

PLUTONIUM DISPOSITION PROJECT (U)

Project M09A

SCOPE OF WORK

E-SOW-K-00017 Revision 0

for

Electrical Power Supply System (U)

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1.0 SCOPE

1.1 General Description

This Scope of Work (SOW) covers the Electrical Power Distribution Systems for the Plutonium Disposition Project. This document categorizes the Electrical Power Distribution System into three primary groups, 1) 13.8 KV Distribution, 2) 480V and Below Normal Distribution and 3) 480V and Below Backup Distribution 4) Lighting and general 120V power receptacle distribution which will be estimated on a per square foot bases. This scope will detail project work within the following areas:

- Process area electrical distribution system inside KAC building which includes 2) 480V and Below normal power distribution from four (4) – 1500 kVA existing transformers located in four transformer rooms at 0' level and 3) 480V and Below backup power distribution.
- Chiller building will have 1) 13.8 KV feeders from and 151-1K and 2) New double ended substation with 480V and below normal distribution
- Fan House building will have 1) 13.8 KV feeders from and 151-1K, 2) New double ended substation with 480V and below normal distribution and 3) SC class 480V and below distribution
- 4) for all above three lighting and 120V power receptacle distribution

1.2 Background

The Office of Environmental Management has approximately 13 metric tons (MT) of plutonium in approximately 21 MT bulk materials without any defined disposition path. The Plutonium Disposition (PUD) Project is critical to meet the Department of Energy's strategic goal of providing a responsible resolution to the permanent disposal of the nation's excess high-level radioactive materials and waste; and to enable the cleanup of Environmental Management sites.

The Plutonium Disposition Facility (PDF) will be located at the K-Area Complex (KAC) to disposition up to approximately 13 Metric Tons (MT) of Environmental Management (EM) owned surplus plutonium. The facility will utilize a vitrification process to vitrify plutonium into a lanthanide borosilicate (LaBS) glass matrix. This glass will be packaged into bagless transfer cans and placed inside a Defense Waste Processing Facility (DWPF) type canister. The canister will be transported to DWPF and filled with High Level Waste (HLW) glass. The DWPF canisters will be stored in the Glass Waste Storage Buildings and later transported to the geologic repository at Yucca Mountain.

This Scope of Work (SOW) has been developed for the purpose of facilitating **construction** cost and schedule estimates for the Conceptual Design Report (CDR) on the PUD project. The input to this SOW was the approved technical baseline consisting of a Facility Design Description (FDD) and associated System Design Descriptions (SDD). Every intent has been made to assure alignment and consistency between this SOW and the appropriate sections of the technical baseline, in order to provide accurate estimates. This SOW is not a PUD technical baseline document. A more detailed description of the system can be found in the associated SDD listed in the reference section.

A **HOLD** is placed to identify information that is preliminary in nature, results from a design uncertainty, originates from insufficient documentation, needs verification, or identifies a discrepancy. A **TBD** is placed to identify places in the text where numeric values or descriptive information is not available at the time that the current revision of the SOW is released.

2.0 ACRONYMS/ABBREVIATIONS

AC	Alternating Current
ATS	Automatic Transfer Switch
AWG	American Wire Gauge
BB	Building Block
CCTV	Closed Circuit Television
CDIN	Classified Distributive Information Network
D&R	Demolition and Removal
DCS	Distributed Control System
DMO	Direct Metal Oxidation
DOT	Department of Transportation
DS	Design Services
ECF	Entry Control Facility
EMT	Electrical Metallic Conduit
E3S	Electronic Safeguards and Security System
GS	General Services
HEPA	High-Efficiency Particulate Air (filter)
HUFP	Hanford Unirradiated Fuel Package
HVAC	Heating, Ventilation and Air Conditioning
IA	Implementing Agency
IDENT-69G	Hanford Fuel Pin Canister
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMC	Intermediate Metallic Conduit
KAC	K-Area Complex
LLW	Low Level Waste
MC&A	Material Control and Accountability
MCC	Motor Control Center
NMC	Neutron Multiplicity Counter
MPC&A	Material Protection Control and Accountability
MRS	Material Receipt System
MT	Modification Traveler
MTS	Manual Transfer Switch
NFPA	National Fire Protection Association
PA	Public Announcement Systemr
PC	Performance Category
PC&S	Process and Control Services Department
PIDAS	Perimeter Intrusion Detection and Assessment System
PU	Plutonium
PUD	Plutonium Disposition
PuVit	Plutonium Vitrification
RGS	Rigid Galvanized Steel
SC	Safety Class
SDD	System Design Description
SOW	Scope of Work

SRID	Safeguards and Security Requirements Identification Document
SRS	Savannah River Site
S&S	Safeguards & Security
SS	Safety Significant
SSC	Structure, System, Component
TBD	To Be Determined
TID	Tamper Indicating Device
UCNI	Unclassified Controlled Nuclear Information
UNO	Unless Noted Otherwise
UPS	Uninterruptible Power Supply
WBS	Work Breakdown Structure
WSRC	Washington Savannah River Company

3.0 DESCRIPTION OF PHYSICAL WORK

3.1 Performance Category and Functional Classification (SC, SS, PS, GS)

3.1.1 Performance Category

3.1.1.1 Provide Electrical Power Distribution System with Performance Category as follows:

- Normal Electrical Power, Production Support (PS), PC-2 construction
- Emergency Electrical Power, Safety Class (SC), PC-3 construction
- Standby Electrical Power, Safety Significant (SS), PC-2 construction
- Uninterruptible Electrical Power, Safety Significant (SS), PC-2 construction

Refer to E-SYD-K-00001 Section1, Table 1-1 for Electrical System performance categories.

