K-STSM-14.1.15-REVC-PHSF
December 1995
Revision C

Facility Handbook for Payload Hazardous Servicing Facility

CONTRACT NAS10-11400

K-STSM-14.1.15
December 1995
Revision C

FACILITY HANDBOOK

FOR

PAYLOAD HAZARDOUS SERVICING FACILITY

PREPARED BY:

/s/Jan Tiberius

Jan Tiberius, MDS&DS-KSC

APPROVED:

/s/P. Thomas Breakfield

P.Thomas Breakfield III, CS
Director, Payload Flight Operations

/s/Bobby G. Bruckner

Bobby G. Bruckner, CG

K-STSM-14.1.15
December 1995
Revision C
Director, Payload Ground Operations

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF EFFECTIVE PAGES

Revision C supersedes the previous publication, dated January 1993.

Total number of pages in this publication is 62 consisting of:

Page No.

i through xiv
1-1 through 1-4
2-1 through 2-4
3-1 through 3-14
4-1 through 4-8
5-1 through 5-4
6-1 through 6-4
7-1 through 7-10

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document. A more comprehensive listing is contained in *NASA Reference Publication 1059 Revised*, Space Transportation System and Associated Payloads: Glossary, Acronyms, and Abbreviations.

A	ampere
ac	alternating current
ACM	Access Control Monitor
BI	bi-phase
BOC	Base Operations Contract(or)
bps	bits per second
°C	degrees Celsius
CCAS	Cape Canaveral Air Station
CCTV	closed circuit television
CFM	Cubic Feet per Minute
CG	Payload Ground Operations (NASA)
CS	Payload Flight Operations (NASA)
CWA	clean work area
EGL	electrical ground lug
ELV	Expendable Launch Vehicle
EMS	Environmental Monitoring System
EPD	Emergency Procedures Document
ESS	Electronic Security System
°F	degrees Fahrenheit
f-c	foot-candle
FCB	Facility Control Building (renamed MOSB)
GHe	gaseous helium
GHz	gigahertz
GN_2	gaseous nitrogen
GSE	ground support equipment
HAD	heat-activated detector
HEPA	High-Efficiency Particle Air
hp	horsepower
HPF	hazardous processing facility

HVAC	Heating, Ventilating and Air-Conditioning
Hz	hertz

ABBREVIATIONS AND ACRONYMS (continued)

IDAS	Intrusion Detection Alarm System
IGP	instrumentation ground plate
IRIG	Inter-range Instrumentation Group
kbps	kilobits per second
kg	kilograms
KHB	Kennedy Handbook
KHz	kilohertz
KMI	Kennedy Management Instruction
KSC	John F. Kennedy Space Center
l	liter
l/sec	liters per second
LC	Launch Complex
LCC	Launch Control Center
lm	lumen
LPS	Launch Processing System
LSSM	Launch Site Support Manager
m	meter
MHz	megahertz
MMH	Monomethylhydrazine
MOSB	Multi-Operations Support Building (previously called FCB)
MPPF	Multi-Payload Processing Facility
N_2O_4	Nitrogen Tetroxide
NASA	National Aeronautics and Space Administration
NEMA	National Electrical Manufacturers Association
NRZ-L	nonreturn to zero level
O&C	Operations & Checkout Building
OIS-D	operational intercommunication system - digital
OMI	Operations and Maintenance Instruction
OS&Y	outside stem & yoke
PA	public address
PACAS	Personnel Access Control Accountability System
PETS	Payload Environmental Transportation System
PGOC	Payload Ground Operations Contract(or)
PHE	Propellant Handlers Ensemble

PHSF	Payload Hazardous Servicing Facility
PKS	power kill switch

ABBREVIATIONS AND ACRONYMS (continued)

PPF	payload processing facility
psig	pounds per square inch gage
RF	radio frequency
SAA	Satellite Accumulation Area
scfm	standard cubic feet per minute
SID	Standard Interface Document
TAA	Temporary Area Authorization
UV/IR	ultra-violet/infra-red
VPF	Vertical Processing Facility
WBTS	Wide-Band Transmission System

THIS PAGE INTENTIONALLY LEFT BLANK

FOREWORD

Launch site payload processing facilities are described in three levels of documentation. These levels and their purposes are:

a. *Launch Site Accommodations Handbook for Payloads*, K-STSM-14.1, provides an overview of the John F. Kennedy Space Center (KSC) launch and landing site operations and each facility.

b. Facility handbooks describe a specific facility, its systems, general operating rules, regulations, and safety systems. Facility handbooks are revised and reissued as needed to maintain the level of usefulness necessary to support customers planning to process their payloads at KSC. The following handbooks are available:

K-STSM-14.1.1	*Facilities Handbook for Building AE*
K-STSM-14.1.2	*Facilities Handbook for Building AO*
K-STSM-14.1.3	***Facilities Handbook for Building AM*
K-STSM-14.1.4	***Facilities Handbook for Hangar S*
K-STSM-14.1.6	***Facilities Handbook for Explosive Save Area 60A (ESA-60)*
K-STSM-14.1.7	*Facilities Handbook for Spacecraft Assembly and Encapsulation Facility - 2 (SAEF-2)*
K-STSM-14.1.8	*Facilities Handbook for Radioisotope Thermoelectric Generator Facility (RTG-F)*
K-STSM-14.1.9	*Facilities Handbook for Life Sciences Support Facility - Hangar L*
K-STSM-14.1.10	**Payload Accommodations at the Rotating Service Structure (RSS)*
K-STSM-14.1.12	*Facilities Handbook for Vertical Processing Facility (VPF)*
K-STSM-14.1.13	**Orbiter Processing Facility (OPF) Payload Processing and Support Capabilities*
K-STSM-14.1.14	**Operations and Checkout (O&C) Building Payload Processing and Support Capabilities*
K-STSM-14.1.15	*Facilities Handbook for Payload Hazardous Servicing Facility (PHSF)*
K-STSM-14.1.16	*Space Station Processing Facility (SSPF) Processing and Support Capabilities*
K-STSM-14.1.17	*Facilities Handbook for Multi-Payload Processing Facility (MPPF)*

* These handbooks are titled differently as the facilities serve functions other than payload support. Only the payload accommodations are described in these documents.

** These handbooks are being phased out and will not be updated; the facilities are no longer available for payload processing activities.

c. Standard Interface Documents (SIDs) - SIDs provide the most detailed information on facility interfaces for KSC launch site payload processing facilities. When SIDs are not available for a payload processing facility, facility handbooks should be used for design interface information and customers should ask for verification of any areas of concern. The Payload Strongback and the Payload Environmental Transportation System (PETS) Multiuse Container do not have facility handbooks, and in these cases, only the SIDs will be used. Customers may obtain copies of any of the following SIDs from their respective Launch Site Support Manager (LSSM):

SID 79K12170	*Payload Ground Transportation Canister*
SID 79K16210	*Vertical Processing Facility*
SID 79K16211	*Horizontal Processing Facility (O&C Building)*
SID 79K17644	*Payload Strongback*
SID 79K18218	*Launch Pad 39A*
SID 79K28802	*Launch Pad 39B*
SID 79K18745	*Orbiter Processing Facility*
SID 82K00463	*Payload Environmental Transportation System Multiuse Container*
SID 82K00760	*Space Station Processing Facility*
SID 82K03223	*Multi-Payload Processing Facility*

SECTION I

INTRODUCTION

1.1 PURPOSE

This handbook will provide basic information regarding payload processing and support capabilities in the Payload Hazardous Servicing Facility (PHSF) at KSC. The location of the PHSF is shown in Figure 1-1, which follows. The PHSF can be used as a payload processing facility (PPF) and/or a hazardous processing facility (HPF). When used as a PPF, the processing flow begins after a payload and its associated ground support equipment (GSE) have been received and inspected. The payload is assembled, configured and readied for launch. This may include installation of solar panels, antennas and other items that have been shipped separately to the launch site. At this stage in processing, initial pressure system tests and payload functional testing with payload-unique ground checkout equipment are conducted. When used as an HPF, the PHSF accommodates the following: ordnance installation; loading of liquid propellants (e.g., hypergols); hazardous systems tests and checkout; buildup, and mating of a payload to a solid propellant upper-stage motor; propellant system leak tests; and other potentially explosive or hazardous operations.

The KSC LSSM, in conjunction with the Launch Site Support Team and the payload owner, determine launch site facility utilization assignments. Assignments take into consideration the identified payload requirements and space shuttle or National Aeronautics and Space Administration (NASA)-purchased Expendable Launch Vehicle (ELV) schedules. The handbooks previously identified in the *Foreword* describe the configuration of the Cape Canaveral Air Station (CCAS) and KSC Payload Flight Operations (CS) and Payload Ground Operations (CG) division-controlled PPFs and HPF's which are available to potential customers.

1.2 SCOPE

This handbook is intended to be used as a guide for payload organizations planning payload activities in the PHSF. This document details the capabilities and standardized interfaces of the PHSF.

1.3 CUSTOMER CHARGE

Use of the PHSF for payload processing is considered an optional service.

1.4 FACILITY ACCOMMODATIONS

The PHSF is designed to accommodate a variety of NASA and NASA customer payloads. In some instances, payload elements may be processed simultaneously, and customers must be aware during design development of the possibility of sharing

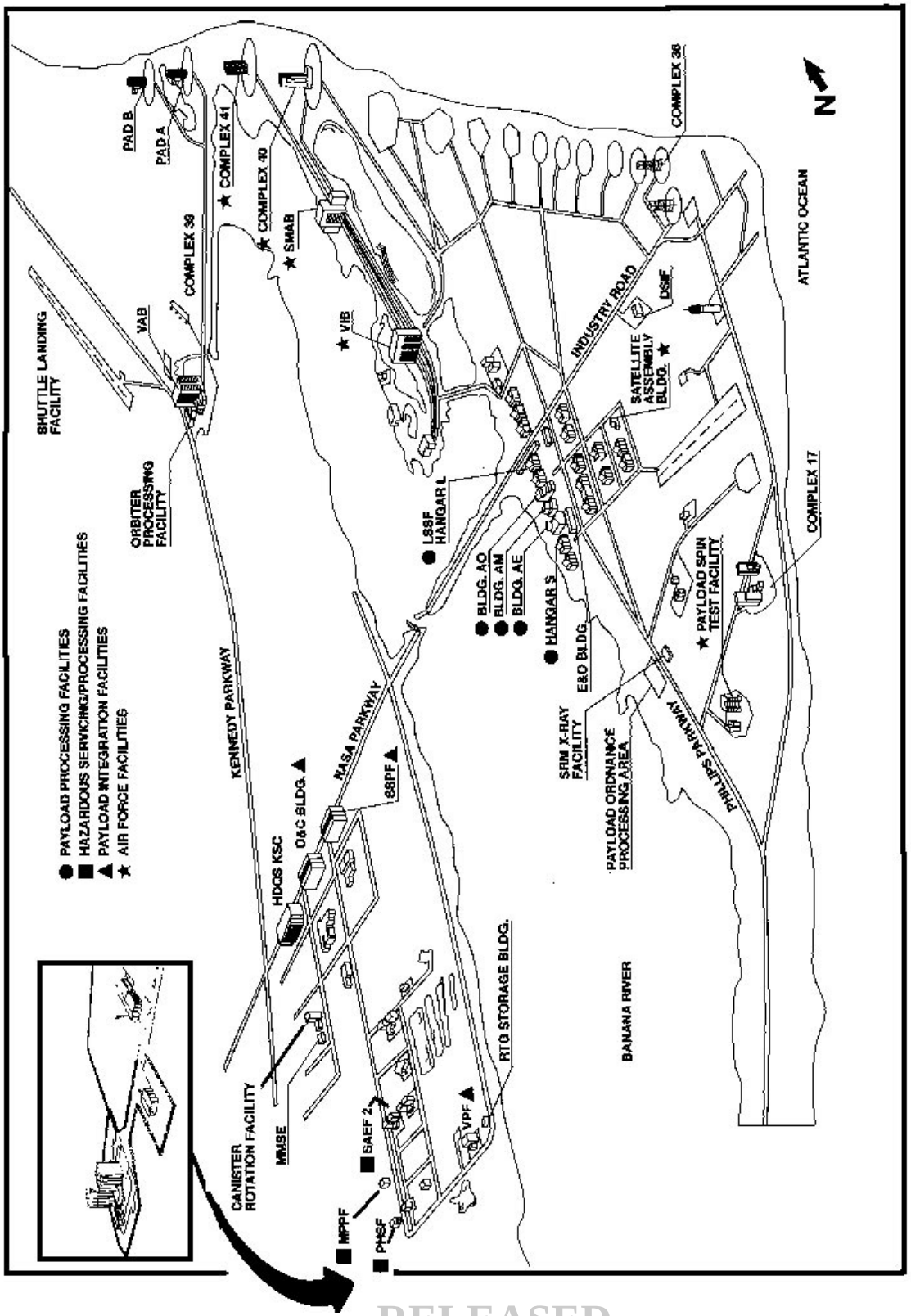

Figure 1-1. KSC/CCAS Payload Processing Facilities

the facility with other payload elements. Each payload customer is required to coordinate closely with the KSC LSSM to ensure that support can be provided when needed.

