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8. Originator Remarks: This EDT is used to release the Tank Farm Lightning Mitigation TASK PLAN and its APPENDIX which includes the Functional Requirements and Technical Criteria.				9. Equip./Component No.: NA	
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				12. Major Assm. Dwg. No.: NA	
				13. Permit/Permit Application No.: NA	
				14. Required Response Date: 02/07/97	

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1	WHC-SD-WM-WP-339 HMF <i>F. M. Jones</i> 2/7/97	NA	0	Lightning Mitigation; Task Plan and Functional Requirement & Technical Criteria	Q	1	1	1

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
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		3. Information	6. Dist (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(H) Reason	(I) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	/	Design Authority: C Scaife	<i>C Scaife</i>	2/7/97	12997						
1	/	Const. Manager: T Ostrandeg	<i>T Ostrandeg</i>	2/5/97	5097						
1	/	Major Maintenance: W Bryant	<i>W Bryant</i>	2/6/97	21697						
1	/	Production Control: R Rodriguez	<i>R Rodriguez</i>	2/7/97	12997						
1	/	QA Rep.: C Sams	<i>C Sams</i>	2/7/97	12997						
1	/	Safety Issues Resolutions: J Meacham	<i>J Meacham</i>	2/7/97	12997						

18. F.M. Jones <i>F.M. Jones</i> 2/3/97 Signature of Originator Date		19. <i>F.M. Jones</i> Authorized Representative Date for Receiving Organization		20. <i>F.M. Jones</i> Design Authority/ Cognizant Manager Date		21. DOE APPROVAL (if required) CTF. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments	
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HNF *Forjona* 2/7/97

ENGINEERING WORK PLAN TANK FARM LIGHTNING MITIGATION SYSTEM

F. M. Jones

Lockheed Martin Hanford Corporation, Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-87RL10930-96RL13200_{pm}

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UC: 2000

Org Code: 74710

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Key Words: Lightning Mitigation, Flammable Gas, Watch List, Single Shell Tanks, Bonding, Air Terminals

Abstract: This Engineering Work Plan defines the scope, function and design criteria, and installation activities that will be provided in support of the Tank Farm Lightning Mitigation System.

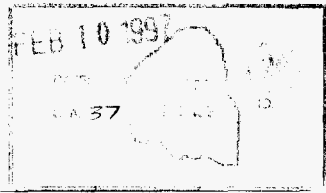
The Tank Farm Lightning Mitigation System is comprised of two tasks, the light pole air terminal design and the tank riser bonding design. Air terminals, riser and riser flange bonding system will be designed and installed to mitigate the effect of lightning strikes in single shell tank farms with watchlist tanks.

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James Bishop
Release Approval

2-11-97
Date



Release Stamp

Approved for Public Release

ENGINEERING WORK PLAN
TANK FARM LIGHTNING MITIGATING SYSTEM

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LIST OF TERMS

ABU	-	ACCEPTANCE FOR BENEFICIAL USE
AIR TERMINAL	-	LIGHTING ROD
AS-BUILT	-	DOCUMENTED FINISHED CONDITION
BOND	-	ELECTRICALLY CONDUCTIVE PATH
CODE	-	LAW OR REGULATORY DOCUMENT
DOWN CONDUCTOR	-	WIRE BETWEEN AIR TERMINAL AND GROUND ROD
GROUNDED	-	CONNECT TO EARTH
NFPA	-	NATIONAL FIRE PROTECTION ASSOCIATION
PERSON IN CHARGE (PIC)	-	OWNER'S REPRESENTATIVE
WALK DOWN	-	VISUAL FIELD INSPECTION

1.0 INTRODUCTION

This Engineering Work Plan defines the design and installation activities that will be provided in support of the Tank Farm Lightning Mitigation System. Mechanical And Instrument Systems (M&IS) will assume control for the cost, schedule, technical implementation and installation of this task.

The Tank Farm Lightning Mitigation System is comprised of two tasks, the light pole air terminal design and the tank riser bonding design. Air terminals will be designed and installed to mitigate the effect of lightning strikes in single shell tank farms with watchlist tanks. In addition, Mechanical And Instrument Systems will be responsible for the design and installation for bonding riser flanges and risers.

2.0 SCOPE

This document identifies the tasks, schedule, design criteria and organizational responsibilities that Mechanical And Instrument Systems will provide for the lightning mitigation activities. Definitive design activities and associated support efforts included in this planning document will be controlled by the Single Shell Tanks Lightning Hazard Remediation Summary, WHC-SD-WM-ER-604, Revision 0 and Letters of Instructions for Engineering and Design Services.

The objective of this task will be to provide the engineering services necessary to manage detail design and installation for grounding of light poles and for bonding riser and riser flanges on single shell tanks. These services will include measurements to record resistivity across tank riser flanges and between specified tank risers.

Provide a design with installation instruction for installing lightning protection on forty-three (43) light poles in nine (9) tank farms. Lightning protection will be installed on light poles in 241-A, 241-B, 241-BY, 241-BX, 241-S, 241-SX, 241-TY, 241-TX and 241-U Tank Farms. Detail design for the air terminal is shown on the attached sketches.

Provide a design with installation instruction for bonding at 575 (five hundred and seventy-five) tank risers on fifty-four (54) tanks. Bonding shall be provided on tank risers in 241-A, 241-B, 241-BY, 241-BX, 241-S, 241-SX, 241-TY, 241-TX and 241-U Tank Farms. Detail designs for the bonding are shown on the attached sketches.

3.0 DESCRIPTION

3.1 PROGRAM DESCRIPTION

Modifications to the light pole grounding and riser flange resistivity are needed to improve lightning mitigation in the single shell tank farms. This task requires modifications of the designated tank farm light poles and tank risers. Air terminals (lightning rods), down conductors and ground rods will be installed on light poles. Bonding links, straps and cables will be installed on risers and riser flanges.

3.2 DESIGN CRITERIA

The design criteria for this activity is described in Appendix A; Functional Requirements and Technical Criteria document.

3.3 CODES AND STANDARDS

Codes, standards, and other documents applicable to this task are listed in Appendix A; Functional Requirements and Technical Criteria.

4.0 WORK BREAKDOWN

4.1 EXISTING LIGHT POLE GROUNDING

4.1.1 ENGINEERING TASKS

This engineering task plan includes guidances for developing definitive design drawings to install air terminals on light poles and locate ground rod placement in nine (9) single shell tank farms and provide installation procedures for definitive job planning.

4.1.2 INSTALLATION

Installation of air terminals will require a ground penetrating radar survey prior to the start of trenching and driving ground rods into the earth. Substructures, cable and piping within 10 feet of the area of influence will be conveyed to Mechanical And Instrument Systems for addition to the drawings. A walk down in each farm will be conducted to identify hazards, ground level and overhead obstructions. Ground rod to earth resistivity measurements will be recorded to document the final readings. Lock and Tag Procedures will be implemented by Tank Farm Operations before start of air terminal and ground rod installation. LMHC Production Control will be responsible for planning and work package preparation. Major Plant Maintenance will review designs for constructibility, provide a person in charge (PIC) and craft control for field activities.

4.1.4 DELIVERABLES

- Detail design drawings that concludes plan views of tank riser locations
- Installation Procedures
- Resistivity measurement procedures
- Resistivity measurement report (Acceptance Report)
- As-Built Drawings
- Approved Acceptance for Beneficial Use (ABU) documentation

4.2 TANK RISER AND RISER FLANGE BONDING

4.2.1 ENGINEERING TASKS

This engineering task plan includes guidances for developing a definitive design to install bonding straps and riser connection. Installation procedures for definitive job planning will also be required.

4.2.2 INSTALLATION

The tank riser and riser flange bonding design will require a ground penetrating radar survey prior to the start of trenching. Substructures, cable and piping within 10 feet of the area of influence will be conveyed to Mechanical And Instrument Systems for addition to the drawings. A walk down in each farm will be conducted to identify hazards and obstructions. Tank Flange and tank riser resistivity measurements will be recorded to document the final readings. The Lock and Tag Procedure will be implemented by Tank Farm Operations before start of air terminal installation and driving ground rods. LMHC Production Control will be responsible for planning, providing person in charge (PIC) and craft control.

4.2.3 DELIVERABLES

- Detail design drawings that concludes plan views of pole locations
- Installation procedures
- Resistivity measurement procedures
- Resistivity measurement report (Acceptance Report)
- As-Built drawings

- Approved Acceptance for Beneficial Use (ABU) documentation

5.0 VERIFICATION

5.1 DESIGN REVIEWS

Mechanical And Instrument Systems will conduct design reviews of facility modifications in accordance with the procedures and requirements of EP 4.1. Design in progress reviews will be informal and as required to assure compliance with cost and schedule. Final design reviews (90%) for each farm will be conducted per EP 4.1. Mechanical And Instrument Systems will have overall responsibility for the designs.

5.2 DRAWING CONTROL

Mechanical And Instrument Systems design drawings will be prepared to WHC EP 1.3, EP 1.5, and SDC 1.3. New drawings will be issued as H-14 series drawings, and existing drawings will be modified by ECN. FDNW Design Services will be responsible for design layouts and check of all drawings issued for this task.

5.3 EQUIPMENT CONTROL

Mechanical And Instrument Systems has not identified any equipment that requires equipment control. FDNW construction will purchase, store and control all materials and measuring instruments required to accomplish these tasks.

5.4 EQUIPMENT INSPECTION

Mechanical And Instrument Systems has not identified any equipment that requires inspection. FDNW construction will provide all materials and measuring instruments required to accomplish these tasks.

5.5 QUALIFICATION TESTING

Mechanical And Instrument Systems has not identified any equipment that requires qualification testing. FDNW construction will conduct and record resistivity measurements at each light pole, riser and flange identified in the design. They will also be required to assist in getting the work accepted for beneficial use (ABU). Work packages will be turned over to Tank Farm Operations per the ABU procedure.

