

SPECIFICATION E-110040-01

BOILER 15

CZD DUCT MODIFICATION

OF THE BOILER FLUE GAS DUCT

FROM PRECIPITATOR 15B TO PRECIPITATOR 15D

SEWARD STATION - BOILER 15, UNIT 5

PCN 110040

B	1/11/91	ISSUED FOR BIDS					
A	12-15-90	ISSUED FOR PENELEC REVIEW					
REV.	DATE	REASON FOR REVISION	BY	CHECK	EGS	PE	
ORIGIN SFRO 	Seward Station - Boiler 15, Unit 5 Pennsylvania Electric Company Johnstown, Pennsylvania		JOB NO. 21178-001				
			SPECIFICATION NO. E-110040-01			REV. B	
			SHEET 1 OF 1 (cover)				

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 PS-8.01C Revision 1 and Attachment 7.1 5 pages
 PS-10.05 Revision 3 and Attachments 7.1, 7.2, & 7.3 7 pages
 PS-10.06 Revision 2 and Attachments 7.1 & 7.2 4 pages
 PS-11.01 Revision 0 and Attachment 7.1 6 pages

APPENDIX B Penelec Specification GDE-JTWN-943 "General Requirements
and Installation Details for Electrical Construction"
April 7, 1989 18 pages

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SECTION I
SCOPE OF WORK AND GENERAL REQUIREMENTS

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SECTION I

SCOPE OF WORK AND GENERAL REQUIREMENTS

1:01 SCOPE

1:01.1 Description of WORK:

1. This Specification covers the technical requirements for modification of one gas duct for Seward Station Boiler 15, Unit 5 between the existing Research-Cottrell precipitator outlet plenum 15B and the Buell precipitator inlet plenum 15D flange, including related design, detailing, materials, fabrication, delivery, demolition, removal, excavation, compaction, erection, foundation, structural, insulation, paving, and electrical WORK at the Seward Station.
2. There are existing items, such as conduits, lighting, piping, platforms, a weather enclosure, drain spouts, etc. attached to the existing duct, duct support structure, and platforms which are not shown on the drawings. Some items will require removal in order to perform the WORK. The items shall be removed by the SUBCONTRACTOR.
3. The WORK shall be accomplished in accordance with the requirements specified herein and as shown on the drawings. To accomplish this WORK, the SUBCONTRACTOR shall furnish all labor, supervision, required material, equipment, temporary lighting, tools, supplies, transportation, formwork, scaffolding, rigging, and services required to complete the WORK.
4. All materials and construction shall be new unless specifically noted otherwise.

1:01.2 ONSITE WORK:

ONSITE WORK is all WORK which is performed at the jobsite and all WORK included in the ONSITE WORK as indicated herein. The ONSITE WORK to be performed includes but is not limited to the following:

1. Partial demolition, removal, modification and extension of the existing gas duct, insulation, jacketing, appurtenances and related items as described in Section II and as shown on the drawings by removing those items necessary to make the modification and complete the WORK.

- a. Identify any removal necessary to modify the existing gas duct, precipitator plenum, or appurtenances and erect the new gas duct sections, insulation, jacketing, platforms, and appurtenances.
 - b. The SUBCONTRACTOR shall visit the site and shall be responsible for identification of all items to be removed.
2. Erecting new sections of gas duct and performing modifications to the existing gas duct and plenum as described in Section III and shown on the drawings.
 3. Installing fabric expansion joints as described in Section IV and shown on the drawings.
 4. Installing ductwork insulation and jacketing as described in Section V and shown on the drawings.
 5. Erecting the gas duct support structure, platforms, ladders, handrails, weather enclosure, and monorails as described in Section VI and shown on the drawings.
 6. Providing foundations for the gas duct support structure which includes:
 - a. Furnishing, and delivery of concrete for the gas duct extension support foundations as described in Section VII and shown on the drawings.
 - b. Detailing, furnishing, fabricating, delivery, and placing of reinforcing steel for the gas duct extension support foundations as described in Section VIII and shown on the drawings.
 - c. Designing, furnishing, delivery, and erecting formwork, and placing concrete for the gas duct extension support foundations as described in Section IX and shown on the drawings.
 - d. Excavation, backfill, compaction, paving, and civil work for the gas duct extension support foundations as described in Section X and shown on the drawings.
 - e. Furnishing and delivery of materials for excavation, backfill, compaction, paving, and civil work for the gas duct extension support foundations as described in Section X and shown on the drawings.

- f. Installing piling and load testing (if required) as described in Section XI and shown on the drawings.
7. Providing miscellaneous concrete WORK as shown on the drawings provided in accordance with Sections VII, VIII, IX, and X of this Specification.
8. Performing as-built measurements of the WORK, and providing "marked-up" record drawings.
9. Keeping all WORK areas clean and orderly, including removing all trash and debris in a timely manner so as not to interfere with plant operations.
10. Providing, installing, and maintaining all temporary lighting and power required to perform the WORK, including keeping all openings and potential hazardous areas well lighted.
11. Providing for maintenance and protection of traffic through and around the WORK area.
12. Performing the WORK in a timely manner to meet the requirements of the WORK SCHEDULE attached to this Specification.

1:01.3

OFFSITE WORK

OFFSITE WORK is all WORK which is performed at locations other than the jobsite location and all WORK included in the OFFSITE WORK as indicated herein. The OFFSITE WORK to be performed includes but is not limited to the following:

1. Verifying existing field conditions and dimensions of interfaces with existing construction by measuring the existing duct, structures, and other existing items at the site as necessary to complete the design and detailing of the WORK as described in the Specification and as indicated on the drawings.
2. Detailing, furnishing, fabricating, and delivery of new sections of gas duct and modifications to existing gas duct and plenum as described in Section III and shown on the drawings.
3. Designing, furnishing, fabricating, and delivery of fabric expansion joints as described in Section IV and shown on the drawings.

4. Designing, furnishing, fabricating, and delivery of ductwork insulation and jacketing as described in Section V and shown on the drawings.
5. Detailing, furnishing, fabricating, and delivery of the gas duct support structural steel, platforms, ladders, handrails, weather enclosure, and monorails as described in Section VI and shown on the drawings.
6. Furnishing piles as described in Section XI and shown on the drawings.
7. Performing the WORK in a timely manner to meet the requirements of the WORK SCHEDULE attached to this Specification.

1:01.4 Items Not Included:

The following will be furnished by OTHERS as specified herein or indicated on the drawings.

1. Provision of thermocouples as described in Section V including installation.
2. Provision of soot blower sleeves as described in Section III.
3. Removal of dust from the existing duct will be performed by PENELEC.
4. Removal of the coal pile in the area of the WORK to a plant nominal grade elevation of approximately 1087 feet will be performed by PENELEC.

1:02 WORK REQUIREMENTS

1:02.1 Technical Sections:

The division of WORK within this Specification is not intended to provide bid documents for any sub-tier contractors or suppliers employed by the SUBCONTRACTOR, but only to provide a ready source of reference. Accordingly, the SUBCONTRACTOR will be held to the performance of all WORK described herein and as necessary to complete the WORK.

1:02.2 WORK Schedule:

1. Each portion of the WORK shall be maintained within the requirements of the WORK SCHEDULE. The SUBCONTRACTOR shall assure timely WORK completion and provide adequate allowance for contingencies.

