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FIRE PROTECTION DESIGN FOR FACILITIES,

STANDARD FOR

ENGINEERING DEVELOPMENT DIRECTORATE

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FIRE PROTECTION DESIGN FOR FACILITIES, STANDARD FOR

Approved:

for Walter T. Mugler
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JOHN F. KENNEDY SPACE CENTER, NASA

TABLE OF CONTENTS

Section	Title	Page
1.	SCOPE	1
1.1	Purpose	1
1.2	General	1
1.3	Basic Goals of KSC Fire Protection	1
1.4	Description of KSC Fire Protection	2
1.4.1	Fire Detection and Alarm	2
1.4.2	Fire Control and Extinguishment	2
1.4.3	Fire-Resistant Construction	3
1.4.4	Launch Effect Systems	3
1.4.5	General Fire Fighting and Rescue	3
1.4.6	Fire Prevention and Fire Safety	4
2.	APPLICABLE DOCUMENTS	4
2.1	Governmental	4
2.1.1	NASA Directives	4
2.1.2	Standards	4
2.1.3	Other Publications	5
2.2	Non-Governmental	5
3.	REQUIREMENTS	6
3.1	Fire Detection and Alarm Systems	6
3.1.1	Fire Alarm System - General	6
3.1.2	Local Fire Alarm Systems	6
3.1.2.1	Fire Alarm Zones	6
3.1.2.2	Fire Alarm Subsystems	6
3.1.2.3	Auxiliary Fire Detection Systems	6
3.1.2.4	Fire Control and Extinguishing System Reporting	6
3.1.2.5	Installation of Local Fire Alarm Systems in Hazardous Areas	7
3.1.2.6	Control Units	7
3.1.2.7	Annunciators	7
3.1.2.8	Circuitry	7
3.1.2.9	Automatic Fire Detectors	9
3.1.2.10	Manual Fire Alarm Stations	9
3.1.2.11	Alarm Signal Appliances	9
3.1.2.12	Visual Alarms	10
3.1.3	Centerwide Fire Monitoring System	10
3.1.4	Installation Acceptance Testing	10
3.2	Fire Control and Extinguishment	10
3.2.1	General	10
3.2.1.1	Regulators	10

TABLE OF CONTENTS (cont)

Section	Title	Page
3.2.1.2	On-Off Sprinkler Heads	10
3.2.2	Fixed Deluge Systems	10
3.2.2.1	Deluge Water Control Valves	10
3.2.2.2	Deluge Water Control Valve Actuators	11
3.2.2.3	Solenoid Valves	11
3.2.2.4	Actuation Systems	11
3.2.3	Types of Deluge Systems	11
3.2.3.1	Type I Deluge Water Systems	11
3.2.3.2	Type II Deluge Water Systems	14
3.2.3	Testing	14
3.2.4	Fixed Deluge System Electrical Controls	14
3.2.5	Halon 1301	14
3.2.5.1	General	14
3.2.5.2	Performance	23
3.2.5.3	Enclosure	23
3.2.5.4	Controls	23
3.2.5.5	Warning Devices	23
3.2.5.6	Manual Release	24
3.2.5.7	System Operation	24
3.2.5.8	Venting	25
3.2.5.9	Manifold Assembly Details and Electrical Controls	26
3.2.6	Hose Stations - General	26
3.2.6.1	Indoor Areas	26
3.2.6.2	Outdoor, Indoor High-Hazard Areas or Work Platforms	26
3.2.7	Fire Pumps	26
3.2.7.1	Pump Redundancy Requirements	26
3.2.7.2	Fire Pump Controls	26
3.2.7.3	Testing	30
3.3	Fire Resistant Construction	30
3.3.1	Responsible Agency	30
3.3.2	Discharge from Exits	30
3.3.3	Panic Hardware	30
3.3.4	Elevators	30
3.3.5	Fire Escapes	30
3.3.6	Flame, Heat, and Smoke Barriers	30
3.3.6.1	Interior Finishes	30
3.3.6.2	Carpeting	31
3.4	Fire Protection Requirements Matrix	31
3.4.1	Data Arrangement	31
3.4.2	Use of the Matrix	31
3.4.3	Notes and Remarks	31
3.4.4	Abbreviations Used in Matrix	31
4.	QUALITY ASSURANCE PROVISIONS	32

TABLE OF CONTENTS (cont)

Section	Title	Page
5.	PREPARATION FOR DELIVERY	32
6.	NOTES	48
6.1	Intended Use	48
7.	DEFINITIONS	48
APPENDIX A	GRAPHIC SYMBOLS FOR FIREX SYSTEM	A-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1	Typical Fire Alarm Signals to Centerwide Monitoring Equipment	8
2	Deluge Water System Actuation System	12
3	Type I Deluge Water System	13
4	Type II Deluge Water System	15
5	Type II Deluge System Pneumatic Control Cabinet	16
6	Electrical Controls for Type I Deluge Water System	17
7	Redundant Electrical Controls for Type II Deluge Water System	18
8	Halon Control Panel Details	19
9	Simplified Halon System Alarm Processing	20
10	Halon 1301 Extinguishing System, 3 or More Bottles	21
11	Halon 1301 Extinguishing System, 1 or 2 Bottles	22
12	Hydropneumatic Tank for Pump Starting Control System	27
13	Partial Wiring Diagram for Firex Diesel Pumps	28
14	Arrangement of Major Components - Booster Fire Pumps	29
15	General Fire Protection Requirements	33
16	Specific Fire Protection System Design Requirements	35

ABBREVIATIONS AND ACRONYMS

ac	alternating current
AWG	American Wire Gage
C	centigrade
CCS	Complex Control System
CO_2	carbon dioxide
CD&SC	Communications Distribution & Switching Center
CP	candle power
CR	conditional requirements
dc	direct current
F	Fahrenheit
FA	fire alarm
FM	Factory Mutual Engineering Division
ft	foot
GN_2	gaseous nitrogen
GOX	gaseous oxygen
gpm	gallons per minute
GSE	ground support equipment
Halon 1301	bromotrifluoromethane
HMF	Hypergol Maintenance Facility
ID	ionization detector
I.D.	internal diameter
KSC	John F. Kennedy Space Center
LC 39	Launch Complex 39
LCC	Launch Control Center
LH_2	liquid hydrogen
LN_2	liquid nitrogen
LOX	liquid oxygen
MDP	monoammonium dihydrogen phosphate
MMH	monomethyl hydrazine
NASA	National Aeronautics and Space Administration
NBC	National Building Code
N.C.	noncombustible
NEC	National Electrical Code (NFPA No. 70)
NFPA	National Fire Protection Association
NST	National Standard Hose Thread
POL	paints, oils, and lubricants
PRB	Panel Review Board
PSI	pounds per square inch (static pressure)
PSIG	pounds per square inch (gage pressure)
PS-FRO	Fire and Rescue Office
Purple K	potassium bicarbonate
RT-SAF	Safety Operations Division
SBC	Southern Building Code
SOV	solenoid operated valve
sq ft	square feet
TFE	tetrafluoroethylene

ABBREVIATIONS AND ACRONYMS (cont)

UDMH	unsymmetrical dimethyl hydrazine
UEW	unit exit width
UL	Underwriters' Laboratories, Inc.
VABR	Vehicle Assembly Building Repeater
vol	volume

JOHN F. KENNEDY SPACE CENTER, NASA

FIRE PROTECTION DESIGN FOR FACILITIES, STANDARD FOR

1. SCOPE

1.1 Purpose. - This document establishes minimum fire protection standards to be used in the design of new facilities and the modification of existing facilities under the design jurisdiction of John F. Kennedy Space Center (KSC). The principles outlined herein shall be used to ensure consistency between facilities where similar fire protection systems are required.

1.2 General. - Requirements of this standard are based on NHB 1700.1, Vol 9; NHB 7320.1B; and design practices unique to KSC, that have evolved over many years of aerospace experience. In the event of difference between this standard and the NFPA standards referenced in the NHB documents, this standard shall govern to the extent of such difference. Where a specific design approach/requirement is not denoted in this document, the NHB's shall govern.

In applying this standard, the following procedure is recommended: The user should first look up the summary data about a facility or usage area in the requirements matrix in paragraph 3.4. The details of these requirements may then be determined by referring to paragraphs 3.1 through 3.3 as indicated at the head of the columns of the matrix. Conditional requirements (CR) will require that the user research the referenced document for detail.

NOTE

Paragraph cross references appear throughout the requirements sections. The user is cautioned to read all referenced paragraphs in order to gain a full understanding of the relationships between various fire protection considerations.

1.3 Basic Goals of KSC Fire Protection. - The designer should be governed by the general consideration that fire protection features are required in KSC facilities to accomplish the following goals, listed in order of importance:

a. To safeguard human life and prevent injury to personnel

b. To preserve critical launch and landing equipment and facilities

c. To protect valuable materials, equipment, and records

d. To minimize/prevent fire damage to KSC facilities

The order of importance of KSC fire protection goals differs from that applicable to nonfederal government agencies. NASA-KSC, as an agency of the Federal Government, is self-insured and functions as "the authority having jurisdiction" in the interpretation and enforcement of existing nationally recognized codes and standards such as the National Fire Codes, The Southern Building Code, and various Underwriters' Laboratories, Inc. standards. Deviations from stated or implied requirements and, in some instances, more restrictive and stringent interpretations of these industry codes and standards are necessary in order to maintain the management risk factor (possible loss of life and property by fire) to a level considered reasonable and economically feasible. In no cases, however, will any deviations result in reducing minimum protection of NASA-KSC facilities.

1.4 Description of KSC Fire Protection. - Fire protection, as practiced at NASA-KSC, is made up of six basic elements, each performing multiple functions. These elements are - Fire Detection and Alarm, Fire Control and Extinguishment, Fire-Resistant Construction, Launch Effect Systems, General Fire Fighting and Rescue, and Fire Prevention and Fire Safety. The last three elements are not covered in detail within the scope of this standard.

1.4.1 Fire Detection and Alarm. - This is defined as "Systems which monitor or supervise conditions within specific areas to give prompt and timely warning of fire or incipient fire." These systems are required to perform one or more of seven functions at KSC:

a. Sound a local general alarm to initiate evacuation

b. Summon fire fighting aid

c. Actuate fire-suppression systems

d. Monitor normally unmanned areas

e. Initiate shutdown of equipment and start protective measures

f. Monitor the condition of fire alarm systems

g. Monitor the condition of fire-suppression systems

1.4.2 Fire Control and Extinguishment. - This element is defined as "Fixed systems and portable equipment located within or adjacent to areas of potential fire for immediate use in control, suppression, and extinguishment of fire." These systems are required to perform one or more of the following functions at KSC:

a. Aid the escape of personnel from high hazard areas

b. Control spread of fire

c. Extinguish fires

d. Prevent fires of flammable fluids by inertion, chemical blocking, dilution, dispersion, and cooling

e. Provide exposure protection from nearby fires

1.4.3 Fire-Resistant Construction. - This element is defined as "Facility construction and arrangement considerations directed toward personnel protection and minimization of damage by fire." The authority for fire-resistant construction shall be the Southern Standard Building Code and NFPA 220. Facility design must provide the following basic features at KSC:

a. Basic fire resistant construction

b. Adequate egress routes

c. Flame, heat, and smoke barriers

d. Access for fire-fighting equipment

e. Impounding ponds and flammable liquid dikes

f. Smoke and heat removal

g. Inertion/hazard-proofing of electrical equipment

1.4.4 Launch Effect Systems. - Systems within this element are unique to launch facilities and static test stands. They are defined as "Special systems which provide damage protection from launches and tests." Their functions are to minimize the degree of damage, the cost, and the time required to refurbish the launch pad or test stand. Characteristically, these systems are high-volume, short-duration water-spray systems. Ablative coatings and special paints are also used for equipment beyond the reach of effective water spray.

1.4.5 General Fire Fighting and Rescue. - This element is defined as "The organization and maintenance of equipment and trained personnel to control and extinguish fires and effect rescue of personnel and equipment." Its function is the rapid and effective application of available resources for fire fighting, rescue, and other related activities. Essentially, this element of fire protection is provided by the equipment and personnel of the KSC Fire Services.

1.4.6 Fire Prevention and Fire Safety. - This element is defined as "Those measures directed toward avoiding the inception of fire." Generally, these are the activities of the safety department and of the fire services when not fighting fires, and they include the performance of at least six functions at KSC:

a. Housekeeping

b. Training (non-professional base personnel)

c. Hazard monitoring

d. Maintenance and validation of fire equipment

e. Routine inspections

f. Fire drills and alerts

2. APPLICABLE DOCUMENTS

2.1 Governmental. - The latest revision of the following documents form a part of this standard to the extent referenced herein:

2.1.1 NASA Directives.

National Aeronautics and Space Administration (NASA)

NHB 7320.1	Facilities Engineering Handbook
NHB 1700.1	NASA Safety Manual, Vol. 9, Fire Protection
NHB 5300.4(1C)	Inspection System Provisions for Aeronautical and Space System Materials, Parts, Components and Services

2.1.2 Standards.

Kennedy Space Center (KSC)

KSC-STD-S-0004	Color Coding of Fluid System Piping
KSC-STD-E-0002	Hazard Proofing of Electrical Equipment
KSC-STD-152-2	Standard Graphical Symbols for Drawings, Part II, for GSE/Vehicle Support Systems

(Copies of NASA and KSC specifications, standards, drawings, and publications may be obtained from the KSC Library, Specifications and Standards.)

2.1.3 Other Publications.

U.S. Department of Commerce

RP-1	Standard Practice for the Fire Protection of Essential Electronic Equipment Operations

(Applications for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

2.2 Non-Governmental. - The latest revision of the following documents forms a part of this standard to the extent referenced herein:

National Fire Protection Association (NFPA)

National Fire Codes, All Volumes

Fire Protection Handbook

(Applications for copies should be addressed to the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269)

Southern Building Code Congress International, Inc.

SBC	Southern Building Code

(Applications for copies should be addressed to the Southern Building Code Congress International, Inc., 900 Montclair Road, Birmingham, Alabama 35213.)

Underwriters' Laboratories, Inc. (UL)

No. 864	Control Units for Fire Protection Signaling Devices
No. 246	Hydrants for Fire Protection Service
No. 448	Pumping Equipment for Private Fire Service
--	Approved Equipment Lists

(Application for copies should be addressed to the Underwriters' Laboratories, Inc., Publications Stock, 333 Pfingsten Road, Northbrook, Illinois 60062.)

American National Standards Institute, Inc. (ANSI)

A117.1	Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.)

