

PCN 98574	<b>DOCUMENT RELEASE AUTHORIZATION KENNEDY SPACE CENTER, NASA</b>	PAGE 1	OF 6
ESR		REV/DATE	
DIR	DRA NO. A - CS000000- 1124	SIGNATURE	
EFF	TITLE Repair KSC Center Wide Fire Monitoring System (Phase 1 of 2)	VEN CODE	
EQ. LOC. SEE TECHNICAL REMARKS		CONTRACT	
SDL 79K11153			

**DOCUMENTS**

I #	PREF	DOCUMENT NUMBER	ISSUE	SIZE	SHTS	B/L NO.	SS	MODEL NUMBER	WUC
1	DR	79K38492	New	F	142	Note 1	Note 1	Note 1	Note 1
2	SP	79K38493	New	A	171	Note 1	Note 1	Note 1	Note 1
3	DM	KSC-TA-9634 Cover, 1-870	New	A	871	Note 1	Note 1	Note 1	Note 1
4	SW	79K38492 (CD No. 1)+2	New	M	1	Note 1	Note 1	Note 1	Note 1
				Note 2					
				M	1	Note 1	Note 1	Note 1	Note 1
				Note 3					
5	SW	79K38493 (CD No. 2)	New	M	"	Note 1	Note 1	Note 1	Note 1
				Note 3					
6	SW	KSC-TA-9634 (CD No. 2)	New	M	"	Note 1	Note 1	Note 1	Note 1
				Note 3					

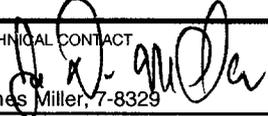
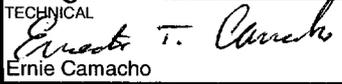
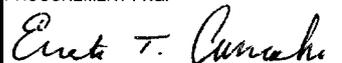
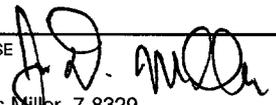
**TECHNICAL REMARKS**

Note 1: Reference Sheet 2  
 Note 2: One CD contains the AutoCad Drawing files  
 Note 3: One CD contains the specifications, drawing package (.pdf files), and data manual.  
 Construction Package Release to EDC prior to procurement.

Replacement of Central Radio Monitoring System (CRMS) with installation at K6-900, M6-342, and K6-1446K. Connection of various facilities in the KSC Industrial Area to the CRMS System. Facilities in Project: K6-900, M6-342, K6-1446K, K6-2496, L7-940A, L7-1557, M5-1494, M6-039, M6-138, M6-495, M6-698, M6-785, M6-794, M6-306, M6-342, M6-399, M6-409, M6-486, M6-744, M6-1025, M7-355, M7-360, M7-409, M7-505, M7-657, M7-777, M7-1061, M7-961, M7-1059, M7-1212, M7-1104, M7-1354, M7-1362, M7-1472, N6-1009, N6-1120, N6-2247, and N6-2296.

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**APPROVALS**

TECHNICAL CONTACT  James Miller, 7-8329	MAIL CODE TA-B3-B	DATE 9/16/09	R&QA	MAIL CODE	DATE
TECHNICAL  Ernie Camacho	TA-B3-B	9-16-09	OTHER		
SPACE AND WEIGHT			JOINT RELEASE		
PROCUREMENT PKG. 		9-16-09	RELEASE  James Miller, 7-8329	TA-B3-B	9/16/09

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		See Sheet 1 For Document List							
		K6-2496	NEW			355.00	L6	K61-2361	L6FFA60000
		M6-342				355.00	IC	K61-0656	ICFFAAS000
		L7-0940A				355.00	GZ	K62-4331	GZFFA00000
		L7-1557				355.00	IS	K61-0650	ISFFAAS000
		M5-1494				355.00	ON	K61-0138	ONFFA00000
		M6-0039				355.00	GO	K61-0213	GOFFA00000
		M6-0138				355.00	CT	K61-0653	CTFFAAS000
		M6-0495				355.00	DI	K61-0665	DIFFAAS000
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		M6-0785				355.00	J5	K61-3476	J5FFA00000
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		M6-0342				355.00	IC	K61-0656	ICFFAAS000
		M6-0399				355.00	LO	K61-0657	LOFFAAS000
		M6-0409				355.00	VH	K61-0658	VHFFAAS000
		M6-0486				355.00	PM	K61-0663	PMFFAAS000
		M6-0744				355.00	CS	K61-0672	CSFFAAS000
		M6-1025				355.00	Z7	K61-5017	Z7FFA9ZA00
		M7-0355				355.00	OC	K61-0681	OCFFAAS000
		M7-0360				355.00	S1	K61-3417	S1FFA00000
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		M7-0777				355.00	Q9	K60-0073	Q9FFA00000
		M7-1061				355.00	FT	K61-0689	FTFFAAS000
		K6-900 (Simplex 2120, 4120)				355.00	LC	K61-2901	LCFFACP000
		M6-138 (Simplex 2120, 4120)				355.00	CT	K61-2900	CTFFACP000
		K6-1446A (Simplex 2120,4120)				355.00	G6	K61-3716	G6FFA00000

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		See Sheet 1 For Document List							
		M7-0961				355.00	EC	K61-0688	ECFFAAS000
		M7-1059				355.00	FT	K61-6077	FTFFA00000
		M7-1212				355.00	HT	K61-0692	HTFFAAS000
		M7-1104				355.00	S2	K61-3579	S2FFA00000
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		K6-2496	NEW			359.25	K-	K62-4987	K-FCSRA200
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1P	TA-B3-D	M. Collins	1B	MILA	F. Fender
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DRA	TA-B3-E	G. Diaz	1B	CSR-4310	G. Davis
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DRA	TA-A3	R. Poinik	1B	45 CES/CELS	R. Elliot
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(Stamp Revision: (05-19-2009))

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	DRAFTSMAN	CHECKER	Repair KSC Center Wide Fire Monitoring System			
	ENGINEER	CHECKER	Phase 1 of 2			
	ENGINEER	STRESS	PCN 98574			
SOFTWARE	ENGINEER		DATE: September 10, 2009			
FILENAME	ENGINEER		AEI Project No. 08411-00			
MATERIAL	ENGINEER		100% CD Final Specifications			
HEAT TREATMENT	SUBMITTED	<i>[Signature]</i> 9/16/09	SIZE	CAGE CODE	DWG NO	REV
FINAL PROTECTIVE FINISH	APPROVED	<i>[Signature]</i> 9/16/09	A		79K38493	
			SCALE	UNIT WEIGHT	SHEET	OF
					1	171

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## SECTION 01 11 00.00 98

SUMMARY OF WORK  
10/07

## PART 1 GENERAL

## 1.1 SUMMARY

The work to be performed under this project consists of providing the labor, equipment, and materials to replace the existing KSC Central Fire Monitoring System (CRMS). The project installs new head-end and control components at K6-900 (Launch Control Center), M6-342 (Central Instrumentation Facility), and K6-1446K (Replacement Electrical Shop Building). Modifications to fire alarm systems at numerous KSC facilities are also performed to connect to the new head-end control equipment. Project includes computer hardware/computer software, fire alarm control panel hardware/software, data network, electrical power, electrical construction elements, and asbestos avoidance, and hazardous material handling, (painted materials), elements.

Reference the solicitation/request for proposal forbid Options and Alternates that apply to this project.

## 1.2 DESCRIPTION

The work consists of:

- a. Immediately after submittal of product data, Contractor's IT representatives shall consult with Government IT representatives at KSC, Florida. These consultations are to assist the Government in developing the required IT Security Plan which must be completed prior to qualification testing. Reference detailed requirements in Section 28 31 33.00 10 FIRE ALARM REPORTING SYSTEM, RADIO TYPE. The Contractor shall allow 30 calendar days for the plan to be completed once KSC IT representatives have the necessary vendor data.
- b. Performing a qualification test with equipment to be provided to prove correct operation and function prior to installation and conversion of the existing KSC CRMS system. This test must be successfully completed prior to installation at any KSC facility. Reference detailed requirements in Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) and Section 28 31 33.00 10 FIRE ALARM REPORTING SYSTEM, RADIO TYPE.
- c. Submittal of approval and as-built documentation, both hardware and software, for new Central Radio Monitoring System CRMS equipment and all facility fire alarm control panel modifications.
- d. Installation of new CRMS head-end equipment at KSC's Launch Control Center (LCC) K6-900, Central Instrumentation Facility (CIF) M6-342, and replacement Electrical Shop Building K6-1446K. Installation includes radio antenna/transceiver/controller installation, operator workstation interface equipment installation, network hardware installation, and conduit/wiring installation.
- e. Initial power-up and full activation testing of newly installed

CRMS head-end equipment prior to transferring of facility reporting to the new system. Head-end system shall include initial programming for transfer of existing radio systems indicated in Paragraph f. below. Once final acceptance testing is complete, this system shall be turned over to the Government for activation and operation by the Government. The Contractor shall allow 45 calendar days for the activation process to be completed.

f. Transfer of existing systems reporting to the current K6-2496 Central Radio Monitoring System head-end equipment to the new head-end equipment. Existing systems to be transferred include both facility fire alarm and other systems. Existing radio transceivers at these facilities shall be replaced or reprogrammed as required and all monitoring points and graphics associated with these transferred systems shall be programmed on the new CRMS system. Full end-to-end validation testing for all monitored alarms shall be performed.

g. Removal of existing obsolete K6-2496 CRMS head-end equipment hardware after transfer of facilities to the new head-end equipment is complete.

h. Transfer of existing facility fire alarm control panel reporting to the new KSC CRMS system. Facility fire alarm work includes fire alarm control panel hardware/software modifications and the installation of radio transceiver equipment. All monitoring points and graphics associated with these transferred systems shall be programmed on the new CRMS system. Full end-to-end validation testing for all monitored alarms shall be performed as well as NFPA 72 required facility fire alarm reacceptance tests. All facility fire alarm control panel work will require a pre-scheduled system outage and temporary turnover of the existing system to the Contractor for modification and testing. Contractor shall transfer facilities nearest M6-342 (CIF) first and progressively move further from this facility. Installation at each facility shall be sequenced as follows:

i.) Government shall verify radio subscriber unit antenna location and inform Contractor of any adjustment required.

ii.) Radio subscriber unit equipment shall be installed, but not powered up.

iii.) Contractor shall request Government support to program radio subscriber unit at the facility site with the Contractor present. Once programmed, the radio shall be powered-up, and communications verified back to all head-end equipment.

iv.) All CRMS head-end programming shall be completed for the facility. Radio transceiver zones to be wired to facility FACP relay contacts shall be end-to-end tested to the head-end equipment.

v.) All other fire alarm related modifications shall be completed to the furthest extent possible without taking an extended outage on the facility FACP.

vi.) Facility fire alarm outage shall be taken to complete hardware modifications, software modifications, CRMS reporting testing, and facility fire alarm system re-acceptance testing.

- i. Environmental and safety work including worker protection, asbestos avoidance, waste segregation, and waste disposal.

### 1.3 CONTRACT DRAWINGS/PUBLICATIONS

The following drawings accompany this specification and are a part thereof.

Drawing No. 79K38492  
Sheets 1 through 142

The publications of the issues of referenced documents in effect on the date of issuance of invitation for bids form a part of this specification and, where referred to herein by basic designation only, are applicable to the extent indicated by the references thereto. In the event of difference between this specification or its accompanying drawings and the referenced document, this specification and its accompanying drawings must govern to the extent of such difference.

### 1.4 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered recycled materials. These items, when incorporated into the work under this contract, must contain at least the specified percentage of recycled or recovered material.

### 1.5 AVAILABILITY OF CADD DRAWING FILES

After award and upon request, the electronic "Computer-Aided Drafting and Design (CADD)" drawing files (scaled plans, i.e. Floor Plans and Site Plans) for contract and existing system configuration drawings will only be made available to the Contractor for use in preparation of shop submittal and record drawings and data related to the referenced contract subject to the following terms and conditions.

Data contained on these electronic files shall not be used for any purpose other than the preparation of construction drawings and data for the referenced project. Contractor shall field verify all drawings as required.

Existing fire alarm system drawing files are not construction documents. Differences may exist between the CADD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CADD files, nor does it make representation to the compatibility of these files with the Contractors hardware or software. In the event that a conflict arises between the signed construction documents prepared by the Government and the furnished CADD files, the signed construction documents shall govern. The Contractor is responsible for determining if any conflict exists. Use of these CADD files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project.

If the Contractor uses, duplicates and/or modifies electronic CADD files for use in producing construction drawings or data related to this contract, all previous indications of ownership (seals, logos, signatures, initials and dates) shall be removed.

## 1.6 ELECTRONIC MAIL (E-MAIL) ADDRESS

The Contractor shall establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, the Contractor shall provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use e-mail to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc. Multiple e-mail addresses will not be allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to this e-mail address.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1 Fire Alarm System Acceptance Test Coordination

The Contractor shall schedule, coordinate, and provide all necessary facility system support required for integrated fire alarm system testing per 28 31 00.01 98 FIRE DETECTION AND ALARM where such systems are installed as part of this Contract. The Contractor shall coordinate and schedule outages on the systems as required.

All Contractor technical support personnel shall be fully qualified to safely and correctly operate all required equipment on their assigned system. All such support personnel shall be present at both the preliminary and final fire alarm tests (a minimum of two separate occurrences on different dates).

Scaffolding or High Crew Support - To access fire alarm devices or wiring installed at heights and locations not safely accessible with ladders. All such support to be provided by the Contractor.

Contractor shall walk down existing fire alarm system test procedures prior to execution and inform the COTR and Construction Inspector in writing of all KSC provided support required for operation of existing systems. Written request for such support shall be provided within 14 days of the proposed test date. Provide written request for support including but not limited to:

- a. Sprinkler Systems - To operate control valves and inspector test stations.
- b. Compressed Air Systems - To verify operation of low air pressure supervisory switches.
- c. Fire Pump Support - To verify monitoring of the required fire pump controller signals.
- d. Chemical Suppression Systems - To test interfaces to control panels and discharge detection pressure switches.

e. Heating, Ventilation, and Air Conditioning (HVAC) Systems - To operate systems for duct smoke detector tests, to restart AHU units after duct smoke detector shutdown tests, and to verify correct operation of fire dampers.

f. Elevator Systems - To safely access fire detectors in the elevator shaft and pit. To reset elevators after recall sequences are initiated.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES  
01/08

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product, and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

All shop drawings shall be produced using Bentley Microstation or AutoCAD (.DXF or .DWG format). Final record shop drawing submittals shall include digital media for all shop drawings.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Final acceptance test and operational test procedure.

## SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

## SD-08 Manufacturer's Instructions

Pre-printed material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

## SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

## SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

## 1.1.2 Approving Authority

Office or designated person authorized to approve submittal; Contracting Officer (CO) or when designated the Contracting Officer's Technical Representative (COTR).

## 1.1.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following submittals prior to construction.

#### SD-01 Preconstruction Submittals

- Submittal register; G
- Certificates of insurance; G
- Surety bonds; G
- List of proposed subcontractors; G
- Construction Progress Schedule; G
- Schedule of prices; G
- Health and safety plan; G
- Work plan; G
- Quality control (QC) plan; G
- Environmental protection plan; G
- Contractor's State Certification; G

### 1.3 PREPARATION

#### 1.3.1 Transmittal Form

Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals"

#### 1.3.2 Identifying Submittals

When submittals are provided by a lower tier contractor the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Date of the drawings and revisions.
- d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier Contractor associated with submittal.
- e. Section number of the specification section by which submittal is required.
- f. Submittal description (SD) number of each component of submittal.
- g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.
- h. Product identification and location in project.

## 1.3.3 Format for SD-02 Shop Drawings

- a. Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background. Cover sheet of all drawings shall include a "Sensitive But Unclassified" review block as appears on the cover sheet of the design drawings.
- b. Present A-size 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Number drawings in a logical sequence. Contractors may use their own number system. Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.
- e. Reserve a blank space, no smaller than 4 inches on the right hand side of each sheet for the Government disposition stamp.
- f. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

## 1.3.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references.
- c. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
- d. Submit manufacturer's instructions prior to installation.

1.3.5 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.3.6 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

1.3.7 Format of SD-10 Operation and Maintenance Data (O&M)

Provide operation and maintenance data on 8 1/2 by 11 inches paper or manufacturer's standard bounded manuals. Organize all material in a 3-ring binder with title sheet and table of contents. Provide tabbed and labeled dividers between each section identified in the table of contents.

Final record submittal of approved data manual shall include .pdf file on digital media.

1.4 QUANTITY OF SUBMITTALS

Submit twelve (12) copies of all submittals requiring review and approval. Four (4) sets marked with review notations by the Contracting Officer, will be returned to the Contractor.

All submittals shall be approved prior to the start of work detailed by the submittals.

1.5 GOVERNMENT'S REVIEW

1.5.1 Review Notations

Contracting Officer review will be completed within 21 calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted", resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "return for correction," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.6 DISAPPROVED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice is to be given to the Contracting Officer.

Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01 35 23.00 40

OWNER SAFETY REQUIREMENTS  
07/07

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA KNPR 8715.3 (2007) KSC Safety Practices and Procedural Requirements

NASA NPG 8621.1 (2004a) NASA Mishap Reporting, Investigating and Record Keeping Policy

NASA NPG 8715.3 (2004) NASA Safety Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70E (2008) Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE EM-385-1-1 (2008) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Government acceptance is required for submittals with a "G, A" designation.

SD-01 Preconstruction Submittals

Contractor's Health and Safety Plan; G  
Protection Plan; G

### 1.3.1 Contractor's Health and Safety Plan

Contractor shall submit a safety plan, including site specific safety plan, to the Contracting Officer for approval within 30 calendar days after contract award and prior to start of construction at project site.

Comply with the requirements in 29 CFR 1926 and NASA NPG 8715.3, COE EM-385-1-1, and NASA KNPR 8715.3.

Safety plan shall include, as a minimum, the following:

- a. Safety program objectives.
- b. Methods to attain safety objectives.
- c. Responsibility of key personnel for the Contractor.
- d. Safety meetings, surveys, inspections, and reports.
- e. Disaster and emergency programs.
- f. Lists of key personnel to be contacted in times of emergency.
- g. Program to show compliance with Federal OSHA Safety and Health Standards 29 CFR 1910 and 29 CFR 1926 and various safety requirements of NASA NPG 8715.3, COE EM-385-1-1, and NASA KNPR 8715.3.
- h. Dust and debris from painted metal is assumed to contain heavy metals and PCB's. Submit safety plan for the removal and disposal of hazardous materials. Plan shall address site specific protection for workers, building personnel, and surrounding environment.
- i. Methods to comply with the requirement for immediate reporting of mishaps to the Contracting Officer in accordance with NASA NPG 8621.1.
- j. Statement that the Contractor will not invalidate the integrity of safety systems without proper authorization.
- k. Procedures for emergency actions to be taken to secure dangerous conditions, to protect personnel, and secure work areas in the event of accident or an act of nature.
- l. Procedures for securing the mishap site so that the area remains secure until arrival of a safety investigator. Mishap site will remain secured until released by the Contracting Officer.

### 1.3.2 Protection Plan

Structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations shall be protected against damage.

### 1.4 GENERAL SAFETY PROVISIONS

Contractor shall take safety and health measures in performing work under this Contract. Contractor shall meet with the Contracting Officer to develop a mutual understanding relative to administration of the safety plan. Contractor is subject to applicable federal, state, and local laws, regulations, ordinances, codes, and orders relating to safety and health in effect on the date of this Contract.

During the performance of work under this Contract, the Contractor shall comply with procedures prescribed for control and safety of persons visiting the project site. Contractor is responsible for his personnel and for familiarizing each of his subcontractors with safety requirements. Contractor shall advise the Contracting Officer of any special safety restriction he has established so that Government personnel can be notified of these restrictions.

#### 1.5 SAFETY LOCKOUT/TAGOUT PROCEDURES

Contractor shall ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

Contracting Officer will, at the Contractor's request, apply lockout/tagout tags and take other actions that, because of experience and knowledge, are known to be necessary to make the particular equipment safe to work on.

No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor shall such tag be removed except as provided in this section.

No person shall work on any equipment that requires a lockout/tagout tag unless he, his immediate supervisor, project leader, or a subordinate has in his possession the stubs of the required lockout/tagout tags.

When work is to be performed on electrical circuits, only qualified personnel shall perform work on electrical circuits in accordance with NFPA 70E..

A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.

Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions.

Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), the apparatus, valves, or systems shall be secured in a passive condition with the appropriate vents, pins, and locks.

Pressurized or vacuum systems shall be vented to relieve differential pressure completely.

Vent valves shall be tagged open during the course of the work.

Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

##### 1.5.1 Tag Placement

Lockout/tagout tags shall be completed in accordance with the regulations printed on the back thereof and attached to any device which, if operated, could cause an unsafe condition to exist.

If more than one group is to work on any circuit or equipment, the employee

in charge of each group shall have a separate set of lockout/tagout tags completed and properly attached.

When it is required that certain equipment be tagged, the Government will review the characteristics of the various systems involved that affect the safety of the operations and the work to be done; take the necessary actions, including voltage and pressure checks, grounding, and venting, to make the system and equipment safe to work on; and apply such lockout/tagout tags to those switches, valves, vents, or other mechanical devices needed to preserve the safety provided. This operation is referred to as "Providing Safety Clearance."

#### 1.5.2 Tag Removal

When any individual or group has completed its part of the work and is clear of the circuits or equipment, the supervisor, project leader, or individual for whom the equipment was tagged shall turn in his signed lockout/tagout tag stub to the Contracting Officer. That group's or individual's lockout/tagout tags on equipment may then be removed on authorization by the Contracting Officer.

#### 1.6 ACCIDENT TREATMENT AND RECORDS

Contractor shall post emergency first aid and ambulance information at project site.

Contractor employees may utilize Government dispensary facilities located in building M6-0495, 'Occupational Health Facility' for injury and emergency medical treatment. Such treatment shall be recorded by the Contractor on form 6-2, 'Record of Injury', Injury Report. Contact Occupational Medicine Services.

#### 1.7 FIRE PREVENTION AND PROTECTION

Open-flame heating devices will not be permitted except by approval in writing from the Contracting Officer. Approval for the use of open fires and open-flame heating devices will not relieve the Contractor from the responsibility for any damage incurred because of fires.

Burning trash, brush, or wood on the project site shall not be permitted.

#### 1.8 USE OF EXPLOSIVES

Explosives shall not be used or brought to the project site.

#### 1.9 ELECTRICAL

Contractor shall appoint an individual responsible for the electrical safety of each work team to restrict entry to dangerous locations to those authorized by him jointly with the Government.

Contractor shall provide materials and training required for their employees, subcontractors, etc. for compliance with NFPA 70E including applicable PPE (Personal Protective Equipment), job hazard analysis, and work procedures.

#### 1.10 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government

shall not be closed or obstructed without written permission from the Contracting Officer.

#### 1.11 PROTECTION OF WORK

Prior to performing any excavation work or any surface penetrations 6 inches or deeper (such as driving stakes more than 6 inches in the ground) on any ground surface, the Contractor shall obtain from the Contracting Officer the current subsurface utility drawing of the particular area to be worked on. Contractor shall stake out subsurface utilities, communication cables and pipe lines indicated within the area of work.

Contractor shall notify the Contracting Officer, 48 hours prior to the start of excavation work or surface penetration, to enable the Contracting Officer to review measures being taken to prevent hazard to employees and possible damage to subsurface utilities. Where emergency conditions preclude the 48 hours advance notification, the Contractor shall immediately inform the Contracting Officer of his intention to initiate work prior to actual start of activity.

After obtaining clearance from the Contracting Officer, the Contractor shall proceed with excavating work, or other surface penetration work. Contractor shall temporarily halt any machine excavation work or other surface penetration when approaching 10 feet 3 meters of an existing utility line until the Contractor has exposed the utility line by hand excavation.

#### 1.12 ROOF ACCESS.

At the beginning of each work day the Contractor shall check with the Contracting Officer before proceeding to work on the roof to ensure safe work conditions. Contractor shall comply with 29 CFR 1926.

Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work.

#### 1.13 WELDING, FLAME CUTTING, AND MELTING

Contractor shall clear welding and cutting operations with the Contracting Officer before operations begin.

Contractor shall discontinue burning, welding, or cutting operations 1 hour prior to the end of the normal work day. A workman shall remain at the site for 1 hour after discontinuing these operations to make thorough inspection of the area for possible sources of latent combustion. He shall be equipped with two full 15-pound carbon dioxide fire extinguishers. Any unsafe conditions shall be reported to the Center Fire Station.

During operations involving possible fire hazard, the Contractor shall notify the Contracting Officer and not proceed until clearance is obtained in writing. Contracting Officer may request a standby from the Fire Station. This requirement does not relieve the Contractor of his responsibility for welding and cutting safety.

#### 1.14 HIGH NOISE LEVEL PROTECTION

Operations performed by the Contractor that involve the use of equipment

with output of high noise levels (jackhammers, air compressors, and explosive device activated tools) shall be scheduled for weekends or after duty working hours. Use of any such equipment shall be approved in writing by the Contracting Officer prior to commencement of work.

Work may take place around Government equipment which produces high noise levels. Provide proper protection for all personnel working in or around high noise environments.

#### 1.15 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor shall:

- a. Secure outside equipment and materials and place materials that could be damaged in protected areas.
- b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
- c. Ensure that temporary erosion controls are adequate.

#### 1.16 CONFINED SPACE

Comply with the requirements in 29 CFR 1910.146, NASA KNPR 8715.3, and NASA NPG 8715.3. Any potential for a hazard in the confined space requires a permit system to be used. Comply with the requirements in 29 CFR 1910.146, NASA KNPR 8715.3 and NASA NPG 8715.3. NASA NPG 8715.3 is available on the internet at <http://nodis3.gsfc.nasa.gov>.

- a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Local Authority or COTR for entry procedures prior to entering confined space.)

All hazards pertaining to the space shall be reviewed with each employee before entry.

- b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.
- c. Ensure the use of rescue and retrieval devices in confined spaces greater than 5 feet in depth.
- d. Sewer waste walls require continuous atmosphere monitoring with audible alarm for toxic gas detection.
- e. Include training information for employees who will be involved as entrant attendants for the work.
- f. Entry Permit. Use Confined Space Entry Permit, information completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

## SECTION 01 42 00

## SOURCES FOR REFERENCE PUBLICATIONS

07/06

## PART 1 GENERAL

## 1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

## 1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)  
1800 East Oakton Street  
Des Plaines, IL 60018-2187  
Ph: 847-699-2929  
Fax: 847-768-3434  
E-mail: [customerservice@asse.org](mailto:customerservice@asse.org)  
Internet: <http://www.asse.org>

ASTM INTERNATIONAL (ASTM)  
100 Barr Harbor Drive, P.O. Box C700  
West Conshohocken, PA 19428-2959  
Ph: 610-832-9500  
Fax: 610-832-9555  
E-mail: [service@astm.org](mailto:service@astm.org)  
Internet: <http://www.astm.org>

COMPRESSED GAS ASSOCIATION (CGA)  
4221 Walney Road, 5th Floor  
Chantilly, VA 20151-2923  
Ph: 703-788-2700  
Fax: 703-961-1831  
E-mail: [cga@cganet.com](mailto:cga@cganet.com)  
Internet: <http://www.cganet.com>

FLORIDA ADMINISTRATIVE CODE (FAC)  
Darby Printing Co.  
6215 Purdue Drive  
Atlanta, GA 30336  
Ph: 1-800-241-5292  
Fax: 404-346-3332

FLORIDA STATUTES (FL-STAT)  
Law Book Distribution Office  
Room LL14, The Capitol  
Tallahassee, FL 32399-1400  
Ph: 904-488-2323

FM GLOBAL (FM)  
1301 Atwood Avenue  
P.O. Box 7500  
Johnston, RI 02919  
Ph: 401-275-3000  
Fax: 401-275-3029  
E-mail: [information@fmglobal.com](mailto:information@fmglobal.com)  
Internet: <http://www.fmglobal.com>

JOHN F. KENNEDY SPACE CENTER (KSC)  
National Aeronautics and Space Administration  
KSC Doc Library - D  
Kennedy Space Center, FL 32899  
Ph: 321-867-3613

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)  
445 Hoes Lane  
Piscataway, NJ 08855-1331  
Ph: 732-981-0060  
Fax: 732-981-1712  
E-mail: [customer-services@ieee.org](mailto:customer-services@ieee.org)  
Internet: <http://www.ieee.org>

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)  
703 Waterford Way (NW 62nd Avenue), Suite 600  
Miami, FL 33126  
Ph: 305-264-7772  
Fax: 305-264-8088  
Internet: <http://www.iata.org>

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-- End of Section --

## SECTION 01 57 20.00 10

ENVIRONMENTAL PROTECTION  
08/08

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8500.1 Rev A-1	(2007) Environmental Requirements
Article J-B-3	(2007) Hazardous Wastes
Article J-B-11	(2007) Restoration of Grassed Areas Disturbed by Construction
Article J-B-22	(2007) Spills
Article J-C-1	(2007) Disposal and Salvage of Materials

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008) Safety and Health Requirements Manual
------------	--

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 267	Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities
40 CFR 268	Land Disposal Restrictions

40 CFR 273	Standards for Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

## 1.2 DEFINITIONS

### 1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

### 1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

### 1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

## 1.3 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work must be protected during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. Any delays resulting from failure to comply with environmental laws and regulations will be the Contractor's responsibility.

## 1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

### 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G

### 1.6 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan must be current and maintained onsite by the Contractor.

#### 1.6.1 Compliance

No requirement in this Section will relieve the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor will be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

#### 1.6.2 Contents

Include in the Environmental Protection Plan, but not limit it to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel training program.
- e. Work area plan showing the proposed activity in each portion of the

area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

f. Include in the Spill Control plan the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1 and environmental contract clause Article J-B-22, Spills. Include in this plan, as a minimum:

- 1) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual will immediately notify 911 or by cell phone 867-7911, then notify the Contracting Officer and the Environmental Assurance Branch. The Permitting and Compliance Office of the Environmental Assurance Branch will be responsible for notifying the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. Include in the plan a list of the required reporting channels and telephone numbers.
- 2) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
- 3) Training requirements for Contractor's personnel and methods of accomplishing the training.
- 4) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
- 5) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
- 6) The methods and procedures to be used for expeditious contaminant cleanup.

g. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris and schedules for disposal.

- 1) Identify any subcontractors responsible for the transportation and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility.
- 2) Evidence of the disposal facility's acceptance of the solid waste must be attached to this plan during the construction. Attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. Submit the report for the previous quarter on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted (e.g. the first working day of January, April, July, and October).
- 3) Indicate in the report the total amount of waste generated and

total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

4) A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. Detail in the plan the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

h. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

i. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be onsite at any given time must be included in the contaminant prevention plan. Update the plan as new hazardous materials are brought onsite or removed from the site.

j. Include in the plan notification of modifications to historical facilities such that historical photographic records can be prepared prior to construction. Historical facilities include:

- K6-900 Launch Control Center
- M6-399 Headquarters Building
- M7-355 Operations and Checkout Building
- M6-342 Central Instrumentation Facility
- M7-657 Parachute Facility
- M7-777 Canister Rotation Facility
- M7-961 Hypergol Module Processing North
- M7-1061 Hypergol Support Building

### 1.6.3 Appendix

Attach to the Environmental Protection Plan, as an appendix, copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents.

### 1.7 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer will make a joint condition survey. Immediately following the survey, the Contractor will prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection. This survey report will be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor must protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their

preservation may cause to the work under the contract.

#### 1.8 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations from the drawings, plans and specifications, requested by the Contractor and which may have an environmental impact, will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

#### 1.9 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. After receipt of such notice, the Contractor will inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

##### 3.1 LAND RESOURCES

###### 3.1.1 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities will be made only when approved.

##### 3.2 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor will be in accordance with all Federal and State air emission and performance laws and standards.

###### 3.2.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; must be controlled at all times, including weekends, holidays and hours when work is not in progress. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

###### 3.2.2 Odors

Odors from construction activities must be controlled at all times. The

odors must be in compliance with State regulations and/or local ordinances and may not constitute a health hazard.

### 3.2.3 Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor will comply with the provisions of the State of Florida rules.

### 3.2.4 Burning

Burning is prohibited on the Government premises.

## 3.3 MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes will be as directed below, unless otherwise specified in Section 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT, Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS, and/or as shown on the drawings.

### 3.3.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no known or presumed hazardous or toxic waste will become co-mingled with solid waste. Painted metals and dust or debris resulting from painted metals is assumed to be contaminated with heavy metals and PCB's, and thus requiring special handling.

Trash items not requiring special handling, or which cannot be resold or recycled, shall be disposed of in receptacles slated for disposal in either the KSC landfill or the Brevard County landfill. The physical dimensions of the waste shall be within the handling capabilities of the landfill disposal equipment. The physical dimensions for the landfill handling capabilities are 8 feet in length x 8 feet in width.

The KSC landfill is an unlined Class III landfill with permit restrictions and limited capacity. Only the following items listed will be accepted at the landfill:

(1) Asphalt: Asphalt removed from parking lots, driveways, and roadways.

(2) Blast Media: The blast media must be as free from debris as possible and determined non-hazardous for acceptance into the KSC landfill. The Spent Sandblast Media Disposal Form must accompany the blast media to the landfill and will be reviewed by the landfill operator. Blasting media determined to be hazardous waste must be managed as hazardous waste.

(3) Carpeting: Carpet may be disposed of in the KSC landfill.

(4) Dry Construction and Demolition Debris: Materials considered not water soluble, not oily, and non-hazardous in nature, including but not limited to steel, brick, glass, concrete, asphalt, pipe, gypsum wallboard and lumber. This includes rocks, soils, tree remains and other vegetative matter, which normally result from land clearing or development. Scrap metal from demolition projects should be managed according to guidance provided in this section for recyclable material.

(5) Fiberglass: Fiberglass is accepted.

(6) Glass (except for Light Bulbs or Lamps): Glass is accepted.

(7) Non-Friable Asbestos: Also referred to as a Non-Regulated Asbestos Containing Materials (NRACM) are handled on a case-by-case basis. KSC policy allows for the disposal of NRACM only. In order to dispose of non-friable asbestos, the Contractor shall complete and submit the KSC/Schwartz Road landfill non-friable asbestos form 28-1024, which can be obtained from the Contracting Officer or the Contracting Officer's designee. The form shall be sent to NASA Environmental Assurance Branch, TA-B1B through the Contracting Officer.

The following scheduling procedures shall be followed before NRACM wastes are accepted at the landfill:

a. The waste generator/hauler shall make arrangements with the landfill operator a minimum of 24 hours before disposal of NRACM waste and shall inform the operator of the quantity of the waste and the scheduled date the shipment will arrive at the landfill.

b. NRACM will be accepted at the landfill with prior arrangement with the scale house attendant (minimum of 24 hours notification) Monday through Friday during regular landfill hours, but will not be accepted later than 1400 hours.

(8) Pallets (Unserviceable Wood and Plastics): Pallets that are not reusable or recyclable are accepted.

(9) PCB Bulk Product Waste (Painted Metal On Dry Electrical System Components): Refer to Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

(10) Wood: Miscellaneous non-pressure treated wood items are accepted.

(11) Yard Waste (Vegetation): Vegetation from maintenance activities is accepted.

The following wastes are not authorized for disposal at the KSC landfill:

(1) Any waste not permitted by DEP regulations to be disposed of in a Class III landfill as defined in Rule 62-701.200(14), FAC.

(2) Putrescible (brown bag) office waste.

(3) Chromated Copper Arsenate (CCA) treated wood.

(4) Liquid or non-liquid polychlorinated biphenyls (PCBs) (with the exception of PCB Bulk Product Waste).

(5) Friable Asbestos.

(6) Hazardous wastes as specified by the U.S. Environmental Protection Agency (EPA); EPA defines hazardous waste as those wastes that exhibit flammability, corrosivity, reactivity, and/or toxicity characteristics; (Per EPA's list of hazardous wastes, 40 CFR 261, Subpart D, and most recent revision thereof).

- (7) Biomedical waste.
- (8) Liquid wastes, including oil (containerized or non-containerized).
- (9) Lead-acid batteries.
- (10) Tires, other than "shredded waste tires."
- (11) White goods (i.e. appliances).
- (12) Unpainted Concrete: Unpainted concrete shall be stockpiled at the Diverted Aggregate Recycling and Collection Yard (DARCY located at the KSC landfill).

### 3.3.2 Chemicals and Chemical Wastes

Dispense chemicals ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. This documentation will be periodically reviewed by the Government. Collect chemical waste in corrosion resistant, compatible containers. Collection drums must be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes will be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations, and environmental contract clause Article J-B-3, Hazardous Wastes.