The PHSF is considered a customer-operated facility; customers are responsible for all day-to-day operations. Customers are required to schedule a pre-operational crane check through the NASA LSSM or Facility Manager prior to crane's first use daily. Customers must also be familiar with the *Payload Customer Emergency Awareness Handbook for the PHSF*, Operations and Maintenance Instruction (OMI) Nos. S9931A, *Emergency Procedures Document (EPD) - PHSF,* KCA-013 and E3517, *Water Deluge System Operation - PHSF*.

1.5 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW

The Emergency Planning and Community Right-to-Know Act, Title III of the Superfund Amendments and Reauthorization Act of 1986, requires persons to report the amount and location of hazardous chemicals produced, stored, used, or released to the environment each year. Customers are required to complete KSC form 28-185, *Environmental Health Protection Program Toxic Substance Registry System (TSRS) Inventory* and provide Material Safety Data Sheets (MSDS) for each chemical brought onto KSC. All forms must be sent to the LSSM 90 days prior to customer arrival.

1.6 HAZARDOUS AND CONTROLLED WASTE

All waste generated at KSC must be managed in accordance with the requirements of Kennedy Handbook (KHB) 8800.7, *Hazardous Waste Management*. Before arrival, customers will complete KSC Form 26-551, *Process Waste Questionnaire* which will identify any potential hazardous and/or controlled waste the customer expects to generate during processing.

A satellite accumulation area (SAA) will be established in facility areas which have been identified as waste generation sites. SAA's will comply with the intent of the Resource Conservation and Recovery Act of 1976 (RCRA), which established a nationwide program to regulate the generation, storage, transportation, treatment, and disposal of hazardous and controlled waste. Regulations for the generation, control and disposal of waste at the launch site are strictly enforced, and customers will be required to coordinate any waste operations or problems with their assigned LSSM.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION II

FACILITY DESCRIPTION

2.1 LOCATION AND DESCRIPTION

The PHSF complex is located off E Avenue, south of the Operations and Checkout (O&C) building in the KSC Industrial Area (see figures 2-1 and 2-2). The complex has three main structures: 1) the PHSF which contains a hazardous operations service bay and airlocks; 2) the Multi-Operations Support Building (MOSB) M7-1357 which contains an office area, support rooms and payload control rooms for the PHSF and Multi-Payload Processing Facility (MPPF) customers; and 3) the transporter storage building. The complex also has a fuel transfer building, an oxidizer shed and a krypton storage building.

Figure 2-1. Aerial Photograph of PHSF Complex

NASA built the PHSF and the Facility Control Building (FCB) in 1987. The FCB was then modified in 1994, and renamed the MOSB. The MOSB south end supports PHSF customers, and MOSB north end supports MPPF customers. This document will address the PHSF-related facilities only. MPPF requirements are documented separately in K-STSM-14.1.17, *Facilities Handbook for Multi-Payload Processing Facility*, Rev Basic dated May 1995.

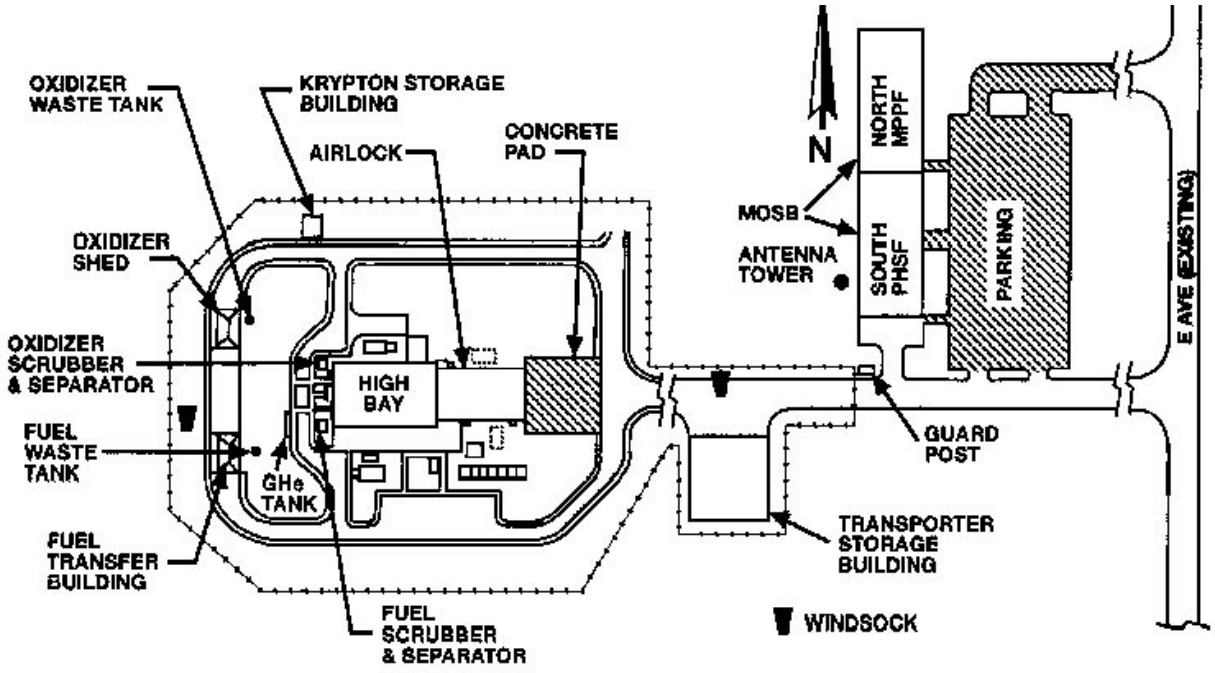

Figure 2-2. PHSF Complex Site Plan

2.2 SECURITY/ACCESS

The PHSF complex is a secured area enclosed by a 3.1 m (10 ft) chain-link fence. Vehicles and personnel must enter the site through an 8.2 m (27 ft) wide gate located off E Avenue at the east end of the PHSF complex. A guard post is located west of the MOSB on the perimeter road, but is manned only during dynamic hazardous operations.

A KSC Industrial Area security patrol conducts random inspections of the PHSF complex on a 24-hour basis. All doors with access to the outside of the PHSF are lead-sealed nightly. Each door is alarmed and monitored by an Intrusion Detection Alarm System (IDAS). If a breach of security occurs, alarms sound at KSC's Protective Services Control Center in the Launch Control Center (LCC) room 1P10. Base Operations Contractor (BOC) security personnel monitor the IDAS 24-hours a day. A graphic display indicates the exact location of the alarm, the alarm is logged and a patrol unit is dispatched. A minimum of five officers are available to respond to security events at the PHSF within 10 minutes.

The NASA Site Manager controls the IDAS alarm status. During first-shift operations, the NASA Site Manager is responsible for changing the IDAS "alarm" status to "access." The access mode enables BOC to monitor the number of door openings at the facility and instructs console operators how to dispatch security/emergency services.

The Payload Ground Operations Contractor (PGOC) maintains security within the facilities as required by the customer. Access requirements to the facility after 4:45 p.m. on weekdays, weekends or holidays must be arranged with PGOC Security at the Access Control Monitor (ACM) station located in the O&C (room 1245). The ACM station can be reached 24-hours a day at 867-7664. Additional security is optional, and may be arranged by the payload organization/customer assigned to the facility.

Personnel who require access to KSC must be issued a NASA/ESMC picture badge or machine pass. To access the PHSF, individuals must possess a valid KSC-area permit or Temporary Area Authorization (TAA). Those with a “to be escorted” TAA must be escorted by a properly badged individual at all times and may only enter the facility with an escort. Access to the PHSF is controlled by a Personnel Access Control Accountability System (PACAS). PACAS monitors and logs each person who enters the facility; the time of entrance and the time of exit. PACAS cards are issued through the NASA Launch Site Support Office. Access to the PHSF Service Bay (room 116) is controlled by PACAS and cipher-locked areas.

2.3 REQUIREMENTS AND SPECIAL CONSIDERATIONS

Because much of the work performed at the PHSF is hazardous, safety restrictions, strict security and personnel controls are enforced. A badge exchange board within the facility allows identification of personnel in the PHSF Hazardous Operations Service Bay. During hazardous operations, a guard restricts vehicle access to the site complex and an amber beacon flashes at the east side of the MOSB entrance. Fire protection systems, sensors and warning devices are used to alert personnel in the event hazardous conditions arise.

The amount of explosives and propellants that can be housed within the PHSF Hazardous Operations Service Bay is limited. Therefore, the NASA Safety Office must approve the quantity of propellant used by each payload before payload processing activities begin in the PHSF. Customers are advised to contact their LSSM’s as early as possible to ensure the payload processing requirements can be met.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION III

PAYLOAD HAZARDOUS SERVICING FACILITY

3.1 DESCRIPTION

The PHSF (M7-1354) is a steel frame building covered with insulated metal siding which contains a Hazardous Operations Service Bay (hereafter called the service bay) and airlock (see figure 3-1). The service bay meets the requirements of a level 4, class 100,000 clean work area (CWA). The airlocks meet a level 5, class 300,000 CWA per K-STSM-14.2.1, *KSC Payload Facility Contamination Control/Requirements Plan*.

Figure 3-1. Payload Hazardous Servicing Facility

A one-story, concrete block structure is connected to the southwest wall of the PHSF and contains the equipment airlock (room 101), an air shower (room 108), the utilities & operations control room (room 114), the electrical/mechanical room (room 115), and several support rooms. Another one-story, concrete block structure is connected to the north wall of the PHSF's service bay and contains the communication room (room 119). Figure 3-2, which follows, provides the floor plan for the PHSF.

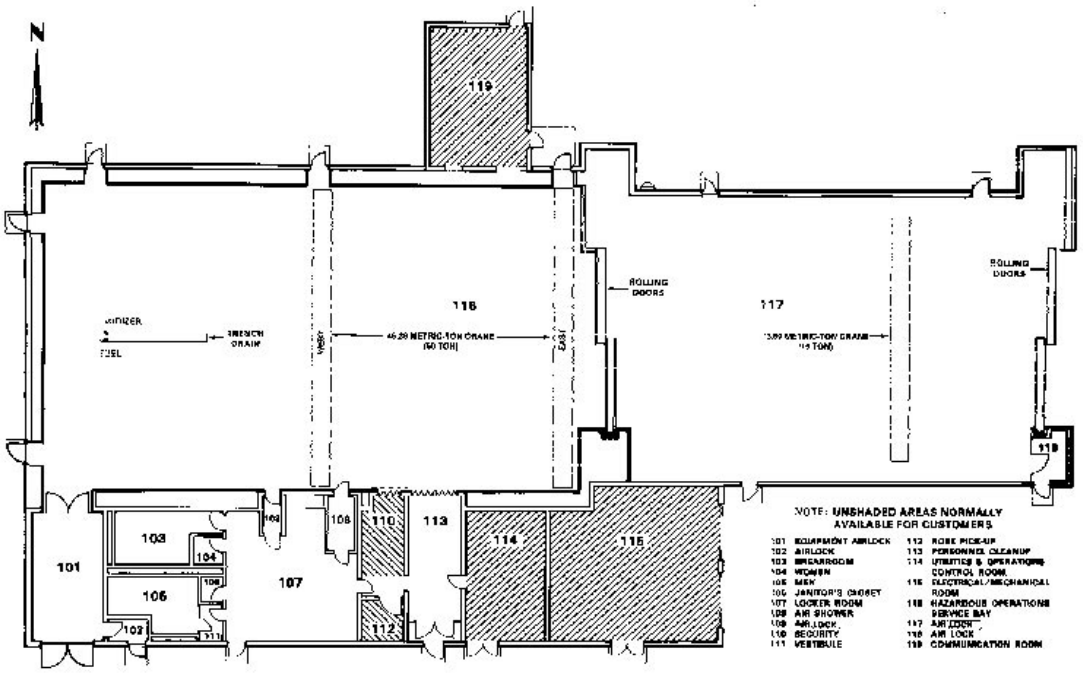

Figure 3-2. PHSF Floor Plan

3.2 ACCESS

Since many areas in the PHSF are classified as CWA's, access to the facility is limited to specific entrances. Personnel may enter the service bay through the air shower (room 108) or the airlock (room 117) located on the south side of the PHSF. Equipment may be brought through the equipment airlock (room 101) located on the southwest side of the building or through the large, double-door entrance to the airlock (room 117) on the east side of the facility. Room specifications are listed in table 3-1. Specific CWA environmental requirements and the environmental monitoring system (EMS) are discussed in detail in section 3.3.10.

Personnel entering the PHSF must use the PACAS card reader located on the south side of the PHSF inside the door of room 113. A cipher lock is located at the entrance of the locker room (room 107) for personnel access to the service bay.

