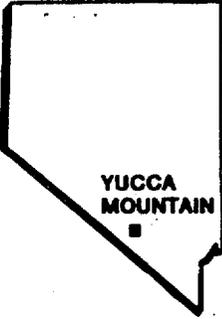


U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN PROJECT

YUCCA MOUNTAIN PROJECT EXPLORATORY SHAFT FACILITY TITLE I DESIGN

SUMMARY REPORT

VOLUME 3A

OUTLINE SPECIFICATIONS



**UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE**

CHAPTER 16

OUTLINE SPECIFICATIONS

The outline specifications presented in this section represent the deliverables for Title I design. Comments from the Title I 100 Percent Technical Assessment Review, documented in the "Yucca Mountain Project Exploratory Shaft Facility Title I 100 Percent Technical Assessment Review, Review Record Memorandum," have been incorporated in the specifications except as noted herein.

The following list of comments by category and number represent those comments deferred to Title II design. The text of the comments and associated resolutions can be found in the Review Record Memorandum.

COMMENTS DEFERRED TO TITLE II DESIGN

Fenix and Scisson

Category: General-General

There are no comments in this category deferred to Title II design.

Category: F&S General

Comment Nos. 11 and 12

Category: Civil

There are no comments in this category regarding outline specifications.

Category: Shaft

Comment Nos. 159

Category: Ventilation

There are no comments in this category regarding outline specifications.

Category: Piping and Instrumentation

There are no comments in this category regarding outline specifications.

Category: Electrical

Comment No. 20

Category: Mechanical

Comment Nos. 1, 5, 6, 7, 8, 10 and 14

Category: Mining

Comment Nos. 77, 80, 116, 121, 131, 134, 135, 139, 140, 141 and 147

Holmes and Narver

Category: General-General

Comment Nos. 39, 40, 42 and 43

Category: H&N General

Comment Nos. 28, 33, 36, 37, 38, 39, 40, 42, and 43

Category: Civil

Comment Nos. 172, 173, 174, 175, 176, 177, 178, 179, 182, 185,
187, 189, 192, 195, 196, 197, 198, 199, 200, 201, 202, 203,
204, 205, 206, 209, 210, 212, 215, 217, 218, 219, 220, 221,
222, 225, 226, 229, 230, 231, 232, 233, 234, 235, 236 and 237

Category: Architectural

There are no comments in this category regarding outline specifications.

Category: Architectural/Structural

Comment Nos. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31,
32, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48,
49, 50, 52, 53, 54, 56, 58, 63 and 64

Category: Mechanical/Fire Protection

Comment Nos. 93, 94, 95, 96, 97 and 98

Category: Electrical/Communications

Comment Nos. 67 and 69

F&S

**YUCCA MOUNTAIN PROJECT EXPLORATORY SHAFT FACILITY
TITLE I DESIGN SUMMARY REPORT**

TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1600

Q.A. LEVEL N/A

TITLE: GENERAL REQUIREMENTS - ELECTRICAL
 DIVISION 16 - MECHANICAL
 SUBDIVISION - BASIC ELECTRICAL REQUIREMENTS

APPROVED BY *J. Greiner* DATE 11/29/88
 APPROVED BY *B. R. E. [unclear]* DATE 12-7-88
 APPROVED BY *[unclear]* DATE 12-7-88

REVISION DESCRIPTION	SECT. OR PAGES	REV. BY	APPROVED BY	REV. NO.	DATE
Revised to add Table of Contents and D.R.L.	2 & 5	<i>MB</i>	SEE ABOVE	1	12-7-88 12-1-88 12-5-88

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SECTION 16XXX
GENERAL REQUIREMENTS - ELECTRICAL

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the basic informational requirements and methods to provide complete and operable electrical utility systems, as described in the following Division 16 sections.

1.1.2 This section applies to all sections of Division 16 except as specified otherwise.

1.2 SYSTEM DESCRIPTION

Furnish and install the surface and subsurface electrical utilities which shall include the electrical equipment, systems, wiring and accessories as indicated on the Contract Drawings and specifications herein.

1.3 QUALITY ASSURANCE

1.3.1 The Quality Assurance Level Assignments will be as assigned in the specific sections.

1.4 SUBMITTALS

1.4.1 Submittal Data

1.4.1.1 Refer to Division 1 for submittal requirements.
1.4.1.2 Submittal Assembly

1.4.2 Shop Drawings

1.4.3 Certification Reports

1.4.4 Operation and Maintenance Manuals

1.5 RECORD DRAWINGS (AS-BUILTS)

PART 2 - PRODUCTS

2.1 GENERAL

2.1.1 All products must meet the requirements of the materials specified herein and in subsequent sections.

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PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Equipment Identification
- 3.1.2 Equipment and Connections
- 3.1.3 Electrical Service
- 3.1.4 Foundations and Supports
- 3.1.5 Cleaning of Equipment and Finished Work
- 3.1.6 Use of Allocated Space
- 3.1.7 Cutting Repairing
- 3.1.8 Product Storage and Handling

3.2 INSPECTION AND TESTING

- 3.2.1 Final Inspection
- 3.2.2 Equipment Performance Tests
- 3.2.3 Load Balancing

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1602

Q.A. LEVEL Refer to 1.4.1

TITLE: ELECTRICAL MOTORS - 460 VOLT
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - BASIC ELECTRICAL MATERIALS AND METHODS

APPROVED BY Tom Greiner DATE 11/29/88
 APPROVED BY B.R. Ely DATE 12-7-88
 APPROVED BY Anshad A.W. DATE 12-7-88

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PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work of this section includes the furnishing installing, inspecting and testing of the 460 Volt AC induction motors for the surface ventilation fans, auxiliary hoisting systems at the headframe and for the underground ventilation fans, waste water pumps, sump pumps and the booster air compressor.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code
- o C50.41 Polyphase Induction Motors for Power Generating Stations

1.2.5 Institute of Electrical and Electric Engineers (IEEE)

- o 112 Standard Test Procedure for Polyphase Induction Motors and Generators
- o 841 Recommended Practice for Chemical Industry and Severe Duty Squirrel - Cage Induction Motors - 600V and Below

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SECTION 16XXX
ELECTRICAL MOTORS - 460 VOLT

- 1.2.6 National Electrical Manufacturer's Association (NEMA)
- o MG1 Energy Guide for Selection and Use of Polyphase Motors

- 1.2.7 Underwriter's Laboratories (UL)
- o 810 Capacitors
 - o 1004 Electric Motors

1.3 SYSTEM DESCRIPTION - This section describes the type and the operational requirements for the 460 Volt AC induction motors.

1.3.1 Alternating Current (AC) Induction Motors shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.

1.3.2 The 460 Volt motors shall be the energy efficient type and built to NEMA MG1 standard frame sizes.

1.3.3 The 460 Volt motors shall be capable of operation on a 3 phase, 60 Hz, resistance - grounded system for the underground.

1.3.4 The motors shall be capable of operating in an environment according to the acceptable codes and standards imposed by the project.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for these 460V AC Inductors Motors are given in the following ESF QALAS for the following items:

1. Surface ventilation fans
2. Auxiliary hoisting system
3. Underground ventilation fans
4. Waste water pumps
5. Sump pumps
6. Booster air compressor

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SECTION 16XXX
ELECTRICAL MOTORS - 460 VOLT

- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 460 Volt Motor Frames: NEMA MG1 standard frame sizes.
- 2.1.2 Locked-rotor and breakdown torques, locked-rotor currents and temperature rise: in accordance with NEMA standard MG1.
- 2.1.3 Motor Service Factor: 1.15 minimum.
- 2.1.4 Insulation Class: Class F or better.
- 2.1.5 Motor Starting: full voltage, across-the-line.
- 2.1.6 Motors: suitable for continuous duty on 480V, 60Hz, 3 phase power system.
- 2.1.7 Motors: grease lubricated anti-friction ball bearings.
- 2.1.8 Frames and Conduit Boxes: cast iron or heavy fabricated steel.
- 2.1.9 Motor Shaft: high grade machine steel or steel forging.
- 2.1.10 Rotors: high grade steel laminations.
- 2.1.11 Stator Windings: random or form wound high conductivity copper.
- 2.1.12 All Motors: totally enclosed fan-cooled (TEFC) equipped with breather and drain.

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SECTION 16XXX
ELECTRICAL MOTORS - 460 VOLT

- 2.1.13 Motor Nameplate: stainless steel.
- 2.1.14 Motor Leads: mechanical compression type lugs or terminal blocks depending on HP.
- 2.1.15 Power Factor Correction Capacitors: dry metallized film, dielectric type with internal discharge capacitor rated for service on a 480V, 3 phase, 60Hz power system.
- 2.1.16 Enclosures for Capacitors: welded aluminum suitable for outdoor applications.

2.2 FABRICATION

- 2.2.1 Frame size shall be in accordance with NEMA standards for each H.P. rating.

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.11 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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<p>** 'ACM' - APPROVAL BY MANAGER</p>	<p>"REC" - RECORD</p>
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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1603
 Q.A. LEVEL Refer to 1.4.1

TITLE: ELECTRICAL MOTORS - 4160 Volt
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - BASIC ELECTRICAL MATERIALS AND METHODS

APPROVED BY *Tom Greiner* DATE 11/29/88
 APPROVED BY *B.R. Phyllis* DATE 12-7-88
 APPROVED BY *Archadoti* DATE 12-7-88

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PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work of this section includes the furnishing, installing, inspecting and testing of the 4160 Volt AC induction motors for the surface ventilation fans and the surface air compressors.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulation (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code
- o C50.41 Polyphase Induction Motors for Power Generating Stations

1.2.5 Institute of Electrical and Electric Engineers (IEEE)

- o 112 Standard Test Procedure for Polyphase Induction Motors and Generators

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SECTION 16XXX
ELECTRICAL MOTORS - 4160 VOLT

1.2.6 National Electrical Manufacturer's Association (NEMA)

- o MG1 Motors and Generators
- o MG10 Energy Guide for Selection and Use of Polyphase Motors

1.2.7 Underwriter's Laboratories (UL)

- o 810 Capacitors
- o 1004 Electric Motors

1.3 SYSTEM DESCRIPTION

This section describes the type and operational requirements for the 4160 Volt AC induction motors.

- 1.3.1 Alternating Current (AC) induction motors shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 The 4160 Volt Motors shall be the energy efficient type and built to NEMA MG1 standard frame sizes.
- 1.3.3 The 4160 Volt Motors shall be capable of operation on a 3 phase, 60 Hz, solidly-grounded system on the surface.
- 1.3.4 The motors shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the 4160V AC Inductors Motors shall be in accordance with the applicable ESF-QALAS.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

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PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 4160 Volt Motor Frames: NEMA MG1 standard frame sizes.
- 2.1.2 Locked-rotor and breakdown torques, lock-rotor currents and temperature rise: in accordance with NEMA standards MG1.
- 2.1.3 Motor Service Factor: 1.15 minimum.
- 2.1.4 Insulation Class: Class F or better.
- 2.1.5 Motors Starting: full voltage, across-the-line.
- 2.1.6 Motors: suitable for continuous duty on 4160V, 60 Hz, 3 phase power system.
- 2.1.7 Motors: grease lubricated anti-friction ball bearings.
- 2.1.8 Frames and Conduit Boxes: cast iron or heavy fabricated steel.
- 2.1.9 Motor Shaft: high grade machine steel or steel forging.
- 2.1.10 Rotors: high grade steel laminations.
- 2.1.11 Stator Windings: random or form wound high conductivity copper.
- 2.1.12 All Motors: totally enclosed fan-cooled (TEFC) equipped with breather and drain.
- 2.1.13 Motor Nameplate: stainless steel.
- 2.1.14 Motor Leads: mechanical compression type lugs or terminal blocks depending on HP.

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SECTION 16XXX
ELECTRICAL MOTORS - 4160 VOLTS

2.1.15 Power Factor Correction Capacitors: dry metallized film, dielectric type with internal discharge capacitor rated for service on a 4160V, 3 phase, 60 Hz power system.

2.1.16 Enclosures for Capacitors: Welded aluminum suitable for outdoor applications.

2.2 FABRICATION

2.2.1 Frame size shall be in accordance with NEMA standards for each H.P. rating.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING.

3.2.1 Field Inspection and Testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1604
 Q.A. LEVEL Refer to 1.4.1

TITLE: LIGHTING SYSTEMS
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - LIGHTING

APPROVED BY *John Greiner* DATE 11/29/88
 APPROVED BY *B.R. Chytrny* DATE 12-7-88
 APPROVED BY *Ashad Ali* DATE 12-7-88

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SECTION 16XXX
LIGHTING SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting and testing of the incandescent, fluorescent, high-intensity-discharge and emergency lighting systems for use in the surface headframe/collar area and the subsurface mine areas.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards -
Underground Metal and Nonmetal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code
- o NFPA 101 Code for Safety to Life from Fire in
Buildings and Structures

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code
- o C78.1 Dimensional and Electrical Characteristics of
Fluorescent Lamps - Rapid Start Types
- o C82.2 Fluorescent Lamp Ballasts - Methods of
Measurement

1.2.5 Illuminating Engineering Society (IES)

- o Lighting Handbook, Application Volume

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**SECTION 16XXX
LIGHTING SYSTEM**

1.2.6 Underwriter's Laboratories, Inc. (UL)

- o 20 General-Use Snap Switches
- o 57 Electric Lighting Fixtures
- o 773 Plug-In, Locking Type Photocontrols for Use with Area Lighting
- o 844 Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
- o 924 Emergency Lighting and Power Equipment
- o 935 Fluorescent-Lamp Ballasts
- o 1029 High-Intensity-Discharge Lamp Ballasts
- o 1570 Fluorescent Lighting Fixtures
- o 1571 Incandescent Lighting Fixtures
- o 1572 High Intensity-Discharge Lighting Fixtures

1.3 SYSTEM DESCRIPTION

This section describes the basic performance and system requirements of the fixtures and accessories for the defined lighting systems.

- 1.3.1 The Incandescent Lighting Fixtures and Accessories shall be 120 volt rated and listed standard equipment under ANSI/UL specifications.
- 1.3.2 The Fluorescent Lighting Fixtures and Accessories shall be 120 volt rated and listed standard equipment under ANSI/UL specifications.
- 1.3.3 The High-Intensity-Discharge Fixtures and Accessories shall be 208 volt rated and listed standard equipment under ANSI/UL specifications.
- 1.3.4 The DC Emergency Lighting Fixtures Accessories shall be 120 volt rated and listed standard equipment under ANSI/UL specifications.

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SECTION 16XXX
LIGHTING SYSTEMS

1.3.5 The lighting system shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for these lighting systems shall be in accordance with the applicable ESF-QALAS.

1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART TWO - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Incandescent fixtures including lamps.

2.1.2 Fluorescent fixtures, including lamps and ballasts.

2.1.3 HID fixtures, including lamps and ballasts.

2.1.4 Emergency fixtures, including lamps.

2.1.5 Lighting.

2.1.6 Push button stations.

2.1.7 Photocell switches.

2.1.8 Snap switches.

2.1.9 Support equipment-brackets and supports.

2.1.10 Lighting transformers.

2.2 FABRICATION

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PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70,
National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

FENIX & SCISSON, INC.	SHEET	OF	WBS NUMBER	DOCUMENT NO.	REV.
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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1605
 Q.A. LEVEL Refer to 1.4.1

TITLE: **GROUND FAULT PROTECTION
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - SPECIAL SYSTEMS**

APPROVED BY Tom Greiner DATE 11/29/88
 APPROVED BY B.R. Ely DATE 12-7-88
 APPROVED BY Arshad Ali DATE 12-7-88

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SECTION 16XXX
GROUND FAULT PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work of this section includes the furnishing, installing, inspecting, and testing of the ground fault protection for the 4160 Volt and 480 Volt electrical systems.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Nonmetal Mines.

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders.

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code

1.2.5 Institute of Electrical and Electronic Engineers (IEEE)

- o 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.

1.3 SYSTEM DESCRIPTION

This section describes the basic performance and system requirements of the ground fault protection systems used in the 4160 Volt and 480 Volt power systems.

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SECTION 16XXX
GROUND FAULT PROTECTION

- 1.3.1 Ground fault protection systems shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 The ground fault protection system shall be designed to detect and localize a ground fault for personnel safety and minimizing equipment damage.
- 1.3.3 The ground fault protection systems shall operate on a 3 phase, 60 Hz, solidly-grounded system on the 208 volt surface equipment and a 3 phase, 60 Hz, resistance-grounded system for all of the 4160 and 480 Volt systems.
- 1.3.4 The ground fault protection systems shall be capable of operating in an environment in accordance with the applicable codes and standards imposed by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 Systems shall be in accordance with the applicable ESF QALAS.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 4,160 Volt surface and underground power system grounded through 25 amp resistor by H&N.

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SECTION 16XXX
GROUND FAULT PROTECTION

- 2.1.2 Feeder breaker shall have:
- o 5 amp ground fault sensor.
 - o Solid state trips (or shunt trips).