### 3.3.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous and controlled waste shall be managed in accordance with all applicable statutes, rules, orders, and regulations which may include but are not limited to 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 266, 40 CFR 267, 40 CFR 268, 40 CFR 273, 40 CFR 279, 40 CFR 761, and KNPR 8500.1 Rev A-1. In no case shall the Contractor or the Contractor's representative transport hazardous waste from KSC. Reference Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

### 3.3.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles must be conducted in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations. Storage of fuel on the project site will be in accordance with all Federal, State, and local laws and regulations.

### 3.4 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Notify the Contracting Office 72 hours prior to beginning work in any historical facility.

### 3.5 PREVIOUSLY USED EQUIPMENT

The contractor will clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

### 3.6 MAINTENANCE OF POLLUTION FACILITIES

Maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.7 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel must be trained in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all personnel prior to commencing construction activities. Additional meetings must be conducted for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

### 3.8 POST CONSTRUCTION CLEANUP

The Contractor will clean up all areas used for construction in accordance with contract clauses Article J-C-1 and Article J-B-11. Unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area must be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

## SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT  
08/08

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 1609 (2001) Development and Implementation of a Pollution Prevention Program

## JOHN F. KENNEDY SPACE CENTER (KSC)

Article J-B-21 (2007) Recycling and Salvaging Materials

## 1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. Solid waste shall be diverted from the landfill by recycling means wherever possible.

## 1.3 MANAGEMENT

Develop and implement a waste management program in accordance with ASTM E 1609 and as specified. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

#### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records; G

#### 1.5 MEETINGS

Conduct Construction Waste Management issues during preconstruction, pre-demolition, and regular project status meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. At a minimum, environmental and waste management goals and issues shall be discussed at the regular project status meetings:

#### 1.6 WASTE MANAGEMENT PLAN

A waste management plan shall be submitted within 30 days after contract award and not less than 10 days before the pre-demolition meeting. The plan shall demonstrate how the project waste diversion goal shall be met and shall include the following:

a. Name of individuals on the Contractor's staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

e. Characterization, including estimated types and quantities, of the waste to be generated. The following wastes related to existing building systems are expected on this project include but are not limited to the following (list does not include Contractor generated waste):

1. Insulated wire is to be removed from KSC by the Contractor for recycling or disposal.
2. Unpainted metal is to be returned to the government for recycling.
3. Painted metals are to be segregated and disposed of in

accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION and Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

4. Sealed lead-acid batteries are to have terminals tape, be palletized one-high on plastic sheets and shrink-wrapped. Return to the government for recycling as universal waste.
  5. Electronic components used on Simplex network communications (network related electronic circuit cards and power supplies) are to be returned to the government for re-use.
  6. Any removed electronic rack equipment is to be returned to the government for reuse.
- f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
- g. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number, including a copy of the permit or license for each facility.
- h. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.
- i. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.
- j. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).
- k. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

#### 1.7 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the Construction and Demolitions Project Form (KSC 7-648)

## 1.8 REPORTS

Submit the Construction and Demolition Projects Report (KSC Form 7-648 NS (02/07)) to the NASA Environmental Management Branch through the Contracting Officer (CO) on a monthly basis and keep a log on site per direction of the Contracting Officer in accordance with environmental contract clause, Article J-B-21, Recycling and Salvaging Materials.

## 1.9 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to subcontractors. Recycling and waste bin areas are to be kept neat and clean, and recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION and Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS. Separate materials by the following method:

### 1.9.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted as described below into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate to the project waste and in accordance with environmental contract clause Article J-B-21:

- a. Concrete and masonry.
- b. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).
  - (1) Ferrous.
  - (2) Non-ferrous.
- c. Wood (nails and staples allowed).
- d. Debris.
- e. Glass (colored glass allowed).
- f. Paper.
  - (1) Bond.

(2) Newsprint.

(3) Cardboard and paper packaging materials.

g. Plastic.

(1) Type 1: Polyethylene Terephthalate (PET, PETE).

(2) Type 2: High Density Polyethylene (HDPE).

(3) Type 3: Vinyl (Polyvinyl Chloride or PVC).

(4) Type 4: Low Density Polyethylene (LDPE).

(5) Type 5: Polypropylene (PP).

(6) Type 6: Polystyrene (PS).

(7) Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

h. Gypsum.

i. Non-hazardous paint and paint cans.

j. Beverage containers.

k. Sealed lead-acid batteries.

1.9.2 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.10 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.10.1 Reuse.

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Coordinate reuse with the Contracting Officer. Sale or donation of waste suitable for reuse shall be considered.

1.10.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible. For additional information, please contact the NASA/KSC Recycling Manager.

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project in accordance with environmental contract clause, Article J-B-21.

#### 1.10.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

#### 1.10.4 Return

Set aside and protect mis-delivered and substandard products and materials and return to supplier for credit.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

#### 3.1 DISPOSAL

Disposal of wastes not recycled or salvaged shall be in accordance with 01 57 20.00 10 ENVIRONMENTAL PROTECTION and SECTION 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS. Notify the Contracting Officer prior to taking disposal action for any hazardous waste.

#### 3.2 RECYCLING AND WASTE MINIMIZATION

##### 3.2.1 Reuse

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

##### 3.2.2 Recycle

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible. For additional information, please contact the NASA/KSC Recycling Manager.

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project in accordance with environmental contract clause, Article J-B-21.

#### 3.3 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

Maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. Submit the Construction and Demolition Projects Report (KSC Form 7-648 NS (02/07)) to the NASA Environmental Management Branch through the Contracting Officer (CO) on a monthly basis and keep a log on site per direction of the Contracting Officer in accordance with environmental contract clause, Article J-B-21, Recycling and Salvaging Materials. Include the following in the report:

a. Construction and Demolition (C&D) Debris Disposed = \_\_\_\_\_ in cubic yards or tons, as appropriate.

b. Construction and Demolition (C&D) Debris Recycled = \_\_\_\_\_ in cubic yards or tons, as appropriate.

c. Total C&D Debris Generated = \_\_\_\_\_ in cubic yards or tons, as appropriate.

d. Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = \_\_\_\_\_ in cubic yards or tons, as appropriate.

-- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS

01/08

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan

Two sets of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

SD-11 Closeout Submittals

Closeout submittals shall be submitted at acceptance (completion of final acceptance testing) of project work as follows:

- a. Upon completion of radio type fire alarm reporting head-end control and monitoring equipment at the Launch Control Center (LCC, K6-900), Central Instrumentation Facility (CIF, M6-342), and Electrical Shop Building (K6-1446K).
- b. Upon completion of fire alarm modifications at each facility to connect to and monitor from the new radio based fire monitoring system.

Record Drawings

Updated 79K38429 design drawings showing final as-built conditions of the project. The manually prepared drawings must consist of 2 sets of the approved marked working as-built prints.

Warranty Management Plan

List of warranted equipment in accordance with paragraph entitled "Warranty Management Plan".

1.2 PROJECT RECORD DOCUMENTS

1.2.1 Record Drawings

This paragraph covers record 79K38492 design drawings complete, as a

requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions.

As-Built shop drawing submittals shall be in accordance with the requirements of other sections.

#### 1.2.1.1 Government Furnished Materials

Two sets of drawings 79K38492 drawings will be provided by the Government at the preconstruction conference.

#### 1.2.1.2 Working Record and Final Record Drawings

Revise two (2) sets of 79K38492 paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and keep at least one set available on the jobsite at all times. As work depicted on the drawings is completed (generally by facility) submit for approval the other applicable drawing set sheets for approval with the as-built shop drawings for the facility.

Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. The working as-built marked prints and final record (as-built) shop drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer. Show on the working and final record drawings, but not limited to, the following information:

a. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, etc.

b. Changes or modifications which result from the final inspection.

c. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

d. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

e. Modifications (include within change order price the cost to change working and final record drawings to reflect modifications) and compliance with the following procedures.

(1) Place a Modification Delta at the location of each deletion.

(2) For new details or sections which are added to a drawing, place a Modification Delta by the detail or section title.

(3) For minor changes, place a Modification Delta by the area changed on the drawing (each location).

(4) For major changes to a drawing, place a Modification Delta by the title of the affected plan, section, or detail at each

location.

(6) For changes to schedules or drawings, place a Modification Circle either by the schedule heading or by the change in the schedule.

(7) The Modification Delta size shall be 1/2 inch high unless the area where the delta is to be placed is crowded. Smaller size delta shall be used for crowded areas.

#### 1.2.1.3 Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Government.

#### 1.2.1.4 Manually Prepared Drawings

Employ only personnel proficient in the preparation of manually prepared drawings to modify the original contract drawing or prepare additional new drawings. Additions and corrections to the contract drawings must be neat, clean and legible, shall be done to the same level of detail, and match the adjacent existing line work, and lettering being annotated in type, density, size and style. Drafting work must be done using the same medium (pencil, plastic lead or ink) that was employed on the original contract drawings and with graphite lead on paper base material. The Contracting Officer will review record drawings for accuracy and legibility.

a. When final revisions have been completed, Letter or stamp each drawing with the words "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high. Mark original contract drawings either "Record" drawings denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date all original contract drawings in the revision block.

#### 1.2.2 Final Approved Shop Drawings and Data Submittals

Furnish final approved project shop drawing and data submittals in accordance with the requirements of other Sections.

### 1.3 WARRANTY MANAGEMENT

#### 1.3.1 Warranty Management Plan

Develop a warranty management plan and submit the warranty management plan for Government approval. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the

date of project acceptance for each facility completed and continue for the full product warranty period. Include within the warranty management plan, but not limited to, the following:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, Subcontractors, manufacturers or suppliers involved.
- b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include all commissioned systems such as fire alarm systems.

With the closeout submittals for each completed portion of the project (head-end equipment or completed facility), provide a list for each warranted equipment, item, feature of construction or system indicating:

1. Name of item.
2. Model and serial numbers.
3. Location where installed.
4. Name and phone numbers of manufacturers or suppliers.
5. Names, addresses and telephone numbers of sources of spare parts.
6. Warranties and terms of warranty. Include one-year overall warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
7. Cross-reference to warranty certificates as applicable.
8. Starting point and duration of warranty period.
9. Summary of maintenance procedures required to continue the warranty in force.
10. Cross-reference to specific pertinent Operation and Maintenance manuals.
11. Organization, names and phone numbers of persons to call for warranty service.
12. Typical response time and repair time expected for various warranted equipment.

#### 1.4 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

## SECTION 02 41 00

## SELECTIVE DEMOLITION

10/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6

(2006) Safety Requirements for Demolition Operations

## 1.2 GENERAL REQUIREMENTS

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer; refer to Section "Summary of Work" for additional requirements and the proposed sequence of work. Remove rubbish and debris from the project site daily; do not allow accumulations inside or outside the buildings. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions; G

SD-07 Certificates

Demolition Plan; G

## 1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6.

## 1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water. Vacuum and dust the work area daily.

All painted materials are assumed contaminated with heavy metals and

PCB's. Demolition and work methods involving these materials shall not inherently produce dust; saw-cutting or grinding is prohibited. Reference Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS for related work and disposal requirements.

Work required on the project is in the vicinity of asbestos containing materials (ACM). The Contractor shall locate all ACM in any work area prior to starting work and avoid all contact with such materials during the progress of the work. Reference specification Section 02 82 13.00 98, ASBESTOS ABATEMENT, Section 1.2.

## 1.6 PROTECTION

### 1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind. Notify the Contracting Officer prior to beginning such work.

### 1.6.2 Existing Conditions Documentation

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Notify the Contracting Officer of any conditions that will prevent execution of the work as specified in the Contract documents. It is the Contractor's responsibility to verify and submit all required outages which will be required during the course of work.

Selected existing conditions are depicted graphically on the drawings. Graphical depictions are approximate in nature, do not indicate the exact size or location of the element shown, nor indicate any or all surrounding work. Drawings are diagrammatic in nature. The Contractor is responsible for confirming the actual existing conditions and making site measurements for the purpose of the procurement and installation of equipment and materials needed to execute the work and to coordinate with constraints imposed by the existing conditions.

### 1.6.3 Items to Remain in Place

Take necessary precautions to avoid damage to existing items (including but not limited to building elements, furniture, equipment, fixtures, and finishes) to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Ensure that structural elements are not overloaded. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

### 1.6.4 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

#### 1.6.5 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

#### 1.6.6 Facilities

Protect electrical and mechanical services and utilities. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

#### 1.6.7 Protection of Personnel

Before, during and after the demolition work, the Contractor shall continuously evaluate the condition of the project, and take immediate action to protect all personnel working in and around the project site. Reference Section 01 35 23.00 40 OWNER SAFETY REQUIREMENTS

#### 1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

#### 1.8 FOREIGN OBJECT DAMAGE (FOD)

Space flight hardware and ground support equipment are subject to FOD from debris and waste material lying in the vicinity of such hardware. Remove all such materials that may appear due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. Anchor the fence and fabric to prevent displacement by wind. Remove barricade when no longer required.

#### 1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Items to be relocated which are damaged by the Contractor shall be repaired or replaced with new undamaged items as approved by the Contracting Officer.

#### 1.10 REQUIRED DATA

Prepare a Demolition Plan. Include in the plan procedures for careful removal, disposition of materials specified to be salvaged or disposed of, work sequence, and utility outages required. Coordinate with Waste Management, Environmental Protection, Safety, and PCB Removal/Disposal Plans.

#### 1.11 USE OF EXPLOSIVES

Use of explosives will not be permitted.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

## 3.1 EXISTING FACILITY MODIFICATIONS

## 3.1.1 Utilities and Related Equipment

## 3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

## 3.1.2 Masonry

Core drill and remove masonry so as to prevent damage to surfaces to remain and to facilitate the installation of new work. Fire-seal to original rating.

## 3.1.3 Acoustic Ceiling Tile

Remove, neatly stack, and reuse acoustic ceiling tiles. Provide new tiles where broken or damaged. New tiles shall match existing.

## 3.1.4 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill and fire seal holes and depressions, left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.
- b. Where installation results in damaged or missing resilient tile flooring, patch to match the existing floor tile.

## 3.1.5 Fire Alarm Equipment

Salvage fire alarm devices and equipment and turn over to the Government. Salvaging of batteries will require hazardous waste handling.

## 3.2 DISPOSITION OF MATERIAL

## 3.2.1 Title to Materials

Except for salvaged, re-used, toxic, and hazardous waste items specified in

related Sections, all materials and equipment removed shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

### 3.2.2 Government Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage or disposal site, as directed within 15 miles of the work site. The following wastes related to existing building systems are expected on this project include but are not limited to the following (list does not include Contractor generated waste):

- a. Insulated wire is to be removed from KSC by the Contractor for recycling or disposal.
- b. Unpainted metal is to be returned to the government for recycling.
- c. Painted metals are to be segregated and disposed of in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION.
- d. Sealed lead-acid batteries are to have terminals taped, be palletized one-high on plastic sheet and shrink wrap. Return batteries to the government for recycling as universal waste.
- e. Electronic components used on Simplex network communications (network related electronic circuit cards and power supplies) are to be returned to the government for re-use.
- f. Electronic components used on Simplex 2120 communications (power supplies, modems, and related electronic circuit cards) are to be returned to the government for reuse.
- g. Any removed electronic rack equipment shall be returned to the government for reuse.

### 3.3 CLEANUP

Remove debris and rubbish from work site(s) daily. Remove and transport in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

### 3.4 DISPOSAL OF REMOVED MATERIALS

#### 3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations in accordance with the following applicable specification sections:

01 57 20.00 10	ENVIRONMENTAL PROTECTION
01 74 19	CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

02 81 00                   TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

-- End of Section --

## SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS  
04/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Publications are referenced in the text by basic designation only.

## INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

IATA DGR (2004) Dangerous Goods Regulations

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards for Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in

	Commerce, and Use Prohibitions
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

## 1.2 DEFINITIONS

### 1.2.1 Hazardous Material

A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S.C. Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Sections .101 and .102 and materials which meet the defining criteria for hazard classes and divisions in 49 CFR 173. EPA designated hazardous wastes are also hazardous materials.

### 1.2.2 Hazardous Waste

A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261 or which has been designated as hazardous by a RCRA authorized state program.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

On-site Hazardous Waste Management Plan; G

Prior to start of work, a plan detailing the manner in which hazardous wastes, (to include PCB and hazardous materials containing wastes), shall be managed. Written documentation of weekly hazardous waste inspections shall be submitted on a monthly basis.

Notices of Non-Compliance and Notices of Violation

Notices of non-compliance or notices of violation, as specified.

#### SD-06 Test Reports

Recordkeeping

Information necessary to file state annual or EPA biennial reports for all hazardous waste transported, treated, stored, or disposed of under this contract. The Contractor shall not forward these data directly to the regulatory agency but to the Contracting Officer at the specified time. The submittal shall contain all the information necessary for filing of the formal reports in the form and format required by the governing Federal or state regulatory agency. A cover letter shall accompany the data to include the contract number, Contractor name, and project location.

#### Spill Response

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Contracting Officer immediately. If the spill exceeds a reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting to the Contracting Officer.

#### Packaging Notifications

In accordance with 49 CFR 178.2(c), the Contractor shall acquire the appropriate notifications from the package manufacturers or any other persons certifying compliance with the packaging provisions and provide these to the Government.

#### SD-07 Certificates

##### Certification

Copies of the current certificates of registration required by 49 CFR 107, Subpart G issued to the Contractor and/or Subcontractors or written statements certifying exemption from these requirements.

##### Shipping Documents and Packagings Certification

All transportation related shipping documents to the Contracting Officer, including draft hazardous waste manifests, draft land disposal restriction notifications, draft asbestos waste shipment records, draft manifests for PCBs, draft bill of lading for hazardous materials, lists of corresponding proposed labels, packages, marks, and placards to be used for shipment, waste profiles, supporting waste analysis documents, for review a minimum of 14 days prior to anticipated pickup. Packaging assurances shall be furnished prior to transporting hazardous material; "generator copies" of hazardous waste manifests, land disposal restriction notifications, asbestos waste shipment records, "generator copies" of manifests used for initiating shipments of PCBs, bill of lading, supporting waste analysis documents shall be furnished when shipments are originated; and "receipt copies" of hazardous waste manifests, PCB manifests and asbestos waste shipment records at the designated disposal facility shall be furnished not later than 35 days after acceptance of the shipment.

#### 1.4 QUALIFICATIONS

##### 1.4.1 Training

The Contractor's hazardous materials employees shall be trained, tested, and certified to safely and effectively carry out their assigned duties. The Contractor's employees transporting hazardous materials or preparing hazardous materials for transportation, including samples, shall be trained, tested, and certified in accordance with 49 CFR 172, Subpart H, including security awareness and any applicable security plans.

#### 1.5 LAWS AND REGULATIONS REQUIREMENTS

Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations which are applicable. These requirements are amended frequently and the Contractor shall be responsible for complying with amendments as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, the Contractor shall notify the Contracting Officer immediately.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

The Government shall provide all of the materials required for containerizing, labeling, marking, and transportation of hazardous wastes and hazardous materials in conformance with Department of Transportation standards and IATA DGR and USACE EP 415-1-266. Details in this specification shall not be construed as establishing the limits of the Contractor's responsibility.

##### 2.1.1 Packagings

The Government shall provide bulk and non-bulk containers for packaging hazardous materials/wastes consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 8. Bulk and non-bulk packaging shall meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 49 CFR 172, Section .101. Each packaging shall conform to the general packaging requirements of Subpart B of 49 CFR 173, to the requirements of 49 CFR 178 at the specified packing group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section .101, and shall be compatible with the material to be packaged as required by 40 CFR 262. The Contractor shall also provide other packaging related materials such as materials used to cushion or fill voids in over packed containers, etc. Sorbent materials shall not be capable of reacting dangerously with, being decomposed by, or being ignited by the hazardous materials being packaged. Additionally, sorbents used to treat free liquids to be disposed of in landfills shall be non-biodegradable as specified in 40 CFR 264, Section .314. In addition, packaging notifications will be provided to the Government in accordance with 49 CFR 172, Section .178.2(c) regarding type and dimensions of closures, including gaskets, needed to satisfy performance test requirements.

##### 2.1.2 Markings

The Government shall provide markings for each hazardous material/waste package, freight container, and transport vehicle consistent with the

requirements of 49 CFR 172, Subpart D and 40 CFR 262, Section .32 (for hazardous waste) 40 CFR 761, Section .45 (for PCBs) 40 CFR 61, Section .149(d) (for asbestos) USACE EP 415-1-266 (for FUSRAP radionuclides). Markings shall be capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

### 2.1.3 Labeling

The Government shall provide primary and subsidiary labels for hazardous materials/wastes consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 6. Labels shall meet design specifications required by 49 CFR 172, Subpart E including size, shape, color, printing, and symbol requirements. Labels shall be durable and weather resistant and capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

### 2.1.4 Spill Response Materials

The Contractor shall provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled.

## 2.2 EQUIPMENT AND TOOLS

The Contractor shall provide miscellaneous equipment and tools necessary to manage hazardous materials and hazardous wastes in a safe and environmentally sound manner.

## PART 3 EXECUTION

### 3.1 ON-SITE HAZARDOUS WASTE MANAGEMENT

These paragraphs apply to Government owned waste only. Contractors are prohibited by 10 U.S.C. 2692 from storing Contractor owned waste on site for any length of time. The Contractor shall be responsible for ensuring compliance with all Federal, state, and local hazardous waste laws and regulations and shall verify those requirements when preparing reports, waste shipment records, hazardous waste manifests, or other documents. Hazardous and controlled waste shall be managed in accordance with all applicable statutes, rules, orders, and regulations which may include but are not limited to 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 273, 40 CFR 279, 40 CFR 761, and KNPR 8500.1 Rev A-1. In no case shall the Contractor or the Contractor's representative transport hazardous waste from KSC.

The Contractor shall be responsible for identifying processes and operations and the location and nature of all potentially hazardous and controlled waste including any chemicals, paints, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761. The Contractor shall prepare copies of Material Safety Data Sheets (MSDS) and a completed KSC Form 25-551 "Process Waste Questionnaire" (PWQ) for each material which may be generated as a waste and provides these to the Contracting Officer (CO) thirty (30) days before the start of

the waste generation process. No substances shall be delivered to KSC without the appropriate Material Safety Data Sheets.

The Contractor shall obtain a Technical Response Package (TRP) from the CO within thirty (30) days after receipt of PWQ. The TRP will contain a hazard determination and analytical, packaging, labeling, and disposal requirements according to KNPR 8500.1 (as revised) and will provide site-specific waste management requirements to be followed by the Contractor.

The Government will provide DOT-compliant storage containers and labels. The CO will arrange for the containers to be available at the JBOSC Supply Building, M6-744, at the request of the Contractor. The Contractor shall request storage containers in writing from the CO a minimum of three (3) days before the required need date. The Contractor shall be responsible for transporting the containers from Building M6-744 to the project site.

The Contractor shall establish an on-site satellite waste accumulation area within 50 feet (ft) of and within sight of any point where hazardous or controlled wastes may be generated. If a satellite accumulation area must be more than 50 ft from the point of generation, or out of sight of the generator, the Contractor shall provide a written request to the CO thirty (30) days before the start of the waste generating process. The CO will send a notification to the NASA Environmental Assurance Branch, TA-B1B, for their review and concurrence. The Contractor shall not place the satellite site in service before receiving written approval of the variance. The Contractor shall store potential or identified hazardous and/or controlled wastes in the appropriate properly labeled containers inside the accumulation area in accordance with KNPR 8500.1 (as revised).

The Environmental Protection Agency (EPA) has set the following standards for wastes collected at satellite accumulation areas:

- a. Hazardous wastes at satellite accumulation areas must be collected in approved containers.
- b. No more than 55 gallons per waste stream of hazardous waste or 1 quart per stream of acutely hazardous wastes may be accumulated.
- c. Containers must be labeled with the words "Hazardous Waste" and with other words which identify the contents of the drum.
- d. The waste being placed in the container must be compatible with the container.
- e. A container holding hazardous waste must always be kept closed during accumulation except when adding or removing waste.
- f. The site must be equipped with emergency equipment per 40 CFR 265.32.
- g. A written contingency plan must be maintained for the site.

Personnel generating and managing the waste must have hazardous waste training per 40 CFR 265.16. The Contracting Officer may at any time during the course of the contract performance period require the Contractor to provide individual training records for any employee involved in the performance of this contract, and the contents of the course or courses completed to satisfy the training requirements. Attendance at KSC Training Course QG-211 "Hazardous Waste Management" will satisfy the above training

requirements.

If more than 55 gallons per waste stream of hazardous waste are generated at a satellite accumulation site, documentation, including the waste type, quantity, locations, and organization responsible for the waste shall be provided on KSC Form 28-809 "Waste Support Request", to the Joint Base Operations Support Contract (JBOSC) Waste Management. The Contractor shall fax the waste support request to the Contracting Officer and JBOSC Waste Management at fax 867-9466.

If a hazardous/non-hazardous waste determination cannot be made by process knowledge and no MSDS is available for the waste stream, the container of waste shall be marked with a Hazardous Waste Determination In Progress (HWDIP) label until chemical analysis is completed. At the request of the Contractor, the CO will provide any analytical support required by the TRP. The CO will arrange for all sampling and testing of potentially hazardous or controlled waste.

Universal Waste (UW) - The EPA established Universal Waste regulations to ease the requirements for managing hazardous wastes that can be recycled. Items which meet the definition of UW can be collected and managed under requirements found in 40 CFR 273 and Chapter 62-730 and Chapter 62-737, FAC. Waste streams currently adopted by the State for management as UW are batteries, mercury-containing lamps and devices, and certain pesticides.

UW generators are called handlers and must comply with the following requirements:

- a. Handlers shall manage UW using the PWQ/TRP.
- b. Handlers shall manage UW in a way that prevents releases to the environment. Non-leaking containers in good condition shall be used if the UW is damaged or leaking.
- c. Handlers shall use the KSC Universal Waste Label and shall not accumulate universal wastes for more than six months.
- d. Handlers shall clearly show the length of time that the wastes have been accumulated by marking or labeling the container with the earliest date that the waste was generated or received.
- e. Handlers shall be familiar with proper waste handling and emergency response procedures. Attendance at the KSC training course QG-299 "Universal Waste Rule" will satisfy the above.

Used Oil - Any lubricant that has been refined from crude oil (or synthetic oil) that has been "used", and as a result of such use is contaminated by physical or chemical impurities shall be considered Used Oil. Used oil is managed according to regulations established in 40 CFR 279 and Chapter 62-710, FAC. The following waste generator standards shall apply to the management of used oil:

- a. Used oil containers, tanks, and associated piping must be marked "Used Oil".
- b. Used oil containers, tanks, and associated piping must be in good condition with no severe rusting, structural defects, deterioration, or leaks.

- c. Used oil containers must be kept in secondary containment.
- d. Containers storing used oil must be sealed or otherwise protected from the weather and stored on an oil-impermeable surface such as polyethylene sheeting, rigid plastic secondary containment, or epoxy-coated concrete.

Within 48 hours of having waste ready for disposal, the Contractor shall contact the CO to have JBOSC Waste Management pick-up and remove hazardous waste. Documentation including the waste type, quantity, locations, and organization responsible for the waste will be provided on KSC Form 28-809 "Waste Support Request" to JBOSC Waste Management when requesting waste disposal. The Contractor shall fax the waste support request to the Contracting Officer and to JBOSC Waste Management at fax 867-9466.

The Contractor shall only use containers in good condition and compatible with the waste to be stored. The Contractor shall be responsible for ensuring containers are closed except when adding or removing waste. The Contractor shall be responsible for immediately marking all hazardous waste containers with the words "hazardous waste" and other information required by 40 CFR 262, Section .32 and environmental contract clause Article J-B-3 Hazardous Wastes as soon as the waste is containerized. The Contractor shall be responsible for inspecting containers for signs of deterioration and shall be responsible for responding to any spills or leaks. The Contractor shall inspect all hazardous waste areas weekly and shall provide written documentation of the inspection. Inspection logs shall contain date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken.

#### 3.1.1 Management Plan

The Contractor shall prepare a plan detailing the manner in which hazardous wastes will be managed and describing the types and volumes of hazardous wastes anticipated to be managed as well as the management practices to be utilized. The plan shall identify the method to be used to ensure accurate piece counts and/or weights of shipments; shall identify waste minimization methods; shall propose facilities to be utilized for treatment, storage, and/or disposal; shall identify areas on-site where hazardous wastes are to be handled; shall identify whether transfer facilities are to be utilized; and if so, how the wastes will be tracked to ultimate disposal.

#### 3.2 SPECIAL REQUIREMENTS FOR ASBESTOS WASTES

If work involves asbestos containing wastes, the Contractor shall manage these wastes in accordance with specification Section 02 82 13.00 98, ASBESTOS HAZARD CONTROL ACTIVITIES.

#### 3.3 WASTE MINIMIZATION

The Contractor shall minimize the generation of hazardous waste to the maximum extent practicable. The Contractor shall take all necessary precautions to avoid mixing clean and contaminated wastes. The Contractor shall identify and evaluate recycling and reclamation options as alternatives to land disposal. Requirements of 40 CFR 266 shall apply to: hazardous wastes recycled in a manner constituting disposal; hazardous waste burned for energy recovery; lead-acid battery recycling; and hazardous wastes with economically recoverable precious metals.

3.4 RECORDKEEPING

The Contractor shall be responsible for maintaining adequate records to support information provided to the Contracting Officer regarding exception reports, annual reports, and biennial reports. The Contractor shall be responsible for maintaining asbestos waste shipment records for a minimum of 3 years from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract. The Contractor shall be responsible for maintaining bill of ladings for a minimum of 375 days from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract.

3.5 EMERGENCY CONTACTS

The Contractor shall be responsible for complying with the emergency contact provisions in 49 CFR 172, Section .604.

-- End of Section --

## SECTION 02 82 13.00 98

ASBESTOS HAZARD CONTROL ACTIVITIES  
04/06

## PART 1 GENERAL

## 1.1 SUMMARY

No asbestos abatement work is in the contract scope, but the Contractor shall avoid and address existing asbestos containing materials in the work area as indicated in Section 1.2 of this specification section.

This section specifies the asbestos abatement requirements and the Contractor's applicable asbestos procedures, which include demolition or salvage of structures where asbestos is present, removal or encapsulation of materials containing asbestos, construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos, installation of products containing asbestos, asbestos spill/ emergency cleanup, transportation, disposal, storage, containment of and housekeeping activities involving asbestos or products containing asbestos, on the site or location at which construction activities are performed.

Asbestos Abatement work is categorized into four classes:

Class I Work: Activities involving the removal of Thermal System Insulation (TSI) and surfacing of Asbestos Containing Materials (ACM) and Presumed Asbestos Containing Material (PACM).

Class II Work: Activities involving the removal of ACM that is not TSI or surfacing material. This includes wallboard, floor tile, roofing, sidings, mastics and other materials.

Class III Work: Repair and Maintenance operations where ACM, including TSI and surfacing material is likely to be disturbed. Class III work cannot exceed more than one glovebag of material.

Class IV Work: Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste, and debris from Class I, II, and III activities.

Conduct abatement work in accordance with the Class I, II, III, or IV Methods of Compliance as required by 29 CFR 1926, 40 CFR 61-SUBPART M, 49 CFR 171, 49 CFR 172, FAC CHAPTER 62-257, and FL-STAT 469.

## 1.2 ASBESTOS AVOIDANCE

No asbestos abatement work is in the contract scope, but the Contractor shall avoid and address existing asbestos containing materials in the work area as follows.

This work plan addresses areas associated with the replacement of central fire monitoring systems for fire alarm control panels throughout KSC. Asbestos-containing gypsum wall board, ceiling tiles, pipe insulation, joint compound, floor tiles, may be present and/or disturbed during the performance of this work. The Contractor shall plan and execute work to

avoid all known or suspected asbestos-containing materials. Where avoidance is not possible and abatement is not indicated on the drawings, the Contractor shall immediately notify the Contracting Officer.

The Contractor shall be responsible for confirming the presence of ACM at the time actual work is performed in each facility.

The work of the project include installation of control equipment and associated conduit/wiring which may be in the vicinity of asbestos-containing materials, but does not require the direct contact or disturbance of any asbestos-containing materials, and no asbestos-containing materials will be disturbed by any aspects of the work being conducted the following protocol elements may be applied in lieu of abatement work and requirements identified in this specification section.

#### Protocol Elements For Work Conducted in the Vicinity of Asbestos-Containing Materials.

1. The Contractor shall have a designated Competent Person as defined by OSHA 29 CFR 1926.1101 for Class IV work on the job site at all time unless otherwise authorized by the Contracting Officer.
2. For Class IV work the Competent Person shall have received documented training that is equivalent in curriculum and training method to the 16-hour Operations and Maintenance course developed by the EPA. Such course shall include "hands-on" training in the use of respiratory protection and work practices.
3. All employees involved in conducting work in the vicinity of asbestos-containing materials shall have received documented training equivalent in curriculum and training method to the Awareness training course developed by the EPA for maintenance workers who work in building containing asbestos. Such a course shall take at least 2-hours.
4. Prior to conducting any work in the area the Contractor shall have developed and implemented an Emergency Response Plan (ERP) that addresses the accidental disturbance of asbestos containing materials. The ERP can be included in the Contractors' Contingency Plan (Section 1.5) The ERP shall present emergency response procedures for the workers and require that as a minimum the following equipment is in the work area at all times that work is being conducted where asbestos materials could be accidentally disturbed or damaged in any way:
  - a. Penetrating encapsulant
  - b. Polyethylene sheeting
  - c. Duct tape
  - d. HEPA equipped vacuum cleaner
  - e. Barricade tape
  - f. Respiratory Protection For the Competent Person
  - g. Asbestos waste disposal bag
5. Prior to conducting work in the area the Competent Person shall review and be familiar with the requirements of the ERP and the Contingency Plan.
6. Prior to conducting work in the area the Competent Person shall assure that the worker are familiar with the requirements and procedures of the ERP and the Contingency Plan.

7. Prior to conducting work in the area the Competent Person shall review the Drawing and Specifications to determine what, if any, asbestos-containing materials will be encountered in the work area.

8. Upon developing the desired route for all conduits, the Competent Person shall visually identify the location of all asbestos-containing materials defined in the drawings and specifications.

9. The Competent Person shall be fully responsible for ensuring that all workers know the exact location of all asbestos-containing materials in the work area and avoid the direct contact or disturbance of same as all the work of the project is conducted.

10. As long as all of the protocol elements for work to be conducted in the vicinity of asbestos-containing materials described above are rigorously followed, and no asbestos-containing materials are directly contract or disturbed, there will be no respiratory protection requirements for workers involved with these tasks.

Where work on the project requires abatement of or direct contact with asbestos-containing materials, the Contractor shall stop work and immediately notify the Contracting Officer. When an asbestos abatement contact change is approved, the Contractor shall comply with all of the following requirements of asbestos abatement indicated in this specification section.

1.3 DEFINITIONS

FLAC - Florida Licensed Asbestos Consultant as defined within the FL-STAT 469 ASBESTOS ABATEMENT.

IH - Kennedy Space Center Industrial Hygienist. This person can be either a government civil servant or an authorized government contractor. This person is responsible for the oversight and approval of the abatement procedures and the health, safety and welfare of those it affects.

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7.1 (2004) Commodity Specification for Air

FLORIDA ADMINISTRATIVE CODE (FAC)

FAC CHAPTER 62-257 (1999) Florida Administrative Code, Asbestos Program

FLORIDA STATUTES (FL-STAT)

FL-STAT 469 (2005) Asbestos Abatement

JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 1840.19 KSC Industrial Hygiene Programs

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 94-113 (1994; 4th Ed) NIOSH Manual of Analytical Methods

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards  
29 CFR 1926 Safety and Health Regulations for Construction  
29 CFR 1926.1101 Asbestos  
40 CFR 61-SUBPART M National Emission Standards for Hazardous Air Pollutants  
40 CFR 763 Asbestos  
49 CFR 171 General Information, Regulations, and Definitions  
49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit Work Schedule; G in accordance with the paragraph entitled, "Worker Protection," of this section.

Notification of Demolition/Renovation; G

SD-02 Shop Drawings

Submit items in accordance with the paragraph entitled, "Implementation Plan," of this section.  
Coordination Drawings; G  
Detailed Drawings; G

SD-06 Test Reports

Submit the following:

Initial Exposure Assessments; G in accordance with 29 CFR 1926

Notification of Demolition/Renovation; G  
as part of the Implementation Plan; G.