Table 3-1. PHSF Room Specifications

• Rm No.	Function	Length	Width	Ceiling Height	Largest Doorway	Floor	Wall	Ceiling
101	Equipment Airlock	8 m (26 ft 1 in)	4.4 m (14 ft 4 in)	3.2 m (10 ft 4 in)	3.1 m x 3.1 m (10 ft x 10 ft)	CVT	GWB	GWB
102	Airlock	2.6 m (8.5 ft)	1.2 m (4 ft)	2.7 m (9 ft)	.9 m x 2.1 m (2 ft 11 in x 7 ft)	C	CMU	ACT
103	Break Room	4.6 m (14 ft 11 in)	3.5 m (11 ft '7 in)	2.7 m (9 ft)	.9 m x 2.1 m (2 ft 11 in x 7 ft)	VT	CMU	ACT
107	Locker Room	8 m (26 ft 1 in)	7.8 m (25.5 ft)	2.7 m (9 ft)	.9 m x 2.1 m (2 ft 11 in x 7 ft)	VT	CMU	ACT
108	Air Shower	3.5 m (11 ft 4 in)	1.4 m (4.5 ft)	2.1 m (7 ft)	0.9 m x 2.1 m (3 ft x 7 ft)	VT	CMU	ACT
109	Airlock	2.5 m (8 ft 4 in)	1.2 m (4 ft)	2.7 m (9 ft)	.9 m x 2.1 m (2 ft 11 in x 7 ft)	VT	CMU	ACT
113	Personnel Cleanup	9.3 m (30 ft 5 in)	3.4 m (11 ft)	2.7 m (9 ft)	.9 m x 2.1 m (2 ft 11 in x 7 ft)	VT	CMU	ACT
116	Hazard Ops Service Bay	32.6 m (107 ft)	18.4 m (60 ft 4 in)	29 m (94 ft 10 in)	10.8 m x 22.9 m (35 ft 5 in x 75 ft)	CVT	GWB	GWB
117	Airlock	25.9 m (85 ft)	15.3 m (50 ft 4 in)	27.4 m (89 ft 10 in)	10.8 m x 22.9 m (35 ft 5 in x 75 ft)	CVT	GWB	GWB

LEGEND

ACT	- Acoustic Tile	GWB	- Gypsum Wallboard - Painted
CMU	- Concrete Masonry Unit - Painted	VT	- Vinyl Tile
CVT	- Conductive Vinyl Tile	C	- Cement

3.3 MECHANICAL SYSTEMS

The PHSF mechanical systems include the following: cranes, air pallets and fork lifts; vacuum and compressed air systems; Gaseous Helium (GHe) and Gaseous Nitrogen (GN_2) systems; Hypergol and Krypton vent systems; propellant waste drain system; the EMS; and an emergency exhaust system. The mechanical systems are depicted in figure 3-3.

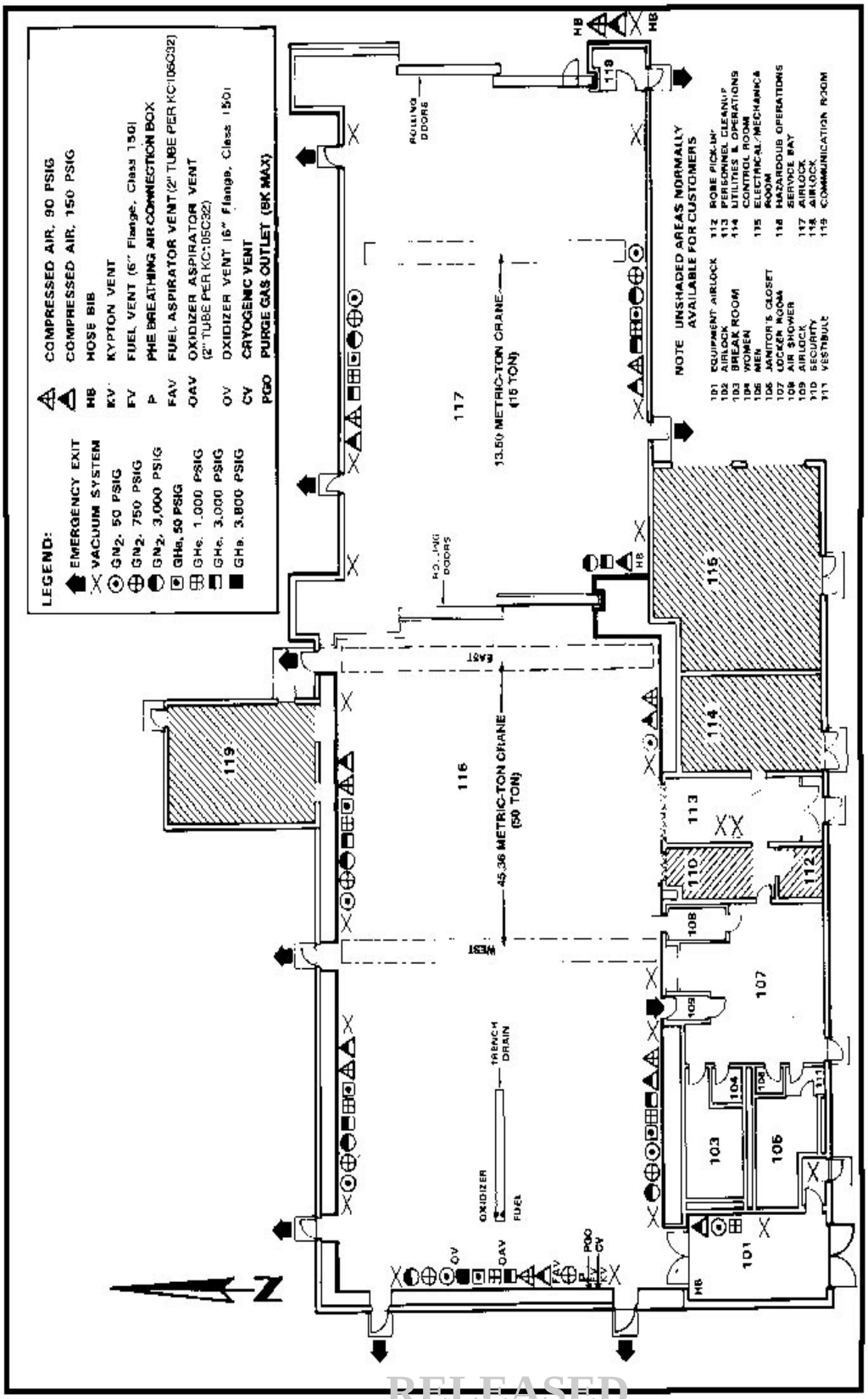

Figure 3-3. PHSF Mechanical Systems

3.3.1 MATERIAL HANDLING EQUIPMENT. Material handling equipment in the PHSF includes one 13.6-metric ton (15-ton) and two 45.36-metric ton (50-ton) cranes and various tugs, pallets and forklifts. Only personnel trained and certified at KSC are permitted to operate cranes, rolling doors and forklifts. The LSSM coordinates all training and KSC contractor support personnel conduct training classes for payload organizations, as required. Crane training is provided in accordance with Kennedy Management Instruction (KMI) 6430.4, *Examination and Licensing of KSC Facility Crane Operators*. Physical examinations are a prerequisite for all crane operator training. ***Note: the airlock and the service bay bridge cranes are not capable of being relocated outside of their respective operational areas.***

3.3.1.1 Airlock Bridge Crane. The airlock has a 13.6-metric ton (15-ton) bridge crane that operates on twin runway girder rails in an east-west direction. The effective east-west travel of the hoist (hook centerline to wall) is to a point 5.5 m (17 ft 11.5 in) from the east wall and 3.9 m (12 ft 11 in) from the west wall. The effective north-south travel of the hoist (hook centerline to wall) is 1.5 m (4 ft 9.5 in) from the north wall and 1.3 m (4 ft 5 in) from the south wall. The maximum hook height is 22.9 m (75 ft).

3.3.1.2 Service Bay Bridge Cranes. The service bay has two 45.36 metric ton (50-ton) bridge cranes which operate on twin runway girder rails in an east-west direction. The nominal hook height for each of the cranes is 24.3 m (80 ft). Both crane hooks can be outfitted with a debris shield to protect payloads from any possible overhead debris falling from the crane.

The effective east-west travel of the west crane hoist (hook centerline to wall) is to a point 9.5 m (31 ft 5 in) from the east wall and 4.2 m (13 ft 9 in) from the west wall. The effective north-south travel of the hoist (hook centerline to wall) is 2 m (6 ft 5 in) from the north and south walls. The effective east-west travel of the east crane hoist (hook centerline to wall) is a point 3.4 m (11 ft 2 in) from the east wall, and 10.4 m (34 ft 3 in) from the west wall. The effective north-south travel of the hoist (hook centerline to wall) is 3.3 m (11 ft) from the north wall and 2.9 m (9 ft 10 in) from the south wall. See table 3.2 which follows for crane speeds.

3.3.1.3 Electric Towing. An electric tug, with a towing weight capacity of approximately 6,123 kg (13,500 lbs) tractive force, is available and used to move payloads in and out of the airlock and the service bay and among facilities on KSC. Equipment must be scheduled 24 hours prior to use.

3.3.1.4 Air Bearing Pallet. An air bearing pallet, using compressed shop air and capable of moving 18,144 kg (40,000 lbs), can be used to move GSE and payloads between the airlock and service bay. Equipment must be scheduled 24 hours prior to use.

3.3.1.5 Electric Fork Lift. An electric fork lift, capable of lifting 1,814 kg (4,000 lbs), is available to move GSE in the airlock or service bay. Equipment must be scheduled 24 hours prior to use.

Table 3-2. Crane Speeds - Meters per Minute

	13.6 Metric-ton (15-ton)	45.36 Metric-ton East (50-ton)	45.36 Metric-ton West (50-ton)
Hoist at Full Load			
Main	4.9/1.6 m (16.2/5.4 ft)	4.1/1.3 m (13.6/4.5 ft)	3.8/1.2 m (12.7/4.2 ft)
Micro	0.4/0.1 m (1.5/0.5 ft)	0.5/0.1 m (1.8/0.6 ft)	0.5/0.1 m (1.8/0.6 ft)
Bridge			
Main	6.4/2.1 m (21.1/7 ft)	6.8/2.2 m (22.5/7.5 ft)	6.4/2.1 m (21.1/7 ft)
Micro	0.4 - m (1.6 - ft)	0.4 - m (1.6 - ft)	0.4 - m (1.6 - ft)
Trolley			
Main	6.2/2.1 m (20.7/7 ft)	6.4/2.3 m (21.3/7.9 ft)	6.2/2 m (20.8/6.9 ft)
Micro	0.4 - m (1.5 - ft)	0.4 - m (1.5 - ft)	0.4 - m (1.5 - ft)

3.3.1.6 Gasoline Fork Lift. A gasoline fork lift, capable of lifting 3,628 kg (8,000 lbs), is available to move equipment in the perimeter areas only. Equipment must be scheduled 24 hours prior to use. Use of this fork lift is prohibited within the service bay and airlock operation areas.

3.3.2 VACUUM SYSTEM. The PHSF has 40 vacuum outlets located within the facility and one outlet outside the entrance to room 118. The vacuum outlets are flush-mounted, wall-valve type for 38.10 mm (1.5 in) base. The vacuum pump produces a vacuum of 0.3 bar (9 in) of mercury and is located outside at the southeast corner of the service bay.

The service bay (room 116) has a total of 22 vacuum outlets. The north and south walls of the service bay each have nine outlets: four located 71.1 cm (28 in) from the floor; four at 20.7 m (68 ft); and one at 29.9 m (98 ft). The west wall of the service bay has four outlets -- two at 71.1 cm (28 in) from the floor and two at 20.7 m (68 ft). The airlock (room 117) has a total of 14 vacuum outlets -- seven each on the north and south walls. Both walls have three outlets 71.1 cm (28 in) from the floor; three at 20.7 m (68 ft); and one at 29.9 m (98 ft). The four remaining vacuum outlets are located as follows: two in the personnel cleanup (room 113) at 71.1 cm (28 in) from the floor; one in the equipment airlock (room 101) at 1.2 m (4 ft); and one in the airlock (room 102) located 71.1 cm (28 in) from the floor. The shoe scrubbers in rooms 102 and 113 and shoe cleaners in rooms 107 and 110 are also connected to the vacuum system. Refer to figure 3-3 for vacuum system locations.

3.3.3 COMPRESSED AIR SYSTEM. Two air compressors located in room 115 supply regulated compressed air to both the PHSF service bay and the airlock. The outlets have 5-micron filters and are located in recessed wall cabinets with cylinder locks on

the doors. Compressed air is available at 6.2 bars (90 psig) at 185 cubic feet per minute (CFM) and 10.3 bars (150 psig) at 325 CFM.

3.3.4 GASEOUS HELIUM SYSTEM. A 14.16 cubic m (500 cubic ft) GHe storage tank and a GHe regulating panel, located at the west end of the building, supply filtered GHe. The GHe is available through outlets in both the PHSF service bay and airlock at rates of 3.5 bars (50 psig), 69 bars (1,000 psig), 206.9 bars (3,000 psig), and 262 bars (3,800 psig) maximum. These outlets are also located in recessed wall cabinets with cylinder locks on the doors. The facility GHe available at KSC is procured to Grade A, MIL-P-27407A.

3.3.5 GASEOUS NITROGEN SYSTEM. The GN_2 system is supplied from the unfiltered industrial area 413.8 bars (6,000 psig) GN_2 system. The connection to this system is located at the west end of the building. A GN_2 regulating panel -- also located at the west end of the building -- filters the GN_2 to 10 microns and regulates the GN_2 down to 3.5 bars (50 psig), 51.7 bars (750 psig) and 206.9 bars (3,000 psig) to outlets available in both the PHSF service bay and airlock. The outlets are located in recessed wall cabinets with cylinder locks on the doors. The facility GN_2 available through this system is Grade B, MIL-P-27401C.