3.1.2 Functional Classification

3.1.2.1 The systems in this SOW shall be designed in accordance with the requirements of WSRC Manual WSRC-E7, Conduct of Engineering and Technical Support Procedure 2.25 Rev 14, "Functional Classification", as follows:

- A. Process Area electrical power distribution system
 1. Functional Classification – Production Support (PS), PC-2 construction
 2. Function Classification – Safety Significant (SS), PC-2 construction for power distribution equipment serving critical and/or safety related equipment located within KAC.
- B. Chiller Building
Functional Classification – Production Support (PS), PC-2 construction
- C. Fan House Building
Functional Classification - Safety Class (SC), PC-3 construction except for 13.8KV overhead line, Unit Substations and 480V Busduct from unit substations to switchgear inside the building as (PS), PC-2 construction

3.2 Mechanical/Nuclear/Process

3.2.1 Process Building

No Input

3.2.2 Chiller Building

No Input

3.2.3 Fan House Building

Provide a 12,000 gallon diesel fuel tank (M-DS-K-00161) for the two SC class diesel generators including two (2) transfer pumps. Diesel Fuel transfer pumps control system is configured to automatically supply up to seven days reserve power following loss of normal facility power.

3.3 Instrumentation and Controls

No new (construction purchased) instruments are anticipated for installation within the scope area. However instrumentation provided as part of vendor packages (skids) for SS Diesel Generator, Unit Substation and UPS equipment will require checkout and/or calibrations. Additionally it will be responsibility of installer to install necessary signal wiring for interconnection of vendor supplied components associated with Unit Substation, D/G and/or UPS equipment. For instrumentation/signal wiring SOW quantities refer to attachment. Typical instrumentation includes (pressure, level, temp, voltage, current, power & frequency monitoring instrumentations).

3.3.1 Process Building

Process building has Diesel Generator, Various BOP Skids, UPS and Switchgear.

- Diesel Generator Control Panel (various monitoring and control signals)
- BOP System Skids (status signals)
- UPS (various monitoring and status signals)

3.3.2 Chiller Building

Chiller building has instrumentation provided with double ended substation

- Transformer Status Panel (temp., oil pressure etc.)
- Various power monitors (voltage, freq., current etc.)

3.3.3 Fan House Building

Fan House Building has instrumentation provided with unit substations, Diesel Generators, Switchgears, Batteries, Fuel Tank. All instrumentation involved with Fan House building except got unit substations are safety class (SC).

- Diesel Generator Control Panel (temp., oil pressure etc.)
- Battery Racks (Status signals)
- UPS (various monitoring and status signals)
- Unit Substations (transformer, breaker condition signals)

3.4 Electrical

There are three independent electrical power distribution systems as per General Description 1.1.:

- 3.4.1 Process area Electrical Power Distribution System from Existing four (4) – 1500 kVA transformers located in Transformers rooms at 0' level in KAC. See reference drawings E-E2-K-02225, E-E2-K-02226, E-E2-K-2229, E-E2-K-02230, E-E2-K-02232, E-E2-K-02233, E-E2-K-02240 and E-E2-K-02244. This Power Distribution System also includes Safety Significant (SS) class of backup power for the process area.
- 3.4.1.1 13.8KV Power Distribution:
- Replace existing 1500 kVA, 13.8KV-480V, Dry type transformer in transformer room #3 as shown on drawing E-E2-K-02232. See data sheet E-DS-K-00056.
- 3.4.1.2 480V and Below Power Distribution:
- Modify existing motor control center MCC-22E located in purification wing to provide new power distribution as shown on drawing E-E2-K-02226 for magazine loading and storage area.
 - Provide total of five (5) motor control centers for the process area as shown on referenced single line drawings and layout sketches. Provide power feeders from existing transformer rooms located on 0' level and as included in bulk material list. Provide five new power breakers 1600AF/800AT for the new feeders in existing switchgears at 0' level
 - Provide following 480-120/208V, 3-ph. power transformers in process area for 120/208V power requirements:
4 each 30 kVA, PS Class
2 each 45 kVA, PS Class
 - Provide following power panels in process area for power distribution for process equipment power requirements
1 each 225A, 480V, 3-ph. panel, PS Class
5 each 225A, 120/208V, 3-ph. panels, PS Class
4 each 100A, PS Class
 - Provide power and signal cable tray system as shown on layout sketches SK-DE-BOP-0007, SK-DE-BOP-0008, SK-DE-BOP-0009, SK-DE-BOP-0010
 - Provide power and signal cable tray system as shown on layout sketches SK-DE-BOP-0007, SK-DE-BOP-0008, SK-DE-BOP-0009, SK-DE-BOP-0010
- 3.4.1.3 480V and Below Back up Power Distribution:
- Provide motor control center for standby backup & UPS power system Safety Significant (SS) class. Provide power feeder from existing transformer room located on 0' level and as included in bulk material list. Provide one new power breakers 1600AF/800AT for the new feeder in existing switchgears at 0' level.
 - Provide following 480-120/208V, 3-ph. power transformers in process area for 120/208V power requirements
1 each 30 kVA, SS Class
1 each 45 kVA, SS Class
2 each 75 kVA, SS Class
 - Provide following power panels in process area for power distribution for process equipment power requirements
2 each 400A, 120/208V, 3-ph. panels, SS Class
4 each 225A, 120/208V, 3-ph. panels, SS Class
 - Provide new 250KW, 480V, 3-ph. diesel generator with day tank, Automatic transfer switch, manual transfer switch and isolation switch for SS Class backup power system as shown on E-E2-K-02240

3.4.1.4 Lighting and General Purpose Receptacles:
Provide normal & emergency lighting including exit light fixtures for the process and utility area. The lighting shall be in accordance with IES recommendations for total of 103,000 square ft. Scope includes all branch circuits, local lighting panels and transformers feed from existing MCC and Distribution panels. Provide 120V convenience duplex receptacles and grounding pigtails for the entire area on same square feet base.

