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Conceptual Design Report, "TWRS Privatization Phase I, Electrical Power System, " Subproject W-503.

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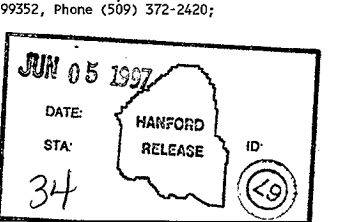
Abstract: This document includes Conceptual Design Report (CDR) for a new 11 km (7 miles) 230 kV transmission line and a new 40 MVA substation (A6) which will be located east of Grout Facility in 200E area Tankfarm. This substation will provide electrical power upto 20 MW each for two private contractor facilities for immobilization and disposal of low-activity waste (LAW).



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HNF-SD-W503-CDR-001
Revision 0

Conceptual Design Report

TWRS Privatization Phase I Electrical Power System

Subproject W-503

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

a.

CONCEPTUAL DESIGN REPORT

TWRS PRIVATIZATION PHASE I ELECTRICAL POWER SYSTEM

SUBPROJECT W-503

Prepared for

Numatec Hanford Corporation

June 1997

Prepared by

Fluor Daniel Northwest
Richland, Washington

W503CDR

W503CDR

CONCEPTUAL DESIGN REPORT

FOR

TWRS PRIVATIZATION PHASE I ELECTRICAL POWER SYSTEM

SUBPROJECT W-503

Prepared by

Fluor Daniel Northwest
Richland, Washington

for

Numatec Hanford Corporation

APPROVED

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Numatec Hanford Corporation

for — Project Manager	5-29-97		5/30/97 Date

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APPENDICES

ABBREVIATIONS

ACSR	aluminum conductor steel reinforced
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
BPA	Bonneville Power Administration
CDR	conceptual design report
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DRD	design requirement document
FDAS	field data acquisition system
FM	Factory Mutual
HLW	High-level waste
HLAN	Hanford Local Area Network
ICD	interface control document
IEEE	Institute of Electrical and Electronics Engineers
IPT	Integrated Product Team
ITTS	protective relaying coordination
LAW	low-activity waste
LPDS	Loss Prevention Data Sheet
LTC	load tap changers
MYWP	Multi-Year Work Plan
NEC	National Electrical Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
P2/WMin	pollution prevention/waste minimization
P2-EDGE	microcomputer program
PC	Private Contractors
PFHA	Preliminary Fire Hazards Analysis
PHMC	Project Hanford Management Contractor
PVC	polyvinyl chloride
QAPP	Quality Assurance Program Plan
RFP	request for proposal
RL	Richland Operations Office
RTU	remote terminal unit

ABBREVIATIONS (Continued)

SCADA	supervisory control of equipment
TWRS	Tank Waste Remediation System
UBC	Uniform Building Code
WBS	work breakdown structures
WDOH	Washington Department of Health
WDOT	Washington State Department of Transportation
WIT	Waste Integration Team

CONCEPTUAL DESIGN REPORT

TWRS PRIVATIZATION PHASE I ELECTRICAL POWER SYSTEM

SUBPROJECT W-503

I. INTRODUCTION

Historically, the primary function of the 200 Areas facilities at the Hanford Site as to process nuclear material for defense purposes. This activity resulted in liquid radiological wastes that were stored in tank farms located in both the 200-East and 200-West Areas. High-level waste (HLW) has been stored in large underground storage tanks at the Hanford Site since 1944; approximately 208 ML (55 M/gal) of waste are stored in 177 tanks. These caustic wastes consist of many different chemicals in the form of liquids, slurries, saltcakes, and sludges. In 1992, the Tank Waste Remediation System (TWRS) program was established to manage, retrieve, treat, immobilize, and dispose of these wastes in a safe, environmentally-sound, and cost-effective manner.

The U.S. Department of Energy (DOE) Richland Operations Office (RL) is pursuing a new business strategy of hiring Private Contractors (PC) to manage the retrieval, immobilization, and disposal of low-activity waste (LAW). This privatization strategy includes design, permitting, construction, operation, and deactivation of equipment and facilities for treatment of tank wastes. The approach to privatization will be conducted in two phases. Phase I includes supernatant pretreatment, LAW immobilization, and an optional HLW immobilization by two competing vendors.

The TWRS Privatization Infrastructure Project is a part of the first phase of the privatization initiative.

Subproject W-503 is one of the four subprojects that make up the TWRS Privatization Infrastructure Project. The subprojects provide the infrastructure (except for sanitary sewer), the site improvements, and interfaces necessary to

support the demonstration phase (Phase I) of TWRS Privatization. The subprojects are:

- W-503, "Electrical Power System"
- W-504, "Raw and Potable Water"
- W-505, "Site Development and Roads"
- W-506, "Liquid Effluent Transfer Systems"

Subproject W-503 will extend the existing 230 kV transmission system and provide a new 230 kV substation and 13.8 kV switchgear and feeders to supply the committed electrical power to the PCs (ref 1, 2, and 10).

In conjunction with preparation of the TWRS Privatization request for proposal (RFP) for the solicitation of PCs, a location was selected for the Phase I facilities (ref 3 and 4). The selected area is east of the major 200-East Area road and rail network, and will require modifications and additions to existing transportation corridors and utility systems.

The TWRS RFP states that the DOE will provide and maintain an electrical power distribution system capable of delivering up to 20 MW of electrical power to each Phase I PC site. A site evaluation concluded that the existing electrical distribution system supplied from substation A8 (251W) is inadequate for the Site (ref 5). The recommended preferred alternative electrical power source is a new 230 kV substation, supplied from the existing Hanford Site 230 kV transmission system.

The work breakdown structures (WBS), budget authorized/budget outlay schedule, cost estimate summary, and conceptual project schedule are in Appendices A, B, C, and D, respectively.

II. SUMMARY

Subproject W-503 will install the necessary electrical infrastructure to provide 20 MW of electrical power to each of two Privatization Contractors (PCs) site.

The design requirements, including codes and standards, for this subproject are established in the Design Requirements Document (ref 10).

The project will modify the Hanford Site 230 kV transmission system to add a new 230-13.8 kV substation between substation A8 (251W) and the A22 Ashe Tap. The new substation installation will include: extension of the 230 kV transmission loop via new transmission lines; a 230 kV switchyard including two 230-13.8 kV power transformers, two 13.8 kV zig-zag grounding transformers, three 230 kV power circuit breakers, 230 kV switches, miscellaneous 230 kV equipment, and grounding and lightning protection systems; a switchgear building containing 13.8 kV switchgear with vacuum circuit breakers, DC control power systems, metering equipment, protective relaying and communication equipment; and new 13.8 kV underground feeders to supply the PCs sites. Each PCs site will be provided electrical power via two (normal and alternate), 13.8 kV feeders in underground duct banks.

Monitoring and control of the new substation equipment will be integrated with the existing site supervisory control and data acquisition and field data acquisition system systems. New fiber optic cables and equipment will be installed to provide communication channels for the integrated transfer trip system and to extend the Hanford Local Area Network to the new substation. Twisted pair (telephone) systems will be extended to the new substation to serve voice and data communication requirements.

Design and construction of the project will be accomplished by an offsite design-build contractor. Completion of construction and startup of the new substation is desired by March 2000.

Subproject W-503 is a fiscal year 1999 Line Item. Total estimated costs (TEC) of the project are $19,460,000; other project costs (expense funded) are $1,840,000. The total subproject cost (TPC) is $21,300,000.

III. JUSTIFICATION

The TWRS privatization Phase I program requires delivery of up to 20 MW of 13.8 kV electrical power to each of the PC sites. Engineering Study WHC-SD-WM-ES-393 analyzed and evaluated several alternative proposals (ref 6). The study concluded that the existing A8 (251W) substation cannot adequately supply the PCs additional 40 MW, 13.8 kV projected load. An alternative source is required. Based on cost, reliability, operation, maintenance, and environmental factors, the recommended preferred alternative is to provide a new 230 kV-13.8 kV substation supplied from the existing 230 kV transmission system.

Preliminary load flow and voltage profile calculations were performed by the Bonneville Power Administration (BPA) to evaluate the impact of the new substation on the overall 230 kV transmission grid. The BPA indicated that up to 60 MW can be provided to the new substation.

The upgrades provided by subproject W-503 are required to support the TWRS Privatization contracts. By supporting TWRS Privatization, subproject W-503 supports the Tri-Party Agreement milestones for site clean-up, processing, and disposal of tank wastes.

IV. DESCRIPTION OF PROJECT SCOPE

A. IMPROVEMENTS TO LAND (460)

1. **230 kV Transmission Lines** (See Sketch ES-W503-01. All sketches are shown in Appendix L.)

   Clearing

   Two adjacent parallel transmission lines will be installed to extend the existing 230 kV transmission loop with approximately 11 km

(7 mi.) of new transmission line to the new 230 kV substation A6. The existing loop will be intercepted along A-8 to the Ashe Tap line, between towers AGL10 and AGL11, approximately 3.6 km (2 mi.) west of the Ashe Tap. From the existing line, the route of the new transmission lines will be generally south, then west into the new substation. The new transmission lines will be supported by 34 steel structures. Locations of transmission tower foundations will require removal and disposal of all brush, roots, and other objects resting on or protruding through the surface.

Excavation

Each new transmission line will include installation of a direct buried counterpoise system consisting of two continuous parallel conductors along the route of each new line, spaced 10.7 m (35 ft) on each side of the transmission line centerline. Each transmission line support structure will have connections to the counterpoise system. Excavation will be required at transmission line support structures for tower footings and, where required, anchor embedments.

Stabilization

The unimproved construction and maintenance roadway will require erosion control and soil stabilization measures in areas subject to potential erosion.

Environmental Remediation

Areas cleared or disturbed during construction activities that are not required for maintenance access will be revegetated.

2. **230 kV Substation** (See Sketches ES-W503-04 and ES-W503-08)

Clearing and Grading

Approximately 1.9 hectares (4.7 acres) will be cleared and graded for the substation. Clearing will remove and dispose of all brush, roots, and other objects resting on or protruding through the surface. The substation switchyard will be sloped and graded to provide surface drainage, level areas for equipment and buildings, erosion control, elimination of standing water, and diversion of water from site to natural drainage area. Grading will conform to DOE Order 6430.1A, Sections 0210 and 0220, as applicable. A substation expansion area (1.9 hectares) to the south of the proposed substation will not be cleared or graded by this project. The expansion area will be reserved for potential future use.

Excavation

Installation of the substation ground grid will require excavation for placement and bonding of the ground grid conductors and equipment grounding conductors. Excavation will also be required for the switchgear building basement. The ground grid will consist of a rectangular array of conductors spaced approximately 3 m (10 ft) on center, buried approximately 600 mm (24 in.) below grade. The ground grid will extend a minimum of 1.5 m (5 ft) beyond the substation fence.

Footings and concrete pads for transmission towers, support poles, power circuit breakers, miscellaneous equipment supports, and transformers and associated oil containment structures will also be built within the substation switchyard.

Yard Surfacing

The substation yard will be surfaced with crushed and graded stone. Depth and grade will be determined during definitive design for minimization of touch and step potentials, however, 150 to 200 mm (6 to 8 in.) depth is assumed.

3. **Access Roads** (see Sketch ES-W503-01)

Subproject W-503 will provide an unimproved roadway along the route of the transmission lines for construction and maintenance access. The roadway will be required for transportation of materials and equipment during transmission line support structure construction and installation of the direct buried counterpoise systems along the length of the lines. A 6 m (20-ft) wide area will be cleared for a 3 m (10-ft) wide roadway.

An all weather access road between the main road and the substation and parking area will be provided by subproject W-505.

4. **13.8 kV Duct Banks** (See Sketch ES-W503-03)

Trenching

The PC sites will be provided with electrical service from 13.8 kV feeders routed through underground duct banks. The duct banks will extend from the switchgear building to the cable vaults at the edge of the PC sites.

B. BUILDINGS (501)

1. **Switchgear Building** (See Sketch ES-W503-07)

A switchgear building will be provided to house the 13.8 kV switchgear, 230 kV relay panels, communication equipment,

125 and 48 Vdc control power distribution systems, and ancillary support systems for the substation.

Structural

The switchgear building will be a prefabricated or engineered steel metal building approximately 9.2 by 15.3 m (30 by 50 ft) in plan with an eave height of approximately 4 m (13 ft). Primary framing will be of rigid or simply supported frames of rafter beams and columns, braced end frames, end wall columns, and wind/seismic bracing. A full basement will be provided for use as 13.8 kV cable spreading room. The ground floor supporting the switchgear, relay panels, battery racks, chargers, and communications equipment will be a steel-grated checker plate floor. Access to the basement will be provided by a stairway. A second fire exit will be provided by a ladder and a floor hatch. Soils investigation for foundation design will comply with the requirements of DOE Order 6430.1A, Section 0210. Foundation design will comply with the Uniform Building Code (UBC) and will follow recommendations in the soils investigation report. Seismic design will comply with the UBC for Zone 2B.

Architectural

The wall and roof system will be preformed metal panels of vertical profile, with subgirt framing/anchorage assembly, insulation, liner sheets, and accessory components.

The wall system will be galvanized steel sheets, 24 gage minimum, exposed fastening panel system.

The roof system will be galvanized steel sheets, 22 gage minimum, concealed fastening, standing seam configuration.

Thermal resistance: Wall system: R value of 24
Roof system: R value of 30

Three hollow-metal hinged man-doors will be provided: Full-flush type doors, 44 mm (1-3/4 in.) thick, with no seams or joints on face, fabricated from American Society for Testing and Materials (ASTM) A 366 or A 569 steel, with stiles and rails. Doors will be furnished with combination locks and panic bars.

A 3 by 3.7 m (10 by 12 ft), electric operated, steel, roll-up type door will be provided for vehicle and equipment access to the switchgear building.

The stairway and ladder from the basement area will meet requirements of National Fire Protection Association (NFPA) 101 for life safety and emergency egress.

The switchgear building will be divided into the following functional areas:

- **Switchgear Room:** The main portion of the switchgear building will be occupied by the 13.8 kV switchgear, 230 kV relay panels, raceway systems, system communications equipment, and ancillary station support equipment.

- **Battery Room:** An enclosed, ventilated battery room will be provided for the 125 and 48 Vdc system batteries.

- **Cable Room:** A full basement will be used as a cable room containing cable trays, supports, and wall penetrations for the 13.8 kV power cables.

Fire Protection

The switchgear building is of noncombustible construction (Type II-000 per NFPA 220), classified as a Special Purpose Industrial Occupancy in accordance with NFPA 101. Multiple means of egress from the facility, and emergency lighting and signs designating exits will be provided in accordance with NFPA 101. Ventilation will be provided in the battery room at the rate of 25 air changes per hour. Factory Mutual (FM)-approved Group 1 cables defined by nonself-sustained flame propagation and having a flame propagation index less than 10 will be used. Cables will be installed in accordance with FM Loss Prevention Data Sheet (LPDS) 5-31/14-5, "Cables and Bus Bars."

An automatic sprinkler system designed for an ordinary Hazard Group 2 occupancy will be installed in the switchgear building. A fire alarm system with smoke detection, manual pull stations, waterflow annunciation, valve position tamper switches, and visible and audible occupant notification devices will also be installed. A radio fire alarm signal box will be installed to transmit alarms to the Hanford fire department.

The switchgear building will be of noncombustible construction (Type II-000 per NFPA 220) and will be less than 465 m^2 (5,000 ft^2).

Space separation between transformers, the switchgear building, and other electrical equipment is sufficient to minimize fire exposures and conforms with recommendations to mitigate exposure damage from an incident involving an oil-filled transformer as specified in FM LPDS 5-4/14-8, "Transformers."

Appropriate fire protection for transformers and cables will be provided in accordance with FM LPDS 5-4/14-8, 5-31/14-5; and NFPA 70, "National Electric Code." An automatic sprinkler system will be installed to provide the best level of protection against potential transient combustibles in the building.

Fire protection systems will be designed in accordance with Hanford Chapter of the DOE Fire Protection Resource Manual. This covers such items as fire sprinkler and alarm design criteria, wiring, etc.

A minimum of two fire hydrants will be installed by subproject W-504 so that all portions of the exterior of the building are within 300-ft hose lay of a fire hydrant. Fire protection water will be supplied by connections to the raw water distribution system.

Heating, Ventilating, and Air Conditioning

The switchgear building will be maintained at 16 °C (60 °F) minimum during the heating season and 30 °C (86 °F) maximum during the cooling season. Outdoor winter design temperature is minus 29 °C (minus 20 °F) and summer outdoor design temperature is 43 ° C (110 °F). A central, base-mounted heat pump will be used for cooling and heating. The unit will be provided with an enthalpy controlled economizer, supplemental electric resistance heat, and 35% American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) rated filters. Cooling capacity will be approximately 18 kW (62,500 Btu/hr). The unit will have a 24 kW (80,000 Btu/hr) supplementary electric resistance heater. Air distribution will be through galvanized steel ducts running overhead along the length of the building. Equipment, components, and system operation will conform to ASHRAE standards.

The battery room will be exhausted with an exhaust fan mounted on the perimeter wall. The fan can provide a minimum of 25-air change

per hour. The battery room door will be provided with louvers fitted with a backdraft damper for room makeup air.

Instrumentation and Control

Instrumentation and control equipment for the substation will be located within the 13.8 kV switchgear, the five 230 kV relay panels, and the three floor-mounted remote terminal unit (RTU) and communications racks. Raceways for instrumentation and control cables will be via overhead cable tray in the switchgear building, and the underground cable trench in the switchyard.

Revenue Metering

Power demand, energy consumption, and reactive consumption will be metered at each 13.8 kV incoming circuit breaker and at each 13.8 kV feeder circuit breaker. Power demand and energy consumption of the switchgear building station service also will be metered. Output from the revenue meters will be supplied to the field data acquisition system (FDAS).

13.8 kV Distribution System Protective Relaying

Distribution line protection will include phase and ground overcurrent relays. Bus protection will include differential relays. The protective system will be in accordance with American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE) 242, and WHC-SD-LL-ES-034 (ref 7).

Electrical (See Sketch ES-W503-06)

The station service electrical power distribution system will be 208Y/120 Vac, supplied from a 600 ampere (A) main power distribution panel and a 225 A subfed distribution panel. The 600 A power distribution panel will be fed via an automatic transfer switch from two station service transformers. Power distribution raceways

within the switchgear building will be exposed electrical metallic tubing. Conduits within 1.5 m (5 ft) of the floor will be rigid steel. Design and installation of the electrical distribution system and equipment will comply with NFPA 70.

Substation equipment control power will be from a 125 Vdc distribution system consisting of: two 225 A control power distribution panels; a 150 Ah stationary battery bank; and a manual transfer switch fed by two redundant battery chargers supplied from a 208Y/120 Vac distribution panel.

Communications equipment will be supplied by a 48 Vdc system consisting of: a 60 Ah stationary battery bank; battery charger supplied from a 208Y/120 Vac distribution panel; and a 100 A, 48 Vdc communication power distribution panel.

Lighting

The switchgear building interior lighting will consist of rows of suspended, energy efficient, twin-tube industrial fluorescent fixtures, T-8 lamps, and electronic ballasts. Approximately 35 fixtures will be installed for the ground floor, and 15 in the basement. Emergency lighting will be supplied by integral automatic battery backup power supplies in selected fluorescent fixtures. Lighting system raceways will be exposed conduit.

Exterior site lighting will be low-pressure sodium luminaries, twin-lamp, 208 Vac, 180 W. Four fixtures will be surface-mounted on the switchgear building, and 26 fixtures will be mounted on dedicated poles or substation equipment supports in the switchyard. Lighting control will be by central photoelectric cell and contactor. Lighting system circuits will be routed via conduit, tray, and trench.

Communications (see Sketches ES-W503-09 and ES-W503-10)
The switchgear building communications systems will include circuits and equipment for voice communications (telephone), data collection (FDAS), supervisory control of equipment (SCADA), protective relaying coordination (ITTS), and Hanford Local Area Network (HLAN) access. Redundant telecommunication circuits will be required for the 230 kV transmission system ITTS protective relaying and SCADA systems.

- **Telephone:** A new 25-pair telephone cable will be installed to a pedestal at the new substation location. The new cable will tap an existing 300-pair cable, and will be routed via existing overhead messengers along Canton Avenue, and then direct buried to the new substation. Two, 6-pair cables will be installed from the pedestal to the switchgear building through a new 103 mm (4 in.) duct.

- **Supervisory Control and Data Acquisition (SCADA):** The 230 kV and 13.8 kV electrical systems will be monitored and controlled by the existing Hanford Site utilities SCADA system. SCADA monitoring will include: amps, watts, volts of 230 kV and 13.8 kV incoming lines and 13.8 kV switchgear feeders; status of 230 kV and 13.8 kV circuit breakers; protective relay operation; transformer status; DC control system status; etc. SCADA control will include 230 kV and 13.8 kV circuit breakers, motor operated disconnect switches, and other associated control. The SCADA system will be compatible with the SCADA system as specified in the SCADA Computer System Acquisition Plan (ref 8). SCADA communication will be via a new twisted pair telephone cable interface with existing telephone switching node at 2220-E, and then a

dedicated channel on the Hanford Site synchronized optical network to the A8 (251W) substation.

- **Field Data Acquisition System:** The FDAS system will monitor electrical energy use and transmit data via voice-grade telecommunication systems. FDAS inputs will include pulse outputs from the 13.8 kV system revenue metering devices. FDAS communication will be via a new telephone cable interface with existing telephone network.

- **Hanford Local Area Network:** HLAN communications will be provided to the substation with the extension of the existing fiber optic network via installation of a new dielectric fiber optic cable system to the substation. The new cable will be routed on existing overhead messenger from the telecommunications building near 272-AW, to the utility corridor where it will be direct buried to a hand hole at the new substation location. Final routing to the switchgear building will be through new 103 mm (4 in.) duct.

- **Integrated Transfer Trip System:** Redundant 230 kV transmission line ITTS communication channels will be provided for the substation with the installation of the new dielectric fiber optic cable system which will also provide HLAN communication.

2. **13.8 kV Switchgear and Bus Duct** (See Sketch ES-W503-05 and ES-W503-08)

   The 13.8 kV distribution switchgear will be double ended, with nine-metal clad vertical sections including circuit breaker cubicles and metering for two incoming lines, one bus tie, four feeders, two spare circuit breakers, four circuit breaker spaces, and two draw-out

fuse compartments for station service. The draw-out fuse compartments will be key-interlocked with their associated station service main circuit breaker. The switchgear will have provisions for additional vertical sections on each end. Incoming and bus tie circuit breakers will be 2000 A, feeder circuit breakers will be 1200 A, all will be 36 kAIC vacuum break. Incoming line will be by 2000 A overhead enclosed bus duct. Feeder compartments will be stacked two-high. Station service transformer feeders will be served by no-load break draw-out fuse compartments. Incoming line and feeder protection will include phase and ground overcurrent relays. Differential protective relaying will be provided for the 13.8 kV busses. Utility revenue metering equipment will be provided for incoming lines and feeders.

3. **230 kV System Protective Relay Panels**

Protective relaying equipment for the 230 kV system and components will be contained at centrally located relaying panels within the switchgear building. One panel will be dedicated to each incoming 230 kV line and each 230 kV transformer. A central panel will provide an annunciator panel, mimic bus, and control switches for 230 kV circuit breakers and disconnect switches.

A direct underreach, permissive overreach, transfer trip relay scheme, coordinated with the existing system, will be used as primary protection for the 230 kV transmission lines. Backup protection will be provided by directional distance and directional ground overcurrent relays. The transmission line protective relay scheme will be compatible with the system described in WHC-SD-LL-FDR-001 (ref 9).

Primary 230 kV transformer protection will include high speed differential relaying. Backup protection will include over

and under voltage and overcurrent relaying. Protective relaying will be commensurate with IEEE C37 and C57 Series, and IEEE 242-1986.

Primary 230 kV bus protection will include high impedance voltage operated differential relays.

Primary protection for the incoming 13.8 kV bus duct will be provided by the reach of the 230 kV transformer differential protection zone.

4. **Substation A8 (251W) Modifications**

Substation A8 (251W) is presently one terminal of a three-terminal transmission line, with A7 (151KW) and Ashe substations at the other terminals. With the addition of new substation A6, the function of substation A8 (251W) as one terminal of the three-terminal line will be transferred to new substation A6. Protective relaying and communications systems and equipment associated with three-terminal line operation at A8 (251W) will be removed or modified accordingly. Transmission line protective relaying settings will also require evaluation, testing, and modification to consider transmission line configuration and protection changes due to the addition of new substation A6.

Additionally, substation A8 serves as the control and monitoring center for the site electrical transmission/distribution system. The addition of new substation A6 will require significant modifications to substation A8 (251W) systems including the mimic board, computer software program, additional communication input channels, procedures, etc.

5. **Substation A7 (151KW) Modifications**

As part of the three-terminal transmission line configuration, the transfer of substation A8 (251W) as one of the three terminals to new substation A6 will require modifications to the systems of substation A7 (151KW). Modifications will include protective relaying evaluation and settings, equipment labels, etc.

6. **Ashe Substation Modifications**

As part of the three-terminal transmission line configuration, the transfer of substation A8 (251W) as one of the three terminals to new substation A6 will require modifications to the systems of Ashe substation. Modifications will include protective relaying evaluation and settings, equipment labels, etc.

C. UTILITIES (600)

1. **Electrical Station Service** (See Sketches ES-W503-06 and ES-W503-07

All water mains supplying fire protection systems and fire hydrants will be treated as fire mains and installed in accordance with DOE requirements and NFPA 24. The water supply for the switchgear building sprinkler system will be controlled by a post indicator valve located a minimum of 50 ft from the building.

Subproject W-504 will install fire hydrants on a maximum spacing of 400 ft, located not more than 300 ft from the switchgear building.

Switchgear building station electrical service will be provided via an automatic transfer switch supplied from two, 150 kVA, 13.8 kV-208Y/120 Vac outdoor, liquid filled, pad-mounted transformers. The transfer switch will have an integral maintenance

bypass and isolation switch. The main station service panelboard will be 208Y/120 Vac, 600 A, 42-pole spaces.

2. **230 kV Transformers**

The substation will contain two, 230-13.8 kV, 3-phase, 60 Hz, power transformers. Each transformer capacity will be 25/33/42 MVA (oil air/forced air/forced air), to normally support a single 13.8 kV bus load, with spare capacity to supply the entire substation load. The transformers will be subjected to momentary parallel operations during load transfers from one bus to the other. The primary winding of each transformer will be solidly grounded wye, and the secondary will be delta connected. Secondary voltage and phasing will allow paralleling with the existing 200 Area 13.8 kV distribution system. The transformers will be outdoor, less-flammable oil-filled, sealed tank, with high-voltage bushings to connect to the 230 kV bus, and secondary bushings and terminal housing to connect to the 13.8 kV enclosed bus duct. Metering and protective relaying will require multiratio current transformers on each primary and secondary bushing. Primary and secondary surge arresters will also be provided.

Adverse voltage effects due to the new substation and its load, will require the installation of load tap changers (LTC) at the 13.8 kV secondary of the 230 kV transformers to provide necessary voltage regulation. The load tap changers will be monitored and controlled by the SCADA system.

3. **230 kV Circuit Breakers**

Two main and one tie-power circuit breakers will comprise the breaker-and-a-half 230 kV switchyard configuration. The circuit breakers will be rated 242 kV, 3-phase, 60 Hz, 1200 A, 40 kAIC, SF6 insulated, outdoor, dead tank. Metering and protective relaying

will require current transformers on each circuit breaker bushing. Circuit breaker SF6 gas status and leak detection will be monitored by the SCADA system.