3. REQUIREMENTS

3.1 Fire Detection and Alarm Systems.

3.1.1 Fire Alarm System - General. - The fire alarm system at KSC is comprised of local fire alarm systems and a centerwide Proprietary Protective Signaling System, as defined in NFPA 72D. Local fire alarm systems are installed in the majority of KSC buildings and aboard the mobile launch structures. The centerwide fire monitoring system is installed to monitor the local fire alarm systems and is designed to accept signals from the mobile launch equipment at selected interface points.

3.1.2 Local Fire Alarm Systems. - Local fire alarm system components (including detectors, signaling appliances, manual fire alarm stations, and control units) shall be designed, installed, and acceptance tested in compliance with NFPA regulations.

3.1.2.1 Fire Alarm Zones. - Alarm-initiating devices installed in multistoried buildings or selected building groups shall be zoned by device type and area for fire reporting purposes. Where alarm-initiating devices are zoned, the local fire alarm system shall have an annunciator panel in an entrance lobby or in a location designated by the authority having design jurisdiction. Zoning and requirements for the number of zones reporting to the centerwide fire monitoring station shall be consistent with the hazard involved, based on an engineering survey. Alarm systems shall be zoned to sound alarm devices within a building as designated by the authority having design jurisdiction following consultation with PS-FRO.

3.1.2.2 Fire Alarm Subsystems. - Local fire alarm systems installed in a group of buildings, trailers, or in areas where a high-hazard fire potential exists shall be centralized in a common subsystem and will be reported on a common annunciator and control unit. Fire alarm signals shall be reported, by individual hazard area or building, to the centerwide fire monitoring equipment.

3.1.2.3 Auxiliary Fire Detection Systems. - Fire-monitoring systems installed for monitoring a particular hazard, such as systems using hydrogen and hypergolic fuel leak detectors, are of a specialized nature and are not within the scope of this standard.

3.1.2.4 Fire Control and Extinguishing System Reporting. - A circuit shall be installed between the actuating devices of a fixed fire control and

extinguishment system and the local fire alarm system, as part of the local fire alarm system, to report the activation of that fixed system, and to sound the facility evacuation alarm. Halon systems may be designed as silent alarm systems provided the protected area is also provided with the facility automatic fire detection devices. The extinguishing system shall provide a reporting circuit to a separate zone on the facility fire alarm control unit.

3.1.2.5 Installation of Local Fire Alarm Systems in Hazardous Areas. - Local fire alarm systems installed in hazardous areas shall comply with Article 500, Hazardous Location, of the NFPA No. 70 (NEC) and KSC Standard KSC-STD-E-0002.

3.1.2.6 Control Units. - Control Units shall be Underwriters' Laboratories, Inc. (UL)-listed or Factory Mutual Engineering Division (FM)-approved as non-coded, continuous-ringing fire alarm system. The control units shall comply with NFPA 72D with initiating device circuits designed to style "D" and signaling line circuits designed to style "7". The local control unit shall provide the centerwide fire monitoring equipment with a normally open alarm contact and a normally closed trouble contact for each zone of alarm initiating devices (see figure 1). Test switches, alarm-silencing switches, and other local fire alarm system control devices shall be located within the control unit and shall be accessible only by unlocking and opening the unit. Control unit enclosures shall be dust-proof, have a hinged cover, and be provided with an integral key lock which will accept the KSC-specified Best 7-Pin lock cylinder.

3.1.2.7 Annunciators.

3.1.2.7.1 Local System Annunciators. - Local system annunciators of the combination annunciator control-unit type or the separate remote-annunciator type shall be supervised and consist of a display unit with alarm and trouble signals distinctively annunciated. Lamp-type display annunciators are preferred with alarm indicated by a red lamp and trouble indicated by a white or amber lamp.

3.1.2.7.2 Detector Annunciators. - The alarm-indicating lamps of products-of-combustion-type detectors located above ceilings, under raised floors, and in other concealed areas, shall be installed in locations readily visible and accessible to the Fire Department. Remote indicators shall be logically grouped, by zone or area, and displayed on a common annunciator. The annunciator shall be mounted in or on the wall of a major hall or passageway. The annunciator shall be of the graphic-display type or shall have a graphic locator posted adjacent to it. Location and type of the annunciator panel shall be specified by the authority having design jurisdiction following consultation with PS-FRO.

3.1.2.8 Circuitry. - Local fire alarm system circuitry external to the control unit shall be installed in accordance with NFPA No. 70 (National Electrical Code) and NFPA No. 72D. All wiring shall be continuous between system components such as detectors, bells, control units, and manual pull stations. Splices, solder connections, or other type connections are not acceptable. Alarm-initiating circuits shall be in accordance with NFPA 72H, Chapter 6, for style D circuits. The positive wire from the zone module to the last

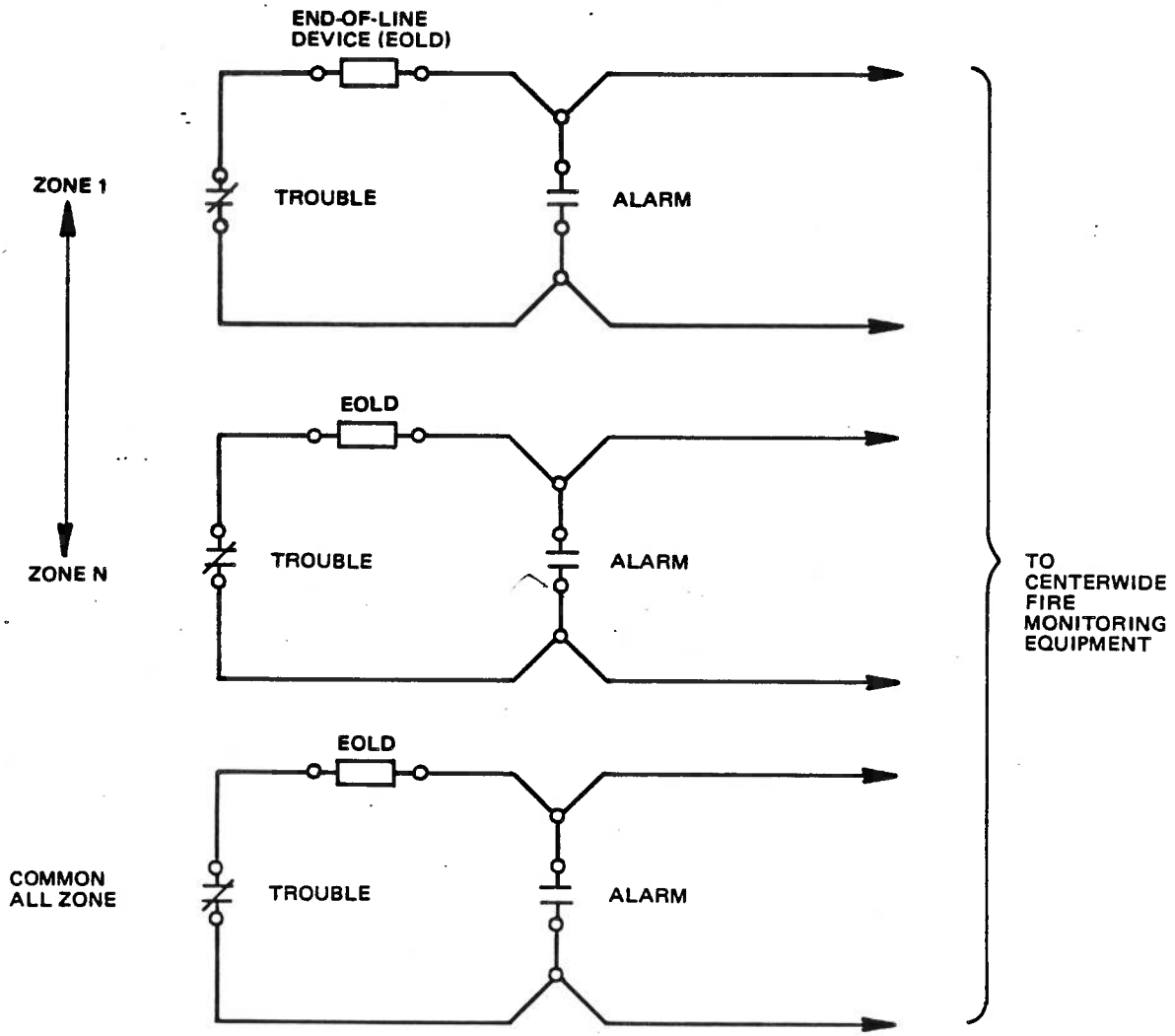


Figure 1. Typical Fire Alarm Signals to Centerwide Monitoring Equipment

initiating device and returning from the last device to the zone module shall be black. The wire from the negative shall be blue. Series wired alarm signaling circuits shall have both wires colored red; parallel wired alarm signaling circuits shall use a red wire for the positive leg and orange wire for the negative leg.

3.1.2.9 Automatic Fire Detectors. - Detectors installed in local fire alarm systems shall be UL-listed or FM-approved for use with applicable control panel, and shall meet the requirements of NFPA No. 72E. Rate compensated detectors are approved only in locations where explosion proof requirements do not allow usage of other heat detectors.

Photoelectric type smoke detectors shall be standard for use in low energy/heat release fire applications, such as under raised computer floors. A combination of photoelectric and ionization smoke detectors will be used in ceilings.

3.1.2.10 Manual Fire Alarm Stations. - Manual fire alarm stations shall be UL-listed or FM-approved for NFPA style D systems, and their construction shall be such that a tell-tale glass or plastic rod or wire seal is broken during actuation of or tampering with the station. Hammer-and-glass or palm-plunger-through-glass types are not acceptable. Each station shall have provision for authorized personnel to use an appropriate tool to gain entrance to the interior of the station without actuating the station.

Design of manual stations shall incorporate an internal toggle switch factory-wired to a terminal block for field connections. In areas classified as hazardous because of the presence of hydrogen, class 1, division 1, group B, UL-listed or FM-approved switches are required and shall be enclosed in a red sheet metal or plastic housing having provision for a plastic or wire seal. Stations shall not be resettable without the use of a key-wrench or other tool except for the above described class 1, division 1, group B switches.

3.1.2.11 Alarm Signal Appliances. - Alarm signals have been standardized at KSC to be a non-coded bell ringing sound. Fire alarm signals shall not be used for any other purposes. In general, alarm bells shall be electric solenoid-operated, plunger-type, vibrating, under-dome alarm-indicating devices not less than 10 inches in diameter. In areas of severe noise levels where occupants wear protective ear devices, revolving beacons or other adequate means of visible signaling shall also be provided. (A beacon or flasher [strobe] must always be used in conjunction with, never substituted for, a bell.) Alarm signal devices also shall be located outside the facility and shall be audible at all entrances.

NOTE

1. The use of a modulating tone or "warbler" horn is not acceptable, since this is already in use at KSC as a general evacuation tone signal.

2. The use of a horn is not acceptable since this tone is already in use at KSC as a warning of a moving structure.

3.1.2.12 Visual Alarms. - The requirement of visual alarms shall be determined by PS-FRO. If provided, electrically powered, internally illuminated emergency exit signs shall flash as a visual alarm in conjunction with an audible alarm. Strobe lights, if installed, will be 70,000 CP minimum. Refer to American National Standard A117.1 for specifications for making buildings and facilities accessible to, and usable by, physically handicapped people.

3.1.3 Centerwide Fire Monitoring System. - The centerwide fire monitoring system consists of monitoring equipment providing a central gathering point for alarm and trouble signals from each local fire alarm system. Additions and modifications to the centerwide fire monitoring system shall be in accordance with NFPA No. 72D, style "7".

3.1.4 Installation Acceptance Testing. - Upon completion of installation, a complete functional test of the protective system, including testing of connections to any equipment that is monitored or controlled by the protective system, shall be conducted for the purpose of verification of compliance with the applicable NFPA Standard. As-built drawings and the manufacturer's manual shall be available at the test for verifying the agreement between the connected equipment and the as-built drawings. The acceptance test procedure shall be in accordance with NFPA 72H.

3.2 Fire Control and Extinguishment.

3.2.1 General. - Except for the requirements set forth herein, the authority for fire control and extinguishment shall be NHB 1700.1, Vol. 9, NHB 7320.1B, and KMI TBD. Deviations from these requirements shall be approved in writing by the KSC Senior Management Council.

3.2.1.1 Regulators. - The use of regulators in water type fire protection systems at KSC is prohibited.

3.2.1.2 On-Off Sprinkler Heads. - The use of on-off sprinkler heads at KSC is prohibited.

3.2.2 Fixed Deluge Systems. - Except for systems that protect payloads, nozzle systems shall be designed such that all headers may be prefilled. Deluge water control valve stations shall consist of butterfly valves with double-acting pneumatic actuators powered by compressed air or dry nitrogen as specified herein. Design densities shall be as specified in NHB 1700.1, volume 9, chapter 5.

3.2.2.1 Deluge Water Control Valves. - Control valves and shutoff valves in deluge systems shall be of the butterfly type with offset shaft and eccentric disc. Both the shaft and disc shall be made of stainless steel. Valve bodies may be of carbon steel when environmental conditions permit. Valve seats shall be made of a single piece of reinforced TFE (Type M). Valve shaft seals shall be virgin TFE (Type T). Valve orientation shall be such that the upstream pressure tends to hold the valve closed, i.e., installed with the shaft

upstream. Deluge water control valves shall be the water sphere design by Jamesbury Corporation or approved equal.

3.2.2.2 Deluge Water Control Valve Actuators. - Valve actuators shall be the double-acting type, rated for at least 150 psi. They shall be sized to open the butterfly valves under full system pressure with 100 psi air available.

Valve actuators shall be types ST 200 or ST 400 by Jamesbury Corporation or approved equal. Shutoff valves shall have manual gear actuators clearly marked OPEN and SHUT and shall have electrical supervision tied to the fire alarm system to indicate a TROUBLE condition when closed.

3.2.2.3 Solenoid Valves. - Solenoid valves shall be four-way two-position with dual coils. They shall be designed to operate on 24 V dc. Solenoid valves shall be ASCO model 8344 or approved equal.

3.2.2.4 Actuation Systems. - Actuation of fixed deluge systems shall be with compressed air or dry nitrogen. Actuation systems shall be designed in accordance with figure 2.

Major system components shall consist of an isolation valve, filter check valve, accumulator with isolation valve and vent valve, flow controller, solenoid valve, pressure switch, pressure gage, with isolation valve, and bleed valve. The accumulator shall be sized to open and close the system control valves not less than five times and still contain 100 psi of actuating medium. Check valves shall be part number 79K80133 or approved equal.