3.4.2 Chiller Building Electrical Power Distribution System:

3.4.2.1 13.8KV Power Distribution:
Provide 2 each 1200A, 15KV, power breakers in 151-1K switchgear for two new feeders for the chiller plant
Provide two new 13.8KV feeders as shown on SK-DE-HVAC-0005
Provide new double ended unit substation ELNH-USS-001C as shown on E-E2-K-02234 and specified in equipment data sheets E-DS-K-00041

3.4.2.2 480V and Below Power Distribution:
Provide new motor control centers ELNH-MCC-001 & ELNH-MCC-002 as shown on E-E2-K-02234 and specified in equipment data sheets E-DS-K-00040
Provide Cable Tray and raceways as shown on layout sketch for chiller building
Provide direct buried 3" RGS conduit with signal and PA cables from the chiller building to KAC main process building. Run direct buried conduit along the new chilled water lines

3.4.2.3 Lighting and General Purpose Receptacles:
Provide normal & emergency lighting including exit light fixtures for the chiller building and cooling tower. The lighting shall be in accordance with IES recommendations. Total area to be considered is approximately 2500 sq. ft. Provide 120V convenience duplex receptacles and grounding pigtails for the entire area on same square feet base.

3.4.3 Fan House Electrical Power Distribution System:

3.4.3.1 13.8KV Power Distribution:
Extend existing 13.8KV overhead lines in K-Area to new substations for fan house building power. See SK-DE-HVAC-0005
Provide new unit substations ELNA-USS-001 & ELNA-USS-002 outside fan house building. These substations and bus ducts connected to switchgears ELNH-SWGR-001 & ELNH-SWGR-002 are PS/GS. See data sheets E-DS-K-00027 and E-DS-K-00028

3.4.3.2 480V and Below Safety Class (SC) Emergency Power Distribution:
Provide following Safety Class emergency power distribution equipment part of fan house building power distribution system. See SK-DE-HVAC-0006

Electrical distribution system installed under this section shall meet two train IEEE 384 requirement.

- ELNH-SWGR-001
- ELNH-SWGR-002
- ELNH-SWGR-003
- ELNH-MCC-001 See E-DS-K-00030

- ELNH-MCC-002 See E-DS-K-00030
- ELNH-MCC-003 See E-DS-K-00031
- EEP-SWGR-001 See E-DS-K-00029
- EEP-SWGR-002 See E-DS-K-00029
- EEP-DG-001 Diesel Generator with control cabinet, day tank, battery chargers and all accessories See E-DS-K-00038
- EEP-DG-002 Diesel Generator with control cabinet, day tank, battery chargers and all accessories See E-DS-K-00038
- 3 each 20 kVA UPS units ELNH-UPS-001, 002 & 003. See E-DS-K-00036 & See E-DS-K-00037
- 1 each 45 kVA, 480-120/208V transformer
- 1 each 225A, 120/208V panel
- 3 each 15 kVA, 125VDC battery systems & chargers
- 2 each 5HP diesel supply pump power
- BUS DUCT as shown on SK-DE-HVAC-0008 and data sheets E-DS-K-00032, 00033, 00034 and 00035
- Provide cables and raceways from fan house building to main KAC building controls and power as shown on sketch SK-DE-HVAV-0005

3.4.3.3 Lighting and General Purpose Receptacle:
Provide normal & emergency lighting including exit light fixtures for the fan house building approximately 9,000 sq. ft. The lighting shall be in accordance with IES recommendations. Provide 120V convenience duplex receptacles and grounding pigtails for the entire area on same square feet base.

3.5 Plant Design

Not Applicable.

3.6 Civil/Structural/Architectural

3.6.1 The C/S/A scope of work required for installation of supports for the major components of Electrical Power Supply Systems is as follows.

3.6.2 Motor control centers [6]:

The weight of each Motor control Center is approximately 1500 lbs. Each unit will be provided with the bolt holes for mounting. Each unit will be supported by a steel frame made of 4"X4"X1/2" angles and anchored with ½" Dia. bolts to the concrete floor at -20 Level. Follow the manufacturer's recommendations for the support details.

3.6.3 Power Transformers [10]:

The weight of each Power Transformer is approximately 400 lbs. Each unit will be provided with the bolt holes for mounting. Each unit will be supported by a steel frame made of 4"X4"X1/2" angles and anchored with ½" Dia. bolts to the concrete floor at -40 Level. Follow the manufacturer's recommendations for the support details.

3.6.4 Panels [16]:

The weight of each Panel is approximately 200 lbs. It will be provided with the bolt holes for mounting Panel. Each panel will be supported by a steel frame made of P 1000 Unistruts and anchored with ½ " Diameter bolts to the wall. Follow the manufacturer's recommendations for the support details.

3.6.5 All equipments in Chiller Building Electric Power Distribution System:
Follow the manufacturer's recommendations for the support details.

3.6.6 All equipments in Fan House Electric Power Distribution System:
Follow the manufacturer's recommendations for the support details.

4.0 ASSUMPTIONS

4.1 General Assumptions

- 4.1.1 The Construction Agency will be the SRS Construction Group. DS will provide engineering documentation for the installation of this equipment and will rely on the use of SRS Guides and Standards.
- 4.1.2 SRS Construction Group will procure all bulk materials.
- 4.1.3 SRS Construction Group will procure all off-the-shelf components and equipment identified on engineering data sheets that do not require testing or quality documentation.
- 4.1.4 All conduits will be IMC or RGS except for under ground or encased in concrete.

4.2 Specific Assumptions

4.2.1 Mechanical

4.2.1.1 No specific assumptions have been made in this group.

4.2.2 Instrumentation and Controls

4.2.2.1 No specific assumptions have been made in this group.

4.2.3 Electrical

- 4.2.3.1 Existing four (3) 1500 kVA transformers in KAC will be utilized to supply power feeds to process and support loads in KAC building. 1500 kVA transformer #3 in transformer room #3 will be replaced.
- 4.2.3.2 Adequate spare capacity is available at 151-1K to support addition of new loads for Chiller and Fan House buildings.
- 4.2.3.3 Existing 13.8KV Over Head lines have adequate spare capacity and will be extended to provide power to Fan House building.
- 4.2.3.4 During conceptual design phase Lighting & receptacle cost estimate will be based upon a per square foot estimated value. Similarly Lightning Protection cost for the new structures will be estimated based upon building & overall size.
- 4.2.3.5 No lightning protection related modifications are necessary for the main KAC process building.