4. **230 kV Potential Transformers**

Metering and protective relaying applications will require eight, 138 kV, multiple-ratio, single-phase potential transformers in the switchyard.

5. **13.8 kV Grounding Transformers/Resistors**

A zig-zag grounding transformer and grounding resistor will be installed on the delta-configured 13.8 kV secondary of each 230 kV transformer in the new substation to provide a system neutral, and to limit ground fault current. The transformer will be rated 13.8 kV, zig-zag connected, 15.94 MVA for 10 seconds, 500 kVA continuous, mineral oil-filled, self cooled, with multiratio current transformers at each primary and neutral bushing.

The low-impedance grounding resistor will be installed between the neutral terminal of the grounding transformer and the ground grid, and will be rated 8 kV, 2000 A for 10 seconds, 40 A continuous, 4 ohms.

6. **230 kV Transmission Line Towers** (See Sketches ES-W503-01 and ES-W503-02)

Extension of the 230 kV transmission loop from the existing line to the new substation will require installation of 34 steel transmission line supporting structures. Dead-end, tangent, small angle, and phase transposition tower structures with associated insulators, guys and anchors will be required.

7. **Switchyard Structures** (See Sketch ES-W503-04)

   Switchyard line support and equipment support structures will include the following types of fabricated steel structures and associated foundations: incoming line dead-end, potential transformer supports, bus supports, air switch supports, circuit breaker supports, bus duct supports, static wire supports and masts, light poles, etc.

8. **230 kV Bus** (See Sketch ES-W503-04)

   The 230 kV rigid bus will consist of a tubular aluminum alloy bus with welded and bolted connections. Jumpers will be 1272 kcmil ACSR "Bittern."

9. **13.8 kV Underground Duct Bank** (See Sketches ES-W503-07 and ES-W503-08)

   Each PC site will be provided with 20 MW of electrical power from the new substation by two (normal and alternate), 13.8 kV feeders. Each feeder will consist of four paralleled 500 kcmil conductors in 129 mm (5 in.) polyvinyl chloride (PVC) ducts within a common concrete encasement. Each of the two duct banks will terminate at a vault and pad-mounted-feed-through cabinet at the edge of the PC site.

10. **Oil Containment**

    Each power transformer and zig-zag transformer will be provided with an oil collection and containment basin. Adjacent equipment may share common containment. The collection and containment system will be designed to minimize potential fire hazard and damage to the environment. The spill containment system will have sufficient capacity to completely collect and contain the entire volume of oil contained in the equipment. Design measures will include a collection basin with provisions for pumping, a system to

prevent spilled oil from entering surrounding soil, and a remote alarm system to alert operating personnel to potential oil spills. The containment system will be an integral element of the transformer foundation design. Oil containment systems will comply with Code of Federal Regulations (CFR), 40 CFR 112, FM LPDS 5-4/14-8, and IEEE 980.

Station service transformer pad will include walls for oil containment and fire protection.

11. **Cable Trench** (See Sketch ES-W503-04)

Signal and control circuits between the switchgear building and switchyard equipment will be routed through the switchyard via an underground, prefabricated cable trench located adjacent to the centerline of the substation extending into the switchyard from the switchgear building. Trench load capacity will be adequate to support vehicle traffic.

12. **Fence** (See Sketch ES-W503-04)

A 3 m high chainlink perimeter safety fence will be provided for the substation. One vehicle and three personnel gates will enclose the substation. Gates will be lockable. Fence clearances will comply with IEEE 1119. The fence will be bonded to the ground grid. The fence will meet the requirements of ANSI C2 as a minimum.

13. **Substation Grounding Grid**

A grounding grid for personnel protection and system grounding will be installed for the substation. The grounding system will consist of a rectangular grid arrangement of 500 kcmil copper conductors, buried approximately 600 mm (24 in.) below finished grade, with a maximum spacing of 3 m (10 ft), under the entire substation extending 1.5 m (5 ft) outside of the fenced area. Ground rods with

a maximum rectangular spacing of 15 m (50 ft) will be installed and bonded to the ground grid. Final detailed design will be based upon actual site soil conditions. Ground grid installation and design will comply with IEEE/ANSI C2, IEEE 142, IEEE 837, and guidance of IEEE 80.

14. **Lightning Protection** (See Sketches ES-W503-02 and ES-W503-04) Lightning protection provided for the transmission line and substation will include overhead ground (static) wires above the transmission lines and substation switchyard. Surge arresters will be installed on incoming 230 kV lines and transformer primary and secondary bushings.

D. DEMOLITION (810)

Extension of the 230 kV transmission loop will require removal of a section of existing 230 kV transmission line for installation of two dead-end structures at the location of the tie-in to the new transmission line.

E. PROJECT SUPPORT (900)

1. **Planning**
   Engineering Studies
   Design Requirements Document (DRD) (ref 10)

2. **Conceptual Design**
   Preliminary Safety Evaluation
   Quality Assurance Program Plan
   Project Management Plan
   Project Validation
   Advanced Conceptual Design

3. **Bid Package**
   Performance Specification
   Bid Package and Contract Solicitation

4. **Definitive Design**
   Cognizant Facility Personnel Design Review
   Fire Hazards Analysis
   Safety Documentation
   Regulatory Permitting

5. **Construction**
   Operations Support
   Facility Planning Resources
   Site Utilities Support
   Radiological Support

6. **Testing and Startup**
   Acceptance Testing
   Maintenance and Operating Procedures
   Training
   Operational Readiness Review

F. DESIGN COMPLIANCE

The design and construction of subproject W-503 will be performed in accordance with the codes, standards and requirements of the DRD and the design and construction specifications.

V. METHODS OF PERFORMANCE

Subroject W-503 will be executed in accordance with the WBS defined in WHC-SP-1101 (ref 11). Deviations from this work plan will be requested and approved by a formal budget/schedule change request. The costs associated

with the WBS numbers used in this conceptual design report (CDR) are for the cost estimating purposes only and will be rolled into the WBS numbers used in the MYWP.

A. ENGINEERING (WBS 1.0)

Definitive Design (WBS 1.1)

Included in Section C as a part of WBS 3.2.

Engineering and Inspection (WBS 1.2)

The contracted engineer/constructor contractor will provide engineering during construction, acceptance inspection, incorporate contractor as-build/vendor submittals into the Hanford system, oversee walkthroughs and preparation of open items and exception lists, and support contract closing documentation.

B. PROCUREMENT (WBS 2.0)

N/A

C. CONSTRUCTION (WBS 3.0)

Force Account Construction (WBS 3.1)

N/A

Design/Construction/Startup (WBS 3.2)

An offsite design-construct contractor will provide the definitive design, procurement, construction, and acceptance testing for the project. The selected contractor will provide a turn-key type project as defined by the design-construct procurement bid packages. The connections to the existing systems and operational testing will be provided by the onsite utilities contractor.

D. PROJECT MANAGEMENT (WBS 4.0)

The performance contractor will be responsible for the development of overall infrastructure project plans, strategy documents, project definition and integration activities, and management of conceptual design, design/construction/startup activities and related PHMC interface activities, and engineering/technical support. The performance contractor will manage and integrate all the scope, cost, and schedule throughout the life of the project. Preparation of inputs to the MYWP, budget and schedule change requests, yearly capital project validations, and the negotiation of performance measures are also part of project management.

E. OTHER PROJECT COSTS (WBS 5.0)

The performance contractor will direct the resources necessary to perform the following expense-funded activities (other project costs) needed to implement subproject W-503:

Project Definition (WBS 5.1)

The performance contractor will provide electrical system integration including interface with the Integrated Product Teams (IPTs) and the Waste Integration Team (WIT), and preparation as well as maintenance of interface control documents (ICDs), and the DRD. Project definition also includes 230 kV system analysis by the BPA.

Conceptual Design (WBS 5.2)

The contracted engineer/constructor contractor will prepare a conceptual design report that will provide sufficient details for developing defensible cost estimates and a project schedule.

Project Technical Support (WBS 5.3)

This task includes the following activities:

- Preparation of validation documentation.

- Performance of unreviewed safety question screening.
- Preparation of procurement documentation for design/construction/ startup contracting including commerce business daily notices, procurement specification and bid package.
- Provide input for integrated schedule.
- Preparation of project management plan.
- Preparation of quality assurance plan.
- Preparation of the safety and environmental documentation.
- Provide design input and adequate reviews of project design media and other project documentation.
- Change control and records management support.
- Provide utilities support for system testing and startup including final tie-ins, the preparation of procedures, personnel training, operational testing, and readiness assessment.
- Provide telecommunication support for system installation, testing, and startup of all communication work including SCADA, FDAS, HLAN, and telephone system.

VI. REQUIREMENTS AND ASSESSMENTS

A. SAFEGUARDS AND SECURITY

Existing safeguards and security measures will not be impacted by this project. No new measures beyond the current practices will be required.

B. HEALTH AND SAFETY

Construction contractors will be required to take necessary precautions for protection of the health and safety of their employees, subcontractors, operating contractor, and DOE personnel. This includes providing continuous access to construction areas by emergency vehicles and personnel, and ensuring that emergency evacuation routes are unobstructed.

A 24-hr advance notice of any excavation work disrupting roadways or other services will be required to ensure that emergency personnel receive adequate notification.

DOE health and safety standards and regulations will be followed to minimize risks during construction. Removing, packing, and disposing of any contaminated soil, radioactive or dangerous waste, and materials found during excavation will comply with appropriate safety standards and procedures.

Industrial Safety Requirements of Occupational Safety and Health Act (OSHA), 29 CFR 1910, 29 CFR 1926, NFPA 70, NFPA 101, NFPA 241, WAC-296-45, WAC-296-46, and National Electrical Code (NEC) IEEE/ANSI C2 will be implemented.

C. DECONTAMINATION AND DECOMMISSIONING

Decontamination and decommissioning are not required for this project.

D. PROVISIONS FOR FALLOUT SHELTERS

Provisions for fallout shelters are not required for this project.

E. MAINTENANCE AND OPERATION REQUIREMENTS

Access to equipment for maintenance will be assured during definitive design to ensure maintenance activities can be performed in a safe and efficient manner in compliance with applicable codes and regulations.

Use of SF6 230 kV circuit breakers will require new training requirements for operation and maintenance of gas-insulated equipment.

F. AUTOMATED DATA PROCESSING EQUIPMENT

Subproject W-503 will provide control, relaying, and metering signals from the new substation to the existing SCADA and FDAS systems located at the main dispatch center (substation A8).

G. QUALITY ASSURANCE/SAFETY CLASSIFICATION

1. Quality Assurance Activities

Minimum project quality attributes are included in the project DRD and will be incorporated into the project specific Quality Assurance Program Plan (QAPP). The QAPP will indicate the project critical characteristics, corresponding safety classification assignments, and programmatic controlling documents. The specific technical and quality programmatic requirements, material certifications, qualification and certification of personnel, inspections, examinations and testing, and applicable quality assurance records will be established during definitive design and included in design documents. Specifications will require controls to exclude misrepresented products.

Subproject W-503 will be designed as a general facility in accordance with DOE Order 6430.1A. The project has been assigned a hazard classification of low.

Independent design verification may be required. Nonsafety class items and services will be procured from commercially available sources unless specific exception is noted during definitive design.

2. **Safety Classification**

Based on a review of documents including WHC-CM-4-46, "Non-Reactor Facility Safety Manual," DOE Order 5481.1B, "Safety Analysis and Review System," and applicable codes and bench marking of commercial practices, it is concluded that substation A6 is a General Services facility. See Appendix G for preliminary safety evaluation.

H. ENVIRONMENTAL COMPLIANCE

The design and construction of subproject W-503 will comply with the following environmental regulations:

10 CFR 1021, "National Environmental Policy Act."

36 CFR 800, "Protection of Historical and Cultural Properties."

DOE Order 5440.1E, "National Environmental Policy Act Compliance Program."

50 CFR 402, "Interagency Cooperation - Endangered Species Act."

DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements."

Adherence to these regulations ensures that the environmental impacts are understood and properly mitigated, cultural sites and artifacts are identified and protected, and that ecological reviews have been completed and mitigation activities identified.

I. PERMITS

The activities of erecting transmission towers and construction of access roads are not expected to be sources of toxic air pollutants or radioactive air emissions to the atmosphere. If, however, surface or underground radioactive contamination is discovered, notification to the Washington Department of Health (WDOH) will be required to ensure compliance with WAC-246-247.

J. POLLUTION PREVENTION/WASTE MINIMIZATION

Beginning January 1, 1997, all new projects having an estimated value at a General Plant Project level or higher and entering into conceptual design will utilize a checklist to document that pollution prevention/waste minimization (P2/WMin) has been considered in the development of the design package.

Through the use of a microcomputer program P2-EDGE (ref 12), a P2/WMin opportunities list was prepared for subproject W-503. The list identifies those P2/WMin opportunities that are to be implemented and/or considered for further evaluation throughout the design and construction process.

A design checklist was developed during conceptual design that documents the evaluation of the items identified in the P2/WMin opportunities list for implementation and/or consideration. Sound engineering judgment based on experience was employed to determine those P2/WMin opportunities that will be implemented into the design and/or construction activities, and when. The P2/WMin opportunities list summary report and the design checklist are shown in Appendix K.

VII. IDENTIFICATION AND ANALYSIS OF UNCERTAINTIES

A. LOCATION OF SUBSTATION

Conceptual design placement of the substation may be reevaluated upon finalization of the PC site configuration. Optimal placement of the new 230 kV substation may require relocation of the conceptual design substation site. Relocation may alter: type and quantity of transmission line towers and length of conductors; length and routing of 13.8 kV feeders; length and routing of telephone and fiberoptic communications cables; configuration of site improvements including clearing and grading; site utilities including fire protection water supply; and access roads.

B. FIRE PROTECTION

Fire protection requirements are preliminary pending completion of a Fire Hazards Analysis for the facility.

Additional fire protection features for the transformers may be required if space separations identified in FM LPDS 5-4/14-8 are not maintained.

FM guidelines assume that regardless of the insulating fluid (mineral oil or approved less flammable fluid), damage to a single transformer from a failure will not be reduced if a fixed waterspray fire protection system is installed. The intent of the waterspray protection is to minimize exposures to/from other equipment and facilities when adequate space separation cannot be maintained. A loss in excess of $1,000,000 in property damage and programmatic impact may result from a single transformer incident.

A Preliminary Fire Hazards Analysis (PFHA) needs to be completed early in the definitive design. Analysis of the programmatic impact that may occur if this facility is out of service needs to be evaluated and addressed by the PFHA.

C. 230 kV TRANSMISSION LINE ROADWAY

Depending upon the type of soils encountered, the unimproved maintenance and construction road along the route of the transmission line may require installation of base rock to stabilize the soft soils for vehicular traffic, i.e. construction equipment, material delivery, concrete trucks, etc. Portions of the road, perhaps on the steeper grades, should be considered and an allowance made to install crushed rock, e.g., Washington State Department of Transportation (WDOT) M 41-10, Section 9-03.g(2), "Shoulder Ballast."

D. PRIVATIZATION ELECTRICAL INTERFACE LOCATION

(See Sketch ES-W503-080)

Subproject W-503 will provide electrical service to a location on the perimeter of the PC site. While the physical layout of the PCs facilities is not available yet, this report has assumed a location at perimeter of each site near the east-west centerline the sites for termination of the 13.8 kV duct banks installed within this subproject's scope. Actual routing of the duct banks, to be finalized during definitive design, may impact the assumed length and location of the duct banks.

E. 230 kV TRANSFORMER CONFIGURATION

Present conceptual design proposes 230 kV transformers with wye-connected primary windings and delta-connected secondary windings with a secondary zig-zag grounding transformer. Evaluation during definitive design may determine transformers with delta primary, wye secondary connections will allow elimination of the zig-zag grounding transformer, and still maintain future paralleling capability with the existing 200 Area 13.8 kV distribution system. The zig-zag grounding transformer may then be deleted.

F. CAPACITOR BANK

Final analysis of the BPA 230 kV system may require the addition of a capacitor bank at Ashe substation to improve the system voltage regulation. It is not certain that BPA will carry the entire cost for the additional capacitor bank.

VIII. REFERENCES

A. DOCUMENTS

1. Letter of Instruction, No. 2, Subproject W-503, Tarik Choho (Numatec Hanford Company) to J. L. Henderson (Fluor Daniel Northwest), "TRWS Privatization Phase I Electrical Systems," NHC-9750682, January 31, 1997.

2. Interface Control Document, "Interface Control Document for Electricity," WHC-SD-WM-ICD-036, Rev. 0, prepared by Westinghouse Hanford Company, January 1996.

3. Contract, "TWRS Privatization Contract," British Nuclear Fuels Limited (BNFL), DE-AC06-96RL13308, 1996.

4. Contract, "TWRS Privatization Contract," Lockheed Martin Advanced Engineering Services (LMAES), DE-AC06-96RL13309, 1996.

5. Site Evaluation Report, "Tank Waste Remediation System Privatization Phase I Site Evaluation Report," WHC-SD-WM-SE-023, Rev. 0A, prepared by Westinghouse Hanford Company, January 1996.

6. Engineering Study, "Engineering Study for the Phase I Privatization Facilities Electrical Power," WHC-SD-WM-ES-393, Rev. 0, prepared by Westinghouse Hanford Company, July 1996.

7. Engineering Study, "Electrical Utilities Distribution System Protective Relay Setting Guidelines, WHC-SD-LL-ES-034, Rev. 2, prepared by Westinghouse Hanford Company, April 1993.

8. Acquisition Plan, "Supervisory Control and Data Acquisition (SCADA) Computer System," WHC-95-353936, prepared by ICF Kaiser Hanford Company, 1995.

9. Final Definitive Report, "Microwave Transfer Trip Relay Project Final Definitive Report," WHC-SD-LL-FDR-001, Rev. 0, prepared by Westinghouse Hanford Company, December 1991.

10. Design Requirements Document, "Design Requirements Document for the Phase I Privatization Electrical Power System," WHC-SD-WM-DRD-011, Rev. 0, prepared by Westinghouse Hanford Company, September 1996.

11. Report, "Support Systems Multi-Year Work Plan (MYWP) FY 1997," WHC-SP-1101, Rev. 2 (Draft).

12. Microcomputer Program P2-EDGE, Version 2.0, "Pollution Prevention Environmental Design Guide for Engineers," Pacific Northwest National Laboratory, 1996.

13. Interoffice Memorandum (ICF Kaiser Hanford Company) J. M. Hache to H. L. Debban, "Commercial Practices Safety Classification," August 22, 1996.

14. Letter, John D. Wagoner (U.S. Department of Energy, Richland Operations Office) to A. L. Trego (Westinghouse Hanford Company), "Clarification of Key Decision 0 for Infrastructure Projects Directly Supporting Tank Waste Remediation System (TWRS) Privatization," 96-WDD-051, September 1996.

15. Letter, William J. Taylor (U.S. Department of Energy, Richland Operations Office) to A. L. Trego (Westinghouse Hanford Company), "Conceptual Design Approach for Support Systems (Infrastructure) Projects," 96-WDD-154, September 1996.

16. Interoffice Memorandum, "Engineering Budgetary Estimate for Telecommunication Requirements, New Electrical Substation," from Lockheed Martin Services, Inc. to Numatec Hanford Corporation, December 12, 1996.

B. CODES AND STANDARDS

29 CFR 1910, "Occupational Safety and Health Standards."

29 CFR 1926, "Safety and Health Regulations for Construction."

40 CFR 112, "Oil Pollution Prevention."

ANSI C2, "National Electrical Safety Code."

ASTM A 366, "Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality."

ASTM A 569, "Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality."

DOE Order 5481.1B, "Safety Analysis and Review System."

DOE Order 6430.1A, "General Design Criteria."
Section 0210, "Site Preparation."
Section 0220, "Earthwork."

FM Loss Prevention Data Sheet (LPDS) 5-31/14-5, "Cables and Bus Bars."

FM LPDS 5-4/14-8, "Transformers."

IEEE C37 Series:
C37.13, "Low-Voltage AC Power Circuit Breakers Used in Enclosures."

C37.20.1, "Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear."

C37.20.2, "Metal-Clad and Station-Type Cubicle Switchgear."

C37.20.3, "Metal-Enclosed Interrupter Switchgear."

IEEE C57 Series:
C57.12.00, "General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers."

C57.12.90, "Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers."

C57.13, "Requirements for Instrument Transformers."

IEEE 80, "Guide for Safety in AC Substation Grounding."

IEEE 142, "Recommended Practice for Grounding of Industrial and Commercial Power Systems."

IEEE 242-1986, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems Buff Book."

IEEE 837, "Qualifying Permanent Connections Used in Substation Grounding."

IEEE 980, "Guide for Containment and Control of Oil Spills in Substations."

IEEE 1119, "Guide for Fence Safety Clearances in Electric-Supply Stations."

IEEE/ANSI C2, "National Electrical Safety Code."

NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

NFPA 70, "National Electrical Code."

NFPA 101, "Life Safety Code."

NFPA 220, "Types of Building Construction."

NFPA 241, "Safeguarding Construction, Alteration, and Demolition Activities."

WAC-246-247, "Radiation Protection-Air Emissions."

WAC-296-45, "Safety Standards for Electrical Workers."

WAC-296-46, Safety Standards--Installing Electrical Wires and Equipment--Administrative Rules."

WDOT M 41-10, "Road, Bridge, and Municipal Construction," Section 9-03.g(2), "Shoulder Ballast."

APPENDIX A

Work Breakdown Structure

WORK BREAKDOWN STRUCTURE

1.0 ENGINEERING

- 1.1 Definitive Design (included in WBS 3.2)
- 1.2 Engineering and Inspection (Contracted Engineer/Constructor Contractor)

2.0 PROCUREMENT (N/A)

3.0 CONSTRUCTION

- 3.1 Force Account Construction (N/A)
- 3.2 Design/Construction/Startup (Fixed-Price Contractor)

4.0 PROJECT MANAGEMENT (Performance Contractor)

5.0 OTHER PROJECT COSTS (Expense Funded)

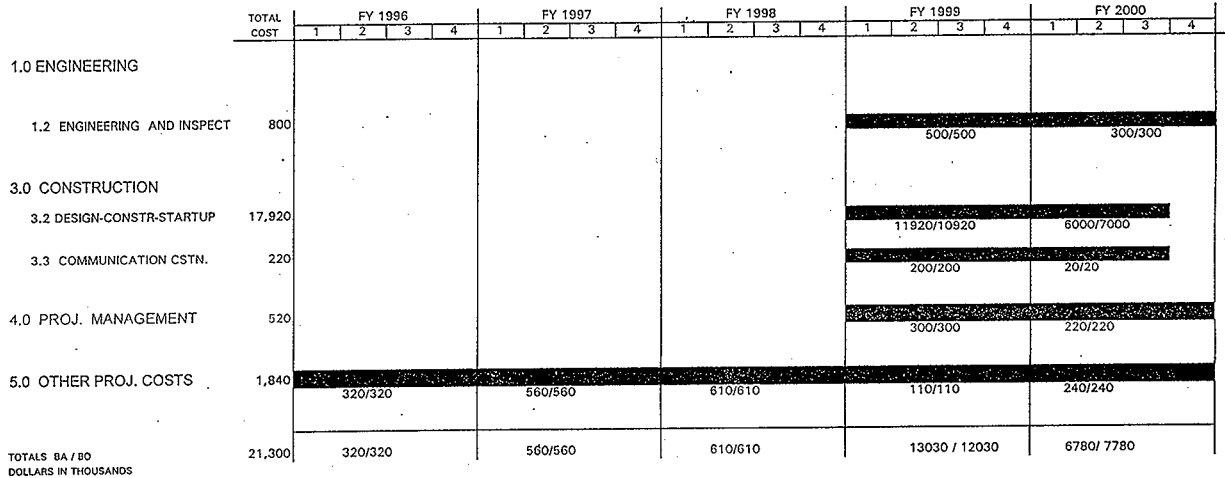
- 5.1 Project Definition (Performance Contractor)
- 5.2 Conceptual Design (Contracted Engineer/Constructor Contractor)
- 5.3 Project Technical Support (Performance Contractor)

APPENDIX B

Budget Authorized/Budget Outlay Schedule

FLUOR DANIEL
NORTHWEST, INC.

SUB-PROJECT W-503
TWRS PRIVATIZATION PHASE I - ELECTRICAL POWER SYSTEM
BA / BO SCHEDULE



DATE: JUNE 1997
FDNW PM: THAKKAR
CLIENT PE: SINGH

APPENDIX C

Cost Estimate Summary

FLUOR DANIEL NORTHWEST
NUMATEC HANFORD INC.
FILE NO. W503BAA4

TWRS PRIVATIZATION PHASE I ELECTRICAL POWER SYSTEM
CONCEPTUAL ESTIMATE
PROJECT COST SUMMARY

DATE 06/05/97

DESCRIPTION	MAN HOURS	COST	SALES TAX	OH&P B&I	CONTR OH&P	ESCLAT	CONT	PHMC ADDERS	TOTAL COST
	H	$	%	%	%	%	%	$	$
ENGINEERING:	5747	495669	0%	0%	0%	4.30%	11.52%	24.18%	795834
ENG./INSPECTION DURING CONSTRUCTION	5747	495669	0.00%	0.00%	0.00%	5.45%	15.00%	32.62%	795834
CONSTRUCTION:	78533	10413607	4.30%	21.47%	0%	7.13%	21.74%	14.55%	16136478
CONSTRUCTION MANAGEMENT	28434	2018783	0.00%	0.00%	0.00%	5.45%	17.00%	17.38%	3368682
DESIGN/CONSTRUCTION- FP	47964	8223991	5.44%	27.19%	0.00%	5.46%	22.86%	11.39%	14552526
DESIGN/CONSTRUCTION PHMC	2135	170833	0.00%	0.00%	0.00%	5.01%	20.00%	0.00%	215270
PROJECT MANAGEMENT:	5116	421867	0%	0%	0%	5.90%	16.04%	0%	511945
PROJECT MANAGEMENT	5116	421867	0.00%	0.00%	0.00%	5.52%	14.95%	0.00%	511945
OTHER PROJECT COST	0	1838077	0%	0%	0%	0%	0.00%	0%	1838077
PROJECT DEFINITION	0	526142	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	526142
CONCEPTUAL DESIGN	0	177000	0.00%	0.00%	0.00%	0.00%	0.00%	0%	177000
PROJECT TECHANICAL SUPPORT	0	1134935	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1134935
SUB-TOTAL PROJECT COST	89396	$13,169,220	3.40%	16.98%	0.00%	5.99%	19.07%	15.73%	$21,282,334
ADJUSTED/ROUNDED									17,666
TOTAL PROJECT COST									$21,300,000

TYPE OF ESTIMATE	CONCEPTUAL ESTIMATE JUN 5, 1997	REMARKS:
FDNW LEAD ESTIMATOR	ESTIMATING MANAGER	
PROJECT MANAGER	P.D. Thalekar 6/5/97	
CLIENT		

C-1

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	SUB TOTAL	SITE ALLOCAT'N	TOTAL DOLLARS
12	ENGINEERING AND INSPECTION	495669	5.45	27014	522683	15	78402	601085	194749	795834
SUBTOTAL 1	ENGINEERING	495669	5.45	27014	522683	15	78402	601085	194749	795834
32	DESIGN/CONSTRUCTION/STARTUP	12952225	5.45	705897	13658122	17	2385779	16043901	1877307	17921208
33	DESIGN/CONSTRUCTION PHMC	170833	5.01	8559	179392	20	35878	215270	0	215270
SUBTOTAL 3	CONSTRUCTION	13123058	5.44	714456	13837514	18	2421657	16259171	1877307	18136478
40	PROJECT MANAGEMENT	421867	5.52	23303	445170	15	66775	511945	0	511945
SUBTOTAL 4	PROJECT MANAGEMENT	421867	5.52	23303	445170	15	66775	511945	0	511945
51	PROJECT DEFINITION	526142	0.00	0	526142	0	0	526142	0	526142
52	CONCEPTUAL DESIGN	177000	0.00	0	177000	0	0	177000	0	177000
53	PROJECT TECHNICAL SUPPORT	1134935	0.00	0	1134935	0	0	1134935	0	1134935
SUBTOTAL 5	OTHER PROJECT COST	1838077	0.00	0	1838077	0	0	1838077	0	1838077
PROJECT TOTAL		15,878,671	4.82	764,773	16,643,444	15	2,566,834	19,210,278	2,072,056	21,282,334

1. ESTIMATE PURPOSE

CONCEPTUAL COST ESTIMATE: THIS ESTIMATE WILL BE USED TO ESTABLISH THE PROJECT BUDGET(BASELINE).