3.2.3 Types of Deluge Systems. - One of two types of fixed deluge water system shall be used. Type I systems shall be used in areas where the consequences of inadvertent actuation are not great, i.e., propellant transfer areas, etc. Type II systems shall be used where damage to payloads or flight hardware would occur due to inadvertent actuation. Flight crew egress water systems shall be Type II. In areas where periodic flow testing of the deluge system cannot be accomplished through its nozzles due to facility operations, a test branch shall be provided that will properly model the flow characteristics of the nozzle system.

3.2.3.1 Type I Deluge Water Systems. - Type I systems shall be configured in accordance with figure 3. Their major components shall consist of an isolation valve, a pneumatically operated butterfly valve with solenoid and limit switches, an orifice, a pressure switch connected to the fire alarm system, strainer, and appropriate nozzles. If the system is located in an area requiring explosion proofing, the solenoid shall be installed inside a properly rated NEMA enclosure with a GN_2 purge. Otherwise, it may be mounted directly on the valve/actuator assembly. Type I systems shall have all major components electronically supervised for trouble, or position, indication.

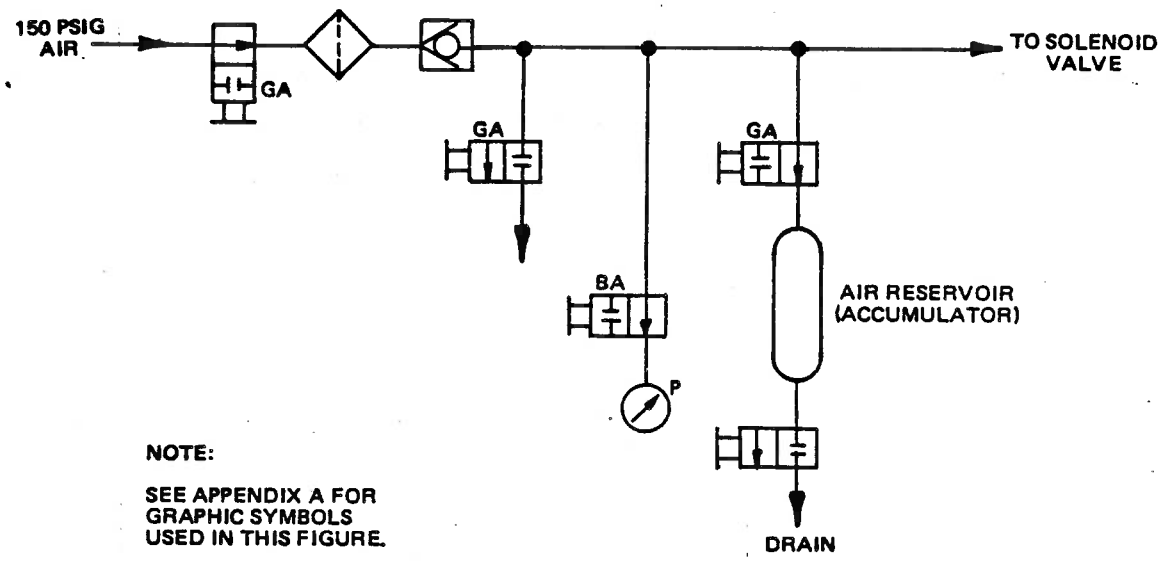


Figure 2. Deluge Water System Actuation System

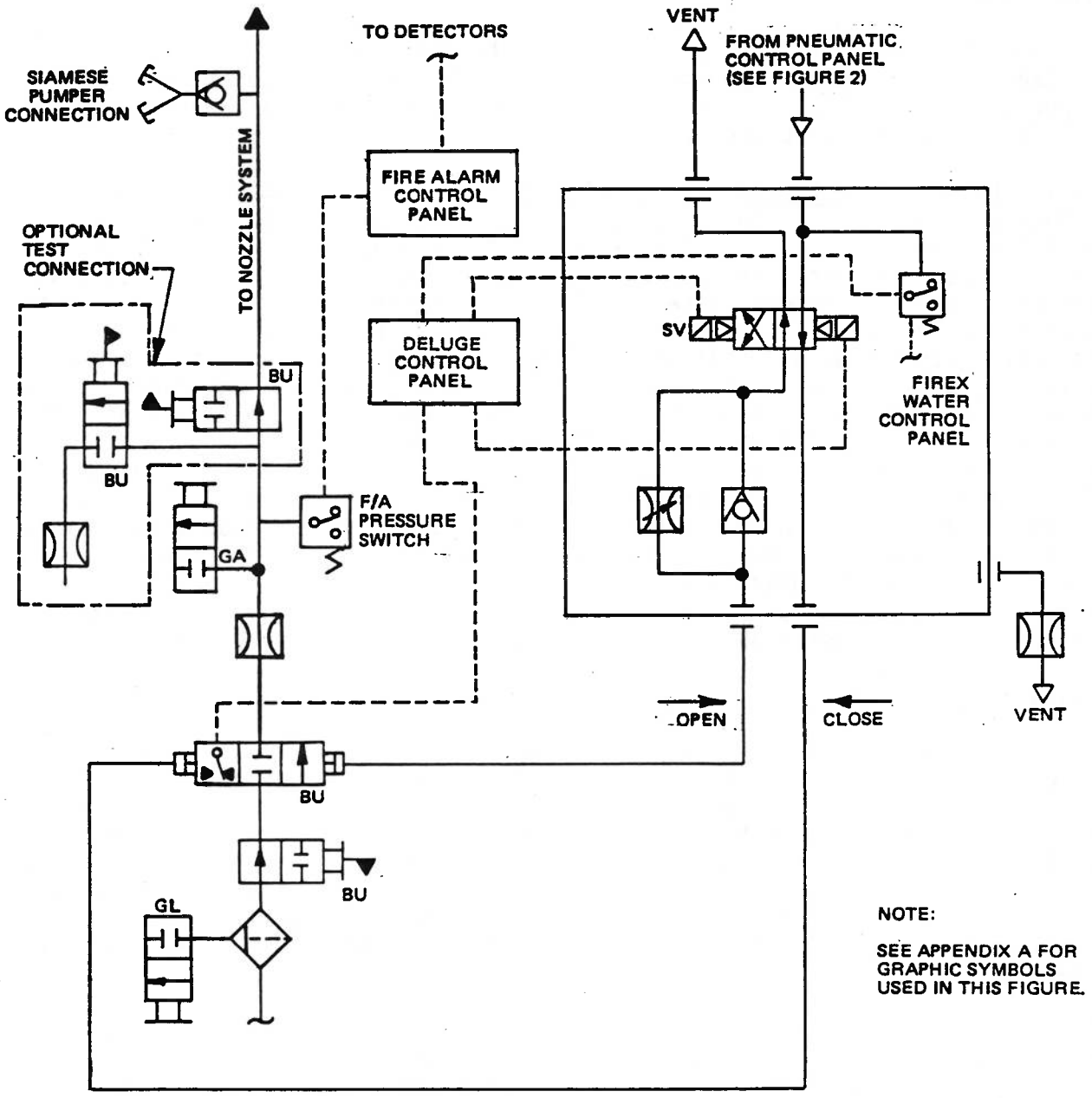


Figure 3. Type I Deluge Water System

3.2.3.2 Type II Deluge Water Systems. - Type II systems shall be configured in accordance with figure 4. Major system components are the same as Type I except that four butterfly valves are required. Solenoid valves for the Type II system shall be installed in a properly rated NEMA enclosure in accordance with figure 5.

3.2.3.3 Testing. - A functional test will be required as a condition of acceptance for all deluge systems. In systems that are provided with a test branch, flow through the nozzles will be prohibited except as approved by the KSC Senior Management Council.

3.2.4 Fixed Deluge System Electrical Controls. - Control power for fixed deluge systems shall be dedicated 24 V dc, with automatic battery backup. When the command is given to flow water, latching-type relays shall keep the circuit energized until the command is given to stop water flow. Electrical controls for fixed deluge systems shall be configured in accordance with figures 6 and 7. Type II systems shall be controlled by manual dual pushbutton control stations, as depicted on 79K32573, equipped with transparent protective covers wired shut with lead or plastic seals to prevent accidental actuation. The covers shall be designed such that they are not self-closing. The phrase "KEEP COVER OPEN DURING HAZARDOUS OPERATIONS WHICH MAY RESULT IN FIRE" shall be written on the cover. Each pushbutton shall have double contacts. The controls shall require personnel to push two separate buttons in order to initiate water flow. A remote control station shall be provided within sight of the area protected, but removed from the immediate hazard. This control station shall permit operating personnel to activate or stop the deluge system. The location of all remote control stations shall be as directed by the authority having design jurisdiction following consultation with PS-FRO.

3.2.5 Halon 1301.

3.2.5.1 General. - The design of these systems will comprise a Halon Control Panel, ionization and photoelectric detectors, manual release stations, local alarm bells and beacon/strobes, cylinders, piping, nozzles, and associated devices noted in figures 8 through 11. Halon-protected areas within a facility shall be equipped with supplemental fire detection to initiate facility evacuation. The supplemental detection system will be a portion of the overall facility fire alarm system, or a fire detection system designed to activate a supplemental fire suppression system, interfaced to the overall facility fire alarm system.

Halon systems are utilized only for protection of mission-critical electronic equipment as defined in KSC KMI TBD. These systems will be designed for a 7 percent concentration utilizing the applicable temperature/flooding factor contained in NFPA 12A. (A typical temperature of 70°F can be assumed.)

For special applications of Halon, NFPA 12A shall be used for guidance in conjunction with this document.