2.1.3 Portable equipment shall have ground-check monitor circuitry.

2.2 FABRICATION

2.2.1 Ground fault protection system shall be coordinated also with a standby diesel generator power system by others.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1606
Q.A. LEVEL Refer to 1.4.1

TITLE: **BELL AND BUZZER CORD SIGNALING SYSTEM**
DIVISION 16 - ELECTRICAL
SUBDIVISION - COMMUNICATIONS

APPROVED BY *Tom Greiner* DATE 11/29/88
APPROVED BY *B.R. Ouyang* DATE 12-7-88
APPROVED BY *Arshad Ali* DATE 12-7-88

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SECTION 16XXX
BELL AND BUZZER CORD SIGNALING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work of this section includes the furnishing, installing, inspecting and testing of the bell and buzzer pull cord hoist - conveyance signaling system utilized in each shaft.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 California Administrative Code (CAC)

o Title 8, Subchapter 17, Mine Safety Orders

1.2.2 Code of Federal Regulations (CFR)

o Title 30, Part 57, Safety and Health Standards
Underground Metal and Nonmetal Mines

1.2.3 National Fire Protection Association (NFPA)

o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

o C2 National Electrical Safety Code

1.3 SYSTEM DESCRIPTION

This section describes the basic performance and system requirements for the conveyance hoist signaling system to be provided for each shaft.

1.3.1 An audible and visual shaft conveyance hoist signaling system shall be available between the respective hoistman, shaft collar, underground bottom area, and any location in the shaft. Each area shall be capable of signaling and receiving.

1.3.2 The system shall be capable of signaling the hoistman at the surface in an emergency situation from any location in the shaft or collar area.

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SECTION 16XXX
BELL AND BUZZER CORD SIGNALING SYSTEM

- 1.3.3 The system shall be capable of operating in an environment dictated by this project.
- 1.3.4 The system shall be capable of signaling the hoistman by bell sound when traveling on the conveyance and by buzzer sound when calling for the conveyance. The system will allow the hoistman to respond by a buzzer sound to the collar area, shaft stations and shaft bottom in response to a call-for-conveyance signal.
- 1.3.5 The system shall be capable of sending a distinct sequence of signals or codes to or from the hoist house.

1.4 **QUALITY ASSURANCE**

- 1.4.1 Systems shall be in accordance with the applicable ESF-QALAS.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

- 2.1.1 Mine Signal Switch (Pull Bottle)
- 2.1.2 Control Relay
- 2.1.3 Electric Bell Device
- 2.1.4 Electric Buzzer Device
- 2.1.5 Indicating Light

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SECTION 16XXX
BELL AND BUZZER CORD SIGNALING SYSTEM

- 2.1.6 Push Button with Light
- 2.1.7 Pull Cord or Cable
- 2.1.8 Electrical Wiring

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1607
 Q.A. LEVEL Refer to 1.4.1

TITLE: **HOIST/CAGE RADIO COMMUNICATION SYSTEM**
DIVISION 16 ELECTRICAL
SUBDIVISION - COMMUNICATIONS

APPROVED BY *[Signature]* DATE 11/29/88
 APPROVED BY *B.R. Ely* DATE 12-7-88
 APPROVED BY *[Signature]* DATE 12-7-88

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SECTION 16XXX
HOIST/CAGE RADIO COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting and testing of the hoist-cage FM radio communication system for ES-1 and ES-2 hoisting systems.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 47, Part 15, Telecommunication Part 15, Radio Frequency Devices
- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 Occupational Safety and Health Administration (OSHA)

- o Title 29, Part 1926/1910, Tunnels and Shafts

1.2.4 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.5 Electronics Industry Association (EIA)

- o 220A Minimum Standards for Land Mobile Communication Continuous Tone-Controlled Squelch Systems

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SECTION 16XXX
HOIST/CAGE RADIO COMMUNICATION SYSTEM

- o 329-A Minimum Standards for Land Mobile Communication Antennas, Part 1-Base or Fixed Station Antennas
- o 450 Standard Form for Reporting Measurements of Land Mobile, Base Station, and Portable/Personal Radio Receivers in Compliance with FCC Part 15 Rules
- 1.2.7 Institute of Electrical and Electronics Engineers (IEEE)
 - o 184 Test Procedure for Frequency-Modulated Mobile Communications Receivers
- 1.2.8 Underwriters Laboratories (UL)
 - o 1414 Across-the-Line, Antenna-Coupling and Line-by-Pass Capacitors for Radio and Television Type Appliances
- 1.2.9 National Telecommunications and Information Administration (NTIA)
 - o Manual of Regulations and Procedures for Federal Radio Frequency Management, Chapter 5

1.3 SYSTEM DESCRIPTION

This section describes the basic performance and system requirements for a new hoist cage FM radio communication system to be provided for each shaft.

- 1.3.1 The hoist/cage FM radio communication system shall be an integrated design of a single supplier.
- 1.3.2 The hoist/cage FM radio communication system shall be comprised of dispatch or hoistman and cage FM transceiver units with associated microphone and speaker, antennas and accessories.

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SECTION 16XXX
HOIST/CAGE RADIO COMMUNICATION SYSTEM

- 1.3.3 The system shall be UL listed, where such listing is applicable and shall meet the requirements of all standards and Codes.
- 1.3.4 The equipment must be capable of performing all required functions and features.
- 1.3.5 The Hoist/Cage FM Radio Communication System shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment is shown on the applicable ESF-QALAS.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Dispatcher FM Transceiver Unit with Microphone and speaker
- 2.1.2 Portable Cage FM Transceiver Unit with Microphone & speaker
- 2.1.3 Antennas
- 2.1.4 Fused Disconnect
- 2.1.5 Coax Cable and Accessories
- 2.1.6 Test Equipment
- 2.1.7 Spare Parts
- 2.1.8 Mounting Hardware

2.2 FABRICATION

FENIX & SCISSON, INC.

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DOCUMENT NO. FS-SP-1607

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SECTION 16XXX
HOIST/CAGE RADIO COMMUNICATION SYSTEMS

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code, MSHA 30 CFR 57, EIA 450 and IEEE 184 standards.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1609

Q.A. LEVEL Refer to 1.4.1

TITLE: 4160/480V MTL MINE POWER CENTER
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - HIGH VOLTAGE DISTRIBUTION (ABOVE 600-VOLT)

APPROVED BY Tom Greiner DATE 11/29/88
 APPROVED BY B.R. Ely DATE 12-7-88
 APPROVED BY Arled Ar. DATE 12-7-88

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PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspection and testing of the main test level 4160/480V mine power center for use in supplying electrical power to all ESF underground testing and operations.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code
- o C37 Ratings, Requirements, Application, Recommendations, Test Procedures and Specifications for Circuit Breakers, Switchgear Protectors, Power Fuses and Fused Disconnect Switches
- o C57.12.01 Standard General Requirements and Test Code for Dry-Type Distribution and Power Transformers
- o Z35.1 Specifications for Accident Prevention Signs

1.2.5 Institute of Electrical and Electronic Engineers (IEEE)

- o 32 Standard Requirements, Terminology and Test Procedure for Neutral Grounding Devices

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1.2.6 National Electrical Manufacturers Association (NEMA)

- o AB1 Molded Case Circuit Breakers and Molded Case Switches
- o ICS 1 General Standards for Industrial Control and Systems
- o SG-5 Power Switchgear Assemblies
- o TRI Transformers, Regulators and Reactors

1.3 SYSTEM DESCRIPTION

This section describes the type and the operational requirements for the MTL 4160/480V mine power center which supplies power for underground testing and operations.

- 1.3.1 The MTL 4160/480V mine power center shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 The MTL 4160/480V mine power center shall consist of 5.0KV rated fused disconnect switches, dry-type power transformers, 480V rated power circuit breakers, associated fault protection equipment and instrumentation equipment.
- 1.3.3 Primary service to the 480V MTL mine power center shall be derived from the 4.16KV, 3-phase, 60Hz, grounded wye system at the surface.
- 1.3.4 The secondary power from the MTL mine power center shall be 480V, 3-phase, 3-wire, 60Hz, neutral grounded through a 25 Amp, continuous rated resistor.
- 1.3.5 The MTL mine power enter equipment shall conform to the requirements of applicable ANSI C37, C57, NEMA TRI and SG5 and tested in accordance with C37 and C57.
- 1.3.6 The MTL 4160/480V mine power center shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the 4160/480V MTL Mine Power Center is shown on ESF-QALAS 6.7.1-0002.

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- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 5.0KV metal enclosed switchgear.
- 2.1.2 4160/480-277V dry-type power transformers.
- 2.1.3 480V power circuit breakers and panels.
- 2.1.4 Neutral grounding resistors - 25 Amp.
- 2.1.5 Power fuses
- 2.1.6 Overcurrent (phase and ground) and undervoltage protective relays and related equipment.
- 2.1.7 Instrumentation accessories and related equipment.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1611
 Q.A. LEVEL Refer to 1.4.1
and 1.4.2

TITLE: POWER DISTRIBUTION PANELS
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - SERVICE AND DISTRIBUTION
 (600 VOLT AND BELOW)

APPROVED BY *J. Greiner* DATE 11/29/88
 APPROVED BY *B.R. Ely* DATE 12-7-88
 APPROVED BY *Arshad Ali* DATE 12-7-88

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SECTION 16XXX
POWER DISTRIBUTION PANELS

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting, and testing of the power distribution panels for the power and lighting requirements at the collar, headframe, shafts and underground mining operations.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 Underwriter's Laboratories (UL)

- o UL 67 Panelboards

1.2.5 National Electric Manufacturer's Association (NEMA)

- o ICS6 Enclosures for Industrial Controls and Systems
- o PB2 Dead-front Distribution Switchboards

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SECTION 16XXX
POWER DISTRIBUTION PANELS

1.3 SYSTEM DESCRIPTION

This section describes the type and system requirements for the power distribution panels to be provided for surface and subsurface lighting purposes and mining operations.

- 1.3.1 Power Distribution Panels shall be capable of continuous operation in an underground mining environment at an approximate elevation of 3,000 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 Panels shall be circuit breaker equipped unless otherwise indicated.
- 1.3.3 Panels shall be furnished with 100% rated main circuit breakers.
- 1.3.4 Bus bars shall be as follows:
 - o Neutral bus shall be provided and isolated for connection of circuit neutral conductors.
 - o Ground bus shall be provided and marked with a green stripe along its front and bonded to the steel cabinet for connection of grounding conductors.
- 1.3.5 Circuit breakers furnished as Ground Fault Circuit Interrupters (GFCI) shall have:
 - o "Push-to-Test" button.
 - o Visible indication of a tripped condition.
 - o Ability to detect a current imbalance of approximately 5 milliamperes.
- 1.3.6 The panels shall be required to operate in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for this equipment is shown on ESF-QALAS (to be issued).
- 1.4.2 The Quality Assurance Level for Power Distribution Panels used below the surface should be II per QALAS 6.7.1-0002.

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**SECTION 16XXX
POWER DISTRIBUTION PANELS**

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 All bus work shall be copper.
- 2.1.2 Panels shall be rated for use on either 480Y/277V or 208Y/120V systems.
- 2.1.3 Panels shall be configured for 3 phase-4 wire, 60 Hz operation.
- 2.1.4 Circuit breakers shall be ambient compensated, thermal-magnetic type with a minimum interrupting capacity of 14,000 amperes rms, symmetrical.

2.2 FABRICATION

- 2.2.1 Bus bar supports shall be independent of the circuit breaker support mounting.

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1612

Q.A. LEVEL Refer to 1.4.1

TITLE:

ELECTRICAL CABLE
DIVISION 16 - ELECTRICAL
SUBDIVISION - BASIC ELECTRICAL MATERIAL AND METHODS

APPROVED BY Tom Greiner DATE 11/29/88
 APPROVED BY B.R. Engstrom DATE 12-7-88
 APPROVED BY Arshad Ali DATE 12-7-88

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SECTION 16XXX
ELECTRICAL CABLE

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work in this section includes the furnishing, installing, inspecting and testing of the power, control, utilization, and instrumentation wire and cable for the hoisting and mining operations.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety, and Health Standards - Underground Metal and Nonmetal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code (NEC)

1.2.5 National Electrical Manufacturer's Association (NEMA)

- o WC3 Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

1.3 SYSTEM DESCRIPTION

This section describes the type and the operational requirements for all cable and wiring used for the hoisting and mining operations.

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ELECTRICAL CABLE

1.3.1 Voltage Class

- o Medium-Voltage cables shall be rated for 5,000 volts and operate on a 4,160 volt, 3 phase, 60 Hz resistance grounded neutral system.
- o Low-Voltage cables shall be rated for 600 volts and operate on a 480 volt, 3-phase, 60 Hz, resistance-grounded (for the underground) or solidly grounded (for the surface area) system.
- o Instrument cables shall be rated for 600 volts and shielded for use in both AC or DC and analog or digital type systems.

1.3.2 Electrical cables shall be capable of continuous operation at a conductor temperature of 90° C in wet or dry locations.

1.3.3 Cables shall be suitable for installation in both vertical and horizontal raceways as required by the specific system configurations.

1.3.4 Cables shall be suitable for use in systems designed to operate at a maximum elevation of 4,500 ft. ASL.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the electrical cable systems shown is on ESF-QALAS 6.7.1-0001, 6.7.1-0005, 6.7.1-0007, 6.7.1-0002 and 6.2.2.-0009.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 All classes of cables shall have copper conductors.

2.1.2 5 KV class cable shall be Type MV-90 with either XHHW or EPR insulation.

2.1.3 600 Volt class cable shall be single or multi-conductor with an overall jacket of heavy-duty hypalon or neoprene.

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ELECTRICAL CABLE

2.1.4 Instrument cable shall be single or multiple twisted pair with aluminum tape shield over each pair.

2.1.5 Cables for power and control circuits extending underground shall have an insulated ground-check wire for monitoring the continuity of the ground circuit.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1613
Q.A. LEVEL Refer to 1.4.1

TITLE:

REMOTE CONTROL AND MONITORING SYSTEMS
DIVISION 16 - ELECTRICAL
SUBDIVISION - COMMUNICATIONS

APPROVED BY *J. Griner* DATE 11/29/88
 APPROVED BY *B.T. Engstrom* DATE 12-7-88
 APPROVED BY *Alstad Jr.* DATE 12-7-88

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SECTION 16XXX
MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 This work of this section includes the furnishing, installing, inspecting, and testing of the necessary instrumentation devices such as sensors, indicators, and switches that are not a part of any vendor supplied system or packaged unit.

1.2 REFERENCED PUBLICATIONS

The publications listed below from a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards -
Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o B40.1 Gauges, Pressure Indicating Dial Type-Elastic
Element

1.2.5 Institute of Electrical and Electronic Engineers(IEEE)

- o 119 Recommended Practice for General Principles
of Temperature Measurement as Applied to
Electrical Apparatus

1.2.6 National Electrical Manufacturer's Association (NEMA)

- o ICS6 Enclosures for Industrial Controls and Systems.

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1.3 SYSTEM DESCRIPTION

This section describes the basic performance and system requirements for remote control and monitoring instrumentation that are not integral parts of packaged supplied units.

- 1.3.1 Furnishing all level, limit, position, and indicating switches for hoisting, conveyance, loading pocket, and mining related operations.
- 1.3.2 Fire detection and alarm devices furnished by others.
- 1.3.3 Air velocity, humidity, quality, and all gas and environmental monitoring devices furnished by others.
- 1.3.4 Control and Monitoring Systems shall be suitable for satisfactory operation at a maximum elevation of 4,500 ft. ASL.
- 1.3.5 The Bell and Buzzer hoist signaling systems are covered under specification 1606.
- 1.3.6 All sensors, indicators, and switches shall be of standard manufacturers design, available as off-the-shelf items.
- 1.3.7 The devices and systems shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the instrumentation devices covered by this specification shall be in accordance with the ESF QALAS of the systems in which the devices are installed.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

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PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Pressure gauges for hoist hydraulics shall be direct indicating with an accuracy of ± 0.5 percent of span.
- 2.1.2 Temperature gauges for hoist motors shall have a 3 inch dial with field replaceable element.
- 2.1.3 Position switches shall be either magnet or mechanical position type operated with a form 'C' contact.
- 2.1.4 All electro-mechanical or solid state type control devices shall have screw type terminals.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1614
 Q.A. LEVEL Refer to 1.4.1

TITLE: **MOTOR CONTROL CENTERS
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - SERVICE AND DISTRIBUTION
 (600 VOLT AND BELOW)**

APPROVED BY *Jan Greiner* DATE 11/29/88
 APPROVED BY *B.T. Ely* DATE 12-7-88
 APPROVED BY *Arhad Ali* DATE 12-7-88

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SECTION 16XXX
MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 This work of this section includes the furnishing, installing, inspecting, and testing of the 480 Volt Motor Control Centers for the surface ventilation fans, for underground primary and auxiliary ventilation fans, for pumps and other mining operation loads.