2. ESTIMATE TECHNICAL BASIS

A. THIS ESTIMATE HAS BEEN PREPARED FOR THE TWRS PRIVATIZATION PROJECT AS REQUESTED BY FDNW PROJECT MANAGEMENT.
B. A DESCRIPTION OF THE TECHNICAL SCOPE OF WORK MAY BE FOUND IN THE FOLLOWING REFERENCE DOCUMENTS:
LETTER OF INSTRUCTION (LOI) #2.
SCOPE OF WORK (SOW) CONCEPTUAL DESIGN REPORT TWRS PRIVATIZATION PHASE I ELECTRICAL POWER SYSTEM APR 1997 ISSUE A.
REQUEST FOR ESTIMATE W503BAA1 2/28/97.
C. THIS ESTIMATE UTILIZES AN ESTIMATE WORK BREAKDOWN STRUCTURE WHICH INTERFACES WITH THE PROJECT WORK BREAKDOWN STRUCTURE AS PROVIDED BY PROJECT MANAGEMENT/PROJECT CONTROLS. WBS PER APPENDIX A CDR.

3. ESTIMATE METHODOLOGY

A. DIRECT COSTS:
A BOTTOMS-UP TECHNIQUE HAS BEEN UTILIZED IN THE PREPARATION OF THIS ESTIMATE.
(1) CONSTRUCTION LABOR, MATERIAL AND EQUIPMENT UNITS HAVE BEEN ESTIMATED BASED UPON ONE OR MORE OF THE FOLLOWING STANDARD IN HOUSE DATABASES, R.S. MEANS, RICHARDSON'S PROCESS PLANT CONSTRUCTION ESTIMATING STANDARDS, NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, INC. (NECA) MANUAL OF LABOR UNITS, ELECTRICAL RESOURCES, INC. ELECTRICAL ESTIMATING PRICE AND LABOR MANUAL.
THE UNITS MAY HAVE BEEN FACTORED/ADJUSTED BY THE ESTIMATOR AS APPROPRIATE TO REFLECT INFLUENCES BY CONTRACT, WORK SITE, OR OTHER IDENTIFIED PROJECT OR SPECIAL CONDITIONS.

(2) FLUOR DANIEL HANFORD & PROJECT HANFORD MANAGEMENT CONTRACT (PHMC) SUBCONTRACTOR DIRECT COSTS FOR LOCKHEED MARTIN HANFORD CORP. DYNCORP. NUMATEC HANFORD CORP. HAVE BEEN PROVIDED BY FDNW PROJECT MANAGEMENT FOR INCLUSION INTO THIS ESTIMATE.

B. DIRECT COST FACTORS
(1) SALES TAX HAS BEEN APPLIED TO ALL MATERIALS AND EQUIPMENT PURCHASES AT 8%.
(2) CONTRACT ADMINISTRATION FACTOR OF 18.75% HAS BEEN APPLIED TO THE DIRECT CONTRACT VALUE WHICH INCLUDES COSTS FOR BID PACKAGE PREPARATION, CONTRACT MANAGEMENT & ADMINISTRATION AND PROJECT MANAGEMENT & PLANNING SUPPORT

C. INDIRECT COSTS
FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED ARE THE FOLLOWING PERCENTAGES: LABOR = 26.5%, EQUIPMENT USE = 10%, MATERIAL = 26.5%, SUBCONTRACT = 10% ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL REPORT.

D. RATES
(1) FLUOR DANIEL NORTHWEST LABOR RATES ARE BASED UPON THE FLUOR DANIEL FEDERAL OPERATIONS (FEDFO) DISCLOSURE STATEMENT AND APPROVED PROVISIONAL BILLING RATES. FOR ESTIMATING PURPOSES, AVERAGE RATES BY OPERATIONS CODE HAVE BEEN DEVELOPED BASED UPON RECENT COST HISTORY.

E. SITE ALLOCATIONS FACTORS
SITE ALLOCATION FACTORS ARE DEVELOPED AND PROVIDED BY FLUOR DANIEL HANFORD (FDH) FOR ESTIMATING USE.
(1) GOVERNMENT FURNISHED SERVICES RATE IS APPLIED TO ALL COSTS TO LIQUIDATE GOVERNMENT FURNISHED SERVICES PROVIDED TO THE ENTERPRISE COMPANIES: 14% FOR FDNW, 10% FOR FDNWS (CONSTRUCTION).

E. SITE ALLOCATIONS FACTORS CONTINUED
(2) HANFORD SITE G&A RATE OF 16.7% IS APPLIED TO ALL COSTS TO LIQUIDATE THE HANFORD GENERAL & ADMINISTRATIVE COSTS.
(3) HANFORD SITE MPR RATE OF 7.0% IS APPLIED TO ALL PURCHASED MATERIAL AND 7.7% TO ALL PURCHASED SERVICES TO LIQUIDATE THE COST OF PROCUREMENT (INCLUDING RECEIVING).

FDNW APPLIES THE ABOVE FACTORS TO ESTIMATED COSTS AS FOLLOWS:
(1) FDH GFS/G&A CM FACTOR: A COMPOSITE FACTOR OF 30.68% HAS BEEN APPLIED TO TOTAL FDNW FIXED PRICE CONSTRUCTION MANAGEMENT WHICH INCLUDES GOVERNMENT FURNISHED SERVICES (GFS) AND SITE G&A/FEE.
(2) FDH CM RATE FP CONST FACTOR: A GFA/FEE RATE FACTOR OF 7.7% HAS BEEN APPLIED TO THE FDNW FIXED PRICE CONSTRUCTION CONTRACT VALUE.
(3) FDH GFS/G&A LABOR FACTOR: A COMPOSITE FACTOR HAS BEEN APPLIED TO TOTAL FDNW LABOR COSTS AS FOLLOWS: AE/CM COSTS = 33.04%, FDNWS CONSTRUCTION LABOR = 28.37%, FDNWS CONSTRUCTION MANAGEMENT LABOR = 33.04%, FDNW CONTRACT MANAGEMENT AND ADMINISTRATION = 30.68%
(4) FDH MPR/G&A MATERIAL FACTOR: A COMPOSITE FACTOR OF 24.87% HAS BEEN APPLIED TO TOTAL FDNW MATERIAL COST WHICH INCLUDE A MPR OF 7% AND MATERIAL G&A/FEE OF 16.7%

4. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED FROM THE JANUARY 1997 UPDATE OF THE ECONOMIC ESCALATION PRICE CHANGE INDICES FOR DOE CONSTRUCTION PROJECTS AS PUBLISHED BY THE "OFFICE OF INFRASTRUCTURE ACQUISITION" FM-50.

5. CONTINGENCY

A. DEFINITION OF CONTINGENCY AS PROVIDED BY DOE

"CONTINGENCY COVERS COSTS THAT MAY RESULT FROM INCOMPLETE DESIGN, UNFORESEEN AND UNPREDICTABLE CONDITIONS, OR UNCERTAINTIES WITHIN THE DEFINED PROJECT SCOPE. THE AMOUNT OF CONTINGENCY WILL DEPEND ON THE STATUS OF DESIGN, PROCUREMENT, AND CONSTRUCTION; AND THE COMPLEXITY AND UNCERTAINTIES OF THE COMPONENT PARTS OF THE PROJECT. CONTINGENCY IS NOT TO BE USED TO AVOID MAKING AN ACCURATE ASSESSMENT OF EXPECTED COST" (OFFICE OF WASTE MANAGEMENT (EM-30) COST AND SCHEDULE GUIDE.

B. CONTINGENCY ALLOWANCE GUIDELINES

THE DOE GUIDELINE CONTINGENCY ALLOWANCE FOR A
BUDGET ESTIMATE - STANDARD = 15% - 25%

C. METHODOLOGY

CONTINGENCY IS EVALUATED AT THE LOWEST WORK BREAKDOWN STRUCTURE (WBS) LEVEL WITHIN THE COST ESTIMATE DETAILS. IT IS SUMMARIZED AT UPPER WBS LEVELS AND REPORTED ON THE SUMMARY REPORTS.

D. ANALYSIS

AN ASSESSMENT OF DESIGN MATURITY, WORK COMPLEXITY AND PROJECT UNCERTAINTIES HAS BEEN PERFORMED. AN EXPLANATION OF THIS ASSESSMENT AND CONTINGENCY RATES WHICH HAVE BEEN ADDED TO THE COST OF WORK ARE AS FOLLOWS:

WBS 21 FIELD ENG/INSP, A CONTINGENCY OF 15% HAS BEEN APPLIED FOR ADDITIONAL ASSISTANCE THAT MAY ARISE DURING CONSTRUCTION THAT WAS NOT PLANED FOR (FOR INSTANCE LOCATION OF SUBSTATION MAY BE RELOCATED OR A HIGHER MATERIAL REJECTION THAN ANTICIPATED)

D. ANALYSIS CONTINUED

WBS 3230 CONSTRUCTION DESIGN, A CONTINGENCY OF 20% HAS BEEN APPLIED FOR POSSIBLE REQUIREMENTS THAT MAY BE REQUIRE OF THE DESIGN ENGINEERING FIRM THAT THIS ESTIMATOR OVERLOOKED.(MORE DRAWINGS/DETAIL THAN ANTICIPATED IN THE CONCEPTUAL ESTIMATE).

WBS 3231 TRANSFORMER PROCUREMENT, A CONTINGENCY OF 15% HAS BEEN APPLIED FOR POSSIBLE ADDITIONAL COST TO MEET SCHEDULE.

WBS 3232 SWITCH GEAR BUILDING AND YARD, A CONTINGENCY OF 20% HAS BEEN APPLIED FOR POSSIBLE INCREASED COST TO METRIC CONSTRUCTION DRAWINGS AND SUPPLIERS SHIPPING IN INCH/POUND EQUIVALENTS. OR POSSIBLE RELOCATION OF SUBSTATION DURING SUB SURFACE SCANNING.

WBS 3233 230 KV TRANSMISSION LINE, A CONTINGENCY OF 15% HAS BEEN APPLIED FOR UNCERTAINTIES SUCH AS ROUTING OF TOWERS MAY BE REVISED DURING DEFINITIVE DESIGN DUE TO LOCATION CHANGE OF SUBSTATION.

WBS 3234 20 MW 13.8 KV DISTRIBUTION DUCT BANK, A CONTINGENCY OF 15% HAS BEEN APPLIED FOR INCOMPLETE DESIGN THE PHYSICAL LAYOUT OF THE PRIVATIZATION CONTRACT FACILITIES IS NOT AVAILABLE.

WBS 3300 UTILITIES COMMUNICATION / ELECTRIC, A CONTINGENCY OF 20% HAS BEEN APPLIED FOR UNCERTAINTIES SUCH AS ROUTING OF THE LAN CABLE DUE TO POSSIBLE LOCATION CHANGE OF THE SUBSTATION.

WBS 40 CLIENT PROJECT MANAGEMENT COST, 15% CONTINGENCY HAS BEEN APPLIED.

WBS 51 PROJECT DEFINITION, THE CONTINGENCY AND ESCALATION IS INCLUDED IN THE AMOUNTS SUPPLIED BY CLIENT.

WBS 52 CONCEPTUAL DESIGN, A CONTINGENCY OF 0% HAS BEEN APPLIED WORK IS COMPLETE.

WBS 53 OTHER PROJECT COST,THE CONTINGENCY AND ESCALATION IS INCLUDED IN THE AMOUNTS SUPPLIED BY CLIENT. OTHER PROJECT COST FOR PRIOR YEARS(FY 96 AND 97) ARE BASED ON ACTUAL EXPENDITURES, FISCAL YEAR 97 BUDGET AND ESTIMATE TO COMPLETE. FISCAL YEARS 98,99,00 AND 01 REFLECT THE LATEST INFORMATION FROM DESIGN REQUIREMENTS DOCUMENTS, STUDIES, AND PLANS COMPLETED TO DATE. THE PROJECT MANAGER'S EXPERTISE AND EXPERIENCE WITH PREVIOUS PROJECTS, THE PREVIOUSLY COMPLETED LIFE CYCLE COST ESTIMATE, AND HISTORICAL DATA FROM PREVIOUSLY COMPLETED PROJECTS HAVE BEEN USED TO DERIVE THE ESTIMATED COSTS. DETAILED PLANNING OF THESE ACTIVITIES WILL BE REFLECTED IN THE PHMC FY98 MULTI YEAR WORK PLAN(MYWP).

6. ROUNDING

THE PROJECT COST SUMMARY REPORT IS SUMMARIZED AND ADJUSTED/ROUNDED AS FOLLOWS:
THE ESCALATED TOTAL COST COLUMN, CONTINGENCY TOTAL COLUMN AND TOTAL DOLLARS COLUMN SUB-TOTALS ARE SUMMARIZED BY CONTRACTOR. THE COLUMN SUBTOTALS ARE ADJUSTED/ROUNDED TO THE NEAREST $1,000/$10,000. THE PROJECT TOTAL SUMMARY LINE TOTALS ARE ADJUSTED/ROUNDED TO THE NEAREST $10,000/$100,000.

7. REMARKS

MAJOR ASSUMPTIONS WHICH HAVE BEEN MADE IN THE PREPARATION OF THIS ESTIMATE ARE AS FOLLOWS:

A.)PROJECT DEFINITION COST WERE SUPPLIED BY CLIENT.

B.)CONCEPTUAL DESIGN COST WERE SUPPLIED BY CLIENT.

C.)ENGINEERING AND INSPECTION DURING CONSTRUCTION WAS MANLOADED BY FDNW ENGINEERING AND INSPECTION.

7. REMARKS CONTINUED

D.)THE DESIGN CONSTRUCT ESTIMATE DETAIL WAS BASED ON PROJECT B-595 (CWBS E420 HIGH VOLTAGE TRANSMISSION LINE AND SWITCHYARD, FINAL DESIGN REVIEW ISSUE DATED MAY 11 1993. THIS DESIGN WAS FOR A 25/33/42 SWITCHYARD AND 3.56 MILES OF 230KV OVERHEAD TRANSMISSION LINE,AND A OVERHEAD 13.8 KV 20 MW TO EACH SITE.

E.)THE CDR DESIGN CONSTRUCT IS FOR A 25/33/42 MVA SWITCHYARD AND 7.1 MILES OF 230KV TRANSMISSION LINE, A CABLE PULLING ROOM (BASEMENT) IN THE SWITCH GEAR BUILDING AND A 13.8 KV 20MW DUCT BANK TO EACH SITE. DUE TO THE SIMILARITY TO THE DESIGN THE ESTIMATE WAS PERFORMED SIMULTANEOUS TO THE CDR DEVELOPMENT WITH ONLY A FEW CHANGES TO THE ESTIMATE AT COMPLETION OF THE CDR.

F.)FDNW PROJECT MANAGEMENT SUPPLIED A COMMUNICATION ENGINEERING BUDGETARY ESTIMATE BY LMSI. FDNW PROJECT MANAGEMENT SUPPLIED A ALLOWANCE FOR WORK ELECTRIC UTILITIES IS TO PERFORM.

G.)FDNW PROJECT MANAGEMENT SUPPLIED PROJECT MANAGEMENT MANHOURS AND MATERIAL FROM CLIENT TO USE IN ESTIMATE, THE CURRENT PHMC RATES WERE APPLIED TO THE MANHOURS.

H.)FDNW PROJECT MANAGEMENT SUPPLIED OTHER PROJECT COST FROM CLIENT TO USE IN ESTIMATE THE AMOUNT INCLUDED 2.7% ESCALATION.

I.)COST ESTIMATE SUMMARY ENGINEERING INCLUDES:
TECHNICAL ENGINEERS (PROCESS,MECHANICAL,ELECTRICAL,I&C,HVAC,.).
SAFETY ENGINEERS.
QUALITY ASSURANCE.
PROCUREMENT PEOPLE: BID PREPARATION,ANALYSIS OF OFFERS, INSPECTION.
PREVIOUS PEOPLE MANAGEMENT.

J.)COST ESTIMATE SUMMARY PROJECT MANAGEMENT INCLUDES:
PROJECT MANAGER/PROJECT ENGINEER.
COST/SCHEDULE CONTROL.
CLERICAL/SECRETARIES.
OTHER COST ARE: TRAVELS.

K.)THE DESIGN/CONSTRUCT CONTRACTOR WILL PROCURE ALL MATERIAL EXCEPT THAT MATERIAL DEFINED AS LMSI PROCUREMENT. MATERIAL ASSUMED AS ALL MAJOR ITEMS (i.e. TRANSFORMERS, SWITCHGEAR, TOWERS AS WELL AS THAT MATERIAL REQUIRED TO COMPLETE THE PROJECT.

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONSTRUCTION MANAGEMENT %	CONSTRUCTION MANAGEMENT TOTAL	OTHER COSTS	SUB TOTAL	TOTAL
12	ENGINEERING AND INSPECTION	495669	0.00	0	0	0	495669
SUBTOTAL 1	ENGINEERING	495669		0	0	0	495669
32	DESIGN/CONSTRUCTION/STARTUP	10907137	18.75	2045088	0	2045088	12952225
33	DESIGN/CONSTRUCTION PHMC	170833	0.00	0	0	0	170833
SUBTOTAL 3	CONSTRUCTION	11077970		2045088	0	2045088	13123058
40	PROJECT MANAGEMENT	421867	0.00	0	0	0	421867
SUBTOTAL 4	PROJECT MANAGEMENT	421867		0	0	0	421867
51	PROJECT DEFINITION	526142	0.00	0	0	0	526142
52	CONCEPTUAL DESIGN	177000	0.00	0	0	0	177000
53	PROJECT TECHNICAL SUPPORT	1134935	0.00	0	0	0	1134935
SUBTOTAL 5	OTHER PROJECT COST	1838077		0	0	0	1838077
PROJECT TOTAL		13,833,583		2,045,088	0	2,045,088	15,878,671

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	DYN EQ.USAGE	FDH GFS/G&A CONST.MGMT	FDH MPR F.P./S.C.	FDH GFS/G&A LABOR	FDH MPR/G&A MATERIAL	SITE ALLOC SUBTOTAL
12	ENGINEERING AND INSPECTION	495669	1002	0	0	159594	0	160596
SUBTOTAL 1	ENGINEERING	495669	1002	0	0	159594	0	160596
32	DESIGN/CONSTRUCTION/STARTUP	10907137	0	675700	839849	0	0	1515549
33	DESIGN/CONSTRUCTION PHMC	170833	0	0	0	0	0	0
SUBTOTAL 3	CONSTRUCTION	11077970	0	675700	839849	0	0	1515549
40	PROJECT MANAGEMENT	421867	0	0	0	0	0	0
SUBTOTAL 4	PROJECT MANAGEMENT	421867	0	0	0	0	0	0
51	PROJECT DEFINITION	526142	0	0	0	0	0	0
52	CONCEPTUAL DESIGN	177000	0	0	0	0	0	0
53	PROJECT TECHNICAL SUPPORT	1134935	0	0	0	0	0	0
SUBTOTAL 5	OTHER PROJECT COST	1838077	0	0	0	0	0	0
PROJECT TOTAL		13,833,583	1,002	675,700	839,849	159,594	0	1,676,145

WBS	DESCRIPTION	SITE ALLOC SUBTOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
12	ENGINEERING AND INSPECTION	160596	0.00	8751	169347	15	25402	194749
SUBTOTAL 1	ENGINEERING	160596	5.45	8751	169347	15	25402	194749
32	DESIGN/CONSTRUCTION/STARTUP	1515549	0.00	82597	1598146	17	279161	1877307
33	DESIGN/CONSTRUCTION PHMC	0	0.00	0	0	0	0	0
SUBTOTAL 3	CONSTRUCTION	1515549	5.45	82597	1598146	17	279161	1877307
40	PROJECT MANAGEMENT	0	0.00	0	0	0	0	0
SUBTOTAL 4	PROJECT MANAGEMENT	0	0.00	0	0	0	0	0
51	PROJECT DEFINITION	0	0.00	0	0	0	0	0
52	CONCEPTUAL DESIGN	0	0.00	0	0	0	0	0
53	PROJECT TECHNICAL SUPPORT	0	0.00	0	0	0	0	0
SUBTOTAL 5	OTHER PROJECT COST	0	0.00	0	0	0	0	0
PROJECT TOTAL		1,676,145	5.45	91,348	1,767,493	17	304,563	2,072,056

STATEMENT OF WORK
FOR
PERFORMANCE CONTRACTOR - OTHER PROJECT COSTS

SUB-PROJECT W-503

TWRS Privatization Phase I - Electrical Power System

I. OBJECTIVE

The PHMC performance contractor shall provide project support services to the U. S. Department of Energy, Richland Operations Office (RL) from the project's inception through completion of construction and project closeout. In addition to project management/project engineering covered by capital funding (FY 99 & 2000), other tasks are identified here within the scope of the performance contractor under the heading of Other Project Costs.

The objective of this Statement of Work is to further describe and delineate these tasks for this sub-project.

II. TASKS

A. Project Definition

Principally provides integration of the sub-project with the interfacing organizations established to implement the TWRS Phase I Privatization contract.

a. Systems Integration (FY 96, 97, 98, 99, 00)

1. Support Integrated Product Teams (IPTs) established per the Phase IA contact around KEY M&I/Privatization Contractor (PC) interfaces.

2. Support the Waste Integration Team (WIT) established per the Phase IA contract to direct the Phase I effort. Tasks include providing technical information, expertise, etc. necessary in contract negotiations and execution.

3. Maintenance/refinement and updating of Interface Control Documents (ICD), and Interface Control Drawings (ICDwgs).

4. Maintenance/revision of the TWRS Systems Engineering Functional Requirements Database (FRDB) through issuance of change Requests based upon IPT negotiations and the reconciliation of ICD 'issues'.

5. Perform engineering analysis including alternative selection and develop Design Requirements Document (DRD) to establish project basis. Most of this work was completed in FY 96. The enhancement to the engineering analyses and the DRD will continued in the FY 98 and FY 99.

B. Conceptual Design

The Conceptual Design Report for this project has been funded and will be completed in FY 97.

C. Project Technical Support

In prior year costs and FY 98, this task includes the project management, project control & reporting, administrative tasks and activities required to manage the project during the expense funded years prior to actual start of construction and during startup.

Activities include:

- Preparation and update of PBS
- MYWP Planning
- Project Management Plan
- Project reporting and performance monitoring and analysis
- Preparation of Procurement documentation, specifications and bid pkg
- Project Control and Cost/Schedule interfaces
- Establishment and maintenance of Change Control for the Project
- Input and Updates to FM-20 reviews
- Clerical Support as required
- Key Decision and Project Validation support

General Technical Support of activities required by the sub-project for the life of the project are also included. Due to the tight schedule constraints, this task also includes the preparation of Task Orders and Letters of Instruction, etc. for preparing performance specification and other related tasks during FY 98. In general, the technical support tasks include:

- Technical leadership, monitoring and reporting
- Preparation of project documentation including Construction Project Data Sheets, Total Project Cost Estimates and Project Schedules
- Establish and maintain project files and provide for records management support for project data
- Perform and direct all safety, environmental and permitting activities, reviews and technical issues related to the sub-project.
- Provide Radiation Protection Technician support as required by the sub-project.
- Provide support for systems testing and startup activity support
- Provide support for turnover of project to operating organization
- Provide for official project closeout activities

Specific Technical Support for activities directed by the Project Engineer include:

- Engineering Assessments due to Privatization contract changes
- Site Utilities Engineering/Reviews
- Bonneville Power Administration (BPA) support for 230 kV system analysis
- Telecommunications support for SCADA, FDAS, HLAN, etc.

- Environmental Reviews
- Infrastructure Design Review Support
- USQ and other safety related support
- Operations reviews and support as required
- ATP, OTP, ORR support as required
- Quality Assurance Planning and Implementation
- Safety Planning and Implementation
- Utilities Authorization Basis Review/Modification

Miscellaneous support includes multi-media/duplicating resources, supplies, computer software requirements and desktop support, travel and training as required by the sub-project.

ENGINEERING STATEMENT OF WORK

PROJECT NO./TITLE : W-503, TWRS Privatization Phase I
Electrical Power System

WORK ORDER : E23390
LE : Elliott L. Ahola
PLE : Ray E. Merriman
PM : Paul I. Thakkar

PROJECT SCOPE:

Subproject W-503 is one of four subprojects that make up the TWRS Privatization Infrastructure Project. These four subprojects together develop the site infrastructure for the support of privatization of Hanford Site waste treatment.

Subproject W-503 provides design for the installation of a 230kV transmission line with tap to the existing 230kV site transmission system, 230kV substation, and 13.8kV distribution service to each of the two privatization contractors' sites.

RESPONSIBILITIES:

Performance specifications, engineering during construction, A/I, and Construction Management services will be prepared and provided by FDNW.

REFERENCES

Conceptual Design Report
Engineering Study
Master Site Plan

DELIVERABLES:

1. Performance specification for design/construct contract.
2. Two bid packages.
3. Engineering during construction.
4. Acceptance Inspection.

CRITERIA DOCUMENTS:

DOE 6430.1A - General Design Criteria.
Design Requirements Document (dated Sept 1996)

ASSUMPTIONS:

1. A DOE 6430.1A checklist will not be provided
2. Highest Safety Class Level is General Services.
3. Electrical power service to each of the two Privatization Contractors' sites (Parcel A and Parcel B) is 20 MW, 13.8kV, three-phase, three-wire, 95 percent power factor, continuous duty, supplied by either of two redundant feeders.
4. Routing of underground 13.8kV electrical service into the Privatization Contractors' site is near midpoint of southern boundary of Parcel A, and near midpoint of northern boundary of Parcel B.
5. Load tap-changers will be provided on the secondary of the 230kV transformers for voltage regulation.
6. Except for the 230kV transmission line, and 13.8kV underground feeders, site preparation and construction not within the boundaries of the substation switchyard will be by others.
7. Transmission line support structures are tubular steel.
8. A full basement is provided in the substation for cable spreading.
9. 13.8kV switchgear provides circuit breakers for two incoming lines, one bus tie, four feeders, and two spares. Two spare vertical sections are also provided.
10. Substation building is prefabricated metal or engineered building.
11. 230kV transformers are connected wye-primary, delta-secondary with zig-zag grounding transformers.
12. Soil characteristics and contours will not impact proposed type and location of structures or foundations.