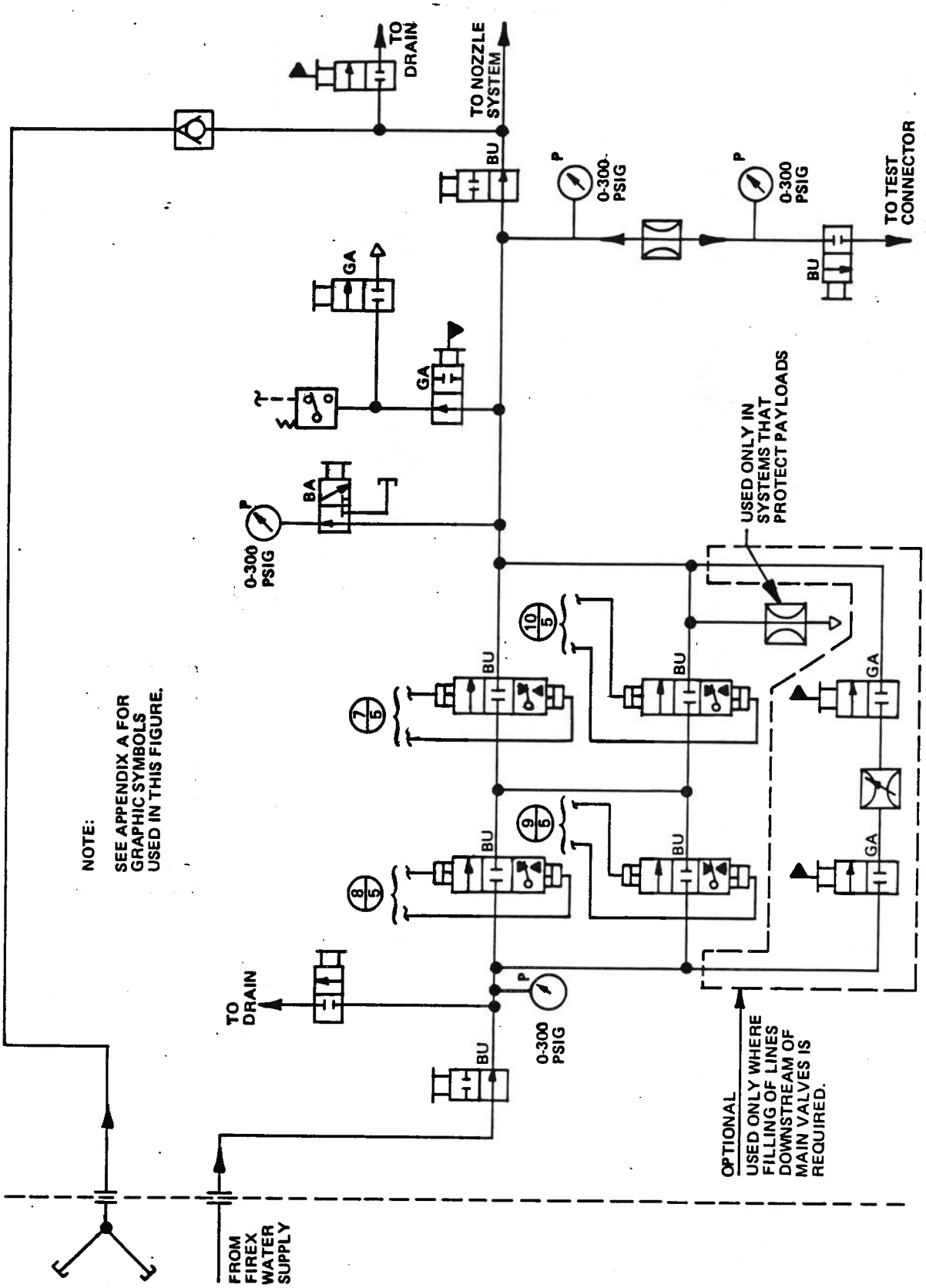


Figure 4. Type II Deluge Water System

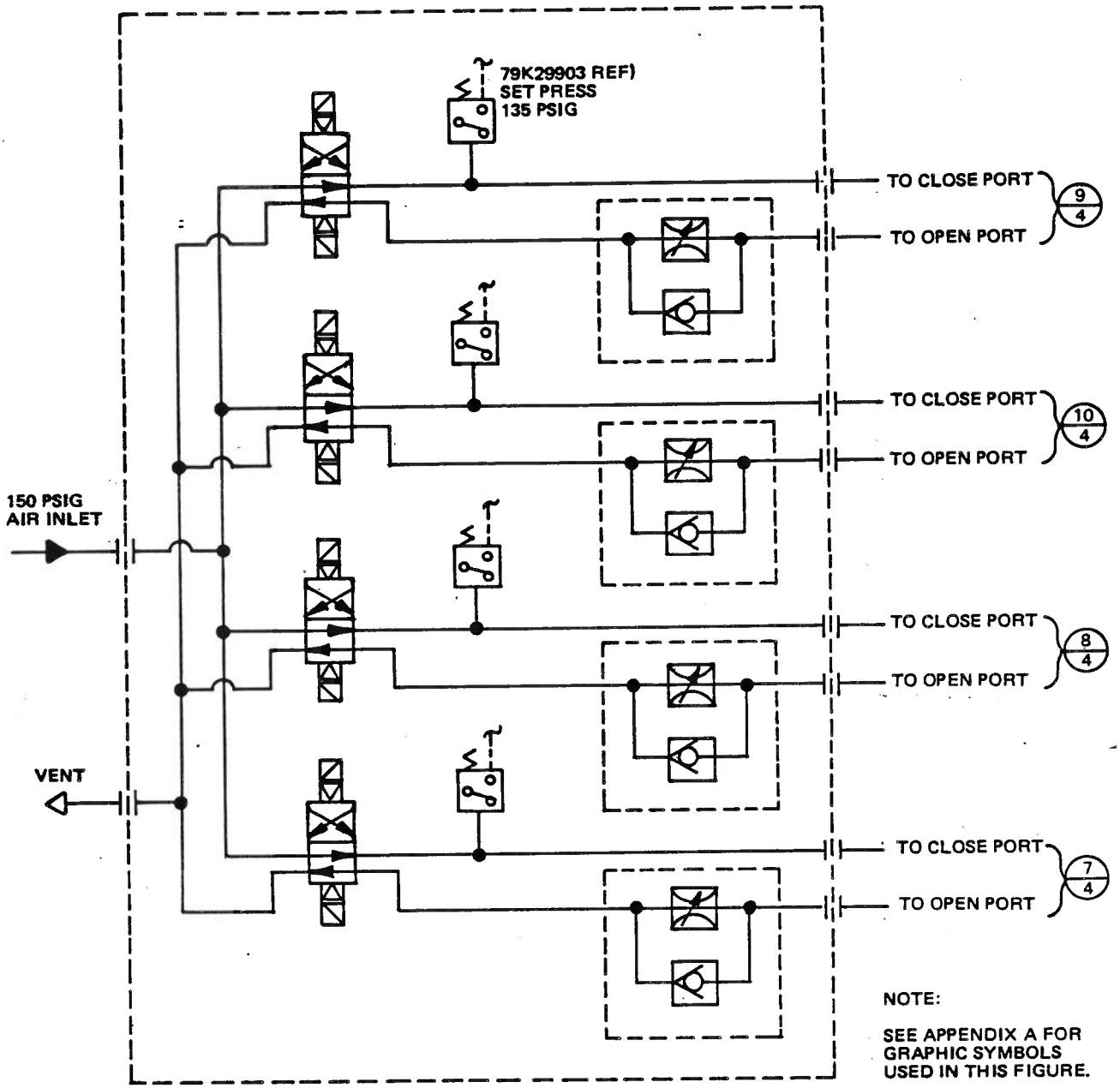


Figure 5. Type II Deluge Water System Pneumatic Control Cabinet

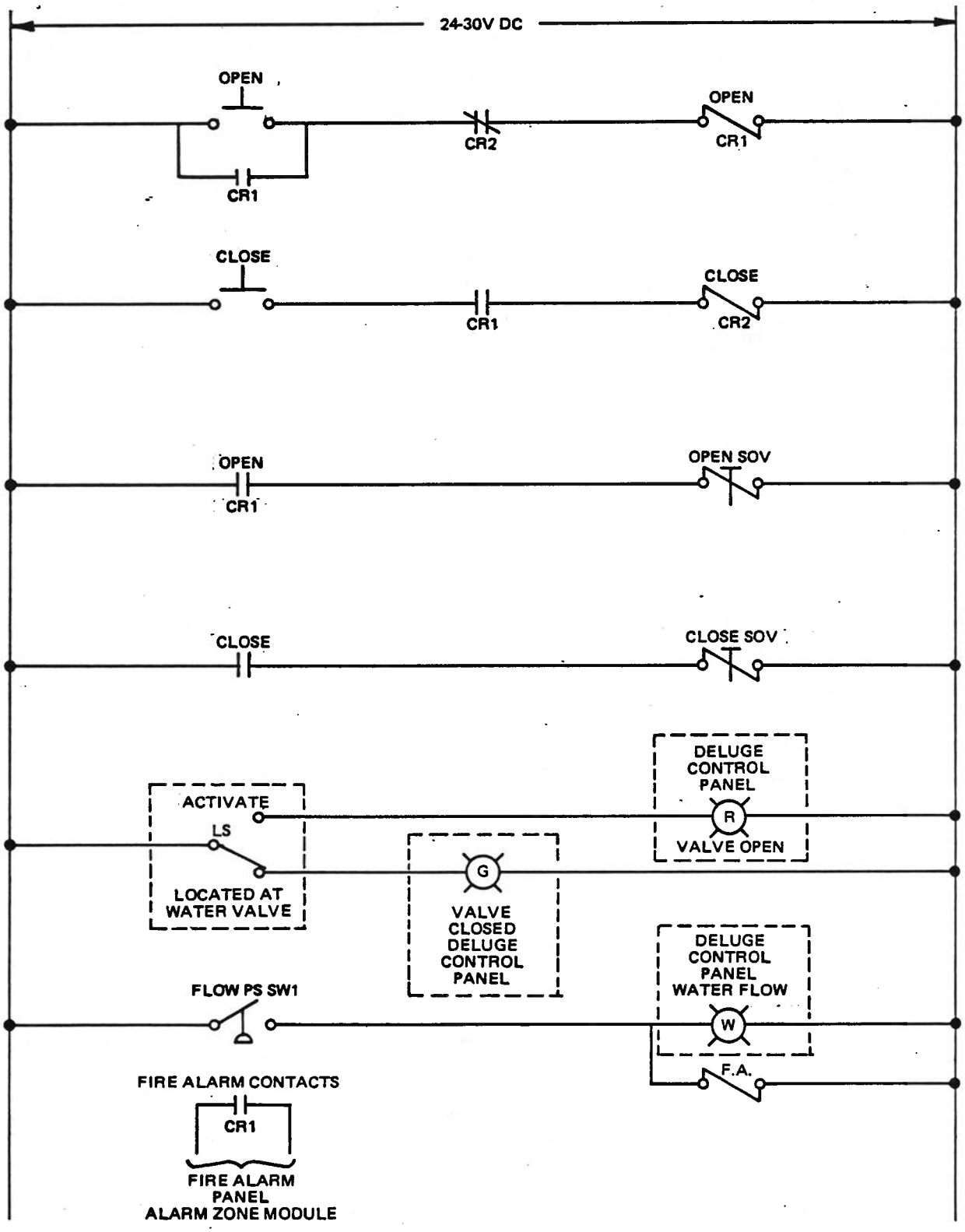


Figure 6. Electrical Controls for Type I Deluge Water System

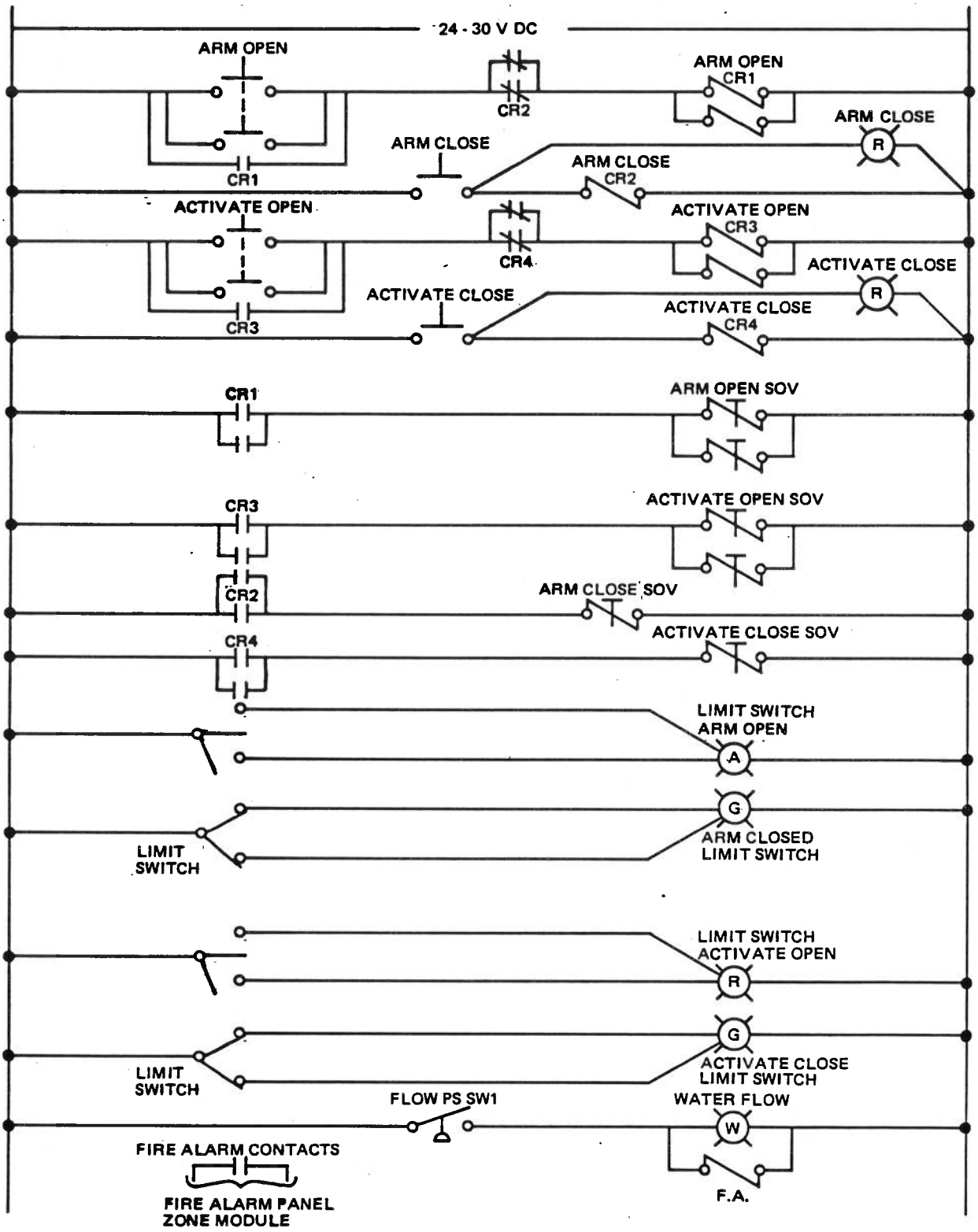
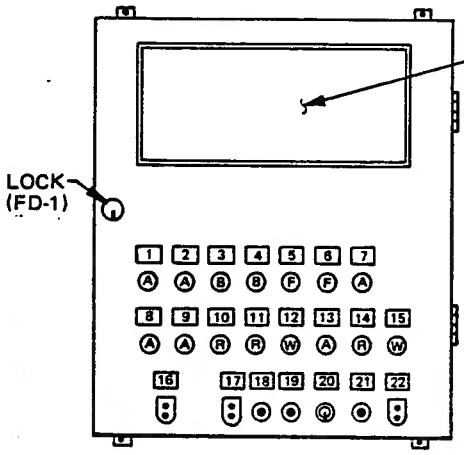


Figure 7. Redundant Electrical Controls for Type II Deluge Water System

LABELS LEGEND

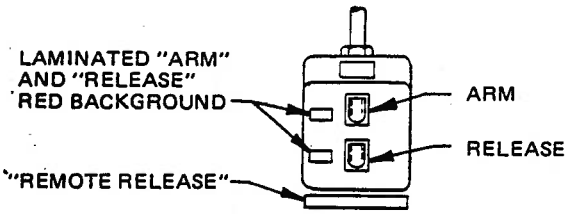
1. RELEASE COMPLETE
2. LOW PRESSURE
3. REMOTE ARM
4. REMOTE RELEASE
5. FUSE NO. 1
6. FUSE NO. 2 (IF REQ'D)
7. TROUBLE
8. EARLY WARNING
9. HALON ARMED
10. FIRE
11. HALON RELEASED
12. AUTOMATIC
13. MANUAL
14. POWER OFF
15. POWER ON
16. MANUAL ARM
17. MANUAL RELEASE
18. SIGNAL SILENCE
19. TROUBLE SILENCE
20. AUTO/MANUAL
21. PANEL RESET
22. POWER



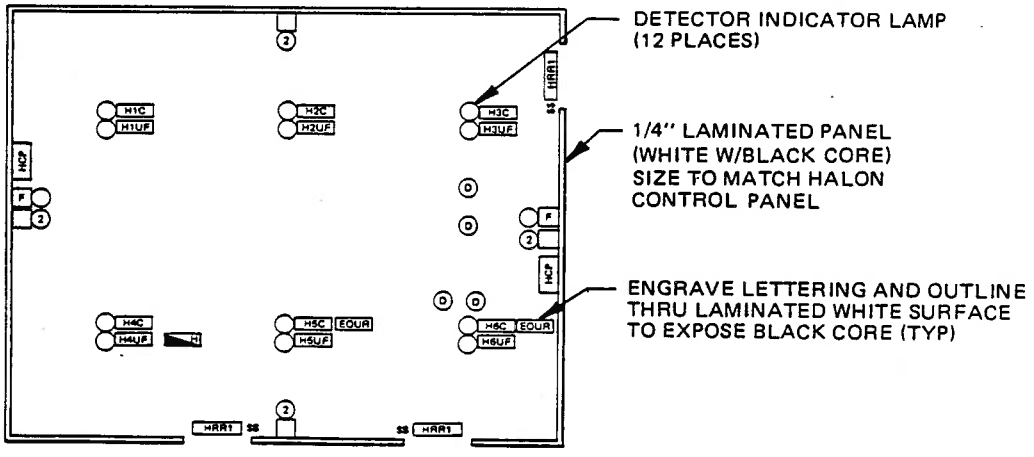
SYMBOLS

- PUSHBUTTON SWITCH
- KEY SWITCH
- GUARDED TOGGLE
- INDICATOR LAMP (LETTERS IN CIRCLE INDICATE LENS COLOR; W-WHITE, R-RED, A-AMBER, B-BLUE
- (F.) FUSE

HALON FIRE CONTROL PANEL LAYOUT (GRAPHIC REPRESENTATION)