Submit Air Monitoring Reports; G in accordance with paragraph entitled, "Air Monitoring Report" of this section.

Maintain Work Site Entry Logs; G of all personnel entering and leaving the regulated work area by the on-site competent person indicating the date and time of entry and egress.

Maintain Daily Site Inspection Logs; G by the on-site competent person indicating the date, time and results of the work area daily site inspections.

Maintain Waste Drum Inventory; G of all generated waste drums or containers indicating the location and approximate quantity of material in each container.

#### SD-07 Certificates

Submit the following certificates:

Asbestos Consultant's License from the State of Florida, Department of Business and Professional Regulation (DBPR)

Asbestos Contractor's License; G or other Contractor license approval from the State of Florida, Department of Business and Professional Regulation (DBPR).

Training Certification; G, and experience of Contractor's "Competent Person", supervisor, and workers.

Proficiency Analytical Test Certification

#### SD-08 Manufacturer's Instructions

Submit Material Safety Data Sheets; G in accordance with the paragraph entitled, "Licenses Permits, and Notices," of this section.

Submit Implementation Plan; G as identified in paragraph entitled, "Implementation Plan" prior to initial site set-ups or start of work.

#### SD-11 Closeout Submittals

Within 10 days after the completion of work, submit to the Contracting Officer a written summary and copies of the following items:

Notification of Demolition/Renovation.

Waste Disposal Permit and all Disposal Shipping Manifests and Tickets.

Daily site inspection logs, Negative pressure logs and other OSHA compliance inspection records.

Air Monitoring Reports or Independent Monitoring Data conducted during the abatement.

Calibration Records; G for sampling equipment taken before and after each air sample.

Work Site Entry Logs and Waste Drum Inventory maintained during the abatement task.

#### 1.6 LICENSES PERMITS, AND NOTICES

The FLAC must possess a current license and comply with all Federal, State and Local Regulations. Only those consultants who are certified and licensed by DBPR are permitted to perform Asbestos Surveys or abatement specifications and plans as per Florida Statute FL-STAT 469.

The Contractor must possess a current Asbestos Contractor's License and secure all necessary licenses and permits associated with asbestos removal, transportation, and disposal as may be required by Federal, State, and local regulations. Only those Contractors who are certified and licensed by the State of Florida DBPR will be permitted to perform asbestos abatement activities at Kennedy Space Center.

A Waste Disposal Permit and all Disposal Shipping Manifests and Tickets are to be obtained.

Submit the following certificates:

Certification of participation in a Proficiency Analytical Test (PAT) program such as or equivalent to the American Industrial Hygiene Association PAT or Asbestos Analytical Registry (AAR) accreditation certificate, and Interlab QA/QC Program participation for the independent air monitoring agency selected by the Contractor before starting work.

Training Certification and accreditation certificates for the independent air monitoring agency's on-site personnel and a copy of independent air monitoring agency's Quality Control Program.

Certification documents by the Contractor verifying that employees have been provided current respirator fit test, training, and medical examinations in compliance with 29 CFR 1926.

Material safety data sheets as required for materials to be used on the specified project.

##### 1.6.1 Notification

A written notice and any required fee's to obtain a Permit to demolish friable asbestos is to be sent to the State Asbestos Coordinator in accordance with FAC CHAPTER 62-257 by the Contractor. A copy of the notification is to be provided to the Government as part of the Implementation Plan.

#### 1.7 IMPLEMENTATION PLAN

Prepare and submit a detailed, written Implementation Plan created, signed and sealed by a FLAC to the Government for approval, prior to the start of work, that includes the following:

Coordination drawings including site specific drawings of proposed work areas, clean room/change areas, mini-enclosures, shower, equipment room, waste loading/staging areas, locations of High Efficiency Particulate Air (HEPA) filtered negative pressure devices and exhaust points, work areas, emergency routing and areas to be modified.

Detailed drawings for asbestos abatement systems consisting of fabrication and assembly drawings for all parts of the work in sufficient detail to enable the Government to check conformity with the requirements of the contract documents.

A copy of Notification of Demolition/Renovation.

Plan of Action, including proposed procedures to be used in complying with the requirements of this specification and 29 CFR 1926, sequence of asbestos abatement work, the interfaces of trades involved in the performance of work, posting of licenses, permits, etc., methods to be used to assure the safety of building occupants and visitors to the site, disposal plan including location of approved disposal site, a detailed description of the methods employed to control pollution and a detailed work schedule. Expand upon the method for removal of ACM, the use of portable HEPA ventilation systems, closing out of the buildings HVAC system, method of removal to prohibit visible emissions in the work area, and packaging of removed debris.

Details of the decontamination areas and procedures, locations of staging areas, posting of warning signs, and details of negative air system to be used in the work area.

Sketch(s) or drawing(s) of complete contract area(s) showing the shower room, clean room, drum staging area, decontamination and containment areas, the negative air system, and exits. Indicate designation of the "Competent Person", and Site Supervisor.

Provide a written Air Monitoring Plan to be prepared under the direction of and signed/stamped by a Certified Industrial Hygienist (C.I.H.) or FLAC specifying monitoring criteria and a resulting action plan for implementation by the Competent Person. The Plan must identify the Competent Person to be on site at all times (unless otherwise authorized by the Contracting Officer) during hazardous abatement operations. The FLAC or his/her representative/competent person is responsible for ensuring OSHA compliance during all phases of the abatement activities. Issue instructions which require this person, independently of production pressures, to stop non-conforming operations. Provide a qualified back-up person in the event that the Competent Person is absent from job site.

Provide certification that the Contractor, his staff and abatement workers (including supervisors) have attended and successfully completed asbestos abatement course(s) including refresher courses as set forth in FL-STAT 469 and in accordance with 29 CFR 1926, and 40 CFR 763.

Provide verification of a Respiratory Protection Program in accordance with 29 CFR 1910 including confirmation of worker training in the care, use, and maintenance of respirators and fit test certification.

Provide a written description of respiratory equipment and protective clothing provided the abatement workers.

Provide documentation that all personnel assigned to the abatement project have been examined annually by a physician. Submit the physician's written opinion containing the results of the medical examination in compliance with 29 CFR 1926 for each employee who will be employed on this project. Establish, maintain, and make readily available for review all Work Site Entry Logs.

Procedures for enforcement of Personal Hygiene Practices.

Prepare and submit a Contingency Plan for emergencies including fire, accident, power failure, heating or cooling, negative air system failure, respirator supplied air system failure, or any other event that may require modification of the work area isolation procedures. Include in the plan specific procedures for decontamination or work area isolation, safe exiting and the need for medical attention in the event of an emergency.

Document all procedures and policies that are in effect to ensure that the worker safety and environmental plans are enforced.

Submit the Implementation Plan is to be submitted to the Government for review, revised by the Contractor where required, and resubmitted for approval. Commencement of work will not be permitted until the Implementation Plan is given final approval.

#### 1.8 AIR MONITORING REPORTS

Obtain the services of an independent Air Monitoring Agency accredited by the American Industrial Hygiene Association (AIHA), for analysis of airborne asbestos concentration levels. Provide a copy of the monitoring agency's Quality Control Program to the contracting officer prior to commencement of the abatement activities. The individual performing the on-site air monitoring must meet the requirements as set forth in FL-STAT 469 and 40 CFR 763 and perform sample collections in accordance with the approved Air Monitoring Plan.

Air Monitoring must be done under the direction of the FLAC by an independent Air Monitoring Contractor and meet the Florida statute FL-STAT 469 requirements.

Calibrate pumps before and after each air sample and submit calibration records to the Government.

Submit Air Monitoring Reports daily logs (AMR) listing the airborne fiber concentration in fibers/cc. Include in AMR the following information for each sample:

- Sample identification, Sample location,
- Employee Name, Social Security Number,
- Description of task being monitored,
- Exposure level results in (f/cc),
- Monitoring instrument identification number,
- Pre-calibration, post calibration and average flow rate of each sample,
- Sample date, start and stop times,
- Type of protective devices worn (if any),
- Project identification number, Facility number and name,
- Sampling and Analytical Methods used,
- Contact name and company, and name of individual performing the sampling.

Submit all Independent Monitoring Data.

##### 1.8.1 Air Sample Analytical Method

Airborne fiber sampling and analytical procedures are to be by Phase

Contrast Microscopy (PCM) in accordance with 29 CFR 1926 or the most current version of the NIOSH 94-113, Method 7400.

#### 1.8.2 Air Sampling Rate, Volumes and Frequency

Conduct daily monitoring utilizing sample rates, volumes and frequency in accordance with 29 CFR 1926 and retain for final submittal at closeout. The minimum number of samples or sample volumes may not be less than those specified below:

<u>Type of Sample</u>	<u>Volume</u>	<u>Minimum No. Samples</u>	<u>Location</u>
Prior to set-up (within 24 hrs)	1200L	2	Regulated Area
Personal, During work	400L	2	Personal B.Z.
Area samples, Adjacent to work area.	1200L	2	Regulated Area
Area samples at Negative Air Unit Exhaust.	1200L	1	In area of outlets

#### 1.9 WORKER PROTECTION

Perform Initial Exposure Assessments and Employee Exposure Monitoring in accordance with 29 CFR 1926.1101 with input and approval of the FLAC.

The Contractor's Competent Person must conduct an exposure assessment immediately before or at the initiation of the abatement work to ascertain expected exposures during the abatement work.

Select and provide respiratory protection to employees and ensure they are utilized in accordance with 29 CFR 1926.

Submit the Work schedule indicating the work days, hours, and the number of workers per shift. Include a bar chart to identify the individual milestones through to the completion of the project (i.e., number of days to complete work site preparation, number of days to complete ACM removal, number of days to complete final cleaning and lockdown, etc.).

Submit the OSHA compliance inspection records as part of the closeout documents.

#### PART 2 PRODUCTS

NOT USED

#### PART 3 EXECUTION

##### 3.1 TEMPORARY UTILITIES AND SERVICES

The Government will make available at the work site, water at hose bibs and 120 Volt AC at receptacles for the Contractor's use. Provide water proof safety lighting where necessary for safe, adequate illumination.

All electrical equipment to be used inside the work areas must be powered from an Underwriters Laboratory (UL) approved Ground Fault Circuit Interrupter (GFCI). Do not exceed the manufacturer's limits per GFCI.

Make all necessary connections and restore the site connections to their original condition or better prior to project completion.

Ensure all energized or pressurized systems inside the work area have been locked out, tagged out or otherwise rendered safe.

Provide temporary water from the existing building water source to control the generation of airborne dust, to allow for area, personnel, and equipment decontamination, and to supply decontamination unit needs. Also provide a backflow preventer at the source.

Provide temporary sanitary drainage piping to the decontamination unit sump and to the shower unit at a minimum slope of 2.0 percent, and temporary drainage piping to waste water pump and existing drain in accordance with local standards and as approved by the Contracting Officer.

### 3.2 WORK AREA PREPARATION

The Government will re-arrange equipment and storage areas to the extent of providing a direct and unobstructed path to the work area(s). During ACM removal, confine equipment and employees to the designated work area(s).

Unless otherwise directed by the Contracting Officer, the Contractor is to establish and maintain a 25 foot access control barrier zone(s) around the designated work area(s). Interference with the functional operation of the building occupants outside these areas is not be permitted.

All building supply and return air ducts from the mechanical system must be isolated to eliminate air flow into or out of containment area(s).

Any work area considered for asbestos removal which shows visual debris is to be interpreted as possible asbestos contamination. The designated work area must be pre-cleaned.

#### 3.2.1 Pre-Cleaning

Shut down HVAC systems and seal all critical barriers prior to initiating pre-cleaning actions. Openings, including but not limited to, windows, corridors, doorways, elevator openings, skylights, ducts, grilles, diffusers, and any other penetrations between the contaminated work areas and uncontaminated areas, must be sealed with plastic sheeting with a minimum thickness of 6 mil.

Pre-clean all movable objects identified as contaminated by the Contracting Officer or his representative within the work area using a HEPA filtered vacuum and wet cleaning methods as appropriate. Remove these objects after cleaning and store in a protected area.

Pre-clean all surfaces in the work area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Methods that would raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, are prohibited. Pay detailed attention to machinery or areas behind grilles and gratings.

Do not remove or otherwise disturb asbestos containing building materials during the pre-cleaning phase.

### 3.2.2 Work Area(s)

Inform all other Contractors on the site of the abatement work, of the nature of the Contractor's work with ACM and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other Contractor employers are not exposed to asbestos in accordance with 29 CFR 1926.

Use industry controls and work practice methods in accordance with 29 CFR 1926. Daily site inspection logs must be posted at the jobsite by the on-site competent person and signed/approved by the FLAC or his/her designated representative.

Use flame resistant, 6 mil polyethylene when constructing Negative Pressure Enclosures (NPE) or decontamination areas.

### 3.3 WASTE LOAD-OUT UNIT

Establish a waste load-out unit to provide for interim secure storage. Include an equipment room for storage of asbestos-contaminated items (drums, tools, equipment). All equipment and waste containers must be decontaminated prior to being taken out of the work area(s).

All asbestos-containing waste material is to be sealed in leak-tight disposal containers. Thoroughly wet all waste within the disposal containers.

Maintain proper labeling protocols and keep a running and final inventory of all filled disposal containers.

### 3.4 SIGNS AND MARKINGS

Post signs prior to commencing asbestos work as required in 29 CFR 1926. Post signs near the perimeter of the asbestos work areas, along the route of the temporary waste material holding (Drum Staging) area, around the perimeter of the temporary holding area, and at all entrances to areas containing asbestos fibers. Signs must be conspicuous and legible.

Post telephone numbers and locations of emergency services including, but not limited to, fire, ambulance, doctor, and hospital, at a designated telephone located near the regulated area.

Post one copy of all permits at the work site perimeter in a accessible location outside the regulated area.

Post one copy of the Abatement Contractors current license at the work site perimeter in a accessible location outside the regulated area.

Hazard communication notification signs must be posted in accordance with KNPR 1840.19 requirements.

### 3.5 NEGATIVE AIR SYSTEM

Construct Negative Pressure Enclosures (NPE's) as required by 29 CFR 1926.

Duct each of the negative air units through the containment barrier walls to the outside of the work area(s). When the building is occupied, the ducts must exhaust into the outside air; otherwise, they may exhaust into an area of the building beyond the critical barriers. Never exhaust the

units into the work area(s).

Provide each unit with temporary back-up electrical power (120 Volt AC) in the event of power failures or outages.

### 3.5.1 Testing

Design the negative air system to provide a minimum of four (4) air changes per hour and test before any work is begun. After the work area has been prepared, the decontamination unit set up, and the negative air units(s) installed, test the system. Prior to beginning abatement activities, a pre-work inspection and test will be conducted by the Contracting Officer or his representative to verify the adequacy of the containment system. Once activated, the negative air exhaust unit(s) must remain in operation until final clearance air monitoring has been performed and the Contracting Officer has approved their shutdown/removal. Maintain daily negative pressure logs for review by the FLAC and submit as part of the closeout documents.

Install a differential pressure meter or manometer to continuously measure pressure differential between inside and outside the work area for all Class I activities which utilize an NPE. Maintain a minimum pressure differential of 0.02 inches of water.

### 3.6 RESPIRATORY PROTECTION

All personnel engaged in the asbestos removal work in the Work Area must at all times wear respirators in accordance with 29 CFR 1926. Instruct and train each worker involved in asbestos abatement in proper respirator use, and require that each worker in the work area always wear a respirator from the start of any operation which may cause airborne asbestos fibers until the Work Area is released for re-occupancy. All respirators must be fitted by approved qualitative or quantitative test. Use respiratory protection appropriate for the fiber level encountered in the Work Area and as specified herein, or as required for other situations encountered.

#### 3.6.1 Air Quality for Supplied Air Respiratory Systems

The Contractor is to provide air used for breathing in Type "C" supplied air respiratory systems that meets or exceeds CGA G-7.1, standards for Grade D air.

### 3.7 REMOVAL OF ASBESTOS

Use industry controls and work practices for all operations in accordance with 29 CFR 1926 Methods of Compliance for Class I, II, III, or IV asbestos work. The FLAC or his/her representative is responsible for these practices.

All Class I and II work must be supervised by an on site Competent Person at all times that work is in progress. All class III and IV work must be supervised by a Competent Person.

Following removal of contaminated items and asbestos material, seal the edges of adjacent surfaces, which were exposed when asbestos was removed, with an asbestos bridging sealant/encapsulant.

### 3.8 DAILY HOUSEKEEPING

Maintain a clean work area in accordance with 29 CFR 1926. Perform the following housekeeping functions at the end of each shift or prior to leaving the work site unattended:

- a. Prepare contaminated waste for disposal by packaging the waste and removing it from the work area.
- b. HEPA vacuum the work area.
- c. Visually inspect polyethylene in the work area and other high traffic areas.

### 3.9 CLEANING PROCEDURES

Clean the work area at the end of each day's abatement activities. Designate a separate, secured area within the work area for storage of debris until it can be properly disposed. Secure the work area after termination of the work day to prevent entry. Regularly dispose and replace disposable supplies, such as mop heads, sponges, and rags. Clean all equipment by HEPA vacuuming and wet wiping.

Clean all work areas in which abatement operations have been completed, starting at the ceiling and working down to the floors, by HEPA vacuuming and wet wiping. Prior to removal of worksite access controls and re-occupancy inspection by the Government, and upon satisfactory final clearance air sampling, and removal of polyethylene sheeting, perform a final cleaning (wet wipe) of all surfaces within the work area.

### 3.10 INSPECTION

Do not commence removal of asbestos materials prior to satisfactory pre-work inspection of work site controls and containment barriers by the Abatement Contractor and a Government designated IH Representative.

#### 3.10.1 Initial Inspection

The Contractor and the Government will conduct a walk-through of the work area prior to beginning the abatement work to review existing conditions and ensure safe and practical conditions for the work to be implemented. Any damage to structures, surfaces, and equipment, which could be misconstrued as damage resulting from work is to be documented by the Contractor and submitted to the Contracting Officer at least one day prior to start of work.

Take background samples for work areas in accordance with 29 CFR 1926 prior to beginning the abatement work.

#### 3.10.2 Daily Inspection

Maintain an access log of all personnel who enter the regulated work area. Through continuous surveillance and inspections of the worksite the Contractor must ensure the integrity of containment, proper function of the negative pressure system, and posting of signs and labels. The Contractor must also ensure, through frequent inspections during each work shift, that negative pressure is maintained, appropriate work practices are followed, appropriate protective clothing and equipment are used, and worker decontamination procedures are being followed.

Ensure that critical barriers and negative pressure enclosures remain effectively sealed and taped. Take immediate action to remedy defects immediately upon discovery. Details of the inspections are to be included in the Contractor's daily inspection log and posted in an accessible location outside the regulated area.

Provide updated copies of the Air Monitoring Reports, Daily Site Inspection Logs and Waste Drum Inventory to the Government at the end of each week of the abatement work.

NASA/Kennedy Space Center reserves the right to conduct periodic inspections and air monitoring in the work area(s). If the work area is unsafe as determined by the contracting officer, NASA/Kennedy Space Center will require the Contractor to stop work until the unsafe conditions are corrected.

### 3.10.3 Final Inspection

The thoroughness of asbestos removal is to be evaluated by visually inspecting the affected surfaces for residual asbestos material and accumulated dust and by air sampling. Evidence of residual asbestos or asbestos debris on any adjacent surfaces upon completion of the work is not acceptable.

Upon completion of the work, a thorough visual inspection of the work area must be conducted by the Abatement Contractor and a Government designated IH Representative to ensure no residual asbestos material, dust or debris remains. Final inspections must be documented on KSC FORM 32-95 provided by the Government designated IH /Representative.

Final aggressive air sampling is to be performed by the Government for each NPE work area after completion of a satisfactory visual inspection. The clearance criteria is 0.01 fibers per cubic centimeter (f/cc) of air as determined by PCM. Satisfactory fiber counts from all final samples are to be less than 0.01 f/cc. If any of the final air samples contain greater than 0.01 f/cc the Contractor must repeat the final cleaning operation and the area re-tested until satisfactory clearance levels can be obtained.

Collect five (5) PCM final air samples for the first 5,000 square feet of containment plus one (1) additional PCM final air sample for each additional 5,000 square feet or one (1) air sample per room, whichever is greater. The number of final air samples may be reduced for small enclosures of less than approximately 2500 square feet. In no case may fewer than two (2) final samples be collected for any enclosure.

Clearance air sample volumes must meet the minimum volumes as indicated for analysis by NIOSH 94-113, Method 7400.

## 3.11 ASBESTOS WASTE AND CONTAMINATED MATERIALS

### 3.11.1 Removal of Asbestos Waste Materials

For purposes of this paragraph, asbestos waste materials are defined as those materials which contain or have been contaminated by asbestos and are not planned to be encapsulated and remain at the job site. They are primarily removed asbestos, disposable clothing and safety equipment, masking sheets, contaminated amended water, vacuum cleaner contents and filters.

Contain all asbestos waste material in two 6-mil polyethylene disposal bags, or two 6-mil disposal bags and a sealed leak-tight container such as, but not limited to, a steel or fiberboard drum. Pack the asbestos waste material while still wet. Clean the external surface of the waste containers by HEPA vacuuming and wet wiping before moving from the work area. Protect the interior of truck or dumpster with two layers of polyethylene sheeting.

Label and clearly mark all disposal containers, dumpsters and trucks, including the inside bags in accordance with 40 CFR 61-SUBPART M, 29 CFR 1910 of OSHA's Hazard Communications Standard, and 49 CFR 171 and 49 CFR 172, Hazardous Substances.

The labels must be conspicuous, legible, and affixed to plastic bags and drums indicating the name of the waste generator and the location (facility name & number) where the waste was generated.

Also provide a Waste Shipment Record (WSR) to the waste site owner in accordance with the instructions in "Figure 4" of 40 CFR 61-SUBPART M.

### 3.11.2 Work Area Disposal

After final inspection has been completed and the work area is released for occupancy, shut off and remove the Negative Air System units. Unseal all entrances and exits. Dispose of all plastic sheeting, tape, and any other trash and debris, except for critical barriers, in sealable plastic bags, or in drums and moved to the staging area. After final wet wipe of the work area and satisfactory clearance air sampling, dismantle critical barriers and the decontamination unit.

### 3.11.3 Decontamination Area And Support Area Disposal

Dismantle the decontamination area after the work area is released by the Contracting Officer for re-occupancy. Vacuum all surfaces of the decontamination unit before it is disassembled.

### 3.12 WASTE TRANSPORTATION AND DISPOSAL

Transport and dispose of asbestos waste in full compliance with 40 CFR 61-SUBPART M, SUBPART A, 49 CFR 171 and 49 CFR 172.

### 3.13 ASBESTOS ABATEMENT NOTICE AND CHECKLIST

A Pre-Work Inspection form (KSC Form 32-96) and a Clearance Reoccupancy Inspection form (KSC Form 32-95) will be provided by the Government designated IH Representative. to the Contracting Officer upon satisfactory completion of the work. At least three days prior to the planned commencement of work, coordinate and schedule all Pre-Work and Clearance Site inspections with the Government designated IH Representative. The completed forms are to be used to establish approval of the containment, work practices and final acceptance/re-occupancy of the work area(s).

### 3.14 FINAL ACCEPTANCE

The work will not be considered complete until the asbestos materials identified herein have been abated, the areas cleaned, satisfactory clearance air monitoring completed, all asbestos contaminated waste has been properly disposed of, and all project close out documents have been

received by the Contracting Officer.  
-- End of Section --

## SECTION 26 05 00.00 40

COMMON WORK RESULTS FOR ELECTRICAL  
08/08

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595 (Rev B; Am 1) Colors Used in Government Procurement

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA FB 1 (2007) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

NEMA OS 1 (2003) Standard for Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA RN 1 (2005) Standard for Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NEMA WD 6 (2002; R 2008) Standard for Wiring Devices - Dimensional Requirements

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

## UNDERWRITERS LABORATORIES (UL)

UL 1 (2005; Rev thru Jul 2007) Standard for Flexible Metal Conduit

UL 489 (2002; Rev thru Jun 2006) Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 797	(2007) Standard for Electrical Metallic Tubing -- Steel
UL 870	(1995; Rev thru Jul 2003) Standard for Wireways, Auxiliary Gutters, and Associated Fittings

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### SD-03 Product Data

Submit manufacturer's catalog data for the following items; UL listing shall be evident on submittal:

- Conduits, Raceways and Fittings; G
- Wire and Cable; G
- Splices and Connectors; G
- Switches; G
- Receptacles; G
- Outlets, Outlet Boxes, and Pull Boxes; G
- Circuit Breakers; G

## 1.3 INTERPRETATIONS OF DRAWINGS AND SPECIFICATIONS

It is the intent of these specifications and the contract drawings to provide a complete and workable facility.

Design drawings are diagrammatic and do not show all offsets, bends, elbows, or other specific elements that may be required for proper installation of the work. Such work shall be verified at the site. Additional bends and offsets, and conduit as required by vertical and horizontal equipment locations or other job conditions shall be provided to complete the work at no additional cost to the Government.

Except where shown in dimensional detail, the locations of fire alarm devices, receptacles, outlets, and other equipment shown on plans are approximate. Such items shall be placed to eliminate interference with ducts, piping, and equipment. Exact locations shall be determined in the field. Door swings shall be verified to ensure that equipment is properly located.

Equipment, conduit, and wire sizes indicated are minimum. Before installing any wire or conduit, the Contractor shall obtain the exact equipment requirements and shall install wire, conduit, disconnect switches, motor starters, heaters, circuit breakers, and other items of the correct size for the equipment actually installed.

## 1.4 CODES AND STANDARDS

Equipment design, fabrication, testing, performance, and installation

shall, unless shown or specified otherwise, comply with the applicable requirements of NFPA 70.

Where materials and equipment are specified to conform to the standards of the <ORG>Underwriters Laboratories (UL)</ORG>, the label of, or listing with re-examination, in UL Elec Const Dir will be acceptable as sufficient evidence that the items conform to the requirements

#### 1.5 COORDINATION

Fire system related requirements specified in SECTION 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) and SECTION 28 31 33.00 10 FIRE ALARM REPORTING SYSTEM, RADIO TYPE shall take precedence over requirements in this section where conflicting.

Raceway and 120 VAC power wiring device or switching materials and methods in this section generally apply to all installations.

Installation of the electrical work shall be coordinated with the work of other trades.

#### 1.6 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer when used for most indoor installations. Do not use aluminum. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts shall be corrosion cadmium plated steel indoors or hot-dip galvanized/Type 316 stainless steel outdoors. All boxes installed in outdoor locations shall be <ORG>NEMA</ORG> 4X rated, Type 316 stainless steel or cast-metal construction.

#### 1.7 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

#### 1.8 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic and 0.125 inch thick. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style. Nameplate color shall be as follows:

White letters on black background for equipment painted red.

White letters on red background for equipment not painted red.

## PART 2 PRODUCTS

## 2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

## 2.1.1 Rigid Steel Conduit

Rigid steel conduit shall comply with UL 6 and be galvanized by the hot-dip process. Rigid steel conduit shall be polyvinylchloride (PVC) coated in accordance with NEMA RN 1, where underground and in corrosive areas. Minimum conduit size shall be 3/4 inch unless otherwise indicated.

Fittings for rigid steel conduit shall be threaded and hot-dipped galvanized. Connections to boxes in exterior, wet, or damp locations shall be by liquid-tight hub.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Covers shall have captive screws and be accessible after the work has been completed.

## 2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with UL 797 and be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable. Minimum conduit size shall be 3/4 inch unless otherwise indicated.

## 2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall comply with UL 1 and be galvanized steel. Minimum conduit size shall be 3/4 inch unless otherwise indicated.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit and shall be hot-dipped galvanized cast metal construction.

## 2.1.4 Wireways and Auxiliary Gutters

Wireway and auxiliary gutters shall be a minimum 4- by 4 inch trade size conforming to UL 870. Gutters shall be provided without factory knockouts. Gutters provided with knockouts will not be accepted. Gutters located indoors shall be NEMA 1 type with galvanized or factory painted steel. Gutters located outdoors shall be NEMA 4X-SS (Type 316 stainless steel).

## 2.2 WIRE AND CABLE

Conductors installed in conduit shall be solid copper 600-volt type THHN/THWN. Minimum size shall be No. 12 unless otherwise indicated. Where existing circuits are tapped or extended color coding for the phase conductor (black-red-blue) shall remain consistent for the entire circuit, both existing and new.

## 2.3 SPLICES AND CONNECTORS

Make all splices in AWG No. 8 and smaller low voltage power conductors with approved insulated electrical type, Scotchlock or equal connectors.

## 2.4 SWITCHES

### 2.4.1 Safety Switches

Safety switches shall comply with NEMA KS 1, and be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coin-proof and be so constructed that an external tool shall be used to open the cover. Provisions to lock the handle in both the "OFF" position and "ON" position shall be provided.

Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors. Provide Class R fuse clips and install current limiting Class RK1 fuses properly sized to protect the fire alarm equipment.

## 2.5 RECEPTACLES

Unless otherwise indicated, receptacles shall be commercial grade, 20A, 125 VAC, 2-pole, 3-wire duplex conforming to NEMA WD 6, NEMA 5-20R.

Where indicated, provide commercial grade, 20A, 125 VAC, 2-pole, 3-wire locking type receptacles conforming to NEMA L5-20R. Device plates shall be stainless or galvanized steel and designed specifically for the box and device attached to.

## 2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with NEMA FB 1 and NEMA OS 1 and be not less than 1-1/2 inches deep. Junction boxes shall be provided without factory knockouts; boxes provided with knockouts will not be accepted. Junction boxes are to be sized per NFPA 70 minimums. Junction boxes located indoors shall be NEMA 1 type. Exterior junction boxes shall be NEMA 4X, Type 316 stainless steel or galvanized cast metal.

Fire alarm terminal cabinets and boxes housing fire alarm modules be hinged cover with back mounting panel and meet all related requirements specified in SECTION 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY).

## 2.7 CIRCUIT BREAKERS

Circuit-breaker interrupting rating shall be not less than those indicated and in no event less than 10,000 amperes root-mean-square (rms) symmetrical

at 120 volts, respectively. Multi-pole circuit breakers shall be the common-trip type with a single handle. Molded case circuit breakers shall be bolt-on type conforming to UL 489 and shall be UL listed for installation in the panelboard installed.

### PART 3 EXECUTION

#### 3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

All metal conduit and raceway systems shall be installed to serve as a continuous equipment grounding conductor in accordance with NFPA 70. Expansion fitting with flexible ground strap must be provided in conduit run crossing building expansion joints.

Exposed ends of conduits or hole in boxes or enclosures must be sealed with watertight caps or plugs.

120-volt power wiring shall be installed in dedicated raceway system per NFPA 70 raceway system requirements. Fire alarm wiring shall be installed in separate conduit systems.

##### 3.1.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

Installed conduit shall show no signs of corrosion. Repair damaged galvanized finish by painting with a suitable zinc repair paint. Corrosion inhibiting compound must be used on all exterior areas.

Rigid conduit shall be installed unless specifically allowed by other specification section. Rigid conduit shall be installed at:

- All exterior locations.
- Mechanical equipment rooms.
- Electrical equipment rooms.
- Wet, damp, or spaces not air conditioned.
- Classified (explosion-proof) locations.
- Firewall, floor, or roof penetrations. Such penetrations shall be sleeved and fire sealed.

##### 3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

EMT may be installed at the following locations if not subjected to mechanical damage:

Air conditioned interior spaces.  
 Above ceilings of air conditioned spaces.  
 Within wall partitions.

### 3.1.3 Flexible Metallic Conduit

Use flexible metallic conduit in lengths less than 3 feet only where flexibility or vibration isolation is required.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Liquidtight flexible metallic conduit shall be used in wet and oily locations.

### 3.1.4 Wireway and Auxiliary Gutter

Straight sections and fittings shall be bolted together to provide a rigid, mechanical connection and electrical continuity. Dead ends of wireways and auxiliary gutters shall be closed. Plug all unused conduit openings.

Wireways for overhead distribution and control circuits shall be supported at maximum 5 foot intervals.

Auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure shall contain no switches, overcurrent devices, appliances, or apparatus and be not more than 10 feet long.

## 3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

<u>CONDUCTOR</u>	<u>COLOR AC</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Grounds	Green

Conductors shall be manufactured with colored insulating materials.

Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Equipment ground conductors shall be installed with all circuits and connected to each device, box, or enclosure in accordance with NFPA 70.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

### 3.3 SAFETY SWITCHES

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four 1/4 inch bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height shall be 5 feet above floor level, when possible.

### 3.4 WIRING DEVICES

#### 3.4.1 Receptacles

Install receptacles as indicated in equipment enclosures.

Ground terminal of each flush-mounted receptacle shall be bonded to the outlet box with an approved green bonding jumper when used with dry wall type construction.

#### 3.4.2 Device Plates

Device plates for receptacle outlets shall be marked indicating the supply panel and circuit number. Where the receptacle is supplied by a rack-mounted UPS unit, indicate the UPS unit, rack number, and rack location; also attach label to the respective supplying cord indicating the receptacle(s) supplied.

### 3.5 BOXES AND FITTINGS

Furnish and install pull and junction boxes where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pull or junction box installed at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

### 3.6 IDENTIFICATION PLATES AND WARNINGS

Furnish and install identification plates for fire alarm equipment enclosures, and disconnect switches. Nameplate for fire alarm enclosures shall match designations on the approved shop drawings.

Furnish identification plates for all safety switches identifying the equipment served, voltage, phase(s) and power source.

### 3.7 PAINTING

Provide a painted red finish coat on the following, Color No. 11105 in accordance with FED-STD-595. After painting attach the appropriate engraved nameplate.

- Fire alarm equipment safety switches
- Pull and equipment boxes
- Outlet box (blank) covers
- Conduit fitting covers
- Equipment and terminal cabinets.

3.8 FIELD TESTING

After completion of the installation and splicing, and prior to energizing the conductors, perform wire insulation tests as herein specified before the conductors are energized.

Isolate completely all wire and cable from all extraneous electrical connections at equipment to prevent damage from test voltages.

Perform Insulation-Resistance Test on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc . Take readings after the reading is constant for 5 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable.

-- End of Section --

SECTION 28 05 26.00 40

GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY  
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B 3 (2001; R 2007) Standard Specification for Soft or Annealed Copper Wire

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

JOHN F. KENNEDY SPACE CENTER (KSC)

KSC-STD-E-0012E Facility Grounding and Lightning Protection Standard (2001)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 780 (2008) Standard for the Installation of Lightning Protection Systems

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-889 (Rev B, Notice 3) Dissimilar Metals

UNDERWRITERS LABORATORIES (UL)

UL 467 (2007) Standard for Grounding and Bonding Equipment

1.2 GENERAL REQUIREMENTS

Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL applies to work specified in this section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Submit equipment and performance data for the following items including life, test, system functional flows, safety features,

and mechanical automated details.

Submit Manufacturer's catalog data for the following items:

Ground Rods; G  
Ground Wires; G  
Connectors and Fasteners; G  
Bonding; G

#### SD-06 Test Reports

Submit Test Reports for the following tests on grounding systems in accordance with the paragraph entitled, "Field Tests," of this section. Within the report include certified record of ground-resistance tests on each driven ground rod, ground rod assembly, and other grounding electrodes. Include within the record the number of rods driven and their depth at each location to meet the required resistance-to-ground measurements specified. Include a statement describing the condition of the soil at the time of measurement.

Bond Resistance Test; G  
Ground Resistance Tests; G  
Continuity Isolation Test; G

## PART 2 PRODUCTS

### 2.1 GROUND RODS

Ground rods must conform to the requirements of NFPA 70.

Ground rods must be copper-clad steel rods not less than 3/4 inch in diameter and not less than 10-feet long per section. Ground rods must be clean and smooth and have a cone-shaped point on the first section and be die-stamped near the top with the name or trademark of the manufacturer and the length of the rod in feet.

### 2.2 GROUND WIRES

Ground wires for AC power systems must be in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

Ground wires for bonding non-current carrying hardware to earth grounding electrodes must be soft drawn copper, in accordance with ASTM B 3, stranded, with green insulation or bare. Wire size shall be as indicated or if not indicated in accordance with NFPA 70.

### 2.3 CONNECTORS AND FASTENERS

Grounding and bonding fasteners and connectors must conform to the requirements of UL 467, and Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

Grounding and bonding fasteners must be copper or bronze.

Bonding straps and jumpers must be copper and have a cross-sectional area of not less than No. 6 AWG. Bonding straps and jumpers for shock-mounted devices with hinged joints must be made of woven-wire braid wire.