6.0 REPORTING REQUIREMENTS

Mechanical And Instrument Systems will provide weekly status reports to the program manager. Status reports will report on progress by work breakdown; identifying cost and schedule variances and recovery plans for activities within the scope of this planning document. Progress will be reported as a percent complete based on assessments by tasks engineers. Mechanical And Instrument Systems will conduct progress meetings to discuss and resolve issues impacting progress. Meeting minutes documenting decisions commitments, and action items will be distributed to the program manager.

Mechanical And Instrument Systems will obtain the required approval for all project documentation in accordance with WHC procedures EP 1.7. Mechanical And Instrument Systems will include, (as required) Tank Farm Operations, Quality Assurance, Safety, and Environmental for the release of H-14 series design drawings and specifications.

7.0 ORGANIZATION

Tank Farm Engineering & Operations are the customer and user. Mechanical And Instrument Systems is responsible for overall project direction. Mechanical And Instrument Systems will be the lead engineering organization for activities described in this document.

8.0 SCHEDULE

A detailed project schedule is attached in Appendix C. Mechanical And Instrument Systems will track and status progress to this schedule. FDNW will be responsible for design support services and construction activities as identified by this schedule. Production Control will prepare job packages and planning support. Major Plant Maintenance will provide a PIC to direct FDNW construction forces and LMHC operation and maintenance crafts as identified by the included schedule.

9.0 COST

Cost estimates for detail design and construction are attached in Appendix D.

10.0 PROJECT QUALITY ASSURANCE

Definitive design activities will comply with the requirements specified in documents WHC-CM-4-2 and Quality Assurance orders in 10CFR-830.120.

11.0 DESIGN ASSUMPTIONS

The installation efforts for the light pole air terminals and bonding task will be initiated no later than January 31, 1997. Start of design later than this date could impact the scheduled September 1, 1997 completion date.

The following assumption have been made:

- Expense funding will be provided as required to support definitive design.
- The Functional Requirements and Technical Criteria for this project has been established and will not change.
- Tank Farm Operations will accept bonding cables buried 6 inches below grade.
- Ground penetrating radar scans will be performed per project schedule.
- Construction will maintain red line marked drawings for AS-Built drawings.
- OperationS will provide access to tank farm light poles and tank risers per project schedule.
- Obstacles and obstructions will not require undue planning and procedure control to mitigate.

APPENDIX A

FUNCTIONAL REQUIREMENT AND TECHNICAL CRITERIA

1.0 SCOPE

1.1 PROJECT OVERVIEW

The Functional Requirement And Technical Criteria for the Tank Farm Lightning Mitigation System is in response to a defense-in-depth controls for lightning as an accident initiator identified in the Evaluation of Hazards to Tank Farm Facilities From Lightning Strikes; WHC-SD-WM-SARR-027.

1.2 DOCUMENT OVERVIEW

This requirements and criteria document specifically defines performance requirements, technical criteria and deliverables for the light poles grounding and tank riser bonding. The task plan in combination with this document will be used to control the cost and schedule for this task. The basis for the definitive design activities are provided here, in the Single Shell Tanks Lightning Hazard Remediation Summary; WHC-SD-WM-ER-604.

2.0 APPLICABLE DOCUMENTS

Codes, standards, and other documents applicable to this program are listed below.

2.1 DESIGN STANDARDS

- Installation Of Lightning Protection Systems (NFPA 780-1996)

2.2 GOVERNMENT DOCUMENTS

- Evaluation of Hazards to Tank Farm Facilities From Lightning Strikes; WHC-SD-WM-SARR-027.

- Single-Shell Tanks Riser Resistance to Ground Test Report; WHC-SD-WM-TR-034, Revision 0;
- Single-Shell Tanks Lightning Hazard Remediation Summary; WHC-SD-WM-ER-604, Revision 0;
- Basis for Interm Operation, WHC-SD-WM-BIO-001.

3.0 PROJECT FUNCTIONS AND REQUIREMENTS

3.1 PERFORMANCE CHARACTERISTICS

Installation of air terminals and tank riser bonding will require ground rods-to-earth and riser-to-riser resistivity measurements. The recorded measurements will serve as the ATP and document the final readings.

3.1.1 DESIGN REQUIREMENTS

Modifications to the light pole grounding and tank riser bonding in the tank farm will comply with the standard design provided in Installation Of Lightning Protection Systems; NFPA 780-1996.

The lightning protection system shall be designed to capture and arrest lightning strokes that occur in the tank farms. Lightning protection equipment that protrudes above the existing tank farm equipment shall not interfere with operations and maintenances. Typical sketches are provided in Appendix E.

3.1.2 PHYSICAL CHARACTERISTICS

The lightning mitigation consists of air terminals with down conductors and not more than two 10 foot ground rods installed on existing light poles in the tank farms. The air terminals and ground rods design shall comply with the requirement in NFPA 780.

Riser bonding will consist of the installing bonding straps around the flanges. A connection of a grounding cable installed between risers will also be utilized. Additionally there are several other options available (see sketches in the Appendix).

3.1.3 PROJECT QUALITY FACTOR

Lightning mitigation is classified "Defense-in-Depth Controls per the Basis for Interm Operation, WHC-SD-WM-BIO-001, Table 5.3.2.23.2-2

3.1.4 ENVIRONMENTAL CONDITIONS

The lightning protection systems shall be conventional types, constructed using materials approved for the following Environmental Conditions:

Temperature range:	-20 to +120 ° F
Humidity range:	10 to 100 %
Elevation above sea level:	550 ± 50 feet
Precipitation:	rain, snow, sleet
Wind blown materials:	sand, dirt, dust
Wind:	75 MPH

3.3 DESIGN AND CONSTRUCT

3.3.1 MATERIALS

Standard, commercial materials will be used including air terminals, cables, ground rods, and miscellaneous fasteners.

3.3.2 WORKMANSHIP

Standard workmanship is required.

3.3.3 NAMEPLATES AND PRODUCT MARKINGS

There are no special requirements for nameplates and product markings. If equipment is UL listed or FM rated, normal cautions should be taken to protect the labelling.

3.3.4 INTERCHANGEABILITY

Not applicable.

3.3.5 SAFETY

Normal industrial safety practices will be used during installation. The cables will be buried so as to preclude a tripping hazard or a concern that the energy from a lightning strike would present a hazard to personnel working in the farms.

3.3.6 HUMAN ENGINEERING

Since there are few human interactions with the lightning mitigation system, there are few human engineering issues. Once installed, the air terminals are passive.

3.3.7 NUCLEAR CONTROL

Since the work is completely external to the tanks, nuclear controls will not be affected.

3.3.8 SECURITY

There are no security aspects of the work. The work will be accomplished by individuals who have been cleared for access to the tank farms.

3.3.9 GOVERNMENT FURNISHED PROPERTY

The work will be done on the Hanford site in the tank farms, which is a government owned site. The material (air terminals, cabling, ground rods, washers, screws, etc.) will be procured and installed and turned over to the government.

3.3.10 COMPUTER RESOURCE CAPACITY

Not Applicable

3.4 INFORMATION

Deliverables

The deliverables have been identified in Sections 4.1.3 and 4.2.3 of the Engineering Work Plan.

3.5 LOGISTICS

Air Terminals

No special requirements. The materials are commercially available, essentially off-the-shelf. The work can be done at any time during daylight, weather permitting.

Riser Bonding

Logistics are required. The work has to be coordinated with Operations to assure that lock\tag procedures can be done, per the Schedule, weather permitting.

3.6 PERSONNEL AND TRAINING

3.6.1 PERSONNEL

Personnel involved in the design and construction will be employees of the Project Hanford companies.

3.6.2 TRAINING

The tasks are within the skill-of-the-trade using normal commercial equipment and design. Once the equipment is installed, it is passive. No training for the operators and mechanics is required.

3.7 CHARACTERISTIC OF SUBORDINATE ELEMENTS

Not Applicable.

3.8 PROCEDURE

Not applicable.

3.9 QUALIFICATION

Not applicable.

4.0 QUALITY ASSURANCE PROVISIONS

Definitive design activities will comply with the requirements specified in document WHC-CM-4-2 QA Manual.

4.1 RESPONSIBILITY FOR VERIFICATION

The PIC will be responsible for resistivity measuring and recording.

4.2 SPECIAL TEST AND EXAMINATION

The materials do not have mechanical or electrical components, no special testing and examination are required for installation.

4.3 REQUIREMENT CROSS REFERENCE

Not applicable.

5.0 PREPARATION FOR DELIVERY

Since the materials are commercially available and designed for use in the environment, no special preparations are required for delivery.

6.0 NOTES

6.1 INTENDED USE

The lightning mitigation equipment is being installed to promote the dissipation of lightning energy outside of the waste material stored in the underground single-shell tanks.

6.1.1 MISSION

The mission of the effort is to reduce the probability that a lightning strike in the tank farms can adversely affect the waste stored in the tanks. This system may provide some personnel protection in the farms when lightning occurs.

6.1.2 HAZARDS

There are no hazards associated with the installation of the equipment affecting the tank waste. Normal construction techniques will be used.

APPENDIX B PROJECT ORGANIZATION

PROJECT
MANAGEMENT LMHC
Mech/Instr. Sys.

F. Jones

CONSTRUCTION
FDNW

T. Ostrander

Air Terminals

T. Ostrander

Bonding

T. Ostrander

PRODUCTION
CONTROL
LMHC

R. Rodriqz

Work Package Prep.