MILESTONES AND TARGET DATES:

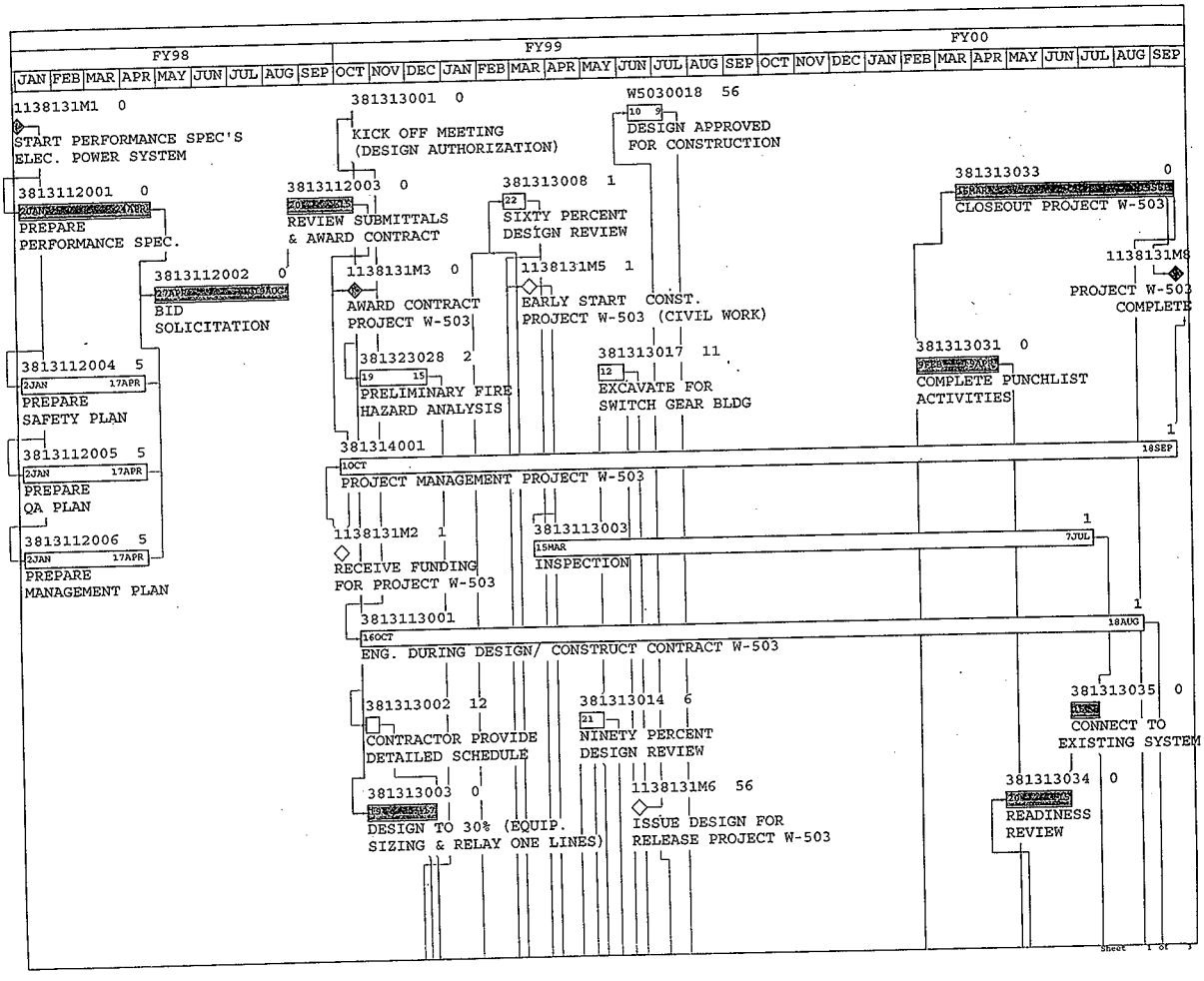
Performance Specification and bid packages will be prepared in Fiscal year 1998. Construction support will be provided in Fiscal year 1999 and Fiscal year 2000.

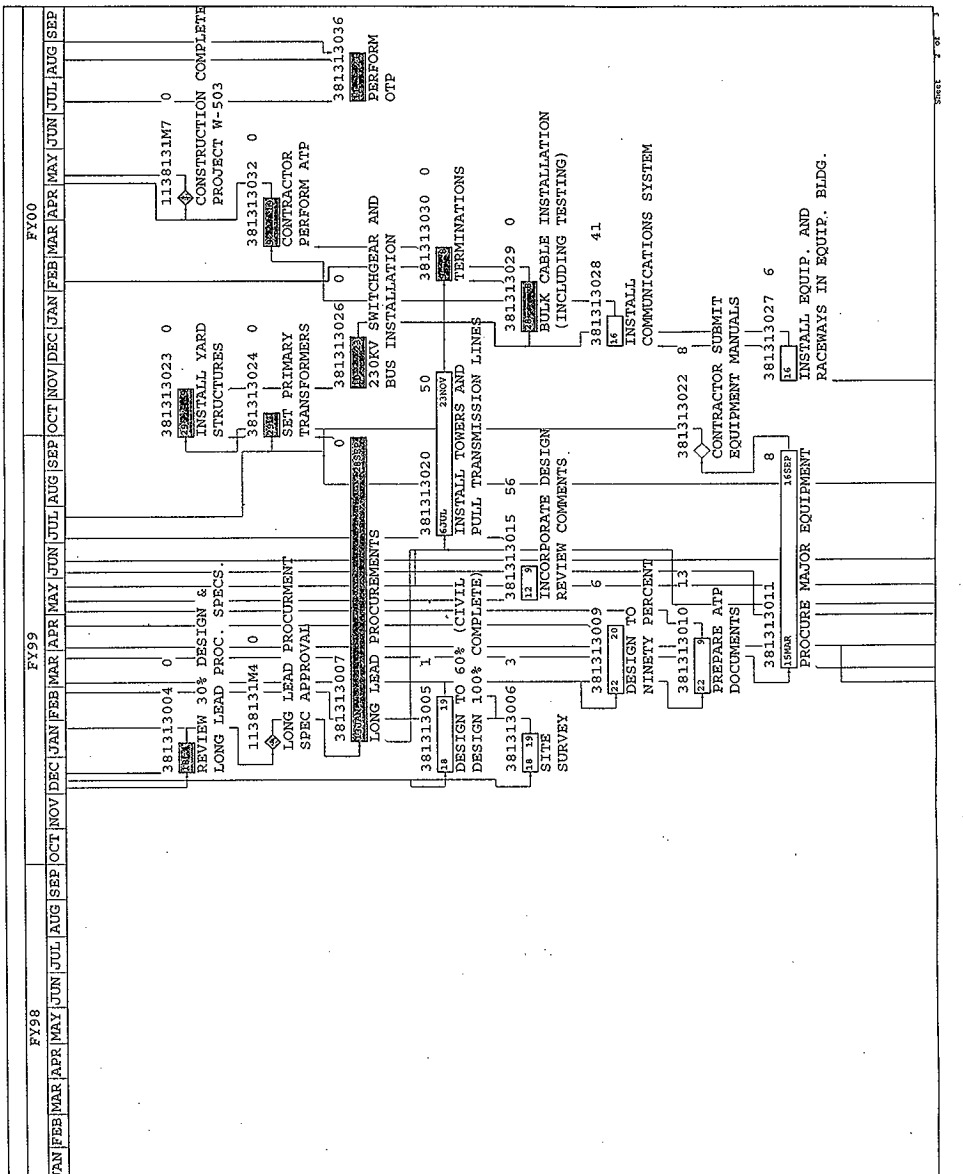
RESTRAINTS:

None

APPENDIX D

Conceptual Project Schedule


FY98
FY99
FY00
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
1138131M1 0
START PERFORMANCE SPEC'S ELEC. POWER SYSTEM
381313001 0
KICK OFF MEETING (DESIGN AUTHORIZATION)
W5030018 56
10 9
DESIGN APPROVED FOR CONSTRUCTION
3813112001 0
20JAN 17APR
PREPARE PERFORMANCE SPEC.
3813112003 0
20OCT 15JUL
REVIEW SUBMITTALS & AWARD CONTRACT
381313008 1
22
SIXTY PERCENT DESIGN REVIEW
381313033 0
15MAR 29SEP
CLOSEOUT PROJECT W-503
3813112002 0
27APR 31OCT
BID SOLICITATION
1138131M3 0
AWARD CONTRACT PROJECT W-503
1138131M5 1
EARLY START CONST. PROJECT W-503 (CIVIL WORK)
1138131M8
PROJECT W-503 COMPLETE
3813112004 5
2JAN 17APR
PREPARE SAFETY PLAN
381323028 2
19 15
PRELIMINARY FIRE HAZARD ANALYSIS
381313017 11
12
EXCAVATE FOR SWITCH GEAR BLDG
381313031 0
9FEB 29APR
COMPLETE PUNCHLIST ACTIVITIES
3813112005 5
2JAN 17APR
PREPARE QA PLAN
381314001
1OCT
18SEP
PROJECT MANAGEMENT PROJECT W-503
3813112006 5
2JAN 17APR
PREPARE MANAGEMENT PLAN
1138131M2 1
RECEIVE FUNDING FOR PROJECT W-503
3813113003
15MAR
INSPECTION
7JUL
3813113001
16OCT
18AUG
ENG. DURING DESIGN/ CONSTRUCT CONTRACT W-503
381313035 0
15SEP
CONNECT TO EXISTING SYSTEM
381313002 12
CONTRACTOR PROVIDE DETAILED SCHEDULE
381313014 6
21
NINETY PERCENT DESIGN REVIEW
381313034 0
20AUG 14SEP
READINESS REVIEW
381313003 0
DESIGN TO 30% (EQUIP. SIZING & RELAY ONE LINES)
1138131M6 56
ISSUE DESIGN FOR RELEASE PROJECT W-503
Sheet 1 of 1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PREPARE ATP
DOCUMENTS
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PROCURE MAJOR EQUIPMENT
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INSTALL YARD
STRUCTURES
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SET PRIMARY
TRANSFORMERS
381313026 0
230KV SWITCHGEAR AND
BUS INSTALLATION
381313020 50
INSTALL TOWERS AND
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381313015 56
INCORPORATE DESIGN
REVIEW COMMENTS
381313022 8
CONTRACTOR SUBMIT
EQUIPMENT MANUALS
8
381313027 6
INSTALL EQUIP. AND
RACEWAYS IN EQUIP. BLDG.
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TERMINATIONS
381313029 0
BULK CABLE INSTALLATION
(INCLUDING TESTING)
381313028 41
INSTALL
COMMUNICATIONS SYSTEM
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CONSTRUCTION COMPLETE
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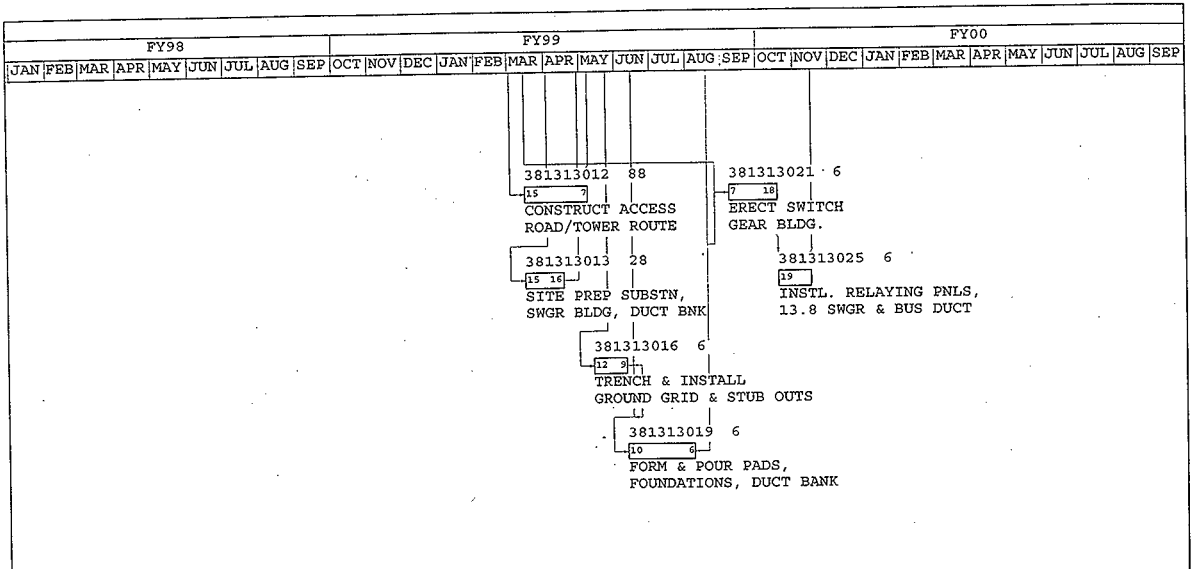

Plot Date 3JUN97
Data Date 29DEC97
Project Start 29DEC97
Project Finish 1FEB02

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

WSOR

Sheet 3 of 3

PROJECT W-503 CONCEPTUAL SCHEDULE
PRIVATIZATION INFRASTRUCTURE PHASE I
ELECTRICAL POWER SYSTEM

FDNW

Date	Revision	Checked	Approved
6/3/97	Rev. 0		
6/3/97	Rev. 0		

APPENDIX E

Outline Specification

OUTLINE SPECIFICATION

DIVISION 2 - SITEWORK

Section 02220 Excavation, Backfill and Compacting

1. Excavation for underground conduit.
2. Excavation for building foundations, miscellaneous electrical, grounding grid system, and HVAC equipment and transmission line towers.
3. Structural Backfill, Compacted: WDOT M 41-10, Section 2-03.3(14)C.
4. Common backfill.
5. Plastic sheet markers for buried conduits.
6. Compliance 29 CFR 1926, Subpart P (CFR 1995b).

Section 02237 Controlled Density Backfill

1. A mixture of Portland cement, fly ash, aggregates, water, and admixtures.
2. Proportioned to provide a non-segregating, self-consolidating, free flowing, excavatable and non-settling material fill.
3. Compression Strength: 345-2070 kPa.

Section 02268 Fire Water Systems

1. Cement-Lined Ductile Iron Pipe: 6 inch.
2. Post indicator valve with supervisory switch.
3. Tapping assembly consisting of iron body valve with cast iron or epoxy coated steel tapping sleeve.
4. Cement-lined ductile iron fittings.
5. Thrust restraints in accordance with NFPA 24.
6. Install, flush, and test in accordance with NFPA 24.
7. Post Barricades (Bollards): Concrete-filled pipe placed in well-compacted soil around post indicator valve.

Section 02271 Aggregates for Access Road and Rock Surfacing

1. Crushed Surfacing Top or Base Course: WDOT M 41-10, Section 9-03.9(3).

2. Substation Yard Surfacing: Special gradation requirements.

   a. 40 mm, 100% passing.

   b. 6 mm, 50% passing (maximum).

   c. No. 200 mesh, 0 to 10% passing (maximum).

3. Drain Rock: Washed rounded rock, 19 to 50 mm size.

Section 02831 Steel Chain-Link Fence and Gates

1. Fence: 3 meter high, galvanized fabric FS RR-F-191/1, Type I, 50 mm mesh, 3 mm gage, with top and bottom selvages twisted and barbed.

2. Posts and braces: FS RR-F-191/3, Class 1, Grade A or B. Braces shall be hot-dip galvanized steel rods 9.5 mm in diameter with turnbuckle.

3. Wire Ties, Clips and Tension Wires: Zinc-coated steel.

4. Vehicle Gate: 7.3 m (24 feet) double-swing opening.

5. Personnel Gates: 1.2 m (4 feet).

6. Design: DOE 6430.1A, Section 0280.

7. Material: IEEE 1119.

DIVISION 3 - CONCRETE

Section 03200 Concrete Reinforcement

1. Reinforcing Steel: Deformed billet steel bars conforming to ASTM A 615M, Grade 300 or Grade 420.

Section 03300 Cast-in-Place Concrete

1. Concrete Minimum Compressive Strength: 28 MPa at 28 days.

2. Concrete Forms: Wood, steel, or plywood.

Section 03600 Grout

1. Non-metallic, non-shrink grout.

DIVISION 5 - METALS

Section 05055 Expansion Anchor Installations

1. ICBO approved with anchor descriptions, tables of allowable tension and shear loads, and test findings.

2. Hilti Kwik-Bolt II or approved substitute.

Section 05120 Structural Steel

1. Structural Steel Shapes and Plates: ASTM A 36.

2. Steel Tubing: ASTM A 500, Grade B.

3. Steel Pipe: ASTM A 53, Type E or S, Grade B.

4. Bolts for Steel Connections: ASTM A 325, Type 1 or 2.

5. Anchor Bolts and Girt Connections: ASTM A 307.

6. Welding: AWS D1.1

Section 05130 Steel Transmission Structures

1. Design Loads:

   a. UBC.

   b. ASCE 7.

2. Materials:

   a. Structural Plate: ASTM A 673.

   b. Poles, Arms, Arm Attachment Plates, Conductor Brackets: ASTM A 572.

   c. Fasteners: ASTM A 325, ASTM A 588, ASTM A 563 DH galvanized.

3. Fabrication: AISC Code of Standard Practice for Steel Buildings and Bridges.

4. Welding: AWS D1.1.

5. Line Supports: ASCE 52.

6. Pole Structures: ASCE 72.

7. Tangent Structures: Self-supporting (no guys).

Section 05500 Metal Fabrications

1. Rolled steel shapes, plates and bars: ASTM A 36.
2. Steel bars and rods: ASTM A 108.
3. Steel pipe: ASTM A 53, Grade B.
4. Fasteners: ASTM A 307 bolts with compatible nuts and washers.

DIVISION 6 - WOOD AND PLASTICS

Section 06100 Rough Carpentry

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07200 Insulation

Section 07460 Metal Siding and Interior Wall Flat Liner Panels

1. 24 gage prefinished steel liner panels.

Section 07900 Joint Sealers

1. Sealants: Nonfirestopping and firestopping systems.

DIVISION 8 - DOORS AND WINDOWS

Section 08100 Metal Doors and Frames

1. Frames for Doors: Standard metal frames, 1.6 mm cold-rolled steel.

Section 08710 Door Hardware

1. Combination locks.
2. Panic bars.

Section 08800 Glazing

DIVISION 9 - FINISHES

Section 09250 Finishes

Section 09500 Acoustical Treatment

Section 09900 Painting

1. Furnish ready-mixed materials. Paint new nonfactory finished materials 2 coats over primer coat.

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13122 Pre-Fabricated Steel Metal Building

1. Switchgear Building: Manual of Steel Construction, Allowable Stress Design (ASD), UBC, American Society of Mechanical Engineers (ASME), and the Metal Building Manufacturers Association (MBMA).

DIVISION 15 - MECHANICAL

Section 15300 Fire Protection Systems

1. Ordinary Hazard Group 1 wet pipe sprinkler system complete with alarm check valve with water motor gong, 2-inch drain and appropriate trim. System will be designed, tested, and installed in accordance with NFPA 13 and Hanford Chapter of the DOE Fire Protection Resource Manual.

2. Fire Department Connection: 4 by 2-1/2 by 2-1/2 inches with gate valve.

3. Strainer: Gem Model B-2, 6 inches.

4. Post indicator control valve.

5. Pipe supports and bracing conforming to NFPA 13.

Section 15500 Heating, Ventilating, and Air Conditioning

1. Heat Pump: Base-mounted air-to-air heat pump with a supplemental electric heater, horizontal enthalpy-controlled economizer, and a remote wall-mounted, 2-stage auto-changeover cooling/heating thermostat. The unit will have 230 Vac, 3-phase power supply. The heat pump will have a cooling capacity of 18 kilowatts (5.0 tons) minimum. It will be provided with 24 kilowatts (80,000 Btu/hr) supplementary electric strip heater. Carrier Model Number 50LJQ006-3.

2. Exhaust Fan: Penn Domex centrifugal wall exhauster, V-belt drive with back draft damper; Penn Ventilator Model WCB81, 1/2 horsepower, 208 Vac, 3-phase.

DIVISION 16 - ELECTRICAL

Section 16121 Tray Cable

1. Factory Mutual Research Corporation Approved Group 1, non-self-sustained flame propagation cable as listed in the Specification Tested Products Appendix to the FM Electrical Equipment Approval Guide.

Section 16122 15 kV Cable

1. Class B, copper, 90 °C, 133% rated EPR, shielded.
2. Factory Mutual Research Corporation Group 1 insulation.
3. UL 1072, National Electrical Manufacturers Association (NEMA) WC5, WC7, WC8.

Section 16144 Batteries and Chargers

1. System Voltages:
   a. 125 Vdc - 230 kV and 13.8 kV controls, relays, indicators.
   b. 48 Vdc - communications systems.
2. Battery racks.
3. Battery chargers.
4. Batteries:
   a. Sizes: IEEE 485.
      1) 125 Vdc: 150 Ah.
      2) 48 Vdc: 60 Ah.
   b. Type: Lead-acid calcium.
5. Accessories.

Section 16331 230 kV Power Transformers

1. Rating:
   a. Primary Voltage: 230 kV, 3-phase, grounded wye, 60 Hertz.
   b. Secondary Voltage: 13.8 kV, 3-phase, impedance grounded delta.
   c. MVA: 25/33/42, oil air/forced air/forced air.

d. Copper windings.

e. Temperature Rise: 65 °C, average.

f. Oil-immersed, sealed tank, nitrogen blanket, outdoor.

2. Bushings:

a. Primary: 1,050 kV basic impulse insulation levels (BIL).

b. Secondary: 110 kV BIL, Located inside flanged terminal chamber for connection to secondary bus duct.

3. Current Transformers: ANSI C57.13

a. Primary bushings.

b. Secondary bushings, including neutral.

4. Secondary Load Tap Changer: IEEE/ANSI C57.12.10 and C57.131.

5. Control Cabinets: NEMA 3R.

6. Accessories: ANSI C57.12.10.

7. Station Type Surge Arresters, Metal Oxide:

a. Primary: 144 kV maximum continuous operating voltage (MCOV), with discharge counters.

b. Secondary: 15 kV MCOV, located inside terminal chamber.

8. Factory inspection and testing.

Section 16346 13.8 kV Switchgear and Bus Duct

1. Ratings: 13.8 kV, 3-ϕ, 3-wire, 60 Hertz, 36 kA Sym., 110 kV BIL.

2. Arrangement: Metal-clad, double-ended, indoor, 2-high vertical sections, UBC seismic.

3. Power Buses: 2000 ampere, copper.

4. Ground Bus: Full length.

5. Vacuum Break Power Circuit Breakers:

a. Incoming.

b. Bus tie.

c. Feeder.

6. Non-load break draw out fuse compartments for station service transformers, key interlocked with associated 480 V station service main breaker.

7. Relaying and Metering Incoming Line and 13.8 kV Feeders:

   a. 27/B: Bus undervoltage relays; Basler BE1-27.

   b. 50/51: Time and instantaneous overcurrent relay; Basler BE1-50/51B.

   c. 50/51N: Time and instantaneous overcurrent relay; Basler BE1-50/51B

   d. Ammeter: 3-phase, 60 Hertz, 0-5 ampere input, 3-phase display, transducer output; Bitronics ATAIE 1.

   e. Voltmeter: 3-phase, 60 Hertz, 0-150 V input, 3-phase display, transducer output; Bitronics VTAIE 1.

   f. Watt/VAR: 3-phase, 60 Hertz, 0-5 ampere, 0-150 V input, transducer output; Bitronics QTWIE 1.

   g. KWH, KVARH, and DM: 3-phase, 60 Hertz, 0-10 ampere, 120 V input; Scientific Columbus JEM104-J-P.

8. Metering - Station Service Feeders:

   a. KWH and DM: 3-phase, 60 Hertz, 0-5 ampere, 0-150 V input, Scientific Columbus

9. Panel mounted devices.

10. Space Heaters: Each vertical section.

11. Incoming Bus Duct: 15 kV, 2000 ampere, 110 kV BIL, copper, totally enclosed, with duct heaters.

12. Accessories:

   a. Circuit breaker test cabinet.

   b. Circuit breaker test leads.

   c. Manual racking crank.

   d. Circuit breaker closing device.

   e. Circuit breaker lifting/transport truck.

   f. Manual charging device.

Section 16347 230 kV Power Circuit Breaker

1. Ratings: 242 kV, 3-phase, 60 Hertz, 1200 ampere, 40 kA interrupting.

2. Insulation: SF6, dead tank, outdoor frame mounting.

3. Current Transformers: ANSI C57.13.

4. Operator: Spring, pneumatic, or hydraulic.

5. Control power:

   a. Close/Trip: 125 Vdc nominal.

   b. Charging Motor: 208 Vac/125 Vdc.

6. Control Cabinet: NEMA 3R.

7. Accessories.

Section 16721 Fire Alarm and Detection Systems

1. Fire Alarm Control Panel (FACP): Pyrotronics, Model [XL-3], [SYSTEM-3], [CP-400] designed for surface mounting. Panel door shall have a cylinder lock with a key matched to Corbin Catalog 60, or keys as specified by Hanford Fire Department. The design will be in accordance with NFPA 72 and the Hanford Chapter of the DOE Fire Protection Resource Manual.

2. Manual Fire Alarm Stations: Double-action, non-break glass type.

3. Detectors: Provide photoelectric smoke detectors FACP manufacturer has approved for use with FACP.

4. Fire Alarm Locator Lighting Fixture: Outdoor lighting fixture, incandescent, Crouse-Hinds Vaporgard No. VXHBF15 with VNF75 red glass globe, V911 guard, and 100 W lamp.

5. Radio Fire Alarm Reporter: G.H. Harlow Company, Incorporated GHR02 Series. Obtain from Hanford Fire Department Radio Maintenance.

Section 16952 Conduit

1. General: UL Listed, NFPA 70.

2. Materials:

   a. Underground: Schedule 80 PVC, concrete encased.

   b. Exposed: Rigid galvanized steel.

c. Interior within 1.5 m of floor: Rigid galvanized steel.

d. Interior greater than 1.5 m above floor: Electrical metallic tubing.

Section 16954 Cable Trays

1. General: UL Listed, NFPA 70, NEMA VE 1.

2. Material: Galvanized steel, solid bottom tray, Class 20C.

Section 16955 Ductbank

1. ANSI/NEMA TC8.

2. Concrete encased, 760 mm (30 inches) below grade, 1050 mm (42 inches) under roadways.

3. Grounding: #4/0 AWG.

Section 16959 Grounding and Bonding

1. General:

   a. IEEE/ANSI C2.

   b. IEEE 142.

   c. IEEE 80.

   d. IEEE 837.

2. Ground conductor: Bare copper, concentric strand, soft drawn.

3. Ground hardware.

4. Ground rods.

5. Welding.

6. Ground grid.

Section 16960 Equipment Wiring Systems

1. General: NFPA 70, UL listed.

2. Control Cable: Copper, THHN/THWN, XHHW, PVC, TC, 600 V.

3. Building Wire: Copper, THHN/THWN, XHHW, 600 V.

4. Instrument Cable: Stranded copper, THHN/THWN, XHHW, PVC, 600 V, TC.

Section 16961 Electrical Identification

1. Equipment Nameplates: 3-layer laminate.
2. Conduits: Metal engraved tags.
3. Site standards.

Section 16962 Distribution Transformers

1. General: Pad mounted, liquid filled, dead front.
2. Ratings: 13.8k - 208Y/120 Vac, 150 kVA, OA, 65 °C, 3-phase, 60 Hertz.
3. Primary Taps: 2 above, 2 below, nominal.
4. Accessories: ANSI C57.12.2.