### PART 3 EXECUTION

#### 3.1 BONDING AND GROUNDING

Bonding and grounding requirements must be in accordance with NFPA 70.

#### 3.2 GROUNDING ELECTRODES

Minimum ground rod section must be 10 feet. Thread sections together and exothermically fusion weld.

Install ground rods so that the top of the rod is not less than 12 inches below finished grade.

#### 3.3 GROUND GRIDS

Ground grids must consist of a series of ground rods installed with interconnecting grounding conductors between ground rods. Space ground rods as noted.

Do not bury ground grid less than 18 inches below the finish grade. Grounding conductors must not be less than No. 4/0AWG and must be exothermically fusion welded together at crossover points and to ground rods.

#### 3.4 EQUIPMENT GROUNDING

Metallic raceway systems must have electrical continuity with equipment individually and be directly connected to the building ground, independent of the raceway system.

Polarized receptacles, lighting fixtures, and equipment enclosures must be grounded with an identified (green color) insulated conductor, not smaller than No. 12 AWG, connected to the branch circuit equipment grounding conductor.

Noncurrent carrying metallic parts of electrical equipment, including metallic cable sheaths, conduit, raceways, and electrical structural members, must be bonded together and connected to the ground grid or ground connection rods.

Feedline surge protective device, (SPD), grounding should be in accordance with NFPA 780 and KSC-STD-E-0012E. Bonding of feedline SPD may be bonded to air terminal cabling provided a secondary feedline SPD is installed at the transceiver and bonded to the local facility ground.

#### 3.5 GROUNDING CONNECTIONS

Ground connections must be bonded connections in accordance with paragraph entitled, "Bonding."

Weld ground connections that are buried or in inaccessible locations.

Bolt connections in accessible locations. Connections to steel building columns in accessible locations must be cast-copper-alloy clamp lugs bolted to the structure.

Clean, grease, and remove foreign matter from ground connection surfaces.

Do not penetrate clad material in the cleaning process. Make connection between like metals where possible. Where dissimilar metals are welded, brazed, or clamped, follow the weld kit manufacturer's instructions. Connections between dissimilar metals must not produce galvanic action in accordance with MIL-STD-889.

### 3.6 BONDING

#### 3.6.1 Type of Bonds

Accomplish bonding of metal surfaces by welding or clamping.

##### 3.6.1.1 Welding

Bonding connections underground shall be by welding. Welding must be by the exothermic process. Within the welding procedure, include the proper mold and powder charge and conform to the manufacturer's recommendations.

Welding processes must be of the exothermic fusion type that will make a connection without corroding or loosening. Process must join all strands and not cause the parts to be damaged or weakened. Completed connection or joint must be equal or larger in size than the conductors joined and have the same current-carrying capacity as the largest conductor.

Reference Section 01 35 23.00 40 OWNER SAFETY REQUIREMENTS regarding fire protection safety and permits required for all welding operations.

##### 3.6.1.2 Clamping

In external locations, use clamping only where a disconnect type of connection is required. Connection device may utilize spring-loaded jaws or threaded type clamping fasteners. Construct device such that positive contact pressure is maintained at all times. Use machine bolts with spring-type lock washers.

Where indicated, use irreversible type splice or tap connection to connect grounding electrode conductors of different sizes together.

#### 3.6.2 Cleaning of Bonding Surfaces

Thoroughly clean surfaces that comprise the bond before joining. Apply an appropriate abrasive with gentle and uniform pressure to ensure a smooth and uniform surface. Do not remove excessive metal from the surface. Clean clad metals in such a manner that the cladding material is not penetrated by the cleaning process. Then clean bare metal with an appropriate solvent to remove any grease, oil, dirt, corrosion preventives, and other contaminants. Bond to the cleaned area must be made within one hour after cleaning. Seal joint and refinish the exposed surfaces within two hours of exposure to prevent oxidation. When additional time is required, apply a corrosion preventive compound until the area can be refinished.

#### 3.6.3 Bonding Straps and Jumpers

Install jumpers such that the vibration by the shock-mounted device will not change its electrical characteristics.

Bond straps directly to the basic structure and do not penetrate any adjacent parts. Install straps in an area that is accessible for

maintenance.

Use single straps for the bonds and install such that they will not restrict movement of structural members. Do not connect two or more straps in series.

Install straps such that they will not weaken structural members to which they are attached.

#### 3.6.4 Equipment and Enclosure Bonding

Each metallic enclosure and all electrical equipment must be bonded to ground. At least one copper connection must be made from the system ground point to one or more enclosures in the area such that all enclosures and equipment provide a low-impedance path to ground when properly bonded together.

#### 3.6.5 Bonding of Conduit and Raceway Systems

Bond all metal conduit, fittings, junction boxes, outlet boxes, armored and metal sheathed cable, and other raceways. Take care to ensure adequate electrical contact at the joints and terminations.

##### 3.6.5.1 Rigid Metal Conduit and Terminations

Threaded connections must be wrench-tight and there must be no exposed threads. Ream all ends of the conduit to remove burrs and rough edges. Conduits entering boxes and enclosures must be bonded to the box with bonding-type locknuts, one outside and one inside.

##### 3.6.5.2 Flexible Metal Conduit

Flexible conduit must have an integral grounding conductor.

#### 3.7 FIELD TESTS

Perform the following tests in the Contractor in the presence of the Contracting Officer.

##### 3.7.1 Bond Resistance Test

Resistance of any bond connection must not exceed 0.5 milliohm. Rework bonds that exceed this resistance at no additional cost to the Government.

##### 3.7.2 Ground Resistance Tests

Test Grounding systems for ground resistance. Total resistance from any point on the ground network to the building counterpoise must not exceed 50 milliohms.

##### 3.7.3 Continuity Isolation Test

Perform continuity test on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

-- End of Section --

## SECTION 28 31 00.01 98

FIRE DETECTION AND ALARM (PROPRIETARY)  
10/07

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## FM GLOBAL (FM)

FM P7825 (2005) Approval Guide Fire Protection

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (2002) IEEE Guide on the Surges  
Environment in Low-Voltage (1000 V and  
Less) AC Power Circuits

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2008) Life Safety Code, 2006 Edition

NFPA 70 (2007; AMD 1 2008) National Electrical  
Code - 2008 Edition

NFPA 72 (2006) National Fire Alarm Code

NFPA 75 (2008) Protection of Information  
Technology Equipment

NFPA 90A (2008) Standard for the Installation of  
Air Conditioning and Ventilating Systems

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES  
(NICET)

NICET 1014-7 (2003) Program Detail Manual for  
Certification in the Field of Fire  
Protection Engineering Technology (Field  
Code 003) Subfield of Automatic Sprinkler  
System Layout

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595 (Rev B; Am 1) Colors Used in Government  
Procurement

## UNDERWRITERS LABORATORIES (UL)

UL 1449 (2006) Surge Protective Devices

UL 346 (2005) Waterflow Indicators for Fire

## Protective Signaling Systems

UL 497B	(2004; Rev thru Oct 2008) Protectors for Data Communication and Fire Alarm Circuits
UL 2196	(2001; Rev thru Dec 2006) Tests for Fire Resistive Cables
UL Fire Prot Dir	(2009) Fire Protection Equipment Directory

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Submit Evidence of the Contractor's State Certification to the Contracting Officer for approval, prior to any work being started on the Fire Alarm System; G

## SD-02 Shop Drawings

Submit the following in accordance with the paragraph entitled, "General Requirements". Separate submittals for each facility shall be provided.

Connection Drawings; G  
Floor Plan Drawings; G  
Module Schematic Drawings; G  
As-Built Drawings; G  
Software Programs; G  
Fire Alarm System Acceptance Tests (For Qualification, Preliminary, and Final Tests); G

## SD-03 Product Data

Product data shall indicate current applicable approvals or listings issued by UL, FM, or other Nationally Recognized Testing Laboratory and compliance with applicable NFPA standards. Where equipment is not UL listed or FM approved, data supporting UL/FM equivalency shall be provided at time of bid and such equipment shall be pre-approved by the KSC Authority Having Jurisdiction. For all equipment not UL listed or FM approved, provide the nationally recognized testing laboratory criteria and cross-reference to all applicable UL/FM criteria to demonstrate equivalency.

Submit Manufacturer's Catalog Data in a single submittal for the following items:

Fire Alarm Control Panel Modules; G  
Addressable Modules/Devices; G  
Water Flow Alarm Devices; G  
Valve Tamper Switches; G  
Remote Auxiliary Control Relays; G  
Power Source; G  
Line Voltage Surge Suppressors; G  
Low Voltage Surge Suppressors  
Wiring (Wire and multi-conductor cable); G

## SD-05 Design Data

Design Analysis and Calculations; G  
Submit separate battery calculations for each facility.

List of parts and components; G  
Provide a list of parts and components for the installed system by manufacturer's name, part number, and nomenclature, and recommended stock level required for normal maintenance and unscheduled repairs.

## SD-07 Certificates

Submit Quality Assurance Plan consisting of the following in accordance with the paragraph entitled, "Quality Assurance" of this section.; G

KSC - Transfer of Responsibility for the designated portion of the Fire Alarm System; shall be submitted in accordance with the paragraph entitled. "Field Testing" of this specification; G

Contractor Readiness Affirmation - For Preliminary Fire Alarm Testing; shall be submitted in accordance with the paragraph entitled. "Field Testing" of this specification; G

## SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Data; G bound in manual format and grouped by technical sections consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions.  
Provide one single .pdf format of the O&M Manual on a single CD.

## 1.3 GENERAL REQUIREMENTS

Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL, , and Section 28 31 33.00 10 FIRE ALARM REPORTING SYSTEM, RADIO TYPE apply to work specified in this section.

Submittals shall be submitted for approval in the following sequence with each approved prior to the next submittal:

1. Product Data (Catalog Data), Proof of UL, (Underwriter Laboratory UL Fire Prot Dir listed), FM, (Factory Mutual FM P7825 approved for intended use and function), or other Nationally Recognized Testing Laboratory Listings, Contractor's Certifications, Quality Assurance Plan, Qualification Test Procedure. Submit within 30 days after notice to proceed.

The following shall be submitted for each facility modified:

2. Contractor shall sign and submit the KSC - Transfer of Responsibility form at the time of system outage for each system to be modified. Form is provided in the Contract Solicitation and Delivery Order.
3. Connection Drawings, Floor Plan Drawings, Module Schematic Drawings, Design Analysis and Battery Calculations, List of Parts and

Components shall be submitted within 45 days of starting work at the applicable facility.

4. New and revised Fire alarm control panel and network software program information and Acceptance Test Procedures for the applicable facility shall be submitted no later than 21 days prior to the scheduled preliminary test. Contractor sign and submit the Readiness Affirmation form no later than seven (7) days prior to the scheduled preliminary test; form is provided in the Contract Solicitation and Delivery Order. Two sets minimum of the As-Built drawings, software program information, and test procedure forms shall be complete and available for reference at the preliminary test.

5. As-Built Shop Drawings, Panel and Network software programs, Battery Calculations, Operations Manual, and final Acceptance Test Procedures shall be submitted for approval no later than fourteen 14 days prior to the scheduled final acceptance test. Two sets minimum of the As-Built drawings, NFPA 72 Fire Alarm System Record of Completion form, and all other documentation shall be complete and available for reference at the final test.

The following shall be submitted after acceptance (successful completion of the final test) of each facility modified:

6. Record As-Built submittal for all Shop Drawings, Panel and Network software programs, Battery Calculations, Completed Final Test Procedures, NFPA 72 Fire Alarm System Record of Completion form and Operations Manuals, shall be submitted within fourteen 14 days after completion of the final acceptance test. This submittal shall include two (2) sets of CD ROM digital media of all the As-Built Shop Drawings, Design Analysis, Battery Calculations and Program software information.

7. Marked-up As-Built design drawings and warranty information for the facility in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS.

Connection Drawings shall consist of point-to-point wiring diagrams of internal and external wiring including, but not limited to, all fire alarm field devices, panel wiring, and interconnection between other building systems and components and the fire alarm system. Wire label designations matching the field installation shall be indicated on these drawings.

Floor Plan Drawings shall shall indicate equipment locations, device locations with address designation, and conduit/wiring routing from the fire alarm control panel(s) to all field devices including looped Class A circuit routing requirements if applicable.

Available existing facility fire alarm control panel connection drawing files (.DWG or .DXF) shall be provided to the Contractor. Reference the paragraph entitled "AVAILABILITY OF CADD DRAWING FILES" in Section 01 11 00.00 98 SUMMARY OF WORK. These drawings shall be used as the basis of new connection drawings. New work shall be incorporated on the existing drawings without major modifications to existing content. These connection drawings will then be used as the basis for updating the existing facility fire alarm control panel connection drawings maintained by KSC fire alarm maintenance organizations.

Module schematic drawings (minimum size 8-1/2 by 11 inches) for zone input modules, relay modules, addressable zone and relay modules, serial data modules, and network interface modules to be provided with connection

drawings.

All drawings shall be computer aided design (CAD) generated. Digital medial compact disc (CD) submittals shall include .DWG or .DXF files for all drawings: Connection Diagrams, Module Schematics, Battery Calculations, Floor plans and Fire Service Floor Plans. Also on this CD provide a complete copy of the aforementioned drawings in PDF format on the same CD.

As-Built Drawings shall include connection drawings, floor plan drawings, module schematics, software programs, design and Battery calculations, and all other data required to fully document the completed system. After final testing is complete, record copies including digital media and hard copies of all new and revised software, drawings, and analysis/calculations shall be provided incorporating approved comments and all changes. As-Built drawings shall document final system configuration including, but not limited to location of the fire alarm control panel, all initiating and auxiliary control devices, signaling line devices, additional cabinets, Central Fire Monitoring System reporting equipment, and all other equipment associated with the fire alarm system(s). Also, annotate the location and address setting for each multiplexed addressable device (when used), deviations from and amendments to the as-built drawings, and field installation changes, concealed and visible.

Software Programs Provide both hard copy and compact discs, for all new and/or existing programmable fire alarm control panels affected by the project. Provide system executable file and report file on the compact disc. Program information for fire alarm control panel including program listings, system point summary, and addressable device switch settings. Corrected program information shall include panel and network programs and sequence of operations in matrix format that clearly shows interaction of system components. For modifications to existing programs, additions and deletions to the program report text shall be annotated in the approval submittals such that they are clearly evident during review; the final and as-built submittals shall not be so annotated.

Fire Alarm System Acceptance Tests shall be conducted in accordance with the paragraph entitled, "Field Testing" of this specification. Prepare a test procedure and test record form for conducting complete tests on control panels, reporting systems, wiring systems, and field devices installed in accordance with the manufacturer's requirements and these specifications. Test procedure must identify each device and circuit to be tested, describe the initial condition, each step or function in the test, required test result, and equipment to be employed. Test procedures are to be written to minimally disrupt facility operations (minimize and/or group activation of evacuation appliances, AHU shutdown, etc.) Provide test forms with suitable spaces for recording test results on all equipment, devices, and wiring to be tested. Test record forms also have identified spaces for verification signatures of official witnesses and dates of the test.

Design Analysis and Calculations must be submitted for approval for the Fire-Alarm and Detection Systems consisting of the battery capacity and loading calculations in accordance with the paragraph entitled, "Fire Alarm Control Panel for new NDU installations and the new remote auxiliary power supply installations only. For facility fire alarm control panels undergoing minor revision to connect to new CRMS equipment, batteries capacity shall be verified by testing.

- a. Battery test shall be performed prior to the system outage to

verify the capability of the existing batteries.

b. Battery testing shall be re-performed during the preliminary and final test.

List of parts and components shall be provided for the installed system by manufacturer's name, part number, and nomenclature, and recommended stock level required for normal maintenance and unscheduled repairs.

#### 1.4 SYSTEM REQUIREMENTS

Fire-alarm system shall be modular type, microprocessor based, supervised, non-coded electrical fire alarm system with NFPA 72 Style D, (Class A), initiating device circuits and NFPA 72 Style 6 signaling line circuits, and Style 7 network interface circuits.

All styles of Class A initiating device, signaling line, notification appliance and control circuits must use diverse routing in accordance with NFPA 72. The outgoing and return redundant circuit conductors must not be run in the same cable assembly, enclosure or raceway.

System must conform to all the applicable requirements of NFPA 70, NFPA 72, NFPA 75, NFPA 90A, and NFPA 101.

Fire alarm systems must contain all of the equipment, devices, programming and circuits required for system operation in accordance with NFPA Codes and KSC requirements, including remote reporting to and remote control from existing, Simplex based equipment.

Provide all additional equipment, cabinets, conduit, and labor to meet the requirements and intent of this specification.

Components installed under this contract cannot be more than one (1) year older than the date of installation.

#### 1.5 QUALITY ASSURANCE PLAN

Equipment to be provided under this specification must be that manufactured fire-alarm equipment which meets the requirements of the section entitled, "System Requirements." It must be the latest standard design, and must be listed by Underwriters' Laboratories or approved by Factory Mutual and be suitable for its intended service. All devices installed must function with the control panel and not interfere with the operation of the control panel.

#### 1.6 SERVICES OF A CERTIFIED FIRE ALARM SPECIALIST

Services of a Certified Specialist thoroughly experienced in fire detection and alarm work must be provided on site to perform or directly supervise the installation, make all necessary adjustments, make all adjustment and perform all tests on the fire alarm system at the site.

Fire Alarm specialist is considered certified when the specialist holds a valid Fire Alarm System, Level III Certification from the National Institute for Certification in Engineering Technologies NICET 1014-7 or a valid Level III Fire Alarm Engineering Technician Certification from the International Municipal Signal Association (IMSA) or is licensed by the State of Florida as a Fire Alarm Contractor I in accordance with Florida State Statute, Chapter 489, Part II.

Certification of other recognized agencies with equivalent requirements will be considered. Evidence of the Contractor's State Certification and the basis of certification must be provided to the Contracting Officer and be approved by the Contracting Officer prior to any work being performed at Kennedy Space Center.

## PART 2 PRODUCTS

### 2.1 FIRE ALARM CONTROL EQUIPMENT

Where indicated provide new Simplex Model 4100U network display unit (NDU) fire alarm control panel (FACP) equipment or modify existing facility fire alarm control panels to connect to new Central Fire Radio Monitoring System (CRMS) equipment. All modular equipment, new and existing shall be UL listed for use with each other.

Fire alarm control panels must contain power-on, alarm, supervisory, and trouble indicating lights plainly visible when the cabinet is closed. It must also contain the following functions and must be accessible only by unlocking and opening the unit:

- Alarm Silence
- Trouble Silence
- Supervisory Silence
- Alarm/Trouble Acknowledge
- System Reset

Central Fire Monitoring System Reporting Bypass Switch - Provide function on new NDU panels and existing facility fire alarm control panels.

Fire alarm control panel must contain all components necessary to monitor and supervise all initiating device circuits. When any detector, manual alarm station (pull box), water flow switch, pressure switch, etc., connected to the fire alarm control panel is activated, the control panels visual alarm, alarm indicator and audible signal must be activated. This must cause all notification appliances to be activated, including all associated auxiliary control functions. The control panel must visually indicate the addressable device or zone in alarm and transmit an alarm condition to the remote Central Fire Monitoring System.

Fire alarm control panel must contain all components necessary to monitor and supervise all supervisory device circuits. When any valve tamper switch, low air pressure switch, water level indicator, maintenance bypass switch, loss of CRMS radio communications, or other supervisory device connected to the control panel is activated, the control panel supervisory visual indication and supervisory audible device must be activated. The control panel must visually indicate the addressable device or zone in supervisory alarm and transmit a supervisory condition to the remote Central Fire Monitoring System. The loss of CRMS radio communication signal shall be such that it automatically resets once radio communication function is restored.

Fire alarm control panel must include maintenance by-pass switches for CRMS reporting functions. By-pass switches must be supervised to report supervisory when in the maintenance (by-pass) position.

Panel and remote power supply equipment must monitor and report as trouble, open supervised circuits, ground faulted supervised circuits, removal of

detector or device, removal or failure of control panel module, , loss of primary power, power supply trouble, low battery voltage, loss of battery voltage, and activation of the alarm silence switch. All trouble signals must be identified by initiating, notification appliance, auxiliary control, or signaling line circuit. Trouble signals must activate the control panel trouble visual indication and trouble audible devices, and send a trouble signal to the remote Central Fire Monitoring System.

Provide annunciation of unacknowledged supervisory and trouble signals to the CRMS system as indicated.

Fire alarm control panels shall be provided with all hardware required to connect to new CRMS radio transceivers or existing Simplex FACP data networks including but not limited to addressable relay cards/modules, serial output (DAC or Printer as required by and coordinated with CRMS radio transceiver manufacturer) card/module, zone module or addressable zone module, and Style 7 fire alarm control panel network interface modules.

All relays must be continuous duty and have self-cleaning Form C dry contacts of silver or an alloy of equivalent performance. Supervisory relays must be suitably protected against dust by individual covers.

Where indicated, provide FACP modules required for installation of a multiple addressable device network. Network must utilize polling methods and provide two-way Style 6 supervised communications between the fire alarm control panel and addressable smoke detectors and monitor, signal, or control addressable modules.

Where indicated install a separate terminal cabinet adjacent to the fire alarm control panel for interfacing device field wiring to the control panel. Install terminal strips for all field wiring circuits plus 25 percent spare. Where a terminal cabinet is installed, install terminal strips to accommodate remote reporting circuits.

Fire alarm control panels, terminal cabinets, surge suppression cabinets, auxiliary power supply cabinets, and battery cabinets (when used) must be steel, provided with a hinged cover and an integral pin-tumbler cylinder lock (Mortise or Standard Rim Cylinder from Best Lock Company) with removable core that accepts the key presently in use with other control units existing in the area; lock core will be provided by the government. Cabinets must be painted with a prime coat and one or more finish coats of scratch-resistant baked enamel. Finish coat must be red unless otherwise indicated. Cabinets and boxes installed in damp or wet locations shall be NEMA 4X rated constructed of stainless steel or cast metal.

Fire alarm control panel and remote auxiliary power supplies must operate from a power supply with 120 grounded V(AC) input and 24 V(DC) output. All modules and field wiring shall operate using the supervised 24 V(DC) power supply output. System must operate satisfactorily with power input voltage varying from 85 to 110 percent of nominal value. Power supply output must be capable of powering all initiation, signaling, annunciation, and control devices during alarm condition with 25 percent minimum spare capacity.

All fire alarm control panels and auxiliary power supplies shall be provided with a fused DC power input and shall have a DC disconnect switch integral with the equipment provided (2P, 30 Amp rated minimum) or a separate fused safety switch shall be provided.

Batteries, charger, and power transfer equipment must provide the means of

automatically supplying the entire fire alarm system with battery backup power in event of a primary power system failure. System must switch to battery power in event of AC power failure and switch back to AC power upon return of primary power. Control panels and auxiliary power supplies must be able to operate when the backup batteries are disconnected for any reason. System must control charging currents and floating voltage levels to maintain batteries in optimum condition. Provide capability to recharge batteries in event of discharge. Wiring must be fused to protect against battery over-current and polarity reversal. Primary power, battery, or charging equipment failure must result in a fire alarm control panel trouble signal and visual indication.

Battery modules must be sealed (no corrosive fumes) and spill-proof. Batteries must be listed for fire alarm service and must be suitable for high discharge currents required under alarm conditions. Batteries must be sized to operate the fire alarm and detection system in normal supervisory condition for 24 hours, minimum, and then operate the system in the alarm mode for 5 minutes (facilities with bells) or 10 minutes (facilities with speakers), minimum.

#### 2.1.1 Simplex Network Display Unit (NDU) Fire Alarm Control Panel

Unit must be a fully addressable system, Simplex Model 4100U, with 392,000 addressable analog points to include addressable CRMS reporting relay modules, zone input module, and serial data output (DAC or printer as required). Construction must be modular with solid-state, microprocessor based electronics. Modules must be equipped with transient suppression. System must include non-volatile programmable operating system memory for all operating requirements. Panel must include all modules required for network communication interface with the existing Simplex Central Fire Monitoring System, including Style 7 module for remote reporting circuits.

### 2.2 CRMS REPORTING EQUIPMENT

#### 2.2.1 FACP Reporting Via Simplex Network 3 Using Existing M6-138 (CD&SC) Summary Reporting Panel B

Existing Summary Reporting Panel B equipment currently installed at the CD&SC (M6-138) shall be modified to report alarm, supervisory, and trouble signals from connected facilities indicated to the CRMS using serial data means. Summary Reporting Panel B has redundant processors and power supplies. Each processor shall control and connect to a separate CRMS radio unit using a serial data output card, addressable relays, and zone module inputs. When the primary processor is operating the secondary processor shall not send any serial or relay to its radio unit and vice versa; redundant signals shall not be received at the CRMS for any given alarm.

#### 2.2.2 FACP Reporting Via a Radio Transceiver

Where indicated, fire alarm control panel shall report to the Central Fire Monitoring System using a radio transceiver located at the facility. Reporting circuit(s) consist of multiple (2) wire, Style B, (Class B), circuit(s) as indicated from the radio transceiver zone module to the fire alarm control panel alarm, supervisory, and trouble relays via shielded cable. An End-of-Line resistor, (value and wattage coordinated with radio manufacturer for equipment provided), is required at the end of each FACP reporting circuit. Where a serial data interface is required, provide required shielded data cable, connectors, and connections to insure proper

communications and circuit supervision.

Fire alarm control panels shall be provided with all hardware required to connect to new CRMS radio transceivers or existing Simplex FACP data networks including, but not limited to, addressable relay or relay card modules, zone or addressable input modules to monitor radio trouble contact, and serial output (DAC or Printer as required) module.

### 2.2.3 Simplex FACP Reporting Via Network Connections

Provide all FACP hardware and software required to digitally connect to existing Style 7 networked Simplex FACP's. These existing Simplex networks will provide a communications path back to new CRMS Equipment via M6-138 (CD&SC) Summary Reporting Panel B. The FACP equipment provided must be capable of digitally communicating with existing networked Simplex FACP's in order to activate interconnect evacuation alarm schemes or for other purposes. Network connections shall be via Style 7 fiber optic cable, copper telephone cable plant, and/or custom installed wiring as indicated, but must be capable of communicating with other existing network cable or fiber media.

Contractor shall provide or modify dedicated house communication cable as indicated between the fire alarm control cabinet and the facility telephone terminal cabinet. Install a 4-point minimum terminal strip in the TTC and FACP/FATC for termination of cabling. Install communication circuit surge suppressors at the FACP/FATC location.

## 2.3 ADDRESSABLE MODULES/DEVICES

Addressable modules must be solid-state and UL listed for use with the Fire Alarm Control panel. Modules must be suitable for individual outlet box mounting or group mounting within a control enclosure.

Modules must be field addressable to individually communicate with the fire alarm control panel using multiplexed communication techniques. Communication circuit wiring connections must be suitable for supervised Style 6 operation. Module power must be derived from the communication circuit or 24 V(DC) power supply supervised by the fire alarm control panel. Invalid address setting, component failure, or power failure must initiate a trouble signal at the fire alarm control panel.

Enclosure housing a single isolated module (not grouped with other modules or no other modules nearby) shall be manufacturer's standard outlet box mounting and cover.

Enclosures housing more than one (1) module shall be hinged door type with back panel for module mounting. Enclosure door shall be provided an integral pin-tumbler cylinder lock (Mortise or Standard Rim Cylinder) with removable Best Lock core that accepts the key presently in use with other control units existing in the area; lock core will be provided by the government. Enclosure shall be adequately sized to allow a minimum of 2-inch wiring space around the cabinet perimeter and all module termination points. Additionally spare space for future modules shall be provided as indicated. Provide terminal strips with 25-percent spare capacity for interfacing all module connections to field wiring; include terminals for cable shield drain wires. Paint enclosures with a prime coat and one or more finish coats of red enamel to provide a smooth, hard, and durable finish. Enclosures must include an engraved phenolic nameplate labeled, "FIRE ALARM CRMS REPORTING MODULES".

Addressable modules for initiation circuits must be supervised 4-wire Class A type unless otherwise indicated.

Addressable relay modules for control and/or remote reporting circuits (addressable relays) must include two (2) fused Form-C contacts rated at 2 Amperes for 28 V(DC) or 120 V(AC).

#### 2.4 WATER FLOW ALARM DEVICES

Water flow devices must be alarm-initiating devices designed for use with automatic/manual fire alarm systems, in accordance with UL 346.

Water flow alarm devices must conform to UL or FM requirements for the particular type of sprinkler system. Contacts must have a minimum of 2 single pole, double throw contacts rated 5 amps at 28 V(DC) or 250 V(AC). Switch shall have an adjustable instant-recycle pneumatic-retard time delay setting with a range incorporating the desired set-point of 60 seconds.

##### 2.4.1 Pressure Switch

Pressure switch alarm must be wired to make or break an alarm circuit depending on rise or fall of water pressure.

##### 2.4.2 Vane-Type Flow Switch

Vane-type flow alarm must make or break an alarm circuit upon deflection by a volume of flowing water that equals or exceeds the capacity of a single sprinkler.

#### 2.5 VALVE TAMPER SWITCHES

Valve tamper switches must be supervisory initiating devices designed for use with automatic/manual fire alarm systems, in accordance with UL 346.

Valve tamper switches must conform to UL or FM requirements for use on the specified valve. Contacts must have a minimum of 2 single pole, double throw contacts rated 5 amps at 28 V(DC) or 250 V(AC).

#### 2.6 REMOTE AUXILIARY CONTROL RELAYS

Remote control relays must have continuous duty coils rated 24 V(DC). Where relays are used on Style Z, (Class A), parallel wired supervised circuits, coils must incorporate supervisory current blocking diode. Relays must have a minimum of 2 single pole, double throw contacts rated 5 amps at 28 V(DC) or 250 V(AC). Where auxiliary control circuits connected to the relay are protected at a higher ampacity than the relay contacts are rated, fusing rated to protect the relay contacts must be installed in the relay enclosure.

Addressable type relays, where indicated or provided, shall be in accordance with the paragraph entitled, "Addressable Modules/Devices".

Mount remote auxiliary control relays in enclosures indicated or, if not indicated, in manufacturer's required enclosure.

Paint enclosures with a prime coat and one or more finish coats of red enamel to provide a smooth, hard, and durable finish. Enclosure must be labeled with an engraved phenolic nameplate labeled, "F/A RELAY."

Remote auxiliary control relays must be mounted and supervised within 3 feet of the controlled device in accordance with NFPA 101.

## 2.7 POWER SOURCE

Normal power to the local systems for all purposes, including separate powered indicating/alarm devices, must be 120 volts 60 hertz. System must operate satisfactorily between 85 and 110 percent of normal voltage. Fire-alarm-system disconnect/protective device must be a fused switch with a red factory finish as specified herein for manual alarm stations. Mount this disconnect switch adjacent to the fire alarm control panel. In addition, it must be marked FIRE-ALARM DISCONNECT FED FROM (indicate supplying circuit) with 1/2 inch high letters in white paint or engraved phenolic identification plates fastened with sheet metal screws. Switch must be capable of being locked in the "on" or "off" position. This feature must not interfere with the circuit protection capability of the device. Switch must be equipped with surge suppression for all phase and neutral conductors. Install current limiting Class RK1 fuses properly sized to protect the fire alarm equipment.

## 2.8 WIRING

Provide wiring in accordance with NFPA 70 and NFPA 72. Conductors must be copper. Conductors for 120 V(AC) circuits must be No. 12 AWG minimum with 600 Volt rated THHN/THWN insulation.

Conductors installed on fire alarm systems must be solid copper with an insulation rating of not less than 300 volts. Conductors must be marked with the size, voltage rating and manufacturer's name permanently marked on the conductor jacket at no less than 2 feet intervals. Conductor size and color are listed below. Where modifications are made to existing systems, the new or added conductors must match the size and color-coding of the existing system.

Conductors for multiplexed communication circuits, signaling line circuits, radio transceiver reporting circuits, radio transceiver trouble contact circuits, and network communication circuits must be solid copper, shielded, twisted pairs meeting UL 2196. Cable must be listed as Type FPL, Power-Limited Fire Protective Signaling Cable. Conductor size must be not less than No. 18 AWG diameter for circuits connecting to radio transceiver subscriber units and No. 16 AWG for other circuits.

Direct current initiating device (manual pull station) circuits must be a two loop circuit per NFPA 72, Class A. Conductor size must be not less than No. 16 AWG diameter. Conductor insulation must be Type TFN for No. 16 AWG diameter, and Type THHN/THWN for No. 14 AWG diameter and larger.

Direct current auxiliary control relay circuits must be parallel wired per NFPA 72, Class A. Conductor size must be not less than No. 16 AWG diameter. Conductor insulation must be Type TFN for No. 16 AWG and Type THHN/THWN for No. 14 AWG diameter and larger.

Direct current power leads must be not less than No. 16 AWG diameter. Conductor insulation must be Type TFN for No. 16 AWG and Type THHN/THWN for No. 14 AWG diameter and larger.

## 2.9 SURGE SUPPRESSORS

Provide line voltage and low voltage surge suppression devices to suppress all voltage transients which might damage the control panel components.

Install surge suppression in accordance with UL 497B on each conductor of fire alarm circuits which extend beyond a building. Locate protection as close as practical to the point where the circuits leave the building. Install protectors in surge suppression cabinets of adequate size with power rated terminal strips for all wiring connections. Paint enclosures with a prime coat and one or more coats of red baked enamel finish to provide a smooth, hard, and durable finish. Provide a copper ground bus inside the cabinet and connect protectors to an earth ground electrode system in accordance with the manufacturer's requirements and NFPA 70. An etched metal or engraved laminated plastic identification plate labeled, "Fire Alarm Cabinet," must be affixed to the cabinet door of the alarm-control unit to identify the cabinet as a fire-alarm cabinet. For cabinets painted red the identification plate must have white letters on a black background.

### 2.9.1 Line Voltage Surge Suppressors

Suppressor must be UL 1449 listed with a maximum 330 volt clamping level. Suppressor must also meet IEEE C62.41 category B tests for surge capacity. Suppressor must be a multi-stage construction which includes inductors and silicon avalanche zener diodes. Suppressor must have a long-life indicating lamp (light emitting diode or neon lamp) which extinguishes upon failure of protection components. Unless otherwise indicated, wire in series with the incoming power source to the protected equipment using screw terminations. Where specifically indicated to provide parallel connected surge suppressors mounted directly to the safety switch using a knockout hole.

### 2.9.2 Low Voltage Surge Suppressors

Provide for all circuits which leave the building shell and as shown on the contract drawings. When circuits interconnect two (2) or more buildings, provide an arrester at the circuit entrance to each building. Suppressor must be UL 497B listed, with a maximum 30 volt clamping level and a maximum response time of 5 nanoseconds. Suppressor must have multi-stage construction and both differential/common mode protection.

## PART 3 EXECUTION

### 3.1 SYSTEM SEQUENCE OF OPERATION

#### 3.1.1 Existing Facility Fire Alarm Control Panels - Radio CRMS Reporting using FACP Relay/Radio Zone Interface

Unless otherwise indicated, the existing sequence of operations for modified fire alarm control panels shall not be changed except as required to provide the modified CRMS reporting indicated. Generally when revising programs:

- a. Unless otherwise indicated, existing software points and control equations used for local control functions (evacuation alarms, AHU shutdown, bypass functions, etc.) and not related to CRMS reporting shall not be modified.

- b. Existing software points and control equations used for CRMS reporting are to be modified (add, change, delete) as required to achieve new CRMS reporting indicated.
- i.) To minimize re-testing requirements, existing CRMS interface points used for IMS or 2120 interface tables shall be re-used and re-grouped to the greatest extent possible to achieve the new reporting configuration.
  - ii.) Software shall be reviewed to insure all initiation devices, supervisory devices/conditions and trouble conditions are assigned to CRMS reporting points and/or control equations.
  - iii.) Point names for new relay outputs are to conform to KSC point name and format standards.
- c. Radio transceiver trouble contacts shall be wired to the fire alarm control panel and shall implement a supervisory alarm that automatically resets once radio communications is restored.
- d. A CRMS reporting bypass shall be programmed (or where existing reporting bypass functions exist, such programming modified) to disconnect all alarm and trouble reporting functions. The fire alarm control panel's supervisory relay shall be turned ON to report supervisory to the CRMS when activated. For network display units (NDU) communicating via a serial data output or Simplex fire alarm control panels communicating over a data network, supervisory signals other than CRMS reporting bypass shall be disconnected along with alarm and trouble functions.
- e. Existing Simplex Information Management System (IMS) units at K6-900 (LCC), Simplex 4100U Summary Reporting Panel, and Simplex 2120 software shall be modified as required for any facility fire alarm system disconnected from these existing reporting systems.