D. wiggins

Planning

D. Wiggins

CONSTRUCTION
INTEGRATION
LMHC

W. Bryant

PIC

R. Dulin

Operations Support

Craft Control

DESIGN
FDNW

F. Jones

Air Terminals

T. Ostrander

Bonding

F. Jones

APPENDIX C PROJECT SCHEDULE

Activity ID	Early start	Early finish	Original duration	Remaining duration	Total float
A501	21NOV96A	31JAN97	20	4	60
A515	03FEB97	12FEB97	8	8	93
A535	13FEB97	21FEB97	6	6	93
A525	24FEB97	04MAR97	7	7	93
A502	03FEB97	03MAR97	20	20	60
A505	17MAR97	21MAR97	5	5	85
A5051	17MAR97*		0	0	85
A503	04MAR97	31MAR97	20	20	60
A540	21JAN97A	31JAN97	3	4	95
A550	29JAN97	31JAN97	3	3	95
A545	01APR97	09APR97	7	7	79
A555	10APR97	17APR97	6	6	79
A504	01APR97	28APR97	20	20	60
A570	03FEB97	05FEB97	3	3	109
A560	06FEB97	10FEB97	3	3	109
A575	29APR97	02MAY97	4	4	72
A565	05MAY97	08MAY97	4	4	72
A506	29APR97	27MAY97	20	20	60
A580	11FEB97	13FEB97	3	3	126
A585	28MAY97	04JUN97	6	6	60
A595		04JUN97	0	0	60

Activity ID	Description	Start	Finish	Duration	ES	EF	LS	LF	TF
	PREPARE B COMPLEX INSTALLATION WORK PKG.								
	PERFORM BX FARM GROUND SCAN								
	INSTALL B FARM TERMINALS (QTY 6)								
	INSTALL BX FARM TERMINALS (QTY 6)								
	PREPARE A-F FARM INSTALLATION WORK PKG.								
	INSTALL A FARM TERMINALS (QTY 3)								
	INSTALL A FARM TERMINALS (QTY 3)								
	PREPARE S COMPLEX INSTALLATION WORK PKG.								
	PERFORM S FARM GROUND SCAN								
	INSTALL S FARM TERMINALS (QTY 6)								
	INSTALL S FARM TERMINALS (QTY 6)								
	PREPARE T COMPLEX INSTALLATION WORK PKG.								
	PERFORM TX FARM GROUND SCAN								
	INSTALL TX FARM TERMINALS (QTY 3)								
	INSTALL TX FARM TERMINALS (QTY 3)								
	PREPARE U FARM INSTALLATION WORK PKG.								
	INSTALL U FARM TERMINALS (QTY 3)								
	INSTALL U FARM TERMINALS (QTY 3)								
	PERFORM U FARM GROUND SCAN								
	INSTALL U FARM TERMINALS (QTY 3)								
	INSTALL U FARM TERMINALS (QTY 3)								
	AIR TERMINAL INSTALLATION COMPLETE								

Project Start	02OCT96	Program Bar	Early Bar
Project Finish	30SEP96	Program Bar	Early Bar
Draw Date	25JAN97	Draw Activity	
Project Name	25JAN97		
Client System, Inc.			

SAFETY EQUIPMENT SCHEDULE FY 97

CURRENT WORKING SCHEDULE

Sheet 18 of 22

DATE: _____

REVISION: _____

APPROVED: _____

APPENDIX D PROJECT COST ESTIMATES

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6EBL4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R01 - PROJECT COST SUMMARY

PAGE 1 OF 7
 DATE 05/01/96 11:26:25
 BY DEA

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY %	TOTAL	TOTAL DOLLARS
000	ENGINEERING	61,000	20	12,000	73,000
	(ADJUSTED TO MEET DOE 5100.4)	- 1,000		- 2,000	- 3,000
050	CONSTRUCTION MANAGEMENT	21,000	30	6,000	27,000
	(ADJUSTED TO MEET DOE 5100.4)	- 1,000		4,000	3,000
706	ELECTRICAL	191,000	30	57,000	248,000
	(ADJUSTED TO MEET DOE 5100.4)	- 1,000		3,000	2,000
PROJECT TOTAL		270,000	28	80,000	350,000

TYPE OF ESTIMATE	STUDY (ROM)	MAY 1, 1996	REMARKS:
ARCHITECT	<i>James L. Dugan</i>		
ENGINEER			
OPERATING CONTRACTOR			

(ROUNDED/ADJUSTED TO THE NEAREST " 1,000 / 10,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 7
 DATE 05/01/96 08:34:40
 BY DEA

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
110000	DEFINITIVE DESIGN	27200	0	27200	0.00	0	27200	20	5440	32640
	SUBTOTAL 11 DEFINITIVE DESIGN	27200	0	27200	0.00	0	27200	20	5440	32640
121000	ENGINEERING	20951	0	20951	0.00	0	20951	20	4190	25141
122000	INSPECTION	12975	0	12975	0.00	0	12975	20	2595	
	SUBTOTAL 12 ENGINEERING/INSPECTION	33926	0	33926	0.00	0	33926	20	6785	40711
	SUBTOTAL 1 ENGINEERING	61126	0	61126	0.00	0	61126	20	12225	73351
310001	ICFKH UTILITIES	28299	0	28299	0.00	0	28299	30	8490	36789
310002	ICFKH CONSTRUCTION FORCES	162405	0	162405	0.00	0	162405	30	48722	211127
317720	CF SUPPORT	20680	0	20680	0.00	0	20680	30	6204	26884
	SUBTOTAL 31 FA CONST-ONSITE E/C	211384	0	211384	0.00	0	211384	30	63416	274800
	SUBTOTAL 3 CONSTRUCTION	211384	0	211384	0.00	0	211384	30	63416	274800
=====										
PROJECT TOTAL		272,510	0	272,510	0.00	0	272,510	28	75,641	348,151

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6EBL4
 FILE NO. Y978SA1

** TEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROW)
 DOE_R03 - ESTIMATE BASIS SHEET

PAGE 3 OF 7
 DATE 05/01/96 15:21:39
 BY DEA

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: WORK SCOPE DESCRIPTION PROVIDED BY JIM ZACH/WHC; AND CATALOG CUT SHEETS FOR INSTALLATION MATERIAL.

DRAWINGS: SKETCH - AIR TERMINAL MOUNTED ON WOOD POLE DETAILS
 SKETCH - GROUND GRID INSTALLATION DETAILS

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS:
 PRICING FOR LIGHTNING PROTECTION MATERIAL QUOTED BY GEM ELECTRICAL SALES AT (206) 763-4010.

3. LABOR RATES

A.) ICF-KH HOURLY RATES ARE BASED ON THE 1996 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 03-11-96). SEE ALSO THE FY 1995 PLANNING RATES * (REPORT BGHB7012).
 B.) BASE CRAFT RATES ARE AS ISSUED BY KEH FINANCE (EFFECTIVE 03-11-96). RATES INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-94).
 * SEE HANFORD SOFT REPORTING, FDS BUDGET GUIDELINE HANDBOOK, SECTION 2 - COMPANY INFORMATION, FY 1995 PLANNING RATES.

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE ICF-KH ESTIMATING FACTOR, REVISION 1, FY96, DATED 03/08/96. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 52% FOR SHOP WORK AND 52% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE NOT USED SINCE A SCHEDULE WAS NOT PROVIDED.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

A.) THE ESTIMATE IS BASED ON A NON-SAFETY CLASS DEFINITIVE DESIGN BEING PROVIDED BY ICFKH FOR INSTALLATION. ONE ECN WILL BE PREPARED TO PROVIDE ALL INSTALLATION DETAILS. DESIGN WILL BE BASED ON NFPA 780, CLASS II, FOR INSTALLATIONS ON POLES HIGHER THAN 75FT TALL. THIS EFFORT WILL NOT INCLUDE UPDATING ANY AFFECTED DRAWINGS.
 B.) THE E&I FOR THE ESTIMATE IS BASED ON THE GROUND GRID TESTING BEING PERFORMED BY A PRIVATE TESTING FIRM, WITH ICFKH'S ACCEPTANCE PERFORMING OVERSIGHT INSPECTIONS.
 C.) THE ESTIMATE ASSUMES A STANDARD AIR TERMINAL, DOWN CONDUCTOR, AND GROUND TERMINAL INSTALLATION FOR 44EA TYPICAL POLES, ALL OF WHICH ARE LOCATED INSIDE THE TANK FARM FENCES.
 D.) THE ESTIMATE IS BASED ON ICFKH UTILITIES PERFORMING THE INSTALLATION OF THE AIR TERMINALS ON EXISTING WOOD POLES. BONDING TO EXISTING METAL AND FIXTURES IS INCLUDED.
 E.) THE ESTIMATE IS BASED ON ICFKH CONSTRUCTION FORCES INSTALLING THE GROUND GRID.
 F.) THE ESTIMATE DOES NOT INCLUDE THE HANDLING OR DISPOSAL OF HAZARDOUS/CONTAMINATED MATERIALS.
 G.) THE ESTIMATE DOES NOT INCLUDE ANY WHC PROJECT MANAGEMENT, INTEGRATION, OR OTHER PROJECT COSTS.