3.3.6 HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS. Air enters the PHSF through High-Efficiency Particle Air (HEPA) filters mounted in the ceilings of the service bay, airlock and equipment airlock and is guaranteed class 5,000 air at the filter discharge for the air-conditioning and reheat systems. These systems maintain temperatures of 21.7 +/- 3.3 $^{\circ}$C (71 +/- 6 $^{\circ}$F) with a maximum relative humidity of 55 percent. Volumetric air change is exchanged minimally four times per hour with positive pressure maintained at all times.

3.3.7 BREATHING AIR SYSTEM. Regulated breathing air for Propellant Handlers Ensemble (PHE) operations is available from four 9.525 mm (3/8 in) quick disconnect couplings on the west wall of the service bay.

3.3.8 HYPERGOL VENT SYSTEM. Hypergol vents are located on the west wall of the service bay. Vapors are piped into the respective fuel or oxidizer separators, and then the effluent travels into the hypergol scrubber system and is vented. Aspirated (vacuumed) hypergol liquids are retained in the aspirator, and vapors are exhausted through the hypergol vents.

3.3.9 PROPELLANT WASTE DRAIN SYSTEM. The propellant waste drain system is a non-storage system that is used in the event of a spill during hypergolic operations. The system consists of a trench drain with an oxidizer drain line and a fuel drain line. Each drain line is connected to its respective stainless steel waste tank. All leaks and spills must be flushed immediately with water to achieve a dilution ratio of at least 1-1/2 parts water to one part hypergol.

The oxidizer waste tank has a capacity of 5,677.5 liters (l) or (1,500 gal), and the fuel waste tank has a capacity of 28,387.5 l (7,500 gal). The tanks' contents are sampled and then disposed of by the KSC Base Operations Contractor.

3.3.10 ENVIRONMENTAL MONITORING SYSTEM. The PHSF is a CWA; the service bay is rated as a CWA level 4 and the Airlock is rated as a CWA level 5. An EMS provides real-time and historical data on the necessary parameters relative to maintaining a clean working environment and is supplemented by physical measuring techniques. Environmental conditions are continuously monitored, stored and recorded for temperature, relative humidity and airborne particle concentration. Surface particulate matter, nonvolatile residue and volatile hydrocarbons are monitored using conventional methods (i.e., witness plates). See table 3-3 for CWA environmental requirements.

EMS sensor sets are installed in recessed purged cabinets in the west, south and north walls of the service bay and in similar recesses in the south wall of the airlock. Each set contains a temperature sensor that reads $^{\circ}$F, a relative humidity sensor that reads percentage and a laser particle counter that measures airborne particle concentration.

The Continuous Monitor/Analyzer is the heart of the EMS. The mainframe is centrally-located and remote from the sensors. Multiple sensor outputs are connected by coaxial cable. The system identifies information from the sensors, archives it in time-correlated channels of data and provides an output to the host computer system. The mainframe and the computer are located in room 113. Real-time data and a printed record of environmental out-of-specification conditions (if any) are available from the computer. During propellant operations, toxic vapor detectors are activated -- one oxidizer and fuel set in the airlock and one set in the service bay -- and results of their sampling are also available from the printed computer record.

3.3.11 KRYPTON VENT SYSTEM. The krypton vent contains one 1/2-horsepower (hp) variable-speed centrifugal direct-drive fan rated at 165.2 1/sec. or 350 standard cubic feet per minute (scfm).

3.3.12 EMERGENCY EXHAUST SYSTEM. Five manually-initiated, belt-driven centrifugal exhaust fans support the Emergency Exhaust System: two 15-hp fans rated at a total of 13,140.48 1/sec (27,840 scfm); two 3-hp fans rated at a total of 3,261.52 1/sec (6,910 scfm); and one 1-hp fan rated at 2,360 1/sec (5,000 scfm). The controls for these fans are located on the hazardous control panel in the facility control room, in the airlock and the security room (110).

3.3.13 SAFETY EQUIPMENT. A combination eyewash and safety shower is located adjacent to the scrubbers outside the west end of the service bay. Additional ones are

located at all emergency exits from the service bay, airlock and attached support rooms.

Table 3-3. KSC CWA Environmental Requirements [1]

• Clean Work Area Levels		Level #4	Level #5
Parameter	**Air Flow**	**Non-Laminar**	**Non-Laminar**
Maximum Airborn Particulate Counts (Per Cubic Foot)	Req = 0.5 µm Req = 5.0 µm Monitoring	100,000 700 Continuous	300,000 1,000 Monthly
Temperature (°F) [3]	Requirement Monitoring	71±6	71±6
Relative Humidity (Percent) [3]	Requirement Monitoring	55 Max Continuous	55 Max Monthly
Maximum Particle Fallout [2]	Goal Monitoring	Level 750 Continuous	Level 1000 Every 6 Months
Maximum NVR ($mg/0.1m^2$/month)	Requirement Monitoring	1.0 Continuous	2.0 Annually
Maximum Volatile Hydrocarbons (PPM) (v/v)	Requirement Monitoring	15 Max Every 2 Weeks	N/A N/A
Minimum Positive Pressure	Requirement Monitoring	0.02 in. H_2O Daily	N/A N/A
Minimum Air Changes	Requirement	4/Hour	2/Hour

[1] During periods of operation
[2] Levels per MIL-STD-1246B for a 24-hour period
[3] Program OMRSD may supersede these requirements

3.4 FIRE PROTECTION SYSTEMS

Fire protection within the PHSF consists of a fire detection system, a fire alarm system, fire control equipment, and a Firex water deluge system. During hazardous operations, KCA-013 *Firewatch Procedure*, will be in effect. Figure 3-4 which follows, shows the locations of the various emergency warning systems within the facility.

3.4.1 FIRE DETECTION SYSTEM. Smoke detectors are installed in the airlock (rooms 117 and 118) and service bay air-conditioning ducts. When a payload is being processed, closed circuit television (CCTV) cameras are used for fire detection purposes. With the exception of the equipment airlock (room 101), which has an

ionization detector in the ceiling, all the remaining rooms in the PHSF have heat-activated detectors (HAD's) installed in the ceilings.

3.4.2 FIRE ALARM SYSTEM. Hand-operated, pull-type fire alarm stations and fire alarm break-glass stations are located at strategic places throughout the building. Activation of either a detector or fire alarm transmits a signal to KSC's Protective Services Control Center in the LCC (room 1P10). At the same time, alarm bells sound in and around the building, the Heating, Ventilating and Air-Conditioning (HVAC) dampers close and the air handlers are shut down to contain the fire.

3.4.3 FIRE CONTROL EQUIPMENT. Fire extinguishers are located at strategic locations in the airlock, service bay and equipment airlock.

3.4.4 WATER DELUGE SYSTEMS. A Firex water deluge system is located in the service bay and contains multiple water nozzles in the ceiling and walls. The system is divided into two zones. Zone 1 covers approximately the west third of the service bay, including the trench drain, and Zone 2 covers the remainder of the service bay. Each zone's control panel is covered in Plexiglas and padlocked to prevent the deluge system from being accidentally activated. During all hazardous operations, the protective Plexiglas covers are removed and the system is readied. The system can then be activated from the service bay (interior north wall at the middle door), the security room, or the facility control room in the MOSB. Operational requirements for this system are defined by the KCA-013 document.

On the opposite wall from the PHSF's Firex water deluge system control panel, is the control panel for the Fuel Transfer Building and the Oxidizer Shed water deluge systems. Refer to Section V of this document for more details.

3.5 ELECTRICAL SYSTEMS

Electrical systems within the PHSF consist of alternating current (ac), fluorescent and emergency lighting units, lightning protection, grounding systems, a power kill switch, and back-up power units. Figure 3-4 also shows the locations of the various electrical systems located within the facility.

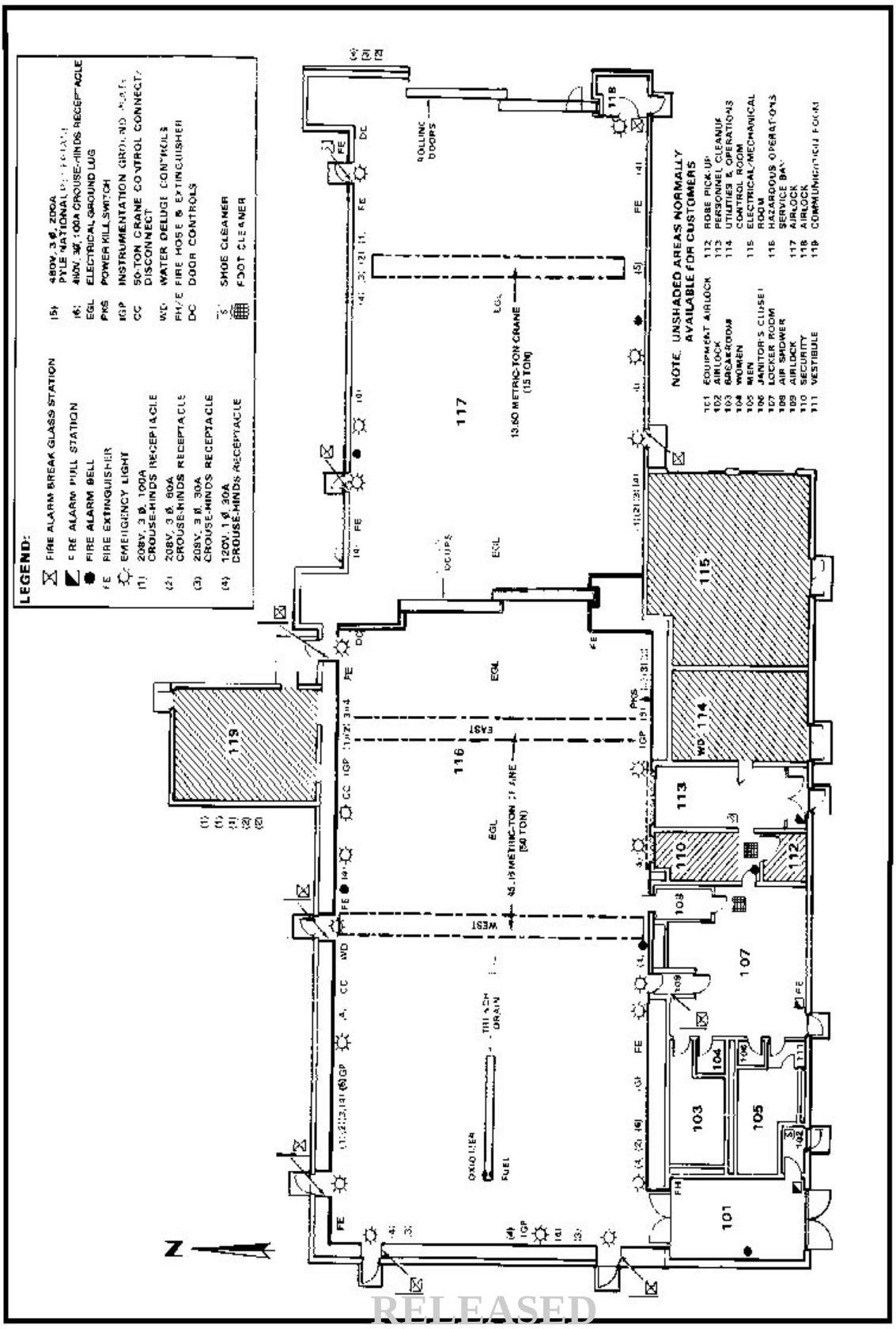

Figure 3-4. PHSF Electrical and Fire Protection Systems

3.5.1 ALTERNATING CURRENT. The ac industrial power delivered to the PHSF airlock, service bay and attached support rooms is summarized as follows:

	Voltage	Amperage	Phase	Hz	Type Receptacle
* a.	120	20	single	60	Standard Duplex NEMA (5-20R)
b.	120	30	single	60	Crouse-Hinds
c.	208Y/120	30	three	60	Crouse-Hinds
d.	208Y/120	60	three	60	Crouse-Hinds
e.	208Y/120	100	three	60	Crouse-Hinds
f.	480	100	three	60	Crouse-Hinds
g.	480	200	three	60	Pyle National

* Additional to those shown in Figure 3-4.

3.5.2 ILLUMINATION. Illumination in the airlock and service bay is provided by high-pressure, sodium light fixtures. Illumination in the attached support rooms comes from flush-mounted ceiling fluorescent light fixtures. The airlock and service bay contain emergency light fixtures which automatically light during an ac power failure. Attached support rooms 107, 113 and 114 each have one wall-mounted, self-charging, battery-powered emergency lighting unit. Each unit has two bulbs and will also light automatically in the event of an ac power failure.

Note: all electrical fixtures and receptacles in the PHSF service bay and airlock are explosion-proof and meet the requirements for Class One, Division Two, Group D and Group C atmosphere.

3.5.3 LIGHTNING PROTECTION. Lightning protection is provided by a system of air terminals, down conductors and grounding rods which are interconnected by No. 4/0 copper wire and connected to the external ground counterpoise.