1.2 REFERENCED PUBLICATIONS

The publications listed below from a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Nonmetal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code

1.2.5 National Electrical Manufacturer's Association (NEMA)

- o ICSI General Standards for Industrial Control and Systems

1.3 SYSTEM DESCRIPTION

This section describes the type and the system requirements for the Motor Control Centers that supply surface and underground air compressors, ventilation fans and other mining operation loads.

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SECTION 16XXX
MOTOR CONTROL CENTERS

- 1.3.1 Motor Control Centers shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 The 480 Volt Motor Control Centers shall provide "on-off" control and protection of the equipment as shown on the Contract Drawings.
- 1.3.3 The 480 Volt Motor Control Centers shall operate on a 3 phase, 60 Hz, resistance-grounded system.
- 1.3.4 The Motor Control Centers shall be capable of operating in an environment dictated by this project.

1.4 **QUALITY ASSURANCE**

- 1.4.1 The Quality Assurance Level Assignment for the Motor Control Centers covered by this specification shall be in accordance with the ESF-QALAS of the systems in which the MCC's are installed.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

- 2.1.1 Ratings:
 - o 480 Volts, (600 V max.) 3 phase, 3 wire with ground bus.
 - o 42,000 Amps rms minimum bracing.
 - o 600 Amp main bus continuous current minimum.

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SECTION 16XXX
MOTOR CONTROL CENTERS

2.1.2 Motor circuit protector type breakers with magnetic only trips.

2.1.3 Three phase, thermal overload relays.

2.1.4 Starters also have:

- o control circuit transformer.
- o door mounted "run" light, Red lens.
- o two N.O. & two N.C. auxiliary contacts.
- o pull-apart type terminal blocks.

2.2 FABRICATION

2.2.1 480 Volt Motor Control Centers shall be of standard 20 inch by 20 inch sections for front mounting only.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1615
 Q.A. LEVEL Refer to 1.4.1

TITLE: PROGRAMMABLE LOGIC CONTROLLERS
 DIVISION 16 - ELECTRICAL
 SUBDIVISION - CONTROLS

APPROVED BY Jan Greiner DATE 11/29/88
 APPROVED BY B.R. Chrylman DATE 12-7-88
 APPROVED BY Ashad Ali DATE 12-7-88

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SECTION 16XXX
PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work of this section includes furnishing, installing, inspecting, and testing of two (2) programmable logic controllers to be used for hoisting and loading control.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

o Title 30, Part 57, Safety and Health Standards -
Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

o NFPA 70 National Electrical Code

1.2.4 Instrument Society of America (ISA)

o S5.3 Graphic Symbols for Distributed
Control/Shared Display Instrumentation,
Logic and Computer Systems

1.2.5 Institute of Electrical and Electronic Engineers (IEEE)

o 488 Standard Digital Interface for Programmable
Instrumentation

1.2.6 Electronic Industries Association (EIA)

o EIA-247 Analog-to-Digital Conversion Equipment

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SECTION 16XXX
PROGRAMMABLE LOGIC CONTROLLERS

1.3 SYSTEM DESCRIPTION

This system describes the basic performance and system requirements for the two (2) Programmable Logic Controllers (PLC) dedicated for hoisting and loading control.

- 1.3.1 The Programmable Logic Controllers shall provide control and safety functions of both existing GFE hoists in the form of discrete (on-off) control used in conjunction with the existing hoist operator's consoles.
- 1.3.2 The PLC's shall have remote input/output (I/O) with operator software programming interface through a Vendor supplied CRT panel and keyboard.
- 1.3.3 Each PLC shall have a communications adapter module to allow data highway communications between the central processing unit (CPU) in the hoist operator's control room and the remote I/O racks located near the MTL shaft stations in each shaft.
- 1.3.4 The CPU's shall be capable of performing the following functions with "ladder" type programmed logic:
 - o Relay functions - Internal as well as output relays.
 - o Timing functions - On and off delay timers.
 - o Counting functions - Up and down counters.
 - o Math functions - The four, basic math functions.
 - o Analog functions - Basic signal processing with Proportional, Integral, Derivative (PID) algorithms.
- 1.3.5 The PLC's shall be capable of operating in the environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the Programmable Logic Controllers is in accordance with the ESF-QALAS of the systems in which the PLC'S are installed.

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SECTION 16XXX
PROGRAMMABLE LOGIC CONTROLLERS

- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Primary power shall be 120 VAC, 60 Hz.
- 2.1.2 PLC's shall be able to send/receive data over an RS232-C link.
- 2.1.3 The CPU's shall have a minimum of 8K, RAM with battery back-up.
- 2.1.4 Memory batteries shall retain memory for at least two (2) weeks.
- 2.1.5 PLC's shall consist basically of:
- o Main CPU
 - o Remote I/O
 - o Programming Panel
 - o Program Loader
 - o Necessary interconnect cables

2.2 FABRICATION

- 2.2.1 All I/O modules shall be capable of being removed or inserted into the I/O racks without disturbing the field wiring.

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SECTION 16XXX
PROGRAMMABLE LOGIC CONTROLLERS

PART 3 - ERECTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1616
 Q.A. LEVEL Refer to 1.4.1

TITLE: **GROUNDING AND LIGHTNING PROTECTION SYSTEMS**
DIVISION 16 - ELECTRICAL
SUBDIVISION - SPECIAL SYSTEMS

APPROVED BY *Tom Greiner* DATE 11/29/88
 APPROVED BY *B.R. Cunningham* DATE 12-7-88
 APPROVED BY *Arshad Ali* DATE 12-7-88

REVISION DESCRIPTION	SECT. OR PAGES	REV. BY	APPROVED BY	REV. NO.	DATE
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SECTION 16XXX
GROUNDING AND LIGHTNING PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting, and testing of the grounding and lightning protection systems utilized for protection of the surface and underground electrical power systems.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards -
Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code
- o NFPA 78 Lightning Protection Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code

1.2.5 Underwriter's Laboratories (UL)

- o 96 Lightning Protection Components
- o 467 Grounding and Bonding Equipment

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SECTION 16XXX
GROUNDING AND LIGHTNING PROTECTION SYSTEMS

1.3 SYSTEM DESCRIPTION

This section describes the type and the operational requirements for the grounding and lightning protection systems to be used for the protection of the surface and underground electrical power systems.

- 1.3.1 The grounding and lightning protection systems shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.
- 1.3.2 This specification shall cover all cable, fittings, road, air terminals, connections and hardware for the grounding and lightning protection systems.
- 1.3.3 The grounding and lightning protection systems shall operate on a 3 phase, 60 Hz, solidly-grounded system on the 208 volt surface equipment and a 3 phase, 60 Hz, resistance-grounded system for all of the 4160 volt and 480 volt surface and underground equipment.
- 1.3.4 The grounding and lightning protection systems shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the grounding and lightning protection systems shall be in accordance with the ESF-QALAS of the equipment dependent upon it.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

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SECTION 16XXX
GROUNDING AND LIGHTNING PROTECTION SYSTEMS

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Ground rods - 3/4" diameter x 10' - 0" long, copper-clad steel furnished by H&N.
- 2.1.2 Air Terminals - 1/2" diameter x 2' - 0" long, copper with hardware and fittings.
- 2.1.3 Grounding conductors - soft drawn, bare copper (SDBC) stranded, #2/0 AWG main loop furnished by H&N.
- 2.1.4 Lightning protection downlead conductors - multi-stranded bare copper, 115 MCM minimum.
- 2.1.5 Connections - Either mechanical bolted type or Exothermic welding process type.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1617

Q.A. LEVEL Refer to 1.4.1

TITLE: **SUBSURFACE AND SHAFT ELECTRIC DISTRIBUTION
DIVISION 16 - ELECTRICAL
SUBDIVISION - BASIC ELECTRICAL MATERIALS AND METHODS**

APPROVED BY	<u><i>Tom Greiner</i></u>	DATE	<u>11/29/88</u>
APPROVED BY	<u><i>B. W. Elmer</i></u>	DATE	<u>12-7-88</u>
APPROVED BY	<u><i>Arshad Ali</i></u>	DATE	<u>12-7-88</u>

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SECTION 16XXX
SUBSURFACE AND SHAFT ELECTRIC DISTRIBUTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting, and testing of the subsurface and shaft electric distribution for use in supplying electrical power to support underground operations and testing.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines.

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders.

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code.

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code.

1.2.5 National Electric Manufacturer's Association (NEMA)

- o WC7 Cross-Linked Thermosetting-Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

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SECTION 16XXX
SUBSURFACE AND SHAFT ELECTRIC DISTRIBUTION

1.3 SYSTEM DESCRIPTION

This section describes the type and the operational requirements for subsurface and shaft electrical distribution to support underground operations and testing.

1.3.1 Subsurface and shaft electric distribution shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40° C.

1.3.2 This specification shall consist of dry-type distribution transformers, the cable and fittings, raceways, and associated support hardware for the shaft and subsurface distribution systems.

1.3.3 Subsurface and shaft electric distribution shall operate on a 3 phase, 60 Hz, resistance-grounded system for the underground.

1.3.4 Subsurface and shaft electric distribution shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the distribution systems is in accordance with the applicable ESF-QALAS 6.7.1-0002.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Power, control and communication cables shall have armored, borehole type construction.

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SECTION 16XXX
SUBSURFACE AND SHAFT ELECTRIC DISTRIBUTION

- 2.1.2 Distribution transformers - 4,160 - 480Y/277 Volts, 3Ø, 60 Hz, Dry-type, indoor. KVA rating as required.
- 2.1.3 Boost transformers - 416 Volts input - 444 Volts output. 3Ø, 60 Hz, Dry-type, KVA ratings as required.
- 2.1.4 Distribution transformers - 480 - 208Y/120 Volts, 3Ø, 60 Hz, Dry-type, KVA ratings as required.
- 2.1.5 Steel raceway with removable cover for electromagnetic interference protection.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1618
Q.A. LEVEL Refer to 1.4.1

TITLE: MEDIUM VOLTAGE MOTOR CONTROLS/ - 5 KV
DIVISION 16 - ELECTRICAL
DIVISION - HIGH VOLTAGE DISTRIBUTION (ABOVE 600 VOLTS)

APPROVED BY *J. Greiner* DATE 11/29/88
APPROVED BY *B.R. Ewing* DATE 12-7-88
APPROVED BY *Arshad Ali* DATE 12-7-88

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SECTION 16XXX
MEDIUM VOLTAGE MOTOR CONTROLS - 5KV

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspecting, and testing of the 4,160 Volts medium voltage motor controls for surface air compressors and surface ventilation fans.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Nonmetal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Subchapter 17, Mine Safety Orders

1.2.3 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

1.2.4 American National Standards Institute (ANSI)

- o C2 National Electrical Safety Code

1.2.5 Underwriter's Laboratories (UL)

- o UL 347 High Voltage Industrial Control Equipment

1.2.6 National Electrical Manufacturer's Association (NEMA)

- o ICS 1 General Standards for Industrial Control and Systems

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SECTION 16XXX
MEDIUM VOLTAGE MOTOR CONTROLS - 5KV

1.3 SYSTEM DESCRIPTION

This section describes the type and the system requirements for the medium voltage motor controls a rated 5KV that supply the surface air compressors and surface ventilation fans.

- 1.3.1 The 5KV motor controls shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a maximum ambient temperature of +40 C.
- 1.3.2 The 4,160 Volt motor controls for the surface ventilation fan(s) and air compressors shall be NEMA Class E2 current-limiting type.
- 1.3.3 The 4,160 Volt motor controls shall operate on a 3 phase, 60 Hz, resistance-grounded system.
- 1.3.4 The motor controls shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the 4,160 Volt motor controls shall be in accordance with the ESF-QALAS of the systems in which they are installed.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Ratings - o 4,160 Volts (5000 Volts max), 3 phase, 60 Hz.

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SECTION 16XXX
MEDIUM VOLTAGE MOTOR CONTROLS - 5KV

- o 200,000 amps rms minimum interrupting capacity with fuses.
- o 50,000 amps rms minimum interrupting capacity of contractor.
- o 200 amp continuous current on contractor.

2.1.2 Class E2 current-limiting fuses.

2.1.3 Solid-state programmable protective device module.

2.1.4 Full voltage, non-reversing fused disconnects for air compressors; full voltage, reversing starters for ventilation fans.

2.2 FABRICATION

Ventilation fans and non-reversing disconnect type for the air compressors.

2.2.1 4,160 Volt motor control sections shall be of standard sections for front mounting only with a clear window for viewing of the disconnect switch position.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1619

Q.A. LEVEL Refer to 1.4.1

TITLE: **ELECTRICAL SHAFT HEATERS - 4.16KV**
DIVISION 16 - ELECTRICAL
SUBDIVISION - ELECTRIC RESISTANCE HEATING

APPROVED BY *Jan Greiner* DATE 11/29/88
 APPROVED BY *B.T. O'Neil* DATE 12-7-88
 APPROVED BY *Arshad Ali* DATE 12-7-88

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SECTION 16XXX
ELECTRICAL SHAFT HEATERS - 4.16KV

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 The work of this section includes the furnishing, installing, inspection and testing of the portable skid mounted electric blast heaters for use in heating the incoming ventilation air at each shaft collar area.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o Title 30, Part 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.2 California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders

1.2.3 Air Movement and Control Association (AMCA)

- o 99 Standards Handbooks
- o 210 Laboratory Methods of Testing Fans for Rating
- o 203 Field Performance Measurements
- o 300 Standard Test Code for Sound Rating

1.2.4 American Society of Heating, Refrigerating, and Air-Conditioning Engineers Incorporated (ASHRAE)

- o Handbook of Systems and Applications

1.2.5 National Fire Protection Association (NFPA)

- o NFPA 70 National Electrical Code

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SECTION 16XXX
ELECTRICAL SHAFT HEATERS - 4.16KV

1.2.6 American National Standards Institute (ANSI)

- o C37 Ratings, Requirements, Application, Recommendation, Test Procedures and Specifications for Circuit Breakers, Switchgear Protectors, Power Fuses and Fused Disconnect Switches.
- o C57.12.01 General Requirements and Test Code for Dry-Type and Power Transformers
- o Z35.1 Specification for Accident Prevention Signs

1.2.7 National Electrical Manufacturers Association (NEMA)

- o AB1 Molded Case Circuit Breakers and Molded Case Switches
- o ICS1 General Standards for Industrial Control and Systems
- o SG-5 Power Switchgear Assemblies
- o TR1 Transformers, Regulators and Reactors

1.2.8 Underwriters Laboratory (UL)

- o 1096 Electric Central Air Heating Equipment

1.3 SYSTEM DESCRIPTION

This section describes the type and the operational requirements for the 4.16KV electrical resistance shaft heaters for supplying warm air to the ventilation air at each shaft collar area.

- 1.3.1 The 4.16KV electrical resistance shaft heaters shall be capable of continuous operation at a maximum elevation of 4,500 ft. ASL and a minimum ambient temperature of - 15°C.
- 1.3.2 The 4.16KV electrical resistance shaft heaters shall consist of 5KV primary fused disconnect switch 5KV rated resistance heating elements, a 460V, 3 phase, 60Hz blower fan with silence, 4.16KV-480V, 3 phase dry-type transformer and associated circuit protection, cabling and instrumentation/control equipment.

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SECTION 16XXX
ELECTRICAL SHAFT HEATERS - 4.16KV

- 1.3.3 Primary service to the 4.16KV electrical resistance shaft heaters shall be through a 5KV rated portable trailing cable derived from the 4.16KV, 3 phase, 60Hz grounded system at the surface.
- 1.3.4 The 4.16KV electrical resistance shaft heaters shall be self-contained on a portable skid-mounted assembly.
- 1.3.5 The 4.16KV electrical resistance shaft heaters shall conform to requirements of applicable ANSI C37, C57, NEMA TR1 and SG-5 and tested in accordance with C37 and C57.
- 1.3.6 The 4.16KV electrical resistance shaft heaters shall be capable of operating in an environment dictated by this project.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the 4.16KV Electrical Resistance Shaft Heaters shall be in accordance with the ESF-QALAS (to be issued).
- 1.4.2 The vendor shall furnish for Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 5KV metal enclosed fused disconnect switchgear.
- 2.1.2 5KV rated electric resistance elements.
- 2.1.3 4160V/480-277V, 3 phase dry-type power transformer with taps.

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SECTION 16XXX
ELECTRICAL SHAFT HEATERS - 4.16K

- 2.1.4 460V, 3 phase blower fan with silencer.
- 2.1.5 Control transformer with associated instrumentation and control equipment.
- 2.1.6 Circuit protection equipment as needed.
- 2.1.7 Power Cabling.

2.2 FABRICATION

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Installation shall be in accordance with NFPA 70, National Electrical Code and MSHA 30 CFR 57.