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y9785AA1

** TEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 7
 DATE 05/01/96 08:34:43
 BY DEA

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
000 ENGINEERING								
110000	DEFINITIVE DESIGN	27200	0	27200	0.00	0	27200 20	5440
121000	ENGINEERING	20951	0	20951	0.00	0	20951 20	4190
122000	INSPECTION	12975	0	12975	0.00	0	12975 20	2595
TOTAL 000	ENGINEERING	61126	0	61126	0.00	0	61126 20	12225
050 CONSTRUCTION MANAGEMENT								
317720	CF SUPPORT	20680	0	20680	0.00	0	20680 30	6204
TOTAL 050	CONSTRUCTION MANAGEMENT	20680	0	20680	0.00	0	20680 30	6204
706 ELECTRICAL								
310001	ICFKH UTILITIES	28299	0	28299	0.00	0	28299 30	8490
310002	ICFKH CONSTRUCTION FORCES	162405	0	162405	0.00	0	162405 30	48722
TOTAL 706	ELECTRICAL	190704	0	190704	0.00	0	190704 30	57212

PROJECT TOTAL		272,510	0	272,510	0.00	0	272,510 28	75,641
								34

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 5 OF 7
 DATE 05/01/96 08:34:44
 BY DEA

CSI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
ENGINEERING								
31	ELECTRICAL	37319	0	37319	0.00	0	7464	44783
40	PROJECT MANAGER	10832	0	10832	0.00	0	2166	12998
44	ACCEPTNCE INSPECTION	12975	0	12975	0.00	0	2595	15570
	TOTAL ENGINEERING	61,126	0	61,126	0.00	0	12,225	73,351
CONSTRUCTION								
16	ELECTRICAL	211384	0	211384	0.00	0	63416	274800
	TOTAL CONSTRUCTION	211,384	0	211,384	0.00	0	63,416	274,800
=====								
	PROJECT TOTAL	272,510	0	272,510	0.00	0	75,641	348,151

ICF KAISER HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. E23494/F6E8L4
FILE NO. Y978SAA1

** TEST - INTERACTIVE ESTIMATING **
LIGHTNING MITIGATION
STUDY (ROM)
DDE_R06 - CONTINGENCY ANALYSIS BASIS SHEET

PAGE 6 OF 7
DATE 05/01/96 15:21:54
BY DEA

REFERENCE: ESTIMATE BASIS SHEET
COST CODE ACCOUNT SUMMARY

PAGE 2 OF 7
PAGE 3 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A 'STUDY' ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20 TO 30 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

ENGINEERING

000 110000/121000/122000

A TWENTY PERCENT CONTINGENCY BASED ON THE LEVEL OF INFORMATION DEFINING THE DESIGN REQUIREMENTS AND POSSIBLE CHANGES DUE TO UNFORSEEN FIELD CONDITIONS.

AVERAGE ENGINEERING CONTINGENCY 20 %

CONSTRUCTION

050 317720
706 310001/310002

A THIRTY PERCENT CONTINGENCY IS BASED ON THE LEVEL OF DESIGN AND POSSIBLE UNFORSEEN CONSTRUCTION IMPACTS

AVERAGE CONSTRUCTION CONTINGENCY 30 %

AVERAGE PROJECT CONTINGENCY 28 %

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

PAGE 1
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DOE_R07 - ESTIMATE DETAIL BY WBS / COST CODE

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y97BSAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R07 - ONSITE INDIRECT COSTS BY WBS

PAGE 7 OF 7
 DATE 05/01/96 08:34:46
 BY DEA

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT %	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
=====	=====	=====	=====	=====	=====	=====	=====
110000	DEFINITIVE DESIGN	27200	0.00	0	0	0	0
121000	ENGINEERING	20951	0.00	0	0	0	0
122000	INSPECTION	12975	0.00	0	0	0	0
310001	ICFKH UTILITIES	28299	0.00	0	0	0	0
310002	ICFKH CONSTRUCTION FORCES	162405	0.00	0	0	0	0
317720	CF SUPPORT	20680	0.00	0	0	0	0
PROJECT TOTAL		272,510		0	0	0	0

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 2
 DATE 05/01/96 08:34:49
 BY DEA

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
121000	ENGINEERING										
121000.3100000	ELECTRICAL ENGINEER - WRITE ECM CHANGES	000	16 MHR	16	1309	0	0	0	0	0	1309
121000.3100010	EXCAVATION PERMITS (10EA) - ENGINEERING/PLANNER TIME	000	200 MHR	200	16368	0	0	0	0	0	16368
121000.3100020	WORK PACKAGE PREPARATION, PLANNING, COORDINATION	000	40 MHR	40	3274	0	0	0	0	0	3274
TOTAL WBS 121000 ENGINEERING				256		0	0	0	0	0	20,951

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

PAGE 3
 DATE 05/01/96 08:34:49
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DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
122000	INSPECTION										
122000.4432000	ELECTRICAL INSPECTOR	000	16 MHR	16	1081	0	0	0	0	0	1081
122000.4432010	GROUND GRID TESTING BELHAVEN 735-9446 (2-MEN/DAY @ 2-GRIDS/DAY)	000	176 CRW	176	11894	0	0	0	0	0	11894
TOTAL WBS 122000 INSPECTION				192		12,975	0	0	0	0	12,975

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/F8N04F
 FILE NO. YA075AA1

**** IEST - INTERACTIVE ESTIMATING ****
LIGHTNING PROTECTION - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R01 - PROJECT COST SUMMARY

PAGE 1 OF 10
 DATE 08/13/96 14:34:31
 BY DEA

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
000	ENGINEERING	162,000	23	38,000	200,000
	(ADJUSTED TO MEET DOE 5100.4)	2,000		2,000	0
706	ELECTRICAL	538,000	30	162,000	700,000
	(ADJUSTED TO MEET DOE 5100.4)	2,000		2,000	0
PROJECT TOTAL		700,000	28	200,000	900,000

TYPE OF ESTIMATE	CHECK ISSUE	DATE	REMARKS: THE ESTIMATE IS ISSUED FOR ICFKH MANAGEMENT REVIEW AND COMMENT.
ARCHITECT	ROUGH ORDER OF MAGNITUDE	AUGUST 13, 1996	
ENGINEER			
OPERATING CONTRACTOR	WHC		

CHECK

(ROUNDED/ADJUSTED TO THE NEAREST " 1.000 / 10.000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

ICF KAISER HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. E40681/F8N04F
FILE NO. YA075AA1

** TEST - INTERACTIVE ESTIMATING **
LIGHTNING PROTECTION - TANK RISER BONDING
ROUGH ORDER OF MAGNITUDE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 10
DATE 08/13/96 14:34:34
BY DEA

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
110000	DEFINITIVE DESIGN	107701	0	107701	0.00	0	107701	20	21540	129241
	SUBTOTAL 11 DEFINITIVE DESIGN	107701	0	107701	0.00	0	107701	20	21540	129241
120000	ENGINEERING/INSPECTION	53851	0	53851	0.00	0	53851	30	16155	70006
	SUBTOTAL 12 ENGINEERING/INSPECTION	53851	0	53851	0.00	0	53851	30	16155	70006
	SUBTOTAL 1 ENGINEERING	161552	0	161552	0.00	0	161552	23	37695	199247
310001	TANK A-101	20233	0	20233	0.00	0	20233	30	6070	26303
310002	TANK A-103	15505	0	15505	0.00	0	15505	30	4652	20157
310003	TANK AX-101	9071	0	9071	0.00	0	9071	30	2721	11792
310004	TANK AX-102	17520	0	17520	0.00	0	17520	30	5256	22776
310005	TANK AX-103	12560	0	12560	0.00	0	12560	30	3768	16328
310006	TANK B-103	3489	0	3489	0.00	0	3489	30	1047	4536
310007	TANK B-201	9457	0	9457	0.00	0	9457	30	2837	12294
310008	TANK B-202	20076	0	20076	0.00	0	20076	30	6023	26099
310009	TANK BX-107	4885	0	4885	0.00	0	4885	30	1466	6351
310010	TANK BX-110	4186	0	4186	0.00	0	4186	30	1256	5442
310011	TANK BY-101	7598	0	7598	0.00	0	7598	30	2279	9877
310012	TANK BY-102	7444	0	7444	0.00	0	7444	30	2233	9677
310013	TANK BY-103	4885	0	4885	0.00	0	4885	30	1466	6351
310014	TANK BY-105	8294	0	8294	0.00	0	8294	30	2488	10782
310015	TANK BY-106	4885	0	4885	0.00	0	4885	30	1466	6351
310016	TANK BY-109	4885	0	4885	0.00	0	4885	30	1466	6351
310017	TANK C-102	3489	0	3489	0.00	0	3489	30	1047	4536
310018	TANK C-103	2790	0	2790	0.00	0	2790	30	837	7
310019	TANK C-104	4108	0	4108	0.00	0	4108	30	1232	0
310020	TANK C-107	4186	0	4186	0.00	0	4186	30	1256	5442
310021	TANK S-101	8918	0	8918	0.00	0	8918	30	2675	11593
310022	TANK S-102	10235	0	10235	0.00	0	10235	30	3071	13306
310023	TANK S-103	10235	0	10235	0.00	0	10235	30	3071	13306
310024	TANK S-105	10235	0	10235	0.00	0	10235	30	3071	13306
310025	TANK S-106	9538	0	9538	0.00	0	9538	30	2861	12399
310026	TANK S-107	9538	0	9538	0.00	0	9538	30	2861	12399
310027	TANK S-109	10235	0	10235	0.00	0	10235	30	3071	13306
310028	TANK S-111	10235	0	10235	0.00	0	10235	30	3071	13306
310029	TANK S-112	10235	0	10235	0.00	0	10235	30	3071	13306

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/F8N04F
 FILE NO. YA075AA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTON - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 3 OF 10
 DATE 08/13/96 14:34:35
 BY DEA