### 3.1.2 Network Connected Fire Alarm Panel Reporting via NDU's at M6-409 and M5-1494.

Existing and new Network Display Units shall be programmed to report alarm, supervisory, and trouble signals to a radio transceiver via a serial data output module for all other fire alarm control panel nodes connected to its network.

- a. The NDU Network interface program shall be programmed to recognize all alarm, supervisory, and trouble public points broadcast on the network by other fire alarm control panel nodes.
- b. The NDU shall transmit to the radio receiver serial data input all alarm, supervisory, and trouble signals received. These signals shall also be displayed locally with descriptive text format and alarm type (alarm-supervisory-trouble). Where indicated, the NDU shall also activate relays connected to relay transceiver zones for summary reporting functions indicated.
- c. Broadcast points from other network nodes shall be programmed such that the NDU operates silently and does not require local acknowledgement or reset as these broadcast public points change state.
- d. NDU trouble and supervisory conditions directly related to the condition of NDU hardware shall activate the corresponding summary

trouble or supervisory relay as well as activate it's local audible and visual annunciations.

### 3.1.3 Network Connected Fire Alarm Panel Reporting via M6-138 (CD&SC) Summary Reporting Panel B.

Existing M6-138 Summary Reporting Panel B shall be programmed to transmit all indicated alarm, supervisory, and trouble signals received from remote facility fire alarm control panels on Network 3 to radio transceiver(s) for final transmission to the CRMS.

a. Both the Summary Reporting Panel B primary and redundant processor serial data cards are to be connected to dedicated CRMS radio transceivers, 1 and 2, for reporting to the CRMS. Only one serial data card shall transmit data depending upon which processor is in operation. In the event the primary processor or Radio Transceiver 1 fails, primary processor radio communications shall cease and all communications shall be transferred to the redundant processor and Radio Transceiver 2. Existing fail-over programming and manual processor transfer means shall also similarly transfer the serial data radio reporting.

b. The Summary Reporting Panel B interface program shall be programmed to recognize all alarm, supervisory, and trouble public points broadcast on the network by other facility fire alarm control panel and Summary Reporting Panel A nodes as indicated.

c. Summary Reporting Panel B shall transmit to the radio receiver serial data for all alarm, supervisory, and trouble signals received. These signals shall also be displayed locally with descriptive text format and alarm type (alarm-supervisory-trouble).

d. Broadcast points from other network nodes shall be programmed such that Summary Reporting Panel B operates silently and does not require local acknowledgement or reset as these broadcast public points change state.

e. Where indicated, separate radio transceivers with summary alarm reporting data are installed at each facility to provide back-up to the serial data reporting radios; FACP programming shall be per applicable provisions of previous paragraph 3.1.1.

f. Summary Reporting Panel B trouble and supervisory conditions directly related to the condition of hardware shall activate the corresponding summary trouble or supervisory relay as well as activate it's local audible and visual annunciations.

## 3.2 INSTALLATION

Prior to performing any installation or modification work to existing Fire Alarm system(s), a Transfer of Responsibility Form (reference Attachment #1) must be completed by the COTR and signed by the Contractor and Institutional Services Contractor (ISC) Fire Protective Systems designee (reference Contract Solicitation or Delivery Order for copy of the form). The completed form will be turned over to the Contracting Officer by the COTR. A copy of the completed "Transfer of Responsibility" Form shall be permanently affixed to the affected fire alarm control panel throughout the construction period.

Install all equipment in accordance with manufacturer's recommendations, and this Section.

Contractor shall transfer facilities nearest M6-342 (CIF) first and progressively move further from this facility.

### 3.2.1 Fire Alarm Control Panel Cabinets

Install equipment in each protected building, located where indicated, and complete with all indicated accessories and devices. Install equipment in accessible locations in such a manner as to prevent damage from vibration or jarring. Equipment requires a minimum of 3 feet clearance directly in front of the panel for maintenance per NFPA 70. With multiple equipment, the 3 feet clearance is required directly in front of the complete configuration. In addition, a 28 inch clear aisle way must be provided for access to the equipment.

Wiring within fire alarm control panel(s) and reporting equipment must be in accordance with the paragraph entitled, "Installation in Cabinets and Boxes."

### 3.2.2 Addressable Modules and/or Devices

Install zone addressable modules at accessible locations indicated. Configure module address switches to settings indicated on approved shop submittals. Modules must be identified individually adjacent to their mounting.

Mount control zone addressable modules used for smoke control, AHU shutdown, etc. in accessible locations within 3 feet of the device to be controlled. Control modules connected to separately energized control wiring from auxiliary systems must not be installed in the same enclosure with initiation and signal zone addressable modules.

Where zone addressable modules are grouped within an enclosure, wiring must be in accordance with the paragraph entitled, "Installation in Cabinets and Boxes."

### 3.2.3 Auxiliary Control Relays

Remote control relays must be installed and supervised in accessible locations within 3 feet of the device to be controlled.

### 3.2.4 Wiring

Wiring must conform to the requirements of NFPA 70 and the following special requirements:

Install fire alarm system circuits in a separate raceway system. Route each circuit type (Initiating, Notification, Signaling, and Control) through a dedicated separate conduit or raceway system configured to comply with NFPA 72 Class "A" conduit system requirements. 60-Hertz power circuits must not enter enclosures containing fire alarm circuits except where required to connect to the fire alarm system.

Conductors must be continuous from a terminal point at one device to a terminal point at the next device and from a device to the fire alarm (control) panel. Break wires at each terminal; wires must not be looped over a terminal. Approved explosion proof devices provided with

pigtail wiring connection leads must be terminated on a field installed terminal strip installed in the box on which the device is mounted. Install solderless ring tongue terminal lugs with manufacturer's required tooling on the device wiring connection leads. This ring type lug is to be used on stranded wire only. Termination of solid wire must be made on compression or screw type terminals. When screw type terminals are used the conductor must be captured under 80 percent of the screw head surface.

Conductor colors are listed below and must be in accordance with FED-STD-595. Where modifications are made to existing systems, the new or added conductors must match the size and color-coding of the existing system.

Conductors for multiplexed communication circuits, radio unit input zone wiring, and remote station signaling circuits must be marked with circuit designation, and consistent color-coding for the positive and negative loops must be maintained throughout the cable system.

Direct current initiating device circuits must be a two loop circuit per NFPA 72, Style D, (Class A), with the positive loop conductor colored blue, Color No. 15102, and the negative loop conductor colored black, Color No. 17038.

Direct current auxiliary device control relay circuits must be parallel wired per NFPA 72, Style Z, (Class A). Positive conductor must be colored yellow, Color No. 13591 and the negative conductor must be colored brown, Color No. 10055.

Direct current power circuit positive conductor must be colored red, Color No. 11105 and the negative conductor must be colored black, Color No. 17038.

### 3.2.5 60-Hertz Power

60-hertz power to fire alarm control panels or separately powered devices must be 120 volts. There must be one black phase conductor, one white or gray solidly grounded neutral conductor and one green equipment grounding conductor. Conductor size must be as shown on the drawing with the minimum size No. 12 AWG copper. Install surge arrestors in accordance with NFPA 72 and NFPA 70.

Circuit Breakers used to supply AC power to the fire alarm control panel shall be clearly identified. Provide a permanently label white background with red lettering adjacent to the circuit breaker.

### 3.2.6 Installation in Cabinets and Boxes

Install wiring in control cabinets and boxes in a neat and orderly manner with wire properly grouped, tie-wrapped, or laced parallel and perpendicular to the major axis, supported and identified. Control wiring must be continuous from device to device with no splices unless otherwise indicated. All wires entering or leaving control cabinets, boxes, and devices must be permanently marked and terminated on screw terminals (shielded cable drain wire shall be terminated on screw terminals, but need not be marked). Marking must be consistent throughout the fire alarm system and must be the same as the identification shown on the connection drawings.

Wire labels shall correspond to the approved connection drawings and use a method indicating the destination of the other end of the wire. Labels in control panel equipment or between fire alarm terminal cabinets shall indicate the destination of the other end by cabinet number (or cabinet identifier)-terminal strip designation-terminal strip number. Labels in fire alarm terminal cabinets shall indicate connection in control panel equipment by fire alarm cabinet number-module identifier-module terminal strip identifier-terminal strip number.

### 3.2.7 Conduit and Raceways

Minimum size for fire alarm system initiating, notification, signaling line and control circuit conduits and raceways must be 3/4 inch. Installation must be in accordance with NFPA 70.

All Class A initiating device, signaling line, notification appliance, and control circuits must use diverse routing in accordance with NFPA 72. The outgoing and return redundant circuit conductors must not be run in the same cable assembly, enclosure, or raceway. The outgoing and return circuit conductors are permitted to be run in a single conduit or raceway for drops that enter or exit an individual device or control unit enclosure.

Use flexible metal conduit, maximum length 6 feet, as the final connecting raceway to a fire alarm device mounted on vibrating equipment or on a suspended ceiling.

Where devices, junction boxes, and cabinets are installed outdoors, arrange conduit systems to drain away from the box; conduit shall enter the box from the side or bottom only and drain type fittings shall be installed.

Conduit through fire-resistant rated walls, floors, ceilings, must be fire-stopped in a manner that maintains the fire-resistant rating of the wall, floor or ceiling.

Conduit installed in a vertical position must be parallel with walls and perpendicular with the floor and ceiling. Conduit installed in a horizontal position must be parallel with the floor and ceiling and be perpendicular with the walls. Changes in direction of runs must be made with symmetrical bends. Bends of over one inch in diameter must be factory made elbows.

### 3.2.8 Water Flow Alarm and Valve Tamper Switches

Install switches in accordance with the manufacturer's requirements and make final connections using liquid-tight flexible metallic conduit. Adjust time delays on flow switches to 60 seconds to prevent false alarms due to momentary water movement.

## 3.3 FIELD TESTING

After complete installation of the equipment and at such time as directed by the Contracting Officer, conduct tests to demonstrate that the installation requirements of this specification have been met and that the sequential functions of the system comply with the requirements specified herein. Tests covered in the following paragraphs must be done in two parts:

- a. Qualification - Reference requirements in Section 28 31 33.00 10 FIRE ALARM REPORTING SYSTEM, RADIO TYPE for an integrated test

qualification test involving fire alarm equipment specified by this section. This test must be successfully completed prior to beginning construction at any KSC facility. Primary facility fire alarm equipment issues for the equipment specified in this section are:

- i.) Verification of serial data reporting capability and compatibility with radio based CRMS equipment.
  - ii.) Verification of facility FACP reporting via a network connection to an NDU or M6-138 (CD&SC) Summary Reporting Panel B.
- b. Contractor Checkout - This test shall be performed by the Contractor to remove all troubles, ground faults, ensure all devices are fully functional and operational, and test the programming to ensure the installation meets the contract drawings and specifications. For modification and rehabilitation work, the Contractor is not responsible for existing troubles and ground faults that are not in contract scope. The existing troubles and ground faults that are not in contract scope shall be clearly conveyed by the Contractor in the Transfer of Responsibility form. Upon successful completion of Contractor Checkout, the Contractor shall submit Contractor Readiness Affirmation (reference Attachment #2) prior to requesting the preliminary test.
- c. Preliminary - This test shall be performed by the Contractor using the approved test procedure and witnessed by the Government construction inspectors. As-built fire alarm system drawings shall be verified against the system installed and all red-lines annotated and summarized on a single set of as-built drawings. The test procedures shall be followed as written and all red-lines annotated on a single Test Procedure. The summarized set of drawings and test procedures shall be initialed and dated by the construction inspector and the fire alarm vendor. The Preliminary test shall not be complete until all steps in the test procedure have been satisfactorily completed. This includes any additional steps required to complete 100% testing of the fire alarm system and its associated functionality.
- d. Final Acceptance - After the successful completion of the preliminary test, a Final Acceptance test shall be scheduled. The final acceptance test procedure and as-built drawings shall have incorporated all red lines from the preliminary test. The Contractor shall provide a copy of the consolidated redlines for the as-built drawings and preliminary test procedures from the preliminary test. The Contracting Officer and the Authority Having Jurisdiction or their designee(s) shall witness the final acceptance test for the fire alarm system. During the Final Acceptance Test, the Contractor shall have two corrected as-built drawings and Final Acceptance Test Procedures for use in conducting the final acceptance test. On both preliminary and final tests, follow the approved testing procedures.

### 3.3.1 External System Wiring

Perform the following tests on the external system wiring before connection to the control panel:

Check continuity of circuits with an ohmmeter. Insert temporary jumpers in appropriate sockets of missing detectors and install the end-of line resistor when this test is performed. Resistance reading for each circuit must be the value of the end-of-line resistor, plus or minus 10

percent.

Each wire must be checked for grounds with a 250-volt insulation resistance test set. Resistance to ground must not be less than 20 mega ohms. Each wire tested shall be insulated from ground, and all other wire within the same conduit or raceway system shall be grounded. The conduit/raceway system shall be verified grounded prior to insulation resistance testing by verifying a short circuit between the conduit/raceway and ground.

### 3.3.2 Fire Alarm System Acceptance Tests

After completion of the above tests, connect the external system wires to the appropriate terminals in the control panel and perform the following tests:

With the control panel energized, demonstrate the proper operation of all indicating lights and alarms.

During re-acceptance tests activate each automatic and manual alarm device to demonstrate proper operation.

Each time an initiating or supervisory circuit is activated, verify that the associated device address, notification appliances circuits, auxiliary control circuits, and alarm reporting to the Central Fire Monitoring System is activated and the correct information is displayed by the CRMS workstations.

Turn off power to each separately powered panel or device to simulate loss of power and to demonstrate operation of the trouble alarm.

For new valve tamper switches installed, open and close water suppression system valves requiring tamper switches, to demonstrate proper operation. Supervision of wiring for each device shall also be verified to include open trouble annunciation, ground annunciation, and alarm over trouble and ground.

For new flow switches installed, activate water flow/pressure switches by water flow at the inspectors test valve to demonstrate proper operation. Set water flow time delay between 45 and 90 seconds. Supervision of wiring for each device shall also be verified to include open trouble annunciation, ground annunciation, and alarm over trouble and ground.

Demonstrate each alarm initiating circuit to operate its associated alarm-control and auxiliary control units and remote reporting.

Demonstrate each alarm control unit to operate in all modes.

Demonstrate capacity and the operation of the battery backup system to operate as required by these specifications by disconnecting the 120 volt, 60 Hz power from the fire alarm (control) panel and operating the system as specified for backup operation.

During re-acceptance tests, demonstrate all circuits interconnecting with other systems fire protection, smoke control, HVAC, security and safety, elevators, etc., to operate as specified on alarm from the associated zone or zones.

Test multiplex equipment, devices, and wiring in accordance with NFPA 70 and manufacturer's requirements. Remove and ground one lead at each addressable device to demonstrate open circuit trouble, ground fault trouble, and operation over ground fault with an open circuit. Alternate between (+) and negative (-) leads during the device testing process.

Test network communications loop. Ground fault must not degrade network communications. The Token must be passed in opposite directions to maintain communications throughout all network nodes. At the same time the abnormal status condition of the communication loop must be reported to the CRMS. When a group of nodes becomes isolated from the rest of the network caused by multiple open faults, the isolated group must automatically form a sub-network with all common interaction of monitoring and control remaining intact. The status of the network faults must be transmitted to the CRMS.

### 3.3.3 Reacceptance System Tests

Perform reacceptance testing after system components are added or deleted; after any modification, repair, or adjustment to system hardware or wiring; or after any change to software. All components, circuits, systems operations, or site specific software functions known to be affected by the change or identified by a means that indicates the system operational changes must be 100 percent tested. In addition, also test 10 percent of the initiating devices and 10 percent of all output circuits that are not directly affected by the change and verify proper system operation.

Battery capacity test with a 10 minute full facility evacuation alarm test at the end of the battery standby period shall also be performed for all reacceptance tests.

Upon completion of the modification, functionally test the existing devices that were reinstalled and test the devices that are on both sides of the point of connection of the new devices (signaling line circuit modifications to install addressable module cabinets). All newly installed devices must be tested in accordance with the paragraph entitled, "Fire Alarm System Acceptance Tests."

After final acceptance testing has been successfully completed, submit test data under the terms of the "GENERAL REQUIREMENTS" clause of this specification section.

#### 3.3.3.1 Modified Facility FACP's Connected to Radio Units Directly or Over a Network.

Includes modified facility fire alarm panels directly connected to radio units via relay methods. Also applies to modified, (software or hardware), facility fire alarm panels communicating data to radio units via an NDU or M6-138 Summary Reporting Panel B (examples: M5-1494, M7-1061, and M7-360/361). Re-acceptance testing shall include the following specific elements:

- a. All local FACP evacuation and control bypass functions (evacuation signal, AHU Shutdown, etc.) shall be turned ON as appropriate during the testing procedure to bypass facility evacuation and control actions.
- b. With the CRMS bypass function off, each input logic point (List, Pseudo, Zone, Addressable Device, etc.) in an equation activating a

reporting signal shall be activated by initiating an alarm at an appropriate field device or activating the appropriate function. If any existing reporting signal point list or Pseudo point equation is added or modified for new reporting purposes, then all inputs in the added or modified lists/equations shall also be re-tested by initiating alarms at the appropriate field devices.

c. For facilities transmitting reporting point data using M6-138 (CD&SC) Summary Reporting Panel B, testing in paragraph b. above shall be repeated with Summary Reporting Panel B operating on the redundant processor and radio. Activate only the minimum number of field devices or functions necessary in order to test all reporting signals to the CRMS.

d. With the CRMS bypass function ON, activate each reporting signal and verify no CRMS signal except the supervisory related to the use of this bypass function.

e. Additional devices shall be activated as required to achieve the NFPA 72 required thresholds of 10-Percent or 50-total initiation devices.

f. With the appropriate bypass functions OFF, 10-Percent of control function outputs (HVAC shutdown, etc.) shall be re-tested.

g. With multiple trouble and supervisory signals on the system, additional unacknowledged trouble and supervisory signals shall be verified to re-sound at the CRMS workstations.

h. RF Communications with the radio unit shall be interrupted and supervisory signal (over circuit with ground and open trouble) shall be verified at the local FACP. RF communications shall be restored and supervisory signal shall verify clear without operator intervention.

i. Battery capacity shall be re-tested (to include the radio CRMS equipment).

j. Facility evacuation audible/visual alarm shall be re-tested at the end of the battery test.

### 3.3.3.2 Non-Modified Facility FACP's Connected to Radio Units Directly or Via Network Methods

Includes panels with existing radios transferred from the existing CRMS system, and panels reporting through networks to M6-138 (CD&SC) Summary Reporting Panel B, but do not require FACP hardware/software modifications (examples: Visitor Center facilities, M7-961, M7-1212, M7-1059, M6-495, M6-698). Re-acceptance testing shall include the following specific elements:

a. All local FACP evacuation and control bypass functions (evacuation signal, AHU Shutdown, etc.) shall be turned ON as appropriate during the testing procedure to bypass evacuation and control actions.

b. Each existing IMS network and CRMS reporting point (List, Pseudo, Zone, Addressable Device, etc.) shall also be re-tested by initiating alarms at the appropriate field device or function key. Remote reporting to the CRMS workstations from both the NDU and the local facility radio shall be verified. Local indications at the NDU shall

also be verified for each signal.

c. The following specific conditions shall be verified to report to the CRMS workstations for each facility fire alarm control panel network node as applicable to existing CRMS programming:

- i.) System Trouble
- ii.) FACP Failure
- iii.) Network Communications Degraded
- iv.) Network Communications Failure
- v.) Ground Trouble
- vi.) Power Trouble
- vii. Battery Trouble
- viii.) AC Power Trouble
- ix.) Power Supply Trouble
- x.) Unacknowledged Trouble
- xi.) Unacknowledged Supervisory

d. For facilities transmitting reporting point data using M6-138 (CD&SC) Summary Reporting Panel B, testing in paragraphs b. and c. above shall be repeated with Summary Reporting Panel B operating on the redundant processor and radio. Activate only the minimum number of field devices or functions necessary in order to test all reporting signals to the CRMS.

e. If a CRMS Bypass function is available at the facility, activate each reporting signal with the bypass ON and verify no CRMS signal except the supervisory related to the use of this bypass function.

f. Back-up radio battery capacity shall be tested.

g. Once testing is complete the FACP shall be restored to normal configuration and returned to service.

#### 3.3.3.3 M6-138 (CD&SC) Summary Reporting Panels

Re-acceptance testing shall include the following specific elements on each of the two (2) Summary Reporting Panels:

a. With the primary processor operating, alarm and trouble CRMS reporting for all zones (remote facilities) shall be verified at the summary panel terminal cabinet by opening and shorting each zone. Remote reporting to the CRMS workstations via Summary Reporting Panel B and local indications at the CD&SC shall be verified.

b. For both Summary Reporting Panels A and B, the primary processor shall be simulated failed to transfer to the secondary back-up processor. With the secondary processor operating, alarm and trouble CRMS reporting for all zones (remote facilities) shall be verified at the summary panel terminal cabinet by opening and shorting each zone. Remote reporting to the CRMS workstations and local indications at the CD&SC shall be verified.

c. Battery capacity shall be re-tested (to include the radio CRMS equipment).

#### 3.4 PAINTING

Manufacturer's standard finish equipment surfaces damaged during

construction must be brought to as-new condition by touchup or repainting to the satisfaction of the Contracting Officer, or replaced with new undamaged equipment at no additional cost to the Government.

Paint all fire alarm equipment and appurtenances red, Color No. 11105 in accordance with FED-STD-595.

-- End of Section --

## SECTION 28 31 33.00 10

FIRE ALARM REPORTING SYSTEM, RADIO TYPE  
04/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## FM GLOBAL (FM)

FM P7825 (2005) Approval Guide Fire Protection

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 72 (2006) National Fire Alarm Code

NFPA 75 (2008) Protection of Information Technology Equipment

## NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7 (2003) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

## UNDERWRITERS LABORATORIES (UL)

UL 497B (2004; Rev thru Oct 2008) Protectors for Data Communication and Fire Alarm Circuits

UL 827 (1996; Rev thru Jan 2007) Central Station Alarm Services

UL 864 (2003; Rev thru May 2007) Control Units and Accessories for Fire Alarm Systems

UL 1981 (2003) Central Station Automation Systems

UL Fire Prot Dir (2009) Fire Protection Equipment Directory

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Submittals in this section shall be submitted for approval in the following sequence with each approved prior to the next submittal:

1. Submit within 30 days after notice to proceed - All Product Data (SD-03) and Certified Equipment Specialist Certificates (SD-07).

Note: Immediately after the submittal of product data above, the Contractor shall coordinate with the Contracting Officer or his representative to schedule Information Technology consultations with KSC personnel related to the development of the Government's required IT Security Plan and other submittal discussions. Reference 1.4 INFORMATION TECHNOLOGY SECURITY. The Government's IT Security Plan must be complete prior to the Qualification Test.

2. Submit within 60 days after notice to proceed - Qualification Test Procedure (SD-06).

The following shall be submitted for all Central Station Head-End or Monitoring Location Equipment:

3. Shop Drawing (SD-02) Interim Review Set - Submit within 90 days of notice to proceed to include rack Equipment Layout drawings with content limited to device and component placement within equipment racks only, and essentially complete Interconnection/Schematic Drawings. Include on drawings cooling load in BTU and power consumption for each rack. Contractor shall attend a review meeting at a KSC location to occur within 14 days of receipt of these drawings.

4. All Shop Drawings (SD-02), Design Data (SD-05), and Installation Manuals (SD-10) - Submit within 150 days after notice to proceed.

5. Submit no later than 21 days prior to the scheduled preliminary test - Preliminary Acceptance Test Reports (SD-06), all software licenses and documentation kits (SD-07 Certificates) and Training Manuals (SD-10). Additionally, (2) up-to-date sets, minimum, of all as-built documentation (SD-02 shop drawings and SD-05 design data) shall be complete and available for reference and validation at the preliminary test.

6. Submit no later than 21 days prior to the scheduled final test -Final Acceptance Test Reports (SD-06), Operations and Maintenance Data/Parts Lists (SD-10), and all As-Built Shop Drawings (SD-02) and Design Data (SD-05) - Additionally (2) two sets of test procedures and all as-built documentation shall be complete and available for reference and inspection at the final test.

7. Submit within 14 days after system acceptance - Marked-up As-Built design drawings and warranty information per Section 01 78 00 CLOSEOUT SUBMITTALS, As-Built Shop Drawings (SD-02), As-Built, Design Data (SD-05), and As-Built Operations and Maintenance Manuals (SD-10). Also provide record copies of the completed and signed-off preliminary test and final acceptance test (SD-06) procedures. Provide (3) sets of CD ROM digital media of all the as-built documentation.

8. All as-built documentation shall be submitted and all training (reference Section 3.4.4, Training) shall be complete prior to connecting remote facilities to the new Central Station system.

The following shall be submitted separately for equipment provided at each

facility reporting to the CRMS. These submittals may be incorporated into and submitted with facility fire alarm submittals described in Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) if desired.

9. Submit within 45 days of starting work at the facility - Shop Drawings (SD-02), Design Data (SD-05). Where drawing and design data is common to multiple facilities it shall be annotated to indicate all facilities involved and can be submitted once.
10. Submit no later than 21 days prior to the scheduled preliminary test - Preliminary Acceptance Test Reports (SD-06). Additionally, two (2) up-to-date sets, minimum, of all as-Built documentation (SD-02 shop drawings and SD-05 design data) shall be complete and available for reference and inspection at the preliminary test.
11. Submit no later than 14 days prior to the scheduled final test - Final Acceptance Test Reports (SD-06), Operations and Maintenance Data (SD-10), and As-Built documentation (SD-02 Shop Drawings and SD-05 Design Data). Additionally, another (2) two sets of test procedures and all as-built documentation shall be complete and available for reference and inspection at the final test.
12. Submit within 14 days of system acceptance - Marked-up As-Built design drawings and warranty information for the facility in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS, As-Built Shop Drawings (SD-02), Design Data (SD-05), Operations and Maintenance Manuals (SD-10) and record copies of the completed and signed-off preliminary and final acceptance test (SD-06) procedures. Include two (2) sets of CD ROM digital media of all the as-built documentation.

#### SD-02 Shop Drawings

All shop drawings shall be computer aided design (CAD) generated. All submittals shall include hard copies and .pdf copies on digital media compact disc(s) (CD's). In addition, final closeout as-built submittals shall include .DWG or .DXF files for all shop drawings.

Changes during the installation shall be documented and incorporated onto the applicable shop drawing(s) to insure a current as-built configuration drawing. Latest version of all shop drawings shall be available at each acceptance test and shall be updated as required as a result of the testing and inspection process. Final closeout as-built drawings with all changes incorporated and representing as-built installation shall be submitted after acceptance testing is complete.

#### Equipment Lay-out Drawings; G

- a. Provide scaled equipment layout drawings for all equipment. Drawings shall include both front and back view of all equipment as physically arranged. Information shall include:
  1. Make, model, and manufacturer of each piece of equipment shall be indicated; reference table format is acceptable.
  2. For each piece of equipment, all operator controls, switches, and visual indications shall be indicated. Layout depicted shall match actual equipment provided.

3. For each piece of equipment, all wiring connections and their function shall be indicated. Layout and connector type shall match actual equipment provided. Wiring/cabbling from each port, plug, or terminal connection shall be indicated and include destination, wire/cable type, connector type, and wire/cable number matching the field installation.
- b. Interconnection/Schematic drawings showing:
1. Interconnection of network and communication interfaces between system components installed at all locations (overall system architecture drawing).
  2. Detailed interconnection of all networked and communication interfaces between system components installed at individual facility (K6-900, M6-342 K6-1446K). All communication connections shall be indicated.
  3. Detailed AC power interconnections and switching for rack mounted components at each facility. All AC power sources and connections shall be indicated.
- c. Provide equipment layout drawings for all remote facility radio subscriber unit configurations including:
1. Make, model, and manufacturer of each piece of equipment and components within it.
  2. All wiring connections and their function shall be indicated. Layout and connector type shall match actual equipment provided. Wiring/cabbling from each terminal or port shall be indicated by table or other method, and shall include destination, wire/cable type, and connector type.

#### Connection Drawings; G

Connection drawings shall consist of block diagram type point-to-point wiring diagrams depicting rack wiring and interconnection between other building systems and components associated with the central station reporting system. Wire label designations matching the field installation shall be indicated on these drawings. Provide separate drawings for AC power and data connections.

#### Floor Plan Drawings; G

Floor plan drawings shall indicate rack locations, equipment locations, device locations, interconnecting conduit/raceways, and wiring to be installed within specific conduit, rack, or other raceway systems. Indicate diverse conduit/wiring routing requirements where required. Provide specific construction and installation details as required on these sheets.

#### As-Built Drawings; G

As-Built drawings shall be provided for all shop drawings submitted. As-Built drawings shall document final system configuration including, but not limited to all equipment locations, equipment/rack layouts, interconnecting wiring,

additional cabinets, and all other equipment associated with the central station system(s). Annotate deviations due to contract changes and field installation changes, concealed and visible.

#### SD-03 Product Data

Product data shall indicate current applicable approvals or listings issued by UL, (Underwriter Laboratory UL Fire Prot Dir listed), FM, (Factory Mutual FM P7825 approved for intended use and function), or other Nationally Recognized Testing Laboratory and compliance with applicable NFPA standards. Where equipment is not UL listed or FM approved, data supporting UL/FM equivalency shall be provided at time of bid in accordance with paragraph 1.5.1(b), and such equipment shall be pre-approved by the KSC Authority Having Jurisdiction.

Provide standard manufacturer's catalog data, technical data sheets, and user manuals for the following equipment that are adequate to allow government review and approval for use in developing shop drawings and then field construction. Annotate actual equipment and options provided. Where different types of the same item are used, provide separate data as required. Submittals in the following groups shall be submitted together; incomplete submittals will be returned for correction without review.

#### Group 1 - All Radio Equipment:

- Radio Subscriber Unit with Zone Inputs; G
- Radio Subscriber Unit Relay Output Interface; G
- Radio Subscriber Unit Serial Data Interface to Simplex 4100 FACP; G
- Central Station Radio Controller; G
- Central Station Radio Transceiver; G
- Antenna equipment (including cables, connectors, filters and surge suppression); G
- Radio Transceiver Unit and Subscriber Unit Power Equipment (batteries, step down transformer); G
- Central Station Radio Controller Workstation Equipment (including operator peripherals); G
- Radio Controller Software Packages; G
- Radio Controller Workstation Software Packages; G
- Line Voltage Surge Suppressors; G
- Low Voltage Surge Suppressors; G
- Manual Printer A-B Switch Equipment; G
- Rack Mounted Data Cable A-B Switch System; G

#### Group 2 - Central Station Alarm Automaton System Equipment:

- Central Station Alarm Automaton Server Equipment (including operator peripherals); G
- Central Station Alarm Automaton Workstations (including operator peripherals); G
- Central Station Alarm Automaton Server Software Packages; G
- Central Station Alarm Automaton Workstation Software Packages; G
- Serial Data to Ethernet Concentrator Equipment; G

#### Group 3 - Other Equipment:

- Electronic Equipment Racks and Accessories (including fan packages); G
- Electronic Equipment Rack Uninterruptible Power Supplies; G
- Electronic Equipment Rack Power Transfer Switch Equipment; G
- Electronic Equipment Power Distribution and Power Cable Management Equipment; G

Managed Ethernet Switch Equipment and Software Packages; G  
KVM Switching Equipment and Software Packages; G  
Managed Ethernet/KVM Switch Workstation; G  
Rack Tray Mounted Operator Keyboard, Mouse, Video Monitor Equipment;  
G  
Laptop Computer For Use As Network Administration Workstation; G  
Power Wiring/Cabling; G  
Data Cabling Components and Cable Management Equipment; G

#### SD-05 Design Data

All calculated, tabulated, or custom written design data (including programming data) shall be computer generated using Microsoft Word or Excel applications. All submittals shall include hard copies and digital media compact disc(s) (CD's). CD submittals shall include .doc or .xls files for all submittals. Also on the same CD provide a signed and dated record copy of the submittal in PDF format.

Changes during the installation shall be documented and incorporated onto the applicable submittals to insure a current as-built configuration. Latest version of all submittals shall be available at each acceptance test and shall be updated as required as a result of the testing and inspection process. Final closeout as-built submittals with all changes incorporated and representing as-built installation shall be submitted after acceptance testing is complete.

#### Battery Calculations; G

Substantiating battery calculations for supervisory and alarm power requirements. Provide for equipment not backed-up by UPS units with generator source. Ampere-hour requirements for each system component and the battery recharging period shall be included.

#### UPS Load and Battery Calculations; G

Provide substantiating UPS AC load and standby battery calculations for both normal (partial connected load) and emergency (total connected load) service. All AC loads shall be indicated by device name with both watts and amps tabulated. Ampere-hour requirements for each service mode and the estimated battery recharging period shall be included.

#### Software Programs and Programming Data Sheets; G

a. Provide system executable software and data files on appropriate digital media (DVD, CD, or tape), for all programmable equipment affected by the project.

b. Specific central station related software programming data related to the facility subscriber unit zone and serial alarm data shall be provided for each facility programmed by the Contractor. Provide separate programming data for each system element required including radio subscriber unit, central station radio controller equipment, and central station alarm automaton equipment. Initially, provide sample computer screen display format(s) and data entry sheets. The Government shall provide a template for facility alarm reporting conventions to be used by the Contractor for programming facility alarms reporting required by this

Contract. Programming data shall resemble the data entry format and include:

1. Radio subscriber unit ID/account number to KSC facility number cross reference.
2. Radio subscriber unit zone data and serial data cross referenced to facility fire alarm control panel alarm function.
3. A bound list in radio subscriber unit ID order shall be kept current at the central receiver equipment indicating items 1. and 2. above.
4. Radio subscriber unit zone data and serial data cross referenced to facility fire alarm control panel alarm function and central station alarm Automaton system alarm data driving operator displays.
5. All other data entry parameters required.

c. For each system data base change including those related to the addition of new remote facility reporting equipment, all computer equipment hard drive and databases shall be updated. Additionally a minimum of two (2) complete digital media sets capable or restoring any system component shall be kept current, one stored by NASA and the other stored by the Contractor. After turnover of the head-end equipment, the Contractor's copy shall be turned over to the government.

#### SD-06 Test Reports

All test report submittals shall be computer generated using Microsoft Word or Excel applications. All submittals shall include hard copies and digital media compact disc(s) (CD's). CD submittals shall include .doc or .xls files for all submittals. Also on the same CD provide a signed and dated record copy of the submittal in PDF format.

#### Feedline Cable Test; G

Where required, provide results of facility feedline cable tests for contractor fabricated feedline cables. For each cable, include Facility and Cable ID, Cable Type, Test Results, and Calculated Feedline Loss.

#### Base Station Feedline System Test; G

For base antenna installations, (M6-342 CIF and K6-900 LCC), provide results of facility feedline system and antenna tests. For each test, include Facility ID, Cable and Connector Types, Surge Protector Type, Test Results, and Calculated Feedline Loss.

Fire Alarm System Acceptance Tests shall be conducted in accordance with the section entitled, "TESTING" of this specification. Prepare test procedure record forms for conducting complete tests on central station equipment installed in accordance with the manufacturer's requirements and these specifications. Test procedure must identify each device and circuit to be tested, describe the initial condition, each step or function in the test, required test result, and equipment to be employed. Provide test forms with suitable spaces for recording test results on all equipment, devices, and wiring to be tested. Test record forms also have identified spaces for verification signatures of official witnesses and dates of the test. Submit separate procedures for:

1. Qualification Test; G
  2. Preliminary Acceptance Test; G - Central Station Equipment
  3. Final Acceptance Test; G - Central Station Equipment.
- Include NFPA 72 Fire Alarm System Record of Completion form.

Procedures for the following (2) tests may be incorporated into and submitted with facility fire alarm testing described in Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) if desired:

4. Preliminary Acceptance Test; G - Provide For Each Remote Facility
  5. Final Acceptance Test; G - Provide For Each Remote Facility.
- Include NFPA 72 Fire Alarm System Record of Completion form.

#### SD-07 Certificates

##### Certified Equipment Specialists; G

Services of a Certified Specialists thoroughly experienced in fire alarm central station and information technology work must be provided on site to perform or directly supervise the installation, make all necessary adjustments, make all adjustment and perform all tests on the fire alarm system at the site. Provide separate specialists from each major equipment vendor.