3.2 FIELD INSPECTION AND TESTING

- 3.2.1 Field inspection and testing will include final acceptance.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0504

Q.A. LEVEL Refer to 1.4

TITLE: **WELDING
DIVISION 5 - METALS
SUBDIVISION - WELDING**

APPROVED BY Larry Barts DATE 11-30-88
 APPROVED BY B.R. Cunningham DATE 12-7-88
 APPROVED BY Paul Bate DATE DEC 7, 1988

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PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification includes furnishing all materials, tools, equipment and labor required for welding services for structural steel, miscellaneous steel, and piping systems.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o Z49.1 Safety in Welding and Cutting
- o B31.1 Power Piping

1.2.2 American Society for Non-destructive Testing (ASNT)

- o SNT-TC-1A Personnel Qualification and Certification in Non-destructive Testing

1.2.3 American Welding Society (AWS)

- o A2.4 Standard Symbols for Welding Brazing and Non-destructive Examination
- o D1.1 Structural Welding Code, Steel
- o D10.9 Qualification of Welding Procedures and Welders for Piping and Tubing
- o QC1-QC2 AWS Standards and Guide for Qualifications and Certification of Welding Inspectors

1.2.4 Code of Federal Regulations (CFR)

- o 30 CFR 57, Safety and Health Standards - Underground Metal and Non-metal Mines

1.2.5 State of California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders

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1.2.6 American Society of Mechanical Engineers (ASME)

Section II-A Boiler and Pressure Vessel Code; Material Specifications, Part A - Ferrous

Section V Boiler and Pressure Vessel Code; Non-destructive Examination

Section IX Boiler and Pressure Vessel Code; Welding and Brazing Qualifications

1.3 SYSTEM DESCRIPTION

This section describes the requirements for welding, welding procedures, qualification of welders/procedures and related inspection requirements for both structural welding and piping systems.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment is as specified in the individual specification for each item or system being welded.

1.5 WELD PROCEDURES

- o Welding Procedure Submittal/Approval
- o Weld Procedure Qualification
- o Welder, Welding Operator Qualification on Procedure

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 General Requirements: All welding equipment and supplies shall be furnished

2.1.2 Welding Material for Test Welds

2.1.3 Welding Materials for Fabrication

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SECTION 05XXX
WELDING

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

3.1.1 Welding Methods: Adequate ventilation shall be supplied during welding operations

3.1.2 Welding Machines

3.1.3 Leads and Connections

3.2 PREPARATION

3.2.1 Cleaning

3.2.2 Alignment

3.2.3 Pre-Heating

3.2.4 Weather

3.3 WELDING

3.3.1 Weld Identification

3.3.2 Repair of Weld Defects

3.3.3 Field Welding Underground

3.3.4 Fab Shop Welding

3.4 INSPECTION

3.4.1 Destructive Tests of Welds

3.4.2 Non-destructive Tests of Welds

3.4.2.1 Radiography

3.4.2.2 Visual Inspection

3.5 CERTIFICATION

3.6 FINAL ACCEPTANCE

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0902

Q.A. LEVEL Refer to 1.4.1

TITLE: PAINTING - EQUIPMENT
 DIVISION 9 - FINISHES
 SUBDIVISION - PAINTING

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.W. Ouellet DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification includes the selection and application of paint and coatings for mechanical equipment.

1.2 REFERENCED PUBLICATIONS

1.2.1 Federal Specifications (Fed. Spec.)

TT-P-645A Primer, Paint, Zinc-Chromate,
Alkyd Type

TT-P-489G Enamel, Alkyd, Gloss (for Exterior and
Interior Surfaces)

1.2.2 Federal Standard (Fed. Std.)

595A Colors, Federal Standard
Notice 6

1.2.3 Steel Structures Painting Council (SSPC)

SSPC-SP1 Solvent Cleaning
 SSPC-SP3 Power Tool Cleaning
 SSPC-SP6 Commercial Blast Cleaning
 SSPC-PA1 Shop, Field and Maintenance Painting

1.3 SYSTEM DESCRIPTION

This section describes the materials, methods and requirements for painting and coating of mechanical equipment, primarily shop applied before being shipped to the NNWSI site.

1.4 QUALITY CONTROL

1.4.1 The Quality Assurance Level Assignment for Painting and Coating shall be the same as the individual specification for each item or system being painted.

1.4.2 Painting procedures and personnel qualifications will be required if the item being painted is QA Level I.

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PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Paint and Coating materials conforming to the applicable standards; or specific equipment manufacturers' paint specifications if more stringent than those indicated.
- 2.1.2 Finish coats which are compatible with prime paints used.
- 2.1.3 Thinners approved by the paint manufacturer to be used within recommended limits.

PART 3 - EXECUTION

- 3.1 INSPECTION OF WORK AREA AND SURFACE CONDITION.
- 3.2 SURFACE PREPARATION
 - 3.2.1 Cleaning-solvent
 - 3.2.2 Sandblasting
- 3.3 MIXING AND THINNING
- 3.4 APPLICATION - PAINTING SCHEDULE
- 3.5 SURFACES TO BE PAINTED
- 3.6 TOUCH UP
- 3.7 INSPECTION OF FINISHED PRODUCT.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1104

Q.A. LEVEL Refer to 1.4.1

TITLE: PORTABLE CHEMICAL TOILETS
 DIVISION 11 - EQUIPMENT
 SUBDIVISION - FLUID WASTE TREATMENT AND DISPOSAL EQUIPMENT

APPROVED BY Larry Berto DATE 12-6-88
 APPROVED BY B.W. Ely Jr DATE 12-7-88
 APPROVED BY Paul B Hale DATE DEC 7, 1988

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SECTION 11XXX
PORTABLE CHEMICAL TOILETS

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing and installation of portable chemical toilets for selected subsurface locations within the ESF.

1.2 REFERENCED PUBLICATIONS

1.2.1 Code of Federal Regulations CFR)

o 30 CFR 57.20008 Safety and Health Standards for Underground Metal and Non-metal Mines

1.2.2 State of California Administrative Code (CAC)

o Title 8, Chapter 4, Subchapter 17 (Article 7), Mine Safety Orders

1.3 SYSTEM DESCRIPTION

The system will consist of strategically located portable chemical toilet units, constructed and maintained to NTS health standards.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment shall be in accordance with the ESF-QALAS when it is issued.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Materials for Construction

2.1.2 Sanitary Chemicals

PART 3 - EXECUTION

3.1 SHIPPING AND HANDLING

3.2 FIELD MAINTENANCE

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1500

Q.A. LEVEL N/A

TITLE: GENERAL REQUIREMENTS - MECHANICAL
 DIVISION - 15 MECHANICAL
 SUBDIVISION - BASIC MECHANICAL REQUIREMENTS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.L. Eyring DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the basic informational requirements and methods to provide complete and operable mechanical utility systems, as described in the following Division 15 sections.

1.1.2 This section applies to all sections of Division 15 except as specified otherwise.

1.2 SYSTEM DESCRIPTION

Furnish and install the subsurface mechanical utilities; mine supply water system, mine waste water system, compressed air system, and mine ventilation system as indicated on the Contract Drawings and specifications herein.

1.3 QUALITY ASSURANCE

1.3.1 The Quality Assurance Level Assignments will be as assigned in the specific sections.

1.4 SUBMITTALS

1.4.1 Submittal Data

1.4.1.1 Refer to Division 1 for submittal requirements.
1.4.1.2 Submittal Assembly

1.4.2 Shop Drawings

1.4.3 Certification Reports

1.4.4 Operation and Maintenance Manuals

1.5 RECORD DRAWINGS (AS-BUILTS)

PART 2 - PRODUCTS

2.1 GENERAL

2.1.1 All products must meet the requirements of the materials specified herein and in subsequent sections.

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PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Equipment Identification
- 3.1.2 Cleaning of Equipment and Finished Work
- 3.1.3 Use of Allocated Space
- 3.1.4 Cutting Repairing
- 3.1.5 Product Storage and Handling

3.2 INSPECTION AND TESTING

- 3.2.1 Final Inspection
- 3.2.2 Equipment Performance tests

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1501

Q.A. LEVEL Refer to 1.4.1

TITLE: PIPE AND FITTINGS
 DIVISION 15 - MECHANICAL
 SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.R. Englund DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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**SECTION 15XXX
PIPE AND FITTINGS**

PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification includes furnishing all materials, equipment, tools, and labor required to construct the water supply system, the waste water system, and the compressed air system. The work shall be performed in accordance with this specification and the Contract Drawings.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o B1.20.1 Pipe Threads, General Purpose
- o B16.5 Pipe Flanges and Flanged Fittings
- o B16.9 Factory Made Wrought Steel Buttwelding Fittings
- o B16.11 Forged Steel Fittings, Socket-Welded and Threaded
- o B16.21 Non-Metallic Gaskets for Pipe Flanges
- o B31.1 Power Piping

1.2.2 American Society for Testing and Materials (ASTM)

- o A53 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless
- o A105 Standard Specification for Forgings, Carbon Steel, for Piping Components
- o A181 Standard Specification for Forgings, Carbon Steel, for General-Purpose Piping
- o A183 Specification for Carbon Steel Track Bolts and Nuts
- o A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

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**SECTION 15XXX
PIPE AND FITTINGS**

- o A536 Specification for Ductile Iron Castings
- o A563 Specification for Carbon and Alloy Steel Nuts
- o D2000 Standard Classification System for Rubber Products |
in Automotive Applications
- o F436 Standard Specification for Hardened Steel Washers |
- 1.2.3 American Water Works Association (AWWA) |
- o C606 Grooved and Shouldered Type Joints |
- 1.2.4 Federal Specification (Fed Spec)
- o WW-P-521G Pipe Fittings, Flange Fittings, and Flanges: |
Steel and Malleable Iron (Threaded and Butt-
Welding)
- 1.2.5 Manufacturers Standardization Society (MSS)
- o SP69 Pipe Hangers and Supports, Selection and
Application

1.3 SYSTEM DESCRIPTION

- 1.3.1 The water supply system is to provide non-potable mine supply water as needed during construction and testing.
- 1.3.2 The waste water system shall be constructed to collect the water and pump it to the surface.
- 1.3.3 The compressed air system shall be constructed to provide for the distribution of compressed air throughout the ESF

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for piping is in accordance with the applicable ESF-QALAS:

Mine Water Supply System Piping: 6.7.1-0013
 Mine Waste Water System Piping: 6.7.1-0015
 Compressed Air System Piping: QALAS to be issued

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**SECTION 15XXX
PIPE AND FITTINGS**

- 1.4.2 For QA Level II items, the vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurement and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Pipe

- o Mine Supply Water System
- o Mine Waste Water System
- o Compressed Air System

2.1.2 Fittings

- o Mine Supply Water System
- o Mine Waste Water System
- o Compressed Air System

2.1.3 Hangers and Supports

PART 3 - EXECUTION

3.1 INSTALLATION

- o General
- o Workmanship
- o Interference with finished Electrical Work

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**SECTION 15XXX
PIPE AND FITTINGS**

- o Welded Pipe and Fittings
- o Grooved Pipe and Fittings
- o Supports and Pipe Hangers

- 3.2 INSPECTION AND TESTING
- 3.3 FLUSHING AND CLEANING
- 3.4 IDENTIFICATION

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1507
 Q.A. LEVEL Refer to 1.4.1

TITLE: VALVES
 DIVISION 15 - MECHANICAL
 SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Berto DATE 11-30-88
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PART 1 - GENERAL

1.1 WORK INCLUDED

The work included in this specification involves the manufacture, testing, inspection, supply and installation of valves for water and compressed air service.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o B16.10 Face-to-Face and End-to-End Dimension of Valves
- o B16.24 Bronze Pipe Flanges and Flanged Fittings Class 150 and 300
- o Z21.22 Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems

1.2.2 American Society for Testing and Materials (ASTM)

- o A536 Ductile Iron Castings
- o A-47 Specification for Ferritic Malleable Iron Castings
- o A-48 Specification for Gray Iron Castings

1.2.3 Manufacturers Standardization Society (MSS)

- o MSS SP-83 Butterfly Valves
- o MSS SP-87 Bronze Gate, Globe, Angle and Check Valves
- o MSS SP-87 Ball Valves with Flanged or Butt-Welding Ends for General Service
- o MSS SP-85 Steel Valves - Socket Welding and Threaded Ends

1.2.4 American Society of Mechanical Engineers (ASME)

- o Section IV Rules for Construction of Heating Boilers

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**SECTION 15XXX
VALVES**

1.3 SYSTEM DESCRIPTION

The water, waste water, and compressed air piping systems will include valves for control, protection of equipment and personnel, and isolation of specific zones.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for valves is in accordance with the applicable ESF QALAS:

Mine Water Supply System Valves: 6.7.1-0013
Mine Waste Water System Valves: 6.7.1-0015
Compressed Air System Valves: QALAS to be issued

1.4.2 For QA Level II items, the vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, materials procurement and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 These valves shall meet the materials and construction requirements of the attached "Valve Data Sheet."

2.2 MANUFACTURER AND ASSEMBLY

2.2.1 Valve fabrication, manufacture and assembly are to be of Manufacturer's standard practice.

2.2.2 Gate and Globe Valves shall be designed for repacking under pressure when fully open.

2.2.3 Ball Valves shall be equipped with blowout proof stems and adjustable packing glands.

PART 3 - EXECUTION

3.1 HANDLING AND TRANSPORTING

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**SECTION 15XXX
VALVES**

3.2 INSTALLATION

- o Valves shall be installed per drawings
- o Valves shall be installed in accessible locations, insofar as possible
- o Valves shall be installed with unions, flanges or grooved fittings so as to be removable

3.3 TESTING AND INSPECTION

3.4 VALVE TAGGING/VALVE LIST

ATTACHMENTS:

Valve Data Sheet (For each valve type)

- o Sizes
- o Pressure Rating
- o Body Material
- o Trim Material
- o End Connections
- o Body Construction
- o Trim Construction
- o Accessories

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1509
Q.A. LEVEL Refer to 1.4.1

TITLE: CONTROL AND MONITORING OF MECHANICAL UTILITIES
DIVISION 15 - MECHANICAL
SUBDIVISION - CONTROLS

APPROVED BY Larry Barto DATE 11-30-88
APPROVED BY B. D. Dughring DATE 12-7-88
APPROVED BY Paul B. Harte DATE DEC 7, 1988

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SECTION 15XXX
CONTROL AND MONITORING OF MECHANICAL UTILITIES

PART 1 - GENERAL

1.1 WORK INCLUDED

The work contained in this specification includes the furnishing and installation of control and monitoring devices for the subsurface mechanical utility systems.

1.2 REFERENCED PUBLICATIONS

(Will be detailed for Title II)

1.3 SYSTEM DESCRIPTION

This system includes the necessary components controlling and/or monitoring: flow, pressure, temperature, motor conditions for mechanical equipment, sump levels, and mechanical failure of piping or system components.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for control and monitoring devices is in accordance with the applicable ESF-QALAS

Mine Water Supply System	6.7.1-0013
Mine Waste Water System	6.7.1-0015
Compressed Air System	QALAS to be issued

1.4.2 For Q/A Level II items the vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1 Flow Meters

2.2 Pressure Indicator

2.3 Temperature Indicator

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SECTION 15XXX
CONTROL AND MONITORING OF MECHANICAL UTILITIES

2.4 Sensors and Indicators

2.5 Flow Controller

2.6 Pressure Controller

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Interface with H&N CCR system

3.2 INSPECTION AND TESTING

3.3 TAGGING

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1510

Q.A. LEVEL Refer to 1.4.1

TITLE: MINE WATER SUPPLY DISTRIBUTION SYSTEM
 DIVISION 15 - MECHANICAL
 SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.R. Eyring DATE 12-7-88
 APPROVED BY Paul R Hale DATE DEC 7, 1988

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**SECTION 15XXX
MINE WATER SUPPLY
DISTRIBUTION SYSTEM**

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing of materials and equipment, installation, and testing of the Mine Water Supply Distribution System.

1.2 REFERENCED PUBLICATIONS

The publication listed below forms a part of this specification.

1.2.1 ANSI B31.1 Power Piping

1.3 SYSTEM DESCRIPTION

1.3.1 This system includes the necessary pipe, valves, fittings and accessories to provide complete and operable Mine Water Supply Distribution capabilities to the underground Site Characterization Testing Program.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Mine Water Supply Distribution System is in accordance with ESF QALAS 6.7.1-0013 and QALAS 1.2.6-0001, Fluid Control, where required.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Pipe and Fittings
- 2.1.2 Valves
- 2.1.3 Hangers
- 2.1.4 Hydronic Specialties

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 INSPECTION AND TESTING

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1511
 Q.A. LEVEL Refer to 1.4.1

TITLE: **MINE WASTE WATER REMOVAL SYSTEM**
DIVISION 15 - MECHANICAL
SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B. G. Luyten DATE 12-7-88
 APPROVED BY Paul B Hale DATE DEC 7, 1988

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SECTION 15XXX
MINE WASTE WATER REMOVAL SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing of materials and equipment, installation, and testing of the Mine Waste Water Removal System.

1.2 REFERENCED PUBLICATIONS

The publication listed below forms a part of this specification.

