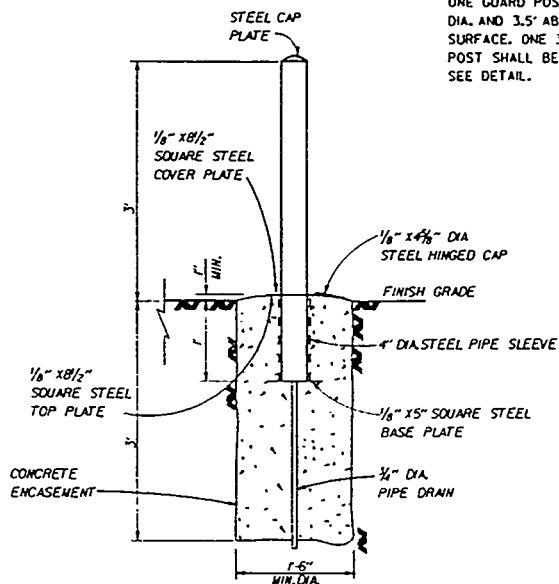
NOTES:

- FOR WSS-1 AND WSS-2 PLACE THREE GUARD POSTS IN A TRIANGULAR ARRAY 2.5' FROM WELL SAMPLING STATION. ONE GUARD POST SHALL BE REMOVABLE. SEE DETAIL.
- FOR WSS-3 AND WSS-4 PLACE FOUR GUARD POSTS IN A SQUARE ARRAY 2.5' FROM WELL SAMPLING STATION. ONE GUARD POST SHALL BE 5" DIA. AND 3.5' ABOVE GROUND SURFACE. ONE 3" DIA. GUARD POST SHALL BE REMOVABLE. SEE DETAIL.

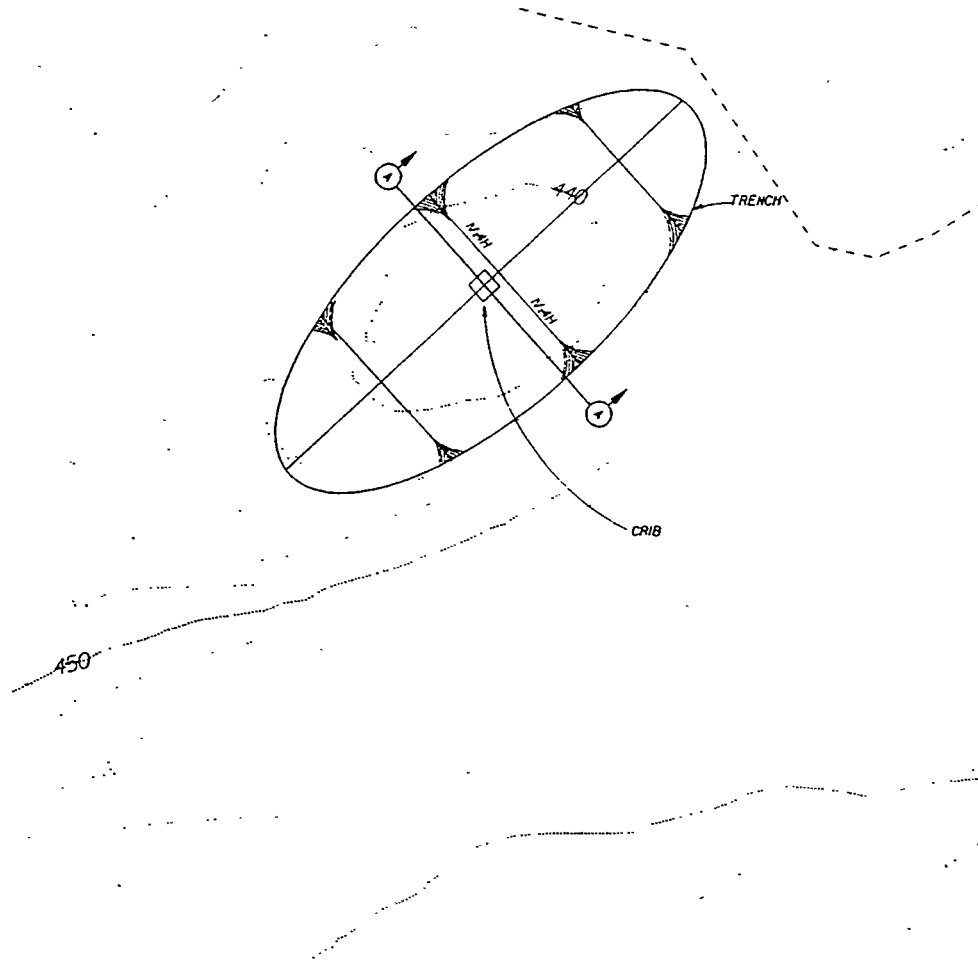
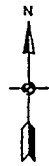


NOTES:

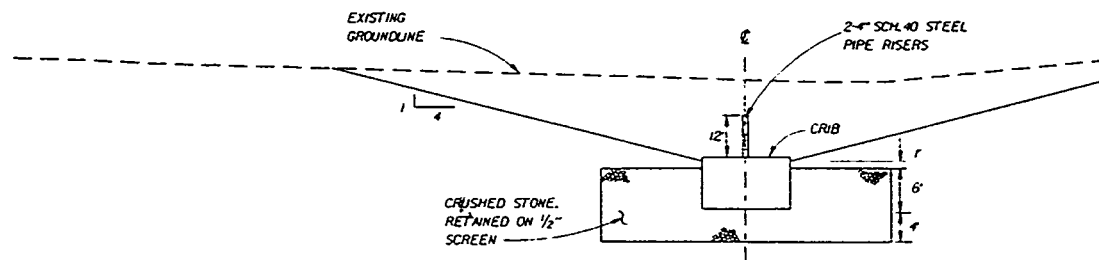
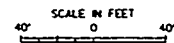
- PROTECTIVE CASING 6" DIA. STAINLESS STEEL PIPE. GRIND SMOOTH ALL ROUGH EDGES AND AREAS. EXPOSED SURFACES FOR PIPE SHALL BE PRIMED AND PAINTED YELLOW.
- WELL CASING 4" DIA. STAINLESS STEEL.
- WELL IDENTIFICATION NUMBER TO BE PLACED ON PROTECTIVE CASING

DETAIL - REMOVABLE GUARD POST
NOT TO SCALEDETAIL - WSS-2
NOT TO SCALE

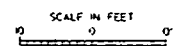
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
HAMMER TRAINING CENTER HANFORD RESERVATION, WASHINGTON	
WELL SAMPLING STATION PLAN AND DETAILS	
SHOULDERS...	SCALE AS SHOWN INV. NO.
MORROW	22C-1
DATE: 1/14/10	FILE NO.

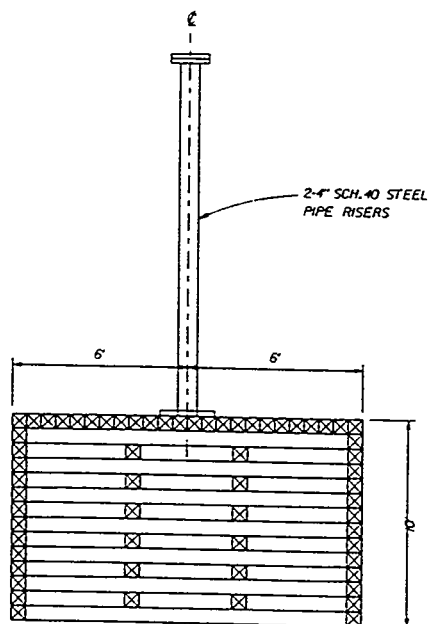


PLAN - TRENCH SITE TRAINING PROP



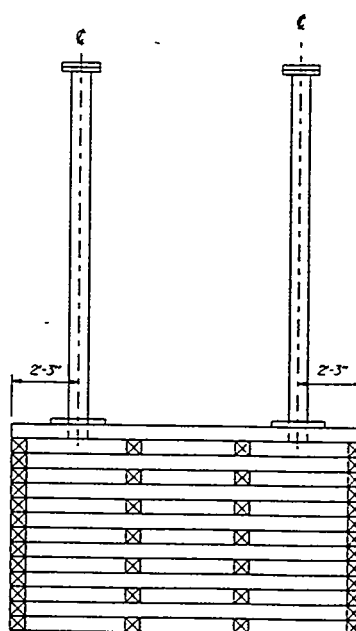
SECTION A





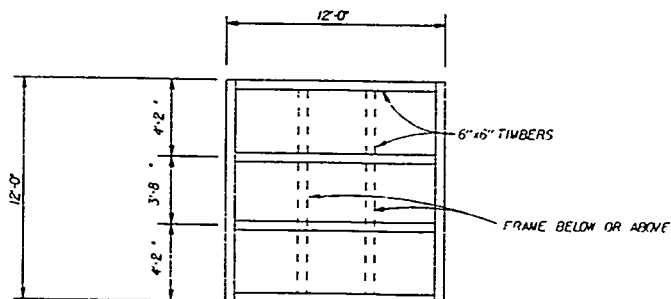
SIDE ELEVATION

SCALE IN FEET
100' 0 100'



END ELEVATION

SCALE IN FEET
100' 0 100'



FRAME DETAIL

SCALE IN FEET
40' 0 40'

U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON	
SHOULDERS MORROW FINK SUPERSEDED CHECK SUBMITTED DATE	HAMMER TRAINING CENTER MANFORD RESERVATION, WASHINGTON TRENCH SITE TRAINING PROP SCALE AS SHOWN INV. NO. SHEET NO. FILE NO. 23C 1

COMPUTER
AIDED
DESIGN &
DRAWING

DESIGN PLANNING - 100% / 100% / 100% / 100%
 PARTIAL TIME - 100% / 100% / 100% / 100%
 PARTIAL TIME - 100% / 100% / 100% / 100%