3.5.4 GROUNDING SYSTEMS. The PHSF has an instrumentation and a structural grounding system. Five instrumentation ground plates (IGP) are located on the walls of the service bay. Three countersunk electrical ground lugs (EGL's) are located in the floor of the service bay and two are located in the floor of the airlock. The EGL's are used to ground equipment during hoisting operations and ground the GSE to the structural grounding system. All structural metal and the conductive vinyl tile floor in the airlock and service bay are also connected to the structural grounding system.

3.5.5 POWER KILL SWITCH (PKS). A single-point, electrical emergency cutoff circuit is provided. A receptacle is mounted on the southeast wall, and a 30.48 m (100 ft) cord with a PKS plugs into the receptacle. When this switch is activated, all ac power to all the receptacles in the service bay is terminated.

3.5.6 BACK-UP POWER. Back-up power is available and can be supplied by a government-furnished diesel generator through an automatic transfer switch located on the interior wall of room 115. This back-up system will supply power to the service bay receptacles and the CCTV receptacles in room 110. This support must be scheduled as needed.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION IV

MULTI-OPERATIONS SUPPORT BUILDING

4.1 DESCRIPTION

The MOSB is located at the entrance of the PHSF complex and northeast of the PHSF. The building is a prefabricated, one-story steel building with an exterior of insulated metal siding. This building was designed to be the office area and payload control center for customers using the PHSF and the MPPF. As stated previously, the southern half of the building supports the PHSF and the northern section supports the MPPF. This document will address the southern section, or PHSF side. Table 4-1 provides room specifications for the areas normally available to customers, and figure 4-1 provides the floor plan for the MOSB.

Table 4-1. MOSB-South Room Specifications

Rm No.	Function	Length	Width	Ceiling Hgt	Largest Doorway	Floor	Wall	Ceiling
103	Office Area	17.7m (58 ft)	15.2m (50 ft)	2.7m (9 ft)	1.8 x 2.2m (5 ft 11 in x 7 ft 2 in)	CA	GWB	ACT
104	Conference Room	6.6m (21.5 ft)	5.0m (16.5 ft)	2.7m (9 ft)	1.9 x 2.1m (6 ft 4 in x 7 ft)	CA	GWB	ACT
105	Facility Storage	5.2m (17 ft)	5.0m (16.5 ft)	2.7m (9 ft)	1.9 x 2.1m (6 ft 4 in x 7 ft)	VT	CMU IMS	ACT
106	Mechanical Room	7.9m (26 ft)	4.7m (15 ft 3 in)	4.6m (15 ft)	1.8 x 2.4m (5 ft 10 in x 7 ft 10 in)	C	CMU IMS	INSB
107	Break Room	5.3m (17.5 ft)	4.7m (15.5 ft)	2.7m (9 ft)	1 x 2.1m (3 ft 4 in x 7 ft)	CA	GWB	ACT
114	PHE Change Rm	6.6m (21.5 ft)	5.6m (18.5 ft)	2.7m (9 ft)	1.8 x 2.1m (5 ft 11 in x 6 ft 10 in)	VT	CMU IMS	ACT
116 117	Payload Ctrl Rms	12.6m (41 ft 4 in)	8.8m (28 ft 9 in)	3.6m (11 ft 9 in)	3.0 x 3.0m (9 ft 10 in x 9 ft 10 in)	VTB	CMU	ACT

LEGEND

ACT	- Acoustic Tile	IMS	- Insulated Metal Siding
CMU	- Concrete Masonry Unit - Painted	VT	- Vinyl Tile
GWB	- Gypsum Wallboard - Painted	VTB	- Vinyl Tile Block-Raised Floor
C	- Cement	CA	- Carpet
INSB	- Insulation Batting		

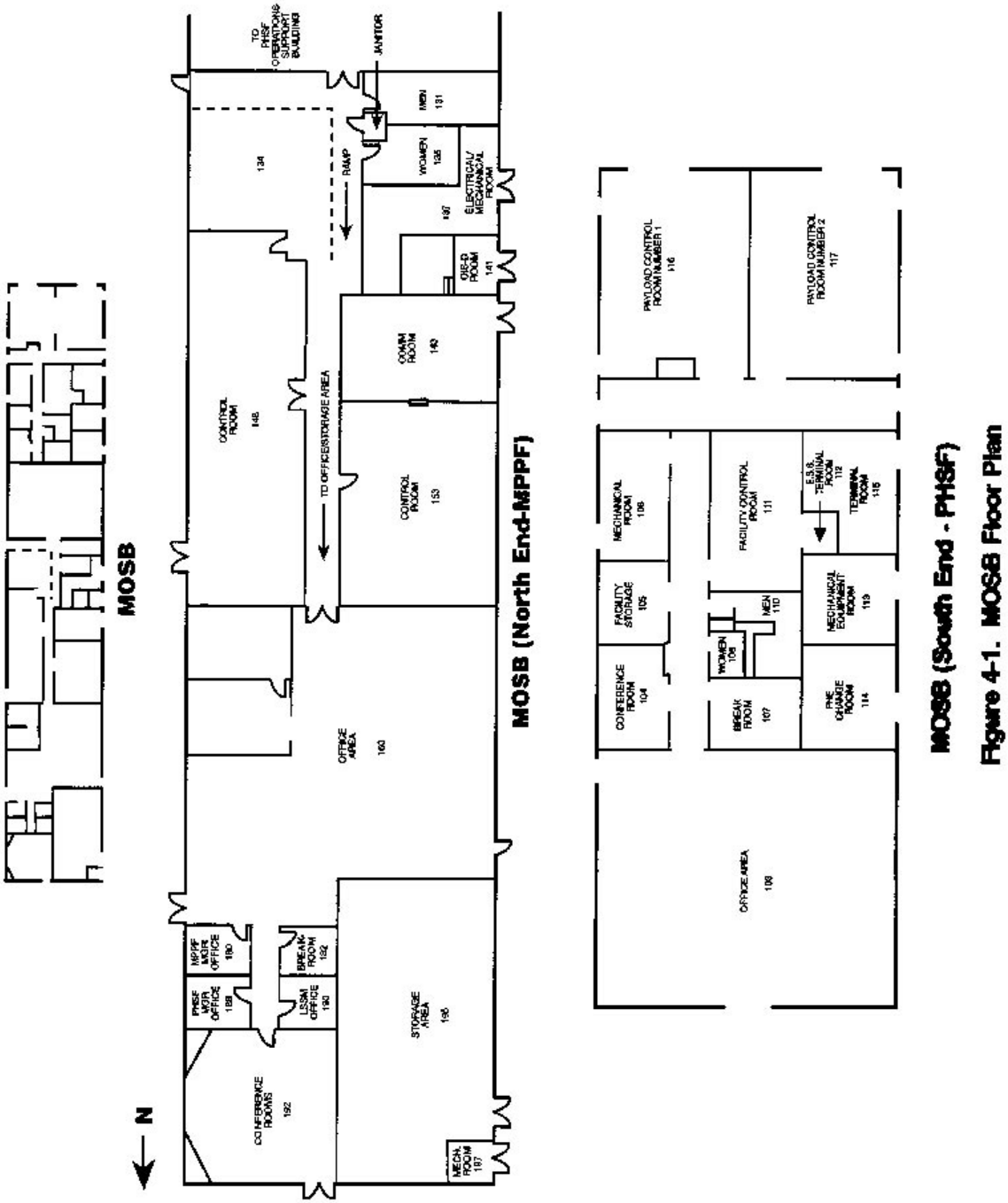

Figure 4-1. MOSB Floor Plan

4.2 ACCESS

Personnel have free access to the MOSB customer areas during normal duty hours. However, the customer can limit entry into the payload control rooms (rooms 116 and 117) using an access list.

4.3 CUSTOMER AREAS

Within the PHSF there are designated areas for customer use. These areas include office and work areas, conference and break rooms, a mechanical shop, a PHE change room, and two payload control rooms.

4.3.1 OFFICE AREA. The office area located in room 103 provides seating for approximately 54 payload customers and the NASA facility manager. A detailed layout of the office area is shown in figure 4-2.

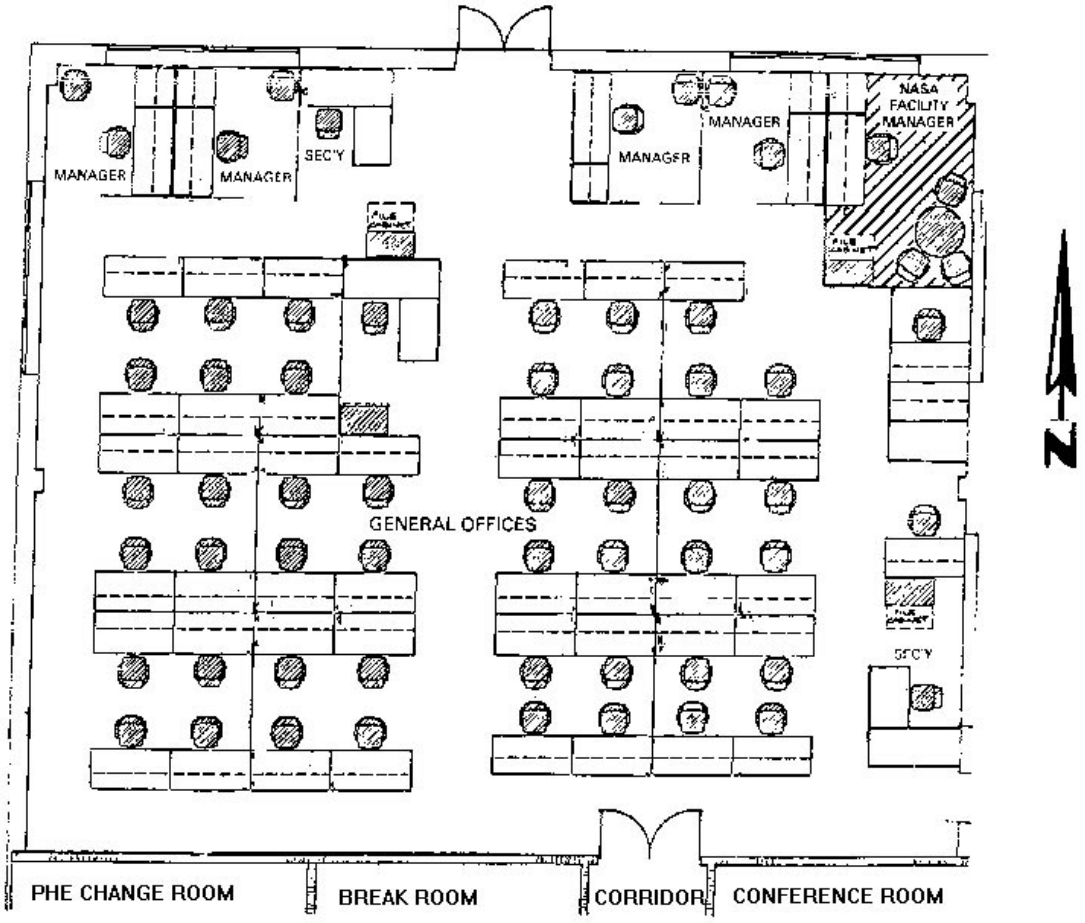

Figure 4-2. Office Area Seating

4.3.2 CONFERENCE ROOM. The conference room (room 104) is adjacent to the office area and can accommodate approximately 25 customers.

4.3.3 FACILITY STORAGE. The facility storage area (room 105) is next to the conference room and can be used to store facility support equipment.

4.3.4 MECHANICAL SHOP. Sections of the mechanical shop (room 106) can be used by the customer. There are three 6.2 bars (90 psig) shop air outlets available -- one each on the west, north and south walls.

4.3.5 BREAK ROOM. The break room (room 107) is located across from the conference room and contains vending machines.

4.3.6 PHE CHANGE ROOM. The PHE change room (room 114) is accessible only from the outside -- the west side of the MOSB. This room contain lockers and the necessary equipment and facilities for a PHE operation change.

4.3.7 PAYLOAD CONTROL ROOMS. Two payload control rooms (rooms 116 and 117) are located at the south end of the building. These rooms serve as a ground station for checkout and testing of the customer's payload located in the service bay. The rooms are separated by a rolling door. When required, the customer may open this door and have the use of both rooms.

4.4 FACILITY CONTROL ROOM

Other NASA/Contractor facility management areas include the facility control room (room 111), the Electronic Security System (ESS) terminal room (room 112), a terminal room (room 115), and the mechanical equipment room (room 113). These areas are not normally available to the customer, but are used to manage and safeguard the MOSB facility.

NASA and payload management can monitor and control hazardous operations using the control panels in the facility control room. The control panels operate the nitrogen tetroxide (N_2O_4) and monomethylhydrazine (MMH) scrubbers and the water deluge system. Monitoring functions include the GN_2 and GHe supply pressure indicator panel, the TV control panels and monitors, the operational intercommunication system - digital (OIS-D), and countdown displays.

Note: the emergency exhaust fans and the facility warning light may also be activated from the southern-most TV control panel.

4.5 HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS

The air-conditioning and reheat systems for the MOSB's payload control and support rooms maintain temperatures of 21.7 +/-3.3 °C (71 +/- 6 °F) with a maximum relative humidity of 55 percent.

4.6 FIRE PROTECTION SYSTEMS

Fire protection systems within the MOSB consist of a fire detection system, a fire alarm system and fire control equipment. Figure 4-3 shows the locations of the various emergency warning systems within the facility.