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS		
310030	TANK SX-101	18141	0	18141	0.00	0	18141	30	5442	23583
310031	TANK SX-102	8141	0	8141	0.00	0	8141	30	2442	10583
310032	TANK SX-103	8141	0	8141	0.00	0	8141	30	2442	10583
310033	TANK SX-104	8840	0	8840	0.00	0	8840	30	2652	11492
310034	TANK SX-105	16201	0	16201	0.00	0	16201	30	4860	21061
310035	TANK SX-106	8840	0	8840	0.00	0	8840	30	2652	11492
310036	TANK SX-109	11866	0	11866	0.00	0	11866	30	3560	15426
310037	TANK T-110	6824	0	6824	0.00	0	6824	30	2047	8871
310038	TANK T-111	5504	0	5504	0.00	0	5504	30	1651	7155
310039	TANK T-201	16046	0	16046	0.00	0	16046	30	4814	20860
310040	TANK T-202	9457	0	9457	0.00	0	9457	30	2837	12294
310041	TANK T-204	11394	0	11394	0.00	0	11394	30	3418	14812
310042	TANK TX-102	4806	0	4806	0.00	0	4806	30	1442	6248
310043	TANK TX-105	5428	0	5428	0.00	0	5428	30	1628	7056
310044	TANK TX-111	6281	0	6281	0.00	0	6281	30	1884	8165
310045	TANK TX-112	3489	0	3489	0.00	0	3489	30	1047	4536
310046	TANK TX-113	4186	0	4186	0.00	0	4186	30	1256	5442
310047	TANK TX-115	4806	0	4806	0.00	0	4806	30	1442	6248
310048	TANK TX-118	22248	0	22248	0.00	0	22248	30	6674	28922
310049	TANK TY-104	8840	0	8840	0.00	0	8840	30	2652	11492
310050	TANK U-102	5504	0	5504	0.00	0	5504	30	1651	7155
310051	TANK U-103	6824	0	6824	0.00	0	6824	30	2047	8871
310052	TANK U-105	6126	0	6126	0.00	0	6126	30	1838	7964
310053	TANK U-106	6824	0	6824	0.00	0	6824	30	2047	8871
310054	TANK U-107	8840	0	8840	0.00	0	8840	30	2652	11492
310055	TANK U-108	8840	0	8840	0.00	0	8840	30	2652	11492
310056	TANK U-109	8840	0	8840	0.00	0	8840	30	2652	11492
310057	TANK U-111	8220	0	8220	0.00	0	8220	30	2466	10686
310058	TANK U-203	17601	0	17601	0.00	0	17601	30	5281	22882
310059	TANK U-204	12332	0	12332	0.00	0	12332	30	3700	16032
SUBTOTAL 31 FA CONST-ONSITE E/C		538380	0	538380	0.00	0	538380	30	161517	699897
SUBTOTAL 3 CONSTRUCTION		538380	0	538380	0.00	0	538380	30	161517	699897
PROJECT TOTAL		699,932	0	699,932	0.00	0	699,932	28	199,212	899,144

ICF KAISER HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. E40681/F8N04F
FILE NO. YA075AA1

** IEST - INTERACTIVE ESTIMATING **
LIGHTNING PROTECTION - TANK RISER BONDING
ROUGH ORDER OF MAGNITUDE
DOE_R03 - ESTIMATE BASIS SHEET

PAGE 4 OF 10
DATE 08/13/96 10:03:16
BY DEA

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: LETTER OF INSTRUCTION FROM G.T.DUKELOW/WHC DATED JULY 11, 1996: TANK RISER LISTING, WHC-SD-WM-ER-604, REV. 0;
TYPICAL INSTALLATION DETAILS; AND GENERAL TANK FARM SKETCHES.

DRAWINGS: NONE.

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

- A.) ICF-KH HOURLY RATES ARE BASED ON THE 1996 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 03-11-96). SEE ALSO THE FY 1996 PLANNING RATES * (REPORT BGHB7012).
- B.) BASE CRAFT RATES ARE AS ISSUED BY KEH FINANCE (EFFECTIVE 03-11-96). RATES INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-94).
- * SEE HANFORD SOFT REPORTING, FDS BUDGET GUIDELINE HANDBOOK, SECTION 2 - COMPANY INFORMATION, FY 1996 PLANNING RATES.

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

- A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED IN THE LOADED CRAFT WAGE RATE AND THE COMPOSITE PERCENTAGE BASED ON THE ICF-KH ESTIMATING FACTOR, REVISION 1, FY95, DATED 10/16/95. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 52% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

AN ESCALATION SCHEDULE WAS NOT PROVIDED AND ON PERCENTAGES WERE APPLIED.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE I-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

- A.) THE ESTIMATE IS BASED ON DEFINITIVE DESIGN BEING PREPARED BY ICFKH ENGINEERING. THE COST IS BASED ON TWENTY PERCENT OF THE DIRECT CONSTRUCTION COSTS.
- B.) THE ESTIMATE IS BASED ON E & I DURING CONSTRUCTION BEING PERFORMED BY ICFKH. THE COST IS BASED ON TEN PERCENT OF THE DIRECT CONSTRUCTION COST.
- C.) THE ESTIMATE IS BASED ON WORK PERFORMED BY ICFKH CONSTRUCTION FORCES DURING NORMAL WORKING HOURS.
- D.) THE ESTIMATE DOES NOT INCLUDE THE REMOVAL/DISPOSAL COSTS OF ANY HAZARDOUS MATERIALS.
- E.) THE ESTIMATE IS BASED ON WHC PROVIDING ALL REQUIRED CONSTRUCTION SUPPORT IN A TIMELY MANNER.

ICF KAISER HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. E40681/F8N04F
FILE NO. YA075AA1

**** IEST - INTERACTIVE ESTIMATING ****
LIGHTNING PROTECTION - TANK RISER BONDING
ROUGH ORDER OF MAGNITUDE
DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 5 OF 10
DATE 08/13/96 14:34:37
BY DEA

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
000 ENGINEERING								
110000	DEFINITIVE DESIGN	107701	0	107701	0.00	0	20	129241
120000	ENGINEERING/INSPECTION	53851	0	53851	0.00	0	30	70006
TOTAL 000 ENGINEERING		161552	0	161552	0.00	0	23	37695
706 ELECTRICAL								
310001	TANK A-101	20233	0	20233	0.00	0	30	26303
310002	TANK A-103	15505	0	15505	0.00	0	30	20157
310003	TANK AX-101	9071	0	9071	0.00	0	30	11792
310004	TANK AX-102	17520	0	17520	0.00	0	30	22776
310005	TANK AX-103	12560	0	12560	0.00	0	30	16328
310006	TANK B-103	3489	0	3489	0.00	0	30	4536
310007	TANK B-201	9457	0	9457	0.00	0	30	12294
310008	TANK B-202	20076	0	20076	0.00	0	30	26099
310009	TANK BX-107	4885	0	4885	0.00	0	30	1466
310010	TANK BX-110	4186	0	4186	0.00	0	30	5442
310011	TANK BY-101	7598	0	7598	0.00	0	30	9877
310012	TANK BY-102	7444	0	7444	0.00	0	30	9677
310013	TANK BY-103	4885	0	4885	0.00	0	30	1466
310014	TANK BY-105	8294	0	8294	0.00	0	30	10782
310015	TANK BY-106	4885	0	4885	0.00	0	30	1466
310016	TANK BY-109	4885	0	4885	0.00	0	30	1466
310017	TANK C-102	3489	0	3489	0.00	0	30	1047
310018	TANK C-103	2790	0	2790	0.00	0	30	837
310019	TANK C-104	4108	0	4108	0.00	0	30	1232
310020	TANK C-107	4186	0	4186	0.00	0	30	1256
310021	TANK S-101	8918	0	8918	0.00	0	30	2675
310022	TANK S-102	10235	0	10235	0.00	0	30	3071
310023	TANK S-103	10235	0	10235	0.00	0	30	3071
310024	TANK S-105	10235	0	10235	0.00	0	30	3071
310025	TANK S-106	9538	0	9538	0.00	0	30	2861
310026	TANK S-107	9538	0	9538	0.00	0	30	2861
310027	TANK S-109	10235	0	10235	0.00	0	30	3071
310028	TANK S-111	10235	0	10235	0.00	0	30	3071
310029	TANK S-112	10235	0	10235	0.00	0	30	3071
310030	TANK SX-101	18141	0	18141	0.00	0	30	5442

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/F8N04F
 FILE NO. YA07SAAI

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTION - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R04 - COST CODE ACCOUNT SUMMARY

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COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
310031	TANK SX-102	8141	0	8141	0.00	0	2442	10583
310032	TANK SX-103	8141	0	8141	0.00	0	2442	10583
310033	TANK SX-104	8840	0	8840	0.00	0	2652	11492
310034	TANK SX-105	16201	0	16201	0.00	0	4860	21061
310035	TANK SX-106	8840	0	8840	0.00	0	2652	11492
310036	TANK SX-109	11866	0	11866	0.00	0	3560	15426
310037	TANK T-110	6824	0	6824	0.00	0	2047	8871
310038	TANK T-111	5504	0	5504	0.00	0	1651	7155
310039	TANK T-201	16046	0	16046	0.00	0	4814	20860
310040	TANK T-202	9457	0	9457	0.00	0	2837	12294
310041	TANK T-204	11394	0	11394	0.00	0	3418	14812
310042	TANK TX-102	4806	0	4806	0.00	0	1442	6248
310043	TANK TX-105	5428	0	5428	0.00	0	1628	7056
310044	TANK TX-111	6281	0	6281	0.00	0	1884	8165
310045	TANK TX-112	3489	0	3489	0.00	0	1047	4536
310046	TANK TX-113	4186	0	4186	0.00	0	1256	5442
310047	TANK TX-115	4806	0	4806	0.00	0	1442	6248
310048	TANK TX-118	22248	0	22248	0.00	0	6674	28922
310049	TANK TY-104	8840	0	8840	0.00	0	2652	11492
310050	TANK U-102	5504	0	5504	0.00	0	1651	7155
310051	TANK U-103	6824	0	6824	0.00	0	2047	8871
310052	TANK U-105	6126	0	6126	0.00	0	1838	7964
310053	TANK U-106	6824	0	6824	0.00	0	2047	8871
310054	TANK U-107	8840	0	8840	0.00	0	2652	11492
310055	TANK U-108	8840	0	8840	0.00	0	2652	11492
310056	TANK U-109	8840	0	8840	0.00	0	2652	11492
310057	TANK U-111	8220	0	8220	0.00	0	2466	10686
310058	TANK U-203	17601	0	17601	0.00	0	5281	22882
310059	TANK U-204	12332	0	12332	0.00	0	3700	16032
TOTAL 706 ELECTRICAL		538380	0	538380	0.00	0	161517	699897
PROJECT TOTAL		699,932	0	699,932	0.00	0	199,212	899,144