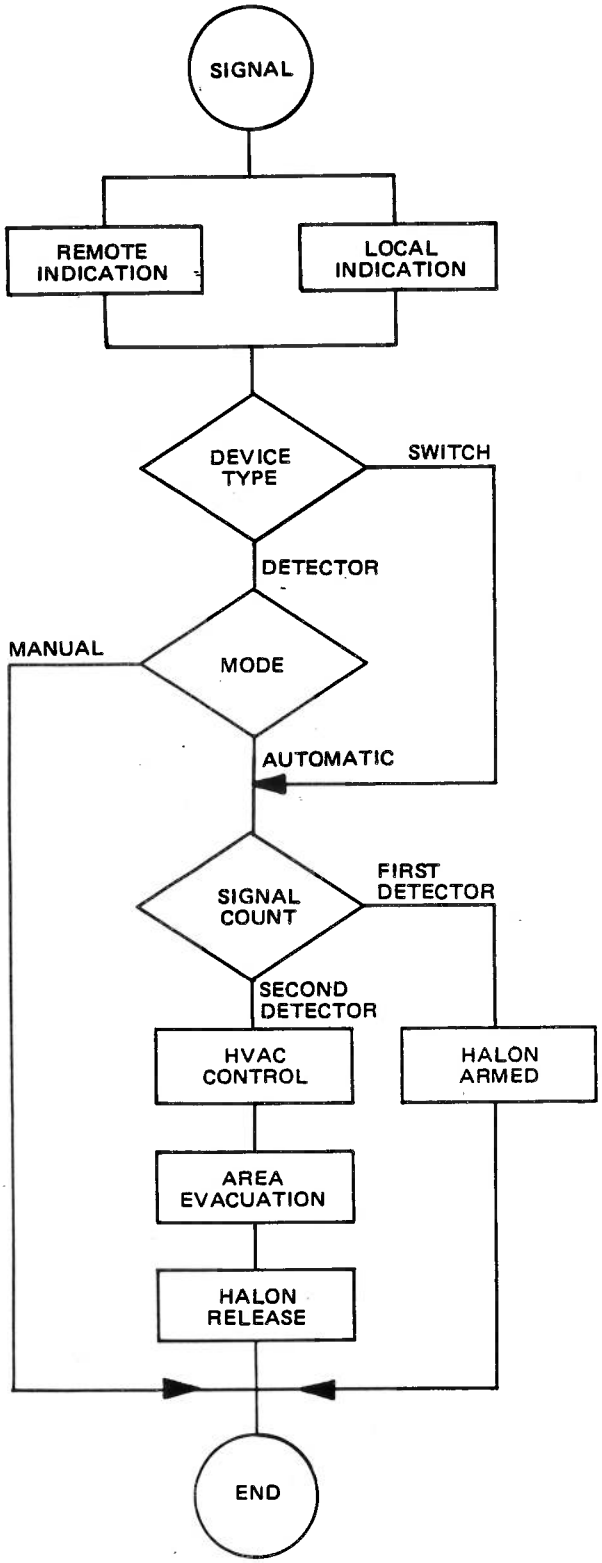


HALON REMOTE ARM AND ACTIVATE SWITCH NTS



ENGRAVING DETAIL GRAPHIC ANNUNCIATOR DISPLAY NTS

Figure 8. Halon Control Panel Details



SIGNAL: INITIATED BY CROSSED ZONED SMOKE DETECTORS OR MANUAL ARM AND RELEASE SWITCH STATIONS

REMOTE INDICATION: SIGNAL TO LCC IP10 ANNUNCIATOR SYSTEM VIA INHOUSE CABLE PLANT INITIATED ON FIRST ALARM SIGNAL

LOCAL INDICATION: ACTIVATED BY FIRST ALARM SIGNALS; PROVIDES LOCAL AUDIBLE AND VISUAL SIGNAL IN FORMS OF BELLS AND BEACON/STROBE LIGHT INDICATION (EARLY WARNING)

MODE: (AUTOMATIC/MANUAL OPERATION)

AUTOMATIC – ALLOWS ACTIVATION OF ARM AND RELEASE SOLENOIDS VIA SMOKE DETECTOR AND ELECTRICAL ARM AND RELEASE CIRCUITRY.

MANUAL – INHIBITS ACTIVATION OF ARM AND RELEASE SOLENOIDS BY SMOKE DETECTOR CIRCUITRY. ELECTRICAL ARM AND RELEASE SWITCHES WILL OVERRIDE THIS FUNCTION.

SIGNAL COUNT: SYSTEM MUST DIFFERENTIATE BETWEEN FIRST AND SECOND ALARM SIGNALS AND RESPOND ACCORDINGLY.

HALON ARMED: WITH SYSTEM IN AUTOMATIC MODE, ACTIVATES ON 1ST ALARM SIGNAL

HVAC CONTROL: PROVIDES DAMPER RELEASE (CLOSURE) OR AIR HANDLER SHUTDOWN UPON RECEIPT OF 2ND ALARM SIGNAL.

AREA EVACUATION: UPON RECEIPT OF SECOND ALARM, SIGNAL SOUNDS AREA BELLS.

HALON RELEASE: ACTIVATED BY SECOND ALARM SIGNAL; RELEASES HALON AGENT INTO PROTECTED AREA

Figure 9. Simplified Halon System Alarm Processing

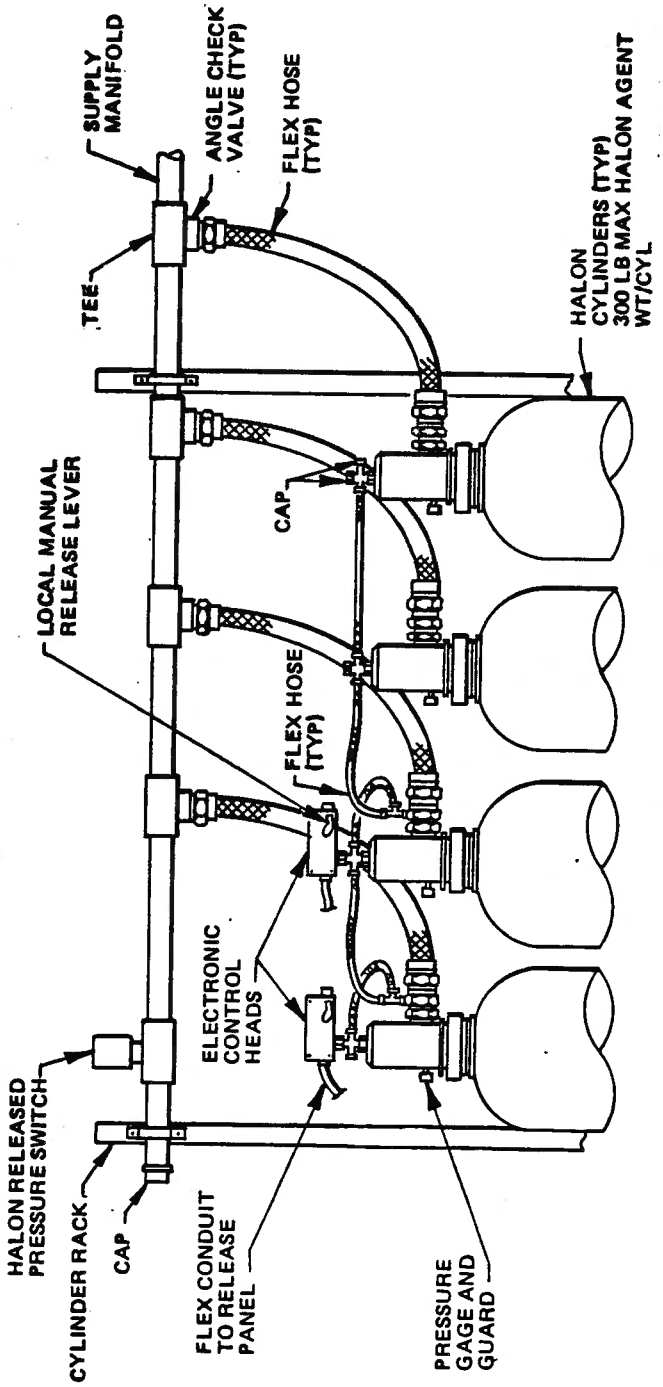


Figure 10. Halon 1301 Extinguishing System, 3 or More Bottles

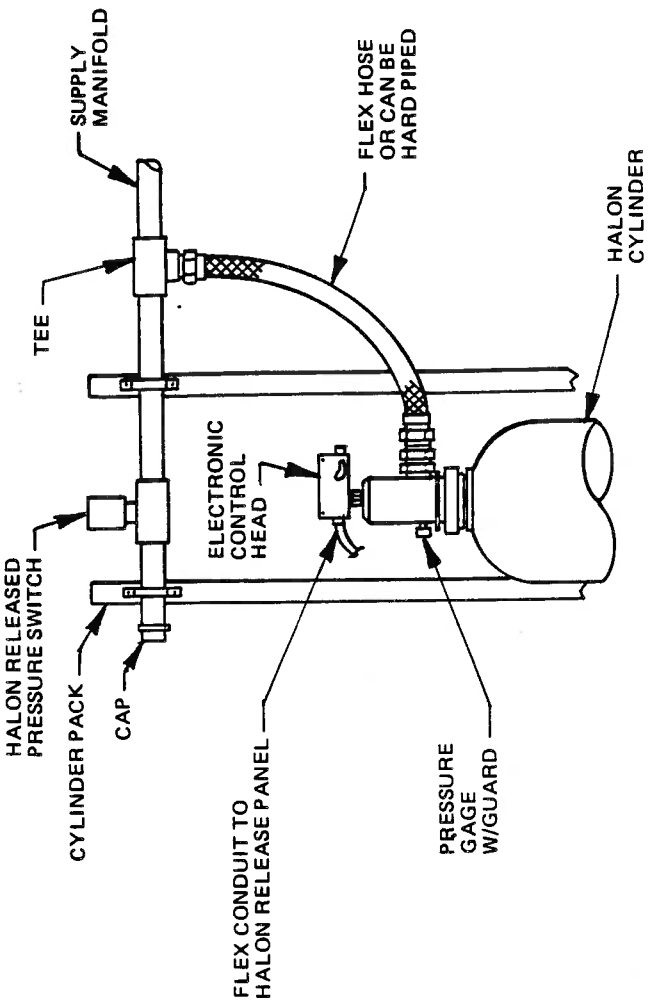


Figure 11. Halon 1301 Extinguishing System, 1 or 2 Bottles

3.2.5.2 Performance. Following the installation of Halon systems, a complete functional test of all components shall be performed to verify proper operation in accordance with this standard. Further, a concentration test will be conducted taking chart recorded samples from a minimum of six locations. The initial concentration shall not exceed 7 percent and the minimum, at the end of 10 minutes, shall not drop below 5 percent. Failure to meet concentration test requirements, as specified, will result in system failure and necessitate corrective action. Retest will be performed until the required results have been achieved.

3.2.5.3 Enclosure. - Since Halon extinguishes fire as a percent-by-volume function, special consideration must be placed on sealing the protected area. leakage can occur through cable and utility wall penetrations, doors, HVAC, and ceiling tiles. Therefore, architectural/mechanical aspects play a fundamental role in the effectiveness of the system and must be coordinated during the design.

Dampers, electrically controlled to close at system discharge, provide an effective method of isolating the protected area from facility HVAC systems. When dampers are installed they shall conform to UL 555S Class II specifications as a minimum. If the damper is installed in a fire rated wall, the unit shall additionally be rated as such.

Computer equipment cooling air units will remain operating provided they serve only the protected area and receive no make-up supply from outside the area.

3.2.5.4 Controls. - All actuation, warning and auxiliary device circuits shall be electrically supervised to report a trouble condition in the event the signal cannot perform its designed function. Supervisor of the control panel and detection devices shall be as specified in 3.1.

Each panel will be equipped with an auto/manual mode selector switch. In addition, the panel shall be lockable. Both shall be key operated and cored in accordance with 3.1.2.6.

Each panel shall consist of appropriate resets, indicators, etc as denoted in figure 8.

3.2.5.5 Warning Devices. - Appropriate signs will be provided to identify all warning devices including bells, beacon/strobes, indicating lights, etc. In addition, signs shall be placed on each entrance door identifying the area as Halon protected.

A prominent visible warning light shall be located above each entrance door and will illuminate upon system discharge. Reset of these lights will occur upon reset of the control panel.

3.2.5.6 Manual Release. - Remote manual release stations of the guarded toggle switch type shall be located at each exit door from the protected area. Guards shall be held closed by a spring-loaded device and have a plastic or lead seal, which breaks when the cover is raised. Both toggles (ARM and ACTIVATE) shall be located in the same switch enclosure and labeled (see figure 8).

3.2.5.7 System Operation. - Dependent upon the operational mode of the Control Panel, the various system components will perform in a specified manner. Halon 1301 systems at KSC are designed to be used in either the manual or automatic operational modes (see figure 9).

3.2.5.7.1 Manual Mode. - Halon discharge requires manual actuation of an arming switch and an activating switch located on the control cabinet, or at remote locations within the protected area. Activation of a single smoke detector will result in the following:

a. Red rotating beacons/strobes are activated.

b. Signal is transmitted to Fire Services.

c. Bell sounds at control panel.

d. Detector locator lamp on graphic display at control panel lights showing location of actuated detector.

e. EARLY WARNING indicator lamp on control panel lights.

f. Appropriate lamp in the room locator panel located in the hallway lights (when installed).

Actuation of a second detector on a different circuit in the same zone causes the following:

g. Fire bells in the room sound (fire bells located in hallways are not connected to the Halon system).

h. A second detector locator lamp on the graphic display at control panel lights.

i. Red fire lamp on control panel lights.

3.2.5.7.2 Automatic Mode. - Operation requires actuation of two smoke detectors on different circuits in the same zone or manual actuation of both an arming and activating switch to initiate agent discharge.

a. Activation of one detector in Automatic Mode causes the same sequence of events as in Manual Mode and, in addition, the HALON ARMED indicator lamp at control panel lights.

b. Activation of the second detector in Automatic Mode causes the same sequence of events as in Manual Mode and, in addition, initiates discharge of Halon, lighting of appropriate HALON RELEASED indicator lamps, and operation of auxiliary device circuits.

3.2.5.7.3 Halon Release Stations. - Halon manual release switch stations shall be located at the control panel and shall be installed at egress doors. Halon discharge can be initiated from any one of these locations. Both arming and activating switches must be moved to the ON position to release the Halon. These switches perform the same functions regardless of the operational mode as follows:

a. Single (Arm or Activate) Switch Placed in ON Position:

(1) Red rotating beacons/strobes activated.

(2) Signal transmitted to Fire Services.

(3) Bell sounds at the control panel.

(4) EARLY WARNING, REMOTE ARM and HALON ARMED indicator lamps at control panel light (when installed).

(5) Appropriate lamp lights up at the room locator panel located in the hallway (when provided).

b. Second (Arm or Activate) Switch Placed in ON Position:

(1) Fire bells in the room sound.

(2) Halon is discharged.