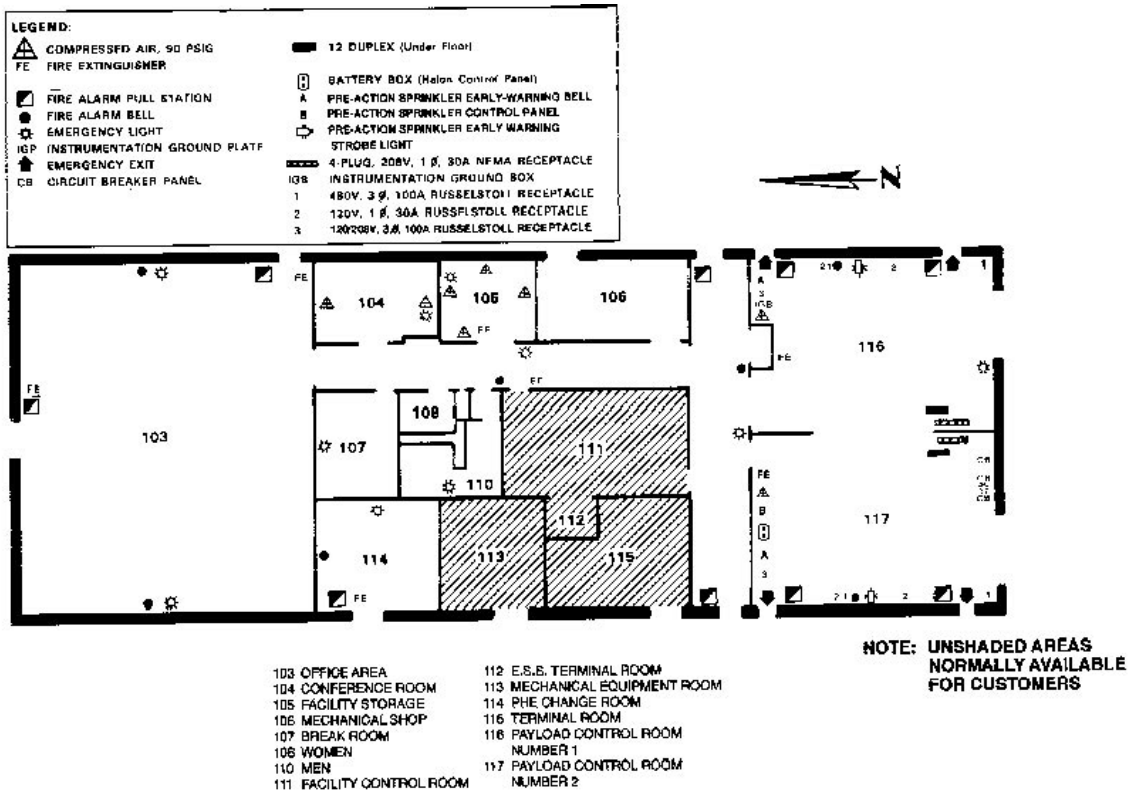

Figure 4-3. MOSB Electrical and Fire Protection Systems

4.6.1 FIRE DETECTION SYSTEM. The MOSB has three types of fire detectors: HAD's; ionization detectors installed in the ceiling and air-conditioning ducts; and ionization detectors installed under the floors. The HADs are installed in all rooms and hallways of the MOSB except for the facility control room, the terminal room (room 115) and the payload control rooms (rooms 116 and 117) which are protected by ceiling-mount and under-floor ionization detectors.

4.6.2 FIRE ALARM SYSTEM. Hand-operated, pull-type alarm stations are located at strategic places throughout the building. When either a fire detector or fire alarm is activated, it transmits a signal to the KSC Protective Services Control Center located at KSC's LCC, room 1P10.

4.6.3 FIRE CONTROL EQUIPMENT. The two payload control rooms are protected by a fire suppression system which has release heads in the ceilings. Each of the rooms has a pre-action sprinkler early warning light which alerts personnel when the system has been activated. Fire extinguishers are also located in the payload control rooms and throughout the MOSB.

4.7 SAFETY EQUIPMENT

A combination eyewash and safety shower is located outside on the west side of the building between the entrances to rooms 114 and 113.

4.8 ELECTRICAL SYSTEMS

Electrical systems within the MOSB consist of ac, fluorescent and emergency lighting units, lightning protection, grounding systems, and back-up power units. Figure 4-3 shows the locations of the various electrical systems located within the facility.

4.8.1 ALTERNATING CURRENT. The ac industrial power available at the MOSB is summarized below:

	Voltage	Amperage	Phase	Hz	Type Receptacle
* a.	120	20	single	60	Standard Duplex NEMA 5-20R
b.	120	30	single	60	RusselStoll
c.	208	30	single	60	NEMA L-14-30R
d.	208Y/120	100	three	60	RusselStoll
e.	480	100	three	60	RusselStoll

* Additional to those shown in figure 4-3.

4.8.2 ILLUMINATION. Illumination in the MOSB is provided by a variety of flush-mounted ceiling fluorescent light fixtures. Wall-mounted, self-charging, battery powered emergency lighting units are strategically located throughout the building. Each unit has two bulbs and will turn on automatically during an ac power failure.

4.8.3 LIGHTNING PROTECTION. Since the MOSB is a one-story building, no lightning protection is required. The antenna tower, however, is protected by of a lightning rod which is connected to the common grounding system.

4.8.4 GROUNDING SYSTEMS. The MOSB has an instrumentation and structural grounding system which consists of grounding rods which are interconnected by 4/0 copper wire and connected to the external ground counterpoise.

4.8.5 BACK-UP POWER. Back-up power is supplied by a government-furnished diesel generator which uses an automatic transfer switch on the southeast wall of payload control room 117. This back-up system supplies power to the receptacles and lights in the payload control rooms only.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION V

SPECIAL SERVICE FACILITIES

Three special service facilities support payload processing activities at the PHSF complex: the fuel transfer building, the oxidizer shed and the krypton storage building. All three facilities are located along the perimeter road at the west end of the PHSF service bay. Refer back to figure 2-2, *PHSF Complex Site Plan* for the location of these special service facilities. Because of the hazardous operations in this area, both the fuel transfer building and the oxidizer shed are CCTV surveillance areas; fixed and ceiling-mounted CCTV cameras are located in the fuel transfer building and the oxidizer shed and all hazardous operations are monitored in the PHSF and MOSB control rooms. A windsock is located on the western edge of the site between the fuel transfer building and oxidizer shed.

5.1 FUEL TRANSFER BUILDING

The fuel transfer building (M7-1354B) is located at the southwest end of the PHSF adjacent to the perimeter road. Fuel is brought to this air-conditioned building in a variety of containers (drums, carts, etc.) and thermo-conditioned. Fuel containers are then moved into the PHSF's service bay through the equipment airlock. Remote fueling is also possible. The fuel transfer building can be connected to the fuel vapor scrubber vent system, as required. The building has a fuel aspirator vent which is used to contain small fuel spills. In the event of large-scale spill, a 200-psi water deluge system can be activated to flood the entire fuel transfer building. Activation switches are located at both the southeast and northwest corners of the building as well as in the security room of the PHSF. Once the water deluge system is activated, the water empties into emergency spill containment tanks underground.

A yellow beacon light is mounted in the center of the building on the exterior, south side. The beacon is activated whenever a hazardous operation is underway. A siamese-connect fire hydrant, a combination safety shower with eye wash and hose bib and a reel-type fire hose are located off the southeast corner of the building. Both the southeast and northwest corners of the building are equipped with fire alarms, beacon switches, water deluge system activation switches, and emergency exhaust switches. A telephone is located off the northeast corner of the building. An electrical ground plate for fuel delivery vehicles is situated on the perimeter road off the southwest corner of the building.

All electrical fixtures and receptacles within the fuel transfer building are explosion-proof and meet the requirements for Class One, Division Two, Group D atmosphere. The interior of the building has overhead pendant-mounted lights with globes and guards, wall-mounted fire extinguishers, a lightning protection system, a grounding system, an emergency exit light system, and an electrical ground plate for fuel delivery

vehicles. See figure 5-1 for the physical locations of the electrical and emergency warning systems.

5.2 OXIDIZER SHED

The oxidizer shed (M7-1354A) is located at the northwest end of the PHSF adjacent to the perimeter road. This area is a roofed, open-sided shed to which oxidizers are brought and then moved into the PHSF's service bay through the equipment airlock. An electrical ground plate for oxidizer delivery vehicles is located across the road at the southwest corner of the shed. Remote loading is also possible. The oxidizer shed can be connected to the oxidizer vapor scrubber vent system, as required. The shed has an oxidizer aspirator vent which is used to contain small oxidizer spills. In the event of a large-scale spill and water deluge activation, a waste drainage system empties into emergency spill containment tanks underground.

All electrical fixtures and receptacles in the oxidizer shed are explosion-proof and meet the requirements for Class One, Division Two, Group D atmosphere. The shed has overhead pendant-mounted lights with globes and guards, ceiling-mounted ultra-violet/infra-red (UV/IR) detection sensors in all four corners which automatically activate the water deluge system, a lightning protection system, and a grounding system. A yellow, hazardous operations beacon light is mounted on the southern exterior of the shed. The beacon switch, fire alarms, emergency exhaust switches, the oxidizer aspirator vent, oxidizer vents, public address (PA) speakers, and GN_2 pressure indicators are located at the southeast corner of the shed.

The water deluge system is manually armed using the outside stem & yoke (OS&Y) valve at the northeast corner of the shed. The 200-psi water deluge system can be activated by switches located at both the southeast and northwest corners of the shed. The water deluge system can also be activated remotely by control panels in the security room of the PHSF and/or the control room at the MOSB.

A combination safety shower with eye wash and hose bib, a reel-type fire hose, a fire extinguisher, and a siamese-connect fire hydrant are located off the northeast corner of the shed. OIS-D zones -- located in the southwest and southeast corners of the shed -- are used to communicate, monitor and record all hazardous operations. See figure 5-1 for the physical locations of the electrical and emergency warning systems.

5.3 KRYPTON STORAGE BUILDING

The krypton storage building (M7-1303) is located off the northwest corner of the PHSF adjacent to the north perimeter road. The interior is illuminated by two industrial fluorescent light fixtures. A fire extinguisher, a fire alarm pull-station, a fire alarm bell, and PA speakers are located outside the building on south end of the structure. The building is grounded and equipped with a manually-activated exhaust fan.

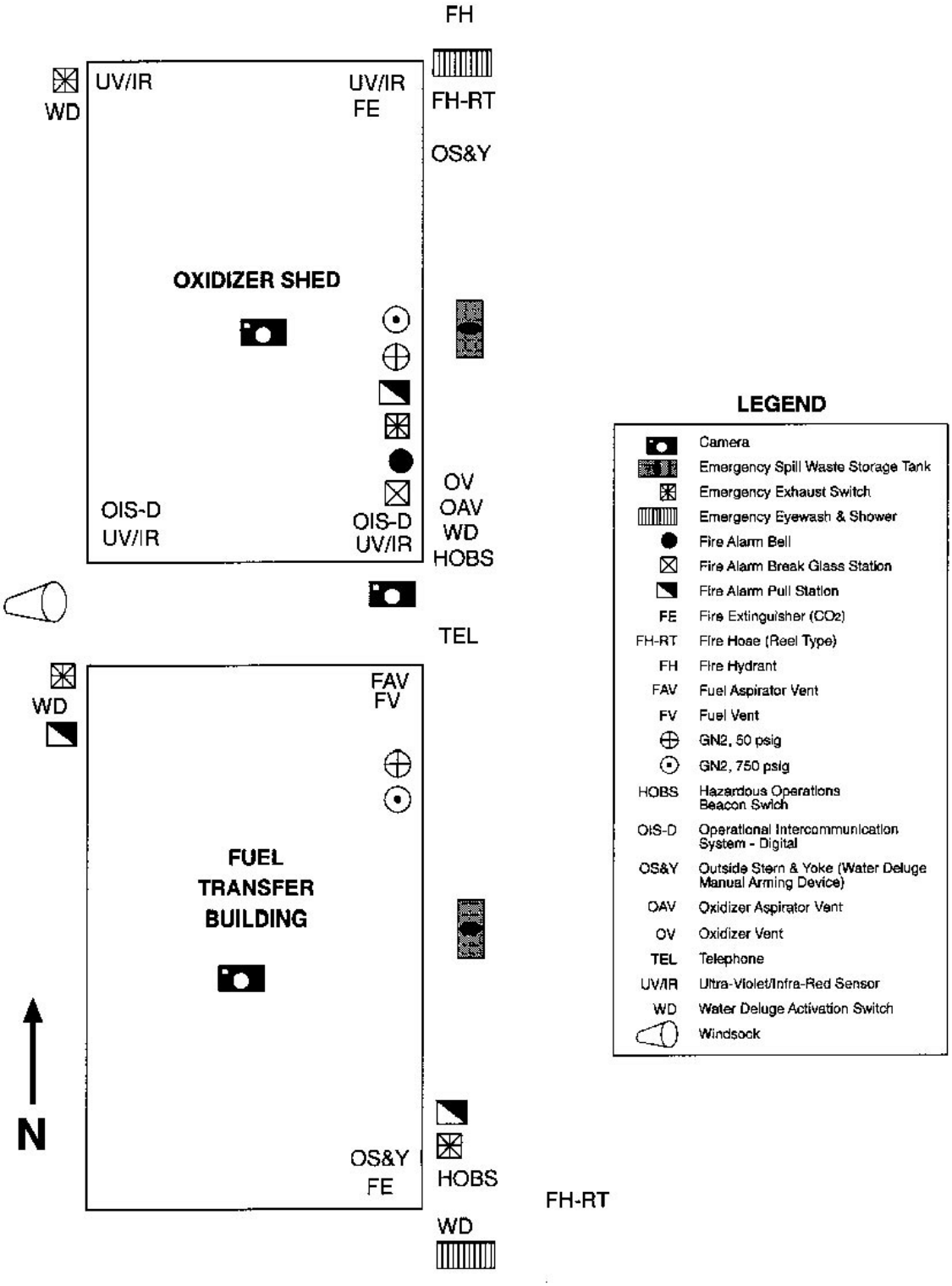
FH
UV/IR
WD
UV/IR
FE
FH-RT
OS&Y
OXIDIZER SHED
OV
OAV
WD
HOBS
OIS-D
UV/IR
OIS-D
UV/IR
TEL
FAV
FV
WD
FUEL
TRANSFER
BUILDING
N
OS&Y
FE
HOBS
WD
FH-RT
FH
LEGEND
Camera
Emergency Spill Waste Storage Tank
Emergency Exhaust Switch
Emergency Eyewash & Shower
Fire Alarm Bell
Fire Alarm Break Glass Station
Fire Alarm Pull Station
FE Fire Extinguisher (CO2)
FH-RT Fire Hose (Reel Type)
FH Fire Hydrant
FAV Fuel Aspirator Vent
FV Fuel Vent
GN2, 50 psig
GN2, 750 psig
HOBS Hazardous Operations Beacon Swich
OIS-D Operational Intercommunication System - Digital
OS&Y Outside Stem & Yoke (Water Deluge Manual Arming Device)
OAV Oxidizer Aspirator Vent
OV Oxidizer Vent
TEL Telephone
UV/IR Ultra-Violet/Infra-Red Sensor
WD Water Deluge Activation Switch
Windsock