Specialist is considered certified for modifications to equipment specifically listed for fire alarm use when the specialist holds a valid Fire Alarm System, Level III Certification from the National Institute for Certification in Engineering Technologies NICET 1014-7 or a valid Level III Fire Alarm Engineering Technician Certification from the International Municipal Signal Association (IMSA) or is licensed by the State of Florida as a Fire Alarm Contractor I in accordance with Florida State Statute, Chapter 489, Part II.

Certification of other recognized agencies with equivalent requirements will be considered. Evidence of the Contractor's State Certification and the basis of certification must be provided to the Contracting Officer and be approved by the Contracting Officer prior to any work being performed at Kennedy Space Center.

##### Software Licenses and Documentation Kits; G

For each dedicated computer and server shared software copy, provide certificates indicating software is properly licensed for use by the government. Provide in a dedicated binder separate from all other submittals with tabs for each computer and/or shared application. Provide software documentation kits for all software packages provided.

#### SD-10 Operation and Maintenance Data

Submit separate bound information grouped by categories indicated below consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions. All hard copy submittals shall include a digital media compact disc with the manual in .pdf, .doc. or .xls format.

## Installation Manuals; G

Submit all applicable manufacturers' instructions for all equipment detailing installation materials, tooling, and methods required to properly install all system components including safety precautions.

## Operation and Maintenance Manuals; G

Six complete copies of all applicable manufacturer's operating instructions, programming manuals, service manuals, or any other literature outlining step-by-step procedures required for system startup, configuration, programming, operation, shutdown, and maintenance. Manuals submitted with Installation Manuals for installation purposes that contain operations and maintenance information shall also be included with this submittal.

## Parts Lists; G

Provide spare parts data in .doc or .xls software format for each different item of material and equipment specified. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service.

Parts list shall be grouped for each equipment submittal type required in SD-03 PRODUCT DATA; also complete part numbers for all integrated assemblies as provided and used on this contract shall also be provided.

## Training Manuals; G

Submit bound training course material for approval. After approved provide a dedicated copy for each person trained. If training for different portions of the system is provided by different vendors than provide separate training manuals from each vendor as required.

All customized written procedures shall be computer generated using Microsoft Word or Excel applications. All submittals shall include hard copies and digital media compact disc(s) (CD's). Digital media submittals shall include .doc or .xls files for all customized procedures. Also on the same CD provide a signed and dated record copy of the submittal in PDF format.

## 1.3 GENERAL REQUIREMENTS

a. Contractor shall provide a turnkey radio based Central Radio Monitoring System (CRMS) including all engineering, labor, materials, technical support, hardware, software, technical documentation, customized programming, testing, and training.

b. Technical support from all vendors associated with the equipment in this section shall be provided as required during the submittal consultations, qualification test, installation, set-up, testing, and training phases of this project. Contractor shall coordinate with different vendors as required to insure that all work is coordinated and

required personnel are on-site during the different phases of the project.

c. Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL, Section 28 05 26.00 40 GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY, and Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) apply to and interface with work specified in this section.

d. IT SECURITY PLAN consultations per 1.4 INFORMATION TECHNOLOGY SECURITY shall occur immediately after submittal of catalog data. The Government's IT Security Plan must be complete prior to qualification testing at KSC. Once the Contractor provides all required information the Government shall be allowed 30 days to complete the initial IT Security Plan.

e. Qualification testing shall be performed at KSC to verify the fire protection and Information Technology (IT) requirements for the system are met. This test must be successfully passed prior to any installation work at KSC.

f. All installation, and testing is to be performed at Kennedy Space Center (KSC), Florida after Qualification Testing is completed in the following general sequence.

1. CRMS head-end equipment installation. Facility installations not involving facility fire alarm control panel modifications .
2. CRMS head-end preliminary test.
3. Training.
4. CRMS head-end final test.
5. Turnover of CRMS head-end equipment to the Government for Activation and Operation. The Government shall be allowed 45 days to complete the activation procedures.
6. Complete individual facility radio subscriber unit installation.
7. Individual facility acceptance testing.

#### 1.3.1 Standard Products

a. Material and equipment shall be the commercial off-the-shelf standard products of a manufacturer regularly engaged in the manufacture of CRMS products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours.

b. Components installed under this contract cannot be more than one (1) year older than the date of installation.

#### 1.3.2 System Capacities

The integrated CMFS system shall have the following minimum capacities:

- a. 9999 Radio Subscriber Units
- b. 256,000 Alarm Points
- c. 20,000 Operator Screens
- d. 10 Operator Workstations
- e. 100 Users

### 1.3.3 Joint Equipment Use and Occupancy

a. This project involves facilities for which reporting must remain on-line 24 hours-a-day, 7-days-a-week. Also, construction will take place in operational areas that must remain on-line continuously. Approved pre-planned and pre-schedule outages will be for limited areas or equipment only; no outages for entire operational areas will be possible.

1. Access to operational areas will be prohibited during periods of KSC critical operations (major tests, sensitive operations, launches, etc.).
2. Any installation work or testing involving LCC (K6-900) central station equipment in Rooms 2P10 and 1P11 must temporarily cease during emergency dispatch operations.
3. Any installation work or testing involving the CIF (M6-342) central station equipment must temporarily cease during emergency periods such as major network disruptions or unplanned outages.
4. Any installation work or testing involving the VABR (K6-1193) must temporarily cease during emergency periods such as major network disruptions or unplanned outages.

### 1.3.4 Keys and Locks

Provide locked enclosures only where indicated or specified. Locks shall be keyed alike; all keys shall be turned over to the government

### 1.3.5 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and verify field conditions prior to submitting shop drawings. Contractor shall advise the Contracting Officer of any discrepancy before performing the work.

### 1.3.6 Compliance

Equipment shall comply with NFPA 72. The equipment furnished shall be listed by Underwriters Laboratories, Factory Mutual Engineering and Research or other Nationally Recognized Testing Laboratory testing to the equivalent applicable product standards.

### 1.3.7 Software Licenses

Software provided on all computer equipment provided shall be licensed for use by the government; any recurring fees and/or renewals must be disclosed with the bid. Government personnel must be able to change data for all system aspects related to system operation including but not limited to, alarm zones, alarm signal types, users, user privileges, network/radio communication parameters, or any other customizable feature.

License(s) shall be issued to the KSC Information Technology (IT) operations Contractor and be transferable to any entity at the (IT) operations contractor discretion. Licenses provided shall include all Servers, databases, Client Access, and workstations.

### 1.3.8 Delivery and Storage

All equipment delivered and placed in storage shall be protected from the weather, humidity and temperature variations, dirt, dust, and other contaminants.

### 1.4 INFORMATION TECHNOLOGY SECURITY

a. All Information Technology (IT) components and equipment connected to existing KSC networks shall pass network testing and vulnerability scanning tests performed by KSC network and information technology personnel and supported by IT qualified CRMS equipment representatives prior to being connected to existing KSC networks. Reference Section 3.4 TESTING.

b. Immediately after product data submittal, representative(s) from IT equipment suppliers possessing knowledge or factory training and installation skill of the provided products shall be provided on site to perform or directly supervise the installation, make all necessary adjustments, and perform all tests on the system at the site. In addition, the representative(s) shall coordinate with NASA by providing 12 hours (each representative - 3 days of 4 hour sessions) of dedicated consultation time at KSC to assist NASA representative with the creation of a written risk assessment and security review for new or significantly modified hardware, software, or configurations as required prior to deployment. This assessment and review must be complete prior to the qualification test.

c. The Contractor shall submit for approval documentation stating the IT representative's qualifications, training, and experience or certifications in the installation and testing of the provided turn-key product prior to performing work. Alarm automation and network administration operating platform license(s) shall be issued to the KSC base operations Contractor and be transferable to any entity at the based operations contractor discretion. Licenses provided shall include all Servers, databases, Client Access, and workstations. In addition the Contractor shall include software documentation kits for all provided equipment.

d. The Contractor shall provide a Support Portal via the Internet that contains an interactive technical support web forum.

e. All portions of the radio based fire reporting system and any components connected to existing KSC networks, wide area networks, or the Internet shall follow all NASA policies and procedures, based upon NIST security guidance as outlined in NIST publications 800-53.rev2 and 800-82. Firewalls shall be provided as required by the Contractor to ensure security. The products reviewed shall be used as a basis to update IT Security Plans, as applicable. If the hardware or software connects to other systems, the risks shall be presented to Government personnel during IT security consultations.

f. Prior to connection any computer system or equipment to KSC Networks, the Contractor shall comply with NIST 800-53 security controls, 800-82 controls for Industrial Control Systems as outlined below, as well as the NASA FAR supplement 1852.204-76. These documents can be located at:

[HTTP://csrc.nist.gov/publications/nistpubs/800-53-Rev2/sp800-53-rev2-final.pdf](http://csrc.nist.gov/publications/nistpubs/800-53-Rev2/sp800-53-rev2-final.pdf)

[HTTP://csrc.nist.gov/publications/drafts/800-82/draft\\_sp800-82-fpd.pdf](http://csrc.nist.gov/publications/drafts/800-82/draft_sp800-82-fpd.pdf)

[HTTP://www.hq.nasa.gov/office/procurement/regs/5200-11.htm#h2\\_204-76](http://www.hq.nasa.gov/office/procurement/regs/5200-11.htm#h2_204-76)

Contractor will be responsible for meeting and compliance with the following sections of NIST 800-53/800-82. The Contractor shall assume the system to be categorized as a high security level system.

AC-Access Control (AC-4,-6,-8,-10,-11,-12,-17)  
AU-Audit Control (AU-2,-3,-4,-8)  
CM-Configuration Management (CM-2,-3,-4,-6,-7)  
IA-Information Assurance (IA-2,-3,-4,-5,-6)  
MA-Maintenance (MA-2,-3)  
SA-System and Services Acquisition (SA-6,-7,-8,-9,-10,-11)  
SC-System and Communications Protection (SC-3,-8,-9)  
SI-System and Information Integrity Policy and Protection  
(SI-2,-3,-7,-8,-9,-10,-11,-12)

#### 1.5 SYSTEM OPERATION

- a. The facility radio subscriber units shall report alarms to the central station alarm automation system via radio controller equipment. All subscriber radio to radio controller to alarm automation system communications shall be supervised in accordance with NFPA 72.
- b. Where redundant equipment is provided for a particular system component or unless otherwise indicated, transfer of operation to such redundant equipment in event of primary operating equipment failure shall be automatic and occur within 30 seconds.
- c. The K6-900/LCC and K6-1446K/Fire Alarm Shop monitoring locations shall have the ability to initiate remote control signals that activate relays at radio subscriber units.
- d. Operation sequences indicated are based on design drawing configuration. Actual sequences, switching actions, circuit designations, or other variations to sequences indicated in these specifications shall be adjusted as required based on actual equipment and configuration provided.

##### 1.5.1 Design Drawings, Concept, and Alternative Methods

- a. Central station design concept is based on the review of data from multiple vendors and is not meant to define a strict equipment configuration based on any given vendor. Variations in equipment offerings and/or configurations meeting the intent of these specifications are acceptable; however, the following minimum system objectives must be maintained.

1. Use of MESH radio system radio subscriber units, AES/Intellinet Model KSC 7788-F MESH radio system, at the approved KSC frequency.
2. Fully redundant equipment at each of two head-end central station sites, LCC/K6-900 and CIF/M6-342, is required. Each site is to be fully capable of alarm monitoring and/or control with redundant equipment should the other site become disabled (disaster recovery).
3. Transfer of central station control (radio controllers, servers) to the M6-342/CIF back-up site shall not require re-programming of equipment such as radio subscriber units or head-end antenna radio transceivers.

4. Redundant network connectivity and managed switching between the (2) head-end central station sites, LCC/K6-900 and CIF/M6-342, is required. Reference Section 1.5.2 NETWORKED CENTRAL RADIO MONITORING SYSTEM - GENERAL REQUIREMENTS.
  5. It shall be possible to install and test all hardware and software modifications at the secondary CIF/M6-342 site without affecting on-line primary equipment operation at the primary K6-900/LCC site. Full transfer of operations to the redundant CIF/M6-342 site shall be accomplished prior to modifying primary LCC/K6-900 head-end equipment. Reference Section 1.5.3.3 SYSTEM HARDWARE/SOFTWARE MODIFICATION SEQUENCE.
  6. Redundant equipment at each site, LCC/K6-900 and CIF/M6-342, shall automatically maintain database synchronization with primary equipment.
  7. Except where A-B type manual switching is specifically indicated, redundant equipment at each site, LCC/K6-900 or CIF/M6-342, shall automatically (without operator intervention) back-up the primary on-line equipment in event of its failure.
  8. Equipment at the back-up CIF/M6-342 site shall be capable of updating its databases to like equipment at the primary K6-900/LCC site. Reference Section 1.5.3.2 DATABASE REPLICATION USING THE NETWORK.
  9. Primary LCC/K6-900 dispatcher and operator interface shall be using the alarm automation system workstations. Radio controller displays and controls shall be available upon failure to back-up the alarm automation system. Two (2) Room 2P10 alarm automation workstations indicated (Workstations 2 and 3) shall utilize an existing KVM system to allow operation at selectable fire console locations.
  10. The K6-900/LCC and K6-1446K/Fire Alarm Shop monitoring locations shall have the ability to initiate remote control signals that activate relays at facility radio subscriber units.
  11. All server equipment shall include tape back-up means for off-site database storage.
  12. Equipment provided must meet AC power circuit and Uninterruptible Power Supply sizes indicated.
- b. Provide the following information with the bid:
1. Contractor's proposed equipment and network arrangement in block diagram form.
  2. Method and operator interface required for remote control or relays installed inside radio subscriber units from central station monitoring locations.
  3. Written point-by-point description of any clarifications to these specification requirements including the use of alternate methods to meet intent. Include exact specification paragraph number reference for each and all clarifications.
  4. Recurring software license and technical support fees shall be disclosed.

5. All software operating system platforms to be used on all supplied computer equipment.

6. List of all equipment not UL listed or FM approved; all such equipment shall be approved by a nationally recognized testing laboratory. All such equipment shall be reviewed against applicable UL or FM criteria and approved by the KSC Authority Having Jurisdiction prior to being installed at KSC. For all equipment not UL listed or FM approved, provide the nationally recognized testing laboratory criteria and cross-reference to all applicable UL/FM criteria to demonstrate equivalency.

#### 1.5.2 Networked Central Radio Monitoring - General Requirements

a. All network connected equipment shall be SNMP Version 2 compliant for full function monitoring (SNMP traps) and, where indicated, direct control on SNMP web browser based network.

b. All networked equipment shall be capable to accepting time and date from an existing KSC Time Protocol Server using NTP.

c. All networked cabling within facilities shall be provided as indicated by the Contractor. The Government shall provide all network connections indicated between facilities.

d. The Government will provide a basic configuration for the Foundry FESX648 FastIron Ethernet switches. This configuration meets the NASA IT Security Standards and Government Contractor Standard Practices for the switches. The default VLAN for the Network Administration shall be different from the administration VLAN for the Radio Controller/Transceiver and associated servers. This is required because different organizations will be maintaining the equipment. Separate operations VLAN(s) for Radio Controller/Transceiver and associated servers is required.

e. The final network administration will be accomplished on existing workstations installed at KSC. For development and demonstration of the Network Administration workstation purposes, the contractor shall provide a lap top Window PC running XP Pro with current security patches. The Network Administration software should be able to accept SNMP traps, presently HP Open View and What's Up Gold in use at KSC. Once testing is complete and the laptop and software installed shall be turned over to the government for software transfer to existing equipment.

f. The government will define the device IP's, subnet masks, and VLAN numbers to be used after contract award. This is required to integrate the new devices into the existing systems.

g. The Contractor is responsible for the development of all required network scripts to turn Ethernet switch ports ON/OFF and/or to modify routing and VLANS to prevent IP clashes and allow functionality as described in the following paragraph "NETWORKED CENTRAL RADIO MONITORING SYSTEM SEQUENCE OF OPERATION. VLANS will be referenced as follows in the sequence of operations:

1. VLAN 1 - Default VLAN is not used.
2. VLAN 2 - Production VLAN. This is the operational VLAN performing

the critical fire alarm monitoring function.

3. VLAN 3 - R&D VLAN. This is a non-operational VLAN, but all equipment operating on this VLAN communicates with each other as if connected to Production VLAN 2.

Note: Network Administration is on a VLAN separate from the (3) above.

#### 1.5.3 Networked Central Radio Monitoring System Sequence of Operation

a. Normal configuration signal transmission from remote facility fire alarm control panels to fire dispatcher/operators is as follows:

1. Fire alarm signal from facility FACP is transmitted to field radio subscriber unit. Method of interface between the radio subscriber unit and the facility FACP can be either by FACP dry contact (relay) to radio subscriber unit zone input or by FACP serial output to radio subscriber unit serial input, DAC or printer port.

2. Field radio subscriber unit transmits signal to optimal base antenna, A1 or B1.

3. Signal receiving base antenna and radio transceiver (A1 or B1) transmits signal to primary LCC Radio Controller A1.

4. Primary LCC Radio Controller A1 processes base antenna signal and transmits a serial data alarm automaton output stream to its connected Ethernet Converter A1. If possible, alarm automation output data stream should be communicated via Ethernet connection, eliminating the need for serial conversion.

5. Primary LCC Central Station Alarm Automaton Server A1 receives alarm data from Radio Controller A1 (via Ethernet Converter if required).

6. All Central Station Alarm Automaton Workstations 1/2/3/4 and future Workstation 5 access Central Station Alarm Automaton Server A1 to display alarm for dispatch and acknowledgement purposes.

b. Fully redundant on-line ("production") equipment shall be located at the Launch Control Center K6-900 (LCC). This equipment consists of primary/back-up Radio Controllers A1/A2, primary/back-up Central Station Alarm Automaton System Servers A1/A2 and Workstations 1, 2, and 3. This equipment is the operating on-line Central Station System except during hardware/software upgrades, an LCC evacuation, or a major LCC power or equipment failure.

c. Workstation 4 and future Workstation 5 shall be located at the Fire Alarm Shop. Depending on the privileges of the logged on user, they are normally used for acknowledging and dispatching trouble signals. They can also be used for back-up fire dispatch since the necessary communications infrastructure is available.

d. Back-up ("R&D") redundant equipment shall be located at the Central Instrumentation Facility M6-342 (CIF) Data Center. This equipment consists of primary/back-up Radio Controllers B1/B2, primary/back-up Central Station Alarm Automaton System Servers B1/B2 and Workstation 6. This equipment serves as an R&D site for testing hardware/software upgrades and an alternate operating site in case of an evacuation or major equipment

failure at the LCC.

e. Base radio antennas A1/B1 and associated transceiver communication equipment shall be located at the LCC and CIF respectively and are connected to Ethernet Switches of same designation, A1/B1.

f. Dedicated radio controller administration workstations shall be installed at the K6-1446K Fire Alarm Shop and M6-342 CIF sites. These workstations shall be used for radio controller database changes and to monitor the status of the MESH radio network. Normally these workstations shall monitor the status radio controllers A1 and A2, but shall be capable of being switched via control script to radio controllers B1 and B2.

g. Equipment at the LCC, Fire Alarm Shop and CIF sites shall be interconnected using a redundant Ethernet switching system, Switch Set 1 and Switch Set 2, connected in a loop configuration.

1. All computer equipment is connected separately to both Switch 1 and Switch 2 using redundant network interface ports, and shall be capable of operating from either network or both networks.

2. All switches are configured in a loop arrangement.

3. The managed Ethernet switches shall have the ability to connect and disconnect any network connections or connect/disconnect any combination of central station equipment from the network via the controlling network administration workstation by use of VLANs, turning ports OFF/ON, or a combination of both. Control sequences shall be by automated software scripts activated by manual operator entry. Network switching sequences and software scripts shall be written to perform the following operations:

- i.) Perform database update process indicated in Section 1.5.3.2, DATABASE REPLICATION USING THE NETWORK.

- ii.) Perform hardware and software modification process indicated in Section 1.5.3.3, SYSTEM HARDWARE/SOFTWARE MODIFICATION SEQUENCE.

- iii.) Perform additional functions per Section 1.5.3.4, OTHER NETWORK SWITCHING FUNCTIONS.

4. Central Station System shall continue to operate in the event of any single cable, Ethernet Switch, power supply, or network interface port failure. Any network communications component or cable failure shall be annunciated as a trouble condition (SNMP Traps) on the network administration workstations.

5. The managed Ethernet switching system shall be monitored and controlled from Network Administration Workstations independent of the alarm automation system workstations and located at an existing KSC site. Provide a laptop network administration computer for development and testing purposes to be turned over to the Government.

6. Network cabling and connections between Managed Ethernet Switches A1/C1, C2/B2 and B1/A2 shall utilize an existing KSC local area network system supporting other operating applications. All other wiring indicated shall consist of network cabling dedicated to CRMS equipment only.

## 1.5.3.1 Normal Equipment Configuration and Back-up

- a. Primary LCC Radio Controller A1 is controlling, communicating to, and supervising all field radio subscriber units via Base Antennas A1 and B1.
- b. Primary LCC Central Station Alarm Automaton System Server A1 receives and processes the Radio Controller A1 Alarm Automaton (alarm) data. If required, converter(s) compatible with the radio controller and alarm automation server equipment shall be provided to convert the serial data to Ethernet TCP/IP format.
- c. LCC Radio Controller A2 shall automatically back-up on-line Radio Controller A1. It shall monitor the status of and keeps its database current to Radio Controller A1. Radio Controller A2 does not communicate with Base Antennas A1/C2/B1 or provides serial Alarm Automaton system data to the Central Station Alarm Automaton System unless Radio Controller A1 fails.
- d. If the transfer of a failed LCC primary radio controller unit A1 or its connected serial data concentrator to redundant equipment is not completely automatic such that the secondary radio controller automatically establishes full connectivity and functionality with the alarm automation system, then provide an A-B switch system for the manual transfer of radio controller equipment as indicated and specified in Section 2.5.4, "Rack-Mounted Data Cable A-B Switch System". Transferring the A-B switch system to the "B" (redundant) position shall interrupt all communications to and from the primary radio controller and its connected serial data concentrator, and switch in any redundant equipment necessary to initiate the remaining transfer to redundant equipment by fully automated means. The only operator action required shall be manually switching a single selector switch to the redundant "B" position.
- e. Central Station Alarm Automaton System Servers A2, B1, and B2 shall automatically back-up on-line Server A1. They shall monitor the status of and keep their database current with Server A1.
- f. All Central Station Alarm Automation System Workstations 1/2/3/4/5 shall normally operate from Server A1. If the workstations lose communications to a Server they shall automatically transfer in a progressive pre-assigned fail-over sequence as follows: A1, A2, B1, B2.
- g. LCC alarm automation system workstation interfaces (keyboard-video monitor-mouse-audio) shall be as follows:
  1. Alarm automation system Workstation 2 and 3 computers shall be located in separate equipment racks located in Room 1P11. Their operator interface components are KVM switched to designated (and selectable) operator consoles (1 through 7) in Room 2P10.
  2. Alarm automation system Workstation 1 computer and operator interface components (keyboard-video monitor-mouse-audio) shall be installed at Room 2P10 Operator Console 1 which is normally not manned; there is no KVM or audio switching. Alarm automation system Workstation 1 is normally logged onto by an operator using alarm automation system Workstation 2 or 3. If alarm automation system Workstation 2 and/or 3 KVM switching fails, Workstation 1 provides audible annunciation of alarms and means of acknowledgement and dispatch.

h. The CIF Servers (B1, B2), Alarm Automation Workstation 6, Network Administration Workstation, and the Radio Controller Administration Workstation shall be KVM switched to a single rack mounted keyboard, mouse, and video monitor.

i. The following CIF site back-up/R&D head-end equipment is assumed disconnected from the LCC/production head-end equipment during normal operations.

1. CIF Radio Controllers B1 and B2. Base Antenna radio transceiver IP addresses shall be fixed. It is assumed that each Base Antenna Ethernet transceiver can only point to two IP address, a primary and back-up radio controller. In this event, the CIF back-up radio controllers B1 and B2 have the same IP address and are configured identically to LCC Radio Controllers A1 and A2 respectively.

j. Equipment and AC power sources shall be grouped as follows:

1. Unless otherwise indicated, primary equipment with designation "1" (A1, B1, etc.) shall not be grouped in the same enclosure or rack with secondary equipment designated "2" (A2, B2, etc.).

2. Each equipment rack shall be provided with two separate power sources indicated, Source 1 and Source 2.

3. Where dual power supplies are employed on equipment then one supply shall be normally powered from Source 1 and the other from Source 2.

#### 1.5.3.2 Database Replication Using the Network

a. LCC Radio Controller A1 and Central Station Alarm Automaton Server A1 are primary on-line units and are controlling.

b. LCC Radio Controller A2 automatically keeps its database current with radio controller A1.

c. Central Station Alarm Automaton Servers A2, B1, and B2 automatically keep their database current with Server A1.

d. CIF Radio Controllers B1/B2 are manually updated on a schedule as follows:

##### **Control Script Sequence 1 to Separate Head-End Equipment:**

1. All CIF head-end equipment except Radio Transceiver B1 connected to Ethernet Switches B1 and B2 is transferred from Production VLAN 2 to R&D VLAN 3.

##### **Control Script Sequence 2 to Update Radio Controller B2 Database:**

2. Back-up CIF Radio Controller B2 is physically disconnected from the network by turning OFF ports 2 and 5 on Ethernet Switch B2.

3. Back-up LCC Radio Controller A2 is transferred from Production VLAN 2 to R&D VLAN 3.

4. CIF Radio Controller B1 database is updated to that of LCC Radio Controller A2.

**Control Script Sequence 3 to Return the LCC-Head-End to Normal Configuration and Update Radio Controller B2 Database:**

5. Back-up LCC Radio Controller A2 is transferred from R&D VLAN 3 to Production VLAN 2.
6. Back-up CIF Radio Controller B2 is physically re-connected to the network by turning ON ports 2 and 5 on Ethernet Switch B2.
7. CIF Radio Controller B2 updates its database to that of CIF Radio Controller B1.
8. Correct operation of all CIF head-end equipment is verified on R&D VLAN 3.

**Control Script Sequence 4 to Return CIF Head-End Equipment to Normal Configuration:**

9. All CIF head-end equipment, except Radio Controllers B1 and B2 are transferred to Production VLAN 2 and communications is re-established with LCC head-end equipment.

**1.5.3.3 System Hardware/Software Modification Sequence**

System shall be configured such that hardware modifications or software modifications related to operating system code (not applicable for data changes such as adding or deleting monitored facilities or points) shall be performed in a staged process with minimal disruption to central station reporting. The only central station reporting outages acceptable are those to perform short (10 minute duration) end-to-end tests of modified equipment using a remote facility radio subscriber unit. Modifications shall be fully tested at the CIF R&D site prior to transferring to the LCC production site as follows:

- a. Update CIF databases to latest LCC via 1.5.3.2.
- b. **Control Script Sequence 1** - All CIF head-end equipment except Radio Transceiver B1 connected to Ethernet Switches B1 and B2 is transferred from Production VLAN 2 to R&D VLAN 3.
- c. Modifications to the CIF (R&D) site head-end equipment are made and tested.
- d. Field Subscriber Radio End-To-End Validation Test Performed on completed CIF R&D site modifications :
  1. Central Station reporting outage period opened.
  2. **Control Script Sequence 5** - Radio Transceiver A1 and B1 are transferred from Production VLAN 2 to R&D VLAN 3.
  3. End-to-End Test performed from facility radio to CIF Workstation 6 via the CIF head-end.
  4. **Control Script Sequence 6** - Radio Transceivers A1 and B1 are transferred from R&D VLAN 3 to Production VLAN 2.
  5. End-to-End Test performed from a facility radio to LCC

Workstations via the LCC head-end to verify normal communication links are restored.

6. Central station reporting outage period is closed (complete).
- e. Perform modifications on LCC Workstation 3 and Fire Alarm Shop Workstation 4.
1. Workstations 1 and 2 manned at the LCC for fire dispatch and future Workstation 5 is manned at the Fire Alarm Shop (controlled by LCC head-end equipment).
  2. **Control Script Sequence 7** - LCC Workstation 3 and Fire Alarm Shop Workstation 4 are transferred from Production VLAN 2 to R&D VLAN 3.
  3. LCC Workstation 3 and Fire Alarm Shop Workstation 4 are modified and tested on the R&D (CIF) network.
- f. Transition Fire Dispatch Operations to LCC Workstation 3, Fire Alarm Shop Workstation 4 operating from the CIF head-end, and modify remaining LCC and Fire Alarm Shop site equipment as follows:
1. Central station reporting outage period is opened.
  2. **Control Script Sequence 5** - Radio Transceiver A1 and B1 are transferred from Production VLAN 2 to R&D VLAN 3.
  3. Perform end-to-end Test from facility radio to LCC Workstation 3 and Fire Alarm Shop Workstation 4 via the CIF head-end operating on R&D VLAN 3.
  4. Workstations 3 manned at LCC for fire dispatch; Fire Alarm Shop Workstation 4 is contingency back-up.
  5. Central station outage period is closed (complete).
  6. Perform modifications and testing on LCC Radio Controllers, Servers A1/A2, future Fire Alarm Shop Workstation 5, and LCC Workstations 1 and 2 operating on Production VLAN 2.
- g. End-to-End test of modified LCC Site equipment.
1. Central Station reporting outage period opened.
  2. **Control Script Sequence 6** - Radio Transceiver A1 and B1 are transferred from R&D VLAN 3 to Production VLAN 2.
  3. End-to-End Test performed from a facility radio to LCC Workstations 1 and 2 and via the LCC head-end.
  4. **Control Script Sequence 8** - LCC Workstation 3 and Fire Alarm Shop Workstation 4 are transferred from R&D VLAN 3 to Production VLAN 2.
  5. **Control Script Sequence 4** - All CIF head-end equipment, except Radio Controllers B1 and B2 are transferred to Production VLAN 2 and communications is re-established with LCC head-end equipment.
  6. End-to-End test performed from a facility radio to all workstations via the LCC head-end on Production VLAN 2.

#### 1.5.3.4 Other Network Switching Functions

- a. **Control Script Sequence 9** - Transfer of Head-End Operation from the LCC to the CIF.
  1. Physically disconnect LCC Radio Controllers A1 and A2 from the network by turning OFF Ports 2 and 5 on Ethernet Switches A1 and A2.
  2. Transfer the operation of CIF Radio Controllers B1 and B2 from R&D VLAN 3 to Production VLAN 2.
- b. **Control Script Sequence 10** - Transfer of Head-End Operation from the CIF to the LCC.
  1. Transfer the operation of CIF Radio Controllers B1 and B2 from Production VLAN 2 to R&D VLAN 3.
  2. Physically reconnect LCC Radio Controllers A1 and A2 to the network by turning ON Ports 2 and 5 on Ethernet Switches A1 and A2.
- c. **Control Script Sequence 11** - Transfer CIF Radio Administration Workstation from Production VLAN 2 to R&D VLAN 3.
- d. **Control Script Sequence 12** - Transfer CIF Radio Administration Workstation from R&D VLAN 3 to Production VLAN 2.
- e. **Control Script Sequence 13** - Transfer Fire Alarm Shop Radio Administration Workstation from Production VLAN 2 to R&D VLAN 3.
- f. **Control Script Sequence 14** - Transfer Fire Alarm Shop Radio Administration Workstation from R&D VLAN 3 to Production VLAN 2.

## PART 2 PRODUCTS

Equipment installed in LCC (K6-900) must be capable of being installed racks with 24-inch clearance from front to rear door.

### 2.1 REMOTE FACILITY FIRE ALARM RADIO SUBSCRIBER UNITS

- a. Provide subscriber units as indicated with radio transceivers manufactured by AES/Intellinet Corporation, Model KSC 7788F. Unit shall be RF Type 6 per NFPA 72 and UL listed for Central Station Service per UL 827 and UL 864. Unit shall comply with FCC Rules, part 15 and 90. Radio subscriber units shall be fully compatible with and listed for use with the central station radio controller equipment provided.
- b. All units of a common configuration shall be interchangeable with the other devices furnished by the manufacturer. Each transmitter and any interface devices shall be the manufacturer's current commercial product completely assembled, wired, tested at the factory, and delivered ready for installation and operation.

#### 2.1.1 Frequency Allocation

The unit shall operate in the radio frequency range of 130-174 MHz with 12.5 KHz channel spacing. Specific KSC licensed frequency will be provided at the time of award.

### 2.1.2 Power Requirements

a. Units shall be powered by a combination of locally available 120 VAC, as indicated, and standby batteries. Step-down low voltage AC power transformers, if required, shall be UL listed for use with the radio transceiver. In the event of loss of 120 VAC power, the transceiver shall automatically switch to battery operation with no interruption of protective service. Upon restoration of ac power, transfer back to normal ac power supply shall be automatic and the battery shall be recharged. The battery and battery charger shall be installed within the transmitter housing.

b. All power trouble conditions including low battery voltage, AC power failure, and charger trouble shall be reported to the CRMS workstations via the central station controller equipment and, if provided, activate the local trouble contact. AC power failure signal shall include programmable delay time to eliminate unnecessary signals due to short power outages.

#### 2.1.2.1 Battery Standby Power

The battery shall be sealed; UL listed for use with the unit and incorporate battery output fusing. Radio fire alarm subscriber unit standby battery capacity shall provide sufficient power to operate the unit in a normal standby status for a minimum of 24 hours and shall be capable of all communications during that period.

### 2.1.3 Functional Requirements

#### 2.1.3.1 Facility Fire Alarm Control Panel Connections

a. Radio subscriber units shall incorporate the provisions for auxiliary interconnection to existing facility fire alarm systems. Unit shall have a minimum of eight (8) input zones to provide general reporting via Fire Alarm Control Panel dry relay contacts as indicated. Zones shall be Class B type with end-of-line resistor supervised for open circuit and ground fault conditions. An additional radio Form-C dry relay contact for trouble conditions (antenna cut, loss of power, low battery, etc.) shall also be provided if required by listing agency.

b. Where a serial digital data interface to a fire alarm control panel is required, provide a serial data module in addition to the 8 input zones specified above. Serial data module must be supervised for wiring or communication trouble conditions and must be compatible for communications with Simplex 4100 to 4100U model series fire alarm control panels.

c. Where a digital control output is required; provide relays with Form-C contacts controlled from the remote monitoring locations.

d. All wiring trouble conditions shall be reported to the CRMS workstations via the central radio controller equipment and, if required, activate the local trouble contact.

#### 2.1.3.2 Generation of Signals

Each radio subscriber unit shall be a standard design which allows the immediate transmission of all initiated signals. Units shall have memory capability. Multiple, simultaneous alarms shall not result in the loss of any messages. Messages shall be stored until they are transmitted and confirmed received.

#### 2.1.3.3 Power Output and Antenna

- a. The radio frequency (RF) power output of each radio subscriber unit shall be sufficient for reliable alarm reporting. The minimum RF power output shall be 5 Watts unless otherwise indicated.
- b. Standard gain antenna mounted directly on the radio enclosure shall be provided unless otherwise indicated. It shall be assumed that units will require relocation to within 10 feet of the indicated location to compensate for RF signal quality issues. Where indicated provide separate standard gain antenna or high db high gain antenna with outdoor mounting provisions indicated. Use manufacturer's required and listed interconnecting cables and Polyphaser IS-B50HN-C1 or equal surge protector for such antennas.

#### 2.1.3.4 Local Indications

Unit shall include local diagnostic indications for communications, trouble, and alarm status. Local reset means shall also be provided.

#### 2.1.4 Radio Subscriber Unit Enclosures

- a. Radio transceiver, input zone assembly, serial data module, battery charger, and batteries shall be housed in the manufacturer's standard metal enclosure.
- b. Provide separate enclosure(s) as required for 120 VAC power supply components including but not limited to receptacle, plug-in step-down power transformer, and AC power surge suppression.
- c. Enclosure front door shall be hinged and lockable. Indoor units shall be rated NEMA 1 and outdoor units shall be rated NEMA 4X (fiberglass type). All enclosures shall be painted manufacturer's standard fire alarm red.
- d. Internal components shall be protected from vandalism by a tamper-proof lock on the enclosures. The housing shall allow access to all internal components for testing, servicing, and replacement at the installation site.
- e. Each enclosure shall be labeled on the front surface with the wording "FIRE MONITORING SYSTEM TRANSCIEEVER UNIT ####" (indicate assigned transceiver code number). The label shall be in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

#### 2.1.5 Wiring

Wiring shall be listed for use with the radio transceiver. Use 300V FPL rated shielded cable or cable as required by the radio transceiver manufacturer.