- 4.2.3.6 Existing building ground grid serving main KAC is adequate to support project related work. Scope only includes installation of new grounding pigtailed for equipment/skids.
- 4.2.3.7 Conduit run between main KAC building and Chiller building will be direct buried (i.e. no concrete encasement required). The 3" conduit shall run inside pipe sleeve by core boring installed beneath PIDAS.
- 4.2.4 Plant Design
 - 4.2.4.1 No specific assumptions have been made in this group.
- 4.2.5 Civil/Structural/Architectural
 - 4.2.5.1 Core drills will be required for routing commodities through existing walls or floors, which is covered in C-SOW-K-00009.
 - 4.2.4.2 Assume all anchor bolts used for equipment and commodity supports will be A36 Drillco Maxi bolts. Alternatively, Hilti Kwik Bolts -TZ are acceptable for anchoring items.
 - 4.2.4.3 Any components inside any equipment like Panels etc. are the integral parts of that equipment as one unit.
 - 4.2.4.4 Functional Classification for drilling holes in concrete surface is SC.
 - 4.2.4.5 Bulk materials other than Listed will be required for the equipments used in the Chiller Building and Fan House Electric Power Distribution Systems. [Due to insufficient data the quantity for Bulk material can not be estimated.] However, follow the manufacturer's recommendations for the support details.

5.0 Technology Development Issues

There are currently no technology issues for the Electrical systems.

6.0 REFERENCES

6.1 Drawing List

- 6.1.1 PUD Project Drawings & Sketches

- 6.1.1.1 E-E2-K-02225, Motor Control Center ELNH-MCC-31E – Single Line Diagram
- 6.1.1.2 E-E2-K-02226, Magazine Loading and Storage – Single Line Diagram
- 6.1.1.3 E-E2-K-02229, Motor Control Center ELNH-MCC-24M – Single Line Diagram
- 6.1.1.4 E-E2-K-02230, Motor Control Center ELNH-MCC-31M – Single Line Diagram
- 6.1.1.5 E-E2-K-02232, Motor Control Center ELNH-MCC-11M – Single Line Diagram
- 6.1.1.6 E-E2-K-02233, Motor Control Center ELNH-MCC-18M – Single Line Diagram
- 6.1.1.7 E-E2-K-02234, Central Chilled Water Plant Unit Substation – Single Line Diagram
- 6.1.1.8 E-E2-K-02235, Central Chilled Water Plant, 480V Motor Control Centers – Single Line Diagram
- 6.1.1.9 E-E9-K-02190, Chiller Building – Power Plan
- 6.1.1.10 SK-DE-BOP-0007, 0008, 0009 & 0010, Power and I&C Cable Tray Layout Plans
- 6.1.1.11 SK-DE-HVAC-0005, Electrical/I&C Services
- 6.1.1.12 SK-DE-HVAC-0006, 0007 & 0008, Fan House Electrical Layouts
- 6.1.1.13 SK-DE-BOP-0004 thru 0006 and 0011 thru 0016, -20' and -40' level Electrical and I&C Equipment Layout
- 6.1.1.14 E-DS-K-00026 thru 00057 Electrical Equipment Data Sheets

6.1.2 Existing Savannah River Site (SRS) Drawings

- 6.1.2.1 W2021983, Electrical Supply System for 100-K Area Single Line Diagram
- 6.1.2.2 W811418, W825663, W825664, W825665 and W825666 480V Swgr.-Single Line Diagrams

6.2 Design Input Documents

The following Facility Design Description and System Design Descriptions are the baseline documents used to develop this SOW.

6.2.1 Facility Design Description

- 6.2.1.1 G-FDD-K-00001, Rev B “PUV Facility Design Description”

6.2.2 System Design Description

- 6.2.2.1 E-SYD-K-00001, Rev. C “Electrical Power & Distribution System (ED) SDD”

6.3 Applicable SRS & Industry Codes, Guides and Standards

6.3.1 Industry Codes and Standards

- 6.3.1.1 IEEE std. 765-1995 – Preferred Power Supply (PPS) for Nuclear Generating Stations
- 6.3.1.2 IEEE std. 323-2003 – Qualifying Class 1E Equipment for Nuclear Power Generating Stations
- 6.3.1.3 IEEE std. 344-2004 – Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations
- 6.3.1.4 IEEE std. 384-1998 – Standard Criteria for Class 1E Equipment and Circuits
- 6.3.1.5 NFPA 70, 2005 – National Electrical Code

See Functional Design Description and System Design Descriptions References 2.2.1.1, 2.2.2.1, 2.2.2.2, and 2.2.2.3 for more codes and standards.

6.3.2 SRS Guides & Standards

- 6.3.2.1 SRSESM 15980-03-R, Mechanical Installation of General and Nuclear Services Instrumentation
- 6.3.2.2 SRSESM 16051-G-02 Installation of Electrical Raceway Systems and Cable Trays
- 6.3.2.3 SRSESM 16052-G-03 Installation of Electrical Wires, Cables and Termination
- 6.3.2.4 SRSESM 16053-G-02 Installation of Electrical Equipment
- 6.3.2.5 SRSESM 16054-G-02 Installation of Electrical Heat Tracing and Freeze Protection
- 6.3.2.6 SRSESM 16055-G-02 Installation of Lighting and Communication Systems
- 6.3.2.7 SRSESM 16056-G-02 Installation of Grounding Systems
- 6.3.2.8 SRSESM 16057-G-02 Installation of Cathodic Protection Systems

6.4 Related Scopes of Work (SOW)

- 6.4.1 C-SOW-K-00009, Structural & Architectural Modifications for the K-Area Complex
- 6.4.2 C-SOW-K-00010, Structural & Architectural Modifications for outside the PIDAS
- 6.4.3 M-SOW-K-00020, Heating Ventilating and Air Conditioning (HVAC) Systems
- 6.4.4 M-SOW-K-00021, Balance of Plant – Compressed Gas Systems
- 6.4.5 M-SOW-K-00022, Balance of Plant – Water System
- 6.4.6 J-SOW-K-00002, ICS and MC&A Network