Figure 5-1. Emergency Warning Systems of Fuel & Oxidizer Servicing Areas

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION VI

COMMUNICATIONS AND DATA HANDLING

6.1 COMMUNICATIONS

The PHSF and MOSB are serviced by administrative and operational communication systems. These systems include the OIS-D, CCTV, administrative telephones, an internal PA system, and timing signals. Figures 6-1 and 6-2 show the locations of these systems in the PHSF and MOSB, respectively.

6.1.1 OPERATIONAL INTERCOMMUNICATION SYSTEM. OIS-D is a multi-channel voice communication network interconnecting operational areas required for payload element processing at KSC with a capability to interface with the Transistorized Operational Phone System at CCAS.

6.1.2 CLOSED CIRCUIT TELEVISION. CCTV provides closed-circuit video surveillance of payload processing from operational areas (PHSF rooms 116 and 117) to control and monitor areas in the payload control rooms and in the facility control room in the MOSB. In addition, four monitors are located in the PHSF security room 110. There are eight pan and tilt CCTV cameras: four in the PHSF and two each -- one portable and one fixed -- in the fuel transfer building and oxidizer shed. These cameras and pan/tilt units are hazard-proof.

6.1.3 OTHER COMMUNICATIONS. Other forms of communication include administrative telephones in the service bay, MOSB, payload control rooms, facility control room, and office area and internal PA systems with aural warning devices. Countdown clocks which display Greenwich Mean Time and range timing are installed in the service bay and the MOSB's payload control and facility control rooms.

6.2 DATA HANDLING

Several data handling systems are available in the PHSF. The payload LSSM should be contacted for current data handling capabilities.

6.2.1 WIDEBAND CABLE TRANSMISSION SYSTEM (WBTS). WBTS provides closed-circuit transmission of complex waveform electromagnetic signals within the 30-hertz (Hz) to 4.5-megahertz (MHz) frequency spectrum at 1.0 Vp-p +/- 0.2 V terminated into a 124 ohms balanced load. These signals include TV video information, Launch Processing System (LPS) data trains, high-density operational intercommunications, multiplex telecommunication carriers, timing distribution, and system and event command response display data. An Inter-Range Instrumentation Group (IRIG)-B timing interface and an IRIG-E timing interface are located in the service bay of the

PHSF and in the payload control rooms and facility control room of the MOSB. Other analog and digital data systems associated with payload checkout, launch preparation and postlanding equipment performance interrogations are also available.

Wideband video frequency (0 Hz to 5 MHz) lines connect the PHSF and the MOSB. The WBTS will be available in the remote payload control rooms in the payload customer's rack. Payload GSE will be connected to a standard interface panel available in each control room. Present circuit assignments do not include any capability for extending these lines from the MOSB to other KSC facilities. The PHSF-to-MOSB lines are 24 balanced twinax of 124-ohm impedance, 40 balanced twinax of 78-ohm impedance and 10 RG11/U coaxial cables. In addition, fiber optics lines exist between the PHSF and MOSB.

6.2.2 RERADIATING ANTENNA SYSTEM. There are eight vertically-polarized antennas on the roof of the PHSF service bay and eight similar antennas west of the MOSB mounted on a tower pedestal support. Two of the antennas are S-band (1.7 to 2.3 Ghz) and two are X-band (7.1 to 8.4 GHz). The remaining four antennas are: one low C-band (3.7 to 4.2 GHz); one high C-band (5.9 to 6.4 GHz); one low Ku-band (11.7 to 12.2 GHz); and one high Ku-band (14.0 to 14.5 Ghz). The configuration is the same at both locations.

The antennas can be manually positioned on a mission-by-mission basis to interface with other KSC facilities and payload processing facilities on CCAS. There are S-, C-, X-, and Ku-band coaxial cable and waveguide installed between the PHSF and MOSB via the inter-building cable trench. See table 6-1 for radio frequency (RF) capability for both locations. Refer to KSC-HB-0004.0, *Payload Antenna Repeater System User's Planning Guide* for additional information.

Table 6-1. RF Capability for the PHSF and MOSB

Band	Number of Links	Interface
C	2	LC-39 A & B, VPF, AE, AM, AO
Ku	2	LC-39 A & B, GMIL, VPF, AE, AM, AO
S	2	LC-39 A & B, VPF, GMIL, S, AE, AM, AO, OPF
X	2	LC-39 A & B, VPF, GMIL

6.2.3 AUDIO FREQUENCY CAPABILITY. An audio frequency cable connects the PHSF to the MOSB. The PHSF-to-MOSB pairs are twisted 22-gauge with a 600-ohm nominal impedance at audio frequencies.

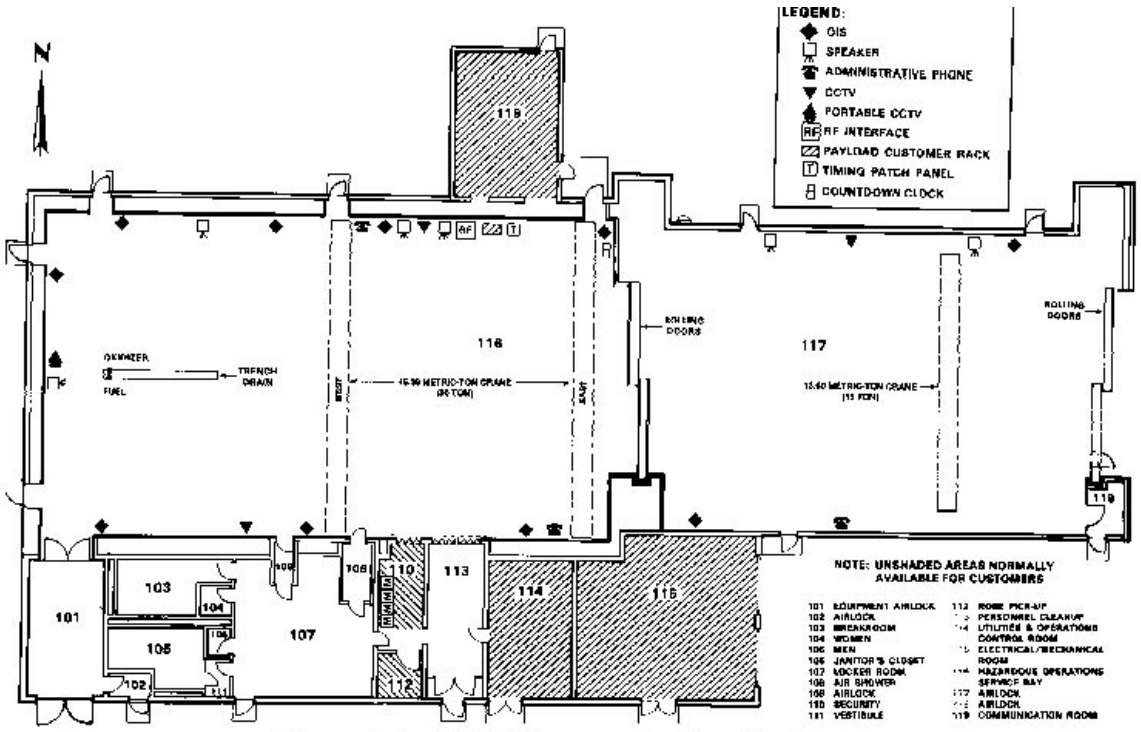

Figure 6-1. PHSF Communication Systems

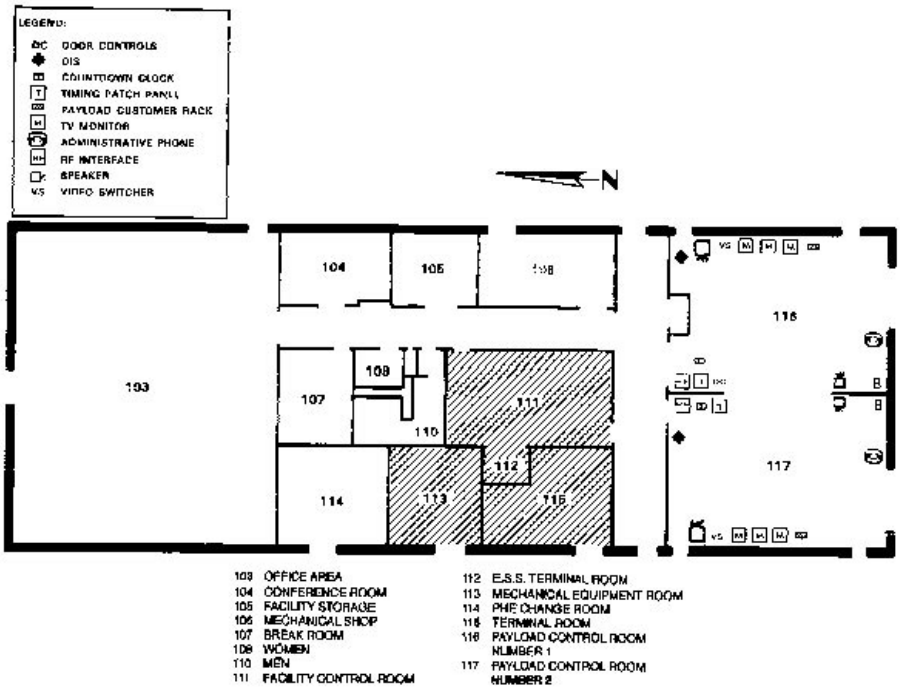

Figure 6-2. MOSB Communication Systems

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION VII

FACILITY DESCRIPTION SUMMARY

7.1 FIRE PROTECTION

a. Personnel-Operated Fire Extinguishers

b. Hand-Operated Fire Alarm System

c. Automatic Fire Detection System

d. Smoke Detectors

e. HAD's

f. Water Deluge Systems

7.2 FLOOR SPACE

a. PHSF

(1)	Airlock Room 117	25.9 m x 15.3 m (85 ft x 50 ft 4 in)
(2)	Haz Ops Service Bay Room 116	32.6 m x 18.4 m (107 ft x 60 ft 4 in)
(3)	Personnel Cleanup Room 113	9.3 m x 3.4 m (30 ft 5 in x 11 ft)
(4)	Airlock Room 109	2.5 m x 1.2 m (8 ft 4 in x 4 ft)
(5)	Air Shower Room 108	3.5 m x 1.4 m (11 ft 4 in x 4.5 ft)
(6)	Locker Room Room 107	8 m x 7.8 m (26 ft 1 in x 25.5 ft)
(7)	Break Room Room 103	4.6 m x 3.5 m (14 ft 11 in x 11 ft 7 in)
(8)	Airlock	2.6 m x 1.2 x