2. The WORK described in this Specification and as indicated on the drawings, except the installation of the expansion joints and duct tie-in sections, shall be performed with the existing Boiler 15 and ductwork remaining in service. The SUBCONTRACTOR shall perform the removal of the existing duct sections and expansion joints and the tie-in of the new duct to the existing Boiler 15 system in 5 calendar days in accordance with the PROJECT SCHEDULE.
3. Existing conditions and dimensions necessary to complete the WORK shall be field verified by the SUBCONTRACTOR prior to preparation of shop and erection drawings. BECHTEL shall be notified immediately in writing of deviations from the contract drawings.

1:03

DOCUMENT REQUIREMENTS

1. The SUBCONTRACTOR shall submit documents, drawings, data, and reproducibles of all the SUBCONTRACTOR'S drawings and data pertaining to the WORK furnished in accordance with Appendix E of this Specification.
2. All documents must bear the following identification in or near the title block:

Pennsylvania Electric Company
Seward Station, Unit 5, Boiler 15
CZD Modification (Precip. 15B to Precip. 15D)
Project Control Number 110040
Bechtel Job Number 21178-001
Purchase Order Number or SUBCONTRACT Number
Descriptive Name
SUBCONTRACTOR'S Document Number
Sheet Number or Page Number
Revision Number or Date

1:03.1

Transmittals

A transmittal letter shall be included with all engineering documents, listing each drawing/document number, sheet or page number, title or description of document, revision or issue number, and/or date of revision, as well as Purchase Order Number or SUBCONTRACT Number required for identification.

1:03.2

Types of Submittals

1. Documents 8-1/2 inches by 13 inches or smaller shall be submitted in unfolded paper form in an envelope with cardboard backing. The documents shall be of a quality acceptable for

microfilming, and conform to reproducible requirements below. Black on white bond paper is acceptable.

2. Documents larger than 8-1/2 inches by 13 inches in size shall be submitted rolled (not folded) inside regular mailing tubes. The documents shall be reproducible as specified below to permit microfilming.
3. A reproducible must be sharp and clear, black line, direct reading, and shall be the same size as the original document. Each reproducible shall be of a quality to produce clean, clear and completely legible microfilm or electrostatic dry process (Xerox-type) copies. For originals larger than 8-1/2 inches by 13 inches, black line prints or vellums are preferred for reproduction. Autopositive mylar tracings are not required but are acceptable.
4. Certified "mark-up" final drawings submitted for record shall be reproducible in the form of washoff Mylar, "Crolux" or EQUAL. The projection washoff Mylar material shall be polyester drafting film with matte finish on both sides, shall accept film lead or ink, shall be moist erasable and redraftable, and shall be of a quality acceptable for microfilming.

1:03.3

Document Submittal:

1. Drawings shall be submitted for review and comment within thirty (30) calendar days of AWARD.
2. All documents shall be checked by the SUBCONTRACTOR prior to submission and shall contain all required information.
3. Documents shall be submitted in the form and quantities outlined in Appendix E, in sets or systems for review.
 - a. Documents submitted will be reviewed and returned by BECHTEL with status marked as follows:
 - 1 WORK MAY PROCEED
 - 2 REVISE AND RESUBMIT. WORK MAY PROCEED SUBJECT TO RESOLUTION OF INDICATED COMMENTS.
 - 3 REVISE AND RESUBMIT. WORK MAY NOT PROCEED.
 - 4 REVIEW NOT REQUIRED. WORK MAY PROCEED.
 - b. Permission to proceed does not constitute acceptance or approval of design, details, calculations, analyses,

test methods, or materials developed or selected by the SUBCONTRACTOR and does not relieve the SUBCONTRACTOR from full compliance with the contractual obligations.

- c. WORK shall not proceed until documents requiring prior review (see Appendix E) have been returned to the SUBCONTRACTOR by BECHTEL with a status code 1 or 2 notation. The SUBCONTRACTOR shall incorporate changes as required by comments on the documents and resubmit corrected documents for review within fourteen (14) calendar days. Documents that have been given a status code 1 notation by BECHTEL shall not be changed without notification to BECHTEL and resubmittal of affected documents for review.

4. The SUBCONTRACTOR shall deliver the copies of the conformed documents and one projection washoff Mylar reproducible to the BECHTEL for record. The required copies and addresses are specified in Appendix E of this Specification.

1:03.4 Document List

A document list, prepared on 8-1/2 inch by 11 inch size paper, shall be submitted to BECHTEL within fourteen (14) calendar days of AWARD and shall be updated periodically during the course of the WORK. This list shall include, as a minimum, all documents required by Appendix E and the scheduled submittal dates for those documents.

1:03.5 General Drawing Requirements

1. All documents submitted, including "marked-up" record drawings, shall be certified. Certified documents shall bear the dated signature and title of an authorized and responsible employee of the SUBCONTRACTOR.
2. The use of a single drawing (one title and one number) to satisfy a general detailing presentation having slight deviations shall not be acceptable. Every item shall be detailed on the drawings. Each drawing shall have its own unique title and drawing number.
3. "Typical", "standard", or "off-the shelf" drawings will be accepted only if they are specifically certified for use in this application. These drawings shall have all non-applicable sections removed or noted on each drawing.
4. When a drawing is revised, revision numbers must be clearly legible, easily distinguishable from the drawing number and should be as close as possible to the title block. A short description of the revision must be included and the affected

areas on the drawings shall be clearly indicated by circling or bubbling the revisions and identifying the area revised with a revision number.

5. Sufficient space (3 inches high and 3 inches wide) for BECHTEL identification applique shall be available above the title block of the drawing. Otherwise, the reproducible shall be made three inches longer than the original drawing (not to exceed 48 inches total length) with the three inch extension on the right side of the sheet.

1:03.6 Rejection of Submittals

BECHTEL and PENELEC retain the right to reject any document, drawing, or data which does not conform to the specified requirements and quality stated herein.

1:03.7 Document Submittal Schedule

Documents shall be submitted no later than the dates required to satisfy the WORK SCHEDULE attached to this Specification. If required, the SUBCONTRACTOR shall accelerate this schedule as necessary to meet the material delivery dates to the site. This shall be done with such promptness as to cause no delay in either the WORK or that of any other contractor. The SUBCONTRACTOR shall allow sixteen (16) calendar days after receipt of the documents by BECHTEL and PENELEC for review and comment.

1:03.8 Record Drawings

1. Authorized field changes which include modifications, additions or relocations that result in a deviation from the drawings shall be recorded on a copy of the drawings and labeled "marked-up." Drawings that do not have any changes will also be labeled "marked-up." "Marked-up" drawings will be developed and maintained by the SUBCONTRACTOR as the WORK progresses and made available for review by the BECHTEL and PENELEC when requested. Upon completion of all his WORK and before final payment, the SUBCONTRACTOR shall formally transmit to the BECHTEL a complete set of all drawings "marked-up" to reflect changes occurring during the WORK. The submitted "marked-up" drawings are to become the property of PENELEC. No extra payment shall be made to the SUBCONTRACTOR for the record drawings.
2. Drawings labeled "marked-up" shall be supplemented with sketches or drawings prepared by the SUBCONTRACTOR where necessary to provide complete details.

1:04 MATERIALS, WORKMANSHIP AND SUBSTITUTIONS

The SUBCONTRACTOR warrants that the goods furnished shall be in accordance with the General Conditions of the Purchase Order or SUBCONTRACT.

Equipment and material designated in the Specification or noted on the drawings by trade name, manufacturer's catalog number or other similar designation cannot be substituted by alternate equipment and material unless followed by the words "or equal". In the latter case, the SUBCONTRACTOR may make a written request to BECHTEL for authorization for the use of alternative equipment or material. Such a request shall contain complete data intended to show that such alternative item is of a quality equal or better than that specified and has the required characteristics for the intended use. BECHTEL will determine whether the proposed alternative meets the requirements of the Purchase Order or SUBCONTRACT, and will inform the SUBCONTRACTOR in writing of its determination.