6.5 Miscellaneous

- 6.5.1 M&O-PUD-2006-00078, Preliminary HVAC Elect. Substation Sizing Requirement
- 6.5.2 M&O-PUD-2007-00006, Safety Class Single Line Diagram Assumptions & Equipment Sizing Calculations
- 6.5.3 M&O-PUD-2007-00007, Preliminary UPS & Backup Power Diesel Generator Sizing Requirement

7.0 ATTACHMENTS

- 7.1 Attachment 1, Bulk Material List (12 Pages)
- 7.2 Attachment 2, Bulk Material List (1 Page)

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *hsh* Reviewed By: *S.S. Shah*

Exterior Glovebox Cables

Sum of Qty XGB (ft)	Total
Ext. Cable Size/Type	
#4 soft drawn copper	200
500 kcmil	2,340
(blank)	
#4/0	780
5/C #2	850
4/C #6	150
2-pair #18 Shild.	1,000
Grand Total	5,320

Interior Glovebox Cables

Sum of Qty NGB (ft)	Total
GB Cable Size/Type	
(blank)	
Grand Total	

All Raceway Types

Sum of Qty RcwY (ft)	Total
RCWY	
n/a	0
(blank)	
3" IMC	720
1 1/2 "	360
3/4" IMC	1,000
Grand Total	2,080

All Raceway Types Grouped by Red Designation

Sum of Qty RcwY (ft)	RCWY	Total
Red		
(blank)	(blank)	
Grand Total		

KAC - ELECTRICAL RM. #1

Description: KAC Pu Disposition Facility Bulk Materials, Cable and Conduit
Electrical Equip Room #1
Reference: E-E2-K-02225 R/C Feed Prep and Oxidation Area MCC-31E Single Line
E-E2-K-02229 R/D Milling/Mixing and Vitrification MCC-24M Single Line
E-E2-K-02230 R/D Milling/Mixing and Vitrification MCC-31M Single Line

Item #	From Equipment	To Equipment	Cable Estimates (Exterior GB)		Shared Rcw/Tray		Raceway Estimates		Notes/Comments	
			XGB Length (A) (ft)	Qty (A)	Cable size/description	Length (C) (ft)	Length (D) (ft)	Qty (D)		Size/Desc. (D)
1	Transformer Rm #2 Swgr	ELNH-MCC-24M	120	6	500 kcmil	0	100	2	3" IMC	N
2	Transformer Rm #2 Swgr	ELNH-MCC-24M	120	2	#4/0	100	0	2	n/a	N grounds
3	ELNH-MCC-24M	ELNH-XFMR-016	20	1	4/C #6	0	15	1	1 1/2"	N
4	ELNH-XFMR-016	ELLV-PNL-009	300	1	5/C #2	220	70	1	1 1/2"	N
5	Transformer Rm #3 Swgr	ELNH-MCC-31M	270	6	500 kcmil	0	260	2	3" IMC	N
6	Transformer Rm #3 Swgr	ELNH-MCC-31M	270	2	#4/0	260	0	2	n/a	N grounds
7	ELNH-MCC-31M	ELNH-XFMR-017	20	1	4/C #6	0	15	1	1 1/2"	N
8	ELNH-XFMR-017	ELLV-PNL-010	300	1	5/C #2	220	70	1	1 1/2"	N
9	Transformer Rm #3 Swgr	ELNH-MCC-31E	270	6	500 kcmil	0	260	2	3" IMC	N
10	Transformer Rm #3 Swgr	ELNH-MCC-31E	270	2	#4/0	260	0	2	n/a	N
11	ELNH-MCC-31E	ELNH-XFMR-006	50	1	4/C #6	0	45	1	1 1/2"	N
12	ELNH-XFMR-006	ELLV-PNL-007	200	1	5/C #2	125	65	1	1 1/2"	N
13	DCS-CAB	Elect. Equip.	1000	1	2-pair #18 Shild.	1000	1000	1	3/4" IMC	N
14	ELNH-MCC-31E	ELNH-XFMR-007	50	1	4/C #6	0	45	1	1 1/2"	N
15	ELNH-XFMR-007	ELLV-PNL-008	200	1	5/C #2	125	65	1	1 1/2"	N
16	ELNH-MCC-31E	ELNH-XFMR-004	50	1	4/C #6	0	45	1	1 1/2"	N
17	ELNH-XFMR-004	ELLV-PNL-004	150	1	5/C #2	125	25	1	1 1/2"	N
18	Equipment	Ground grid	200	1	#4 soft drawn copper	0	0	0	n/a	N grounds for equipment

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *gsr* Reviewed By: *S. C. Shah*

All Raceway Types Grouped by Red Designation

Sum of Qty RcwY (ft)		Total
Red	RCWY	
Grand Total		

All Raceway Types

Sum of Qty RcwY (ft)		Total
RCWY		760
3" IMC		70
1 1/2 "		1,000
3/4" IMC		1,830
Grand Total		

Interior Glovebox Cables

Sum of Qty NGB (ft)		Total
GB Cable Size/Type		
Grand Total		

Exterior Glovebox Cables

Sum of Qty XGB (ft)		Total
Ext. Cable Size/Type		
#4 soft drawn copper		60
500 kcmil		2,400
#4/0		800
4/C #6		50
5/C #2		40
2-pait #18 Shild.		1,000
Grand Total		4,350

KAC - ELECTRICAL RM. #2

Description: KAC Pu Disposition Facility Bulk Materials, Cable and Conduit
Electrical Equip Room #2
Reference: E-E2-K-02233 R/C Motor Control Center Single Line MCC-18M
E-E2-K-02244 R/A Motor Control Center Single Line MCC-24E