1.2.1 ANSI B31-1 Power Piping

1.3 SYSTEM DESCRIPTION

1.3.1 This system includes the necessary pipe, valves, fittings and accessories to provide complete and operable Mine Waste Water Removal System capabilities to the Underground Site Characterization Testing Program.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Mine Waste Water Removal System is in accordance with ESF QALAS 6.7.1-0015.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 MTL Main Sump Pumps

2.1.2. Gathering Pumps

2.1.3 Diaphragm Pumps

2.1.4 Sump Construction Material

2.1.5 Pipe and Fittings

2.1.6 Valves

2.1.7 Hangers

2.1.8 Hydronic Specialties

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SECTION 15XXX
MINE WASTE WATER REMOVAL SYSTEM

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 INSPECTION AND TESTING

3.3 EQUIPMENT PERFORMANCE TESTS

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TECHNICAL SPECIFICATION

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NO. FS-SP-1512
 Q.A. LEVEL Refer to 1.4.1

TITLE: COMPRESSED AIR SYSTEM
 DIVISION 15 - MECHANICAL
 SUBDIVISION - PLUMBING

APPROVED BY Larry Barts DATE 11-30-88
 APPROVED BY B. W. Engstrom DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing of materials and equipment, installation, and testing of the Compressed Air System.

1.2 REFERENCED PUBLICATIONS

The publication listed below forms a part of this specification.

1.2.1 ANSI B31.1 Power Piping

1.3 SYSTEM DESCRIPTION

This system includes the compressors, and necessary pipe, valves, fittings and accessories to provide complete and operable Compressed Air System capabilities to the underground Site Characterization Testing program.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Compressed Air System shall be in accordance with ESF QALAS to be issued.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Air Compressors - Surface

2.1.2 Booster Compressors

2.1.3 Pipe and Fittings

2.1.4 Valves

2.1.5 Hangers

2.1.6 Specialties

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**SECTION 15XXX
COMPRESSED AIR SYSTEM**

PART 3 - EXECUTION

- 3.1 Installation
- 3.2 Inspection and Testing
- 3.3 Equipment Performance Tests

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1513
 Q.A. LEVEL Refer to 1.4.1

TITLE: **WASTE WATER PUMPS: MTL SUMP**
DIVISION 15 - MECHANICAL
SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.T. Luyten DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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SECTION 15XXX
WASTE WATER PUMPS - MTL SUMP

PART 1 - GENERAL

1.1 WORK INCLUDED

The work contained in this specification includes the furnishing and installation of electric submersible mine waste water pumps, for the primary MTL sump.

1.2 REFERENCED PUBLICATIONS

Reference standards for pumps materials will be provided in Title II specifications.

1.3 SYSTEM DESCRIPTION

This specification describes the requirements for the MTL Sump Pumps which are part of the Mine Waste Water Removal System.

1.4 QUALITY ASSURANCE

1.4.1 This Quality Assurance Level Assignment for the Mine Waste Water Removal System shall be in accordance with the ESF QALAS to be issued.

1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurement and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- o The pumps shall be heavy duty, designed to handle mine water containing abrasive suspended solids and deliver it at very high heads.
- o Pump materials requirements
- o Pump head pressure, capacity requirements
- o Impeller requirements
- o Seal requirements

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- o Motor requirements
- o Coating requirements
- o Factory inspection and testing

PART 3 - EXECUTION

3.1 INSTALLATION

- o Install pumps in conformance with manufacturer's recommendations and this specification.

3.2 FIELD INSPECTION AND TESTING

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1514
 Q.A. LEVEL Refer to 1.4.1

TITLE: **GATHERING PUMPS: DIAPHRAGM**
DIVISION 15 - MECHANICAL
SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY *Larry Barto* DATE 11-30-88
 APPROVED BY *B. G. Quinlan* DATE 12-7-88
 APPROVED BY *Paul B. Hale* DATE DEC 7, 1988

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PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing of portable air operated diaphragm pumps.

1.2 REFERENCED PUBLICATIONS

1.2.1 Referenced standards for pump materials will be provided in Title II specifications.

1.3 SYSTEM DESCRIPTION

This specification describes the requirements for the diaphragm pumps which are part of the Mine Waste Water Removal System.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Mine Waste Water Removal System shall be in accordance with the ESF QALAS to be issued.

1.4.2 The vendor shall furnish for the Contracting QA Representative's Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- o The diaphragm pumps shall be compressed air operated, diaphragm design with ball check valves.
- o The diaphragm pumps shall be self priming, and able to run dry without damage.
- o Pump material requirements.
- o Pump head pressure, capacity, requirements.
- o Factory inspection and testing

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PART 3 - EXECUTION

3.1 INSTALLATION

o Install gathering pumps in conformance with manufacturer's recommendations and this specification.

3.2 FIELD INSPECTION AND TESTING

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1515
 Q.A. LEVEL Refer to 1.4.1

TITLE: **GATHERING PUMPS - CENTRIFUGAL**
DIVISION 15 - MECHANICAL
SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.S. Engstrom DATE 12-7-88
 APPROVED BY Paul B Hate DATE DEC 7, 1988

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SECTION 15XXX
GATHERING PUMPS: CENTRIFUGAL

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing and installation of electric, submersible, mine water pumps which transfer mine waste water to the MTL sump.

1.2 REFERENCED PUBLICATIONS

Referenced standards for pump materials will be provided in Title II specifications.

1.3 SYSTEM DESCRIPTION

This specification describes the requirements for the mine waste water gathering pumps which are a part of the Mine Waste Water Removal system.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level assignment for the Mine Waste Water Removal System shall be in accordance with the ESF-QALAS to be issued.

1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance Program describing specified work, relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- o The gathering pumps shall be heavy duty, centrifugal type designed to handle mine water containing abrasive suspended solids.
- o Pump material requirements
- o Pump head pressure, capacity requirements
- o Motor requirements

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SECTION 15XXX
GATHERING PUMPS: CENTRIFUGAL

- o Coating requirements
- o Factory inspection and testing

PART 3 - EXECUTION

3.1 INSTALLATION

- o Install gathering pumps in conformance with manufacturer's recommendations and this specification.

3.2 FIELD INSPECTION AND TESTING

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1516
 Q.A. LEVEL Refer to 1.4.1

TITLE: **ROTARY SCREW AIR COMPRESSORS
 DIVISION 15 - MECHANICAL
 SUBDIVISION - SPECIAL SYSTEMS**

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.R. Eyring DATE 12-7-88
 APPROVED BY Paul B. Hale DATE DEC 7, 1988

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SECTION 15XXX
ROTARY SCREW AIR COMPRESSORS

PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification covers the requirements of electric motor driven, rotary screw air compressor units.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Military Specifications (Mil. Spec.)

- o MIL-V-18634B Valve Safety, Relief and Safety Relief
- o MIL-C-17596E Compressors, Reciprocating or Rotary, Power-Driven (EMD), Air, Base Mounted, 10 H.P. to 300 H.P.
- o MIL-S-16293G Strainers, Sediment, Pipeline, Water, Air, Gas, Oil, or Steam

1.2.2 American Society of Mechanical Engineers (ASME)

- o Boiler and Pressure Vessel Code and Interpretations Section VIV, Division I, Pressure Vessels
- o Performance Test Code PTC9 - Displacement Compressors, Vacuum Pumps and Blowers

1.2.3 National Electrical Manufacturers Association (NEMA)

- o ICS 6 Enclosures for Industrial Controls and Systems

1.2.4 Instrument Society of America (ISA)

- o S7.3 Quality Standard for Instrument Air

1.3 SYSTEM DESCRIPTION

This section describes the requirements for rotary screw air compressors which are a part of the ESF Compressed Air System. These compressors will be located at the surface near the main pad.

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SECTION 15XXX
ROTARY SCREW AIR COMPRESSORS

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for the Compressed Air System shall be in accordance with the ESF QALAS to be issued.
- 1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurements and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- o Compressors
- o Motors
- o Housing and Skid Base for outdoor installation
- o Oil Receiver/Separator - ASME coded and stamped
- o Safety Relief valve
- o Blow-down Valve w/muffler
- o Oil Cooler - air cooled
- o Air After Cooler w/moisture separator
- o Surge Protection
- o Electrical Enclosures
- o Inlet Filter w/condition indicator
- o Oil Filter
- o Compressor Overload and Safety Devices
- o Controls and Instrumentation - cabinet mounted
- o Sequence Controller for multiple units

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SECTION 15XXX
ROTARY SCREW AIR COMPRESSORS

- o Piping
- o Valves
- o Spare Parts

PART 3 - EXECUTION

3.1 INSTALLATION

- o Install compressors in conformance with manufacturer's recommendations and this specification.

3.2 INSPECTION AND TESTING

- o Field performance test

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1517
Q.A. LEVEL Refer to 1.4.1

TITLE: **BOOSTER AIR COMPRESSOR UNIT**
DIVISION 15 - MECHANICAL
SUBDIVISION - BASIC MECHANICAL MATERIALS AND METHODS

APPROVED BY Larry Barta DATE 11-30-88
APPROVED BY B.T. Szymanski DATE 12-7-88
APPROVED BY Paul B Hale DATE DEC 7, 1988

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SECTION 15XXX
BOOSTER AIR COMPRESSOR UNIT

PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification covers the requirements of an electric motor driven, skid mounted, booster air compressor unit.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Military Specifications (MIL Spec.)

- o MIL-V-18634B Valve Safety, Relief and Safety Relief
- o MIL-V-17596E Compressors, Reciprocating or Rotary Power - Driven (EMD), Air, Base Mounted, 10 H.P. to 300 H.P.
- o MIL-S-16293G Strainers, Sediment, Pipeline, Water, Air, Gas, Oil, or Steam.

1.2.2 American Society of Mechanical Engineers (ASME)

- o Boiler and Pressure Vessel Code and Interpretations Section VIV, Division I, Pressure Vessels.
- o Performance Test Code PTC9- Displacement Compressors, Vacuum Pumps and Blowers.

1.2.3 National Electrical Manufacturers Association (NEMA)

- o ICS 6 Enclosures for Industrial Controls and Systems

1.2.4 Instrument Society of America (ISA)

- o S7.3 Quality Standard for Instrument Air

1.3 SYSTEM DESCRIPTION

This section describes the requirements for a booster air compressor unit which is a part of the ESF Compressed Air System. The booster compressor unit will increase the compressed air supply pressure to the large hole drill jumbo used for test hole drilling.

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SECTION 15XXX
BOOSTER AIR COMPRESSOR UNIT

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Booster Air Compressor Unit shall be in accordance with the ESF-QALAS to be issued.

1.4.2 The vendor shall furnish for the Contracting QA Representative's approval, a Quality Assurance program describing specified work, including descriptions which identifies management controls relative to the fabrication process, quality control and inspection requirements, material procurement and test procedures, and documentation.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- o Compressors
- o Motors
- o Skid Base
- o Receiver ASME Coded and Stamped
- o Safety Relief Valve
- o Blowdown Valve w/muffler
- o Air Cooled After Cooler w/separator-trap
- o Electrical Enclosures
- o Compressor Overload and Safety Devices
- o Controls and Instrumentation

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SECTION 15XXX
BOOSTER AIR COMPRESSOR UNIT

- o Inlet Pulsation Bottle
- o Piping
- o Valves
- o Spare Parts

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 INSPECTION AND TESTING

3.2.1 Final Inspection

3.2.2 Performance Tests

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-1518
Q.A. LEVEL Refer to 1.4.1

TITLE: EMERGENCY EYEWASH STATION
DIVISION 15 - MECHANICAL
SUBDIVISION - PLUMBING

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.D. Ely DATE 12-7-88
 APPROVED BY Paul B Hale DATE DEC 7, 1988

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**SECTION 15XXX
EMERGENCY EYEWASH STATION**

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing and installation of an emergency eyewash station.

1.2 REFERENCED PUBLICATIONS

1.2.1 The publication listed below forms a part of this specification.

- o ANSI Z358.1-81 Emergency Eyewash and Shower Equipment

1.3 SYSTEM DESCRIPTION

This specification describes the emergency eyewash station, which is part of the mine water supply system. It will be located near the UPS Battery Bank on the Main Test Level.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Mine Supply Water System shall be in accordance with the ESF-QALAS to be issued.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Emergency Eyewash unit shall feature twin eyewash heads mounted into a receptor which is impervious to damage from alkalis, salt solutions, oils, and most acids.

2.1.2 Valve shall be operated by hand and/or foot treadle, and shall stay open until manually closed.

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 ACCEPTANCE TEST

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-1519
 Q.A. LEVEL Refer to 1.4.1

TITLE: **HYDRONIC SPECIALTIES**
DIVISION 15 - MECHANICAL
SUBDIVISION - HEATING, VENTILATING, AIR CONDITIONING

APPROVED BY Larry Barto DATE 11-30-88
 APPROVED BY B.R. Chytrny DATE 12-7-88
 APPROVED BY Paul B Hale DATE DEC 7, 1988

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**SECTION 15XXX
HYDRONIC SPECIALTIES**

PART 1 - GENERAL

1.1 WORK INCLUDED

1.1.1 The work contained in this specification includes the furnishing and installation of hydronic specialties as indicated on the drawings and specified herein.

1.2 REFERENCED PUBLICATIONS

Reference standards for hydronic specialties will be provided in Title II specifications.

1.3 SYSTEM DESCRIPTION

This specification describes the requirements for hydronic specialties to make the Mine Supply Water System and the Mine Waste Water Removal System, complete and operable. Control and Monitoring devices are covered under a separate specification.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignments for hydronic specialties will be the same assignment as the system it is a part of and shall be in accordance with the applicable ESF QALAS:

Mine Water Supply System	6.7.1-0013
Mine Waste Water System	6.7.1-0015

PART 2 - PRODUCTS

2.1 EQUIPMENT

- o Expansion tanks
- o Air Vents
- o Relief Valves
- o Oil Separators
- o Strainers
- o Pump Connectors

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**SECTION 15XXX
HYDRONIC SPECIALTIES**

PART 3 - EXECUTION

3.1 INSTALLATION

- o Install specialties in accordance with manufacturer's instructions.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0204
 Q.A. LEVEL II

TITLE: EXCAVATION FOR STATIONS, DRIFTS AND ALCOVES
 DIVISION 2 - SITEWORK
 SUBDIVISION - SITE PREPARATION

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.T. Engineering DATE 12-7-88
 APPROVED BY Asst. Eng. AW DATE 12-7-88

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SECTION 02XXX
EXCAVATION FOR STATIONS, DRIFTS AND ALCOVES

PART 1 GENERAL

1.1 WORK INCLUDED

This specification covers underground excavation of stations, drifts, and alcoves by drill and blast methods and services for these areas. The work includes furnishing all materials, tools, labor and incidental services needed for excavation, rock reinforcement, surveying and providing utilities and services for underground testing.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Code of Federal Regulations (CFR)

- o 30 CFR 57 Safety and Health Standards-Underground Metal and Nonmetal Mines
- o 27 CFR Chap. 1 Part 55, Commerce in Explosives
- o 29 CFR 1926 Part U, Blasting and Use of Explosives (OSHA)

1.2.2 State of California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, - Mine Safety Orders
- o Title 8, Chapter, 4, Subchapter 20, - Tunnel Safety Orders

1.3 SYSTEM DESCRIPTION

The system specifies activities required for Stations, Drifts and Alcoves excavation, including:

- o Blast Hole Drilling*
- o Blasting*
- o Mucking
- o Ground Support

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- o Schedule
- o Location
- o Dimensions

*Requirements for blasthole drilling and blasting are further specified in FS-SP-0205, "Controlled Drilling and Blasting."

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for Underground Excavation is II.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 Equipment Requirements

The Contractor shall provide all equipment necessary that is not furnished by the Government (Owner).

All equipment shall be compatible with the requirements of MSHA and shall be subject to the review of the CONTRACTING OFFICER. All equipment shall be compatible with the equipment size and load restrictions imposed by shaft hoist capacities, shaft access areas, and underground excavation dimensions specified and as shown on the Contract Drawings.

3.1.2 Dust Control

Dust from general excavation operations shall be controlled to comply with Federal and State requirements. Refer to FS-SP-1109 "Mobile Dust Collection Units."

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3.1.3 Drill and Blast Excavation Tolerance

For drill and blast excavation, the wall and roof surfaces shall be within a radial tolerance +6 inches, -0 inches of the lines, grades and levels shown on the Contract Drawings.

Finished floor, back and rib surfaces shall be of uniform appearance free from local protrusions and depressions.

3.1.4 Drilling and Blasting

Prior to excavation of any underground opening, a blasting plan shall be submitted to the CONTRACTING OFFICER for review. The blasting plan shall include the location, surface storage and onsite transportation of explosives, depth, size and direction of drill holes; type, quantity, loading configuration of explosive, location and type of delay detonator; and type and location of any boosters used per hole. When cross sectional areas change, or if the geology substantially changes, or if blasting is performed to remove loose rock for safety reasons, a new plan shall be submitted. Controlled blasting methods shall be used in order to limit overbreak and keep the excavation within the specified tolerances. All use of explosives shall conform to 30 CFR 57. Refer to FS-SP-0205 "Controlled Drilling and Blasting."