(3) FIRE, REMOTE RELEASE, HALON RELEASE lamps at control panel light.

(4) HALON RELEASED lamp at control panel and HALON RELEASED lamp in hallway light.

(5) Operation of auxiliary device circuits (i.e., dampers close, doors close).

3.2.5.8 Venting. - A suitable means will be provided for the Fire Department to vent the area directly outside the facility.

3.2.5.9 Manifold Assembly Details and Electrical Controls. - Manifold assemblies for Halon 1301 Extinguishing Systems shall be in accordance with figures 8 and 9. Remote electrical controls shall function as indicated in figures 10 and 11.

3.2.6 Hose Stations - General. - Hose stations shall be located within reach of the hazards in the area they serve. Where specified in this standard as "hose station," the following arrangement of equipment shall be provided.

3.2.6.1 Indoor Areas. - The standard KSC indoor hose station shall consist of the following UL-listed or FM-approved equipment:

a. One 1-1/2-inch valved hose connection (2-1/2 X 1-1/2-inch adapter at stand pipes)

b. One semi-automatic hose rack

3.2.6.2 Outdoor, Indoor High-Hazard Areas or Work Platforms. - The standard KSC outdoor, indoor high-hazard area or work platform hose station shall consist of the following UL-listed or FM-approved equipment:

a. One valved water connection (minimum 1-1/2-inch connection with 1/4-turn ball valve or butterfly valve)

b. One flow-through hose reel

c. One length of 1-1/2-inch I.D. rubber-lined, rubber-covered fire hose no longer than 100 feet.

d. One combination spray, straight stream, shutoff nozzle

3.2.7 Fire Pumps.

3.2.7.1 Pump Redundancy Requirements. - Except for light and ordinary hazards as defined by the authority having design jurisdiction following consultation with PS-FRO, fire pump installations providing primary fire protection water shall contain not less than two diesel-driven pumps or two electric motor-driven pumps with a redundant source of power, each sized to provide 100 percent of the system's maximum flow and pressure requirements. A single pump and driver may be used to provide 100 percent of the system's maximum flow and pressure requirement for light and ordinary hazards.

3.2.7.2 Fire Pump Controls. - Fire pumps shall be controlled by either a hydropneumatic tank system as shown in figure 12 (The electrical control system for figure 12 is shown in figure 13.) or jockey pump system as shown in figure 14. Direction as to which control system to use will be given by the authority having design jurisdiction following consultation with PS-FRO.

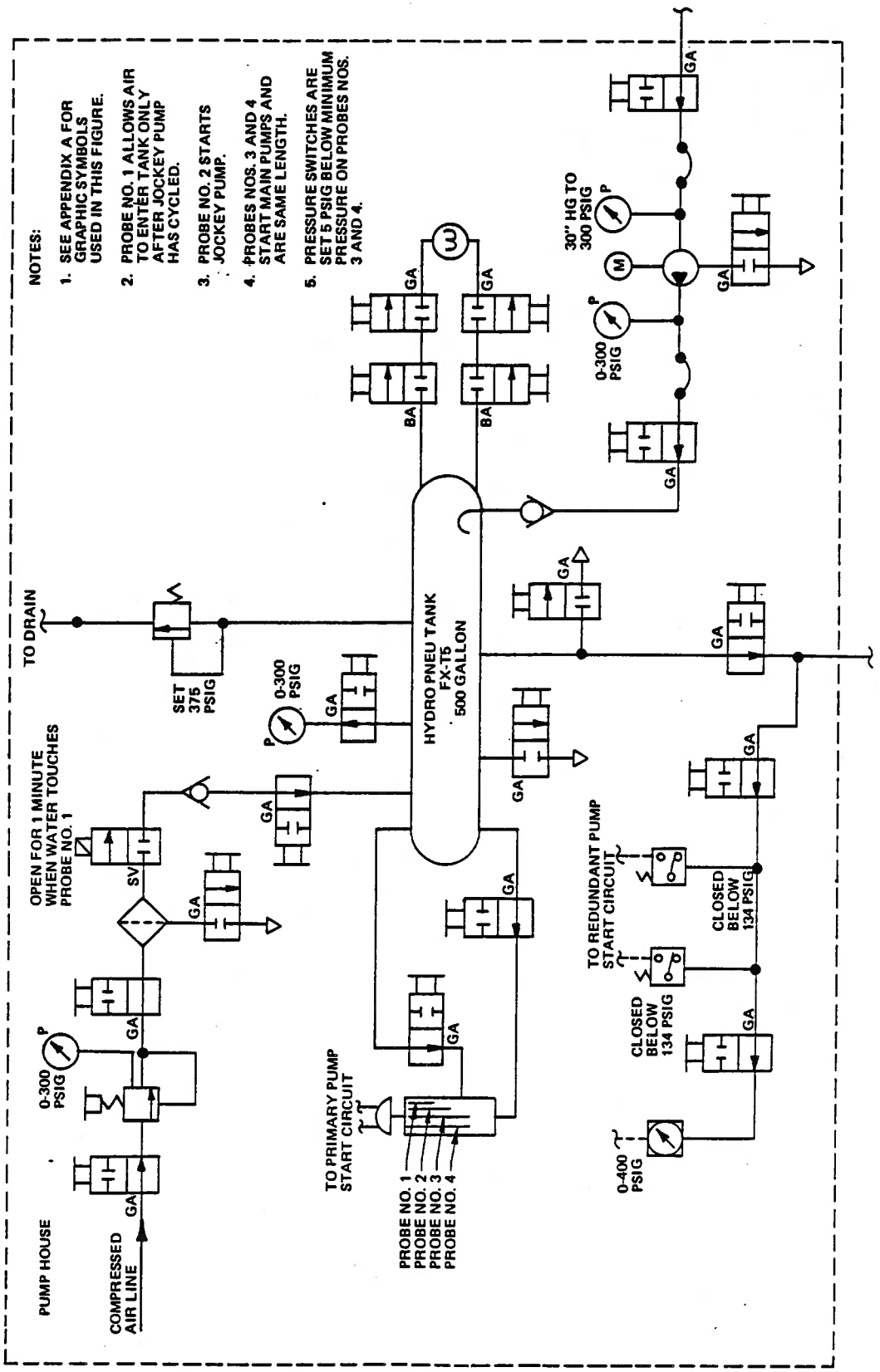


Figure 12. Hydropneumatic Tank for Pump Starting Control System

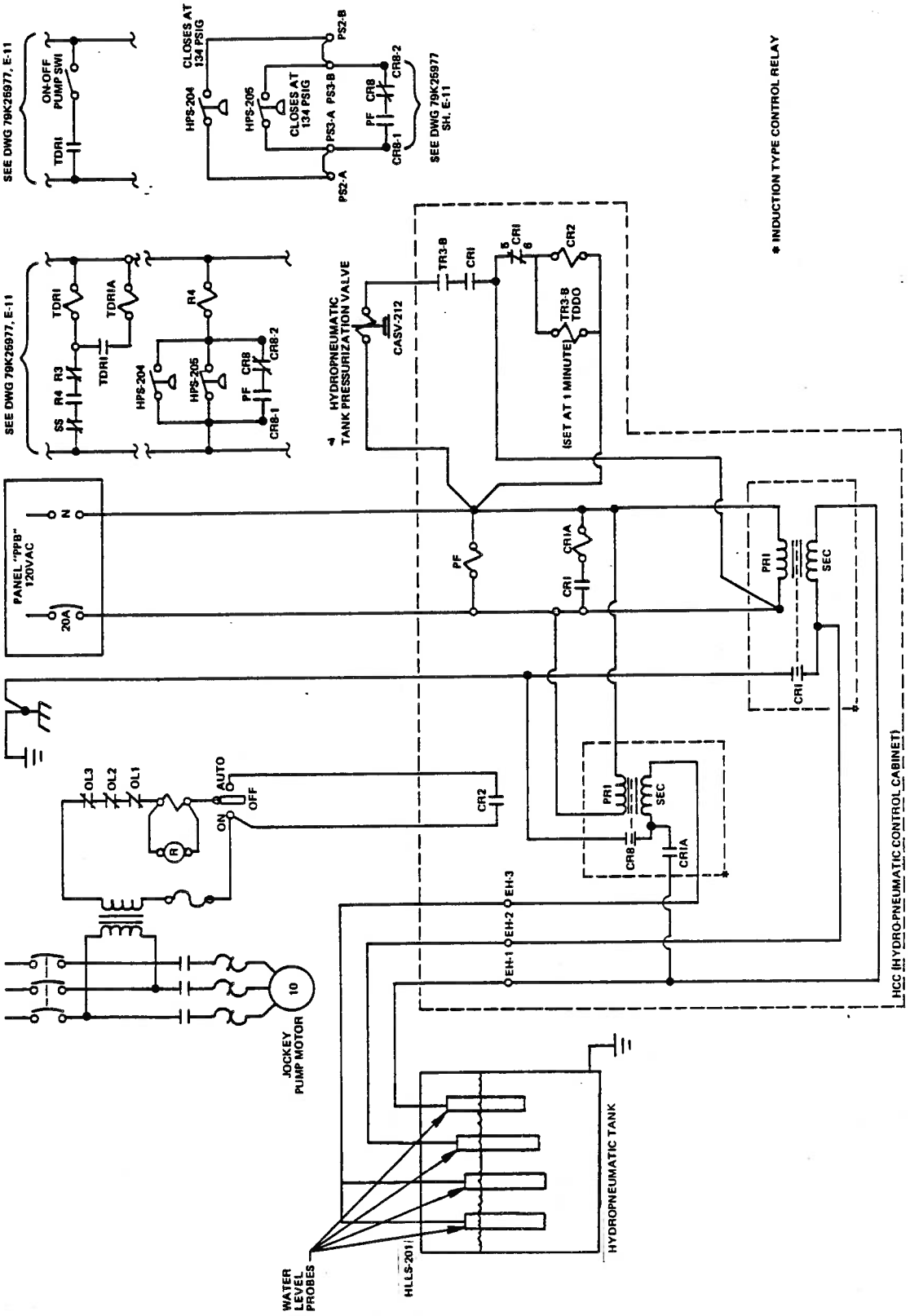


Figure 13. Partial Wiring Diagram for Firex Diesel Pumps

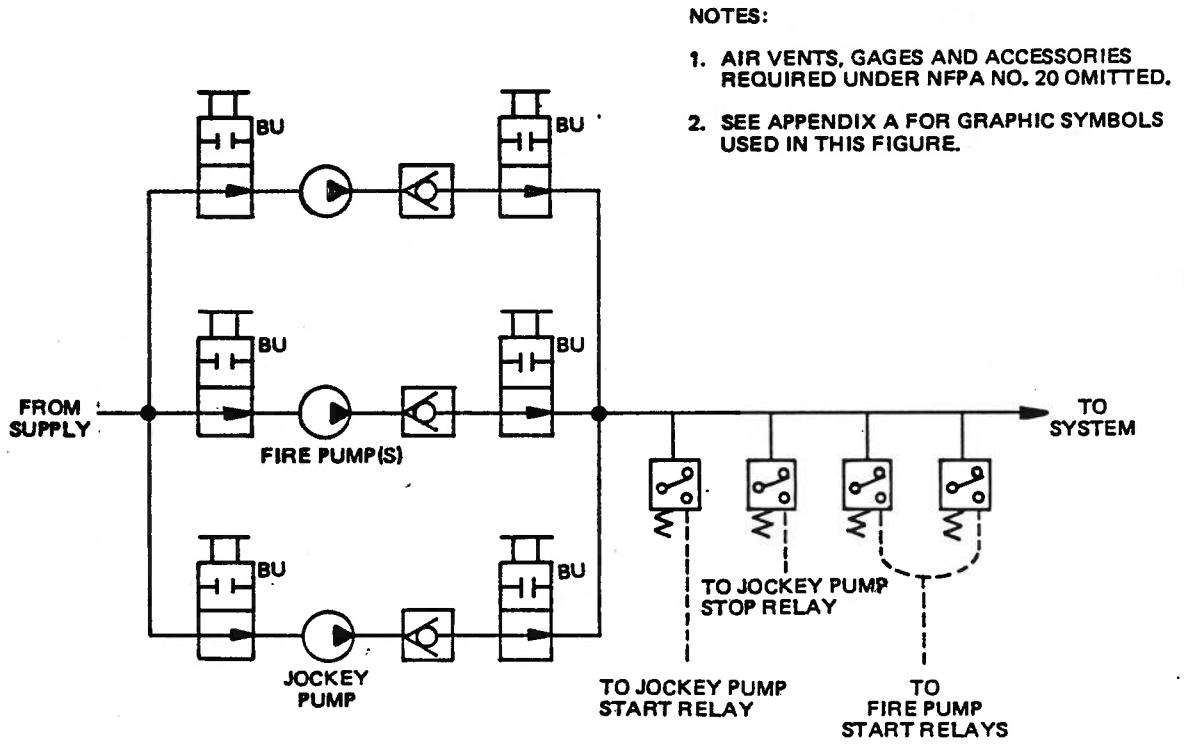


Figure 14. Arrangement of Major Components - Booster Fire Pumps

3.2.7.3 Testing. - A suitable flowmeter shall be installed to permit acceptance and annual flow testing. (See NHB 1700.1, volume 9, chapter 5 for additional details.)

3.3 Fire Resistant Construction.

3.3.1 Responsible Agency. The determination of the class of construction to be used at KSC for buildings and structures (facilities) shall be the responsibility of the authority having design jurisdiction. In general, the construction of permanent facilities shall be either Fire-Resistive, Type A; Fire-Resistive, Type B; protected noncombustible, or unprotected noncombustible. The detailed requirements for the various classes of construction shall be in accordance with the requirements of NHB 7320.1B.

3.3.2 Discharge from Exits. - All exits shall discharge directly to the street, to a yard or court, or to other open space that provides safe and unobstructed access to open areas away from the facility. Exits may discharge into fenced open areas only if the fence is at least 500 feet from the facility or if less than 500 feet, it contains sufficient personnel gates for the number of personnel discharged into the area.

3.3.3 Panic Hardware. - Panic hardware shall be provided to meet the requirements of the NFPA No. 101 in addition to the following locations:

a. Door opening directly to the exterior from exit passages, corridors, or fire stairs

b. Doors leading from high-hazard occupancy areas

c. Doors leading from flammable liquid storage areas

3.3.4 Elevators. - Elevators shall not be recognized as required exitways.

3.3.5 Fire Escapes. - Fire-escape stairs exterior to buildings shall not be accepted as part of the required exits for new facilities. The use of fire-escape stairs, ladders, slides, or other unique means of egress shall be limited to special structures and towers and shall be approved by the authority having design jurisdiction following consultation with PS-FRO.