#### 2.1.6 Special Tools and Spare Parts

Special tools necessary for the programming and maintenance of the equipment shall be furnished, used during the installation as required, and turned over to the government.

## 2.2 CENTRAL STATION RADIO CONTROLLERS

### 2.2.1 Central Radio Controller System

- a. Provide dual-redundant master radio fire alarm central radio controller systems as indicated. Radio controllers shall be compatible with all other interconnected equipment provided including radio transceiver units, MESH radio subscriber units, and CRMS Alarm Automaton System (servers/operator workstations) equipment. Radio controllers shall be completely assembled, wired, tested at the factory, and delivered ready for installation and operation. Transceivers shall be the most current solid-state design available and be listed for Central Station Service per UL 864.
- b. Central receiver operation and connectivity shall be per Section 1.5 SYSTEM OPERATION. Network security shall be per Section 1.4 INFORMATION TECHNOLOGY SECURITY.
- c. Input power shall be 120 VAC, 60-Hertz, single-phase. A power on/off switch shall be provide on the unit. If the power on/off switch is accessible from the front of the unit where the operator displays and controls are located, then the switch shall be guarded or require activation for a minimum of 5 seconds in order to interrupt power to the unit.
- d. Unit shall be designed for mounting in a standard 19-inch rack (not shelf mounted). Unit shall include its own cooling fan and shall be suitable for operating in a temperature range of 55 Degrees F to 95 Degrees F. If the unit is overheating it shall result in audible and visual trouble indications at the transceiver unit that specifically identify this trouble condition locally and at the CRMS Alarm Automaton workstations.
- e. System shall allow new radio subscriber units and associated zone or serial data to be configured and placed on-line without interruption of the operating software and provide a real-time graphical display of the signal traffic received.
- f. System shall allow control of relay outputs at remote facility radio subscriber units from the K6-900/LCC and K6-1446K/Fire Alarm Shop monitoring locations.
- g. Unit shall retain its memory in the event of a total loss of power to the unit.

#### 2.2.1.1 CRMS Alarm Automation System Connectivity

The central station controller unit shall provide bi-directional connectivity to the CRMS Alarm Automaton system by either an Ethernet port or a serial data port. Communications over and connectivity to this port shall be supervised and the loss of communications with the CRMS Alarm Automaton system shall result in audible and visual trouble indications at the transceiver unit that specifically identify this trouble condition.

#### 2.2.1.2 Network Connectivity

The central station receiver unit shall provide connectivity to a local area network, wide area network, or the internet via Ethernet port(s) Communications over and connectivity to this port shall be supervised (Ethernet via universal data packet-UDP) and the loss of network

communications shall result in audible and visual trouble indications at the transceiver unit that identify this trouble condition. If the CRMS Alarm Automaton system is connected to a dedicated serial port, then loss of network communications shall also be annunciated at the Alarm Automaton system workstations.

#### 2.2.1.3 Workstation Interface

a. Access to radio controller unit set-up, configuration, database maintenance, and other maintenance functions shall be by a network connected workstations (See 2.5.1) using a password protected Graphical User Interface (GUI). Access to the radio controller using the GUI or local KVM equipment shall not be required for back-up controller equipment to assume control in the event of primary equipment failure. The GUI shall be used to perform functions including but not limited to:

1. Assign user and passwords; password for each user shall be unique.
2. Assign functions to users based on their responsibility: administrator, engineer, other.
3. Configure any required system parameters such as date, time, etc.
4. Configure Ethernet communications.
5. Configure CMFS Alarm Automaton communications.
6. Configure field subscriber radio unit interface tables.
7. Database back-up and maintenance functions.
8. Radio network management functions.
9. Controlled server program shutdown and restart functions.

#### 2.2.1.4 Receiver Unit Operator Displays and Controls

a. Normal receipt and acknowledgement of alarm, trouble, and supervisory signals shall be through the CRMS Alarm Automation (server/workstations) system with printer output back-up. Alarm silence, acknowledgement, or closing at the radio controller equipment shall not be required if the alarm automation system is operational.

b. In the event of CRMS Alarm Automation system failure or loss of communications, the radio controller shall include the following minimum operator displays and control functions:

1. Audible alert sounder and visual alert indication activated upon receipt of any signal from a radio subscriber unit or control unit trouble signal.
2. LCD display showing as a minimum, signal type, facility number, reporting zone in alarm zone, time, and date.
3. Silence button that silences the audible alert signal.
4. Acknowledge button that acknowledges any alert or trouble signal and removes it from the message queue.

5. Print all alarm signal information and operator actions at a local printer.

#### 2.2.2 Radio Frequency Transceiver System

- a. Provide MESH radio transceiver and antenna units that are fully compatible with and provide the interface link between remote radio subscriber units and the central station radio controller units. Unit shall be RF Type 6 per NFPA 72 and listed for Central Station Service per UL 827 and UL 864. Unit shall comply with FCC Rules, part 15 and 90.
- b. All transceivers of a common configuration shall be interchangeable with the other devices furnished by the manufacturer. Each transceiver and any interface devices shall be the manufacturer's current commercial product completely assembled, wired, tested at the factory, and delivered ready for installation and operation.
- c. Each transceiver shall be a standard design which allows the immediate transmission of all initiated signals to and from the central receiving unit and remote facility radio subscriber units. Transceivers shall have memory capability. Multiple, simultaneous alarms shall not result in the loss of any messages. Messages shall be stored until they are transmitted and confirmed received.

##### 2.2.2.1 Radio Frequency, Antenna, and Feedline cable.

- a. The unit shall operate in the radio frequency range of 130-174 MHz with 12.5 KHz channel spacing. Specific KSC approved frequency will be provided at the time of award. The radio frequency (RF) power output of each transmitter shall be sufficient for reliable alarm reporting. The minimum RF power output shall be 5 Watts.
- b. The antenna system shall be either omni-directional or shaped-coverage as selected by the Contractor based on the topography. The antenna system and cabling shall be furnished to provide adequate system gain. The antennas shall be capable of withstanding the environmental conditions of 125 mph wind without failure. Antenna supporting structures shall be fabricated from Type 316 stainless steel.
- c. Feedline cable, (transmission line between the transmitter/receiver and the antenna), shall be 50-ohm impedance rated for the transmitter output power. Utilize LMR-400 and LMR-240 or equivalent cable as described in the construction drawings. Overall line loss from the transmitter/receiver to the antenna, including cable, connectors, and surge protector shall not exceed manufacturer's recommendations.

##### 2.2.2.2 Power Requirements

- a. Transceivers shall be powered by a combination of locally available 120 VAC, as indicated, and standby batteries. Step-down low voltage AC power transformers, if required, shall be UL listed for use with the radio transceiver. In the event of loss of 120 VAC power, the transmitter shall automatically switch to battery operation with no interruption of protective service. Upon restoration of ac power, transfer back to normal ac power supply shall be automatic and the battery shall be recharged. The battery and battery charger shall be installed within the transmitter housing.
- b. All power trouble conditions including low battery voltage, AC power

failure, and charger trouble shall be reported to the CRMS workstations via the radio controller equipment.

#### 2.2.2.3 Battery Standby Power

The battery shall be sealed type; UL listed for use with the unit and incorporate battery output fusing. Radio fire alarm transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 24 hours, and shall be capable of all communications during that period.

#### 2.2.2.4 Transceiver Enclosures

a. Radio transceiver, filter, and standby batteries shall be housed in the manufacturer's standard metal enclosure(s). Provide separate enclosure(s) as required for 120 VAC power supply components including but not limited to receptacle, plug-in step-down power transformer, and AC power surge suppression.

b. Enclosure front door shall be hinged and lockable. Indoor units shall be rated NEMA 1 and outdoor units shall be rated NEMA 4X (Type 316 stainless steel). All enclosures shall be painted the manufacturer's standard fire alarm red.

c. Internal components shall be protected from vandalism by a tamper-proof lock on the transmitter enclosures. The housing shall allow access to all internal components for testing, servicing, and replacement at the installation site.

d. Each publicly accessible transmitter shall be labeled on both sides and on the front surface with the word "FIRE MONITORING SYSTEM -BASE RADIO TRANSCEIVER." The label shall be white with red lettering. The label shall be in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

#### 2.2.2.5 Wiring

Wiring to radio equipment shall be in accordance with the manufacturer's requirements. Use 300V FPL rated shielded data cable as required by the radio transceiver manufacturer. All data inputs shall be surge protected using data surge suppressors listed per UL 497B. Use manufacturer's required and listed interconnecting cables and surge suppressors for antenna wiring.

#### 2.2.2.6 Special Tools and Spare Parts

Special tools necessary for the programming and maintenance of the equipment shall be furnished, used during the installation as required, and turned over to the government.

### 2.3 RADIO FIRE ALARM OPERATOR INTERFACE - CRMS ALARM AUTOMATION SYSTEM

#### 2.3.1 General

a. Provide dual-redundant server configuration with client workstations, and associated hardware and software equipment as indicated. Hardware and software shall be fully compatible with the connecting central station radio controller units, be of the most current design, and be UL 1981 classified for fire alarm monitoring.

b. Client workstation and server hardware connectivity, normal operation, and redundant equipment fail-over operations shall be as indicated and per Section 1.5 SYSTEM OPERATION. Network security shall be per Section 1.4 INFORMATION TECHNOLOGY SECURITY.

c. The system shall retain its memory in the event of a total loss of power to the unit.

#### 2.3.1.1 Connectivity to Radio Controller Unit

The CRMS alarm automaton system shall provide connectivity to all primary and redundant central station radio receiving units by an Ethernet network connection, serial data port connection, or serial data to Ethernet conversion (serial concentrator) connection. This communications link shall be supervised and the loss of communications between the CRMS alarm automation and radio controller systems shall result in audible and visual trouble indications at the operator workstations.

#### 2.3.1.2 Network Connectivity

The central station alarm automation system unit shall provide connectivity to a fully redundant local area network, wide area network, or the internet via Ethernet network interface ports with failover operation. Loss of communications or loss of connectivity on one network shall not result in a loss of communications. Communications over and connectivity to these redundant networks shall be supervised (Ethernet via universal data packet-UDP), and the loss of supervised communications shall result in audible and visual trouble indications that identify the trouble condition.

#### 2.3.1.3 Operation Requirements

a. The system shall allow the user to define signal type (alarm classifications) in the following priority order:

1. Fire Alarm
2. User Defined
3. User Defined
4. Fire Supervisory
5. User Defined
6. Fire Trouble
7. User Defined
8. User Defined

b. The system shall have the ability to assign different audio wav files to each of the different classification of alarms above for distinguishable signal type audible annunciation.

c. The system shall allow each alarm classification above to be viewed and acknowledged at user pre-defined workstation(s) (signal "filtering" or "vectoring"). If a workstation is not on-line or the signal is not acknowledged within a preset period of time, the signal shall be annunciated and acknowledged at one or more redundant workstation locations. All such assignments may be user configurable in real time with proper password privilege. General operational requirement (based on logged on user privileges) is as follows:

1. Acknowledge fire alarm and fire supervisory signals at one LCC

Room 2P10 workstation location (Workstation 3 - fire seat).

2. Acknowledge other signal types at another LCC Room 2P10 workstation (Workstation 2).
3. Acknowledge trouble signals at the fire alarm shop (Workstations 4 - maintenance seat).
4. Annunciate all signals, except trouble signal sent to Maintenance Workstation 4, at LCC 2P10 Workstation 1, but allow acknowledgement at the other assigned workstation.
5. On-Test Feature: Temporarily allow all signals from multiple (up to 5) defined radio subscriber units to be monitored by only pre-defined workstations (generally fire alarm shop Workstations 4 and 5) for new installation, major modification or maintenance testing purposes. Activation of feature shall be based on user logon privilege.

d. The system shall include capability to automatically send notification of alarm signals received to multiple alphanumeric-pagers and/or email addresses, based on facility, signal type and zone. E-mail transmission shall be outbound only to a KSC server and shall be in SMTP format. E-mail alarm information shall include but not be limited to facility number, signal type and zone. When a facility radio transceiver is configured for test mode, the e-mail and paging transmission shall be inhibited except to addresses or pager numbers specifically designated to receive the test signals.

e. All activity, both automatic and operator inputs, associated with all alarms shall be archived on the servers for historical record purposes and to provide a complete alarm signal and operator input log/audit trail. It shall be possible to transfer history database information to back-up media to free-up hard drive space.

f. Each work station shall be capable of any function from view only, to dispatch operation, to engineer operation, to system administration based on the privilege of the logged on user. Each of these functions will have its own set of screens with access based on user account authorization. Each user shall have specific privileges related to alarm acknowledgement such that only qualified dispatchers acknowledge emergency signals. These functions shall be an integral part of the overall system software application. The system shall accommodate simultaneous operations from multiple users.

g. Software shall include provisions for general system installation and maintenance related to radio controller, radio subscriber unit, database backup/restore, and system administration.

h. System shall allow new radio subscriber units and associated zone or serial data to be configured and placed on-line without interruption of the operating software.

i. The system shall have the ability to automatically bypass or transfer cyclic (swinging) alarm, trouble, and supervisory signals from facility/field systems. Cyclic frequency rate shall be user selectable to 3 or more cycles per minute.

j. The system shall monitor for system trouble situations and generate alarm signals to alert the dispatch staff of these situations.

k. The system shall provide the ability to create a variety of user defined templates to make data entry or alarm acknowledgement easier based on user defined data fields to include complete facility/systems, zones list, telephone list, notepads, users and outage time schedules. They system shall have the ability to create "Hot Key" activated displays for facilities to quickly allow the operator to access facility graphics or special instructions such as facility hazards.

l. The system shall allow for the display and data importation, .DWG, .DXF, .JPG, .GIF and .TIF files, of graphical information relating to the monitored site (e.g. floor plans) during alarm processing.

#### 2.3.1.4 General Operation Sequence

a. Operator screens shall utilize a windows environment with user configurable automatic display of alarm signals, floor plan graphics, note-pad, users list, special instructions, signal history or zones. For dispatch operation workstations all applications other than those necessary to view, acknowledge, and close alarms shall run in the back-ground to allow delay-free operator interface.

b. Normal Quiescent/Standby Operation - System quiescent /standby screen shall display as a minimum the time of day, system health status, number of pending alarms by type, in addition to Operator interfacing tabs for drop down menus related to system reports, log in, Email, Signal Disable, Acknowledgement, Signal processing, System tools, and Help menus.

c. Alert Condition - Alarm, supervisory, or trouble signals (for fire or other monitoring functions) shall transmit the appropriate class signal to the assigned workstations and provide both a mutable audible indications along with a visual banner annunciation including facility/zone/point description. Processing shall include but not limited to graphics, selection and operator notes/logs. Alarm display shall include the following mandatory information as follows:

1. Alarm Type (e.g. FIRE).
2. KSC Building Number (e.g. K6-848).
3. Additional Location Information, if applicable (e.g. Rm. 1040).
4. Additional alarm information (e.g. Water Flow).
5. Date and time of alarm.

d. Initial Operator acknowledgement of an alarm shall not remove the information from the display. Operator shall be able to access all alarm account information and enter all required dispatch responses and additional log information (of unlimited length) prior to closing the event. An on-line history of alarms and operator actions shall be available to the operator including instant access to the most recent alarm conditions.

e. The operator shall have the ability to classify false alarm information for tracking, troubleshooting, and report generation purposes.

f. A "pending signals screen" shall be customizable by user and by signal type. It shall also allow the operator to quickly log alarm signals by facility number, signal type, a specific signal or all pending signals. Pending signals shall be displayed by priority, and chronologically sequenced.

### 2.3.1.5 Reports

- a. The system shall provide for user customized report capabilities for automated (pre-scheduled) and manual report generation which can be viewed on screen, printed, faxed, stored to digital media, or emailed.
- b. System report generator shall allow searching or customized "report query" conditions by facility number, name, alarm type, location, panel type, asset numbers, start and end date/times, or names in the phone list or facility contact name. Search options shall include equal to, not equal to, greater than, less than, starts with and text searches.
- c. Ability to view reports before printing and to select output mode as hard copy, disk, modem transfer, email or faxing in user selectable DOC, XLS, or PDF formats. System software shall provide the following report capabilities via drop down menu selection:
  1. User Reports based on user selectable criteria capability for detail, summary, and system records status.
  2. Signal History depicting all events, emergency, non-emergency and opening/closing, with the option to add zone descriptions, signal disposition, system signals, operator notes, auto adjustment for daylight savings time
  3. Miscellaneous Reports containing operator listing, operator events, signal codes listing, time schedule listing, and false alarm statistics.
  4. Automated Reports. System shall be able to email out reports in .pdf, .doc. or .xls file type reports to designated addresses based upon alarm event or calendar time.

### 2.3.2 Server Equipment

- a. Redundant server installations at two separate facilities shall be the storehouse for the system's program and database engine and data files. The system shall accommodate simultaneous operations from multiple users and applications from other redundant servers or computer equipment.
- b. Servers shall be designed for draw-out mounting in a standard 19-inch rack; tower units mounted on rack shelves are not acceptable. Each server shall include dual and "hot swappable" cooling fans.
- c. Input power shall be two (2) 120 VAC, 60-Hertz, single-phase circuits feed dual "hot-swappable" power supplies with separate power input circuits. A power on/off switch shall be provide on each unit.
- d. Workstation and components are required to fit in existing, owner supplied, equipment racks. **Coordinate Component Size With Rack Dimensions.**
- e. Server shall include all necessary hardware and software required for system operation; minimum requirements are as follows and are based on a Dell PowerEdge R710 or equivalent:
  1. Chassis - R710 Chassis for six 3.5" Hard Drives, High Output Power Supply, Redundant, 870W
  2. Processors - Two X5550 Xeon Processors w/ Heatsinks, 2.66GHz, 8M Cache, 6.40 GT/s QPI, TurboHT
  3. RAM - 24GB, (12X2GB), 1066MHz Dual Ranked UDIMMs for 2 Processors

4. HD Controller - PERC 6/i SAS RAID Controller 2x4 Connectors, PCIe356MB Cache, x6 Chassis
5. Hard Drives - Six 146GB 15K RPM Serial-Attach SCSI 3.5" Hot Plug Hard Drives
6. Hard Drive Configuration - RAID 5 for PERC 6/i Controller.
7. Network Adapters - Two Broadcom 5709 Dual Port 1GbE NIC w/ TOE PCIe-4
8. DVD Drive - DVD ROM, SATA, Internal
9. I/O Ports - (6) USB ports; 2-front, 4-rear
10. Communication interface to radio controller as required
11. Power Cord - C13 to C14, PDU Style, 12 Amps, 2 meter
12. Warranty - 5 years, Mission Critical 4-hour, 7x24, Onsite Service with Emergency Dispatch
13. Support - 5 years, HW/SW Technical Support for certified IT Staff, 7x24
14. Support - 5 years, Dell "Keep Your Hard Drive", 7x24
15. Accessories - Bezel, Sliding Ready Rails w/ Cable Management Arm
16. Accessories - Riser with 2 PCIe x8 + 2 PCIe x4 Slot
17. Operating System - Windows Server 2008 with current patches
18. System Management - iDRAC6 Enterprise with vFlash 1GB SD Card
19. Misc. - Electronic System Documentation and OpenManage DVD Kit
20. Data Base - MS SQL Server 2008 or Oracle 11g, (If Oracle, government will provide)

f. The government shall provide the following additional software packages to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with this software.

1. GFI Logging Client 5.8
2. Symantec Endpoint Protection 11.0
3. Patchlink Agent 6.4.378
4. Symantec Backup Exec 12.5
5. System Center Operations Manager
6. Dell Server Administrator

g. The government shall provide FDCC template security settings via .INF file to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with these settings.

### 2.3.3 Workstation Equipment

a. Workstations shall be desk-top tower type, draw-out rack-mounted or portable, (laptop), as indicted. Workstations designated for rack mounting shall be designed for mounting in a standard 19-inch rack; tower units mounted on rack shelves are not acceptable. Rack mounted keyboard, video display, and mouse equipment shall be mounted on rack enclosure draw-out tray system; Dell 2UKVM-125 suitable for 17-inch LCD monitor.

b. Workstation and components are required to fit in existing, owner supplied, equipment racks. **Coordinate Component Size With Rack Dimensions.**

c. Workstations shall include all necessary hardware and software required for system operation; minimum requirements are as follows and are based on a Dell OptiPlex 960 or equivalent:

1. Case and Power Supply - OptiPlex 960 Minitower Base Standard Power Supply Unit
2. Processor - Core 2 Duo, E8400/3.0GHz, 6M, 1333FSB
3. RAM - 4GB, Non-ECC, 800MHz DDR2, 2X2GB
4. Video Card - 512MB NVIDIA Quadro NVS 420 Quad DVI Adapter, Full

## Height

5. Hard Drive - 160GB SATA 3.0GB/s and 8MB Data Burst Cache
6. Mouse - USB 2 Button Optical Mouse with Scroll, Black
7. Keyboard - USB, No Hot Keys English, Black
8. Network Adapter - PCIe 10/100/1000 Network Card Full Height
9. DVD Drive - 16X DVD+/-RW SATA, Data Only, Black
10. DVD Support Software - Roxio Creator Dell Edition 9.0, Cyberlink Power DVD 8.2
11. Power Cord - 125V, 2M, C13
12. Warranty - 5 years, 4-hour, 7x24 Onsite Service
13. Support - 5 years, Technical Support for certified IT Staff, 7x24
14. Support - 5 years, Dell "Keep Your Hard Drive", 7x24
15. Accessories - Chassis Intrusion Switch
16. Sound card - Dedicated sound card with audio output ports, (on-board sound is not acceptable);
17. Speaker - Internal Chassis Speaker
18. Speaker - Provide desktop speakers only where indicated, AX210, Two Piece, Black
19. Display - Provide only where indicated, 1280 x 1024 resolution, 17", Flat Panel Color Display
20. I/O Ports - (2) PS2 ports and (6) USB ports - 2-front and 4-rear
21. OS - FreeDOS OS Installation and CD
22. OS - Windows XP SP3 with current patches
23. System Management - vPro Secure Advanced Hardware Enabled System Management
24. System Management - vPro Secure Advanced Hardware Enabled System Management
25. Misc. - English Documentation, Resource DVD

d. The government shall provide the following additional software packages to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with this software.

1. GFI Logging Client 5.8
2. Symantec Endpoint Protection 11.0
3. Patchlink Agent 6.4.378
4. Symantec Vackup Exec 12.5
5. System Center Operations Manager

e. The government shall provide FDCC template security settings via .INF file to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with these settings.

#### 2.3.4 Serial to Ethernet Data Conversion Equipment

Provide serial concentrator equipment as required for connection to central station radio controller equipment, plus any spare required for UL installations. Concentrators shall be Digi Etherlite type indicated or as required by the manufacturer.

#### 2.4 CRMS SYSTEM RACK ENCLOSURES AND POWER SUPPLY EQUIPMENT

##### 2.4.1 Rack Enclosures

a. Modify and outfit existing computer equipment racks in Launch Control Center (K6-900) Room 1P11, Central Instrumentation Facility (M6-342) Room 243, and K6-1445K as required for new CRMS equipment installation. Existing LCC (K6-900) Room 1P11 rack depth is 24-inches; Contractor shall select equipment as required to meet this existing rack depth limitation. Modify racks as required, including but not limited to the following:

1. Rack enclosure equipment - Rework existing and provide new equipment as required. Relocate and add mounting channels as required to mount new equipment within the rack. Add cooling fan equipment; LCC Room 1P11 racks have existing top mounted cooling fans.
  2. Provide rack-mounted keyboard drawers with cable management system for rack-mounted keyboard-video-mouse operator equipment where indicated.
  3. Power distribution controllers; provide vertical or horizontal configuration as indicated or as required. All such equipment shall be UL listed and designed for installation electronic rack enclosures.
    - i.) Unit shall be rated for 120 VAC input. Current input rating shall be 20 Amp except where 30 Amp rating is required for connection to existing 30 Amp under-floor receptacles. Provide integral AC current meter if controller is not connected to UPS or other equipment that can indicate AC current loads.
    - ii.) Input power cord receptacle shall be coordinated with supplying rack-mounted UPS equipment or under-floor receptacle as applicable.
    - iii.) Output receptacles shall be NEMA configuration and as required to power UPS, computer and network equipment provided.
  4. Cable management equipment - Provide vertical and horizontal trays or brackets to secure and dress-out power and communications cables.
- b. Provide new rack enclosure equipment at the Launch Control Center (K6-900) Room 2P10 following:
1. Rack enclosure shall be 24U height; provide side panels, stabilizing hardware, miscellaneous hardware, equipment mounting hardware, and filler panels. Rack shall match existing console furniture as indicated.
  2. Air-flow and cooling equipment including perforated front and rear doors (80% perforated) and cooling fan packages.
  3. Cable management systems. Provide vertical and horizontal trays or brackets to secure and dress-out power and communications cables.
  4. Vertical and horizontal power distribution controllers. All such equipment shall be UL listed and suitable for installation in the rack enclosure equipment provided.
    - i.) Provide integral AC current meter if controller is not connected to UPS or other equipment that can indicate AC current loads.
    - ii.) Input power cord receptacle shall be coordinated with supplying rack-mounted automatic transfer switch equipment.
    - iii.) Output receptacles shall be NEMA configuration and as required to power computer and network equipment provided.

#### 2.4.2 Rack Enclosure Power Supply

- a. AC power to all racks and CRMS equipment shall be fully redundant. Arrangement shall be as indicated in accordance with Section 1.5.2 Networked Central Radio Monitoring - General Requirements.

b. The operating power for Central Radio Monitoring Equipment shall be single phase taken from the building electric service as indicated. Short term emergency backup power shall be provided by uninterruptible power supply (UPS) units using sealed lead-acid type batteries. Long term emergency back-up power (up to 48 hours) shall be provided by connecting all CRMS equipment at to AC circuits indicated which will be backed-up by emergency generator equipment within 30 seconds of a power failure.

#### 2.4.2.1 Uninterruptible Power Supply (UPS) Units

a. UPS units shall be UL listed and rack enclosure mounted. UPS Volt-Amp/Watt and standby battery back-up time ratings shall be as follows:

1. UPS KVA rating shall be the maximum available for the AC input capacity, but not less than 2000 VA / 1850 Watt. Connected loads shall be as indicated.
2. All UPS units supplied shall be from a 20-Amp, 120 VAC dedicated circuit via a rack mounted automatic transfer switch. UPS Power cord shall be rated for 20-Amps with NEMA plug configuration coordinated to that of the supplying transfer switch.
3. Standby battery back-up time rating time for UPS units installed in the Launch Control Center (K6-900) shall be shall be 5 minutes minimum in normal load configuration.
4. Standby battery back-up time rating time for UPS units installed at the Fire Alarm Shop (K6-1446K) shall be shall be 15 minutes minimum in normal load configuration.
5. Standby battery back-up time rating time for UPS units installed at the Central Instrumentation Facility (M6-342) shall be shall be 15 minutes minimum in normal load configuration.

b. UPS Power Electronics Module shall incorporate the following features

1. Rack mounted enclosure with cooling fan.
2. 90-138 VAC, 45-65 Hertz single phase utility input range with input circuit breaker protection.
3. 120 VAC  $\pm 3\%$ , 60-Hertz  $\pm 3\%$  output via a minimum of two (2) NEMA 5-20 Amp configuration receptacles.
4. Battery input from rack mounted or tower mounted battery modules. Any internal battery shall be of "hot-swappable" design.
5. Maintenance bypass mode to allow power to bypass the UPS module for maintenance purposes or in the event of electronic module trouble.
6. Emergency power off input activated by remote relay closure. Input activation shall shutdown the UPS and interrupts all output power.
7. Dry relay contact UPS trouble output. Contact shall close on UPS trouble condition and be connected to the facility fire alarm control system as indicated.
8. 0 Degree C to 40 Degrees C operating temperature range and 5% to

90% non-condensing relative humidity operating range.

9. Front panel LCD multi-line display showing UPS status, mode, battery condition, and power loading.
10. Front panel controls to start, stop and change operating modes.
11. Communications ports including serial, USB, and optional communication card slots.
12. SNMP Version 2 Web card and software for direct monitoring on SNMP web browser based networks.

c. UPS Battery Modules shall incorporate the following features.

1. Rack or stand-alone tower mounted battery enclosure as indicated.
2. Sealed valve regulated lead acid type.
3. Batteries and enclosure are of "hot-swappable" design such that battery modules can be changed with the UPS unit on-line.

#### 2.4.2.2 AC Power Transfer Switches

a. AC power transfer switches shall be rack-mounted type. Switch shall normally power all connected loads from the normal source. If the normal source fails and the alternate source is available, then power is transferred to the alternate source without delay. Load is returned to the normal source upon its return

b. Transfer switch shall incorporate the following features.

1. 120 VAC single-phase, 60-Hertz dual input. Amperage rating shall be 20 Amp and circuit breaker protected.
2. Normal source drop-out and pull-in voltages shall be coordinated with the UPS units provided such that the UPS will only operate on battery when both AC source voltages are not acceptable.
3. NEMA configuration L5-20 type plug on 15-foot long input power cables for input power sources.
4. Eight (8) NEMA output configuration receptacles as required for connected equipment.
5. LED indications for primary and redundant input power sources.
6. Line-to-line and line-to-ground EMI/RFI filtering.
7. Line-to-neutral, line-to-ground, and neutral-to-ground transient voltage surge suppression.
8. SNMP Version 2 Web card and software for direct monitoring on SNMP web browser based networks.

#### 2.4.2.3 Power Cables

All power cables shall be UL listed with NEMA plug configuration ends. Cord receptacle ends shall be as required to connect to equipment power

input receptacle, IEC or NEMA configuration. Wiring shall be in accordance with NFPA 70 and as indicated.

## 2.5 COMMUNICATIONS EQUIPMENT

### 2.5.1 Workstation Equipment

a. Provide workstation equipment as indicted and as required for providing operator interface to radio controller, KVM switching controller, and managed network switching equipment. Network administration workstation shall be a portable laptop computer.

b. Workstations indicated for draw-out rack mounting shall be designed for mounting in a standard 19-inch rack; tower units mounted on rack shelves are not acceptable. Rack mounted keyboard, video display, and mouse equipment shall be mounted on rack enclosure draw-out tray system; Dell 2UKVM-125 suitable for 17-inch LCD monitor.

c. Workstation and components are required to fit in existing, owner supplied, equipment racks. **Coordinate Component Size With Rack Dimensions.**

d. Workstations shall include all necessary hardware and software required for system operation; minimum requirements are as follows and are based on a Dell OptiPlex 960 or equivalent:

1. Case and Power Supply - OptiPlex 960 Minitower Base Standard Power Supply Unit
2. Processor - Core 2 Duo, E8400/3.0GHz, 6M, 1333FSB
3. RAM - 4GB, Non-ECC, 800MHz DDR2, 2X2GB
4. Video Card - 512MB NVIDIA Quadro NVS 420 Quad DVI Adapter, Full Height
5. Hard Drive - 160GB SATA 3.0GB/s and 8MB Data Burst Cache
6. Mouse - USB 2 Button Optical Mouse with Scroll, Black
7. Keyboard - USB, No Hot Keys English, Black
8. Network Adapter - PCIe 10/100/1000 Network Card Full Height
9. DVD Drive - 16X DVD+/-RW SATA, Data Only, Black
10. DVD Support Software - Roxio Creator Dell Edition 9.0, Cyberlink Power DVD 8.2
11. I/O Ports - (6) USB - 2-front and 4-rear
12. Power Cord - 125V, 2M, C13
13. Warranty - 5 years, 4-hour, 7x24 Onsite Service
14. Support - 5 years, Technical Support for certified IT Staff, 7x24
15. Support - 5 years, Dell "Keep Your Hard Drive", 7x24
16. Accessories - Chassis Intrusion Switch
17. Sound card - Dedicated sound card with audio output ports, (on-board sound is not acceptable);
18. Speaker - Internal Chassis Speaker
19. Speaker - Provide desktop speakers only where indicated, AX210, Two Piece, Black
20. Display - Provide only where indicated, 1280 x 1024 resolution, 17", Flat Panel Color Display
21. I/O Ports - (2) PS2 ports
22. OS - FreeDOS OS Installation and CD
23. OS - Windows XP SP3 with current patches
24. System Management - vPro Secure Advanced Hardware Enabled System Management
25. System Management - vPro Secure Advanced Hardware Enabled System Management
26. Misc. - English Documentation, Resource DVD

e. The government shall provide the following additional software packages to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with this software.

1. GFI Logging Client 5.8
2. Symantec Endpoint Protection 11.0
3. Patchlink Agent 6.4.378
4. Symantec Backup Exec 12.5
5. System Center Operations Manager

f. The government shall provide FDCC template security settings via .INF file to be installed by the contractor on the workstation computers. The contractor must ensure system interoperability with these settings.

#### 2.5.2 Managed Network Switches

a. Each 1-Gbps managed network switch shall consist of the following components:

1. Foundry Products Code FESX648 - FastIron Edge X648 includes 44 ports 10/100/1000 Mbps Ethernet plus four combination FJ45/SFP Gigabit Ethernet for copper or fiber uplink connectivity. Includes L2 and Base L3 IPv4 IronWare software and (1) 600-Watt power supply. Switch shall be field upgradeable to Full L3 IPv4 IronWare software and (2) ports of 10-GbE.
2. Foundry Products Code RPS-X448 - Redundant 600-Watt power supply for the FESX648.
3. Foundry Products Code SILVER FESX448 - TechNet Silver for the FESX648.
4. Transition Network Part Number TN-CWDM-SFP-XXXX - FluxLight brand Cisco compatible SFP transceiver. Provide two (2) Course Wave Division Multiplexing fiber optic interface modules per switch for looped fiber optic network configuration indicated.

b. Network switch shall be rack-mounted with cooling air back or top exhausted.

c. Power supply input voltage shall be 120 VAC. Each power supply shall connect to separate power source as indicated. Power cord shall be supplied for each power supply with NEMA 5-15 or 5-20 plug.

#### 2.5.3 Keyboard-Video Monitor-Mouse (KVM) Switching

a. Provide components and wiring as indicated to modify and/or connect new computer equipment to existing the existing K6-900 (LCC) KVM switching system.

b. Provide KVM switching system at M6-342 consisting of the following elements:

1. KVM computer break-out cable to CAT5e cable interface module. Provide PS/2 or USB type break-out cable connections as required to connect to actual computer equipment peripheral ports provided.
2. KVM switch assembly with (1) RS232 network connection, (8) CAT5e connections (from computer cable interface module) and (2) console

connections via 15-pin VGA monitor, PS/2 (or USB if required) mouse, and PS/2 (or USB if required) keyboard. Power input shall be 120 VAC with NEMA 5-15 plug.

#### 2.5.4 Rack-Mounted Data Cable A-B Switch System

a. If the transfer of a failed primary radio controller unit or its connected serial data concentrator to redundant equipment is not completely automatic such that the secondary radio controller automatically establishes full connectivity and functionality with the alarm automation system, then provide an A-B switch system for manual transfer of radio controller equipment as indicated. Transferring the A-B switch system control switch to the "B" (redundant) position shall interrupt all communications to and from the primary radio controller and its connected serial data concentrator, and switch in any redundant equipment necessary to initiate remaining transfer to redundant equipment by fully automated means.

b. If required, A-B transfer equipment shall be dataprobe RSS "Redundancy Switch System" or approved equal including, but not limited to, the following components:

1. Rack-mounted card cage construction housing separate power supply, control, network, and A-B switch modules. Provide blank covers for any unused slots.
2. Redundant power supplies each with 120 VAC input. Power cord shall have NEMA 5-15 or 5-20 plug. Failure of either power supply shall not affect unit operation. Cards shall include visual power status indicator lamps. Total failure of both power supplies shall not result in the loss of connectivity through the normal (A-position) switch path.
3. Network card and software for SNMP Version 2 full capability direct control and component monitoring on SNMP web browser based networks.
4. Control card for connection of selector switch for manual transfer to redundant equipment by the dispatch operator(s).
5. High speed Ethernet A-B switch cards as required. Card shall have A-B switch status indicator lamps. Connector configuration shall match that of connected equipment and all pins shall be switched.
6. Printer or parallel port A-B switch cards as required. Card shall have A-B switch status indicator lamps. Connector configuration shall match that of connected equipment and all pins shall be switched.

c. Provide industrial grade selector switch for manual operation of the all installed A-B switch cards. Switch shall be mounted within a pendant mount metal enclosure and stowed on the top of the LCC Room 2P10 equipment rack. Cord connector at each end shall include bushing and appropriate strain relief. Engraved nameplate on selector switch shall be marked as follows:

"CRMS MANUAL TRANSFER"  
"PRIMARY-A REDUNDANT-B"

### 2.5.5 Manual Printer A-B Switch

- a. Switch shall be enclosed stand-alone manual A-B switch for the transfer of a single printer between two computers.