Item #	From Equipment	To Equipment	Cable Estimates (Exterior GB)		Shared Rewy/Tray		Raceway Estimates			Notes/Comments
			XGB Length (A) (ft)	Qty (A)	Length (ft)	Length (C) (ft)	Length (D) (ft)	Qty (D)	Size/Desc. (D)	
1	Transformer Rm #1 Swgr	ELNH-MCC-18M	225	6	500 kcmil	0	215	2	3" IMC	N
2	Transformer Rm #1 Swgr	ELNH-MCC-18M	225	2	#4/0	215	0	2	n/a	N grounds
3	ELNH-MCC-18M	ELNH-XFMR-018	50	1	4/C #6	0	40	1	1 1/2"	N
4	ELNH-XFMR-018	ELLV-PNL-009	40	1	5/C #2	0	30	1	1 1/2"	N
5	Transformer Rm #2 Swgr	ELNH-MCC-24E	175	6	500 kcmil	0	165	2	3" IMC	N
6	Transformer Rm #2 Swgr	ELNH-MCC-24E	175	2	#4/0	165	0	2	n/a	N
7	DCS-CAB	Elect. Equip.	1000	1	2-pair #18 Shield.	0	1000	1	3/4" IMC	N I&C Cable
20	Equipment	Ground grid	60	1	#4 soft drawn copper	0	0	0	n/a	N grounds for equipment

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *[Signature]* Reviewed By: *[Signature]*

All Raceway Types Grouped by Red Designation

All Raceway Types

Interior Glovebox Cables

Exterior Glovebox Cables

Sum of Qty RcwY (ft)		Total
Red	RCWY	
Grand Total		

Sum of Qty RcwY (ft)		Total
RCWY		330
3" IMC		470
2" IMC		60
1 1/2" IMC		1,000
3/4# IMC		1,860
Grand Total		

Sum of Qty NGB (ft)		Total
GB Cable Size/Type		
Grand Total		

Sum of Qty XGB (ft)		Total
Ext. Cable Size/Type		
#4 soft drawn copper		300
500 kcmil		1,065
#4/0		355
4c #1/0		540
350 kcmil		320
4/c #2		80
5/c #4		40
2-pair #18 Shield		1,000
Grand Total		3,700

KAC - 108-1K

Description: KAC Pu Disposition Facility Bulk Materials, Cable and Conduit
Mechanical Equipment Room 108-1K
Reference: E-E2-K-02240 R/B 480V Backup Power & Motor Control Center Single Line MCC-12E

Item #	From Equipment	To Equipment	Cable Estimates (Exterior GB)		Shared Raceway/Tray		Raceway Estimates		Notes/Comments	
			XGB Length (A) (ft)	Qty (A)	Cable size/description	Length (ft)	Qty (C)	Length (D) (ft)		Qty (D)
1	Transformer Rm #1 Swgr	ELNH-DISC-011	175	3	500 kcmil	0	165	1	3" IMC	N
2	Transformer Rm #1 Swgr	ELNH-DISC-011	175	1	#4/0	165	0	1	n/a	N ground
3	EPP-DG-003	ELNH-ATS-003	40	3	500 kcmil	0	30	1	3" IMC	N
4	EPP-DG-003	ELNH-ATS-003	40	1	#4/0	30	0	1	n/a	N ground
5	ELNH-DISC-011	ELNH-MTS-004	30	3	500 kcmil	0	20	1	3" IMC	N
6	ELNH-DISC-011	ELNH-MTS-004	30	1	#4/0	20	0	1	n/a	N ground
7	ELNH-DISC-011	ELNH-ATS-003	30	3	500 kcmil	0	20	1	3" IMC	N
8	ELNH-DISC-011	ELNH-ATS-003	30	1	#4/0	20	0	1	n/a	N ground
9	ELNH-ATS-003	ELNH-MTS-004	30	3	500 kcmil	0	20	1	3" IMC	N
10	ELNH-ATS-003	ELNH-MTS-004	30	1	#4/0	20	0	1	n/a	N ground
11	ELNH-MTS-004	EPP-MCC-012E	50	3	500 kcmil	0	35	1	3" IMC	N
12	ELNH-MTS-004	EPP-MCC-012E	50	1	#4/0	35	0	1	n/a	N ground
13	EPP-MCC-012E	ELNH-DISC-012	250	1	4c #1/0	20	210	1	2" IMC	N includes ground
14	ELNH-DISC-012	ELNH-XFMR-011	20	1	4c #1/0	0	10	1	2" IMC	N includes ground
15	ELNH-XFMR-011	ELLV-UPS-004	20	4	350 kcmil	0	10	1	3" IMC	N includes ground
16	ELLV-UPS-004	ELLV-PNL-002	20	4	350 kcmil	0	10	1	3" IMC	N includes ground
17	EPP-MCC-012E	ELNH-DISC-013	250	1	4c #1/0	20	210	1	2" IMC	N includes ground
18	ELNH-DISC-013	ELNH-XFMR-012	20	1	4c #1/0	0	10	1	2" IMC	N includes ground
19	ELNH-XFMR-012	ELLV-UPS-005	20	4	350 kcmil	0	10	1	3" IMC	N includes ground
20	ELLV-UPS-005	ELLV-PNL-003	20	4	350 kcmil	0	10	1	3" IMC	N includes ground
21	EPP-MCC-012E	ELNH-XFMR-013	40	1	4/c #2	0	30	1	1 1/2" IMC	N includes ground
22	ELNH-XFMR-013	ELLV-PNL-006	20	1	5/c #4	0	15	1	2" IMC	N includes ground
23	EPP-MCC-012E	ELNH-XFMR-014	40	1	4/c #2	0	30	1	1 1/2" IMC	N includes ground
24	ELNH-XFMR-014	ELLV-PNL-001	20	1	5/c #4	0	15	1	2" IMC	N includes ground
25	DCS-CAB	Elect. Equip.	1000	1	2-pair #18 Shield	0	1000	1	3/4" IMC	N I&C Cable
26	Equipment	Ground grid	300	1	#4 soft drawn copper	0	0	0	n/a	N grounds for equipment

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *[Signature]* Reviewed By: *S. C. Shah*