1:05 STANDARDS, CODES, AND REGULATIONS

The edition or revision of the standards, codes, or regulations, referenced in this Specification, in effect on the date of the SUBCONTRACTOR'S Proposal, shall apply unless otherwise expressly set forth in this Specification or other Purchase Order or SUBCONTRACT documents.

1:06 INSPECTION AND SHOP TESTS

Without limiting the provisions of the Purchase Order or SUBCONTRACT Conditions, the following shall also apply. Should material tests in addition to those required by the Specification be desired by BECHTEL, the SUBCONTRACTOR will be advised in ample time to permit the preparation of test specimens during the shop manufacture. Unless otherwise provided, such additional tests shall be in accordance with the requirements of the American Society of Testing and Materials, and other applicable codes, and shall be at BECHTEL'S expense. If these tests show the product to be defective, the SUBCONTRACTOR shall pay for the additional test. BECHTEL has the right to reject any materials shown to be defective by such tests and the SUBCONTRACTOR shall replace such rejected material at its own expense.

1:07 FIELD TESTS

Without limiting the provisions of the Purchase Order or SUBCONTRACT Conditions, the following shall also apply. The conditions of field tests, if any, shall be as agreed upon by PENELEC and the SUBCONTRACTOR. The SUBCONTRACTOR shall be notified of, and may be represented at, all field tests that may be made. Such field tests

will be made at the expense of PENELEC unless otherwise specified, except that the expense of the SUBCONTRACTOR'S representative, if any, shall be borne by the SUBCONTRACTOR. Retests to meet guarantees shall be at the SUBCONTRACTOR'S expense.

1:08

DRAWING LIST

The following drawings set forth the extent and location of the WORK to be performed and are hereby made an integral part of this Specification to the extent indicated. Reference drawings are so designated:

<u>Drawing No.</u>	<u>Rev.</u>	<u>Date</u>	<u>Title</u>
<u>Gilbert & Penelec drawings:</u>			
11-B-0149	0	4-24-85	Precipitator and Flue System General Layout (For Reference Only)
11-D-0001 Sh 1	3	8-18-82	New Service Road Location and Grading Plan (For Reference Only)
11-D-0001 Sh 2	3	9-29-81	New Service Road Location and Grading Plan (For Reference Only)
11-D-0002	2	9-7-79	New Service Road Typical Sections & Details (For Reference Only)
A-1390-1	1	6-30-75	New Precipitator Area Paving (For Reference Only)
C-787-100		April 1975	Geologic Cross Sections (For Reference Only)
D-30959 Sh 1	8	11-17-89	Structural Steel Framing - Precipitator Supports - South End of Boiler House (For Reference Only)
D-30959 Sh 2	V	2-24-75	Structural Steel Framing - Sections & Elevations of Precipitator Supports - South End of Boiler House (For Reference Only)

D-487-101	3	8-15-75	Boiler Gas Flow System Precipitator & Duct Support Foundations Sections, & Details (For Reference Only)
D-587-104	3	12-13-74	Boiler Gas Flow System Duct Support Steel Inlet Side Of Precipitator, Boiler #15 (For Reference Only)
D-587-120	2	10-15-75	Boiler Gas Flow System Bottom Plan Inlet Ducts From Existing Precipitator To New Precipitator (For Reference Only)
D-587-121	1	8-25-75	Boiler Gas Flow System Top Plan Inlet Ducts From Existing Precipitator To New Precipitator (For Reference Only)
D-587-122	1	8-25-75	Boiler Gas Flow System Inlet Ducts - Sections & Details (For Reference Only)
D-587-123	1	8-25-75	Boiler Gas Flow System Inlet Ducts - Elevations & Sections (For Reference Only)
D-787-001	3	8-22-83	Civil Plot Plan Coal Pile Drainage (For Reference Only)
E-087-101	15	1-28-86	Layout - New Precipitator & ID Fans for Boilers 12,14,& 15 (For Reference Only)
E-087-102	2	12-27-75	Layout New Chimney And Future Plant Additions (For Reference Only)
E-387-006	10	8-3-82	Waste Treatment Yard Piping Plot Plan and Details (For Reference Only)

E-387-199	2	5-27-75	Layout of New Catch Basins and Drains, Plan, Section & Details (For Reference Only)
E-487-100	4	8-19-86	Boiler Gas Flow System Plan-Precipitator, Duct Support & I.D. Fan Foundations (For Reference Only)

Raybestos Manhattan drawings:

RL-5582-1	2	3-24-75	Expansion Joint Mark V (For Reference Only)
RL-5582-1-A	1	3-24-74	Back-up Bars for Expansion Joint (Rectangle) (For Reference Only)

Buell drawings:

2-18348	1	4-25-75	Expansion Joint Data & Notes (For Reference Only)
2-18364	2	10-3-75	Expansion Joint Baffle Detail for Inlet Duct (For Reference Only)

Bechtel drawings:

E-408-1002	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D), Foundations, Boiler 15
E-518-1002	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D), Support Steel, Boiler 15
E-518-1003	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D), Support Steel Sections & Details, Boiler 15

E-518-1004	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D), Duct Top Plan, Sections & Details Boiler 15
E-518-1005	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D), Duct Bottom Plan, Boiler 15
E-518-1006 Sheet 1	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) Duct Elevations, Sections & Details, Boiler 15.
E-518-1006 Sheet 2	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) Duct Elevations, Sections & Details, Boiler 15.
E-518-1007 Sheet 1	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) Miscellaneous Steel & Platforms, Boiler 15
E-518-1007 Sheet 2	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) Sections & Details - Miscellaneous Steel & Platforms, Boiler 15
E-518-1007 Sheet 3	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) Sections & Details - Miscellaneous Steel & Platforms, Boiler 15.
E-518-1008	B	1-11-91	Boiler Gas Flow System - CZD Duct Modification (Precip 15B to Precip 15D) General Notes and Demolition Plan

SECTION II
DEMOLITION AND REMOVAL

Section Contents

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SECTION II
DEMOLITION AND REMOVAL

2:01 SCOPE

2:01.1 Description of WORK:

This Section covers the removal of certain equipment and material in preparation for modifications to the existing gas duct, Research-Cottrell precipitator outlet 15B plenum and installation of the new gas duct sections, insulation, jacketing, platforms, and appurtenances. The existing duct sections, insulation, jacketing, platforms and appurtenances to be removed shall be removed in a manner which will permit reinstallation and reuse at a later time by PENELEC.

2:01.2 Items Included:

This Section includes but is not limited to the following:

1. Cut free, temporarily support, and remove gas duct sections, insulation, jacketing, platforms, appurtenances, and related expansion joints for the duct sections between the existing Research-Cottrell precipitator outlet plenum 15B and the Buell precipitator inlet plenum 15D flange as shown on the drawings.
2. Where determined by the SUBCONTRACTOR and acceptable to PENELEC, remove electrical equipment (such as light fixtures, switches, terminal boxes, power and control feeds, and conduits), piping, piping supports, and air lines necessary for the removal of the gas duct sections.
3. Remove existing insulation, jacketing and expansion joints from existing equipment and material, as required, to allow installation of modifications to the precipitator outlet plenum 15B, the existing gas duct, the gas duct extension and new expansion joints.
4. Dispose of material as follows:
 - a. PENELEC-determined nonsalvageable material (except asbestos contaminated material) at an offsite disposal area provided by the SUBCONTRACTOR.
 - b. PENELEC-determined salvageable material at an onsite storage area designated by PENELEC.
5. Provide protection to property and all personnel during demolition operations.