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/7B8N04F
 FILE NO. YA075AA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTON - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION

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CSI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
ENGINEERING								
31	ELECTRICAL	161552	0	161552	0.00	0	161552 23	37695 199247
	TOTAL ENGINEERING	161,552	0	161,552	0.00	0	161,552 23	37,695 1 7
CONSTRUCTION								
16	ELECTRICAL	538380	0	538380	0.00	0	538380 30	161517 699897
	TOTAL CONSTRUCTION	538,380	0	538,380	0.00	0	538,380 30	161,517 699,897

	PROJECT TOTAL	699,932	0	699,932	0.00	0	699,932 28	199,212 899,144

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/FBN04F
 FILE NO. YA075AA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTION - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R06 - CONTINGENCY ANALYSIS BASIS SHEET

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REFERENCE: ESTIMATE BASIS SHEET
 COST CODE ACCOUNT SUMMARY

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THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A "STUDY" ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20 TO 30 %.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

ENGINEERING

000 110000
 TWENTY PERCENT IS USED BASED ON THE LEVEL OF INFORMATION AVAILABLE AND THE POSSIBILITY OF UNFORSEEN FIELD CONDITIONS

000 120000
 THIRTY PERCENT IS USED BASED ON THE POSSIBILITY OF ENCOUNTERING UNFORSEEN FIELD CONDITIONS

AVERAGE ENGINEERING CONTINGENCY 23 %

CONSTRUCTION

706 31XXXX
 THIRTY PERCENT IS USED BASED ON THE POSSIBILITY OF ENCOUNTERING UNFORSEEN FIELD CONDITIONS

AVERAGE CONSTRUCTION CONTINGENCY 30 %

AVERAGE PROJECT CONTINGENCY 28 %

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/FBN04F
 FILE NO. YA075AA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTION - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R07 - ONSITE INDIRECT COSTS BY WBS

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WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT X	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
110000	DEFINITIVE DESIGN	107701	0.00	0	0	0	0
120000	ENGINEERING/INSPECTION	53851	0.00	0	0	0	0
310001	TANK A-101	20233	0.00	0	0	0	0
310002	TANK A-103	15505	0.00	0	0	0	0
310003	TANK AX-101	9071	0.00	0	0	0	0
310004	TANK AX-102	17520	0.00	0	0	0	0
310005	TANK AX-103	12560	0.00	0	0	0	0
310006	TANK B-103	3489	0.00	0	0	0	0
310007	TANK B-201	9457	0.00	0	0	0	0
310008	TANK B-202	20076	0.00	0	0	0	0
310009	TANK BX-107	4885	0.00	0	0	0	0
310010	TANK BX-110	4186	0.00	0	0	0	0
310011	TANK BY-101	7598	0.00	0	0	0	0
310012	TANK BY-102	7444	0.00	0	0	0	0
310013	TANK BY-103	4885	0.00	0	0	0	0
310014	TANK BY-105	8294	0.00	0	0	0	0
310015	TANK BY-106	4885	0.00	0	0	0	0
310016	TANK BY-109	4885	0.00	0	0	0	0
310017	TANK C-102	3489	0.00	0	0	0	0
310018	TANK C-103	2790	0.00	0	0	0	0
310019	TANK C-104	4108	0.00	0	0	0	0
310020	TANK C-107	4186	0.00	0	0	0	0
310021	TANK S-101	8918	0.00	0	0	0	0
310022	TANK S-102	10235	0.00	0	0	0	0
310023	TANK S-103	10235	0.00	0	0	0	0
310024	TANK S-105	10235	0.00	0	0	0	0
310025	TANK S-106	9538	0.00	0	0	0	0
310026	TANK S-107	9538	0.00	0	0	0	0
310027	TANK S-109	10235	0.00	0	0	0	0
310028	TANK S-111	10235	0.00	0	0	0	0
310029	TANK S-112	10235	0.00	0	0	0	0
310030	TANK SX-101	18141	0.00	0	0	0	0
310031	TANK SX-102	8141	0.00	0	0	0	0
310032	TANK SX-103	8141	0.00	0	0	0	0
310033	TANK SX-104	8840	0.00	0	0	0	0
310034	TANK SX-105	16201	0.00	0	0	0	0
310035	TANK SX-106	8840	0.00	0	0	0	0
310036	TANK SX-109	11866	0.00	0	0	0	0
310037	TANK T-110	6824	0.00	0	0	0	0
310038	TANK T-111	5504	0.00	0	0	0	0
310039	TANK T-201	16046	0.00	0	0	0	0

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E40681/FBNO4F
 FILE NO. YA07SAAI

** TEST - INTERACTIVE ESTIMATING **
 LIGHTNING PROTECTON - TANK RISER BONDING
 ROUGH ORDER OF MAGNITUDE
 DOE_R07 - ONSITE INDIRECT COSTS BY WBS

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WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT X	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
-----		-----	-----	-----	-----	-----	-----
310040	TANK T-202	9457	0.00	0	0	0	0
310041	TANK T-204	11394	0.00	0	0	0	0
310042	TANK TX-102	4806	0.00	0	0	0	0
310043	TANK TX-105	5428	0.00	0	0	0	0
310044	TANK TX-111	6281	0.00	0	0	0	0
310045	TANK TX-112	3489	0.00	0	0	0	0
310046	TANK TX-113	4186	0.00	0	0	0	0
310047	TANK TX-115	4806	0.00	0	0	0	0
310048	TANK TX-118	22248	0.00	0	0	0	0
310049	TANK TY-104	8840	0.00	0	0	0	0
310050	TANK U-102	5504	0.00	0	0	0	0
310051	TANK U-103	6824	0.00	0	0	0	0
310052	TANK U-105	6126	0.00	0	0	0	0
310053	TANK U-106	6824	0.00	0	0	0	0
310054	TANK U-107	8840	0.00	0	0	0	0
310055	TANK U-108	8840	0.00	0	0	0	0
310056	TANK U-109	8840	0.00	0	0	0	0
310057	TANK U-111	8220	0.00	0	0	0	0
310058	TANK U-203	17601	0.00	0	0	0	0
310059	TANK U-204	12332	0.00	0	0	0	0
PROJECT TOTAL		699,932		0	0	0	0

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

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DOE_R07 - ESTIMATE DETAIL BY WBS / COST CODE

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)
 DOE_R07 - ONSITE INDIRECT COSTS BY WBS

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WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT %	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
=====	=====	=====	=====	=====	=====	=====	=====
110000	DEFINITIVE DESIGN	27200	0.00	0	0	0	0
121000	ENGINEERING	20951	0.00	0	0	0	0
122000	INSPECTION	12975	0.00	0	0	0	0
310001	ICFKH UTILITIES	28299	0.00	0	0	0	0
310002	ICFKH CONSTRUCTION FORCES	162405	0.00	0	0	0	0
317720	CF SUPPORT	20680	0.00	0	0	0	0
PROJECT TOTAL		272,510		0	0	0	0

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

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DOE_RO8 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
121000	ENGINEERING										
121000.3100000	ELECTRICAL ENGINEER - WRITE ECM CHANGES	000	16 MHR	16	1309	0	0	0	0	0	1309
121000.3100010	EXCAVATION PERMITS (10EA) - ENGINEERING/PLANNER TIME	000	200 MHR	200	16368	0	0	0	0	0	16368
121000.3100020	WORK PACKAGE PREPARATION, PLANNING, COORDINATION	000	40 MHR	40	3274	0	0	0	0	0	3274
TOTAL WBS 121000 ENGINEERING				256		20,951	0	0	0	0	20,951

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6EBL4
 FILE NO. Y97BSAA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

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DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
122000	INSPECTION										
122000.4432000	ELECTRICAL INSPECTOR	000	16 MHR	16	1081	0	0	0	0	0	1081
122000.4432010	GROUND GRID TESTING BELHAVEN 735-9446 (2-MEN/DAY @ 2-GRIDS/DAY)	000	176 CRW	176	11894	0	0	0	0	0	11894
TOTAL WBS 122000 INSPECTION				192		12,975	0	0	0	0	12,975

ICF KAISER HAWFORD
WESTINGHOUSE HAWFORD COMPANY
JOB NO. E23494/FGE8L4
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** IEST - INTERACTIVE ESTIMATING **
LIGHTNING MITIGATION
STUDY (CROM)

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DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
310001	ICFKH UTILITIES										
310001.16	ELECTRICAL										
310001.1644000	INSTALLATION - LIGHTNING PROTECTION ON WOOD POLE - W/BUCKET TRUCK EQUIP. USAGE & STANDBY TRUCK RENTAL	706	44 EA	132	6948	1540	0	3300	0	3613	15401
310001.1644010	AIR TERMINAL, 1/2" D, 4FT LG THOMPSON LIGHTNING PROTECTION No. 661E	706	44 EA	0	0	0	774	0	0	0	
310001.1644012	POINT SUPPORT, FOR 1/2" PT THOMPSON LIGHTNING PROTECTION No. 575	706	88 EA	0	0	0	532	0	0	0	532
310001.1644014	VERTICAL POINT BASE THOMPSON LIGHTNING PROTECTION No. 690M	706	44 EA	0	0	0	451	0	0	0	451
310001.1644016	ADAPTER THOMPSON LIGHTNING PROTECTION No. 69	706	44 EA	0	0	0	55	0	0	0	55
310001.1644018	CABLE HOLDER THOMPSON LIGHTNING PROTECTION No. 166X	706	300 EA	0	0	0	75	0	0	0	75
310001.1644020	CABLE #4/0 CU STRANDED THOMPSON LIGHTNING PROTECTION No. 507	706	2000 LF	0	0	0	5700	0	0	0	5700
310001.1644022	BONDING JUMPER	706	44 EA	0	0	0	660	0	0	0	660
310001.1644024	MISC. HARDWARE	706	1 LOT	0	0	0	200	0	0	0	200
310001.1644026	FREIGHT - ST. PAUL, MINN. TO RICHLAND, WA.	706	1 LOT	0	0	0	500	0	0	0	500
SUBTOTAL ELECTRICAL				132	6,948	1,540	8,947	3,300	0	3,613	24,348
CONSUMABLES 6.00 %							536				536
SALES TAX 8.00 %							758				758
WAREHOUSING 28.00 %							2655				2655
TOTAL COST CODE 70616				132	6,948	1,540	12,897	3,300	0	3,613	28,298
WBS 310001											
(ESCALATION 0.00% - CONTINGENCY 30.00 %)											
TOTAL WBS 310001 ICFKH UTILITIES				132	6,948	1,540	12,897	3,300	0	3,613	28,298