Section 16963 High Voltage Air Break Switches

1. General: IEEE/ANSI C37.30, C37.32, C37.33, C37.34, C37.35.
2. Ratings: 230 kV, 3-phase, gang-operated, 1200 ampere, 1050 BIL.
3. Ground Switch: 600 ampere.
4. Motor Operators: ANSI C37.32.
   a. Control Power: 125 Vdc.
5. Manual Operators: Swing handle, 180 degree rotation.

Section 16966 Panelboards

1. Type: Circuit breaker, NEMA PB 1.
2. Enclosure: NEMA 1.
3. Integrated Short Circuit Rating: 10 kA for dc systems, 22 kA for ac system.

Section 16967 Enclosed Circuit Breakers

1. NEMA AB 1.

Section 16969 Interior Luminaries

1. Luminaries: 120 Vac, 2-lamp fluorescent, T-8 lamps, electronic ballast, wrap-around acrylic lens, pendant mounting.
2. Emergency Power Packs: Sealed nickel cadmium.
3. Exit Signs: Self-luminous.

Section 16970 Site Lighting

1. Luminaries: 208 V, 2-lamp, 180 W LPS, -20-degree operation, pole mount.

2. Poles: 6 meters (20 feet) high, base mounting.

3. Control: Photoelectric cell and contactor.

Section 16971 Lightning Protection Systems

1. General: NFPA 780, IEEE/ANSI C62.11.

2. Surge Arresters: ANSI 70.

   a. At transformer bushings.

   b. At 230 kV line entrance to substation yard.

3. Static Wire: 9.5 mm (3/8 in.), zinc coated, 7-strand extra high strength, ASTM A 363.

Section 16974 Protective Relay Panels

1. Enclosures: 800 by 800 by 2300 mm (32 by 32 by 90 inches), NEMA 12, front and rear access doors, 100 W light, 120 Vac GFCI receptacle.

2. Transmission Line Protective Relay Panels:

   a. Relaying in accordance with meter/relay diagram.

   b. Manufactured by Schweitzer Engineering Laboratories (SEL).

3. Transformer Protective Relay Panels: Relaying in accordance with meter/relay diagram.

4. Annunciator Panel: Mimic bus and annunciator panel.

Section 16975 Zig-Zag Grounding Transformers and Grounding Resistors (13.8 kV)

1. Grounding Transformers:

   a. General: 13.8 kV, zig-zag, 15.94 MVA for 10 seconds, 500 kVA continuous, 3-phase, pad-mount, oil-filled, 110 kV BIL.

   b. Primary Terminations: NEMA pads for connection to 13.8 kV, 2000 ampere bus duct.

   c. Tank: Sealed tank.

   d. Bushings: With current transformers.

e. Accessories.

2. Grounding Resistor:

   a. General: 8000 Vac, 1-phase, 110 kV BIL, 4 ohms, 40 ampere continuous, 2000 ampere for 10 seconds.

   b. Terminations: To HO on zig-zag transformer, NEMA pad for ground connection.

3. Enclosure: Outdoor.

4. Control Cabinet: NEMA 3R.

Section 16976 230 kV Overhead Transmission

1. Structures: Hot-dipped galvanized steel conforming to Section 05130.

2. Hardware: Hot-dipped galvanized steel or ductile iron.

3. Insulators: ANSI C29.1 through C29.9.

4. Conductors: 1272 kcmil, 45/7 ACSR conforming to ASTM B 232, Code word "Bittern."

5. Overhead Ground Wires: Steel, 9.5 mm (3/8 inch), 7-strand steel galvanized cable, ASTM A 475.

6. Structure hardware.

7. Counterpoise: All aluminum conductor (AAC) conforming to ASTM B 231.

8. Vibration Dampers: Weighted Stockbridge type.

9. Anchors: Corrosion-protected disk-type anchors.

10. Guy Wire: Stranded-steel galvanized cable conforming to ASTM A 475.

Section 16978 230 kV Bus and Insulation System

1. Bus Support Insulators: Station post, 230 kV, 1050 BIL, 2.3 m (92 inch) 567 kg (1250 lbs) cantilever strength.

2. Rigid Bus: Aluminum, Schedule 40, ASTM B 188.

3. Connectors.

4. Strain and Jumper Bus: 1272 kcmil, 45/7 ACSR conform to ASTM B 232, Code word "Bittern."

5. Welding: MIG, Alloy ER 4043, by welder able to meet requirements of Standard Qualifications for Welding Procedures and Welding Operators, ASME Section IX.

Section 16979 Electric Power System Testing

1. Construction Acceptance Tests:

   a. Switchgear.

   b. Transformers.

   c. Cables: Low and medium voltage.

   d. Air switches.

   e. Circuit Breakers: High voltage - SF6.

   f. Protective relays.

   g. Instrument transformers.

   h. Metering and instrumentation.

   i. Grounding systems.

   j. Battery systems.

   k. Medium- and high-voltage surge-protective devices.

   l. Outdoor bus.

   m. Fiber optic cables.

   n. Communications equipment.

   o. Remote terminal unit (RTU).

   p. Lighting systems.

   q. Fire detection and alarm systems.

Section 16980 Underground Distribution

1. General: IEEE/ANSI C2.

2. Conduit:

   a. Above ground: Rigid Metal Conduit, Galvanized, UL 6.

   b. Underground: PVC, Schedule 80, UL 651.

3. Fittings.

4. Power Cable and Wire: 15 kV, shielded.

5. Wire connectors and terminations.

6. Power Cable Termination:

   a. Indoor: IEEE 48, Class 1, rubber

   b. Pad-Mount Transformer Primary: Loadbreak elbows.

   c. ANSI/IEEE 386.

7. Pull Wire: 200 pound test.

8. Grounding and Bonding: UL 467.

9. Concrete: Section 03300, Class M.

Section 16981 Automatic Transfer Switch

1. General: 208/120 Vac, 3-phase, 4-wire, 4-pole, 600 ampere, 65 kAIC.

2. Transfer Switch: Electrically-operated, mechanically-held.

3. Bypass Switch: Mechanically-operated, mechanically-held.

4. Enclosure: NEMA 1.

Section 16984 RFL 6750 Tone Equipment

1. RFL 6750 Tone Units: Manufactured by Dowty RFL Industry, Bonneville Power Administration compatible.

2. Rack mounting.

Section 16985 Cable Trench

1. Precast, 510 mm wide by 460 mm deep (20 inches wide by 18 inches deep).

2. Loading: Standard, 200 psf; road crossings, HS 20-44.

3. Center barrier.

Section 16986 230 kV Voltage Transformers

1. Ratings:

   a. Nominal System Voltage: 230 kV, grounded wye, 3-phase.

   b. BIL: 1050 kV.

c. Primary Voltage Rating: 138 kV.

d. Voltage Ratio: 2000/1200:1.

e. Secondary Voltage: 115/66.4 V.

f. Accuracy Class: 0.3 through ZZ.

g. Thermal Rating: 7500 VA.

2. Accessories.

3. Windings: Copper.

4. Control Cabinet: NEMA 3R.

Section 16987 Communications Equipment

1. General: Rack mounting, 48 Vdc.

2. MAG Lines: Farinon Microwave End of Life Cycle, WHC-SD-GN-ER-20007 (WHC 1996b).

3. Integrated Transfer Trip (ITTS): Farinon Microwave End of Life Cycle, WHC-SD-GN-ER-20007 (WHC 1996b).

4. Fiber optic/microwave SCADA: Supervisory Control and Data Acquisition (SCADA) Computer System, Acquisition Plan WHC-95-353936 (KEH 1995).

5. FDAS (Buyer Supplied):

   a. Description of FDAS - End Use Load and Conservation Assessment Program, DOE/BPA/13795-4 (BPA 1985).

   b. Development and Transfer of Energy Use Monitoring Technology at Pacific Northwest Laboratory (PNL 1985).

6. Fiber Optic Distribution Panel: Telect 015-2333-3312.

7. Fiber Optic Multiplexer:

   a. Four T1 I/O cards.

   b. Conoga-Perkins 3240-BU-9.

   c. T1 I/O Cards, Conoga-Perkins 3240-IO-TIX-000.

8. Digital Signal Cross-connect (DSX):

   a. Equipment IN/OUT.

   b. Cross-connect IN/OUT.

c. Jack IN/OUT.

9. T1 Multiplexer:

   a. Coast Com 30305-106.

   b. Channel cards: Coast Com 33245-103.

10. Jack Field:

   a. Four-wire Connectorized: Telect 020-0005-0000.

   b. Two-wire Connectorized: Telect 020-0004-0000.

11. Main Frame:

   a. Terminal Block, 6 by 26 wire wrap both sides.

   b. Newton Instrument 5076-6

12. Mounting Shelf:

   a. Fifty-six pin card connectors.

   b. Tellabs Type 10-1011U.

13. Bridge:

   a. Four-wire, 6-way type.

   b. Tellabs Type 4446.

14. Bridge Card Signal Converter: Tellabs Type 60008B.

15. Terminal Interface Module: Tellabs Type 6131.

16. Ringing Generator

   a. 5 Watt, 100 Vac, 20 Hertz output.

   b. Tellabs 8102.

17. Communication Rack:

   a. 480 by 2300 mm (19 by 90 inches).

   b. Harris/Dracon 46356-105.

18. ST/ST Patch Cords

   a. ST Connectors: Single-mode, 1300 nm fiber.

   b. AT&T-FS1E-E-04.

19. Fuse Panel:

    a. General: 48 Vdc, 10-position, GMT-type fuses, dual-power feed.

    b. Telect 009-0004-0001.

20. Optical Attenuator:

    a. Five dB.

    b. Telect 102302.

21. Fiber Optic Cable (Dielectric):

    a. R fiber, loose-tube, single-mode, 1310 nm, non-metallic strength member, duct type cable.

    b. Alcoa Fujikura Ltd. L1012H1511601.

22. Fiber Optic Cable Interduct:

    a. Optic-Guard, PVC conduit, orange.

    b. Carlon 14108

23. Alarm Remote Station

    a. 16 BI state alarm points, FSK operation.

    b. Badger M00-1725-FSK.

24. Telephone.

Section 16990 Substation Equipment Installation

1. Power Transformers: Heavy hauling.
2. 13.8 kV Switchgear and Bus Duct: Heavy hauling.
3. 230 kV Power Circuit Breakers: Heavy hauling.
4. Batteries and chargers.
5. Distribution Transformers: Heavy hauling.
6. High Voltage Air Break Switches: Heavy hauling.
7. Relay panels.
8. Zig-Zag Transformers and Grounding Resistors: Heavy hauling.
9. 230 kV Voltage Transformers: Heavy hauling.
10. Remote Terminal Unit (RTU): ILEX

11. Field Data Acquisition System (FDAS): Buyer supplied.

Section 16991 Remote Terminal Unit

1. Power: 125 Vdc.
2. Inputs: 64 analog, 24 accumulator.
3. Outputs: Wetted contact logic, 24 control, 120 indication points.
4. SCADA Interface: 1200 baud modem to SCADA's 7020/4 BCH protocol.
5. System Northwest SR8000.
6. Communication Rack: 480 by 2300 mm (19 by 90 inches).

APPENDIX F

Energy Conservation Report and Analysis

(Waived per DOE Letter, 96-WDD-154)

APPENDIX G

Unreviewed Safety Question Evaluation

Safety Classification

Electrical utilities equipment fall under nonsafety class. (Reference Interoffice Memorandum, J. M. Hache [ICF Kaiser Hanford Company] to H. L. Debban [ICF Kaiser Hanford Company], "Commercial Practices Safety Classification," August 22, 1996. Any further evaluation/analysis is not required.

Unreviewed Safety Question (USQ) Screening/Determination

The new power system for Phase I privatization facilities will have no impact on the availability of electrical power to the existing facilities and, therefore, does not result in a USQ.

USQ Tracking No. TF-97-0365, Rev. 0

PROJECT W-503
CONCEPTUAL DESIGN
UNREVIEWED SAFETY QUESTION

An Unreviewed Safety Question (USQ) screening/determination was performed using the Project W-503 Design Requirements Document (reference 1) and the W-503 Engineering Study (reference 2). During performance of the USQ screening/determination, TF-97-0365, it was determined that the design does not place the facility outside of that described in the current Tank Waste Remediation System (TWRS) Authorization Basis; Interim Safety Basis (WHC-SD-WM-ISB-001, Rev 0-M) and RL approved documentation referenced therein.

The existing facilities in the 200 East receive power from the A8 substation, as described in the current Authorization Basis. Since project W-503 is installing the A6 substation, and will be separate from the existing A8 substation, the project does not impact the current Authorization Basis. No further evaluation needs to be performed at this time per the outcome of the Unreviewed Safety Question screening/ determination.

Prior to actual facility modification, the USQ screening/determination will need to be revisited and potentially revised. The reason for revisiting the USQ screening/determination is to ensure that the assumptions remain valid for any new Authorization Basis documentation that might exist at time of construction. Additional USQs might be required depending on Safety Analysis outcome for the Privatization Facilities. Subsequently, updates of Authorization Basis documentation may be required to assure accuracy of facility descriptions.

References:

(1) WHC-SD-WM-DRD-011, Rev. 0, *Design Requirements Document for the Phase I Privatization Electrical Power System*, September 30, 1996.

(2) WHC-SD-WM-ES-393, Rev. 0, *Engineering Study for the Phase I Privatization Facilities Electrical Power*, July 18, 1996.

UNREVIEWED SAFETY QUESTION SCREENING/DETERMINATION FORM
(Per WHC-IP-0842)

USQ Tracking No. TF-97-0365

Rev. 0

AREA: [] East [] West [X] General

Facility: [X] 242-A [X] DST [X] SST [] LERF
[X] Aging Waste [] Other

ECN No. N/A PCA No. N/A

Work Pkg No. N/A Other (Specify) Project W-503

TITLE: New 230 kV Substation for TWRS Privatization Phase I

Description of the Proposed Activity/REPORTABLE OCCURRENCE or PIAB:

Project W-503 will provide 40 MW of power for the TWRS Phase I Privatization contractor facilities. Each facility will receive 20 MW capacity via a 13.8 kV line (separate lines for each facility). The conceptual design proposes to provide a new substation (A6) in the SE corner of 200E Area. The substation will be fed from the Hanford 230 kV loop which is normally powered from the Midway Substation. The new A6 substation will be located in the 230 kV loop between the A8 Substation and the Ashe tap, allowing feed via A8 or from the Ashe tap switch station.

The new facility will extend the existing 230 kV loop south by adding approximately 11 km (7 mi) of new transmission line. The new substation will incorporate protective relaying for switching under fault conditions.

Introduction:

This modification to the 230 kV loop will not affect the existing 200 Area power distribution. The tank farms and other 200 Area facilities will continue to receive power via the A8 (251-W Bldg.) Substation. Preliminary load flow and voltage profile calculations were performed (Reference 3 below) by the Bonneville Power Administration (BPA) to evaluate the impact of the new substation on the overall 230 kV transmission grid. The BPA has indicated that 60 MW can be provided to the new substation without impact to the overall grid.

The existing A8 Substation will continue to provide fault isolation in the event of a fault at the new A6 substation. The new A6 substation will have fault isolation as well and will isolate faults occurring east of A6 (in the Ashe direction).

Scope:

This USQ includes the modification to the 230 kV loop, the new A6 Substation, and the 13.8 kV distribution system to the new private facilities. This USQ is intended to evaluate whether the new power system affects the existing authorization basis. The new facilities will require their own safety assessment for construction and operation.

Authorization Basis:

The authorization basis for 200 East Tank Farms is contained in the "Hanford Site Tank Farm Facilities Interim Safety Basis", WHC-SD-WM-ISB-001, Rev. 0-M. In addition the following documents were reviewed:

UNREVIEWED SAFETY QUESTION SCREENING/DETERMINATION FORM (Continued)	Page 2 of 5
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	Rev. 0

1. WHC-SD-WM-OSR-004, Rev 1E, Aging Waste Facility Interim Operational Safety Requirements
2. WHC-SD-WM-OSR-005, Rev 0F, Single Shell Tank Interim Operational Safety Requirements
3. WHC-SD-WM-OSR-016, Rev 0E, Double Shell Tank Interim Operational Safety Requirements
4. WHC-SD-WM-SAR-006, Rev 2, Single Shell Tank Isolation Safety Analysis Report
5. WHC-SD-HS-SAR-010, Rev 2, Aging Waste Facility Safety Analysis Report
6. WHC-SD-WM-SAR-016, Rev 1, Double Shell Tank Farm Facility Safety Analysis Report
7. 97-01, East and West Tank Farms Standing Order

The 242-A Evaporator authorization basis, *242-A Evaporator/Crystallizer Safety Analysis Report*, WHC-SD-WM-SAR-023, Rev. 2-B, was reviewed for any special assumptions regarding electrical power.

Conclusion:

The Interim Safety Basis makes reference to the 230 kV power system loop in the facility description and discusses how the 200 Areas receive power from the A8 Substation. This description would remain correct with the addition of the new substation. The remaining documents (1 through 6) make various references to the power distribution within the 200 Areas or within the tank farms. None of these descriptions are affected by the proposed activity. With regard to Standing Order 97-01, the new facilities are constructed in a non-intrusive area.

The Evaporator SAR describes the A8 Substation and the 230 kV grid as the source of power for the 242-A facility with standby power provided by diesel generator. No assumptions regarding power reliability are made.

References

1. WHC-SD-WM-ES-393, Rev 0, Engineering Study for the Phase I Privatization Facilities Electrical Power.
2. WHC-SD-WM-DRD-011, Rev 0, Design Requirements Document for the Phase I Privatization Facilities Electrical Power System.
3. HNF-SD-W503-CDR-001, Rev F, Preliminary CDR TWRS Phase I Privatization Facilities Electrical Power System.

USQ Screening:

A. Does the PROPOSED ACTIVITY represent a change to the facility as described in the AUTHORIZATION BASIS?

[X] No [] Yes [] N/A

Basis: The facilities as described in the authorization basis will continue to receive power from the A8 Substation. The new substation will make no changes to the power distribution from A8 which serves the 200 Areas. Substation A8 will continue to operate as before.

B. Does the PROPOSED ACTIVITY represent a change to procedures as described in the AUTHORIZATION BASIS?

UNREVIEWED SAFETY QUESTION SCREENING/DETERMINATION FORM (Continued)	Page 3 of 5
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[x] No [] Yes [] N/A

Basis: No procedures described in the AB will be affected by the addition of the new substation. The addition of the new substation will have no impact on the operation of the power system in the 200 Areas. In addition, no references to procedures affecting power were found.

C. Does the test or experiment represent a test or experiment not described in the AUTHORIZATION BASIS documentation?

[] No [] Yes [x] N/A

Basis: The change is not a test or experiment.

D. Does the PROPOSED ACTIVITY or REPORTABLE OCCURRENCE, impact:

- OSRs or IOSRs?
- Approved IOSR Compliance Implementation Plan?

[x] No [] Yes [] N/A

Basis: The OSRs and IOSRs were reviewed and none of them will be affected by this change. The addition of the substation will be transparent to all existing operations.

E. Does the REPORTABLE OCCURRENCE or PIAB involve analytical errors, omissions, and/or deficiencies in the AUTHORIZATION BASIS?

[] No [] Yes [x] N/A

Basis: This is not a reportable occurrence or PIAB.

USQE No. 1 CC Scaief III (Print Name) _____ USQE No. 2 MS Tiffany (Print Name) _____

C.C. Scaief III (Signature) 4-15-97 (Date) Matthew S Tiffany (Signature) 4-15-97 (Date)

IF "YES", USQE CONTINUE WITH DETERMINATION BELOW

USQ DETERMINATION:

1. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB significantly increase the frequency of occurrence of an accident previously evaluated in the AUTHORIZATION BASIS?

[] No [] Yes/Maybe

UNREVIEWED SAFETY QUESTION SCREENING/DETERMINATION FORM (Continued)	Page 4 of 5
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Basis:

2. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB significantly increase the consequences of an accident previously evaluated in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

3. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB significantly increase the frequency of occurrence of a malfunction of EQUIPMENT IMPORTANT TO SAFETY previously evaluated in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

4. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB significantly increase the consequences of a malfunction of EQUIPMENT IMPORTANT TO SAFETY previously evaluated in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

5. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB create the possibility of an accident of a different type than any previously evaluated in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

6. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB create the possibility of a malfunction of EQUIPMENT IMPORTANT TO SAFETY of a different type than any previously evaluated in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

7. Could the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB reduce the margin of safety for any OSR/IOSR as defined in the AUTHORIZATION BASIS?

   [] No [] Yes/Maybe

   Basis:

8. Does the PROPOSED ACTIVITY, REPORTABLE OCCURRENCE or PIAB require a new or revised OSR/IOSR (including compensatory measures required by a Compliance Implementation Plan)?

   [] No [] Yes/Maybe

   Basis:

UNREVIEWED SAFETY QUESTION SCREENING/DETERMINATION FORM (Continued)	Page 5 of 5
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	Rev. 0

USQE No. 1 _____ USQE No. 2 _____
Print Name Print Name

_____ _____ _____ _____
Signature Date Signature Date

PRC REVIEW

Meeting No.: _____ Date _____

PRC Chairman Concurrence: _____ _____
Signature Date

APPENDIX H

Economic Analysis and Life Cycle Cost Analysis

(Waived per DOE Letter, 96-WDD-154)

APPENDIX I

Physically Handicapped Assessment

(Waived per DOE Letter, 96-WDD-154)

APPENDIX J

Plant Forces Work Review

FDH	Fluor Daniel Hanford, Inc. P.O. Box 1000, Richland, WA 99352-1000 PLANT FORCES WORK REVIEW	Plant Forces Work Review No. FDH-053-97	Date 3/6/97	Page 1 of 2

	Title	JCS Work Pkg or Project No.	Area	Bldg. No.
REQUESTER	INSTALL 230 KV SUBSTATION	W-503	600	N/A

Estimated Cost of Work:

*1.	Procured Material/Equipment	$ 1,200,000
*2.	Materials/Equipment Purchased for Shop Fabrication	$ 0
*3.	Job-Site Material	$ 4,500,000
4.	Shop Labor	$ 0
5.	Job-Site Labor	$ 1,440,000
6.	Other Costs (design, field inspection, and contingency allowance)	$ 3,600,000
7.	General Overhead (Labor Only)	$ 580,000
	Total Job	$ 11,320,000

*Include estimated fair value of material or equipment acquired on site

Requester's Name and Phone No. P.I. Thakkar, 373-6457 Date 3/4/97

FDH

Reviewed By:

Area Work Review Agent Gene Lamm Date 3/7/97

Company Work Review Agent Gary Maxwell Date 3/10/97

DOE

The following determination has been made regarding applicability of the Davis-Bacon Act, as amended, to the work described above:

Applicable Construction	Not Applicable Plant Forces	
[XX]	[ ]	Chairman RL-Labor Standards Board *Original Signed by Alt. Paul Davis* Date *3/12/97*

"Description of Work"

Briefly state the reason for this work activity:

Project W-503 installs a new 230 kV substation east of the 200 E Area fence for TWRS privatization support work. This project will provide the required electrical power to the privatized contractors selected by DOE RL.

NOTE: In order to maintain configuration control of the 230 kv and 13.8 kV grids, DynCorp Electric Utilities will test the installed circuit breakers, switches, transformers, conductors, instruments, and label the electrical equipment for future maintenance.

Job summary:

Procure and install a 230 kV substation, 230 kV transmission line section, 13.8 kV switchgear room, approx. 500' of 13.8 kV duct bank sections, access road, and all associated equipment. A"Hot tie-in" is not required because one leg of the 230 kV loop will be shut down to make a cold tie-in. The second leg will carry the site loads.

Discuss all programmatic or physically associated work planned, underway, or recently completed in the work area:

The W-503 electrical project will be coordinated with other site development projects to be completed at the same time. PFWRs will be submitted for these projects as soon as the design has been completed.

F D H	Fluor Daniel Hanford, Inc. P.O. Box 1000, Richland, WA 99352-1000 PLANT FORCES WORK REVIEW Continued	Plant Forces Work Review No. FDH-053-97	Page 2 of 2

Describe entire work scope. Fully describe complete job scope using a stepped work flow format. Describe and estimate the cost of labor and material on foundations, structures, utility systems, or other construction type activity. Provide sketches or measurements for all work:

1. Install two parallel 230 kV transmission lines approx. three and one half miles to extend the 230 kV transmission loop. See pages 3 of 5 and 4 of 5.

2. Install a new substation that includes three 230 kV circuit breakers, two 230 kV - 13.8 kV step-down 50 MVA transformers, associated instrumentation, and bus work.

3. Erect a new 50' x 60' prefabricated metal switchgear building with a concrete floor to house the new 13.8 kV switchgear, 230 kV relay, control and instrument panels, communication equipment, and 125V dc control voltage system (station battery and battery charger).

4. Install 500' of new duct banks to extend from the switchgear building to the contractors site boundary. See page 5 of 5. (The privatization contractors will be provided with electrical service through underground duct banks for 13.8 kV feeders).

5. Excavate approximately one mile of trench in order to install fiber optics from existing systems to the new sub-station.

6. Build a three and one half mile long transmission line access road from existing 230 kV line to new substation.

NOTE: Pages 3 to 5 are Sketches and are on file in the Davis-Bacon Office.

APPENDIX K

Pollution Prevention/Waste Minimization Plan

P2-EDGE SUMMARY REPORT

Project Information

Project: TWRS Privatization Phase I Electrical Systems
Project Number: W-503
Project Manager: Tarik Choho
Address: 2440 Stevens Place, Room 1215
Phone: (509) 376-0590

Project Size: Line Item Project
Type of Project: New Construction
Design Phase:

P2-EDGE Analysis
Origination Date: 20 Mar 97

Evaluator Comments

Name: David Fort and Gurdhian Singh
Telephone: (509) 376-4250 and 376-7578

Notes

Most of the opportunities will be considered during the preparation of performance procurement specifications, definitive design, and during construction activities.

Data is unfiltered.