3.3.6 Flame, Heat, and Smoke Barriers.

3.3.6.1 Interior Finishes. - All interior finishes, including acoustical treatment, shall be noncombustible construction having a class A rating. Ten percent of the aggregate wall of an unsprinklered space may have materials with a flame-spread rating of 200, such as combustible paneling, if approved by the design authority. A noncombustible backing shall be provided if combustible paneling is used. The percentage of aggregate wall may be increased to 25 percent where there are sprinklers.

3.3.6.2 Carpeting. - Carpet shall be class A (ASTM E84) or class I (NFPA 253) in all cases.

3.4 Fire Protection Requirements Matrix.

3.4.1 Data Arrangement. - The information is arranged in two groups. The general fire protection requirements are presented first (see figure 15), followed by a more specific area requirements notation (see figure 16). The specific requirements are arranged by usage in groups of like activities or function.

3.4.2 Use of the Matrix. - The requirements matrix is a summary of the general fixed fire-protection requirements for the various area usages at KSC. The requirements for portable devices/systems must be determined in addition to those contained in the matrix. Users of the matrix should familiarize themselves with the abbreviations and footnotes applicable to the matrix. The appearance of the letter "R" opposite an area indicates a firm requirement for that fire protection feature in that space or facility. The symbol "CR" indicates that the feature may be required if certain other conditions are present. An evaluation of the need for such features shall be made based upon criteria contained in NHB 1700.1 (volume 9), NHB 7320.1B and/or fire risk assessment. The appearance of a dash (-) indicates that the fire protection feature listed is not normally required unless identified as such through a fire risk assessment. The symbol "AA" indicates that the referenced fire protection feature is an acceptable alternate to another feature. The criteria for acceptable alternates is primarily based on economic considerations provided the level of fire protection afforded is essentially equal to that provided by the preferred feature.

3.4.3 Notes and Remarks.

When NHB 1700.1 is referenced, it refers to Volume 9, Fire Protection.

3.4.4 Abbreviations Used in Matrix.

Occupancy Classifications

Key	Symbol
Assembly	A
Educational	ED
Residential - Apartments	R-A
Residential - Dormitory	R-D
Business	B
Industrial - General	I-G
Industrial - Special Purpose	I-SP
Industrial - High Hazard	I-HH
Health Care	HC
Unusual Structure	US
Storage	S
Not Applicable	NA

Fire Hazard Classifications

Key	Symbol
Light	L
Ordinary	O
High (Extra Hazard)	EH

Fire Classification

Ordinary Combustible Solids	A
Flammable Liquids and Gases	B
Electrical	C
Combustible Metals	D

Requirements

Required	R
Preferred	P
Acceptable Alternate	AA
Conditional Requirement	CR
Not Normally Required	-

4. QUALITY ASSURANCE PROVISIONS

Quality Assurance will review designs and modifications for fire protection in accordance with KSC requirements and assure compliance with NHB 5300.4(1C), Inspection System Provisions for Aeronautical and Space System Materials, Parts, Components and Services.

5. PREPARATION FOR DELIVERY

There are no applicable requirements.

PRIMARY BUILDING OR AREA USAGE	GENERAL FIRE PROTECTION REQUIREMENTS																						NOTES * AND REMARKS
	DETECTION, ALARM, EXTINGUISHMENT									BUILDING CONSTRUCTION									OTHER FEATURES ' '				
	DETECTOR CONTROL UNIT	REPORT TO CENTERWIDE MONITOR	DETECTION	MANUAL PULL STATION	ALARM SIGNAL APPLIANCES	HYDRANT IN THE AREA	STANDPIPE SYSTEM	EXTINGUISHING SYSTEM		FIRE RESISTANT TYPE A	FIRE RESISTANT TYPE B	PROTECTED NON-COMBUSTIBLE	UNPROTECTED NON-COMBUSTIBLE	HEAVY TIMBER	ORDINARY	WOOD FRAME			FIRE AREA LIMITS	EXITS	FACILITY SITING		
REFERENCE PARAGRAPH	3.1.2.6			3.1.2.10	3.1.2.11	NHB 1700.1 (CH. 2)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)		3.3.1	3.3.1	3.3.1	3.3.1						NHB 1700.1 (CH. 3)	NFPA 101	NHB 7320.1 (CH. 4)		
OFFICES	R	R	R	R	R	R	CR	CR		AA	P	AA	AA	–	–	–			R	R	R		SEE SPECIFICS
SHOPS	R	R	R	R	R	R	CR	CR		–	P	AA	AA	–	–	–			R	R	R		SEE SPECIFICS
LABORATORIES	R	R	R	R	R	R	CR	CR		AA	P	AA	AA	–	–	–			R	R	R		SEE SPECIFICS
FOOD SERVICE	R	R	R	R	R	R	CR	CR		AA	P	AA	–	–	–	–			R	R	R		SEE SPECIFICS
STORAGE	R	R	R	R	R	R	CR	CR		AA	AA	P	AA	–	–	–			R	R	R		SEE SPECIFICS
MECHANICAL EQUIPMENT	R	R	R	R	R	R	CR	–		AA	P	AA	AA	–	–	–			–	R	R		SEE SPECIFICS
ELECTRICAL EQUIPMENT	R	R	R	R	R	R	CR	–		AA	P	AA	AA	–	–	–			–	R	R		SEE SPECIFICS
ELECTRONIC EQUIPMENT	R	R	R	R	R	R	CR	CR		AA	P	–	–	–	–	–			R	R	R		SEE SPECIFICS
CABLING	CR	CR	CR	CR	CR	R	–	CR		AA	P	AA	AA	–	–	–			–	R	R		SEE SPECIFICS
COMMUNICATIONS EQUIPMENT	R	R	R	R	R	R	CR	CR		AA	P	AA	AA	–	–	–			–	R	R		

(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 15. General Fire Protection Requirements (Sheet 1 of 2)

PRIMARY BUILDING OR AREA USAGE	GENERAL FIRE PROTECTION REQUIREMENTS																					NOTES * AND REMARKS
	DETECTION, ALARM, EXTINGUISHMENT									BUILDING CONSTRUCTION									OTHER FEATURES			
	DETECTOR CONTROL UNIT	REPORT TO CENTERWIDE MONITOR	DETECTION	MANUAL PULL STATION	ALARM SIGNAL APPLIANCES	HYDRANT IN THE AREA	STANDPIPE SYSTEM	EXTINGUISHING SYSTEM		FIRE RESISTANT TYPE A	FIRE RESISTANT TYPE B	PROTECTED NON-COMBUSTIBLE	UNPROTECTED NON-COMBUSTIBLE	HEAVY TIMBER	ORDINARY	WOOD FRAME			FIRE AREA LIMITS	EXITS	FACILITY SITING		
REFERENCE PARAGRAPH				3.1.2.10	3.1.2.11	NHB 1700.1 (CH. 2)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)		3.3.1	3.3.1	3.3.1	3.3.1						NHB 1700.1 (CH. 3)	NFPA 101	NHB 7320.1 (CH. 4)		
SERVICE STRUCTURE	CR	R	R	R	R	R	R	CR		–	–	–	P	–	–	–			–	R			SEE SPECIFICS
PROPELLANTS AND GASES	R	R	R	R	R	R	CR	CR		–	AA	AA	P	–	–	–			–	R			SEE SPECIFICS
S/C AND L/V ASSEMBLY AND TEST	R	R	R	R	R	R	R	CR		AA	P	AA	AA	–	–	–			R	R			SEE SPECIFICS
ORDNANCE	R	R	R	R	R	R	–	CR		AA	P	–	–	–	–	–			–	R			SEE SPECIFICS
PERSONNEL ASSEMBLY	R	R	R	R	R	R	CR	CR		AA	P	–	–	–	–	–			R	R			SEE SPECIFICS
TRANSPORTATION TERMINALS	–	R	–	R	R	R	–	–		–	P	AA	AA	–	–	–			–	R			SEE SPECIFICS
MISCELLANEOUS																							SEE SPECIFICS

(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 15. General Fire Protection Requirements (Sheet 2 of 2)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																						NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
OFFICES																							
ADMINISTRATIVE	B	O	A, C	–	R	CR		CR	CR*	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 7)
COMPUTER SUPPORT	B	O	A, C	–	R	CR		CR	CR*	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 7)
SHOPS																							
CARPENTER	I–G	O	A, C	–	R	–		P	CR*	–	–	–	–	–	–		–		–	–	CR	CR	NHB 1700.1 (CH. 5)
ELECTRICAL	I–G	O	A, B, C	–	R	CR*		–	CR*	–	–	–	–	–	–		–		–	–	–	CR*	NHB 1700.1 (CH. 8)
MECHANICAL	I–G	O	A, B, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 5)
PAINT	I–HH	EH	B, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	R	CR	NHB 1700.1 (CH. 5)
VEHICLE REPAIR	I–G	O	A, B, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	CR	CR	NHB 1700.1 (CH. 7)
WELDING	I–G	O	A, C	–	R	–		–	CR*	–	–	–	–	–	–		–		–	–	CR	CR	NHB 1700.1 (CH. 5)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 1 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																						NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
LABORATORIES																							
CALIBRATION	I–G	0	A, C	–	R	CR*		–	CR*	–	–	–	–	–	–		–		–	–	–.	CR	NHB 1700.1 (CH. 5, 7)
CHEMICAL	I–HH	EH	A, B, C, D	–	R	CR*		CR	CR*	–	–	–	–	–	–		–		–	–	CR	R	NHB 1700.1 (CH. 5, 7)
CLEANING	I–SP	0	A, B, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	CR	CR	NHB 1700.1 (CH. 5, 7)
FILM PROCESSING	I–SP	0	A, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	CR	R	NHB 1700.1 (CH. 5, 7)
PROPELLANT TEST	I–HH	EH	A, B, C, D	–	R	–		CR	CR*	CR*	–	–	–	–	–		–		–	–	R	R	NHB 1700.1 (CH. 5)
FOOD SERVICE																							
DINING AREA	A	0	A, C	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
KITCHEN	I–SP	0	A, B, C	–	R	–		CR	CR*	–	–	–	–	–	CR*		–		–	–	R	R	NHB 1700.1 (CH. 5, 7)
SNACK BAR	A	0	A, C	–	R	–		–	–	–	–	–	–	–	CR		–		–	–	–.	R	NHB 1700.1 (CH. 7)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 2 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
STORAGE																								
OUTDOOR–CABLE	NA	0	A	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
OUTDOOR–FLAMMABLE LIQUIDS	NA	EH	B	–	–	–		–	–	–	–	–	–	–	–		–		–	CR	–	R	
OUTDOOR–H.P. GAS BOTTLES	NA	EH	B	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	R	
OUTDOOR–HEAVY EQUIPMENT	NA	0	B, C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
INDOOR–COMBUSTIBLE	S	0	A	–	R	–		CR	CR*	–	–	–	–	–	–		–		–	–	CR	R	NHB 1700.1 (CH. 5)
MOTOR FUEL	I–SP	EH	B	–	–	–		CR	–	–	–	–	–	–	–		–		–	CR	–	–	
MOTOR VEHICLE	I–SP	0	A, B, C	–	R	–		CR*	CR*	–	–	–	–	–	–		–		–	–	CR	CR	NHB 1700.1 (CH. 7)

KSC FORM OT–2932 (10/80) (ONETIME FORM – REPRINT NOT AUTHORIZED)

(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 3 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES • AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS													OTHER FEATURES[1]				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
MECHANICAL EQUIPMENT																								
AIR HANDLERS AND FILTERS	NA	0	A, C	–	R	–		–	CR*	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 5)
BOILERS (FURNACES)	NA	0	B, C	–	CR	–		CR	–	–	–	–	–	–	–		–		R	–	–	R	
COMPRESSORS (PUMPS)	NA	0	C	–	R	–		–	CR*	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 5)
HYDRAULIC EQUIPMENT	NA	0	B, C	–	–	–		–	CR*	–	–	–	CR AA	CR AA	CR AA		–		–	–	–	R	NHB 1700.1 (CH. 5)
ELEVATOR HOISTING EQUIPMENT	NA	0	A, C	–	R			–	–	–	–	–	–	–	–		–		–	–	–	–	
ELEVATOR SHAFTS	NA	L	A, C	–	–	CR*		–	–	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
ENGINES, FUEL	NA	0	B, C	–	R	–		CR	–	–	–	–	–	–	–		–		–	–	–	R	
ENGINES, PORTABLE	NA	0	B, C	–	R	–		CR	–	–	–	–	–	–	–		–		–	–	–	R	

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 4 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL	BOOSTER PUMP	HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
ELECTRICAL EQUIPMENT																								
CIRCUIT BREAKERS, INDOOR	NA	L	C	–	CR*	CR*		–	–	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 6)
CIRCUIT BREAKERS, OUTDOOR	NA	L	C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
MOTORS AND HEAVY POWER EQUIPMENT	NA	L	C	–	CR*	CR*		–	–	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
PANELBOARDS AND MOTOR CONTROL CENTERS	NA	0	C	–	CR*	CR*		–	–	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 6)
PRIMARY SWITCH GEAR	NA	L	C	–	CR*	CR*		–	–	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
SECONDARY SWITCH GEAR	NA	L	C	–	CR*	–		–	–	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 6)
TRANSFORMERS, INDOOR, DRY	NA	0	C	–	–	CR*		–	CR*	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 7)
TRANSFORMERS, OUTDOOR, OIL	NA	0	B, C	–	–	–		–	–	–	CR*	–	–	–	–		–		–	R	–	–	NHB 1700.1 (CH. 7)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 5 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS											OTHER FEATURES					
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
ELECTRONIC EQUIPMENT																							
CONCEALED CABLEWAY	NA	0	C	–	–	R		CR*	CR*	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
COMPUTER ROOM	I–SP	0	A, C	–	R	R		CR*	CR*	–	–	–	–	–	–		CR*		–	–	–	R	NHB 1700.1 (CH. 7)
COMPUTER ACCESSORY EQUIPMENT ROOM	I–SP	0	A, C	–	R	R		CR*	CR*	–	–	–	–	–	–		CR*		–	–	–	R	NHB 1700.1 (CH. 7)
COMPUTER PAPER STORES	GS–II	0	A	–	CR	–		CR*	CR*	–	–	–	–	–	–		–		–	–	–	CR	NHB 1700.1 (CH. 7)
COMPUTER TAPE STORES	GS–II	0	A	–	–	R		CR*	CR*	–	–	–	–	–	–		CR*		–	–	–	CR	NHB 1700.1 (CH. 7)
FIRING ROOMS	I–SP	0	A, C	–	R	R		CR	CR*	–	–	–	–	–	–		R*		–	–	–	R	NHB 1700.1 (CH. 7)
DATA LINK REPEATER	US	0	C	–	CR	CR		–	–	–	–	–	–	CR	–		CR*	–	–	–	–	–	NHB 1700.1 (CH. 7)
TERMINAL DISTRIBUTOR	US	0	C	–	–	R		CR	–	–	–	–	–	–	–		CR*	–	–	–	–	–	NHB 1700.1 (CH. 7)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