2:02

APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. Building Officials and Code Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.
2. National Fire Protection Association (NFPA) 51B-1989, "Standard for Fire Prevention In Use of Cutting and Welding Processes."
3. Occupational Safety and Health Administration (OSHA) "Safety and Health Standards" (29CFR 1926) Subpart T - Demolition.

2:03

REMOVAL REQUIREMENTS

1. The SUBCONTRACTOR shall visit the site and shall be responsible for identification of all items to be removed. The SUBCONTRACTOR shall prepare a detailed inventory list of items to be removed in order to perform this WORK. The list of items to be removed shall be submitted for review and comment. No items shall be removed without prior authorization by PENELEC. Removal shall include temporarily disconnecting, removing, and storing any piping, hangers, supports, steel framing, grating, handrail, mechanical equipment, conduits, lights, and other items necessary to modify the existing gas duct and to erect the new gas duct sections, insulation, jacketing, platforms, and appurtenances.
2. The SUBCONTRACTOR shall perform the WORK, in so far as practicable, without removal of existing items. The SUBCONTRACTOR shall be responsible to determine the most practical method to perform this WORK to avoid removal of existing items.
3. Insulation and jacketing shall be removed from the existing duct and precipitator plenums as necessary to complete the WORK. This insulation and jacketing shall not be reused by the SUBCONTRACTOR.
4. The existing expansion joint between the existing duct and the Buell precipitator 15D plenum inlet flange shall be removed. This expansion joint shall not be reused.
5. The portions of existing duct, insulation, jacketing, and platforms to be removed, as determined by the SUBCONTRACTOR and as shown on the drawings, shall be removed and stored by the SUBCONTRACTOR in such a manner that will permit reuse at a future time by PENELEC.

6. Insulation, jacketing and appurtenances attached to the duct sections to be removed shall remain attached to the removed duct section as much as practical.
7. The SUBCONTRACTOR shall prepare a demolition plan and removal and reinstallation procedures. The SUBCONTRACTOR shall submit his detailed removal procedures and demolition plan thirty (30) calendar days after AWARD for review and comment.
8. Care shall be exercised when removing parts and appurtenances of structures, duct, and equipment to prevent weakening of remaining structures, duct, expansion joints, and materials. They shall be temporarily braced and shored, as required, to preclude collapse and to maintain integrity. Temporary bracing, shoring, and closures shall be removed, as the WORK of reconstruction progresses, in an orderly manner.
9. Suitable barriers, subject to the authorization of PENELEC, shall be erected and maintained by the SUBCONTRACTOR around all operations as long as such operations or openings constitute a hazard or a dangerous condition.
10. The SUBCONTRACTOR shall furnish, erect, and maintain acceptable danger, warning, and keep out signs at places and locations where the placing of such signs is necessary for general safety, or as directed by PENELEC.
11. Blasting or burning of combustible materials as a means of demolition is strictly prohibited.
12. During the entire period of WORK, equipment and utilities shall be protected against weather, debris, dirt, dust, or damage. The SUBCONTRACTOR shall provide and maintain any necessary protective overhead, floor, wall, and equipment closures including provisions for adequate water runoff to established site drainage system, and shall remedy damage or the effects of any penetrations through such protection, all to the satisfaction of PENELEC.
13. All cutting and burning torch operations are to be controlled to prevent fire and damage in accordance with NFPA 51B. Existing facilities, such as electrical trays, conduit, and equipment, shall be adequately protected from such operations.
14. To the best of BECHTEL'S and PENELEC'S knowledge, the existing insulation does not contain asbestos. The expansion joint between the existing duct and the Buell precipitator inlet plenum 15D flange may contain asbestos. If asbestos contaminated material is determined to exist, the SUBCONTRACTOR shall be responsible for providing services and

procedures as required to conform to applicable government regulations for removal of asbestos-impregnated material and its disposal on-site. PENELEC will dispose of the asbestos contaminated material.

15. The existing ductwork and tie points to existing precipitators contain arsenic and are therefore regulated areas. The SUBCONTRACTOR shall take appropriate measures and perform all work in accordance with OSHA regulations covering the work place.
16. Removal WORK shall be accomplished in strict compliance with the OSHA "Safety and Health Standards" (29 CFR 1926) Subpart T - Demolition, within the PROJECT SCHEDULE, and Specification requirements. The overall plant operations and facilities shall not be interfered with by this WORK.
17. The SUBCONTRACTOR shall accept the site as is and shall remove all trash, rubbish, and debris which may interfere with the construction operation. The SUBCONTRACTOR shall keep the site as neat and clean as possible during the entire course of the WORK.

2:04

SUBMITTALS

Submittals required by this section are given in Appendix E.

SECTION III
DUCTWORK STEEL
Section Contents

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SECTION III
DUCTWORK STEEL

3:01 SCOPE

3:01.1 Description of WORK:

This Section covers technical requirements to detail, fabricate, furnish, deliver, and erect the steel gas duct sections and modifications, and related items, as described in this Section, as shown on the drawings, and as necessary to complete the WORK for the following:

1. Gas ducting from the existing Research-Cottrell precipitator outlet plenum 15B to the existing Buell precipitator inlet plenum 15D flange.
2. Gas duct appurtenances on the existing precipitator outlet plenum 15B, gas duct, and the new gas duct sections.
3. Field cutting openings in gas duct, shop installation of nozzles, soot blower sleeves, fittings, etc. where final locations are known, and field attaching ports in the existing plenum and duct.
4. All items included in this Section or required to properly install and connect the gas duct system, including supports attached to the duct extension support steel.
5. Turning vanes in the new gas duct sections.
6. Duct access doors in the new gas duct sections.
7. Verification of existing field conditions and dimensions of interfaces with existing construction.

3:01.2 Items Included:

This Section includes but is not limited to the following items:

1. Shop detail drawings, shop weld details and procedures, and erection drawings for the steel ducts and related items
2. Fabrication of steel ducts and related items.
3. Temporary pipe struts, and bracing inside the ducts required for fabrication, transportation, storage, and erection as determined by the SUBCONTRACTOR.

4. Thermal expansion bearing plates, restraints, including bolts, nuts, and washers to attach the ducts to support steel.
5. Flanges, bolts, and gaskets.
6. Access doors.
7. Nozzles (ports or sleeves) including flanges and caps.
8. Delivery of all materials.
9. Mill test reports.
10. Erection of all items.
11. Inspection and testing.

3:02

APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. The American Institute of Steel Construction (AISC):
 - a. "Specification for Structural Steel Buildings, Allowable Stress Design", June 1, 1989.
 - b. "Code of Standard Practice for Steel Buildings and Bridges," effective September 1, 1986.
2. American Society for Testing and Materials (ASTM):
 - a. A 36/A 36M-89, "Standard Specification for Structural Steel."
 - b. A 53-90, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless."
 - c. A 167-89a, "Standard Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate."
 - d. A 181-87, "Standard Specification for Forgings, Carbon Steel, for General Purpose Piping."
 - e. A 307-90, "Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength."
 - f. A 563-90, "Standard Specification for Carbon and Alloy Steel Nuts."