Opportunities that WILL BE CONSIDERED:

1.A.3	1.A.8	1.A.9	1.A.12	1.A.21	1.A.24	1.A.30	1.B.1	1.B.2
1.B.3	1.B.5	1.B.6	1.B.7	1.D.2	2.A.2	2.A.14	2.D.1	3.A.1
3.B.1	3.B.2	3.B.4	5.A.1	5.B.1	6.B.1	6.D.1	7.A.1	7.B.2
7.B.3	8.A.1	8.A.3	8.B.2	9.A.5	9.A.6	9.A.7	9.B.1	9.B.2
9.B.3	9.D.1	11.A.1	11.B.1	11.B.2	12.B.1	12.B.5	15.A.2	15.A.6
15.A.25	16.A.6	16.A.7	16.A.8	16.A.10				

Opportunities that WILL NOT BE CONSIDERED:

1.B.9	2.A.3	2.A.8	3.B.3

Opportunities that WILL BE IMPLEMENTED:

1.A.28	2.A.10	16.A.1	16.A.9	16.A.11

Opportunities that are NOT APPLICABLE:

1.A.1	1.A.2	1.A.4	1.A.5	1.A.6	1.A.7	1.A.10	1.A.11	1.A.13
1.A.14	1.A.15	1.A.16	1.A.17	1.A.18	1.A.19	1.A.20	1.A.22	1.A.23
1.A.25	1.A.26	1.A.27	1.A.29	1.B.4	1.B.8	1.B.10	1.B.11	1.B.12
1.B.13	1.C.1	1.D.1	1.D.3	2.A.1	2.A.4	2.A.5	2.A.6	2.A.7
2.A.9	2.A.11	2.A.12	2.A.13	2.A.15	2.A.16	2.B.1	2.B.2	2.B.3
2.B.4	2.B.5	2.B.6	2.B.7	2.B.8	2.B.9	2.B.10	2.B.11	2.B.12
2.B.13	2.C.1	2.C.2	2.D.2	4.A.1	4.B.1	4.B.2	5.A.2	5.B.2
5.C.1	6.B.2	6.B.3	7.A.2	7.B.1	7.B.4	8.A.2	8.B.1	9.A.1
9.A.2	9.A.3	9.A.4	9.A.8	9.A.9	9.A.10	9.A.11	10.A.1	10.A.2
10.A.3	10.A.4	10.B.1	10.C.1	10.D.1	11.A.2	11.A.3	11.A.4	11.A.5
11.A.6	11.A.7	11.A.8	11.A.9	11.A.10	11.A.11	11.A.12	11.A.13	11.A.14
11.A.15	11.A.16	11.A.17	11.A.18	11.A.19	11.A.20	11.A.21	11.A.22	11.A.23
11.A.24	11.A.25	11.A.26	11.A.27	11.B.3	11.C.1	11.D.1	12.A.1	12.A.2
12.A.3	12.B.2	12.B.3	12.B.4	12.B.6	13.A.1	13.A.2	13.A.3	13.A.4
13.A.5	13.A.6	13.A.7	13.A.8	13.A.9	13.A.10	13.A.11	13.A.12	13.A.13
13.A.14	13.A.15	13.A.16	13.A.17	13.A.18	13.A.19	13.A.20	13.A.21	13.A.22
13.A.23	13.B.1	13.B.2	13.B.3	13.B.4	13.B.5	13.C.1	13.C.2	13.D.1
13.D.2	13.D.3	14.A.1	15.A.1	15.A.3	15.A.4	15.A.5	15.A.7	15.A.8
15.A.9	15.A.10	15.A.11	15.A.12	15.A.13	15.A.14	15.A.15	15.A.16	15.A.17
15.A.18	15.A.19	15.A.20	15.A.21	15.A.22	15.A.23	15.A.24	15.A.26	15.A.27
15.A.28	15.B.1	15.B.2	15.B.3	15.B.4	15.B.5	15.B.6	15.C.1	15.D.1
16.A.2	16.A.3	16.A.4	16.A.5	16.B.1				

POLLUTION PREVENTION/WASTE MINIMIZATION OPPORTUNITIES
DESIGN CHECKLIST
Dated: 5-6-97

PROJECT NUMBER W-503

PROJECT TITLE TWRS PRIVATIZATION, PHASE 1 - ELECTRICAL SYSTEMS

PROJECT CONTRACTOR NHC PROJECT MANAGER TARIK CHOHO

DESIGN CONTRACTOR FDNW DESIGN AGENT FDNW

Opportunity Number 1.A.3

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.A.8

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.A.9

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.A.12

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 1.A.21

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.A.24

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 1.A.28

____ Will Consider
____ Will Not Consider
X Implemented
____ Not Applicable

Description: Field Data Acquisition Systems (FDAS) and Supervisory Control and Data Acquisition (SCADA) Systems are computer based.

Opportunity Number 1.A.30

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 1.B.1

X Will Consider
____ Will Not Consider
____ Implemented
____ Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 1.B.2 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 1.B.3 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.B.5 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during procurement of equipment and materials.

Opportunity Number 1.B.6 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.B.7 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 1.D.2 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 2.A.2 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during definitive design.

Opportunity Number 2.A.10 — Will Consider; Will Not Consider; X Implemented; Not Applicable

Description: To be finalized during definitive design.

Opportunity Number 2.A.14 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during definitive design and prior to initiation of construction activities.

Opportunity Number 2.D.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during definitive design and construction activities.

Opportunity Number 3.A.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during definitive design and construction activities.

Opportunity Number 3.B.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during definitive design and construction activities.

Opportunity Number 3.B.2 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 3.B.4 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 5.A.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 5.B.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 6.B.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 6.D.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be considered during construction activities.

Opportunity Number 7.A.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 7.B.2 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 7.B.3 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 8.A.1 — X Will Consider; Will Not Consider; Implemented; Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 8.A.3 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during definitive design.

Opportunity Number 8.B.2 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during definitive design.

Opportunity Number 9.A.5 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during definitive design.

Opportunity Number 9.A.6 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during construction activities.

Opportunity Number 9.A.7 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be included in performance and procurement specifications.

Opportunity Number 9.B.1 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during construction activities.

Opportunity Number 9.B.2 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during construction activities.

Opportunity Number 9.B.3 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during construction activities.

Opportunity Number 9.D.1 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during construction activities.

Opportunity Number 11.A.1 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during definitive design.

Opportunity Number 11.B.1 — X Will Consider / Will Not Consider / Implemented / Not Applicable

Description: To be considered during definitive design.

Opportunity Number 11.B.2

Description: To be considered during definitive design and procurement activities.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 12.B.1

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 12.B.5

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 15.A.2

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 15.A.6

Description: To be included in performance and procurement specifications.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 15.A.25

Description: To be considered during construction activities.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 16.A.1

Description: To be finalized during definitive design.

___ Will Consider
___ Will Not Consider
X Implemented
___ Not Applicable

Opportunity Number 16.A.6

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 16.A.7

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 16.A.8

Description: To be considered during definitive design.

X Will Consider
___ Will Not Consider
___ Implemented
___ Not Applicable

Opportunity Number 16.A.9

Description: To be finalized during definitive design.

	Will Consider
	Will Not Consider
X	Implemented
	Not Applicable

Opportunity Number 16.A.10

Description: To be considered during definitive design.

X	Will Consider
	Will Not Consider
	Implemented
	Not Applicable

Opportunity Number 16.A.11

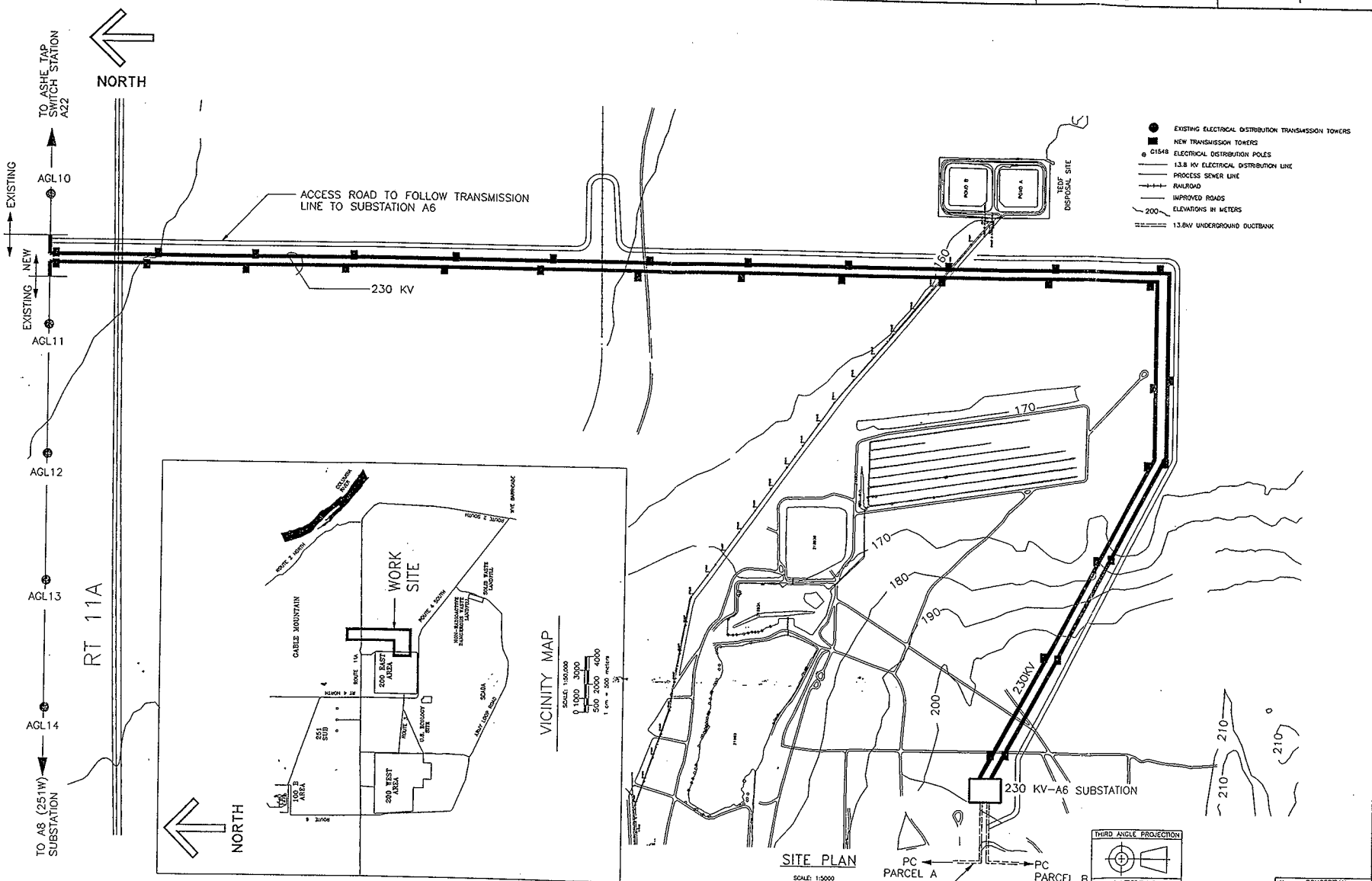
Description: To be finalized during definitive design.

	Will Consider
	Will Not Consider
X	Implemented
	Not Applicable

APPENDIX L

Sketches

ES-W503-01 Site Plan
ES-W503-02 System Phasing Diagram
ES-W503-03 Substation Ductbank
ES-W503-04 A6 Substation Arrangement
ES-W503-05 One-Line Substation
ES-W503-06 Meter Relay
ES-W503-07 Switchgear Building Layout
ES-W503-08 Electrical Substation
ES-W503-09 Cable Routing
ES-W503-10 Signal Block Diagram
ES-W503-11 Bill of Materials
ES-W503-12 Bill of Materials
ES-W503-13 Bill of Materials



DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		NEXT USED ON	

REVISIONS

CADFILE ESW50301 CADCODE WIN95:ACD2:12.0:SS

THIRD ANGLE PROJECTION

METRIC

CONCEPTUAL

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503CDR
SITE PLAN

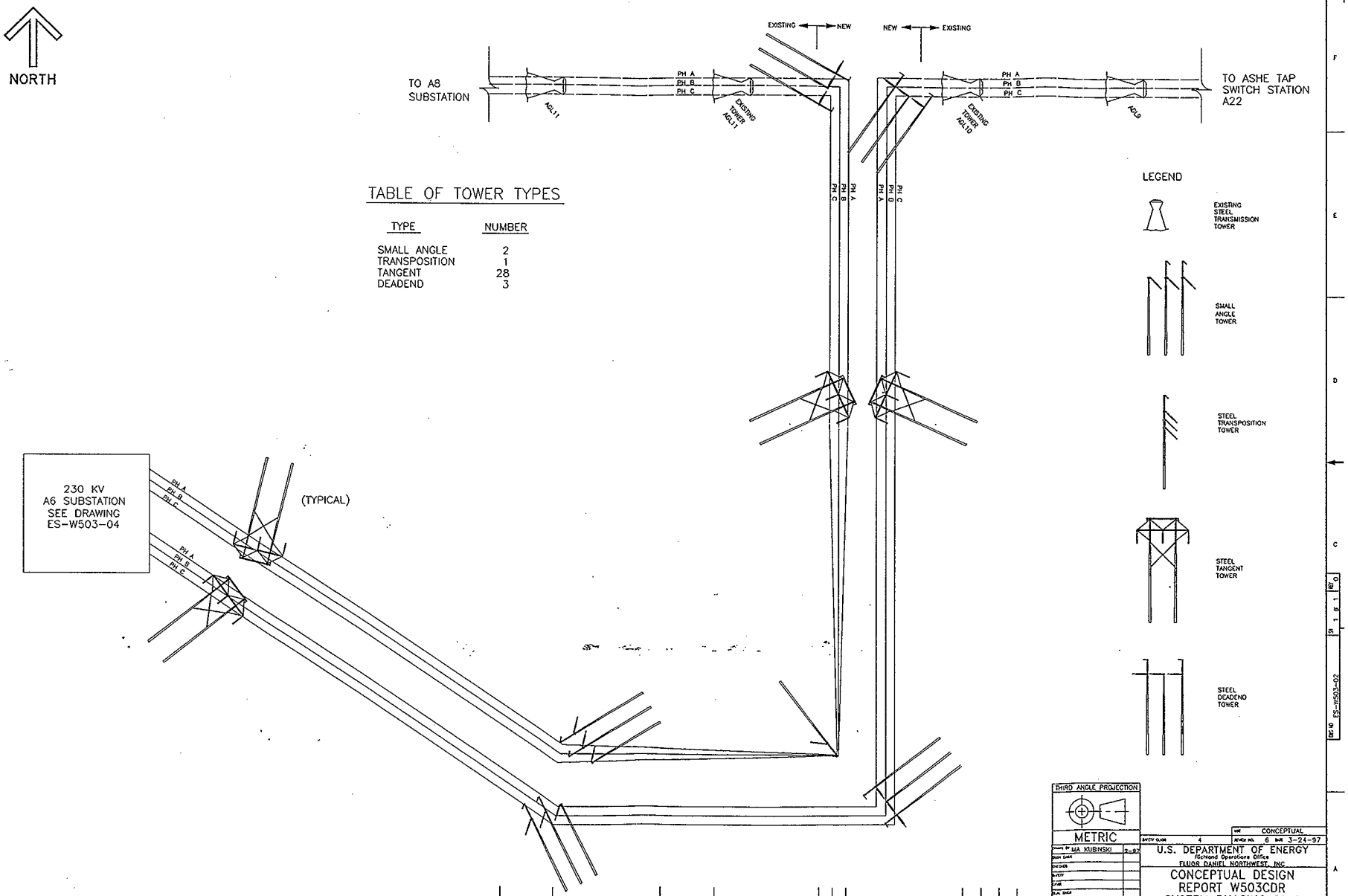
PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS

ES-W503-01 0

SIZE SHEET 1 OF 1

2 PLOT SCALE: 1=1

L-1



DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		NEXT USED ON	REFERENCES

REVISIONS

REV	DESCRIPTION	CHK

CADFILE ESW50302 CADCODE WIN95:ACD2:12.0:SS

THIRD ANGLE PROJECTION

METRIC

CONCEPTUAL

DRAWN BY MA KUBINSKI 2-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

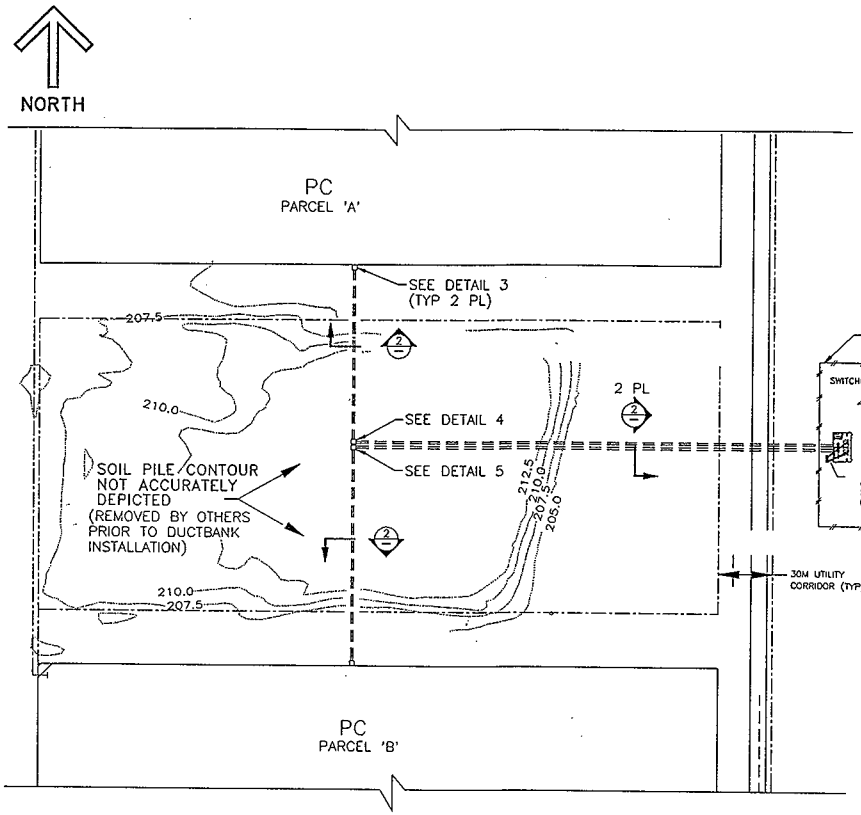
CONCEPTUAL DESIGN REPORT W503CDR
SYSTEM PHASING DIAG

PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS

DWG NO ES-W503-02 REV 0

SCALE SHOWN

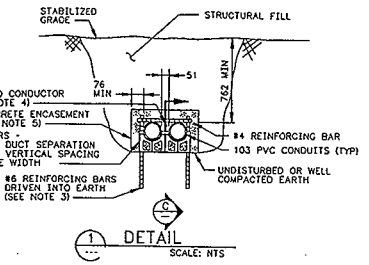
2 PLOT SCALE: 1=1



SITE PLAN

0 45 90 180

(METERS)



1 DETAIL
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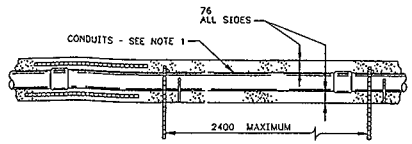
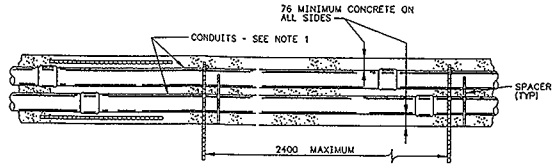
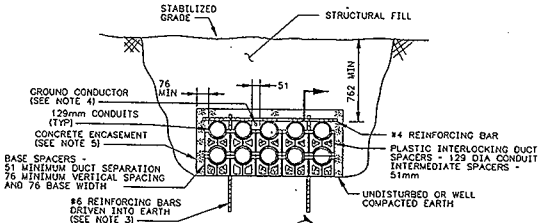


C 1 TIER DUCTBANK -TYP ELEVATION
SCALE: NTS



D 2 TIER DUCTBANK -TYP ELEVATION
SCALE: NTS



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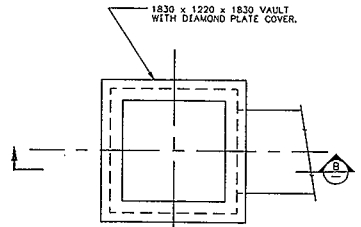
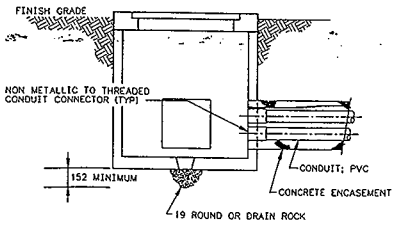
SCALE: NTS



3 DETAIL
SCALE: NONE

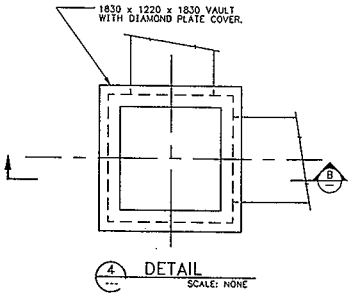


B SECTION
SCALE: NONE

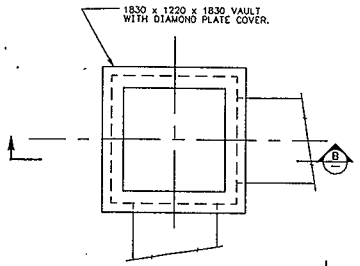
NOTES:

DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE. CONTOUR ARE SHOWN IN METERS.

1. CONDUIT FOR CONCRETE-ENCASED DUCTS SHALL BE SCHED 40 PVC.
2. DUCTS SHALL BE SLOPED A MINIMUM OF 76mm PER 30m TO DRAIN INTO A HANDHOLE OR CONDUIT DRAIN. ALL LOW POINTS SHALL BE DRAINED.
3. SPACING OF CONDUIT SUPPORTS SHALL NOT EXCEED 2438mm. LENGTH OF VERTICAL REINFORCING BARS SHALL BE AS REQUIRED FOR FIRM ANCHORAGE. THE HORIZONTAL REINFORCING BARS SHALL BE WIRE TIED OR WELDED TO THE VERTICAL DRIVEN BARS.
4. A GROUNDING CABLE SHALL BE INSTALLED IN ENCASEMENTS. THE CONDUCTOR SHALL BE #4/0 AWG COPPER. THIS CONDUCTOR SHALL BE USED FOR INTERCONNECTION OF GROUNDING GRIDS AND FOR GROUNDING OF CONDUIT RISERS, CABLE SHIELDS, ETC. IT SHALL NOT BE USED FOR THE EQUIPMENT GROUNDING CONDUCTOR.
5. CONCRETE ENCASED DUCT BANK SHALL EXTEND TO WITHIN APPROXIMATELY 25mm OF FOUNDATION WALL. INSTALL EXPANSION/DEFLECTION COUPLING (PER MANUFACTURER'S INSTALLATION INSTRUCTIONS) ON EACH CONDUIT, ONE END IN DUCT BANK CONCRETE THE OTHER END IN FOUNDATION WALL OPENING. EXTEND CONDUITS TO TRAY DROP OUT BUILDING STUB-UP LOCATIONS. GROUT FOUNDATION WALL OPENING AFTER CONDUIT INSTALLATION MAINTAINING THE APPROXIMATE 25mm SPACE FROM DUCT BANK END.



4 DETAIL
SCALE: NONE



5 DETAIL
SCALE: NONE

DRAWING TRACEABILITY LIST

DWG NO	TITLE	REF NUMBER	TITLE
		NEXT USED ON	

REFERENCES

REVISIONS

NO	BY	DESCRIPTION	DATE	CHK
5	MA KUBINSKI	CONCEPTUAL	3-27-97	

CADFILE ESW50303 CADCODE WIN95ACD2;12.0;SS

METRIC

2 PLOT SCALE: 1=1

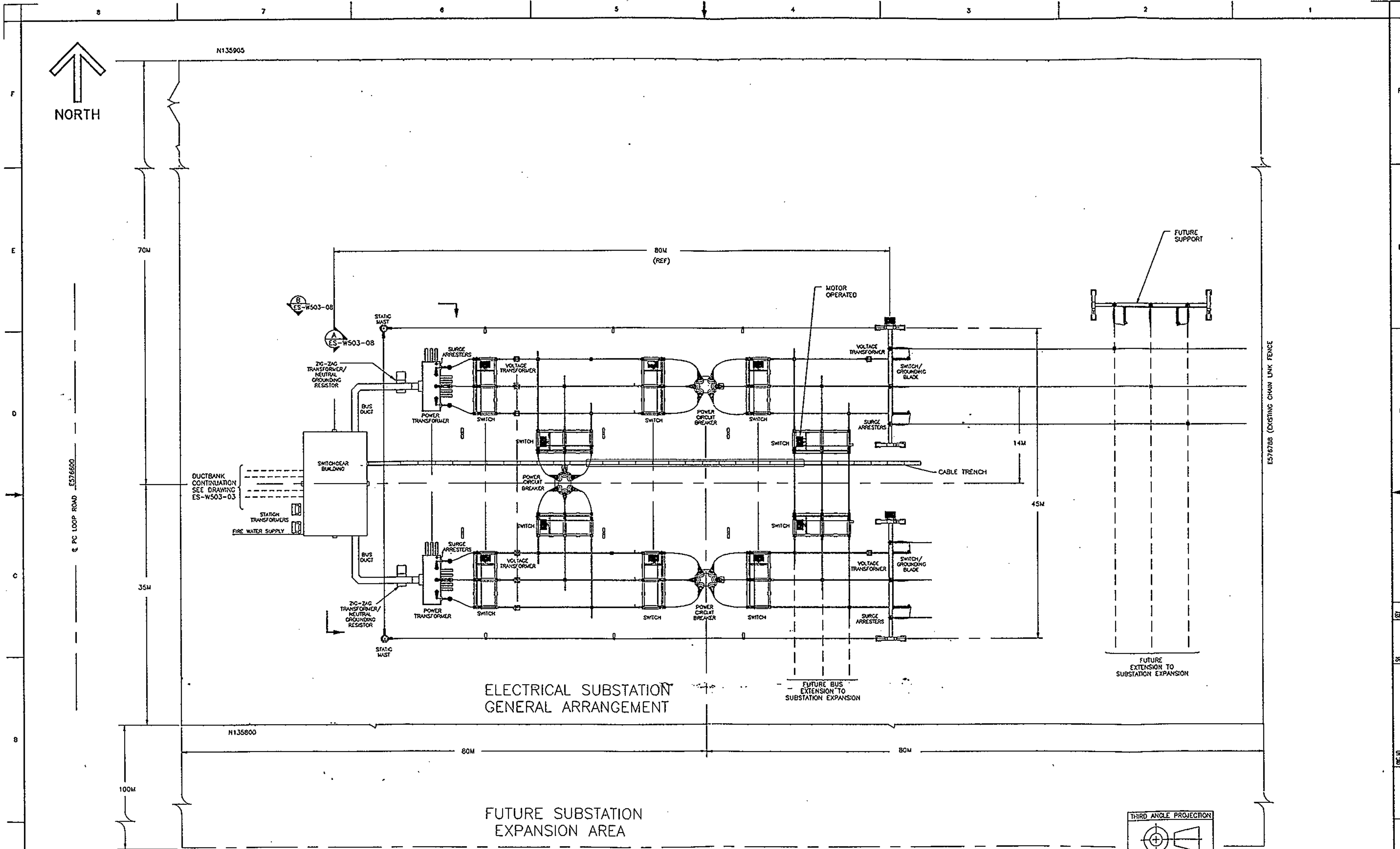
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC.