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/P6E8L4
 FILE NO. Y978SAA1

** TEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (R0H)
 DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLAR
310002	ICFKH CONSTRUCTION FORCES										
310002.16	ELECTRICAL										
310002.1644030	GROUND ROD, 5/8" X 10FT, CU THOMPSON LIGHTNING PROTECTION No. TL5810-5/8" X 10FT	706	132 EA	264	13897	0	2132	0	0	7226	2321
310002.1644032	GROUND ROD CLAMP THOMPSON LIGHTNING PROTECTION No. 231	706	132 EA	53	2790	0	746	0	0	1451	491
310002.1644034	GROUND ACCESS WELL THOMPSON LIGHTNING PROTECTION No. GVP-1024	706	44 EA	44	2316	0	2490	0	0	1204	601
310002.1644040	CABLE #4/0 CU STRANDED THOMPSON LIGHTNING PROTECTION No. 507	706	3000 LF	150	7896	0	8550	0	0	4106	2051
310002.1644050	HAND EXCAVATION (1'W X 1'D X 80FT/POLE)	706	3520 LF	1056	40413	0	0	0	0	21015	6141
310002.1644052	HAND BACKFILL/COMPACTION (1'W X 1'D X 80FT/POLE)	706	3520 LF	528	20207	0	0	0	0	10508	3071

SUBTOTAL	ELECTRICAL			2,095		0	13,918	0	0	45,510	146,911
	GENERAL FOREMAN 7.00 X			146	6126						811
	CONSUMABLES 6.00 X						835				611
	SALES TAX 8.00 X						1180		0		411
	WAREHOUSING 28.00 X						4130				311
	OH&P (ON MARKUPS ONLY)									3185	311

TOTAL	COST CODE 70616			2,241		0	20,064	0	0	48,695	162,411
	WBS 310002				93,645				0		
	(ESCALATION 0.00% - CONTINGENCY 30.00 X)										

TOTAL WBS 310002	ICFKH CONSTRUCTION FORCES			2,241		0	20,064	0	0	48,695	162,411
					93,645				0		

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y9785AA1

** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

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DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
317720	CF SUPPORT										
317720.16	ELECTRICAL										
317720.1644000	SUB-SURFACE SCANNING	050	352 MHR	352	20680	0	0	0	0	0	2068
	SUBTOTAL ELECTRICAL			352	20,680	0	0	0	0	0	20,68
	TOTAL COST CODE 05016			352	20,680	0	0	0	0	0	20,68
	WBS 317720										
	(ESCALATION 0.00X - CONTINGENCY 30.00 %)										
	TOTAL WBS 317720 CF SUPPORT			352	20,680	0	0	0	0	0	20,68

ICF KAISER HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. E23494/F6E8L4
 FILE NO. Y978SAA1

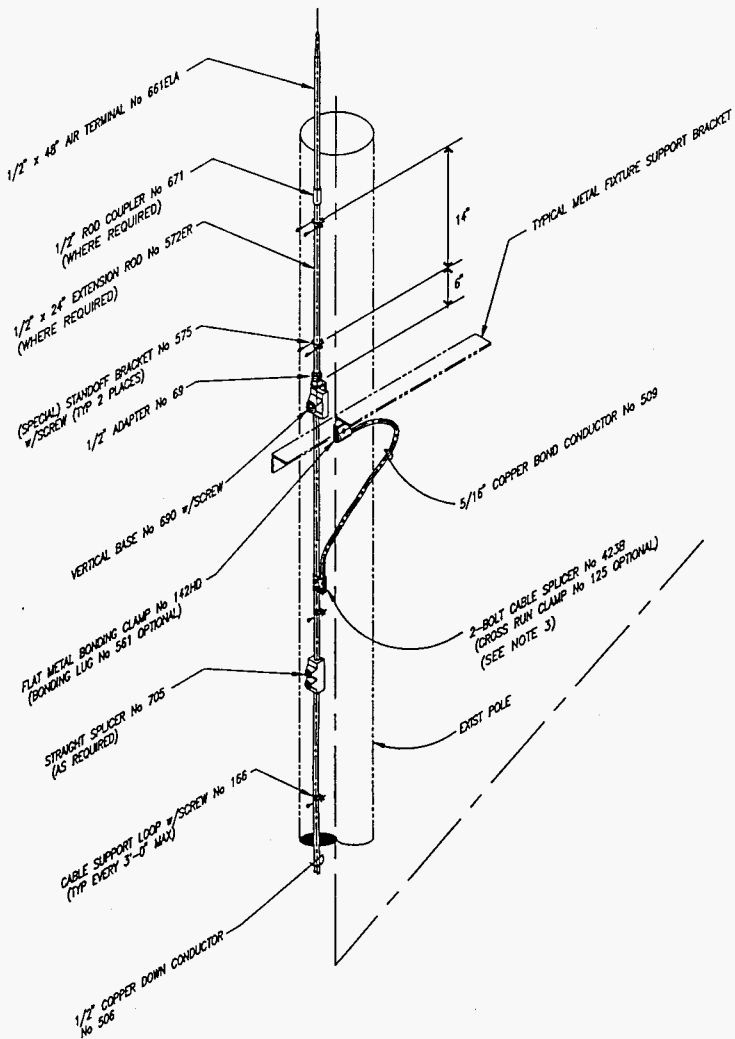
** IEST - INTERACTIVE ESTIMATING **
 LIGHTNING MITIGATION
 STUDY (ROM)

PAGE 7
 DATE 05/01/96 08:34:49
 BY DEA

DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

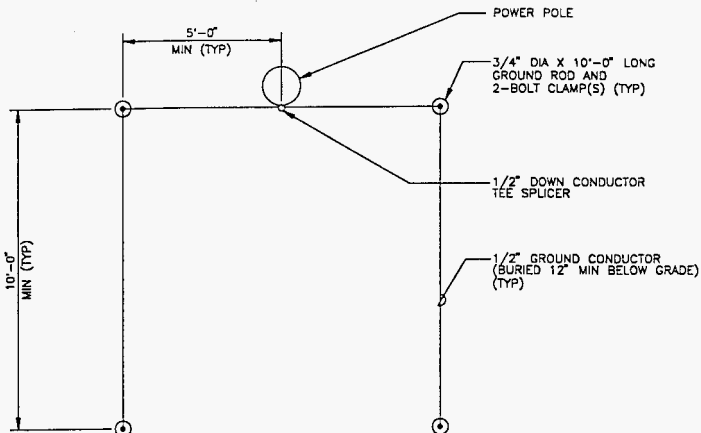
ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
REPORT TOTAL				3,493	182,399	1,540	32,962	3,300	0	52,308	272,510

APPENDIX E SKETCHES



ITEM 1
LIGHTNING PROTECTION TANK
FARM POLES
TYPICAL INSTALLATION DETAILS

SCALE: NONE
(H-14-100875, SH. 2)



ALTERNATE GROUNDING PLAN EXAMPLE

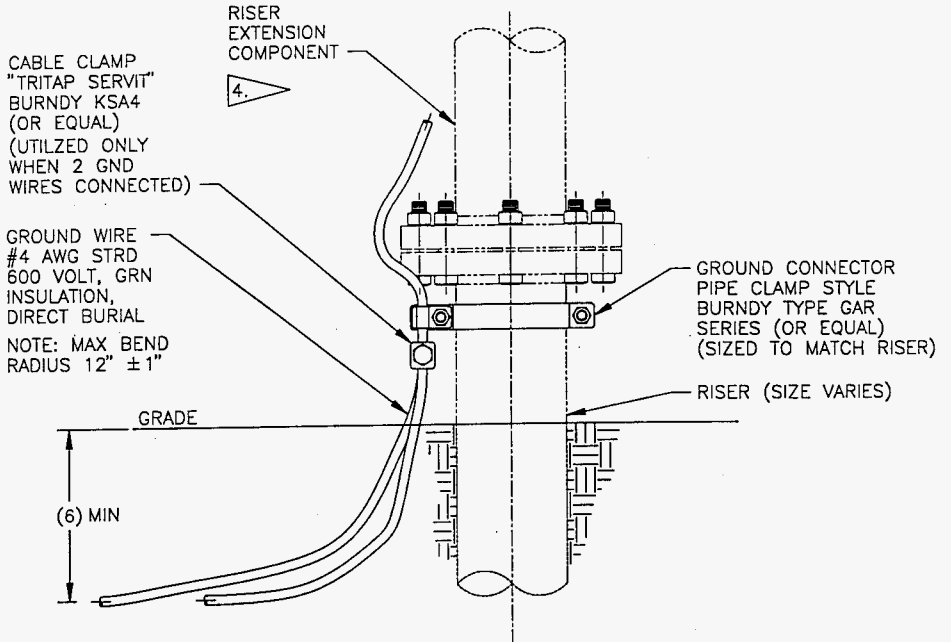
SCALE: 1/2" = 1'-0"
FIELD DETERMINE EXACT ARRANGEMENT
(SEE NOTE 4)