Exterior Glovebox Cables Interior Glovebox Cables All Raceway Types All Raceway Types Grouped by Red Designation

Sum of Qty XGB (ft)	Total
Ext. Cable Size/Type	0
N/A	0
Grand Total	0

Sum of Qty NGB (ft)	Total
GB Cable Size/Type	
Grand Total	

Sum of Qty Rcwy (ft)	Total
RCWY	237
12" x 4", 90degree	27
12" x 4", Tee fitting	650
24" x 4" 10' straight	2,000
12" x 4" x 10' straight	20
18" x 4" x 10' straight	3
24" to 12" x 4" reducer	69
24" x 4", 90degree	51
24" x 4", Tee fitting	
Grand Total	3,057

Sum of Qty Rcwy (ft)	RCWY	Total
Red		
Grand Total		

KAC - CABLE TRAY

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *[Signature]* Reviewed By: *[Signature]*

Exterior Glovebox Cables

Sum of Qty XGB (ft)	Total
Ext. Cable Size/Type	
#2 15kV	4,520
#4 (19 strand) MHD Copper	3,375
#2 (7strand) MHD Copper	1,125
#6 MHD Copper	300
#4 soft drawn copper	530
500 kcmil	240
#10	100
#2/0	120
#6	330
#1/0	80
n/a	0
2-pair #18 Shild.	1,000
Grand Total	11,720

Interior Glovebox Cables

Sum of Qty NGB (ft)	Total
GB Cable Size/Type	
Grand Total	

All Raceway Types

Sum of Qty Rcw (ft)	Total
RCWY	
4" IMC	1,040
1" IMC	80
2" IMC	20
12" x 4"	110
3" PVC	1,300
3/4" IMC	1,000
Grand Total	3,550

All Raceway Types Grouped by Red Designation

Sum of Qty Rcw (ft)	Total
Red	
RCWY	
Grand Total	

OVERHEAD LINE POLE:

55' Class 3 Wooden Poles: Total 5

CHILLER BUILDING

Description: KAC Pu Disposition Modifications Chiller Plant, Bulk Materials, Cable and Conduit
Reference: E-E2-K-02234 R/B Central Chilled Wtr Plant Unit Substation Single Line and
E-E2-K-02235 R/B Central Chilled Wtr Plant 480V Motor Control Centers Single Lines

Item #	From Equipment	To Equipment	Cable Estimates (Exterior GB)			Raceway Estimates			Notes/Comments	
			XGB Length (A) (ft)	Qty (A)	Cable size/description	Length (C) (ft)	Length (D) (ft)	Qty (D)		Size/Desc. (D)
1	Existing 151-1K Swgr Bus 1 Breaker 1-12	13.8kV feeder 1 pole near 704-23K	430	4	#2 15kV	0	420	1	4" IMC	Underground in red dyed concrete includes ground conductor inside conduit
2	13.8kV feeder 1 pole near 704-23K	13.8kV feeder 1 pole at Chiller Plant	575	3	#4 (19 strand) MHD Copper	0	0	0	n/a	Aerial Lines
3	13.8kV feeder 1 pole at 151-1K	13.8kV feeder 1 pole at Chiller Plant	575	1	#2 (7strand) MHD Copper	0	0	0	n/a	Aerial Static Line
4	13.8kV feeder 1 pole at Chiller Plant	ELNH-USS-001C	150	4	#2 15kV	0	140	1	4" IMC	Underground in red dyed concrete includes ground conductor inside conduit
5	Each new pole	Ground rods	300	1	#6 MHD Copper	0	0	0	n/a	N grounding of static lines
5	Duct bank	duct bank	430	1	#4 soft drawn copper	0	0	0	n/a	N routed in ductbanks
6	Existing 151-1K Swgr Bus 2 Breaker 2-7	13.8kV feeder 2 pole at 151-1K	430	4	#2 15kV	0	420	1	4" IMC	Underground in red dyed concrete includes ground conductor inside conduit
7	13.8kV feeder 2 pole at 151-1K	13.8kV feeder 2 pole at Chiller Plant	550	3	#4 (19 strand) MHD Copper	0	0	0	n/a	Aerial Lines
8	13.8kV feeder 2 pole at 151-1K	13.8kV feeder 2 pole at Chiller Plant	550	1	#2 (7strand) MHD Copper	0	0	0	n/a	Aerial Static Line
10	13.8kV feeder 2 pole at Chiller Plant	ELNH-USS-001C	120	4	#2 15kV	0	0	0	4" IMC	Underground in red dyed concrete includes ground conductor inside conduit
9	ELNH-USS-001C	ELNH-MCC-001C	40	3	500 kcmil	0	30	1	4" IMC	N ground
10	ELNH-USS-001C	ELNH-MCC-001C	40	1	#1/0	30	0	0	0	N ground
11	ELNH-USS-001C	ELNH-MCC-002C	40	3	500 kcmil	0	30	1	4" IMC	N ground
12	ELNH-USS-001C	ELNH-MCC-002C	40	1	#1/0	30	0	0	0	N ground
13	ELNH-MCC-001C	ELLV-XFMR-001C	50	3	#6	0	40	1	1" IMC	N ground
14	ELNH-MCC-001C	ELLV-XFMR-001C	50	1	#10	40	0	0	0	N ground
15	ELLV-XFMR-001C	ELLV-PNL-001C	15	4	#2/0	0	10	1	2" IMC	N ground
16	ELLV-XFMR-001C	ELLV-PNL-001C	15	1	#6	10	0	0	0	N ground
17	ELNH-MCC-002C	ELLV-XFMR-002C	50	3	#6	0	40	1	1" IMC	N ground
18	ELNH-MCC-002C	ELLV-XFMR-002C	50	1	#10	40	0	0	0	N ground
19	ELLV-XFMR-002C	ELLV-PNL-002C	15	4	#2/0	0	10	1	2" IMC	N ground
20	ELLV-XFMR-002C	ELLV-PNL-002C	15	1	#6	10	0	0	0	N ground
21	MCCs	Cooling Towers	0	0	0	0	110	1	12" x 4"	N aluminum ladder type, 9" rung sp.
22	105 building	chiller plant	0	0	n/a	0	1300	1	3" PVC	N
23	DCS-CAB	Elect. Equip.	1000	1	2-pair #18 Shield.	0	1000	1	3/4" IMC	N I&C Cable
24	Equipment	Ground grid	100	1	#4 soft drawn copper	0	0	0	0	N ground