CONCEPTUAL DESIGN
REPORT W503CDR
SUBSTATION DUCTBANK

PROJECT TWRS PRIVATIZATION PHASE I ELEC POWER SYS

ES-W503-03 | 0

SCALE SHOWN



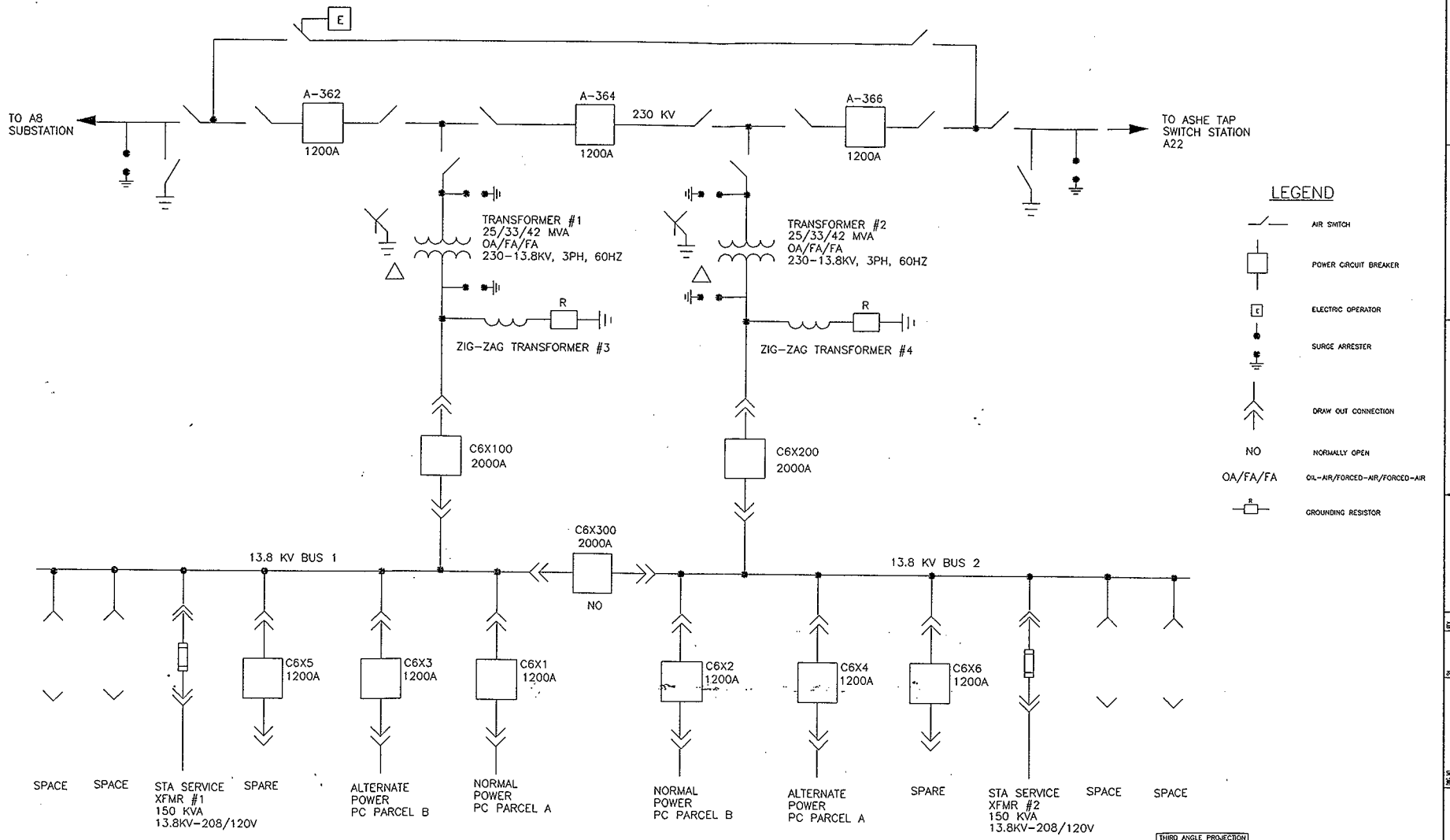
DWG NO	TITLE	REF NUMBER	TITLE
		HNF-SD-W-505-CDR-001	FIGURE 1
DRAWING TRACEABILITY LIST		NEXT USED ON	REFERENCES

REVISIONS
CADFILE ESW50304 CADCODE WIN95:ACD2:12.0:SS

THIRD ANGLE PROJECTION
METRIC
MA KUBINSKI 2-97

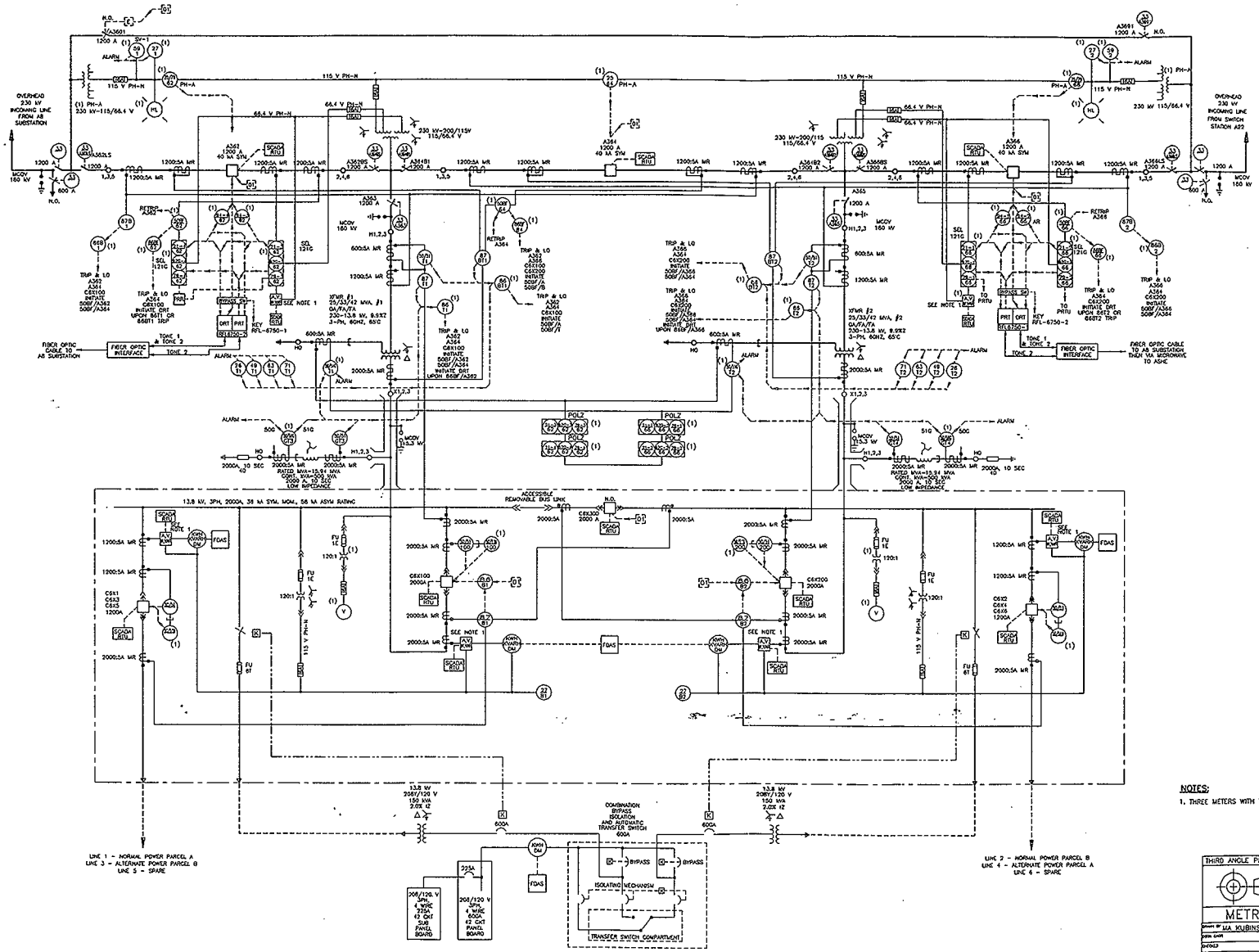
CONCEPTUAL
SAFETY CLASS 4 7 3-28-97
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC
CONCEPTUAL DESIGN
REPORT W503CDR
A6 SUBSTATION ARR
TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS
F ES-W503-04 0
SCALE SHOWN SHEET 1 of 1
PLOT SCALE: 1=1

L-4



THIRD ANGLE PROJECTION
METRIC
CONCEPTUAL
SAFETY CLASS 4 REVISION NO. 4 DATE 3-24-97
DRAWN BY MA KUBINSKI 2-97
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC
CONCEPTUAL DESIGN REPORT W503CDR
ONE-LINE SUBSTATION A6
PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS
DWG NO H-8002 REV NO ES-W503-05 0
SCALE SHOWN SHEET 1 OF 1

DWG NO TITLE
DRAWING TRACEABILITY LIST
REF NUMBER TITLE
REFERENCES
NEXT USED ON
REVISIONS
CADFILE ESW50305
CADCODE Win95:ACD2:12.0:SS
2 PLOT SCALE: 1=1



ONE LINE LEGEND	
SYMBOL	DESCRIPTION
A	AMMETER
E	ELECTRIC OPERATION
FDAS	FIELD DATA ACQUISITION SYSTEM
G	GROUND
kA	KILOAMP
KWHR	KILOWATT HOUR
KVA	KILOVOLT AMPERE
MR	MULTI RATIO
N	NEUTRAL
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
RTU	REMOTE TERMINAL UNIT
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
21,67G,79	SCHWEITZER RELAY MODEL NO. 121G-5 PHASE DISTANCE, GROUND DIRECTIONAL OVERCURRENT,& RECLOSING RELAY
V	VOLTMETER
KVARH	KILOVAR HOUR METER
VAR	VAR METER
W	WATTMETER
KWH	KILOWATT HOUR METER
KWHDM	KILOWATT HOUR DEMAND METER
01	CONTROL SWITCH
21	DISTANCE RELAY
25	SYNCHRONISM CHECK RELAY
26	HIGH OIL TEMPERATURE
27	UNDERVOLTAGE RELAY
33	POSITION SWITCH
49	HIGH WINDING TEMPERATURE
50	INSTANTANEOUS OVERCURRENT RELAY
50/51	AC TIME OVERCURRENT RELAY WITH INSTANTANEOUS OVERCURRENT
50N	INSTANTANEOUS NEUTRAL OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
51G	GROUND OVERCURRENT RELAY
51N	NEUTRAL OVERCURRENT RELAY
59	OVERVOLTAGE RELAY
63	TRANSFORMER SUDDEN PRESSURE RELAY
67	DIRECTIONAL OVERCURRENT RELAY
71	LOW OIL LEVEL
79	RECLOSING RELAY
86	LOCKOUT RELAY, MANUAL RESET
87B	BUS DIFFERENTIAL RELAY
87T	TRANSFORMER DIFFERENTIAL RELAY
94	TRIPPING RELAY

NOTES:

1. THREE METERS WITH TRANSDUCER OUTPUT.

LINE 1 - NORMAL POWER PARCEL A
LINE 3 - ALTERNATE POWER PARCEL B
LINE 5 - SPARE

LINE 2 - NORMAL POWER PARCEL B
LINE 4 - ALTERNATE POWER PARCEL A
LINE 6 - SPARE

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		NEXT USED ON	

REVISIONS					
NO	REV	DESCRIPTION	DATE	APPD	COMPANY
CADFILE	ESW50306	CADCODE	WIN95/ACD2;12.0/SS		

THIRD ANGLE PROJECTION

METRIC

DRAWN BY	MA KUBINSKI	2-97	
DESIGN LEAD			
CHECKED			
QUALITY			
APPD			
APPD			
ENG LEAD			
ENG APPD			
PLANT ENG			
COMPANY APPD			
APPD			
APPD			

STATUS	CONCEPTUAL
SAFETY CLASS	4
REVISION NO.	3
DATE	3-24-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC.

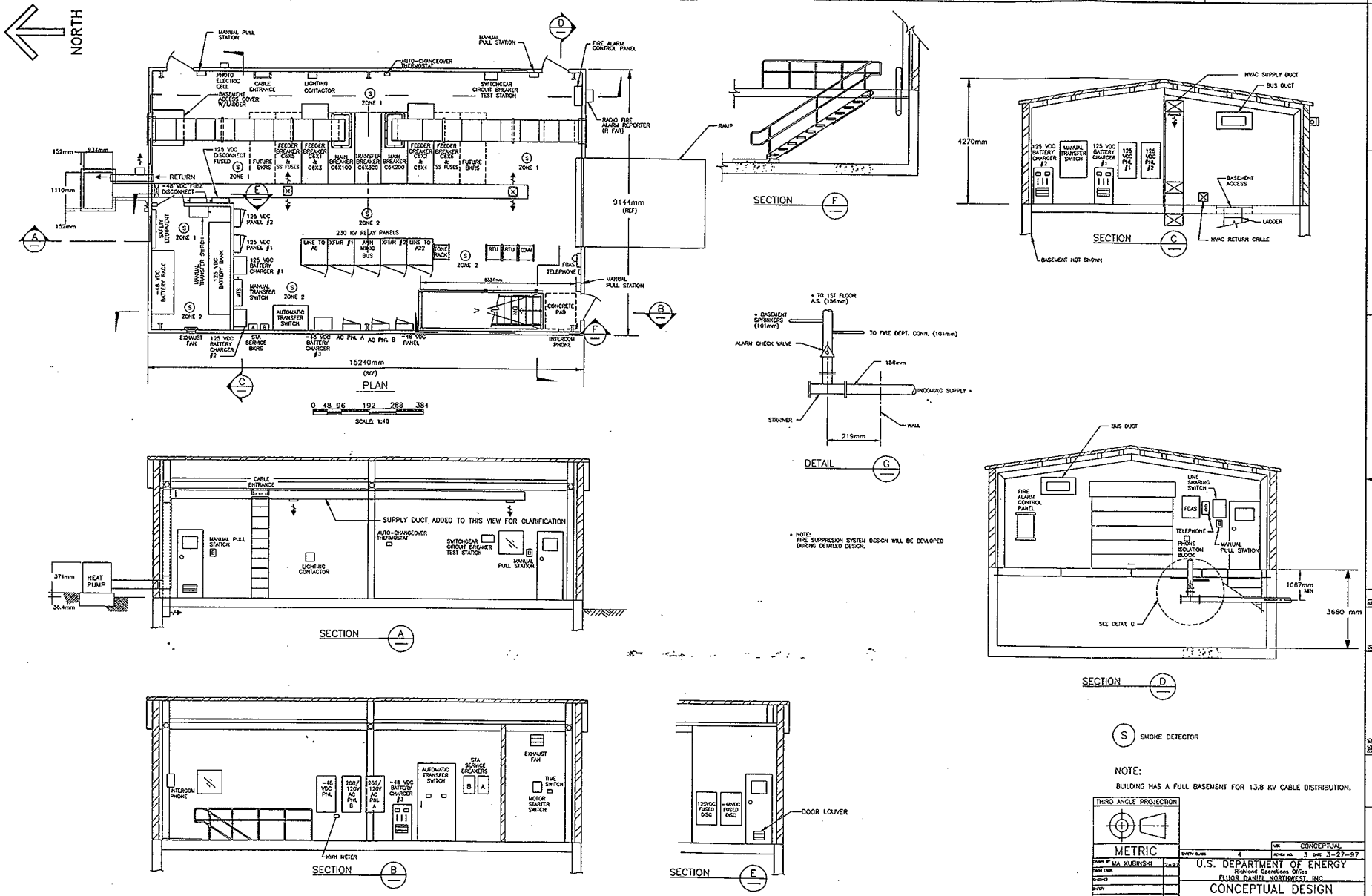
CONCEPTUAL DESIGN
REPORT W503CDR
METER RELAY

PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS

DWG NO	REV
ES-W503-06	0

SCALE SHOWN | SHEET 1 OF 1

2 PLOT SCALE: 1=1



THIRD ANGLE PROJECTION

METRIC

CONCEPTUAL

DRAWN BY MA KUBINSKI 2-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503CDR
SWGR BLDG LAYOUT

PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS

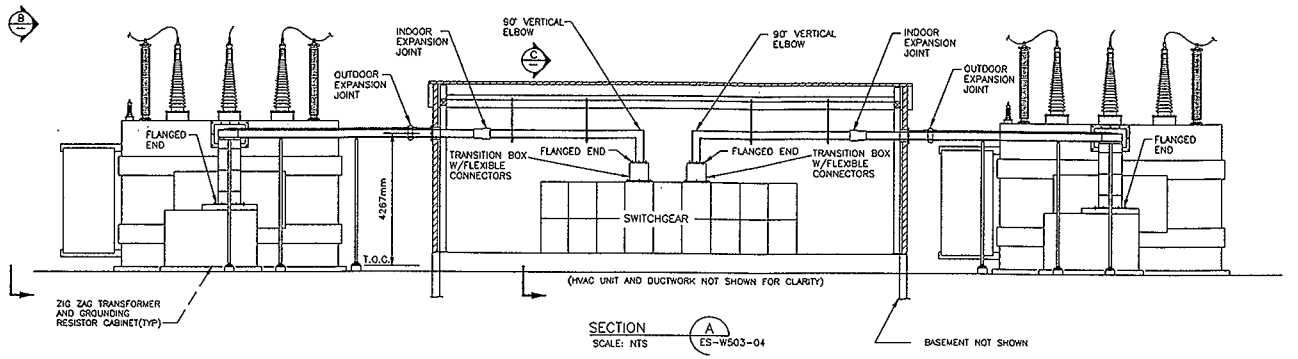
ES-W503-07 0

SCALE SHOWN

2 PLOT SCALE: 1=1

DWG NO | TITLE | REF NUMBER | TITLE
DRAWING TRACEABILITY LIST | REFERENCES | NEXT USED ON

REVISIONS | DESCRIPTION | CADFILE ESW503.07 | CADCODE WIN95ACD2-12.0:SS



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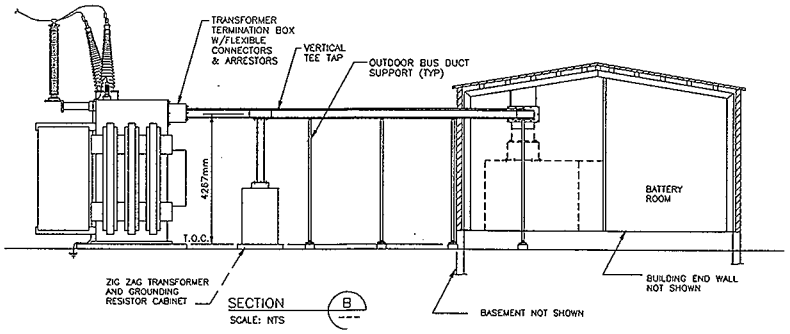
ES-W503-04



SECTION B
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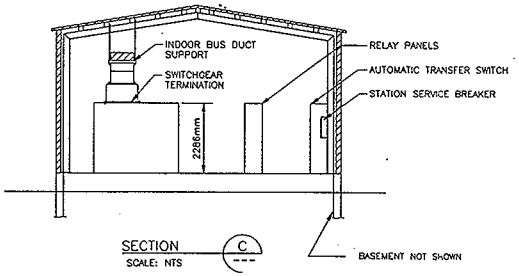


SECTION C
SCALE: NTS

SPACE	SPARE BKR C6X5	NORMAL POWER PC PARCEL A C6X1	MAIN BKR C6X100 CONTROL	TRANSFER BKR C6X300 CONTROL	MAIN BKR C6X200 CONTROL	NORMAL POWER PC PARCEL B C6X2	SPARE BKR C6X6	SPACE
SPACE	STA SERVICE #1 FUSES	ALTERNATE POWER PC PARCEL B C6X3	MAIN BKR C6X100	TRANSFER BKR C6X300	MAIN BKR C6X200	ALTERNATE POWER PC PARCEL A C6X4	STA SERVICE #2 FUSES	SPACE
	FEEDER BKRS					FEEDER BKRS		

13.8KV SWITCHGEAR LAYOUT

FRONT ELEVATION

NOTE:
BUILDING BASEMENT NOT SHOWN.

THIRD ANGLE PROJECTION

METRIC

DRAWN BY	MA KUBINSKI	2-97
DSGN ENGR		
CHECKED		
SAFETY		
QUAL		
QUAL ENGR		
APPROVED		
COMPANY		
APVD		
APVD		

USE: CONCEPTUAL
SAFETY CLASS: 4
REVISION NO. 3 DATE 3-28-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503DCR
ELEC SUBSTATION

PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS

DWG NO	TITLE	REV
	ES-W503-08	0

SCALE SHOWN | SHEET 1 OF 1

DRAWING TRACEABILITY LIST

REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

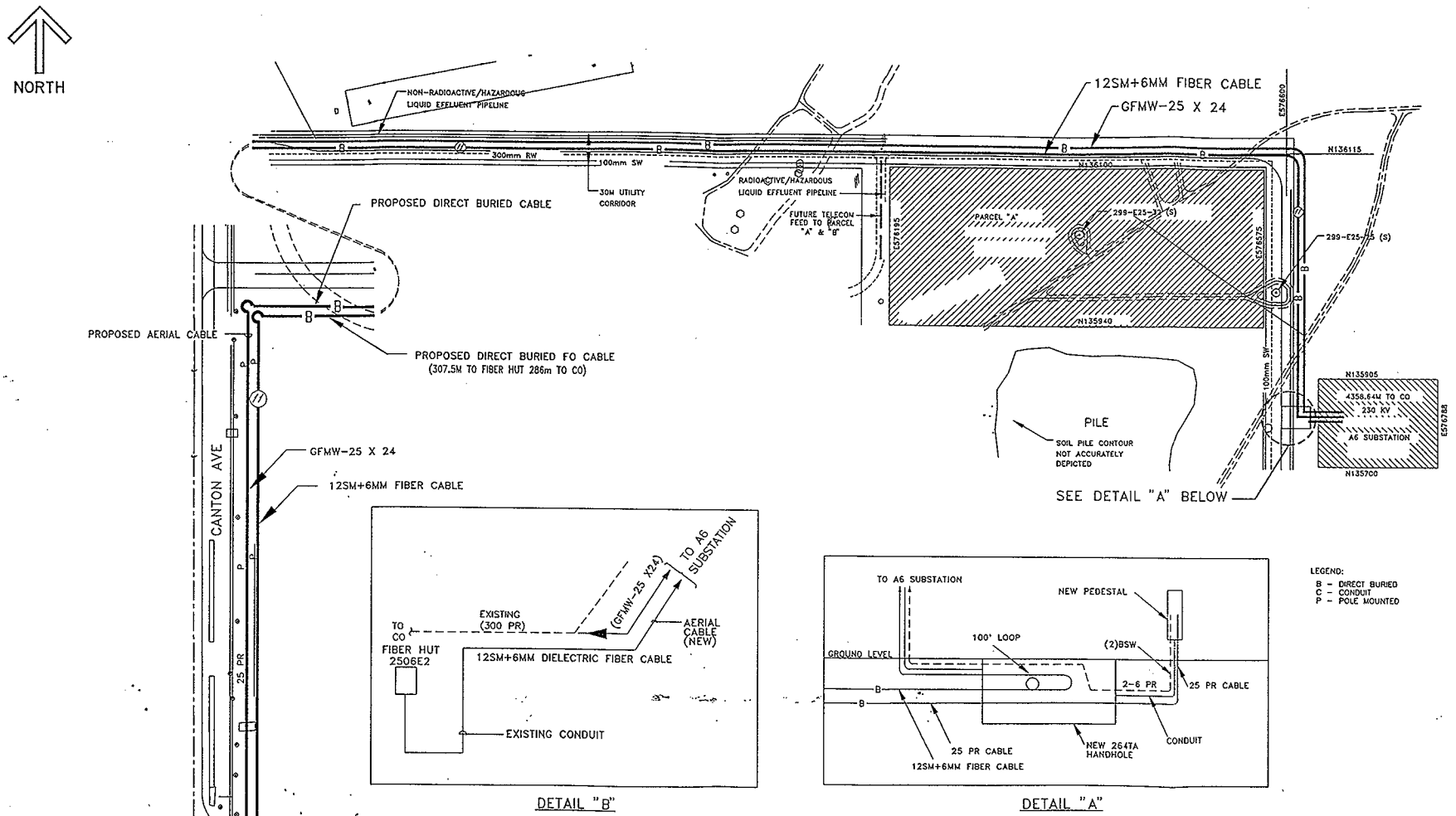
REVISIONS

NO	DESCRIPTION	CHK

CADFILE UNNAMED CADCODE WIN95:ACD2:12.0:SS

2 PLOT SCALE: 1=1

DOC NO ES-W503-08 REV 0



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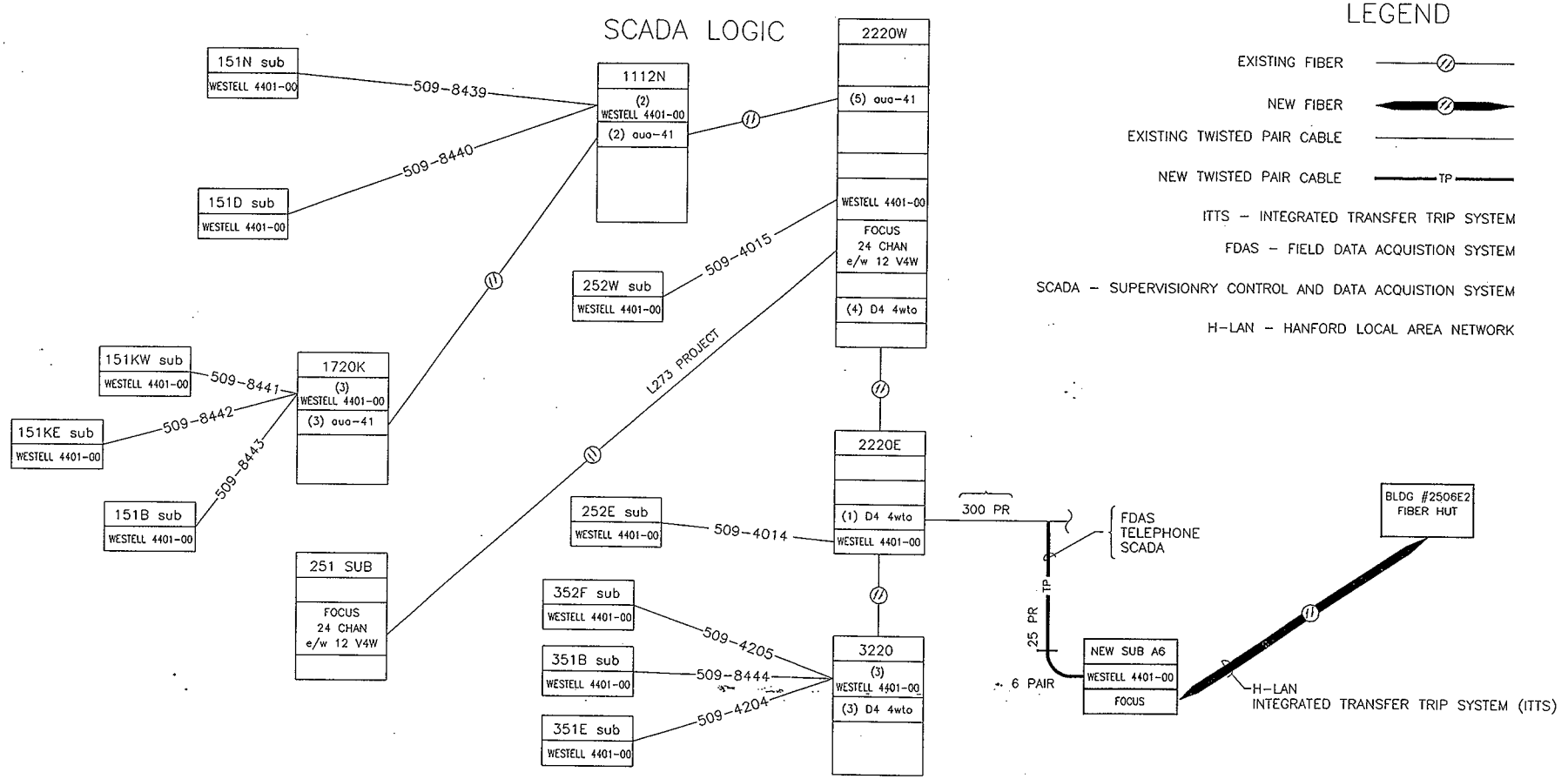
THIRD ANGLE PROJECTION
METRIC
SAFETY CLASS 4 WORK NO. 3 DATE 3-25-97
DRAWN BY MA KUBINSKI 2-97
CONCEPTUAL