3.1.5 Loose Materials

All loose material shall be removed from ribs and roof following excavation.

3.1.6 Excavated Materials

Excavated material shall be disposed of on surface at the waste locations designated on the site and stockpiled according to the Contract Drawings and Specifications.

3.2 SHAFT STATION

3.2.1 Excavation

The excavation of the shaft stations and the drift required for the equipment assembly shall be excavated by drill and blast methods to the dimensions of the Contract Drawings. The CONTRACTOR shall begin excavating in a manner that will provide space for an early assembly of the equipment.

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3.2.2 Blast Effect Monitoring

To be determined.

3.2.3 Safety and Storage Plan for Powder and Caps

The CONTRACTOR shall provide, in the form of a plan, the storage and transportation of explosive materials, both surface and underground.

3.3 EXCAVATION OF ROOMS, DRIFTS AND CROSSCUTS

3.3.1 Excavation Methods

The excavation of the rooms, drifts ramps, alcoves and crosscuts shall be carried out by drill and blast methods. The work shall be performed to the dimensions of the Contract Drawings and in accordance with the tolerance requirements of Paragraph 3.1.3 of this section.

3.3.2 Constraints on Excavation Sequence

A number of testing activities under the direction of the CONTRACTING OFFICER will be carried out concurrent with underground construction and which will require construction to stop for specified periods of time at particular locations. These constraints allow for the installation of test facilities to be time-phased with excavation in order to avoid loss of test data. The constraints imposed on an excavation sequence and schedule by the concurrent testing activities are to be determined.

Constraints Related to DAS Alcoves: To be determined

Constraints Related to Monitoring Arrays: To be determined

Constraints Related to Tests: To be determined

Constraints Related to Sequential Mining: To be determined

Constraint Related to Groundwater Inflow Monitoring: The CONTRACTOR shall notify the CONTRACTING OFFICER immediately of any groundwater inflow during underground excavation.

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3.3.3 Testing Support

The CONTRACTOR shall provide support to underground testing as described herein.

- o Perched Water Test if water encountered
- o Geologic Mapping
- o Location Markers
- o Rock Matrix Tests
- o All other tests as required

Utilities: The CONTRACTOR shall supply the following utilities to support testing and instrument installation.

The utilities will be provided on a continuous basis and any required interruption shall be subject to CONTRACTING OFFICER'S review.

Mine Supply Water: To be determined

Mine Waste Water: To be determined

Electric Power: To be determined

Compressed Air To be determined

Lighting: To be determined

Telephone: To be determined

3.3.4 Ventilation Air: Adequate ventilation air shall be provided as shown on the Contract Drawings.

3.4 ROCK REINFORCEMENT

Installation and testing of rock bolts shall be in accordance with Section 0208, "Rock Bolting."

3.5 SURVEY WORK - UNDERGROUND

Surveying shall include furnishing surveying equipment and personnel to perform survey control required before and during excavation and maintaining indicated tolerances. Survey monuments on the surface, provided by others and shown as reference on the Contract Drawings, shall be used and maintained by the CONTRACTOR.

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A survey for conformance with the Contract Drawings and with specified tolerances shall be conducted for every 10 linear feet of tunnel excavation and survey points established at all intersections. Survey reports shall be submitted for record daily with CONTRACTOR's Daily Report.

In addition to the required survey points for excavation, the following marks need to be installed at a maximum distance of 100 feet from the excavated face for testing operations:

To be determined

- 3.5.1 Survey accuracy for instrumentation locations not included in drill specification shall be +/- 0.1 feet.
- 3.5.2 Underground surveys shall be carried out by mining surveyors with more than three years experience in underground surveying. Survey records shall be certified by a licensed professional engineer or land surveyor.

3.6 FIELD QUALITY CONTROL

- 3.6.1 The Contractor shall be responsible for the correctness of the positions, levels, dimensions and alignment of all parts of the work in accordance with the Contract Drawings.

Blasting personnel shall conform to 30 CFR, Part 57, Paragraph 57.6090 and 57.6091. Persons authorized to directly control blasting operations shall demonstrate, by certified records, the successful supervision of blasting in test horizon formations.

3.6.2 Inspection and Acceptance

All inspections and tests shall be performed by the CONTRACTOR with appropriately calibrated inspection equipment.

Inspection for the acceptance of the complete excavation submitted to the CONTRACTING OFFICER for acceptance shall be carried out by an inspector authorized by the CONTRACTING OFFICER.

Inspection Procedure: To be determined

Acceptance Standards: To be determined

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Remedial work for the excavation ribs and back required as a result of gouging shall consist of additional rockbolting, and/or increased rockbolt depth and additional wire meshing and strapping as a minimum. The CONTRACTING OFFICER shall determine the type and schedule of remedial work required.

Penalty: Failure by the CONTRACTOR to consistently produce smooth excavation outlines conforming to the excavation tolerances shall be cause for contract cancellation as determined under acceptance procedures by the Contracting Officer. Penalty shall be in force only when it is determined that geological conditions are not changing.

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DATA REQUIREMENTS LIST

DESCRIPTION	* WHEN REQUIRED	NUMBER OF COPIES REQUIRED	REFERENCE	** REQUIRED FOR
<p>NO DATA REQUIREMENTS REQUIRED FOR THIS OUTLINE SPECIFICATION</p>				

* `AC` - AS COMPLETED `BC` - BEFORE CONTRACT CAN BE AWARDED `BU` - BEFORE USE (OF PROCEDURE OR BY PERSONNEL)	`BFR` - BEFORE FABRICATION RELEASE `PS` - PRIOR TO SHIPMENT `WS` - WITH SHIPMENT
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** `ACM` - APPROVAL BY MANAGER	"REC" - RECORD
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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-0205

Q.A. LEVEL II

TITLE: **CONTROLLED DRILLING AND BLASTING
DIVISION 2 - SITEWORK
SUBDIVISION - TUNNELING**

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.T. Gustin DATE 12-7-88
 APPROVED BY Ashad Ali DATE 12-7-88

REVISION DESCRIPTION	SECT. OR PAGES	REV. BY	APPROVED BY	REV. NO.	DATE
Incorporation of Title I 100% Review Comments	See Text	<i>ras</i>	SEE ABOVE	1	12-7-88 12-1-88 12-5-88

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SECTION 02XXXX
CONTROLLED DRILLING AND BLASTING

PART 1 - GENERAL

1.1 WORK INCLUDED

This specification covers drilling and blasting operations for rock excavation in vertical shafts, shaft stations, and drifts.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Specification Number</u>	<u>Description</u>
FS-SP-0201	ES-1 and ES-2 Collar Installation
FS-SP-0202	Shaft Sinking, ES-1
FS-SP-0203	Shaft Sinking, ES-2
FS-SP-0204	Excavation for Stations, Drifts and Alcoves

1.3 REFERENCED PUBLICATIONS

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

In the event of a conflict between this specification and a referenced publication, this specification shall take precedence.

1.3.1 Federal Regulations

27 CFR Chap 1 Part 55, Commerce in Explosives

29 CFR 1926 Part U, Blasting and Use of Explosives (OSHA)

30 CFR 57 Safety and Health Standards - Underground Metal and Nonmetal Mines

1.3.2 U.S. Dept. of the Interior - Bureau of Reclamation

Construction Safety Standards, Sec. 24

1.3.3 US DOE NNWSI

DOE/NV/00410-77 Exploratory Shaft at Yucca Mountain - Safety and Health Program Plan

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1.3.4 State of Nevada

Title 46, Chapter 512, Health and Safety Standards for Open Pit and Underground Metal and Nonmetal Mines, and Sand, Gravel and Crushed Stone Operations

1.3.5 State of California Administrative Code (CAC)

Title 8, Chapter 4, Subchapter 17 Mine Safety Orders

1.3.6 American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment

1.4 SYSTEM DESCRIPTION

All subsurface rock excavations which require explosives to expedite removal, shall employ controlled blasting methods to create designed shaft, station and drift spaces, to minimize disturbance to the rock remaining outside of the spaces and fragment the rock to be moved.

The smooth blasting technique of controlled blasting shall be employed as the drilling and blasting method as shown on the Construction Drawings for vertical shaft sinking and horizontal drifting. The "Line Drilling" controlled blasting technique shall be used in initiating shaft openings or other areas where precise opening dimensions are required.

Shots required to trim rock projections inside of the neat excavation line shall use the minimum amount of explosive required to remove the projection. Blasts of this type will be controlled in the same manner as all other blasting governed by this specification.

1.5 QUALITY ASSURANCE REQUIREMENTS

The Quality Assurance level assignments are given in the ESF-QALAS. To assure that controlled blasting for the ESF will be performed in accordance with specified drilling and blasting procedures, restrictions and tolerances, a set of comprehensive quality control procedures for the drilling, blasting and excavation processes are required. In summary, these procedures shall describe:

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1. The blasting/excavation Quality Control organization:
 - Titles
 - Responsibilities
 - Authorities
 - o Stop Work
 - o Work Acceptance
 - o Approval of Changes in Blasting Program

2. Quality Control inspection methods and procedures together with acceptance standards:
 - Blasthole location and drilling alignment
 - Methods of controlling charge density in holes and/or blasthole pattern
 - Water usage
 - Blast results
 - Dust control

3. Records that will be used to verify the application of Quality Control methods employed, the acceptability of the drilling and blasting methods used and the blasting results obtained.

1.6 SUBMITTALS

The following items shall be submitted, by the Subcontractor, in accordance with the Data Requirements List (DRL) following Section 3 of this specification. The DRL will indicate intent of each submittal, i.e., for approval or for record and required submittal periods or dates.

- a. Chemical analysis of all blasting materials proposed for the job. The manufacturer's certified chemical analysis will be acceptable.
- b. Chemical analysis of all drilling lubricants or fluids, other than water, used to assist blast hole drilling. The manufacturer's certified chemical analysis will be acceptable.
- c. Credentials and resumes of Contractor's Drilling and Blasting Supervisor.

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- d. Contractor's Drilling and Blasting Plan.
- e. Contractor's Individual Shot Plan.
- f. Contractor's Daily Blasting Log.
- g. Contractor's Blasting Vibration Monitoring Plan.
- h. Contractor's Seismograph Tape Records of Each Blast's Peak Particle Velocities with the Blast Round Location, Number and Time of Blast Identified.
- i. Blast Area Security Plan

1.7 DELIVERY, STORAGE AND HANDLING

The Contractor shall transport, handle, store, and use explosives in accordance with the provisions of 29 CFR 1926 Part U, "Blasting and the Use of Explosives," 27 CFR Chap 1, Part 55, "Commerce in Explosives", the Bureau of Reclamation, "Construction Safety Standards", Sec. 24 and 30 CFR 57, Subpart E, "Explosives"

The Contractor shall maintain an inventory record of storage and withdrawal of all explosives. This record shall be available to the Contracting Officer, who shall be promptly notified of any loss or theft of explosives. The Contractor shall provide such reasonable and adequate protective facilities, as necessary, to prevent loss or theft of explosives. Storage of explosives and detonators outside of approved magazines is not permitted.

PART 2 - PRODUCTS

2.1 EXPLOSIVE MATERIALS

Free running explosives are prohibited for use in the shaft.

A chemical analysis of all explosive materials proposed for use on the job is required to be submitted 30 days prior to proposed use date. The Contracting Officer shall approve or disapprove the material within 10 days of receipt. No blasting materials shall be used prior to the issuance of the Contracting Officer's written approval of their use. Approval for each lot or each individual shipment is required.

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- 2.1.1 Explosives for Production Holes (Stopping Holes and Cut Holes) - Production Holes shall be charged with water gel explosive or emulsion, with blast strength characteristics equal.
- 2.1.2 Explosive for Perimeter Holes - Perimeter Holes shall be charged by string loading small-diameter cartridges of a low density water gel explosive, or emulsion with strength characteristics equal.

2.2 DETONATORS

- 2.2.1 Blasting Caps - An approved non-electric detonating system must be used. Caps shall be furnished in delay groups to fire in the sequences and timing interval shown on Contract Drawings. Other approved non-electric detonating systems may be used. An electric blasting cap may be used to initiate the non-electric detonating circuit.
- 2.2.2 Detonating Cord and Connectors - An approved detonating cord system shall be used.

2.3 STEMMING MATERIAL

The stemming shall be granular or non-granular material as shown on the drawing (approximately 100 pounds/cubic foot when tamped). The stemming material shall not contain any particles larger than 1/4 inch in any direction.

PART 3 - EXECUTION

3.1 DRILLING AND BLASTING METHODS

The Contractor shall employ the controlled blasting methods identified on the construction drawings for all subsurface excavation. In smooth blasting, closely spaced parallel holes are drilled along the excavation line, lightly loaded with string loaded charges, and fired after the main interior excavation charges have detonated. Line drilling uses a single row of closely spaced holes, not charged, along the excavation neatline. Main interior charges develop fractures between the line-drilled perimeter holes to form the excavated surface.

The Contractor shall take all steps necessary to ensure that no damage or unacceptable excavation of shaft, drift, or foundation occurs. The Contracting Officer, or his representative and the Mining Inspector, will inspect the excavation following each blast and cleanup cycle to

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determine acceptability. If a portion of a shaft, drift, or foundation is deemed unacceptable by the Contracting Officer or Mining Inspector, the Contractor shall plan an adjustment to his procedures to prevent any further damage. The revised shot plan shall be approved by the Contracting Officer, prior to the next detonation.

3.2 DRILLING AND BLASTING SAFETY

Drilling and blasting will be permitted only after adequate provision has been made for the protection of persons, the work, and public or private property. Blasting shall conform to safety standards as set forth in 30 CFR 57, Subpart E, "Explosives".

The Contractor shall make every effort to prevent surface blasting fly rock damage to structures or injury to personnel. The Contractor shall be responsible for any damage or injury resulting from blasting. When necessary, as determined by the Contractor, blasting mats shall be used to protect adjacent property and installations.

The Contractor shall erect proper warning signs of adequate number and size that state that blasting operations are taking place in the area. The warning signs shall be clearly visible to all traffic entering the area. The Contractor shall establish and use a reliable audible blast-warning system, and use watchmen to ensure that all personnel in the area are properly warned and kept at a safe distance from each impending blast.

The Contractor shall submit a Blast Area Security Plan which includes pre-blast evacuation and shot guarding procedures.

3.3 MAPPING, MEASURING AND TESTING BY OTHERS

During the excavation of ES-1, the UDBR and MTL levels, scientific testing personnel will map and measure the rock fractures, in situ stresses and other parameters. The measurements will be available to the Contracting Officer for use in controlling blasting activity and performance. If these measurements indicate the creation of unacceptable conditions such as, but not limited to, excessive fracture dilation, creation of excessive new fracturing or creation of damaged zones beyond the pre-established limits, the Contracting Officer may direct modifications to the Contractor's blasting procedures.

The Contractor shall be responsible for determining that blasted areas are adequately prepared for the safe entrance of measurement and testing personnel, and that preparatory treatment of surfaces to be measured and mapped has been performed as specified in test support specifications.

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3.4 VIBRATION MONITORING

In addition to visual damage inspections to be performed by the Mining Inspectors, the Contractor shall supply, install, and maintain a calibrated seismograph system. The seismograph system shall be suitable for use in measuring and recording velocity and include transducer channels. Operation, calibration and interpretation of seismograph records will be performed by the Mining Inspector. The system shall be installed in accordance with manufacturers' instructions and the transducers shall be placed by the Contractor at designated locations on the rock or structures, or both, as directed by the Contracting Officer. The monitoring of not less than two locations will be required of the Contractor during each blast. If concrete shaft lining is placed closer than 30 feet from the blast, the Contractor shall demonstrate through coring evidence, that vibration did not damage the concrete. The seismograph recording or seismogram shall be a real-time, direct-readout, permanent record and should provide both the peak particle velocity and the frequency of vibration. These records shall be made available to the Contracting Officer for analysis before the next shot is made.

A Blasting Vibration Monitoring Plan shall be submitted by the Contractor, for approval, at least 10 days prior to conducting the initial test blast program. Additional blasting vibration monitoring shall be conducted at the Contractor's expense if the pounds per delay is increased by more than 25 percent.

3.5 DRILLING AND BLASTING PROCEDURES

The specific drill and blast procedures and patterns, as specified herein, are to be used to prepare the Contractor's initial Blasting Plan.

3.5.1 Test Blast Program - Strict adherence to proven drilling and blasting practices shall be applied at the start of the work and progressive improvements in the excavation of the work will be expected as the result of test blast programs. The Contractor shall demonstrate the ability to maintain the specified tolerance as each new blasting plan is established. Test blasting programs shall be performed at the onset of blasting for Shaft ES-1 collar, the Topopah Springs Member at approximately the 100-foot level (L), and at the shaft breakouts occurring at the UDBR and MTL, in order to verify Contractor's blasting plans. The results of each test blast shall be approved by the Contracting Officer before continuing use of the test blast pattern and loading. The Contractor shall conduct additional test blast programs as necessary to accommodate any changing rock conditions and to assure that the shaft construction meets the requirements of this Specification.