		Room 102	(8.5 ft x 4 ft)
	(9)	Equipment Airlock Room 101	8 m x 4.4 m (26 ft 1 in x 14 ft 4 in)

b. MOSB

(1)	Payload Control Room No. 1 Room 116	12.6 m x 8.8 m (41 ft 4 in x 28 ft 9 in)
(2)	Payload Control Room No. 2 Room 117	12.6 m x 8.8 m (41 ft 4 in x 28 ft 9 in)
(3)	PHE Change Room Room 114	6.6 m x 5.6 m (21.5 ft x 18.5 ft)
(4)	Break Room Room 107	5.3 m x 4.7 m (17.5 ft x 15.5 ft)
(5)	Mechanical Shop Room 106	7.9 m x 4.6 m (26 ft x 15 ft 3 in)
(6)	Facility Storage Room 105	5.2 m x 5.0 m (17 ft x 16.5 ft)
(7)	Conference Room Room 104	6.6 m x 5 m (21.5 ft x 16.5 ft)
(8)	Office Area Room 103	17.7 m x 15.2 m (58 ft x 50 ft)

c.	Fuel Transfer Building	12.3 m x 5.7 m (40 ft 2 in x 18 ft 9 in)
d.	Oxidizer Shed	11.8 m x 5.9 m (38 ft 8 in x 19 ft 5 in)
e.	Krypton Storage Building	2.9 m x 2.7 m (9 ft 5 in x 8 ft 10 in)

7.3 CEILING HEIGHTS

a. PHSF

(1)	Airlock Room 117	27.4 m (89 ft 10 in)
(2)	Haz Ops Service Bay Room 116	29.0 m (94 ft 10 in)
(3)	Personnel Cleanup Room 113	2.7 m (9 ft)
(4)	Airlock Room 109	2.7 m (9 ft)
(5)	Air Shower Room 108	2.1 m (7 ft)
(6)	Locker Room Room 107	2.7 m (9 ft)
(7)	Break Room Room 103	2.7 m (9 ft)
(8)	Airlock Room 102	2.7 m (9 ft)
(9)	Equipment Airlock Room 101	3.2 m (10 ft 4 in)

b. MOSB

(1)	Payload Control Room No. 1 Room 116	3.6 m (11 ft 9 in)
(2)	Payload Control Room No. 2 Room 117	3.6 m (11 ft 9 in)
(3)	PHE Change Room Room 114	2.7 m (9 ft)
(4)	Break Room Room 107	2.7 m (9 ft)
(5)	Mechanical Shop Room 106	4.6 m (15 ft)

	(6)	Facility Storage Room 105	2.7 m (9 ft)
	(7)	Conference Room Room 104	2.7 m (9 ft)
	(8)	Office Area Room 103	2.7 m (9 ft)
c.	Fuel Transfer Building		4.6 m (15 ft)
d.	Oxidizer Shed		4.6 m (15 ft)
e.	Krypton Storage Building		2.4 m (7 ft 10 in)

7.4 EQUIPMENT ENTRY (CLEAR)

a. PHSF

(1)	Airlock Room 117	10.8 m x 22.9 m (35 ft 5 in wide x 75 ft high)
(2)	Haz Ops Service Bay Room 116	10.8 m x 22.9 m (35 ft 5 in wide x 75 ft high)
(3)	Personnel Cleanup Room 113	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)
(4)	Airlock Room 109	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)
(5)	Air Shower Room 108	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)
(6)	Locker Room Room 107	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)
(7)	Break Room Room 102	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)
(8)	Airlock Room 102	0.9 m x 2.1 m (2 ft 11 in wide x 7 ft high)

	(9)	Equipment Airlock Room 101	3.1 m x 3.1 m (10 ft wide x 10 ft high)
b.	MOSB		
	(1)	Payload Control Room No. 1 Room 116	3 m x 3 m (9 ft 10 in wide x 9 ft 10 in high)
	(2)	Payload Control Room No. 2 Room 117	3 m x 3 m (9 ft 10 in wide x 9 ft 10 in high)
	(3)	PHE Change Room Room 114	1.8 m x 2.1 m (5 ft 11 in wide x 6 ft 10 in high)
	(4)	Break Room Room 107	1 m x 2.1 m (3 ft 4 in wide x 7 ft high)
	(5)	Mechanical Shop Room 106	1.8 m x 2.1 m (5 ft 10 in wide x 6 ft 10 in high)
	(6)	Facility Storage Room 105	1.9 m x 2.1 m (6 ft 4 in wide x 7 ft high)
	(7)	Conference Room Room 104	1.9 m x 2.1 m (6 ft 4 in wide x 7 ft high)
	(8)	Office Area Room 103	1.8 m x 2.1 m (5 ft 11 in wide x 7 ft high)
c.	Fuel Transfer Building		3.1 m x 3.1 m (10 ft wide x 10 ft high)
d.	Oxidizer Shed		12.3 m x 4.6 m (40 ft 2 in wide x 15 ft high)
e.	Krypton Storage Building		2.1 m x 1.8 m (7 ft wide x 5 ft 11 in high)

7.5 CRANES

a.	PHSF Airlock	One 13.6 metric-ton (15-ton) bridge crane

b.	PHSF Haz Ops Service Bay	Two, 45.36 metric-ton (50-ton) bridge cranes

7.6 CRANE HOOK HEIGHTS

a.	PHSF Airlock	22.9 m (75 ft)
b.	PHSF Haz Ops Service Bay	24.3 m (80 ft nominal)

7.7 PNEUMATIC SYSTEMS

a. PHSF

(1)	Compressed Air	6.2 bars (90 lb/in^2 gage) 10.3 bars (150 lb/in^2 gage)
(2)	GN_2	3.4 bars (50 lb/in^2 gage) 51.7 bars (750 lb/in^2 gage) 206.9 bars (3000 lb/in^2 gage)
(3)	GHe	3.4 bars (50 lb/in^2 gage) 69.0 bars (1000 lb/in^2 gage) 206.9 bars (3000 lb/in^2 gage) 262.0 bars (3800 lb/in^2 gage)
(4)	Vacuum System	.3 bars (9 in of mercury)
(5)	PHE Breathing Air	4.5 bars (65 lb/in^2 gage) 8.3 bars (120 lb/in^2 gage)

7.8 TEMPERATURE/HUMIDITY

a.	PHSF CWAs and Support Rooms	21.7 ± 3.3 °C (71 ± 6 °F)/55 percent max
b.	MOSB Payload Control and Support Rooms	21.7 ± 3.3 °C (71 ± 6 °F)/55 percent max

7.9 ENVIRONMENT

a.	PHSF Airlock	CWA 5
b.	PHSF Service Bay	CWA 4

7.10 ELECTRICAL POWER

a. PHSF

(1) 120-volt/20-A/single-phase/60 Hz

(2) 120-volt/30-A/single-phase/60 Hz

(3) 208Y/120-volt/30-A/3-phase/60 Hz

(4) 208Y/120-volt/60-A/3-phase/60 Hz

(5) 208Y/120-volt/100-A/3-phase/60 Hz

(6) 480-volt/100-A/3-phase/60 Hz

(7) 480-volt/200-A/3-phase/60 Hz

b. MOSB

(1) 120-volt/20-A/single-phase/60 Hz

(2) 120-volt/30-A/single-phase/60 Hz

(3) 208-volt/30-A/1-phase/60 Hz

(4) 208Y/120-volt/100-A/3-phase/60 Hz

(5) 480-volt/100-A/3-phase/60 Hz

7.11 ILLUMINATION

a. PHSF

(1)	Airlock Room 117	376.25 lm/m^2 (35 f-c)
(2)	Service Bay Room 116	519.25 lm/m^2 (55 f-c)
(3)	Personnel Cleanup Room 113	709.50 lm/m^2 (66 f-c)
(4)	Locker Room Room 107	1021.25 lm/m^2 (95 f-c)

	(5)	Break Room Room 103	591.25 lm/m^2 (55 f-c)
	(6)	Equipment Airlock Room 101	537.50 lm/m^2 (50 f-c)

b. MOSB

	(1)	Payload Control Room No. 1 Room 116	860.00 lm/m^2 (80 f-c)
	(2)	Payload Control Room No. 2 Room 117	860.00 lm/m^2 (80 f-c)
	(3)	PHE Change Room Room 114	1397.50 lm/m^2 (130 f-c)
	(4)	Break Room Room 107	1075.00 lm/m^2 (100 f-c)
	(5)	Mechanical Shop Room 106	1182.50 lm/m^2 (110 f-c)
	(6)	Facility Storage Room 105	1182.50 lm/m^2 (110 f-c)
	(7)	Conference Room Room 104	752.50 lm/m^2 (70 f-c)
	(8)	Office Area, Room 103	774.00 lm/m^2 (72 f-c)

7.12 COMMUNICATIONS

a.	CCTV Surveillance Areas	Cameras in the MOSB, Service Bay, Fuel Transfer Building, and Oxidizer Shed.
b.	CCTV Monitors	CCTV monitors are located in PHSF room 110 and in MOSB rooms 111, 116 and 117.

c.	Telephones - Administrative Oxidizer	Commercial telephone service is available in all areas except the Shed and the Krypton Storage Building.
d.	OIS-D	Transmit and receive from LC-39 and CCAS/KSC Industrial Area
e.	Public Address	All operational areas; aural warning device overriding microphone input. Paging and area warning system in all operational and support areas.

7.13 DATA HANDLING

a.	Wideband Transmission System		
	(1)	Frequency	30 Hz to 4.5 MHz
	(2)	Capability	CCTV video, telemetry, data display, weather, and automated payload checkout and surveillance monitoring information; multiplex telecommunications carriers; high-density OIS-D; timing distribution; system/event command and response display data
b.	Data Display		Voice and low bit rate digital transmission 100 bps-256 kbps in NRZ-L format 128 kbps maximum in BI-L format
c.	Radiating System		C-band to LC-39A, LC-39B, AE, AM, MOSB, AO, and VPF Ku-band to LC-39A, LC-39B, GMIL, VPF, AE, AM, and AO S-band to LC-39A, LC-39B, GMIL, VPF, S, AE, AM, and AO X-band to LC-39A & 39B, VPF, and GMIL

S-band coaxial from PHSF to MOSB

C-band waveguide from PHSF to MOSB

Ku-band waveguide from PHSF to MOSB

X-band waveguide from PHSF to MOSB

317A K-STSM-14.01.15 FACILITY HANDBOOK FOR PAYLOAD HAZARDOUS SERVICING FACILITY

(ELECTRONIC LIST) 12/13/95

CG	R. HEUSER
CG-ESD	S. KERR
CG-ESD-4F	G. LIEBIG
CG-ISO	R. ROMANELLA
CG-LSO	K. MEASE
CG-LSO	M. RUETHER
CG-LSO	J. SCHNERINGER
CM-PMO	C. BEGGS
CS	M. CARDONE
CS-OTE	R. BOURNE
MDS&DS-KSC-F200	J. SCHOFIELD
MDS&DS-KSC-F602	D. CROOKER
MDS&DS-KSC-F674	J. PASTER
TOTAL	14

For distribution changes contact your Validation Representative:
KSC/**CM**--P. Davis:[**CG-ASD-3,7-7755**]
KSC/**DE/DF/DL**--J. Potter:[**DF-FSO,7-4112**]
KSC/**RQ**--D. Coleman:[**RQ-ADM,7-3577**]
KSC/**IM**--H. Brown:[**IM-SST-A,7-4540**]
KSC/**TM**--H. Johnson:[**TM-ADM,7-3898**]
ALL OTHERS [**PAYLOAD**]--P. Davis, **CG-ASD-3**, (**407**)**867-7755**
ALL OTHERS [**SHUTTLE**]--H. Johnson, **TM-ADM**, (**407**)**867-3898**
SYSTEM PROBLEMS/PERFORMANCE--KSC Documents Library, **LIBRARY-D**, **7-9601/3613**

317B K-STSM-14.01.15 FACILITY HANDBOOK FOR PAYLOAD HAZARDOUS SERVICING FACILITY

(NON-ELECTRONIC LIST) 12/13/95

45 SPW/SESE	W. BREYER		
AC-PRO	N. TALLUTO		
ARC-N204A-3	B. DALTON		
BOC-323	S. MCGOVERN		
CG-ESD-4	C. ARNOLD		
CG-LSO	LIBRARY	25	
CS-OTE-2	LIBRARY		
DE-PMO-3	H. HILTON		
DE-PMO-5	LIBRARY		
DF-ESD-2	B. NELSON		
DF-ESD-2A	W. GLUSING		
FORMS WAREHOUSE		30	
IM-FEO-B	D. TWEED		
JPL-AO/CCAFS	S. BERGSTROM		2
LERC-60-3	A. LILLY		
LIBRARY-D	KSC LIB DOCS	2	
LSO-038	LIBRARY		
MDS&DS-KSC-F334	J. SALAMONE		
MDS&DS-KSC-F658	TDC LIBRARY		
MMC-AF	E. O'CONNOR		
RT-SOE	R. GILLETT		
TOTAL		76	

For distribution changes contact your Validation Representative:
KSC/**CM**--P. Davis:[**CG-ASD-3,7-7755**]
KSC/**DE/DF/DL**--J. Potter:[**DF-FSO,7-4112**]
KSC/**RQ**--D. Coleman:[**RQ-ADM,7-3577**]
KSC/**IM**--H. Brown:[**IM-SST-A,7-4540**]
KSC/**TM**--H. Johnson:[**TM-ADM,7-3898**]
ALL OTHERS [**PAYLOAD**]--P. Davis, **CG-ASD-3**, (**407**)**867-7755**
ALL OTHERS [**SHUTTLE**]--H. Johnson, **TM-ADM**, (**407**)**867-3898**
SYSTEM PROBLEMS/PERFORMANCE--KSC Documents Library, **LIBRARY-D**, **7-9601/3613**