### 2.5.6 Data Cables

Cables installed under raised floors and not in conduit shall be plenum rated. Data and patch panel cable and connector construction shall be for high reliability applications.

## PART 3 EXECUTION

### 3.1 GENERAL

All work shall be installed as shown and in accordance with the manufacturer's recommendations, unless otherwise specified. Necessary interconnections, services, and adjustments required for a complete and operational system shall be provided. Electrical work shall be in accordance with NFPA 70 and NFPA 72.

#### 3.1.1 Power Supply for the System

Connect equipment to new and/or existing branch circuits indicated. All central station rack mounted control equipment shall be supplied by power sources as indicated. All equipment installed in essential electronic equipment rooms shall be connected to emergency AC power disconnect systems indicated in accordance with NFPA 75.

#### 3.1.2 Wiring for Systems

- a. Install the fire alarm circuits in dedicated and separate conduit or raceway systems, and in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL. 60-Hertz AC power circuits must not enter enclosures containing fire alarm circuits except where required to connect to system components.

- b. All wiring shall be labeled at each connection point. Wire labels shall correspond to the approved shop drawings and use a method indicating the destination of the other end of the wire. Labels shall indicate the destination of the other end by enclosure identifier, equipment identifier, port number or terminal strip designation/terminal strip number.

### 3.2 EQUIPMENT RACK INSTALLATION AND WIRING

- a. Mount equipment based on function (primary/redundant) in racks as indicated or as required for maintenance and heat dissipation purposes. Arrange equipment to provide ample maintenance access and heat dissipation. Follow all manufacturer's recommendations and safety requirements to insure equipment is properly secured and supported within the rack enclosure.
- b. Install rack structure, components, and wiring in accordance with the manufacturer's instructions using manufacturer's specifically designed components and accessories where available. Secure rack to the floor structure and adjacent racks; level in accordance with the manufacturer's recommendations.
- c. Install wiring in rack enclosures in a neat and orderly manner with

wire properly grouped, tie-wrapped, or laced parallel and perpendicular to the major axis, supported and identified. Wiring shall not obstruct diagnostic indications or prevent equipment removal; provide expansion loops as required such that removable equipment can be drawn out for inspection without removing cable connections. Wiring must be continuous from device to device with no splices.

d. All wiring leaving equipment racks shall be installed in accordance with the manufacturer's requirements and utilize dedicated conduit systems in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL unless otherwise indicated.

e. All data patch cables shall be pre-manufactured or connectors shall be installed with manufacturer's required tooling and methods.

f. Separate AC power and data cable within rack enclosures to the greatest extent possible.

g. User different and consistent color coding schemes for cables connected to the following devices:

1. Provide different color patch cables from equipment to Network 1 and Network 2 Ethernet Switches. Provide a third color patch cable or connections between Network 1 and Network 2 switches (network loop cables).

2. Place different color bands on power cables plugged into primary and secondary AC power source systems. Label all cords at plugs indicating load served.

h. Grounding shall be in accordance with the manufacturer's requirements and Section 28 05 26.00 40, GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Rack enclosures and surge suppressor ground terminals shall be directly connected to earth ground and bonded to equipment grounding conductors.

i. Contractor shall provide all programming software services required for a fully functional system. Reference 1.4 INFORMATION TECHNOLOGY SECURITY, and 1.5 SYSTEM OPERATION. Initial software shall include all fire alarm application data to allow for the immediate transfer of all systems connected to the existing CRMS system; reference sheets FA-7 through FA-9. Government shall provide a template of naming conventions and the reporting display format after review of the capabilities of equipment to be provided.

### 3.3 RADIO FREQUENCY TRANSCEIVER AND SUBSCRIBER UNITS

a. Radio subscriber units shall be installed where indicated on the drawings, in accordance with the manufacturer's instructions, and in accordance with NFPA 72.

b. Prior to installing radio equipment, the Contractor shall request Government support to verify RF reception at radio transceiver locations indicated. Location shall be adjusted up to 10-feet as necessary. Radio units, power supply cabinets, and other associated shall be securely mounted such that cabinets do not interfere with antenna operation.

c. All wiring leaving subscriber unit cabinets shall be installed in accordance with the manufacturer's requirements and utilize dedicated

conduit systems in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL. Connection to facility fire alarm equipment shall be in accordance with applicable requirements of Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY).

- d. Surge suppression in accordance with applicable requirements of Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY) shall be installed on the 120 VAC power input to the radio subscriber unit.
- e. The manufacturer's recommended surge suppressor shall be installed between the unit and any exterior mounted antenna not directly mounted to the transceiver enclosure. Surge suppressor shall be installed within a Type 316 NEMA 4X stainless steel junction box, adequately sized for the suppressor and coaxial cables including adequate bending and connect/disconnect space. Surge suppressor and box shall be installed adjacent to where the coaxial cable enters the building interior. Coaxial cable indicated shall be installed in rigid steel conduit from the transceiver to the surge suppressor, and shall include adequate bend radius and/or junction box size for the coaxial cable installed; do not use L, C or T form type conduit fittings. Coaxial cable from the surge suppressor to the antenna shall be as indicated and shall leave the bottom or side of the box and be arranged to prevent water entry; opening shall also be sealed to prevent insect and debris entry. Install outdoor antennas securely to facility structure using Type 316 stainless steel supporting structure/hardware, and locate to minimize probability of being struck by lightning.
- f. A feedline cable test shall be conducted for all contractor fabricated feedline cables. This test shall include Continuity, and Short Circuit tests, Voltage Standing Wave Ratio, (VSWR), Test and an Insertion Loss Test. VSWR and Insertion Loss Tests should be conducted at the operating frequency of the system. The VSWR test should be conducted with a calibrated 50 ohm load connected to one end of the cable. Results of the VSWR test should be 1.1:1 or lower. Results of the insertion loss test are to be within .5dB of calculated cable and connector loss.
- g. A base station feedline system test shall be conducted for base antenna installations, (M6-342 CIF and K6-900 LCC). This test shall include a Voltage Standing Wave Ratio, (VSWR), Test and an Insertion Loss Test. VSWR and Insertion Loss Tests should be conducted at the operating frequency of the system. The VSWR test should be conducted with the antenna connected. Results of the VSWR test should be 1.8:1 or lower. Results of the insertion loss test are to be within .5dB of calculated cable and connector, and surge protector loss.
- h. Grounding shall be in accordance with the manufacturer's requirements and Section 28 05 26.00 40, GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Radio subscriber units and surge suppressors shall be directly connected to earth ground and bonded to any other system equipment ground available including AC power. Earth ground, antenna surge suppressor ground, fire alarm equipment ground, and AC power ground shall all be bonded together. Provide provisions for terminating and grounding shielded cable shields in accordance the manufacturer's requirements.
- i. Prior to powering up the subscriber unit, the Contractor shall request Government support to locally program the field radio subscriber unit.

### 3.4 TESTING

a. After complete installation of the equipment and at such time as directed by the Contracting Officer, conduct tests to demonstrate that the installation requirements of this specification have been met. Tests covered in the following paragraphs must be done in four parts:

1. Qualification - Perform an integrated qualification test in accordance with 3.4.1 of this section. Test involves both central station equipment specified by this section and facility fire alarm equipment specified by Section 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY). This test must be successfully completed prior to beginning construction at any KSC facility.

b. The following tests shall be performed for the completed central station control and monitoring equipment (see 3.4.2) as well as for each connected facility (see 3.4.3).

2. Contractor Checkout - This test shall be performed by the Contractor to remove all troubles, ground faults, ensure all equipment is fully functional and operational, communications are established, and programming is initially tested to ensure the installation meets the contract drawings and specifications. Upon successful completion of Contractor Checkout, the Contractor shall submit Contractor Readiness Affirmation prior to requesting the preliminary test.

3. Preliminary - This test shall be performed by the Contractor using the approved test procedure and witnessed by the Government construction inspectors. As-built documentation shall be verified against the system installed and all red-lines annotated and summarized on a single set of documents. The test procedures shall be followed as written and all red-lines annotated on a single Test Procedure. The summarized set of drawings and test procedures shall be initialed and dated by the construction inspector and the fire alarm vendor(s). The Preliminary test shall not be complete until all steps in the test procedure have been satisfactorily completed. This includes any additional steps required to complete 100% testing of the system and its associated functionality.

4. Final Acceptance - After successful completion of the preliminary test, a Final Acceptance test shall be scheduled. The final acceptance test procedure and as-built documentation shall have incorporated all red lines from the preliminary test. The Contractor shall provide a copy of the consolidated redlines for the as-built documentation and preliminary test procedures from the preliminary test. The Contracting Officer and the Authority Having Jurisdiction or their designee(s) shall witness the final acceptance test for the system. During the Final Acceptance Test, the Contractor shall have two corrected sets of as-built documentation and Final Acceptance Test Procedures for use in conducting the final acceptance test.

#### 3.4.1 Qualification Test

a. Perform qualification test at a KSC location as directed by the Contracting Officer. This test shall insure the system will meet specification requirements and allow advance trouble-shooting prior to installation. Provide and install the following test mock-up equipment. Simplex Panel and radio subscriber equipment indicated below is to remain in place and functional until central station final testing is complete.

1. Simplex Hardware: Provide a mock-up of a KSC Simplex 4100U panel network consisting of at least two (2) panels as described below. The panels shall be networked together using NFPA 72 Style 7 wiring forming a "mini-network" that is a simulation in form and function to the existing KSC installation.

i.) Panel 1 - Simplex 4100U configured to emulate a "network display unit" (NDU) and M6-138 (CD&SC) Summary Reporting Panel B. Panel shall have one digital input card connected to switches for local summary alarm-supervisory-trouble condition simulation.

Provide programmable output relay card (4 relays minimum) and connect (3) relay contacts to the radio subscriber unit input zones.

Provide a serial data capable port (printer or DAC port coordinated with the radio manufacture) and connect to the radio subscriber unit serial data port.

ii.) Panel 2 - Simplex 4100U fire alarm control panel configured to emulate both M6-138 (CD&SC) Summary Reporting Panel A and a facility fire alarm control panel. Panel shall have two (2) sets of digital inputs as follows.

Input Set 1 shall be configured and programmed as utility point types used on the KSC summary reporting system panels located at M6-138/CD&SC and K6-1193/VABR. Simulate multiple (at least 2 each of) remote facility alarm, trouble and supervisory signals.

Input Set 2 be configured and programmed to emulate a standard KSC fire alarm panel. Simulate multiple (at least 2 each of) fire alarm, trouble, and supervisory signals.

Provide programmable output relay card (4 relays minimum) and connect all relay contacts to the radio subscriber unit input zones.

2. Simplex Software: NDU Panel 1 Test Program Characteristics:

i.) Acts on "public" summary alarm, trouble, and supervisory points from networked Fire Alarm Control Panel 2. Panel 1 is to operate silently on all signals (points) from Panel 2 with no local acknowledgement or reset required. All Panel 2 initiation inputs are to be transmitted out Panel 1's serial port into the radio subscriber unit serial input for CRMS alarm processing

ii.) Acts on local points programmed as alarm, supervisory, and trouble with switch inputs wired to input card zones 1, 2, and 3 respectively. These points are not to be programmed at the CRMS equipment.

iii.) If provided, Simplex panel is to monitor its radio subscriber unit trouble relay. When activated Panel 1 is to activate a supervisory condition and transmit a supervisory signal to Panel 2.

iv.) Output relays connected to the radio subscriber unit zone inputs are to be programmed as follows:

Zone 1 - Track summary alarm activated by any Panel 1 or 2 alarm input.

Zone 2 - Track summary supervisory activated by any Panel 1 or

2 supervisory inputs.

Zone 3 - Track summary trouble activated by any Panel 1 or 2 trouble input.

3. Simplex Software: Alarm Panel 2 Test Program Characteristics:
  - i.) Summary panel input Set 1 zones programmed per existing VABR or CD&SC summary panels; silent operation with no operator acknowledgement or reset (utility points).
  - ii.) FACP input Set 2 programmed as standard fire alarm control panel alarm, trouble, and supervisory points. One input is to be wired to the radio subscriber unit remote control relay contact. If provided, another input is to be wired to the radio subscriber unit antenna/power trouble contact.
  - iii.) Transmits all alarm, trouble, and supervisory signals as "public" points on the network which are acted on by Panel 1.
  - iv.) If provided, panel to monitor radio subscriber unit trouble relay. When activated panel is to activate a supervisory condition and transmit to Panel 1 for CRMS annunciation via its serial data port.
  - v.) Panel to monitor radio subscriber unit control relay. When activated panel is to activate a corresponding feedback relay.
  - vi.) Output relays connected to the radio subscriber unit zone inputs are to be programmed as follows:
    - Zone 1 - Summary alarm signal.
    - Zone 2 - Summary supervisory signal.
    - Zone 3 - Summary trouble input.
    - Zone 4 - Radio subscriber unit control relay feedback signal.
4. Central Radio Monitoring System (CRMS) Vendor Hardware:
  - i.) (2) CRMS radio controllers configured in redundant configuration.
  - ii.) (1) Radio transceiver and antenna.
  - iii.) (1) Radio subscriber units connected to Simplex Panel 1 with input/output capability as follows: (8) EOL dry contact supervised inputs and serial data input (communications method, DAC or printer port, coordinated with Simplex).
  - iv.) (1) Radio subscriber units, connected to Simplex Panel 2 with input/output capability as follows: (8) EOL dry contact supervised inputs and dry relay contact output.
  - v.) (2) Central Station Alarm Automaton Servers configured in redundant configuration. Provide redundant network interface ports on at least one unit.
  - vi.) (2) Central Station Alarm Automaton Workstations. Provide redundant network interface ports on at least one unit.
  - vii.) A-B Switch hardware and Serial to Ethernet conversion equipment as required to interface radio controller to alarm Automaton equipment.
  - viii.) (2) Managed Ethernet network switches. Connect equipment in a configuration that simulates the design requirement.
  - ix.) Workstation(s) for radio controller and managed Ethernet switch control as required.
  - x.) UPS or power conditioning equipment to protect test equipment as required.
5. CRMS Vendor Software: Program all CRMS equipment as required to operate as an integrated system with necessary equipment/wiring supervision and automatic fail over as specified in this section.

Program equipment to accept, process, and display Simplex fire alarm control panel signals from each connected radio subscriber unit.

Vector the fire alarm signals from Panel 1 to one workstation and the signals from Panel 2 to the other. Program for Workstation 1 to back-up Workstation 2 and vice-versa.

Contractor shall coordinate with KSC IT network administrators for Configuration of computer equipment for network (TCP/IP protocol) communications as required to allow network testing and vulnerability scanning. Provide sample network script programming to demonstrate switch port and VLAN controls.

b. Fire Alarm Control Panel Interface Qualification Tests:

1. Individually initiate an facility fire (Input Set 2) alarm-supervisory, and trouble signal at Panel 2 and verify:
  - i.) Panel 2 transmits a "public" network point acted upon by Panel 1 software.
  - ii.) Verify CRMS system receives the alarm signal via all relay and serial data interfaces. Verify annunciation correctly reflects the signal class, description and its location.
  - iii.) Clear the alarm input to Simplex Panel 2, reset Panel 2, and verify both Simplex Panels and the CRMS show the signal cleared.
2. Initiate a control signal from the CRMS, and verify relay closure at the Simplex Panel 2 radio subscriber unit. Verify FACP alarm and relay feedback received at the CRMS (feedback alarm relay signal) and addressable alarm data via the serial interface.
3. Individually initiate a summary panel facility (Input Set 1) alarm-trouble-supervisory signals at Panel 2 and verify:
  - i.) Panel 2 transmits a "public" network point acted upon by Panel 1 software.
  - ii.) CRMS system receives the alarm signal via all relay and serial data interfaces. Verify annunciation correctly reflects the signal class, description, and its location.
  - iii.) Clear the alarm input to Simplex Panel 2. Verify that both Simplex Panels and the CRMS show the alarm cleared.
4. Verify correct signal vectoring to the (2) alarm automation workstations.
5. Initiate all alarm/supervisory and trouble signals at Panel 2 in random order.
  - i.) Verify the radio CRMS system receives all relay and serial data alarm signals.
  - ii.) Verify all alarm signals are distinguishable by type and location and are displayed in the correct priority.
  - iii.) Reset Panels 2 alarms one at a time and verify the CRMS system sees each signal individually clear on the data interface and summary relay signals when each class of alarms are all cleared.
6. Initiate Simplex Panel 1 system alarm-supervisory-trouble wired zone inputs not programmed at the CRMS, and note response of the CRMS.

7. Initiate a Simplex Panel 1 system trouble (disconnect batteries or similar) not programmed at the CRMS, and note response of the CRMS.
  8. Disconnect the Panel 2 radio subscriber unit's AC power. Verify correct fire alarm panel and CRMS annunciation including signal delay time. Re-connect power and verify signal clears at Simplex Panels without operator intervention.
  9. Disconnect the Panel 1 radio subscriber unit's antenna.
    - i.) Verify correct fire alarm panel and CRMS annunciation.
    - ii.) After antenna is disconnected initiate all Panel 2 alarm and supervisory signals.
    - iii.) Re-connect antenna and verify correct fire alarm panel and CRMS annunciation via Panel 1 radio subscriber unit.
  10. Disconnect Simplex Panel 2 from its network connection to Panel 1 and verify identifiable trouble signals at the CRMS equipment.
- c. Networked CRMS Equipment Failure and Data Back-Up Qualification Tests - Demonstrate all equipment back-up capabilities and associated supervision including but not limited to the following:
1. Change the database on the primary CRMS radio controller and demonstrate automatic database update by the secondary radio controller. Also demonstrate manual database back-up ability.
  2. Repeat Step 3.4.1.C.1 for the primary CRMS alarm Automaton system server.
  3. Simulate a primary radio controller failure.
    - i.) Verify identifiable trouble annunciation and automatic transfer to the secondary CRMS radio controller. Demonstrate manual intervention, if required, to complete the transfer from primary to back-up controller.
    - ii.) Initiate multiple Simplex Panel 2 signals to verify correct operation.
    - iii.) Using the managed Ethernet switch, disconnect the primary CRMS radio controller from the network and initiate a change to its database.
    - iv.) Using the managed Ethernet switch, re-connect the primary CRMS radio controller to the network and demonstrate database restoration to the secondary CRMS radio controller and transfer of reporting back to the primary unit.
    - v.) Initiate multiple Simplex Panel 2 signals to verify correct operation on the primary radio controller.
  4. Repeat Step 3.4.1.c.3 for the primary CRMS alarm automation system server.
  5. Simulate both a primary radio controller failure and primary alarm automation system server failure.
    - i.) Verify identifiable trouble annunciation and automatic transfer to the redundant equipment.
    - ii.) Initiate multiple Simplex Panel 2 signals to verify correct system operation on redundant equipment.

6. Using the managed Ethernet switch, disconnect each workstation individually and completely from the network. Initiate Simplex Panel 2 signals and verify "vectored" alarms not normally handled by the workstation transfer to the other workstation.
7. Using the managed Ethernet switch, turn-off one network path to CRMS alarm Automaton system server(s) and workstation(s) with redundant network interface ports. Verify no loss of communications or function. Initiate Simplex Panel 2 signals and verify correct system operation.
8. Fail the serial data link to the alarm automation system at the primary CRMS radio controller.
  - i.) Demonstrate fail-over procedure to re-establish alarm automation system communications to the secondary radio controller.
  - ii.) Verify appropriate trouble signals are received at the both radio controller and alarm automation equipment.
  - iii.) If the transfer is manual, initiate Simplex Panel 2 alarms prior to manual transfer, and verify correct system response at the primary radio controller equipment.
  - iv.) After manual or automatic transfer, initiate Simplex Panel 2 alarms and verify correct system response.
9. If provided, Step 3.4.1.c.8 by failing the serial data to Ethernet Concentrator between the primary CRMS radio controller and alarm automation system.
10. Fail both data links between the primary and secondary CRMS radio controllers and alarm automation system.
  - i.) Verify appropriate trouble signals are received at the both radio controller and alarm automation equipment.
  - ii.) Initiate all Simplex Panel 2 signals and verify correct alarm annunciation and operator control functions at the radio controller equipment.
  - iii.) Re-establish the serial data links and verify normal operation is restored.
11. Fail the radio subscriber unit connected to Simplex Panel 1 by disconnecting its antenna.
  - i.) Verify identifiable trouble signal at the CRMS equipment.
  - ii.) Initiate all Simplex Panel 2 alarm signals.
  - iii.) Restore the radio antenna and verify correct signal transmission to the CRMS equipment.
12. Repeat 3.4.1.c.11, but transfer the head-end radio transceiver antenna to a non-operational VLAN.
13. Repeat 3.4.1.c.11, but fail the network connection at the head-end radio transceiver.
14. Fail the radio subscriber unit connected to Simplex Panel 2 by disconnecting its antenna.
  - i.) Initiate a control signal (arm) from the CRMS.
  - ii.) After a time delay in excess of normal signal transmission

reconnect the antenna.

iii.) Verify relay closure at the CRMS radio subscriber unit.

15. Repeat Step 3.4.1.c.14, but fail the head-end radio transceiver antenna.

16. Repeat Step 3.4.1.c.14, but transfer the head-end radio transceiver to a non-operational VLAN.

d. IT Network Testing and Vulnerability Scanning: Entire mock-up system will be connected to KSC provided equipment and/or networks. Support vendor(s) shall support KSC Information Technology personnel in their assessment of the systems required IT security capabilities; reference Section 1.4 INFORMATION TECHNOLOGY SECURITY. Testing is expected to take no more than 16 hours.

### 3.4.2 Central Station Equipment Acceptance Testing

After completion of the Central Station monitoring and control system installation, and before connecting the remote reporting of any facility fire alarm control panel, perform testing in accordance with NFPA 72. Use the (2) radio subscriber units and Simplex panels from qualification testing for end-to-end testing purposes, with signals from each unit "vectored" ("filtered") to different alarm automation system workstations. Testing shall include but not be limited to the following:

IT Network Testing and Vulnerability Scanning:

a. Entire system will be connected to KSC provided equipment and/or networks. Support vendor(s) shall support KSC Information Technology personnel in their assessment of the systems required IT security capabilities; reference Section 1.4 INFORMATION TECHNOLOGY SECURITY. Testing is expected to take no more than 16 hours.

Normal Radio Subscriber Unit Alarm Signal Receipt Tests:

b. Demonstrate Capabilities of all alarm automation system workstations including:

1. Send multiple fire alarm-supervisory-trouble class signals from both radio subscriber units. Verify correct "vectoring" ("filtering") and visual/audible alarm annunciation at each alarm automation system workstation. Verify alarm silence, acknowledge, and close-out procedures work properly.
2. Demonstrate all workstation KVM switching sequences.
3. Disconnect LCC Room 2P10 Workstation 2 and 3 KVM switching and verify fully redundant monitoring for Workstation 1.
4. Demonstrate fail-over of "vectoring" alarm signals to an off-line or un-manned workstation.
5. Demonstrate transferring of "vectored" alarm signals between the workstations. Demonstrate transferring of all alarm signals to one workstation.
6. Demonstrate report generation, alarm pending, system modification, and other system features.

## Radio Controller and Alarm Automation System Failures:

c. Demonstrate automatic transfer of control from the primary central station radio controller(s) to all redundant unit(s) in defined succession by simulating failure modes. Repeat test 3.4.2.b for each of the four (4) on-line radio controllers and verify correct and consistent operation.

d. Demonstrate automatic transfer of control from the primary central station alarm Automation server to all redundant units in defined succession by simulating failure modes. Repeat test 3.4.2.b for each of the four (4) on-line servers and verify correct and consistent operation.

e. Fail both the primary radio controller(s) and primary alarm automation system server(s). Verify identifiable trouble annunciation and automatic transfer of operations to the redundant equipment. Initiate multiple subscriber unit signals to verify correct system operation on redundant equipment.

## f. Serial Data Link Between Radio Controller and Alarm Automation System Tests:

1. Fail the data link to the alarm automation system at the primary CRMS radio controller(s):

i.) Demonstrate the fail-over procedure to re-establish alarm automation system communications to the secondary radio controller(s).

ii.) Verify appropriate trouble signals are received at the both radio controller and alarm automation equipment.

iii.) If the transfer is manual, initiate subscriber unit alarm signals prior to manual transfer, and verify correct system response at the primary radio controller equipment.

iv.) After manual or automatic transfer, initiate subscriber unit alarm signals and verify correct system response at the CRMS workstations.

2. If provided, repeat Step 3.4.2.f.1 above by failing the serial data to Ethernet Concentrator between at the primary CRMS radio controller(s) and the alarm automation system.

3. Fail both serial data links between the primary and secondary CRMS radio controller(s) and the alarm automation system:

i.) Verify appropriate trouble signals are received at the both radio controller and alarm automation equipment.

ii.) Initiate radio subscriber unit alarm/supervisory/trouble signals and verify correct alarm annunciation and operator control functions at the radio controller equipment.

iii.) Re-establish the serial data links and verify normal operation is restored.

## Radio Base Transceiver/Antenna Tests:

g. Fail a radio subscriber unit power supply and verify trouble signal to CRMS equipment is delayed for the programmed period.

- h. Fail facility radio subscriber unit by disconnecting its antenna.
  - i.) Verify identifiable trouble signals at the CRMS equipment.
  - ii.) Initiate facility subscriber unit alarm signals.
  - iii.) Restore the radio antennas and verify correct signal transmission to the CRMS equipment.
- i. Fail all head-end radio transceiver units by disconnecting their antennas.
  - i.) Verify identifiable trouble signals at the CRMS equipment.
  - ii.) Initiate facility unit alarm signals.
  - iii.) Restore one (1) transceiver antenna and verify correct signal transmission to the CRMS equipment.
- j. Repeat Step 3.4.2.i above, but fail all network connections to head-end radio transceivers. Restore 1 network connection verify correct signal transmission to the CRMS equipment.

Network Security, Failure, and Switching Capabilities:

- k. Verify network operation:
  - 1. Demonstrate full operation and communications with each Network Ethernet switch turned off.
  - 2. Demonstrate full operation and communications with each network connection disconnected at all Network Ethernet switches.
  - 3. Demonstrate full operation and communications between LCC (K6-900) and Fire Alarm Shop (K6-1446K) with both CIF (M6-342) Network Ethernet Switches turned off.
  - 4. Demonstrate full operation and communications between LCC (K6-900) and CIF (M6-342) with both Fire Alarm Shop (K6-1446K) Network Ethernet Switches turned off.
  - 5. Demonstrate full operation and communications between CIF (M6-342) and Fire Alarm Shop (K6-1446F) with both LCC (K6-900) Network Ethernet Switches turned off.
  - 6. Demonstrate network monitoring via SNMP traps of all network connected equipment.

AC Power System Tests:

- l. Turn OFF AC power to the head-end AC radio transceivers and verify standby battery back-up capability for the specified time. Restore AC power and verify battery re-charges.
- m. Interrupt redundant AC power sources to each UPS unit input, one at a time, and verify transfer to the alternate AC source.
- n. Configure normal loading on each UPS unit at each monitoring site, K6-900/LCC and M6-342/CIF. Turn OFF AC power and verify standby battery operations for the specified time.
- o. Configure maximum loading on each UPS unit at each monitoring

site, K6-900/LCC and M6-342/CIF. Turn OFF AC power and verify operation on standby battery for 5 minutes.

p. For equipment with dual power supplies, interrupt AC power to each power supply and verify continuous equipment operation on the other power supply.

q. With radio and server equipment secured, verify the emergency shunt trip function at each monitoring site, K6-900/LCC and M6-342/CIF. Verify all rack and equipment power is turned OFF and UPS units are shut down.

### 3.4.3 Radio Subscriber Unit Acceptance Testing

Radio subscriber unit testing for all new and existing radios shall be in accordance with NFPA 72 at each facility. Testing shall include the following:

a. Prior to connecting to facility fire alarm control panel equipment the following testing shall be completed.

1. Check continuity of circuits with an ohmmeter. Check each wire for grounds with a 250-volt insulation resistance test set. Resistance to ground must not be less than 20 meg-Ohms. Each wire tested shall be insulated from ground, and all other wire within the same conduit or raceway system shall be grounded. The conduit/raceway system shall be verified grounded prior to insulation resistance testing by verifying a short circuit between the conduit/raceway and ground.

2. Verify AC power supply and battery voltages are within acceptable tolerances.

b. After radio subscriber unit power-up perform the following testing prior to connecting to the facility fire alarm control panel.

1. Verify radio communicates to all required Central Station head-end equipment and correctly annunciates all alarm zone signals.

2. Verify any radio fault conditions including AC power fail, circuit supervision, communications loss, and loss of battery voltage correctly annunciate at central station head-end equipment.

3. Verify correct operation of local radio subscriber unit indications and reset functions.

c. After a radio subscriber unit is connected to the facility fire alarm control panel or for existing subscriber unit radios transferred from the existing CRMS system, perform end-to-end preliminary and final acceptance testing from the facility fire alarm control panel to the CRMS workstations in accordance with requirements of SECTION 28 31 00.01 98 FIRE DETECTION AND ALARM (PROPRIETARY). Testing also shall include the following:

1. Each time a facility fire alarm control panel alarm, trouble, or supervisory signal is activated, verify that reporting to the

Central Radio Monitoring System is activated and the correct information is displayed at the pre-defined (signal vectored) CRMS workstations.

2. Individually turn off AC power and disconnect DC power to demonstrate operation of the trouble signals. Verify correct trouble signal is received at the CRMS workstations and, if required, locally at the facility fire alarm control panel. Verify correct time delay for transmission of AC power failure signal.

3. Disconnect antenna and verify correct trouble signal is received at the CRMS workstations and, if provided, locally at the FACP. Next, initiate multiple fire alarm panel signals. Restore antenna and verify correct signals are received at the CRMS workstations.

4. Demonstrate supervision of all circuit wiring. Verify alarm over ground fault for all zones and that the correct signals are received at the CRMS workstations and, if required, locally at the facility fire alarm control panel.

5. Demonstrate capacity and the operation of the battery backup system to operate as required by these specifications by disconnecting the 120 volt, 60 Hz power from the fire alarm (control) panel and operating the system as specified for backup operation.

d. After all radio subscriber units are operating on the network:

1. Use the radio network management software to determine which three (3) radio subscriber units are being used most for signal relaying purposes. Disconnect the antennas to these units and verify the other radio subscriber units re-configure to re-establish communications to the head-end equipment.

2. Turn OFF each head-end radio transceiver, one at a time, and verify the radio system re-configures to maintain radio communications with all facility radio subscriber units.

3. Operate from each head-end radio transceiver alone (only one head-end antenna on-line at a time) and verify radio system re-configures to maintain radio communications with the facility radio subscriber units.

#### 3.4.4 Training

a. Government will provide training rooms. The subcontractor will be responsible to provide the appropriate training instructor for the type and level of end users to ensure the following type of training is conducted.

b. The Contractor shall provide all labor (from multiple vendors if required), workbooks, materials, written procedures, software, etc. to train Contractor personnel in the operation, configuration, and maintenance of the entire radio based CRMS. All training shall be completed prior to placing the CRMS in operational status by connecting remote facility monitoring systems to it.

c. Training session dates and time shall be coordinated with the

Contracting Officer (30) days minimum prior to the session. Training shall be conducted after the preliminary test and before the final test on the head-end monitoring and control equipment.

d. Provide separate training manual for each type of training session indicated below.

e. Dispatch Operator Training Session:

1. Training will be at KSC LCC, Building K6-900 Room 2P10.
2. Room 2P10 Console 1 (Workstation 1) and Console 2 (Workstation 2 or 3) will be used for hands-on training.
3. Tables in Room 2P10 and the break room can be used for workbook instruction. No computer or projection equipment is available.
4. Training for twenty-four (24) operators shall be provided, and shall consist of 4-hour sessions occurring approximately between the hours of 05:00-09:00, 14:00-18:00, and 21:00-01:00. Actual quantity and time period of training sessions shall be provided as required based on the time required to complete all course content, and dispatch operator scheduling issues. Four (4) personnel shall attend each session.
5. Training shall fully address all relevant operator dispatch issues and system features including but not limited to:
  - i.) Equipment logon, logoff, shutdown, and restart.
  - ii.) System menus, icons, functions, etc.
  - iii.) Dispatch operation from the radio controller equipment.
  - iv.) Dispatch operation from the alarm automation system workstations.
  - v.) Equipment failure simulations including: radio controller failure (both primary and secondary), serial data converter failure, alarm automation server failure (both primary and secondary), radio subscriber unit failure.
  - vi.) Accessing and printing system facility data, alarm data, and reports.

f. Engineer Training Session:

1. Training will be at KSC Fire Alarm Shop/K6-1446K and the LCC/K6-900.
2. Provide other hardware training aides including radio subscriber unit zone input, serial data card, and programming unit.
3. Tables at the Fire Alarm Shop training room can be used for workbook instruction. No computer or projection equipment is available.
4. Training for (8) operations and maintenance engineers shall be provided, and shall consist of 7-hour sessions between the hours of 07:30-15:00. Actual quantity of training sessions shall be based on time necessary to complete all required training course content. Four (4) personnel shall attend each session.
5. Training shall fully address operation and facility configuration issues including but not limited to:

- i.) Content of dispatch operator training course.
  - ii.) Equipment familiarization and walk down at the LCC/K6-900 site.
  - iii.) Radio controller equipment familiarization and alarm dispatch operation from the radio controller equipment (at LCC Room 2P10).
  - iv.) Field radio set-up for connection to FACP relays and serial data output using programming unit.
  - v.) Radio controller radio subscriber unit set-up including hands on configuration of account, zone, and serial data.
  - vi.) Radio controller set-up including hands on configuration of facility subscriber unit account, zone, and serial data.
  - vii.) Alarm automation system radio subscriber unit set-up including hands on configuration of facility subscriber unit account definition, zone and serial data alarm signal definition, alarm signal vectoring (routing), graphical display generation and linking to alarm signals, report generation, and test configurations. Training shall include the assistance with the set-up of (2) facility fire alarm control panel conversions associated with the project: (1) subscriber unit with zone inputs and (1) subscriber unit with serial data input.
- g. System Administrator Training Session:
1. Training will be primarily at KSC Building M6-342/CIF with some instruction at KSC Building K6-900/LCC.
  2. Conference Room at M6-342 with computer and projection equipment can be made available at M6-342 instruction.
  3. Training for twenty (20) system administration and contract inspection personnel shall be provided, and shall consist of 7-hour sessions between the hours of 07:30-15:00. Quantity of sessions provided shall be as required to cover all course material. Five (5) personnel shall attend each session. In addition to designated KSC system administration personnel, Contract inspection representatives including the COTR, construction inspector, two (2) fire alarm representatives, and the Authority Having Jurisdiction's representative will take this training to insure requirements compliance.
  4. Training shall address all system operation and maintenance issues including:
    - i.) Overall system overview with abbreviated content of dispatch operator and engineer training course.
    - ii.) Equipment familiarization and walk downs at the CIF/M6-342 and LCC/K6-900 sites.
    - iii.) User account management, network administration, and system administration functions on radio controller, alarm automation server, alarm automation workstation, and network administration equipment.
    - iv.) Using step-by-step written instructions, execute the entire system hardware/software modification process indicated in Section 1.5.3.3, SYSTEM HARDWARE/SOFTWARE MODIFICATION SEQUENCE.
    - v.) Using step-by-step written instructions, execute other network switching processes (following step by step written instructions) indicated in Section 1.5.3.4, MISCELLANEOUS NETWORK SWITCHING FUNCTIONS including transfer of control operations from

the K6-900/900 head-end equipment to the M6-342/CIF head-end equipment.

vi.) Using step-by-step written instructions, execute the entire automatic database update processes in Section 1.5.3.2, DATABASE REPLICATION USING THE NETWORK.

vii.) Using step-by-step written instructions, update all databases to tape media and restore system using this media only.

viii.) Using step-by-step written instructions demonstrate removal/restoration of primary radio controller equipment. Remove the primary radio controller from the network. Re-install and update its database to that of the operating redundant controller. Transfer normal operation back to the primary radio controller.

ix.) Using step-by-step written instructions demonstrate removal/restoration of primary alarm automation system server equipment. Remove the primary alarm automation system server from the network. Re-install and update its database to that of the operating redundant server. Transfer normal operation back to the primary alarm automation system server.

x.) Using step-by-step written instructions demonstrate transferring of server database to digital medial for archive purposes to free-up hard drive space.

-- End of Section --