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In conjunction with the test blast program specified herein, the Contractor shall monitor the blasting vibrations during shaft excavations and lining to measure the actual peak particle velocity results of the test blast. If monitored blasting vibrations exceed the limits specified herein, the Contractor shall modify the blasting plan to ensure that the stated requirements are met.

The test blasting programs shall produce the following results:

- a. Demonstrate that:
 - 1. The blasted round will break consistently 85% of the drilled depth in both shafts and drifts. If the Contractor fails to break 85% of the drilled depth in 8 out of 10 blast rounds, the contractor shall order a reduction in the depth of drill holes at any location.
 - 2. The Peak Particle Velocities are held within the specified limits.
 - 3. The overbreak is held to a maximum of 6 inches.
 - 4. "Half-casts" of the perimeter holes are visible after the walls have been scaled where rock conditions permit.
- b. Improved blasting and excavation practices.
- c. Demonstrate that the blasting program proposed can be safely accomplished.
- d. Demonstrate that the pounds of explosive or blasting agent detonated with each delay, does not produce peak particle velocities at the closest in place concrete, that exceed the allowable ppv mentioned in section 3.10.2.2.

3.5.2 Drilling Patterns - Initial drill patterns to be employed for smooth blasting of ES-1 and ES-2 shafts, and horizontal drifts are shown in the Contract Drawings. The diameter of drill holes shall be a maximum of 1-7/8 inches. The maximum depth of drill holes for each blasting round shall not be greater than 10 feet in the shaft and 12 feet in drifts.

3.5.3 Hole Charging - Typical loading for blast round drillholes shall be as shown on the Contract Drawings and as specified in the following paragraphs.

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- 3.5.3.1 Production Holes (Stopping and Cut Holes): Production holes shall be loaded and tamped to the charge density shown on Contract Drawings.
- 3.5.3.2 Perimeter Holes: Perimeter holes shall be loaded with light, string loaded charges, as shown on the Contract Drawings. Perimeter holes shall not be tamped, and they shall be loaded with a decoupled charge (the use of small diameter explosive cartridges with respect to the hole diameter, leaving an air cushion in the annulus space.)
- 3.5.3.3 Timing - Timed delays shall be used to stagger blasting in each round. Initial time delays to be employed are indicated on Contract Drawings. The initial Blasting Test Program results may determine a better delay sequence.
- 3.5.4 Stemming - Production holes shall be stemmed, if necessary, to prevent hole charges from being "sucked out" by the firing of holes detonated earlier in the delay sequence. Two feet of non-granular stemming is required in the perimeter. The stemming in perimeter holes shall be above the decoupled explosive charge. A means of preventing the stemming material from filling the annulus between the decoupled explosives and the hole wall shall be provided.
- 3.5.5 Fragmentation - It is the intent of this specification that the rock be adequately fragmented to allow effective muck loading to be accomplished. The acceptance criterion for drift fragmentation shall be that 90% (by volume) of all rock fragments resulting from a blast shall pass through a 12" x 12" grizzly.

3.6 DRILLING BLAST HOLES

Drill water use is to be limited to the minimum amount required for efficient blast hole drilling. A selected chemical tracer will be added to all of the water used in drilling so that it can be distinguished from water being used for other construction and testing activities or naturally occurring water. Unnecessary and uncontrolled use of water is prohibited. In areas that require dry drilling of blast holes, a dust collection system shall be used to keep airborne dust below threshold limits.

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The Contractor shall provide, to the Contracting Officer for approval, a chemical analysis of all drilling lubricants or other fluids to be used to assist the drilling operations.

3.7 DRILL HOLE ALIGNMENT

Drill Hole alignment shall conform to the Contract Drawings. Maximum allowable deviation from planned direction shall not exceed 1/2 inch per foot. Drill holes will be inspected for alignment by the Mining Inspectors prior to charging.

3.8 DUST AND FUME CONTROL

When drilling in rock or other dust-producing material, the dust shall be controlled within the limits specified in the ACGIH "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment". The Contractor shall provide to the Contracting Officer for approval, a description of the dust collection equipment to be used.

3.9 DRILLING EQUIPMENT

A description of the drilling equipment also be provided for approval by the Contracting Officer.

3.10 DRILLING AND BLASTING QUALITY CONTROL

All drilling and blasting activities will be subject to inspection methods described in the "ESF Controlled Drilling and Blasting Quality Control Procedures". These procedures describe the Quality Control processes that the Mining Inspector will employ to assure that the drilling and blasting practices used meet the requirements of this specification. The following describes elements of the Quality Control procedures.

3.10.1 Field Inspection of Drilling and Blasting - Field inspection or the quality control evaluation of drilling and blasting practices and results will be performed by assigned Mining Inspectors, acting in behalf of DOE/WMPO. The Mining Inspectors will review and approve the Contractor's drilling and blasting documentation and observe all drilling and blasting results. Inspectors will advise the Contracting Officer of all areas of non-compliance and, when requested, consult and advise on corrective actions. In addition, Inspectors will observe the work place for unsafe working conditions and/or potential hazards and immediately advise the Contracting Officer. The above actions will be documented in Mine Inspector's daily Quality Control reports.

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3.10.2 Acceptance Criteria

- 3.10.2.1 Visual Observations: The following visual observations shall be used by the Mining Inspectors to evaluate the effectiveness of the controlled blasting programs.
- a. Success or failure to achieve advance of 85% of the drilled depth.
 - b. Muck fragmentation
 - c. Overbreak or Underbreak. Blast Hole Traces - Half casts of at least a portion of the drill hole traces, in horizontal and shaft excavations, in any round or lift, shall be visible in the final rock surface. These traces should be distributed uniformly after the scaling down of all loose and shattered rock. If, after a reasonable trial this half cast standard is unattainable, the Contracting Officer may direct an adjustment in the blasting pattern and charge density.
- 3.10.2.2 Seismograph Readings: Seismograph readings shall indicate that peak particle velocities are within specified limits of 5 ips in the lined shafts, and 10 ips in drifts. These limits, empirically developed, will be confirmed or adjusted as actual data are obtained from shaft and drift blasting in tuff, in order to achieve optimum results.
- 3.10.2.3 Drift Wall Smoothness: At the start of drifting at each test level, a smooth wall standard panel or area shall be established at a location designated by the Contracting Officer. This standard for wall smoothness in rock shall be established during the Contractor's drilling and blasting test program at that level. Routine drilling and blasting shall not proceed until a smooth wall standard is established and agreed upon with the Contracting Officer. The approved standard shall be marked off and protected during the drifting phases and shall be used to determine subsequent drilling and blasting of horizontal drifts. If the Contractor fails to comply with the established standard wall smoothness,

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as determined by the Contracting Officer, all drilling and blasting operations shall cease and a new drilling and blasting testing program shall be submitted and performed by the Contractor to meet the established smoothness standard.

- 3.10.2.4 Coring Tests: At the discretion of the Contracting Officer, cores shall be drilled at designated locations in rock and/or in-place concrete in accordance with approved specifications.

3.11 DRILLING AND BLASTING PLANS

- 3.11.1 Project Drilling and Blasting Plan - The Contractor shall submit to the Contracting Officer, for approval, an ESF Drilling and Blasting Plan. No drilling and blasting activity shall begin until the Drilling and Blasting Plan and the assignment of the drilling and blasting supervisor have been approved by the Contracting Officer.

The Contractor's Drilling and Blasting Plan shall include a complete summary of the proposed use, source, chemical composition, transportation, handling, and storage of explosives. The plan shall include the proposed activities for drilling and blasting to achieve the desired excavations, using controlled blasting techniques and the methods for the control of noise, dust, fly rock, airblast, and vibrations. The Plan shall provide data that demonstrates the adequacy of the Contractor's proposed efforts regarding the safety of structures and excavated surfaces, and the assurance that adequate rock conditions will be maintained.

The Drilling and Blasting Plan shall contain, but not be limited to, the following information:

- Drill hole pattern, hole depth and diameter
- Types of explosives to be used
- Size of cartridges
- Powder factor

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- Hole loading configurations
- Delays (arrangement, type, brand and periods between delays)
- Stemming or decking details (if required)
- Blasting circuit details (machine brand, voltages, wire sizes, detonating cord, etc.)
- Rock type and conditions
- Safety procedures - step by step description of procedures for preventing the uncontrolled detonation of explosives, and prevention of injury or damage.

The blasting plan shall also indicate the safe distance of blasting from segments of already placed concrete lining.

Under normal circumstances, the liner will be no closer than 20 feet from the next blasting round.

Before the blasting plan is submitted and before blasting agents or explosives are used underground, a technical representative(s) of the manufacturer or supplier of the blasting agents, explosives, and initiating device shall be consulted and his recommendations reviewed for incorporation into the blasting plan. The technical representative(s) shall visit the site and inspect the blasting equipment to be used.

During the refinement procedures of blasting plans, the manufacturers or suppliers technical representative(s) shall observe the drill-blast patterns, and the results of trial blasts, and make recommendations. The technical representative's recommendations shall be considered in any adjustments to the blasting plan. All recommendations by the manufacturer's technical representatives shall be in writing.

Approval of the blasting plans, all blasting operations, blasting materials and the assigned blasting supervisor, by the Contracting Officer, shall not relieve the Contractor of his responsibility or liability for the safety of persons and property.

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CONTROLLED DRILLING AND BLASTING

After an initial review by the Contracting Officer, the adequacy of the blasting plan shall be confirmed by a test blast program. Blasting plans shall be revised and resubmitted, for approval and record, prior to continuation of construction, based on satisfactory results of the test blast program. Review of blasting plans does not relieve the Contractor of the responsibility for minimizing the overbreak or for performing required corrective action, by modifying the blasting plan, if excessive overbreak or other undesirable conditions occur. A new blasting plan shall be submitted, for record, when conditions require alteration of the previous plan, to assure that shaft and drift construction meets the requirements of this Specification.

3.11.2 Individual Shot Drilling and Blasting Plan - In addition to the Drilling and Blasting Plan, a plan for each individual shot, signed by the Drilling and Blasting Supervisor, shall be submitted to the Contracting Officer so that the plan is received no less than 4 hours before each blast. The plans for individual shots shall include:

- Drilling patterns - number, location, inclination, diameter, and depth of drilled holes; amount, type, and distribution of blasting agent/explosive per hole
- the blasting material data
- powder factor
- time delays
- sequence of firing
- planned time of blast
- weight of explosives in place at any one time within the area to be excavated under this contract

In the event that rock conditions, discovered while drilling, dictate a change in an individual shot blasting plan, such changes shall be approved by the Contracting Officer before drill/blast/muck operations are allowed to proceed.

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DATA REQUIREMENTS LIST

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1. Chemical Analysis of Blasting Materials	PS	TBD	1.6(a)	ACM
2. Chemical Analysis of Drilling Lubricants	PS	TBD	1.6(b)	ACM
3. Credentials and Resumes of Drilling and Blasting Supervisor	BU	TBD	1.6(c)	ACM
4. Contractor's Drilling and Blasting Plan	BU	TBD	1.6(c)	ACM
5. Contractor's Individual Shot Plan	BU	TBD	1.6(e)	ACM
6. Contractor's Daily Blasting Log	AC	TBD	1.6(f)	ACM
7. Contractor's Blasting-Vibration Monitoring Plan	BU	TBD	1.6(g)	ACM
8. Contractor's Seismograph Tape Records	AC	TBD	1.6(h)	ACM
9. Contractor's Blast Area Security Plan	BU	TBD	1.6(i)	ACM

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0208

Q.A. LEVEL II

TITLE: **ROCK BOLTING
DIVISION 2 - SITEWORK
SUBDIVISION - EXCAVATION SUPPORT SYSTEMS**

APPROVED BY	<u>Bruce T. Stanley</u>	DATE	<u>12-1-88</u>
APPROVED BY	<u>B.R. Eyring</u>	DATE	<u>12-7-88</u>
APPROVED BY	<u>Alshad Ali</u>	DATE	<u>12-7-88</u>

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PART 1 - GENERAL

1.1 WORK INCLUDED

The work covered by this specification includes furnishing and installing the rock reinforcement. The work shall include the supply of all labor, tools, equipment and materials to install rock reinforcement and support for the shaft and underground excavations as shown in the Contract Drawings. Shotcrete, which in certain cases is an integral part of the support system, is described in greater detail in FS-SP-0307, Shotcrete.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 Federal Regulations (CFR)

- o 30 CFR 57 Metallic and Nonmetallic Underground Mines (MSHA)

1.2.2 State of California Administrative Code

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders
- o Title 8, Chapter 4, Subchapter 20, Tunnel Safety Orders

1.2.3 American Society for Testing and Materials (ASTM)

- o A36 Standard Specification for Structural Steel
- o A116 Standard Specification for Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
- o A615 Standard Specification for Deformed and Plain Billet-Steel Bars For Concrete Reinforcement
- o C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
- o F432 Specification for Roof and Rockbolts and Accessories

1.2.4 American Concrete Institute (ACI)

- o 318 Building Code Requirements for Reinforced Concrete

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ROCK BOLTING**

1.3 SYSTEM DESCRIPTION

The rock reinforcement system is generally comprised of point-anchored and fully resin-grouted rock bolts of various lengths assembled with wire mesh, the required steel bearing plate, and the nut.

Under certain conditions, the system may also include a combination of rock bolts, light steel ribs or lattice girders and shotcrete as shown in the Contract Drawings.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for Rock Reinforcement is II.

1.4.2 The Vendor shall have an approved Quality Assurance Program.

PART 2 - PRODUCTS

- 2.1 ROCKBOLTS
- 2.2 CORROSION PROTECTION
- 2.3 RESIN CARTRIDGES
- 2.4 STEEL BEARING PLATES AND NUTS
- 2.5 WIRE MESH
- 2.6 SHOTCRETE
- 2.7 GROUT

PART 3 - EXECUTION

- 3.1 GENERAL
 - 3.1.1 Timing
 - 3.1.2 Borehole and Rock Face Preparation
 - 3.1.2.1 Rockbolt Borehole Alignment Criteria
 - 3.1.2.1.1 Shaft Station Area
 - 3.1.2.1.2 Underground Areas

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- 3.1.2.2 Tolerances
- 3.1.3 Installation - General
- 3.1.4 Cartridge Placement Tool
- 3.1.5 Placement of Resin Cartridges
- 3.1.6 Placement of Plastic Retainer
- 3.1.7 Installation of Rockbolts
 - 3.1.7.1 Mechanical Bolts Installation
 - 3.1.7.2 Resin-Anchored Bolts Installation
 - 3.1.7.2.1 Shaft Station Area
 - 3.1.7.2.2 Underground Area
- 3.1.8 Pretensioning
- 3.1.9 Retightening of Rockbolts
 - 3.1.9.1 Pullout Tests
- 3.2 INSTALLATION OF WIRE MESH
 - 3.2.1 Timing
 - 3.2.2 Areas of Installation
 - 3.2.3 With Shotcrete
- 3.3 INSTALLATION OF STEEL RIBS
 - 3.3.1 Timing
 - 3.3.2 Areas of Installation
 - 3.3.3 With Shotcrete
- 3.4 TESTS AND INSPECTIONS
 - 3.4.1 Progress Inspection
 - 3.4.2 Certification Tests
 - 3.4.3 In-Place Pull Testing

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0213

Q.A. LEVEL II

TITLE: TEST DRILL: ELECTROHYDRAULIC POWERED, COLUMN MOUNTED
 DIVISION 2 - SITEWORK
 SUBDIVISION - SUBSURFACE INVESTIGATION

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.R. Eyring DATE 12-1-88
 APPROVED BY Archad Aw DATE 12-7-88

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SECTION 02XXX
TEST DRILL: ELECTROHYDRAULIC POWERED, COLUMN MOUNTED

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the performance and dimensions required for an electrohydraulic powered column mounted drill which will be used to drill several site characterization test related holes.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o B15.1 Safety Standard for Mechanical Power Transmission Apparatus
- o S1.13 Methods for Measurement of Sound Pressure Levels

1.2.2 National Fluid Power Association (NFPA)

- o B93.5M Use of Fire Resistant Fluids in Industrial Hydraulic Fluid Power Systems

1.2.3 American Welding Society (AWS)

- o D1.1 Structural Welding Code, Steel

1.2.4 California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders
- o Title 8, Chapter 4, Subchapter 20, Tunnel Safety Orders

1.2.5 Code of Federal Regulations (CFR)

- o 30 CFR 57 Safety and Health Standards, Metal and Nonmetal Underground Mines

1.2.6 National Fire Protection Association (NFPA)

- o NFPA 17P Standard for Dry Chemical Extinguishing Systems

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1.2.7 National Electrical Manufacturer's Association (NEMA)

- o ICS2 Standards for Industrial Control Devices, Controllers and Assemblies

1.2.8 Diamond Core Drill Manufacturers Association (DCDMA)

- o Bulletins 1 through 4.