- g. A 700-90, "Standard Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment."
 - h. F 436-90, "Standard Specification for Hardened Steel Washers."
3. American Welding Society (AWS):
- a. D1.1-90, "Structural Welding Code."
 - b. A5.4-81, "Specifications for Covered Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Electrodes."
4. Building Officials and Code Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.
5. Penelec Quality Assurance Specifications Manual PS-8.01C, Rev. 1, and Attachment 7.1.
6. Steel Structures Painting Council (SSPC) SP 3-89, "Power Tool Cleaning."

3:03

MATERIAL REQUIREMENTS

Unless noted otherwise on the drawings, all materials shall conform to the following requirements listed below.

- 1. Structural steel shapes and bars shall conform to ASTM A 36.
- 2. Steel pipe nozzles for test ports and sample ports shall conform to ASTM A 53.
- 3. Ductwork plate steel shall conform to ASTM A 36 and shall have a thickness of 1/4 inch.
- 4. Bolts shall conform to ASTM A 307.
- 5. Nuts shall conform to ASTM A 563, Grade C.
- 6. Washers shall be of hardened steel and conform to ASTM F 436.
- 7. Pipe fittings shall conform to ASTM A 181, Grade 70.
- 8. Stainless steel threaded and welding studs shall be as supplied by Nelson Division of TRW, Inc., or KSM Division of Omark Industries, Inc. or equal.
- 9. Duct support sliding plates shall be Type 316 stainless steel conforming to ASTM A 167.

10. Woven glass fiber gaskets for flanged and bolted joints for ports shall be high-temperature, heat resisting gaskets, such as, Johns-Manville 1122, Southern Manufacturing, Inc., Style 300 Web Center Tape, or equal.
11. Glass rope gaskets for duct access doors shall be style 500-1 rope, one inch outside diameter, with Weldguard or Cleanguard treatment as manufactured by Southern Manufacturing, Inc. or equal.
12. Welding Electrodes:

Electrodes and filler metal for all carbon steel welding processes shall produce a low-hydrogen deposit of 70,000 pounds per square inch minimum tensile strength with impact properties of 20 foot-pounds at -20° F. Welding electrodes and filler metal for welding carbon steel shall conform to the provisions of AWS D1.1, Table 4.1, for the type of steel to be welded. Welding of dissimilar materials shall use Type E309 electrodes conforming to AWS A5.4.

3:04

SPECIAL DETAILS AND DIMENSIONAL REQUIREMENTS

1. The dimensions shown on the drawings are calculated dimensions. Deviations are likely to occur due to duct assembly, existing conditions, and variances in field equipment setting. Therefore, means for reasonable dimensional adaptability shall be provided by the SUBCONTRACTOR as required for shop and field assembly. The SUBCONTRACTOR shall verify existing field conditions and dimensions as necessary to detail the new duct modifications and accommodate to existing construction.
2. All stiffeners shall be external. The use of permanent internal bracing is not permitted except as specifically shown on the drawings.
3. No permanent holes are allowed in duct stiffeners. Temporary holes made for fabrication and erection shall be completely plug welded or suitably patched with a patch plate.
4. All materials and connections necessary to support the duct shall be furnished by the SUBCONTRACTOR.
5. Typical details for shop and field joints are shown on the drawings. The SUBCONTRACTOR shall determine the optimum location and arrangement of such details and provide all missing details as necessary to complete the WORK.

6. The duct shall be all welded construction except connections to expansion joints shall be bolted. The SUBCONTRACTOR shall be aware that the duct plates and stiffeners are an integral part of the structural design of the duct. All splices and joints in the duct shall be detailed and constructed to develop the full strength capacity of the duct plate and the full strength capacity of all stiffeners interrupted by a splice.
7. The minimum radius for cold bending of duct plates shall not be less than 1 inch unless noted otherwise on the drawings.
8. The minimum radius for a notch or corner of an included angle of a cut in duct plate or stiffener shall be 1/2 inch minimum unless noted otherwise on the drawings.

3:05

FABRICATION REQUIREMENTS

1. Fabrication requirements shall be in accordance with the provisions of the codes, standards, and specifications listed in Section 3:02, with the following additions:
 - a. Parts not completely assembled in the shop shall be secured by bolts, insofar as practicable, to prevent damage in shipment and handling.
 - b. Structural steel shall be kept clean; handling shall be performed in a manner to minimize damage to steel shapes.
 - c. Unless the drawings indicate otherwise, tolerances shall comply with the AISC references listed in Section 3:02-1.a and 3:02-1.b, except that for welded structural members, Section 3 of AWS D1.1 shall govern.
2. Shop-fabricated duct sections shall be as large as practicable, depending upon space limitations set by the existing structures and other power plant equipment and site access restrictions.
3. Temporary interior struts and bracing shall be provided as required for shipping and erection.
4. V-notches and pockets that might trap ash and cause corrosion shall be eliminated or closure angles provided.
5. Gaskets for flanged and bolted joints shall be 1/8 inch thick and of sufficient width to encompass the bolt holes in the flanged joints with at least a 1-1/4 inch wide distance from

the centerline of bolt to edge of gasket unless shown otherwise on the drawings.

6. Ducts shall be of welded, gas tight construction. The SUBCONTRACTOR shall insure that all gaps are seal welded gas tight on shop assembled duct sections.
7. Corners of ducts shall have closure angles on the inside surface of the gas duct. The toes of the angles shall have a continuous seal weld to the duct plates to insure no gas leakage. The duct corner angles shall be fabricated in lengths as long as practicable to minimize splice joints. Splice joints between angles shall be full penetration butt welds unless shown otherwise on the drawings.
8. Gas duct assemblies shall have necessary guides or adequate temporary connection to properly align sections during erection.
9. Temporary bolted field connections, in addition to those shown on the drawings, may be provided to facilitate installation of shop-fabricated duct sections. Such additional connections shall be detailed and prepared for field welding so that all design criteria are satisfied.
10. Each fabricated piece shall be marked with an identification mark corresponding to that indicated on the shop and field erection drawings.
11. All nozzles (ports or sleeves) shall be provided with threaded pipe caps where the nozzle is 2 inches in diameter or less. Nozzles greater than 2 inches in diameter shall be provided with slip-on flanges having a pressure rating of 150 pounds with a bolted closure plate as shown on the drawings.
12. Shop welding shall comply with the following:
 - a. Except as described herein, all carbon steel welding shall be in accordance with AWS D1.1.
 - b. The dew point of argon, helium, and argon oxygen gas shall be -60° F or lower. The dew point of carbon dioxide gas shall be -50° F or lower.

3:06

ERECTION REQUIREMENTS

1. Erection requirements shall be in accordance with the provisions of the codes, standards, and specifications listed in Section 3:02.

2. Ductwork shall be erected in sequence which is in accordance with the PROJECT SCHEDULE.
3. Temporary bracing shall not be removed until permanent connections are made. Care shall be taken not to damage permanent parts during removal of temporary bracing.
4. Temporary bolted connections shall comply with the following:
 - a. Bolted connections provided to facilitate installation of shop-fabricated duct sections shall be designed, detailed, and prepared for field welding for gastightness. Details shall be shown on the drawings submitted for review.
 - b. Temporary bolted connections provided to facilitate installation of shop-fabricated duct sections shall be made gastight by field welding after installation. Gusset or attachment plates shall be removed. Bolt holes shall be plug welded.
5. Each bolted connection shall have at least two bolts.
6. Ducts shall be of welded, gas tight construction. The SUBCONTRACTOR shall insure that all gaps are seal welded gas tight on field assembled duct sections.
7. Field welding shall comply with the following:
 - a. Except as described herein, all carbon steel welding shall be in accordance with AWS D1.1.
 - b. Carbon steel welding shall comply with Penelec Quality Assurance Specifications Manual PS-8.01C.
 - c. The dew point of argon, helium, and argon oxygen gas shall be -60° F or lower. The dew point of carbon dioxide gas shall be -50° F or lower.
 - d. When connections to the existing structure are made by welding, the area of the existing steel where field welding is to be performed shall be:
 - (1) Cleaned of dirt, rust, or paint in accordance with SSPC SP 3.
 - (2) Reinforced, braced or temporarily supported if required to support existing loads.
8. Gas duct erection tolerances:

The flange-to-flange dimensions breach shall be on center, uniform, and parallel to $\pm 1/4$ ", $\pm 1/2$ " axial, and to $\pm 1/2$ " lateral offset and as necessary to accommodate the expansion joint design.