* DENOTES CHANGE

Figure 16. Specific Fire Protection System Design Requirements (Sheet 6 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 6)					NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 6)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
CABLING																								
TUNNELS AND VAULTS	NA	L	A, C	–	–	CR		CR*	CR*	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 7)
VERTICAL, INDOOR	NA	L	A, C	–	–	CR		CR*	–	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
VERTICAL, OUTDOOR	NA	L	A, C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 6)
COMMUNICATIONS																								
TELEPHONE FRAME ROOMS	I–SP	0	A, C	–	CR	R		CR*	–	–	–	–	–	–	–		CR*		–	–	–	R	NHB 1700.1 (CH. 7)
TELEVISION STUDIO	I–SP	0	A, C	–	R	–		–	CR*	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
FILM EDITING ROOMS	I–SP	0	A, C	–	R	–		–	CR*	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
SERVICE STRUCTURE																								
LAUNCH VEHICLE ACCESS PLATFORMS (HAZARDS)	I–HH	0–2	A, B, C, D	P	CR	–		CR	–	CR*	R	CR*	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)

KSC FORM OT–2932 (10/80) (ONETIME FORM – REPRINT NOT AUTHORIZED)

(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 7 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 6)					NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
PROPELLANTS AND GASES																								
LH_2 STORAGE	US	EH	B, C	CR*	R	–		–	R	–	–	R	–	–	–		–		–	–	–	R	
LH_2 TRANSFER EQUIPMENT	US	EH	B, C	CR*	R	–		–	R	–	R	–	–	–	–		–		–	–	–	R	
GH_2 STORAGE	US	EH	B, C	CR*	R	–		–	R	–	–	R	–	–	–		–		–	–	–	R	
GH_2 TRANSFER EQUIPMENT	US	EH	B, C	CR*	R	–		–	R	–	R	–	–	–	–		–		–	–	–	R	
GH_2 DISPOSAL POND	US	EH	B, C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
LOX STORAGE	US	EH	C	–	R	–		–	R	–	–	CR*	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
LOX TRANSFER EQUIPMENT	US	EH	C	–	R	–		–	R	–	R	–	–	–	–		–		–	–	–	R	
GOX STORAGE	US	EH	C	–	R	–		–	R	–	–	CR*	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)
GOX TRANSFER EQUIPMENT	US	EH	C	–	R	–		–	R	–	CR*	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 6)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 8 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES* AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES'				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 6)					NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 6)	NHB 1700.1 (CH. 6)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
RP-1 STORAGE	US	EH	B, C	P	R	–		CR	R	–	–	–	CR	–	–		–		–	R	–	R	
RP-1 TRANSFER EQUIPMENT	US	EH	B, C	P	R	–		–	R	–	AA	–	R	–	–		–		–	–	–	R	
UDMH/MMH STORAGE	US	EH	B, C	P	R	–		–	R	R	CR	–	–	–	–		–		–	R	–	R	
UDMH/MMH TRANSFER EQUIPMENT	US	EH	B, C	P	R	–		–	R	–	R	–	–	–	–		–		–	R	–	R	
UDMH/MMH VAPOR DISPOSAL	US	EH	B, C	–	–	–		–	R	–	CR	–	–	–	–		–		–	–	–	R	
N_2O_4 STORAGE	US	EH	C	P	R	–		–	R	–	–	R	–	–	–		–		–	R	–	R	
N_2O_4 TRANSFER EQUIPMENT	US	EH	C	P	R	–		–	R	–	–	R	–	–	–		–		–	R	–	R	
N_2O_4 VAPOR DISPOSAL	US	EH	C	–	–	–		–	R	–	CR	–	–	–	–		–		–	–	–	R	
LN_2 STORAGE	US	L	C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
GN_2 STORAGE	US	L	C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 9 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																						NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS											OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	SMOKE AND HEAT RELEASE	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)															
S/C AND L/V ASSEMBLY AND TEST																							
ANECHOIC CHAMBER	I–SP	EH	B, C	–	–	R		R	–	–	–	–	–	–	–		–		–	–	–	R	
CRYOGENIC SYSTEM TEST	I–HH	EH	C	CR	R	–		–	R	–	CR°	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
ECS SYSTEM TEST	I–HH	EH	B, C	–	R	–		–	CR°	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
HYPERGOLIC SYSTEM TEST	I–HH	EH	B, C	P	R	–		–	R	CR°	R	–	–	–	–		–		–	R	–	R	NHB 1700.1 (CH. 5)
ORDNANCE INSTALLATION	I–HH	EH	C, D	–	R	–		–	CR	–	–	CR°	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
S/C ASSEMBLY	I–SP	0	A, B, C	CR	R	CR		R	R	–	CR°	CR°	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
L/V ASSEMBLY	I–SP	0	A, B, C	CR	R	CR		R	R	–	CR°	CR°	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 10 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS												OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
ORDNANCE																								
ORDNANCE RECEIVING	I–HH	EH	A, C, D	CR	R	–		–	R	–	–	CR	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
ORDNANCE STORAGE	I–HH	EH	A, C, D	CR	R	–		–	R	–	–	CR	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
ORDNANCE TEST	I–HH	EH	A, C, D	CR	R	–		–	R	–	–	CR	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 5)
PERSONNEL ASSEMBLY																								
AUDITORIUM	A	0	A, C	–	R	CR*		CR*	R	–	–	–	–	–	–		–		–	–	–	R	NFPA 101 (CH. 8)
PROJECTION ROOMS	I–SP	0	A, C	–	R	CR		CR	CR	–	–	–	–	–	–		–		–	–	–	R	NFPA 101 (CH. 8)
TRANSPORTATION TERMINALS																								
BARGE TERMINAL	I–G	L	A, B, C	–	–	–		–	CR	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
RAILROAD TERMINAL	US	L	A, B, C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 11 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																								NOTES * AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS														OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT				NHB 1700.1 (CH. 6)				NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
MISCELLANEOUS																								
CAMERA SITE	NA	L	A, C	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
CRANE CONTROL CABS	I–SP	0	A, C	–	CR	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
DISPENSARY	B	0	A, B, C	–	R	–		–	R	–	–	–	–	–	–		–		–	–	–	R	
FIRE STATION	S	0	A, B, C	–	R	CR*		CR*	CR*	–	–	–	–	–	CR*		–		–	–	–	R	NHB 1700.1 (CH. 5) NFPA 101 (CH. 16)
FLIGHT CREW TRAINING	B	0	A, C	–	R	CR		–	R	–	–	–	–	–	–		–		–	–	–	R	
METEOROLOGICAL STATION	US	L	A	–	R	CR		–	–	–	–	–	–	–	–		–		–	–	–	–	
PRESS SITE	A	0	A, C	–	R	–		–	CR	–	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 5)
RESIDENTIAL	R–D	0	A, C	–	CR	CR		–	–	–	–	–	–	–	–		–		–	–	–	R	NFPA 101 (CH. 20)

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(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 12 of 13)

PRIMARY BUILDING OR AREA USAGE	SPECIFIC FIRE PROTECTION SYSTEM DESIGN REQUIREMENTS																							NOTES AND REMARKS
	GENERAL DATA			DETECTORS				EXTINGUISHING SYSTEMS													OTHER FEATURES				
	OCCUPANCY CLASS	HAZARD CLASS	FIRE CLASS	FLAME	HEAT ACTUATED	PRODUCTS OF COMBUSTION		SPRINKLER SYSTEM	FIRE HOSE STATION	DELUGE SPRAY (EXTINGUISHING)	DELUGE SPRAY (CONTROL)	DELUGE SPRAY EXPOSURE PROTECTION	LOW EXPANSION FOAM	FIXED CO_2	FIXED DRY CHEMICAL		HALON 1301		COMBUSTION SAFEGUARDS	DRAINS AND CURBS	VENTING	SEPARATION OF HAZARDS	
REFERENCE PARAGRAPH AND/OR DOCUMENT								NHB 1700.1 (CH. 5)					NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)	NHB 1700.1 (CH. 5)				NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 7320.1 (CH. 7)	NHB 1700.1 (CH. 3)	
TRAILER OFFICES	B	0	A, C	–	CR*	–		–	–	–	–	–	–	–	–		–		–	–	–	R	NHB 1700.1 (CH. 7)
WOODEN TOWERS	US	0	A	–	–	–		–	–	–	–	–	–	–	–		–		–	–	–	–	
WOODEN FILLED COOLING TOWERS	US	0	A	–	CR*	–		CR*	–	CR*	–	–	–	–	–		–		–	–	–	–	NHB 1700.1 (CH. 7)

KSC FORM DT-2932 (10/80) (ONETIME FORM – REPRINT NOT AUTHORIZED)

(SEE PARAGRAPHS 3.4.3 AND 3.4.4 FOR EXPLANATION OF SYMBOLS.)

Figure 16. Specific Fire Protection System Design Requirements (Sheet 13 of 13)

6. NOTES

6.1 Intended Use. This standard is intended for use as a fire-protection design guide for all new facilities and modifications to existing facilities under design jurisdiction of John F. Kennedy Space Center.

7. DEFINITIONS

a. General Fire Protection - Everything relating to the prevention, detection, and extinguishment of fire and to the reduction of losses by fire, including the safeguarding of human life and the preservation of property

b. Fire Prevention - Measures directed towards avoiding the inception of fire

c. Fire Detection and Alarm - Systems and devices which monitor conditions within a specific area and give early warning of fire

d. Electrical Supervision - Monitoring the flow of controlled electrical current through nonoperative circuits to assure the continuity of the circuit

e. Fixed Extinguishing System - An engineered arrangement of equipment designed to provide a specified firefighting capability against a particular fire hazard within a specified area (does not include portable fire extinguishers)

f. Fire Fighting - The physical deployment of available fixed or portable extinguishing agents for the purposes of aiding escape or rescue, suppression of fire spread, and extinguishment

g. Complicated Escape Route - A condition in which the physical arrangement of equipment requires an escapee to follow two or more passageways to accomplish escape; e.g., platform deck/ships ladder/elevator

h. Water Spray - A directed stream of high velocity, divided water droplets having a uniform full 90-degree conical pattern produced by conversion of pressure energy by shear, swirl, or momentum change in a nozzle device specifically designed for the purpose

i. Water Fog - Finely divided water spray characterized by a fine mist appearance

j. Portable Fire Extinguishers - All extinguishing devices that are movable and not permanently attached to the facility

APPENDIX A

GRAPHIC SYMBOLS FOR FIREX SYSTEM

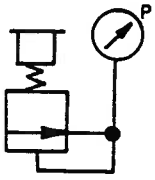

FLEXIBLE HOSE


WATER TANK


ACCUMULATOR


AUTOMATIC AIR VENT


SIGHT GLASS



PRESS REGULATOR W/GAGE


LIQUID LEVEL PROBES


LIQUID LEVEL TRANSMITTER

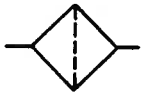
THERMOMETER

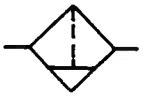
MOTOR


PUMP


COMPRESSOR


PIPE CAP


WYE STRAINER/ FILTER-SEPARATOR


FILTER-SEPARATOR, MANUAL DRAIN

TEMPERATURE GAGE

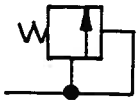
PRESSURE GAGE (DIRECT)


CHECK VALVE


PRESS TRANSDUCER


ORIFICE, LINE WITH FIXED RESTRICTION


FLOW CONTROL VALVE, RESTRICTOR, ADJUSTABLE


PRESSURE RELIEF VALVE


PRESSURE SWITCH

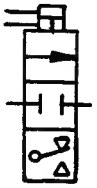

INDICATOR LAMP (LETTERS IN CIRCLE INDICATE LENS COLOR; W-WHITE, R-RED, A-AMBER, B-BLUE, G-GREEN

VALVE, MANUAL,
3 WAY, 2 POSN

SOLENOID VALVE,
3 WAY, SPRING RETURN

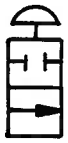
VALVE, MANUAL

SOLENOID VALVE,
2 WAY, 2 POSN



PNEUMATIC OPERATED BUTTERFLY
VALVE, WITH DOUBLE-ACTING
ACTUATOR AND POSITION SWITCH

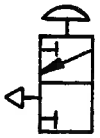
SOLENOID VALVE



VALVE, DIAPHRAM
OPER

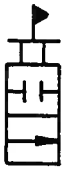
VALVE, METER, THERMOSTATIC

VALVE, NEEDLE



VALVE, SOLENOID, PILOT OPER

VALVE, 2 POSN,
4 WAY



VALVE W/POS
IND

VALVE TYPES

BU – BUTTERFLY
GL – GLOBE
GA – GATE
CO – CONE
BA – BALL
CL – CLAPPER
PL – PLUG
SV – SOLENOID

NOTES:

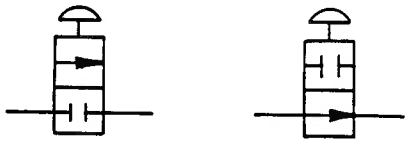
REFERENCE DOCUMENTS:
- 79K09579 OMD BASELINE NO. 402.00
- 79K29921 SYSTEM DOCUMENTATION LIST
- 79K29849 LRU PARTS LIST

SOLENOID VALVES ARE DEPICTED IN DE-ENERGIZED STATE. OTHER SYSTEM VALVES ARE DEPICTED IN POSITION (OPEN, CLOSED, ACTUATED, UNACTUATED) SHOWING WATER SYSTEM OPERATIONALLY PRESSURIZED WITH NO FLOWS.

SYMBOLOGY IS PER KSC-STD-152-2. (SPECIAL SYMBOLS FOR WATER SYSTEM ADDED AS REQUIRED.)

IN MULTIPLE ENVELOPE SYMBOLS, FLOW CONDITION SHOWN NEAREST A CONTROL SYMBOL TAKES PLACE WHEN THE CONTROL IS CAUSED OR PERMITTED TO ACTUATE.

EXAMPLE:



ACTUATED UNACTUATED