Scope Set: ELECTRICAL Date: 4/10/2007

Prepared By: *[Signature]* Reviewed By: *[Signature]*

Exterior Glovebox Cables Interior Glovebox Cables All Raceway Types All Raceway Types Grouped by Red Designation

Sum of Qty XGB (ft)	Total
Ext. Cable Size/Type	
#4 (19 strand) MHD Copper	4,500
#2 (7strand) MHD Copper	1,500
#6 MHD Copper	1,500
500 kcmil	1,410
#2/0	470
#4/0 soft drawn copper	380
n/a	0
2-pair #18 Shield.	1,000
#2 15kV	600
Grand Total	11,360

Sum of Qty NGB (ft)	Total
GB Cable Size/Type	
Grand Total	

Sum of Qty RcwY (ft)	Total
RCWY	
3" IMC	4,650
2" IMC	2,840
3/4" IMC	1,000
4" IMC	120
Grand Total	8,610

Sum of Qty RcwY (ft)	Total
SC	
Y	0
n/a	4,650
3" IMC	2,840
2" IMC	1,000
3/4" IMC	120
Grand Total	8,490

OVERHEAD LINE POLE:

55' Class 3 Wooden Poles: Total 12

FAN HOUSE

Description: KAC Pu Disposition Modifications Fan House, Bulk Materials, Cable and Conduit
Reference: E-E2-K-02236 R/B Emergency Power System Single Line, 13.8KV-480V Swgr and
E-E2-K-02237,-02238, -02239 R/B Emergency Power System Motor Control Centers Single Lines

Item #	From Equipment	To Equipment	Cable Estimates (Exterior GB)		Rwy/Tray Raceway Estimates		Size/Desc. (D)	Rel	Notes/Comments
			XGB Length (A) (ft)	Qty (A)	Length (C) (ft)	Qty (D)			
1	Tie-in to 13.8KV overhead feeder at existing pole K116-005 (from 151-1K)	13.8KV north feeder pole @ new substation (north)	550	3	#4 (19 strand) MHD Copper	0	0	0	N Aerial lines
2	Existing 13.8KV (from 151-1K) overhead feeder at pole K116-005	13.8KV north feeder pole @ new substation (north)	550	1	#2 (7strand) MHD Copper	0	0	0	N Aerial Static Line Underground in red dyed concrete includes ground conductor inside conduit
3	13.8KV north feeder pole @ new substation	ELNA-USS-001	50	4	#2 15KV	0	40	1	N 4" IMC
4	Tie-in to 13.8KV underground feeder from existing splice box 152-6K (from 151-2K)	13.8KV south feeder pole @ new substation (south)	950	3	#4 (19 strand) MHD Copper	0	0	0	N Aerial lines
5	13.8KV south feeder pole near 152-6K	13.8KV south feeder pole @ new substation (south)	950	1	#2 (7strand) MHD Copper	0	0	0	N Aerial Static Line Underground in red dyed concrete includes ground conductor inside conduit
6	13.8KV south feeder pole near 152-6K	13.8KV south feeder pole @ new substation (south)	950	1	#2 (7strand) MHD Copper	0	0	0	N Aerial Static Line Underground in red dyed concrete includes ground conductor inside conduit
7	13.8KV north feeder pole @ new substation	ELNA-USS-002	50	4	#2 15KV	0	40	1	N 4" IMC
8	Each new pole	Ground rods	1500	1	#6 MHD Copper	0	0	0	N grounding of static lines
9	Duct bank	duct bank	180	1	#4/0 soft drawn copper	0	0	0	N ground routed in ductbanks
10	ELNH-SWGR-001	ELNH-MCC-001	50	3	500 kcmil	0	40	1	N 3" IMC
11	ELNH-SWGR-001	ELNH-MCC-001	50	1	#2/0	40	0	0	N n/a
12	ELNH-SWGR-002	ELNH-MCC-002	50	3	500 kcmil	0	40	1	N 3" IMC
13	ELNH-SWGR-002	ELNH-MCC-002	50	1	#2/0	40	0	0	N n/a
14	ELNH-SWGR-003	ELNH-MCC-003	50	3	500 kcmil	0	40	1	N 3" IMC
15	ELNH-SWGR-003	ELNH-MCC-003	50	1	#2/0	40	0	0	N n/a
16	ELNH-SWGR-001	ELNH-SWGR-003	60	6	500 kcmil	0	50	2	N 3" IMC
17	ELNH-SWGR-001	ELNH-SWGR-003	60	2	#2/0	50	0	2	N n/a
18	ELNH-SWGR-002	ELNH-SWGR-003	100	6	500 kcmil	0	85	2	N 3" IMC
19	ELNH-SWGR-002	ELNH-SWGR-003	100	2	#2/0	85	0	2	N n/a
19	DCS-CAB	Elect. Equip.	1000	1	2-pair #18 Shild.	0	1000	1	N 3/4" IMC
20	105 building	fan house bldg.	0	0	n/a	0	710	4	N 2" IMC
21	105 building	fan house bldg.	0	0	n/a	0	710	6	N 3" IMC
22	Equipment	Ground grid	200	1	#4/0 soft drawn copper	0	0	0	N grounds for equipment

ATTACHMENT No. 2
(Bulk Material CSA)

<u>½" Diameter Anchor Bolts = 200 Nos.</u>
P1000 Unistrut = 100 ft
L4x4x1/2 Angle = 200 ft

Note: Follow the manufacturer's recommendations for the support details. More bulk materials than above List will be required for equipments used in the Chiller Building and Fan House Electric Power Distribution Systems per manufacturer's recommendations.