3:07 PERSONNEL REQUIREMENTS

For all carbon steel welding, welders shall be qualified in accordance with AWS D1.1, Chapter 5, Parts A, C, and E and Penelec Quality Assurance Specifications Manual PS-8.01C.

3:08 INSPECTIONS AND TESTS

1. Materials used in the WORK shall be tested in accordance with and certified to conform to the applicable ASTM and/or AWS Specifications.
2. Welding inspections and tests shall conform to the following:
 - a. Welding inspections and tests shall be performed in accordance with AWS D1.1, Section 6, to quality acceptance levels defined in AWS D1.1, Paragraph 8.15.1.
 - b. Marked-up drawings or weld maps showing location and method of testing of all welds tested shall be maintained.
 - c. All welds shall be 100 percent visually inspected and the results shall be documented.
 - d. All unacceptable welds shall be repaired using the same procedure used to perform the original weld or with a qualified repair procedure. Repairs shall be documented.
 - e. After necessary repairs have been made, the repaired weld shall be 100 percent inspected and documented with the same method that disclosed the original defect.
3. Material test results and certifications shall be on file before the material is used in the fabrication.

3:09 HANDLING, DELIVERING, RECEIVING, UNLOADING, AND STORING

1. Material shall be delivered with temporary bracing, as required, to maintain its shape during transportation, storage, and handling. Packaging, marking, and delivery shall be in accordance with ASTM A 700.

2. All specified materials shall be received, unloaded, inspected, stored, and handled by the SUBCONTRACTOR. Materials shall be stored on platforms, skids, or other supports, and protected from weather as required so as to prevent degradation prior to erection.
3. PENELEC shall be immediately notified of damaged, unacceptable, or nonconforming materials found during receiving and inspection.
4. Handling, storage, and erection shall be performed in a manner which minimizes damage to the steel shape, and maintains the material in a clean condition.

3:10

SUBMITTALS

Submittals required by this section are given in Appendix E.

SECTION IV
FABRIC EXPANSION JOINTS

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SECTION IV
FABRIC EXPANSION JOINTS

4:01 SCOPE

4:01.1 Description of WORK:

This Section covers technical requirements for designing, fabricating, delivering, and installing nonmetallic expansion joints.

4:01.2 Items Included:

This Section includes but is not limited to the following:

1. Designing, providing, and installing expansion joints in the gas duct including replacement of an existing expansion joint as shown on the drawings.
2. Designing, providing, and installing baffle plates that are designed to protect the expansion joints from the flue gas stream.
3. Shop inspecting and testing.
4. Shop cleaning and painting of backup bars.
5. Providing shop detail and erection drawings.

4:01.3 Items Not Included:

1. The duct flanges that interface with the backup bars and the expansion joint drilling.
2. Bolts, nuts, and washers.

4:02 APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. Ducting Systems, Nonmetallic Expansion Joint Division of the Fluid Sealing Association, "Technical Handbook," Second Edition.
2. Steel Structures Painting Council (SSPC):
 - a. PA 1-82, "Shop, Field, and Maintenance Painting."
 - b. SP 1-82, "Solvent Cleaning."

c. SP 10-89, "Near-White Blast Cleaning."

4:03

DESIGN REQUIREMENTS

1. The expansion joints shall comply with the guidelines of the Technical Handbook, Ducting Systems Nonmetallic Expansion Joint Division of the Fluid Sealing Association.
2. The expansion joints shall be of the integral flange design as described in Illustration D and defined in Appendix 1 of the Technical Handbook referenced above. Expansion joints shall be a continuous belt with molded corners. Each expansion joint shall be delivered as a closed loop that does not require a field splice.
3. The bolt hole drilling pattern for the expansion joint and backup bars at the Buell precipitator inlet plenum 15D flange shall be in accordance with Buell drawing 2-18348.
4. The expansion joints will be installed outdoors in the flue gas ducts of a coal burning power plant.
5. The expansion joints shall be designed for wet and dry service and to withstand the local environmental considerations, such as resistance to abrasion, SO₂, ozone, and ultraviolet radiation. The expansion joints shall also be capable of withstanding possible corrosive attack during periods of inactivity. The sulfur content in coal is estimated to be approximately 2.25 percent.
6. The expansion joints shall be Raybestos Manhattan Industries Company Model Mark III and shall consist of two plies of wire reinforcing, integrally vulcanized (pressure cured) between two plies of calendared fluorelastomer compound formulated for corrosive gas service. The fluorelastomer shall contain between 67 and 77 percent virgin Viton B by volume. The wire reinforcement shall be a net wire mesh of Carpenter 20, Class 3.
7. Expansion joints must be set back from the gas stream to prevent erosion and abrasion from particulate in the gas stream. The SUBCONTRACTOR shall specify the required setback; however, under no circumstances shall it be less than 1 inch at the worst case of combined movements specified.
8. Asbestos shall not be used in the fabrication of the expansion joints.
9. The elastomer fabric and bolting hardware shall be field replaceable from the outside of the ductwork.

10. The backup bars shall be 3/8 inch thick by 2 inches wide, made of carbon steel, and shall have inside edges with a smooth radius.
11. The expansion joints and backup bars shall have 11/16 inch by 1 inch slotted holes, with the 1 inch dimension linearly aligned with the center of the bolt hole pattern. The center-to-center dimension of the slotted holes shall equal the center-to-center dimension of the bolt hole pattern.

4:04

PERFORMANCE REQUIREMENTS

The expansion joints shall be designed to meet the following conditions:

1. Transient pressure: +25/-25 inches H₂O
2. Operating pressure range: +15/-24 inches H₂O
3. Gas temperature
 - a. Operating temperature range: 120° F to 400° F
 - b. Design temperature: 400° F
 - c. Excursion temperature (2 hours): 600° F (max)
4. Ambient temperature range: -10° F to 100° F
5. Flowing medium: Flue gas
6. Movement along the axis of the duct
 - a. extension: 1 inch (min)
 - b. compression: 1-1/2 inch (min)
7. Movement perpendicular to the axis of the duct in any direction: 3/4 inch (min)
8. The expansion joints shall be designed by the SUBCONTRACTOR for movements based on the duct and expansion joint arrangement and support arrangement as shown on the drawings; however, the expansion joints shall be designed for not less than the minimum movements listed above.

9. The expansion joint shall be designed for service conditions where the interior surface may be intermittently wetted with water.

4:05 CLEANING AND PAINTING

4:05.1. Surface to be Painted:

All exterior metal parts of the expansion joints shall be shop painted in the following prescribed manner.