1.3 SYSTEM DESCRIPTION

The rotary core drill covered by this specification shall be capable of the following performance:

- o Passing through a 4'-8" x 4'-8" shaft opening without cutting and welding type tear down.
- o Drilling NQ size cores or full holes to a minimum depth of 1000 feet in any direction or orientation.
- o Use without modification with DCDMA standard wire line coring systems.
- o Operating in the normal mode in a space not greater than 12 feet wide by 12 feet long by 14 feet high.
- o Operating with a variety of commercially available dust collection systems.
- o Cutting over cores.
- o Allowing the insertion of a variety of logging tools and test fixtures in the drill holes.
- o Rigid stabilization with a minimum of set-up time.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Assignment for the Test Drill is II.

1.4.2 The Vendor shall have an approved Quality Assurance Program.

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SECTION 02XXX
TEST DRILL: ELECTROHYDRAULIC POWERED, COLUMN MOUNTED

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- o Electrohydraulic power system.
- o Hydraulically actuated rod holder and feed system.
- o Precise feed pressure, feed rate, rotational speed, and torque application controls.
- o Screw type jack stabilizer system.
- o Hydraulic tank capacity and cooling requirements (if required).
- o Operational warning lights signs and labels.
- o Frame and Decking Materials.
- o Fire extinguisher.

2.2 FABRICATION

- 2.2.1 Welding and Fastening Requirements
- 2.2.2 Tolerances
- 2.2.3 Shop Fit up
- 2.2.4 Painting
- 2.2.5 Wiring
- 2.2.6 Piping
- 2.2.7 Nameplates and gages
- 2.2.8 Machining

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Surface Start-up and Inspection
- 3.1.2 Tear Down for Lowering Underground
- 3.1.3 Subsurface Assembly
- 3.1.4 Systems Fill up and Power up

3.2 INSPECTION

- 3.2.1 Initial Inspection (Surface)
- 3.2.2 Final Inspection

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TECHNICAL SPECIFICATION

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NO. FS-SP-0214

Q.A. LEVEL II

TITLE: TEST DRILL: ELECTROHYDRAULIC POWERED, TRACK MOUNTED
 DIVISION 2 - SITEWORK
 SUBDIVISION - SUBSURFACE INVESTIGATION

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.T. Stanley DATE 12-7-88
 APPROVED BY Armed AW DATE 12-7-88

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SECTION 02XXX
TEST DRILL: ELECTROHYDRAULIC POWERED, TRACK MOUNTED

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the performance and dimensions required for a electrohydraulic powered, track mounted drill which will be used to drill several site characterization test related holes.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o B15.1 Safety Standards for Mechanical Power Transmission Apparatus
- o S1.13 Methods for Measurement of Sound Pressure Levels

1.2.2. National Fluid Power Association (NFP(A))

- o B93.5M Use of Fire Resistant Fluids in Industrial Hydraulic Fluid Power Systems

1.2.3 American Welding Society (AWS)

- o D1.1 Structural Welding Code, Steel

1.2.4 California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders
- o Title 8, Chapter 4, Subchapter 20, Tunnel Safety Orders

1.2.5 Code of Federal Regulations (CFR)

- o 30 CFR 57 Safety and Health Standards, Metal and Nonmetal Underground Mines

1.2.6 National Fire Protection Association (NFPA)

- o NFPA 17P Standard for Dry Chemical Extinguishing Systems

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TEST DRILL: ELECTROHYDRAULIC POWERED, TRACK MOUNTED

1.2.7 National Electrical Manufacturers Association (NEMA)

- o ICS2 Standards for Industrial Control Devices, Controllers and Assemblies

1.2.8 Diamond Core Drill Manufacturers Association (DCDMA)

- o Bulletins 1 through 4

1.3 SYSTEM DESCRIPTION

The rotary core drill covered by this specification shall be capable of the following performance:

- o Passing through a 4'-8" x 4'-8" shaft opening without cutting and welding type tear down.
- o Drilling 15 inch diameter cores or full holes to a minimum depth of 1000 feet in any direction or orientation.
- o Use without modification with DCDMA standard wire line coring systems.
- o Operating in the normal mode in a space not greater than 16 feet wide by 20 feet long by 14 feet high.
- o Cutting over cores.
- o Allowing the insertion of a variety of logging tools and test fixtures in the drill holes.
- o Rigid stabilization with a minimum of set-up time.

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment for the Test Drill is II.

1.4.2 The Vendor shall have an approved Quality Assurance program.

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SECTION 02XXX
TEST DRILL: ELECTROHYDRAULIC POWERED, TRACK MOUNTED

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- o Electrohydraulic power system.
- o Hydraulically actuated chock and feed system.
- o Precise feed pressure, feed rate, rotational speed, and torque application controls.
- o Hydraulic jack stabilizer system.
- o Hydraulic tank capacity and cooling requirements (if required).
- o Operational warning lights signs and labels.
- o Frame and Decking Materials.
- o Fire Extinguisher.

2.2 FABRICATION

- 2.1.1 Welding and Fastening Requirements
- 2.2.2 Tolerances
- 2.2.3 Shop Fit up
- 2.2.4 Painting
- 2.2.5 Wiring
- 2.2.6 Piping
- 2.2.7 Nameplates and gages
- 2.2.8 Machining

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Surface Start-up
- 3.1.2 Tear Down for Lowering Underground
- 3.1.3 Subsurface Assembly
- 3.1.4 Systems Fill-up and Power-up

3.2 INSPECTION

- 3.2.1 Initial Inspection (Surface)
- 3.2.2 Final Inspection

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0215
 Q.A. LEVEL II

TITLE: TEST DRILL: COMPRESSED AIR POWERED, SCREW FEED TYPE
 DIVISION 2 - SITEWORK
 SUBDIVISION - SUBSURFACE INVESTIGATION

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.R. Luytman DATE 12-7-88
 APPROVED BY Archard Ho DATE 12-7-88

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SECTION 02XXX
TEST DRILL: COMPRESSED AIR POWERED, SCREW FEED TYPE

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the performance and dimensions required for a compressed air powered, screw feed type drill which will be used to drill several site characterization test related holes.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American National Standards Institute (ANSI)

- o B15.1 Safety Standards for Mechanical Power Transmission Apparatus
- o S1.13 Methods for Measurement of Sound Pressure Levels

1.2.2 American Welding Society (AWS)

- o D1.1 Structural Welding Code, Steel

1.2.3 California Administrative Code (CAC)

- o Title 8, Chapter 4, Subchapter 17, Mine Safety Orders
- o Title 8, Chapter 4, Subchapter 20, Tunnel Safety Orders

1.2.4 Code of Federal Regulations (CFR)

- o 30 CFR 57 Safety and Health Standards, Metal and Nonmetal Underground Mines

1.2.5 National Fire Protection Association (NFPA)

- o NFPA 17P Standard for Dry Chemical Extinguishing Systems

1.2.6 National Electrical Manufacturer's Association (NEMA)

- o ICS2 Standards for Industrial Control Devices, Controllers and Assemblies

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SECTION 02XXX
TEST DRILL: COMPRESSED AIR POWERED, SCREW FEED TYPE

1.2.7 Diamond Core Drill Manufacturers Association
(DCDMA)

- o Bulletins 1 through 4

1.3 SYSTEM DESCRIPTION

The rotary core drill covered by this specification shall be capable of the following performance:

- o Passing through a 4'-8" x 4'-8" shaft opening without cutting and welding type tear down.
- o Drilling NQ size cores or full holes to a minimum depth of 300 feet in any direction or orientation.
- o Use without modification with DCDMA standard wire line coring systems.
- o Operating in the normal mode in a space not greater than 12 feet wide by 12 feet long by 14 feet high.
- o Operating with a variety of commercially available dust collection systems.
- o Cutting over cores.
- o Allowing the inspection of a variety of logging tools and test fixtures in the drill holes.
- o Rigid stabilization with a minimum of set-up time.

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level assignment for the Test Drill is II.
- 1.4.2 The vendor shall have an approved Quality Assurance Program.

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SECTION 02XXX
TEST DRILL: COMPRESSED AIR POWERED, SCREW FEED TYPE

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- o Compressed Air power system.
- o Manual Chock and feed system.
- o Screw type jack stabilizer system.
- o Frame and Decking Materials.

2.2 FABRICATION

- 2.2.1 Welding and Fastening Requirements
- 2.2.2 Tolerances
- 2.2.3 Shop Fit Up
- 2.2.4 Painting
- 2.2.5 Machining

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 Surface Start-up
- 3.1.2 Tear Down for Lowering Underground
- 3.1.3 Subsurface Assembly
- 3.1.4 Systems Fill-up and Power-up

3.2 INSPECTION

- 3.2.1 Initial Inspection (Surface)
- 3.2.2 Final Inspection

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TECHNICAL SPECIFICATION (OUTLINE SPECIFICATION)

NO. FS-SP-0303
Q.A. LEVEL II

TITLE: **CAST IN PLACE CONCRETE**
DIVISION 3 - CONCRETE
SUBDIVISION - CAST IN PLACE CONCRETE

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B. D. J. [Signature] DATE 12-7-88
 APPROVED BY [Signature] DATE 12-7-88

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**SECTION 03XXX
CAST IN PLACE CONCRETE**

PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification includes furnishing all materials, tools, equipment and labor necessary to mix, transport, place in accordance with the Contract Drawings, and test concrete. This shall include concrete at the surface and underground excluding the shaft liner concrete.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American Concrete Institute (ACI)

- o ACI 211.1 Practice for Selecting Proportions for Normal and Heavyweight and Mass Concrete
- o ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete
- o ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
- o ACI 306 Standard Specification for Cold Weather Concreting
- o ACI 308 Standard Practice for Curing Concrete
- o ACI 318 Building Code Requirements for Reinforced Concrete
- o ACI 347 Recommended Practice for Concrete Formwork

1.2.2 American Society for Testing and Materials (ASTM)

- o C29 Standard Test Method for Unit Weight and Voids in Aggregate
- o C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
- o C33 Specification for Concrete Aggregates

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**SECTION 03XXX
CAST IN PLACE CONCRETE**

- o C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens |
- o C87 Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar |
- o C88 Test Method for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate |
- o C94 Standard Specification for Ready-Mixed Concrete
- o C128 Test Method for Specific Gravity and Absorption of Fine Aggregate |
- o C136 Method for Sieve Analysis of Fine and Coarse Aggregates |
- o C138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete |
- o C143 Test Method for Slump of Portland Cement Concrete |
- o C150 Standard Specification for Portland Cement
- o C156 Test Method for Water Retention by Concrete Curing Materials |
- o C171 Standard Specification for Sheet Materials for Curing Concrete
- o C172 Method of Sampling Freshly Mixed Concrete |
- o C227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
- o C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method |
- o C233 Standard Test Method for Testing Air-Entraining Admixtures for Concrete
- o C260 Specification for Air-Entraining Admixtures for Concrete |
- o C289 Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)

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- o C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- o C494 Specification for Chemical Admixtures for Concrete
- o C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- o D75 Practice for Sampling Aggregates
- o D1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- o D1850 Specification for Concrete Joint Sealer, Cold-Application Type

1.3 SYSTEM DESCRIPTION

Furnish, place and cure concrete for the following:

- a. Foundations, Hoists and Other Equipment
- b. Shaft Collars
- c. Sumps
- d. Rock Support
- e. Subsurface Equipment Bases

1.4 QUALITY ASSURANCE

1.4.1 The Quality Assurance Level Assignment is II for headframe and hoist foundations. The Quality Assurance Level Assignment is III for equipment bases and concrete floors.

1.4.2 The vendor shall have an approved Quality Assurance program for level II items.

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SECTION 03XXX
CAST IN PLACE CONCRETE

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Portland Cement ASTM C150
- 2.1.2 Aggregates ASTM C33
- 2.1.3 Clean, Uncoated, Aggregate Size Limits (To Be determined)
- 2.1.4 Air-Entraining Admixtures ASTM C260
- 2.1.5 Chemical Admixtures ASTM C94
- 2.1.6 Liquid Membrane - Forming Compounds for Curing Concrete
ASTM C309
- 2.1.7 Sheet Materials for Curing Concrete ASTM C171
- 2.1.8 Preformed Expansion Joint Fillers for Concrete Paving and
Structural Construction ASTM D1751

2.2 MIXES

- 2.2.1 Concrete for Foundations
- 2.2.2 Other Concrete

PART 3 - EXECUTION

3.1 MIXING

In accordance with ASTM C94 and ACI 304 requirements.

3.2 TRANSPORTATION

Transport concrete from the mixer to the forms as rapidly as practical without causing segregation or loss of ingredients.

Concrete placed underground shall be transported dry and mixed at the pour location, unless suitable remix facilities are utilized.

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**SECTION 03XXX
CAST IN PLACE CONCRETE**

3.3 FORMWORK

Forms will be placed to conform to ACI 347 requirements.

3.4 PLACING

Conform to ACI 306 requirements for mass concrete placement including:

- o Gravity Placing
- o Pump Placing
- o Continuous Placing
- o Depositing
- o Compacting
- o Airing
- o Bonding

3.5 SAMPLING

Samples shall be obtained at the point of discharge into the forms to perform slump tests by forming test cylinders for analysis in an approved materials testing laboratory.

3.6 FINISH

- o Surface Finishing (Later)
- o Classification of Concrete Finishing (Later)
- o Formed Surface Finishing (Later)
- o Unformed Surface Finishing (Later)

3.7 CURING

- o Conform to ACI 308 Requirements

3.8 TESTING

Frequency of obtaining concrete samples for testing shall be at the direction of the Contracting Officer.

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TECHNICAL SPECIFICATION

(OUTLINE SPECIFICATION)

NO. FS-SP-0304

Q.A. LEVEL II

TITLE: **GROUT, MATERIALS AND PLACEMENT**
DIVISION 3 - CONCRETE
SUBDIVISION - GROUT

APPROVED BY Bruce T. Stanley DATE 12-1-88
 APPROVED BY B.T. Stanley DATE 12-7-88
 APPROVED BY Arshad Ali DATE 12-7-88

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PART 1 - GENERAL

1.1 WORK INCLUDED

The work under this specification includes the supply of labor, equipment and materials required for the drilling of holes and pressure injection of cementitious or chemical grout materials into the rocks surrounding the shaft and underground openings to shut off potential groundwater inflow into the excavations.

Drilling and grouting of instrument emplacement holes are not included in this specification.

1.2 REFERENCED PUBLICATIONS

The publications listed below form a part of this specification.

1.2.1 American Society for Testing and Materials (ASTM)

4D 016 Test Method for Viscosity of Chemical Grouts by Brookfield Viscometer (Laboratory Method)

C150 Standard Specification for Portland

C937 Specification for Grout Fluidifier for Preplaced Aggregate concrete.

C938 Practice for Proportioning Grout Mixtures for Preplaced Aggregate concrete.

1.2.2 U. S. Army Corps of Engineers:

EM 1110-2-3500 Grouting Technology

EM 1110-2-2901 Tunnels and Shafts in Rock

CE-1305.02 Guide Specification for Tunnel Grouting or Equivalent

1.3 SYSTEM DESCRIPTION

1.3.1 Drill holes, furnish materials, mix and inject grout for the following:

a. To shut-off excessive inflow of groundwater into excavated openings.

b. Perform backwall contact grouting behind the concrete shaft lining if necessary.

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SECTION 03XXX
GROUT, MATERIALS AND PLACEMENT

1.4 QUALITY ASSURANCE

- 1.4.1 The Quality Assurance Level Assignment for pressure grouting II.
- 1.4.2 The supplier of grouting materials shall have an approved Quality Assurance Program.

PART 2 - PRODUCTS

2.1 GROUT MATERIALS

- 2.1.1 Portland Cement, ASTM-C-150
- 2.1.2 Colloidal Cement
- 2.1.3 Microfine Cement MC-500
- 2.1.4 Bentonite
- 2.1.5 Sodium Silicate - Cement
- 2.1.6 Lignin group grouts
- 2.1.7 Acrylate (AC-400) group grouts
- 2.1.8 Water

2.2 GROUT ADDITIVES:

- 2.2.1 Accelerators
- 2.2.2 Retarders
- 2.2.3 Viscosity reducers (fluidifiers)
- 2.2.4 Fillers and lost circulation materials:
 - a. Ground walnut shells
 - b. Sawdust
 - c. Wood shavings
 - d. Flocele

2.3 EQUIPMENT: All associated grouting equipment shall be of a type, capacity and mechanical condition for performing the work as specified and determined by the Contracting Officer.

Such equipment shall include, but not be limited to:

- o Valves
- o Packers
- o Hoses
- o Pressure Gauges
- o Grout Mixing Tanks
- o Proportioning and Injection Pumps

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PART 3 - EXECUTION

- 3.1 DRILLING
- 3.2 DELIVERY AND MIXING
- 3.3 INJECTION AND PRESSURE LIMITATIONS
- 3.4 RECORDS
- 3.5 ACCEPTANCE

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