NOTES

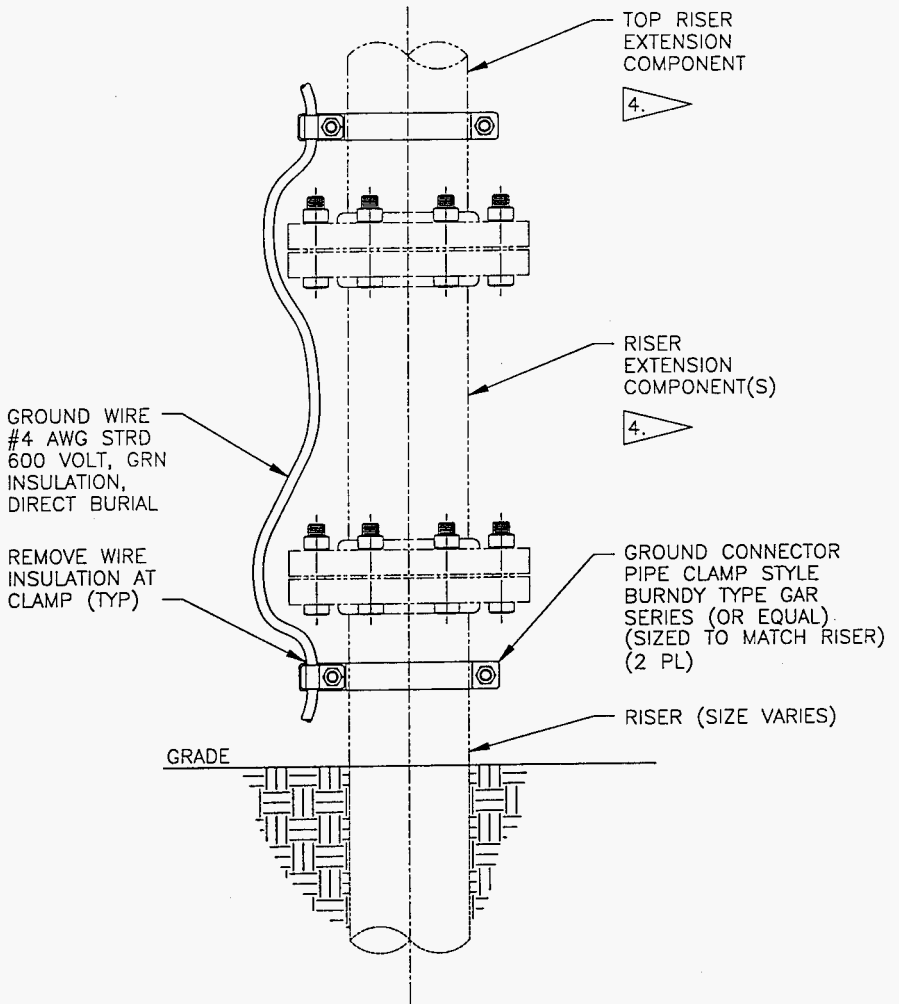
1. CONDUCTOR, AIR TERMINAL GROUND ROD, HARDWARE, ETC TO BE THOMPSON LIGHTNING PROTECTION (CAT No TLP 1993) OR APPROVED EQUAL MISCELLANEOUS FASTENERS TO BE SUPPLIED BY THE FIELD.
2. MAINTAIN 2'-0" MINIMUM FROM POLE (OR OTHER STRUCTURES) TO GROUND ROD IN ANY DIRECTION WITH 10'-0" MINIMUM BETWEEN RODS.
3. OPTIONAL BONDING CONDUCTOR ATTACHMENTS TO THE DOWN CONDUCTOR MAY BE MADE USING CLAMP No's 125, 141X AND 143.
4. SURVEY FOR UNDERGROUND OBSTRUCTIONS. OWNER TO DETERMINE LOCATIONS TO DRIVE GROUND RODS. TOP OF GROUND RODS, WHEN FULLY DRIVEN SHALL BE NO LESS THAN 1'-0" BELOW GRADE AND SHALL PENETRATE EARTH AT LEAST 11'-0".
5. ACCEPTANCE TESTING REQUIREMENTS.
 - A) VERIFY CONTINUITY THROUGH ALL CONNECTIONS.
 - B) MEASURE AND RECORD GROUND RESISTANCE OF INSTALLED PARALLEL GROUND TERMINALS.
 - C) PROVIDE DOCUMENTATION OF GROUNDING RESISTANCE TESTS. OWNER WILL DETERMINE IF ANY FURTHER GROUND TERMINAL UPGRADE WORK IS REQUIRED.

ITEM 2 LIGHTNING PROTECTION TANK FARM POLES TYPICAL INSTALLATION DETAILS

(H-14-100875, SH. 2)

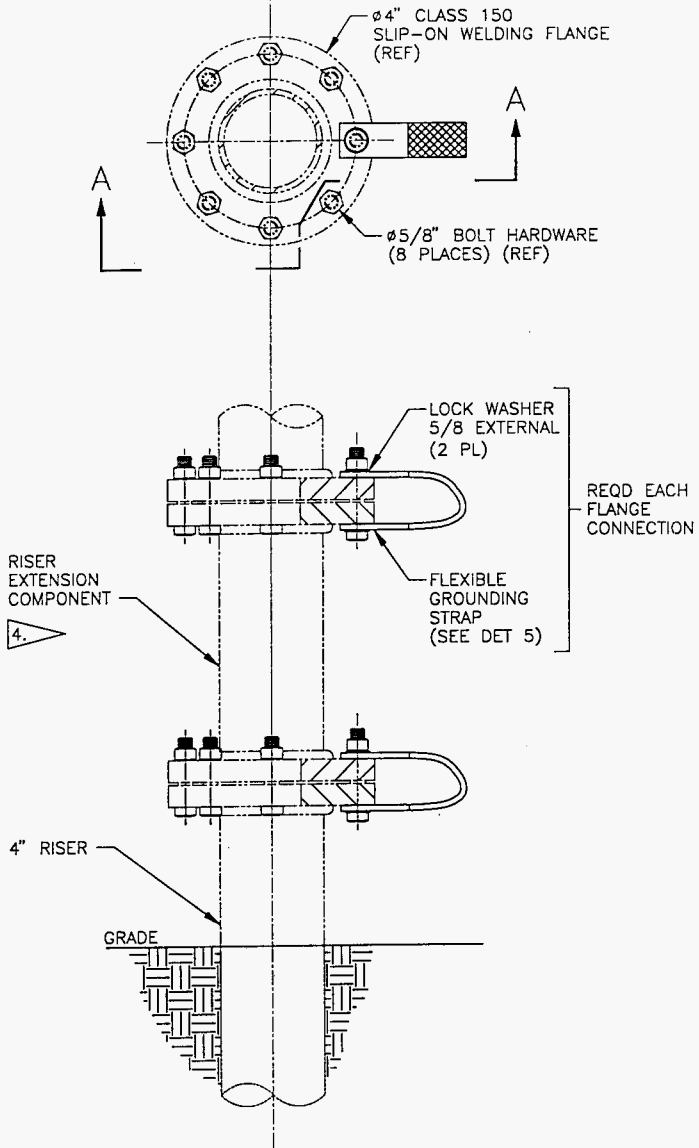


ITEM 4
TYPICAL GROUNDED/BONDED
RISER CONNECTION LINK TO
ANOTHER ACCEPTABLE RISER



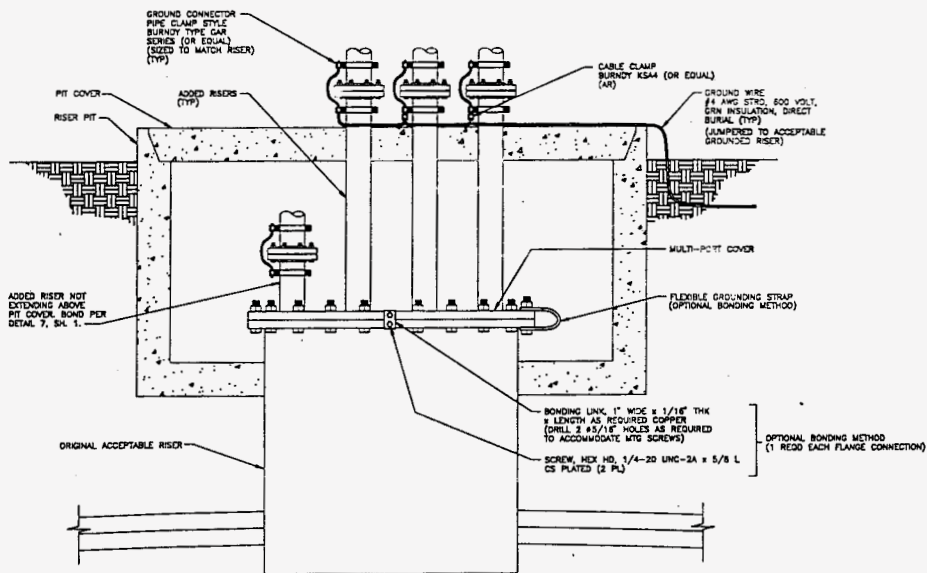
ITEM 5

EXISTING RISER BONDING SCHEME



ITEM 6

EXISTING 4" RISER BONDING SCHEME



ITEM 7

TYPICAL MULTI-POLE RISER BONDING SCHEME
AND ADDED RISER GROUNDING SCHEME

CORRESPONDENCE DISTRIBUTION COVERSHEET

Author

Addressee

Correspondence No.

F. M. Jones
373-1269

Distribution

EDT-156649

Subject: ENGINEERING WORK PLAN TANK FARM LIGHTNING MITIGATION SYSTEM

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