4:05.2 Surface Preparation:

1. Surface preparation of steel for painting after fabrication shall be in accordance with SSPC SP 10 "Near-White Blast Cleaning" except wet blasting shall not be used. Oil and grease shall be removed in accordance with SSPC SP 1, "Solvent Cleaning."
2. Special care shall be given to cleaning around rivet heads, bolts, edges, and corners of members and in pockets, angles, and out-of-the-way places.
3. Insofar as possible, painting of cleaned surfaces shall be accomplished on the same day, and no more surface shall be cleaned than can be painted on the same day.

4.05.3 Paint:

The paint system selected shall be compatible with the expansion joint design and excursion temperatures. Use the following or an equivalent system:

Primer: Aquapon Zinc Rich 97-670 as manufactured by PPG Industries.

Finish: Speedhide Hi Heat Silicone as manufactured by PPG Industries.

4:05.4 Application:

All shop paint shall be mixed and applied in accordance with SSPC PA-1, "Shop, Field, and Maintenance Painting," except as modified below:

1. Under no circumstances shall painting be continued should the temperature fall below 50 degrees F or the relative humidity exceed 85 percent.

2. Paint shall be applied as recommended by the paint manufacturer. All lap marks shall be concealed.
3. Each paint coat shall have a minimum wet film thickness of 3.5 mils or a minimum dry film thickness of 2.2 mils. This film thickness shall be the minimum thickness of any one reading and not an average of several readings. The film thickness shall not be so great as to permit the paint to run or sag or otherwise be detrimental to the handling of the materials, or the appearance, or service life of the paint.

4:06

MARKING AND IDENTIFICATION

Each expansion joint furnished shall have a permanent nameplate affixed thereto in a readily visible place, showing the serial number, model number, name and address of the manufacturer, rated conditions, and other applicable pertinent data.

4:07

PACKAGING

1. All equipment and materials shall be prepared for shipment so as to facilitate transit, unloading, and handling, free from damage. Where necessary, heavy parts shall be mounted on skids or shall be crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly marked for identification. When parts are crated or boxed, detailed packing lists shall be provided with each crate or box.
2. All equipment shipped to the jobsite will be stored outside with no exterior weather protection other than cribbing. The equipment will be stored in this manner until installed by the SUBCONTRACTOR. The SUBCONTRACTOR shall make certain that no deterioration occurs in the equipment over this storage period. Also, the SUBCONTRACTOR shall make any additional requirements for storage of this equipment.

4:08

SUBMITTALS

Submittals required by this section are given in Appendix E.

**SECTION V
INSULATION AND JACKETING**

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SECTION V
INSULATION AND JACKETING

5:01 SCOPE

5:01.1 Description of WORK:

This Section covers the technical requirements to design, furnish, fabricate, deliver, and install thermal insulation and jacketing on the external surfaces of the existing and modified ductwork, between the existing Research-Cottrell precipitator outlet plenum 15B and the Buell precipitator 15D inlet plenum flange on Seward Station Boiler 15, Unit 5, as required to complete the ductwork modification.

5:01.2 Items Included:

This Section includes but is not limited to the following:

1. Designing, furnishing, delivering to the jobsite, unloading, storing, protecting during storage, and installing 2-1/2 inch thick block and board insulation and jacketing on the external surfaces of the ductwork.
2. Furnishing and installing fasteners, sealers, flashing, subgirts, and other items required for installation of the insulation and jacketing on the ductwork.
3. Providing shop detail and erection drawings.
4. Designing, providing, and installing removable insulation and jacketing panels to permit installation of thermocouples and grounding by OTHERS at locations shown on the drawings.
5. Designing, providing, and installing removable insulation and jacketing panels at the duct access doors at locations shown on the drawings.

5:02 APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. American Society for Testing and Materials (ASTM):
 - a. B 209-89, "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate."
 - b. C 612-83, "Standard Specification for Mineral Fiber Block and Board Thermal Insulation."

2. Building Code Officials and Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.
3. Penelec Quality Assurance Specifications Manual PS-10.06 Rev. 2 and Attachments 7.1 and 7.2, "Marking of Asbestos - Free Insulation."

5:03 MATERIAL REQUIREMENTS:

5:03.1 General:

1. Material shall be new and in strict compliance with this Section.
2. Substitutions shall not be permitted unless submitted with the Proposal.

5:03.2 Thermal Insulation for Ductwork:

1. Insulation for ductwork shall be 2-1/2 inch thick block conforming to ASTM C 612, Class 3 and to Penelec PS-10.06. Nominal density shall be 12 pcf. Insulation shall have a single, solid, non-white color throughout.
2. Exterior face of the insulation shall be covered with a 0.003 inch thick aluminum foil.
3. The insulation shall not contain asbestos.

5:03.3 Jacketing for Ductwork:

1. Exterior jacketing, corners, flashing, and closure pieces shall be stucco-embossed Alclad 3004 aluminum conforming to ASTM B 209. The color and appearance of the external jacketing shall match as close as practical to the jacketing on the existing ductwork. Color samples shall be submitted to PENELEC for final color selection prior to use.
2. Jacketing for ductwork sides and bottom shall be flat. Jacketing for the roof sections of ductwork shall be box-ribbed (4 inch).
3. Minimum jacketing thickness shall be as follows:
 - a. Ductwork vertical and bottom surfaces: 0.040 inch
 - b. Ductwork top walking surface: 0.050 inch
 - c. Flashing: 0.040 inch

5:04 APPLICATION REQUIREMENTS

5:04.1 Insulation and Jacketing:

The insulation and jacketing for the ductwork shall be either prefabricated assemblies or field-applied as follows:

1. Prefabricated Ductwork Insulation:

- a. Panels shall consist of 2-1/2-inch thick block insulation attached to the jacket on 12-inch centers. Interior surfaces of the insulation shall be covered with 16-gage 2" by 2-5/8" welded fabric, galvanized after welding, retained by pins or prongs and 3-inch square or round aluminum pin clips or washers.
- b. Where necessary, insulation subgirt supports shall be supplied and installed.
- c. Maximum spacing of supports on the sides of ductwork shall be 4 feet. Supports shall be of sufficient size to provide adequate support and a smooth exterior surface.
- d. Insulation shall be attached to the supports with No. 14 stainless steel self-tapping screws on 12 inch centers. All exposed screws shall have metal backed neoprene washers preassembled to the screws.
- e. Panel construction and method of attaching panels to the ductwork shall be such that compressive loads on the exterior surface at screw locations do not compress the insulation.
- f. Ductwork dimensions shall be verified by the SUBCONTRACTOR as necessary prior to fabricating panels to ensure proper fitting of insulating panels to surfaces. BECHTEL and PENELEC will not be responsible for discrepancies between the design drawings and the actual duct and plenum dimensions.

2. Field-Fabricated Ductwork Insulation:

- a. Field-fabricated insulation shall have a 16-gage 2" by 2-5/8" welded fabric attached directly to the ductwork stiffeners, or to any subgirts.
- b. The block insulation shall be closely butted together and fastened securely in place with 14-gage annealed galvanized wire or pin clips.

c. The jacket shall be securely fastened to the insulation.

3. Removable Insulation and Jacketing Panels

a. The requirements of prefabricated ductwork insulation and jacketing shall apply to removable insulation and jacketing panels.

b. Removable insulation and jacketing panels shall be provided at twenty-five (25) locations indicated on the drawings to allow access to the surface of the duct for the installation and maintenance of 20 thermocouples and 5 grounding connections at a latter day by Others. Each access panel shall have a handle. The panel (insulation and jacketing) shall be removable in one piece.

c. Removable insulation and jacketing panels shall be provided at four (4) locations as indicated on the drawings at the duct access door locations. The number of panels per access door shall be kept to a minimum. The weight of each panel shall not exceed 50 pounds. Each removable panel shall have two handles per door. Each panel (insulation and jacketing) shall be removable in one piece. The opening in the insulation and jacketing after removal shall allow a minimum 120 degree swing angle for the duct access door opening.