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503CDR CABLE ROUTING

PROJECT TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS
DRAWING NO ES-W503-09 REV 0
SCALE SHOWN SHEET 1 OF 1
2 PLOT SCALE: 1=1



THIRD ANGLE PROJECTION
METRIC
CONCEPTUAL
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC
CONCEPTUAL DESIGN REPORT W503CDR
SIGNAL BLOCK DIAGRAM
TWRS PRIVATIZATION PHASE 1 ELEC POWER SYS
ES-W503-10 0
SHEET 1 OF 1
2 PLOT SCALE: 1=1
1-10
DRAWN BY LIA KUBINSKI 2-97
DWG NO TITLE
DRAWING TRACEABILITY LIST
REF NUMBER TITLE
REFERENCES
NEXT USED ON
REVISIONS
CADFILE ESW50310
CADCODE WIN95:ACD2:12.0:SS

ELECTRICIAL SWITCHGEAR BUILDING

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
APPROX 33528 mm (110')	EA.	CABLE TRAY: STRAIGHT 610mm (24") WIDE, 152mm(6") DEEP, 127mm (5") LOADING DEPTH GALVANIZED STEEL SOLID BOTTOM, 3658mm (12'-0") LENGTHS	REFER TO SPEC SECTION 16954
1	EA.	ELBOW: CABLE TRAY, OUTSIDE RISER 305mm (12") RADIUS GALVANIZED STEEL	REFER TO SPEC SECTION 16954
		BARRIER STRIPS: GALVANIZED STEEL, 152mm (6") LOAD DEPTH AS FOLLOWS:	REFER TO SPEC SECTION 16954
AS REQD		HORIZONTAL FITTING: 1829mm(6'-0") LENGTHS.	
AS REQD		STRAIGHT SECTION: 3658mm(12'-0") LENGTHS.	
1		VERTICAL ELBOW FOR OUTSIDE RISER ELBOW.	
5	EA.	FLAT ELBOW CABLE TRAY, RADIUS GALVANIZED STEEL.	REFER TO SPEC SECTION 16954
AS REQD	EA.	CONNECTORS: CABLE TRAY, GALVANIZED STEEL OUTSIDE RISER.	
AS REQD	EA.	CONNECTORS: CABLE TRAY, GALVANIZED STEEL TO JOIN STRAIGHT LENGTHS AND FLAT FITTINGS.	
1	EA.	BLIND END: CABLE TRAY.	
AS REQD	EA.	SPLINE BOLTS: GALVANIZED.	
AS REQD	EA.	NUTS: HEX HEAD WITH INTEGRAL LOCK WASHER, ELECTRO-GALVANIZED.	
AS REQD	EA.	CLAMPS: CABLE TRAY HOLD-DOWN	
AS REQD	EA.	VERTICAL SUPPORT BRACKET: BOLTING DIRECTLY TO TRAY, FOR SUPPORTING TRAY VERTICALLY UP A WALL.	
1	EA.	THERMOSTAT: WALL MOUNTED, TWO-STAGE AUTO-CHANGEOVER THERMOSTAT.	REFER TO SPEC SECTION 15500
1	EA.	HEAT PUMP: TOTAL COOLING CAPACITY OF 62,500 BTU/HR; HEATING CAPACITY OF 80,000 BTU/HR.	REFER TO SPEC SECTION 15500
1	EA.	TIME SWITCH: 120 V. 20 A RATED WITH 120 V TIMER MOTOR AND COIL 24 HOUR DIAL WITH TABS TO PERMIT 1 TO 48 OFF-ON OPERATIONS, 24 HOUR CYCLE.	DAYTON 2E026 OR EQUAL
1	EA.	LIGHTING CONTACTOR: 6 POLE, 30 A 480 V. NEMA ICS 2 MAGNETIC LIGHTING CONTACTOR, WITH 120V CONTROL COIL, ANSI/NEMA ICS 6, TYPE 1 ENCLOSURE AND ELECTRICALLY HELD CONTACTS.	WESTINGHOUSE A20251FA OR EQUAL
1	EA.	PHOTOCONTROL: 120 VAC, 1800 WATT OPERATING RANGE -57 C (-25 F)TO 93 C (+125') F.	DAYTON 2E331 OR EQUAL
1	EA.	MOTOR STARTER SWITCH: FRACTIONAL HORSEPOWER, MANUAL, 1 POLE 120 V. NEMA TYPE 1 GENERAL PURPOSE ENCLOSURE, SURFACE MOUNTING WITH PROVISIONS FOR 1 OVERLOAD ELEMENT, PROVIDE OVERLOAD ELEMENT SIZED PER MOTOR FULL LOAD CURRENT.	SQUARE D/CLASS 2510, TYPE FG-1 OR EQUAL

ELECTRICIAL SWITCHGEAR BUILDING

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
2	EA.	SAFETY DISCONNECT SWITCH: 600 VOLT, 3 PHASE, 3 POLE, SINGLE THROW, NON-FUSIBLE, 60 AMPS, RATED 15 HORSEPOWER AT 240 VOLTS, NEMA TYPE 3R RAIN PROOF ENCLOSURE, MINIMUM 10,000 AC.	SQUARE D/DU322RB OR EQUAL
10	EA.	EMERGENCY FLUORESCENT POWER PACK: TO PROVIDE 90 MINUTES OF POWER TO ONE FLUORSCENT TUBE FOR MINIMUM OF 20% LIGHT OUTPUT.	REFER TO SPEC SECTION 16969
50	EA.	FLUORESCENT LAMINAR: INDOOR INDUSTRIAL TYPE WITH METAL REFLECTOR, TWO 4'-0" T8 LAMPS, WITH ELECTRONIC BALLAST AND LAMPS, 22 GAUGE STEEL, 120 VAC.	REFER TO SPEC SECTION 16969
3	EA.	EXIT LIGHT: SELF-LUMINOUS, TRITIUM, NON-ELECTRIC, SINGLE-SIDED WITH STANDARD BLACK HOUSING AND GREEN FACE.	SERIES 700 OMNI-GLO SELF-LUMINOUS OR EQUAL
9	EA.	RECEPTACLE: DUPLEX CONVENIENCE, 125 V. 20 A. 3-WIRE SPECIFICATION GRADE, BACK AND SIDE WIRED, SELF-GROUNDED, BROWN NYLON FACE.	HUBBELL 5362 OR EQUAL
1	EA.	TOGGLE SWITCH: SINGLE POLE, SPECIFICATION GRADE APPROVED FOR 120 VAC OPERATION, 20 A BACK AND SIDE WIRED, BROWN HANDLE.	HUBBELL /1221 OR EQUAL
4	EA.	TOGGLE SWITCH: 3-WAY TYPE, SPECIFICATION GRADE APPROVED FOR 120 VAC OPERATION, 20 A BACK AND SIDE WIRED, BROWN HANDLE.	HUBBELL/1223 OR EQUAL
2	EA.	TOGGLE SWITCH: 4-WAY TYPE, SPECIFICATION GRADE APPROVED FOR 120 VAC OPERATION, 20 A BACK AND SIDE WIRED, BROWN HANDLE.	HUBBELL/1224 OR EQUAL
1	EA.	MANUAL TRANSFER SWITCH: 2 POLE, 250 VDC, 60 A UL NEMA TYPE 1 WITH AUXILIARY "C" CONTACT ELECTRICAL INTERLOCK 2 NO. AND 2 NC. CONTACTS INSTALLED IN BOTH "ON" POSITIONS.	SQUARE D/82252 E1 OR EQUAL
1	EA.	MANUAL TRANSFER SWITCH: 2 POLE, 250 VDC, 100 A, UL NEMA TYPE 1.	SQUARE D/82253 OR EQUAL
2	EA.	BATTERY CHARGER: 125 VDC OUTPUT, 208 V, 20 A, 3 PHASE INPUT.	REFER TO SPEC SECTION 16144
1	EA.	BATTERY: 125 VDC BANK SHALL INCLUDE 60 LEAD ACID CALCIUM CELLS WITH STANDARD RACK FOR SEISMIC ZONE 2B, 150 A HRS. 2.33 V PER CELL, BATTERY SHORT CIRCUIT RATING 1,600 A.	REFER TO SPEC SECTION 16144
1	EA.	BATTERY: -48 VDC BANK SHALL INCLUDE 23 LEAD-ACID-CALCIUM CELLS WITH STANDARD RACK FOR SEISMIC ZONE 2B, 2.33 V PER CELLS, 60 A HRS, BATTERY SHORT CIRCUIT RATING 1,600 A.	REFER TO SPEC SECTION 16144
1	EA.	BATTERY CHARGER: -48 V BATTERY, 3 PHASE INPUT, 208 v.	REFER TO SPEC SECTION 16144
2	EA.	RELAY PANEL: TRANSFORMER 1 AND TRANSFORMER 2 RELAY PROTECTION PANEL; 125 VDC, 120 VAC LIGHT & RECEPTACLE.	REFER TO SPEC SECTION 16974
2	EA.	RELAY PANEL: LINE A8 AND LINE A22 RELAY PROTECTION PANEL; 125 VDC, 120 VAC LIGHT AND RECEPTACLE.	REFER TO SPEC SECTION 16974
1	EA.	RELAY & ANNUNCIATOR MIMIC BUS CONTROL PANEL: 125 VDC, 120 VAC LIGHT & RECEPTACLE.	REFER TO SPEC SECTION 16974

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DRAWING TRACEABILITY LIST — DWG NO / TITLE / REF NUMBER / REFERENCES / NEXT USED ON

REVISIONS — CADFILE ESW50311 — CADCODE WIN95:ACO2:12.0:SS

VIR CONCEPTUAL — SAFETY CLASS 4 — REVISION NO. 2 — DATE 3-21-97

Drawn M.A. KUBINSKI 2-92

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503CDR
BILL OF MATERIALS

PROJECT TWRS PRIVATIZATION PHASE I ELEC POWER SYS

CS 8888 — DRAWING NO. ES-W503-11 — REV NO. 0

SCALE NONE — SHEET 1 OF 1

2 PLOT SCALE: 1=1

ES-W503-11 REV 0

ELECTRICIAL SWITCHGEAR BUILDING

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
1	EA.	SWITCHGEAR: 2000 A, 36 kA SYMMETRICAL RATING, 13.8 kV, METALCLAD, FREE STANDING, VERTICAL DEAD-FRONT STRUCTURE, INDOOR TYPE WITH TWO INCOMING BREAKERS BUS TIE BREAKER, SIX FREEDER BREAKERS, FOUR BREAKER SPACES.	REFER TO SPEC SECTION 16346
1	EA.	FUSE DISCONNECT SWITCH: 250 VDC, 200 A FUSED AT 100 A.	SQUARE D H224N
2	EA.	FUSE: 100 A, ONE-TIME, GENERAL PURPOSE INTERRUPTING RATING 10.000 A.	BUSSMAN NON-100 OR EQUAL
1	EA.	AUTOMATIC TRANSFER SWITCH: NEMA ICS 2, ELECTRICALLY OPERATED MECHANICALLY HELD TRANSFER SWITCH, 240 V, 3 PHASE, FOUR WIRE, 60 HZ 600 A.	REFER TO SPEC SECTION 16981
2	EA.	ENCLOSED CIRCUIT BREAKER: 600 A MOLDED CASE CIRCUIT BREAKERS NEMA AB 1, TYPE 1, STANDARD ENAMEL FINISH, GRAY COLOR. PROVIDE PAD LOCKABLE ENCLOSURE FOR INTERLOCK WITH 13.8 kV NO-LOAD DRAWOUT FUSE COMPARTMENT	REFER TO SPEC SECTION 16967
2	EA.	RTU: 125 VDC REMOTE TERMINAL UNIT CONTAINING INDICATION, CONTROL AND ANALOG POINTS.	ILEX
1	EA.	FDAS: FIELD DATA ACQUISITION SYSTEM.	
1	EA.	TONE EQUIPMENT RACK: STANDARD 483mm(19") ALUMINUM RACK	REFER TO SPEC SECTION 16984
1	EA.	COMMUNICATIONS RACK: STANDARD 483mm(19") RACK	REFER TO SPEC SECTION 16987
1	EA.	BATTERY SAFETY EQUIPMENT: INCLUDES GOGGLES, GLOVES APRONS, OVERSHOES, WATER FACILITY.	PER SPEC SECTION 16144
1	EA.	EXHAUST FAN: 1/20 HP, 120 V, 1050 RPM, WITH MOTORIZED LOUVER AND MESH SCREEN.	COOK 10SP150 OR EQUAL
1	EA.	REAR: RADIO FIRE ALARM BOX.	
1	EA.	PANEL BOARD: 250 VDC, 100 A, 1 PHASE, 2 WIRE, 12 CIRCUIT, 100 A 10,000 AIC MAIN BREAKER, NEMA 1 ENCLOSURE, COMPLETE WITH INTERIOR SURFACE MOUNTED COVER AND ENCLOSURE. PANEL SHALL INCLUDE THE FOLLOWING BRANCH CIRCUIT BREAKERS.	REFER TO SPEC SECTION 16966
12	EA.	CIRCUIT BREAKER: 2 POLE, 20 A, 250 VDC, 10,000 AIC.	SQUARE D/FA26020 OR EQUAL
1	EA.	TELEPHONE: STANDARD WALL MOUNT TELEPHONE, SLIM LINE TOUCH TONE WITH, 25' COILED CORD.	CONTELO OR EQUAL
1	EA.	LINE SHARING SWITCH: 4 PORT, 120 VAC CLASS 2, 400 mA POWER JACK.	TELTONE MODEL #M394 OR EQUAL
1	EA.	FUSE DISCONNECT SWITCH: 250 VDC 30 A FUSED AT 5 A.	SQUARE D H221N
2	EA.	FUSE 5 A, ONE-TIME, GENERAL PURPOSE, INTERRUPTING RATED 10,000 A.	BUSSMAN NON-100 OR EQUAL
2	EA.	PANELBOARD: 250 VDC, 225 A, 1 PHASE, 2 WIRE, 42 CIRCUIT, 2 POLE, 225 A 10,000 AIC MAIN BREAKER, 2 POLE SUB-FEED LUGS, NEMA 1 ENCLOSURE, COMPLETE WITH INTERIOR SURFACE MOUNT COVER AND ENCLOSURE. THE TOTAL NUMBER OF BRANCH CIRCUIT BREAKERS REQ ARE:	REFER TO SPEC SECTION 16966
16	EA.	CIRCUIT BREAKER: 2 POLE, 30 A, 250 VDC, 10,000 AIC.	SQUARE D/FA26030 OR EQUAL
24	EA.	CIRCUIT BREAKER: 2 POLE, 20 A, 250 VDC, 10,000 AIC.	SQUARE D/FA26020 OR EQUAL

ELECTRICIAL SWITCHGEAR BUILDING

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
1	EA.	PANEL BOARD: 208/120 V, THREE PHASE, 600 A, MLO 20,000 AIC MIN, 42 CIRCUIT SOLID NEUTRAL PANEL SHALL BE COMPLETE INCLUDING INTERIOR, BOX COVER AND GROUND BAR. PANEL SHALL INCLUDE THE FOLLOWING BRANCH CIRCUIT BREAKERS.	REFER TO SPEC SECTION 16966
21	EA.	CIRCUIT BREAKER: 1 POLE, 20 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B140 VH OR EQUAL
2	EA.	CIRCUIT BREAKER: 2 POLE, 20 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B220 VH OR EQUAL
1	EA.	CIRCUIT BREAKER: 2 POLE, 30 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B230 VH OR EQUAL
2	EA.	CIRCUIT BREAKER: 3 POLE, 30 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B330 VH OR EQUAL
2	EA.	CIRCUIT BREAKER: 3 POLE, 100 A, 22,000 AIC BOLT IN TYPE. 120 V SHUNT TRIP.	SQUARE D/00B360 VH OR EQUAL
1	EA.	CIRCUIT BREAKER: 3 POLE, 200 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B200 VH OR EQUAL
1	EA.	TELEPHONE ISOLATION BLOCK: STANDARD RJ11C JACK CAPABLE OF SUPPORTING UP TO 6 WIRES.	
1	EA.	PULL BOX RISE COVER: FABRICATED BY SELLER.	
8	EA.	SMOKE DETECTOR: PHOTOELECTRIC, CROSS ZONED	CHEMETRON FIRE SYSTEMS 7-010-0450 OR EQUAL REFER TO SPEC SECTION 16721
3	EA.	MANUAL PULL STATION: (FIRE)	CHEMETRON FIRE SYSTEMS 2-010-0143 OR EQUAL REFER TO SPEC SECTION 16721
1	EA.	PANEL BOARD: 208/120 V, THREE PHASE, 225 A, MLO 22,000 AIC MIN, 42 CIRCUIT SOLID NEUTRAL PANEL SHALL BE COMPLETE INCLUDING INTERIOR, BOX COVER AND GROUND BAR. PANEL SHALL INCLUDE THE FOLLOWING BRANCH CIRCUIT BREAKERS.	REFER TO SPEC SECTION 16966
1	EA.	CIRCUIT BREAKER: 1 POLE, 20 A, 22,000 AIC BOLT IN TYPE. 120 V SHUNT TRIP.	SQUARE D/00B115 VH OR EQUAL
22	EA.	CIRCUIT BREAKER: 1 POLE, 20 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B140 VH OR EQUAL
2	EA.	CIRCUIT BREAKER: 2 POLE, 20 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B220 VH OR EQUAL
3	EA.	CIRCUIT BREAKER: 2 POLE, 30 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B230 VH OR EQUAL
1	EA.	CIRCUIT BREAKER: 3 POLE, 20 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B320 VH OR EQUAL
2	EA.	CIRCUIT BREAKER: 3 POLE, 40 A, 22,000 AIC BOLT IN TYPE.	SQUARE D/00B340 VH OR EQUAL

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DRAWING TRACEABILITY LIST — DWG NO | TITLE

REFERENCES — REF NUMBER | TITLE | NEXT USED ON

REVISIONS — VPS | REV NO | DESCRIPTION | REV DAT | DWN | CHKD | CADFILE ESW50312 | CAOCODE WIN95;ACD2;12.0;SS

CONCEPTUAL — SAFETY CLASS 4 — REVISION NO. 2 DATE 3-21-97

DRAWN BY MA KUBINSKI 2-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC.

CONCEPTUAL DESIGN REPORT W503CDR
BILL OF MATERIALS

PROJECT TWRS PRIVATIZATION PHASE I ELEC POWER SYS
A/E JOB NO 8888 | BECHTEL JOB NO | DOE NO ES-W503-12 | REV 0
SCALE NONE | SIZE | SHEET 1 OF 1

2 PLOT SCALE: 1=1

ELECTRICAL SUBSTATION

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
3	EA.	POWER CIRCUIT BREAKER: 242 kV, 1050 kV BIL, 1200 AMP CONTINUOUS, 40 kA INTERRUPTING, SF6 INTERRUPTING MEDIUM, OUTDOOR FRAME MOUNTED.	REFER TO SPEC SECTION 16347
10	EA.	HIGH VOLTAGE SWITCH: 230 kV, 1050 kV BIL, 1200 AMP CONTINUOUS, VERTICAL BREAK, HORIZONTAL MOUNT, GROUP OPERATED, 3-PHASE WITH AUXILIARY CONTACT.	REFER TO SPEC SECTION 16963
20	EA.	INSULATOR: 230 kV, 1050 kV BIL, STATION POST, 1250 POUND CANTILEVER STRENGTH, 127mm(5") BOLT CIRCLE 2337mm(92") HEIGHT, GRAY GLAZE, PORCELAIN CONSTRUCTION, TR-316.	LAPP 50439-70 OR EQUAL
6	EA.	SURGE ARRESTER: 144 kV, METAL OXIDE, STATION CLASS, GRAY GLAZE, METAL TOP.	OHIO BRASS VN-217744 OR EQUAL
8	EA.	VOLTAGE TRANSFORMER: SINGLE PHASE, SINGLE BUSHING, 60 HERTZ, OIL FILLED, 900 kV BIL, 230 KV-115/66.4 VOLTS.	REFER TO SPEC SECTION 16986
9	EA.	TERMINAL: ALUMINUM INTERNAL WELDMENT TYPE, TUBE TO CENTER-FORMED FLAT, 127mm(5") SCH 40 IPS TO 4-HOLE PAD.	ANDERSON WSTFX-50-D-CF OR EQUAL
33	EA.	TERMINAL: ALUMINUM WELDMENT EXPANSION, TUBE TO CENTER FORMED FLAT, 127mm(5") SCH 40 IPS TO 4-HOLE PAD.	ANDERSON WFTF-50D OR EQUAL
20	EA.	BUS SUPPORT: ALUMINUM WELDMENT TYPE, TUBE TO INSULATOR, 127mm(5") IPS TO 127mm(5") BOLT CIRCLE, SLIP OR FIXED.	ANDERSON WTH-50-5 OR EQUAL
12	EA.	TEE: ALUMINUM WELDMENT TYPE, MAIN TUBE TO TAP TUBES, 127mm(5") IPS TO 76mm(3") IPS, 15°.	ANDERSON WTT2-15-5030 OR EQUAL
24	EA.	TEE: ALUMINUM WELDMENT TYPE, TUBE TO TUBE, 76mm(3") IPS TO 76mm(3") IPS, 15°.	ANDERSON WTT-15-3030 OR EQUAL
24	EA.	TEE: ALUMINUM WELDMENT TYPE, TUBE TO TUBE, 127mm(5") IPS TO 76mm(3") IPS, 15°.	ANDERSON WTT-15-5030 OR EQUAL
8	EA.	TEE: ALUMINUM WELDMENT TYPE, TUBE TO FLAT, 127mm(5") IPS TO 4-HOLE PAD.	ANDERSON WTTFR-30-60-D OR EQUAL
72	EA.	TERMINAL: COMPRESSION FITTING, CABLE TO FLAT, 1272 ACSR TO 4-HOLE PAD.	ANDERSON CCL-1382-D OR EQUAL
12	EA.	COUPLER: ALUMINUM WELDMENT TYPE, TUBE TO TUBE, 127mm(5") IPS TO 127mm(5") IPS.	ANDERSON WCI-5050 OR EQUAL
6	EA.	GROUNDING STUD: ALUMINUM WELDMENT, STUD TO TUBING, 127mm(5") IPS.	ANDERSON WTESTR-30-60 OR EQUAL
12	EA.	END PLUG: ALUMINUM WELDMENT INTERNAL END PLUG, 127mm(5") IPS.	ANDERSON WEB-50 OR EQUAL
6	EA.	TEE: COMPRESSION TYPE, 1272 ACSR TO 4-HOLE PAD.	ANDERSON CTCF-1382-D OR EQUAL
AS REQD	FT.	BUS TUBE: ALUMINUM, SCHEDULE 40, 127mm(5") IPS, 6063-T6 ALLOY.	

ELECTRICAL SUBSTATION

BILL OF MATERIALS

QUAN	UNITS	DESCRIPTION	MFG/CAT. NO.
AS REQD	FT.	BUS TUBE: ALUMINUM, SCHEDULE 40, 76mm(3") IPS, 6063-T6 ALLOY.	
AS REQD	FT.	CONDUCTOR: 1272 kcmil, ACSR 45/7 STRAND, CODE WORD "BITTERN".	
AS REQD	FT.	CONDUCTOR: 477 kcmil, AAC, 19 STRAND, CODE WORD "COSMOS".	
2	EA.	POWER TRANSFORMER: 230-13.8 kV, 25/33/42 MVA, OA/FA/FA, 3-PHASE, WYE-DELTA, OIL FILLED, FURNISHED, WITH HIGH AND LOW VOLTAGE SURGE ARRESTERS.	REFER TO SPEC SECTION 16331
6	EA.	SUSPENSION INSULATOR: POLYMER TYPE, 2187mm(86.1") LENGTH, 25,000# ROUTINE TEST LOAD, Y-CLEVIS-BALL.	OHIO BRASS 232022-3101 OR EQUAL
6	EA.	DEADEND: COMPRESSION, 1272 kcmil ACSR, WITH VERTICAL EYE, SINGLE 4-HOLE TERMINAL, STEEL EYE.	ALCOA VES153 OR EQUAL
6	EA.	PARALLEL CONNECTOR: ALUMINUM U-BOLT, 1272 kcmil ACSR TO 477 AAC.	ANDERSON LCU-700-85 OR EQUAL
22	EA.	TERMINAL: COMPRESSION TYPE, CABLE TO FLAT, 477 AAC TO 4-HOLE PAD.	ANDERSON CCL-814-C OR EQUAL
2	EA.	HIGH VOLTAGE SWITCH WITH GROUNDING BLADE: 230 kV, 1050 kV BIL, 1200 AMP CONTINUOUS, VERTICAL MOUNT WITH GROUNDING BLADE AND TWO WORM GEAR OPERATORS, AUXILIARY CONTACTS.	REFER TO SPEC SECTION 16963
1	EA.	HIGH VOLTAGE SWITCH: 230 kV, 1050 kV BIL, 1200 AMP CONTINUOUS, VERTICAL BREAK, HORIZONTAL MOUNT WITH MOTOR OPERATOR.	REFER TO SPEC SECTION 16963
6	EA.	SOCKET Y-CLEVIS: DUCTILE IRON, HOT DIP GALVANIZED, 50,000# ULTIMATE STRENGTH.	ANDERSON SYC-50 OR EQUAL
4	EA.	DEADEND: COMPRESSION, 10mm(3/8") EHS STEEL WITH VERTICAL EYE, BOLTED JUMPER CLAMP.	ALCOA E4514.12-J OR EQUAL
4	EA.	Y-CLEVIS-CLEVIS: DUCTIVE IRON, HOT DIP GALVANIZED, 30,000# ULTIMATE STRENGTH, 90°.	ANDERSON YCC-30-90 OR EQUAL
2	EA.	STATION SERVICE TRANSFORMER: 13.8 kV DELTA-208Y/120 VOLT 4-WIRE, THREE PHASE, 150KVA LIQUID-FILLED, PAD MONTED, DEAD FRONT CONSTRUCTION.	REFER TO SPEC SECTION 16962
2	EA.	ZIG ZAG TRANSFORMER & GROUNDING RESISTOR: RATED MVA=15.94, CONTINOUS kva=500, LOW IMPEDENCE	REFER TO SPEC SECTION 16975
1	EA.	MOTOR OPERATOR: 125 VDC, LOCAL/REMOTE CONTROLLED, PROVISIONS FOR MANUAL OPERATIONS.	REFER TO SPEC SECTION 16963
AS REQD	FT	ALUMINUM BUS BAR: 5101-T61 ALLOY, 57% IACS CONDUCTIVITY, 10mm(3/8") x 1524mm(5'). CUT LENGTH TO FIT.	

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DWG NO / TITLE: DRAWING TRACEABILITY LIST | REF NUMBER / TITLE: REFERENCES | NEXT USED ON | REVISIONS | CADFILE: E3W503I3 | CADCODE: W503/ACD2;12.0;SS

CONCEPTUAL

4 | 2 | 2-21-97

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
FLUOR DANIEL NORTHWEST, INC

CONCEPTUAL DESIGN REPORT W503CDR
BILL OF MATERIALS
TWRS PRIVATIZATION PHASE I ELEC POWER SYS

ES-W503-13 | 0

2 PLOT SCALE: 1=1

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