5:04.2 Aluminum Flashing:

1. Flashing shall be formed and installed so that water will drain freely from all surfaces and will not enter the jacketing and wet the insulation.
2. Insulation on top of ducts shall be designed for a live and snow load of 30 pounds per square foot. Insulation and jacketing on sides of duct shall be designed for wind load ($P_d = 30$ psf) per BOCA. Insulation on top surfaces shall be supported and of a thickness such that walking loads will not crush the insulation.
3. Top surfaces of gas duct insulation jacketing shall have a minimum slope of 1/4 inch per foot, toward the side shown on the drawings.
4. Flashing shall be attached using No. 10 sheet metal screws with neoprene washers set at 12 inch centers.

5:04.3 Weather Protection:

1. Temporary fire-resisting weather protection shall be provided for the insulating materials used for the WORK.
2. Temporary protection shall be provided, when required, to guard the SUBCONTRACTOR'S workers from any overhead work taking place.

5:05

INSTALLATION REQUIREMENTS

1. Thermal Expansion:
 - a. Necessary provisions shall be made for thermal expansion so that insulation and jacketing lay flat, and are weathertight, straight whether the ducts are hot or cold.
 - b. The following design criteria shall be utilized:
 - (1) Ambient air: -10° F to 100° F
 - (2) Gas Temperature:
 - (a) Operating range: 120° F to 400° F
 - (b) Design: 400° F
 - (c) Excursion temperature: 600° F (max)
(2 hours)
2. WORK performed under this Section shall be moistureproof, and all necessary closures, joint covers, flashing, sealants, etc., as required to keep the insulation dry, shall be provided.
3. Jacketing shall be installed so that the flat faced panels are horizontal on the ductwork sides. Side laps in the aluminum jacketing shall not be less than 6 inches. End laps, corners reinforced with external flashing, and vertical joints with external flashing shall not be less than 6 inches and occur over a support. Open ends of all jacketing panels shall be closed with formed rubber closure strips. Joints around nozzles, fittings, platform supports, and other items which protrude through the jacketing shall be adequately sealed with flashing and a suitable sealing compound.
4. Jacketing and flashing shall be designed and installed so there will be no rattling due to vibration or wind.
5. Fabric expansion joints shall not be insulated but shall be jacketed. The jacketing at the expansion joints shall be

weathertight and shall permit unrestricted movement of the duct sections and expansion joints.

5:06 INSPECTION

1. Material, equipment, design, and workmanship shall at all times be subject to the inspection of BECHTEL and PENELEC, and any materials, equipment, or workmanship not meeting the Specification shall be replaced or reworked immediately by the SUBCONTRACTOR. Inspection by BECHTEL or PENELEC shall not relieve the SUBCONTRACTOR in any way from the responsibility for full compliance with the specified requirements and applicable codes.
2. Insulation showing any evidence of moisture shall be rejected.
3. Insulating material shall not show signs of cracking, crumbling, excessive shrinkage, spalling, or excessive charring.
4. The insulating material and cement shall not emit volatile components or leach out any component part upon exposure to heat or moisture.

5:07 CLEANING

1. Removal of empty boxes, cartons, papers, and other debris shall be performed on a daily basis. If the SUBCONTRACTOR fails to keep his WORK areas cleaned on a daily basis, PENELEC will take whatever action is necessary to clean the areas and back charge the SUBCONTRACTOR for all costs incurred.
2. If the plant is operating before insulation and protective covering WORK is completed, all unused material and loose scaffolding shall be removed from the operating area at the end of each workday to allow free and safe access for operating personnel.

5:08 SUBMITTALS

Submittals required by this section are given in Appendix E.

SECTION VI
WEATHER ENCLOSURE, HOISTS,
STRUCTURAL STEEL FOR DUCTWORK
SUPPORT, AND MISCELLANEOUS STEEL

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SECTION VI
WEATHER ENCLOSURE, HOISTS,
STRUCTURAL STEEL FOR DUCTWORK
SUPPORT, AND MISCELLANEOUS STEEL

6:01 SCOPE

This Section cover the technical requirements to furnish, detail, fabricate, deliver to the site, store, and erect all the structural steel for support of the ductwork including miscellaneous platforms, weather enclosure, monorails, stair framing, and related items required in connection with the duct modifications as shown on the drawing and as necessary to complete the WORK. The WORK shall include, but not necessarily be limited to, the following:

1. Verification of existing field conditions and dimensions of interfaces with existing construction.
2. Shop and erection drawings.
3. Detailing all connections required.
4. Structural and miscellaneous steel for the ductwork support structure, platforms, and weather enclosure installations consisting of:
 - a. Columns.
 - b. Base, caps, and bearing plates.
 - c. Shims for setting of all base and bearing plates.
 - d. Beams and girders.
 - e. Plates, angles, tees, and bars.
 - f. Trusses.
 - g. Posts, hangers, ties, and rods.
 - h. Struts and bracing.
 - i. Stair stringers, and treads.
 - j. Monorail beams.

- k. Ladders, safety cages, safety chains and eye bolt snaps.
 - l. Toe plates.
 - m. Bolts, nuts, and washers.
 - n. Welds.
 - o. Anchor bolts and associated plates, nuts, and washers.
 - p. Grating and grating fasteners, including holes for handrails, toe plates, banding, and cut-outs in grating.
 - q. Handrails.
- 5. Shop painting.
 - 6. Field painting.
 - 7. Monorail trolleys and chain hoists.
 - 8. Weather enclosure which includes:
 - a. Metal door, frame, and door hardware.
 - b. Window.
 - c. Wall and roof insulation.
 - d. Corrugated metal siding and roof.
 - 9. Mill test reports.

6:02

APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

- 1. The American Institute of Steel Construction (AISC):
 - a. "Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design," June 1, 1989
 - b. "Code of Standard Practice for Steel Buildings and Bridges," effective September 1, 1986.
 - c. "Manual of Steel Construction, Allowable Stress Design," Ninth Edition.

2. American Society for Testing and Materials (ASTM):

- a. A 36/A 36M-89, "Standard Specification for Structural Steel."
- b. A 53-90, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless."
- c. A 123-68, "Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip."
- d. A 153-82, "Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware."
- e. A 307-90, "Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength."
- f. A 325-90, "Standard Specification for High Strength Bolts for Structural Steel Joints."
- g. A 500-89, Grade B, "Standard Specification for Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes."
- h. A 501-84, "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing."
- i. A 526-85, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Commercial Quality."
- j. A 563-90 "Standard Specification Carbon and Alloy Steel Nuts."
- k. A 569-85, "Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality."
- l. A 700-90, "Standard Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment."
- m. F 436-90, "Standard Specification for Hardened Steel Washers." (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality."

- n. D 4257-84, "Standard Practice for Design and Use of Safety Alert System for Hazardous Work Locations in the Coatings and Lining Industry."
3. American Welding Society (AWS) D1.1-90 "Structural Welding Code."
4. Building Code Officials and Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.
5. National Fire Protection Association (NFPA) 51B-89, "Standard for Fire Protection in Use of Cutting and Welding Processes."
6. Occupational Safety and Health Act of 1970 (OSHA), Part 1910, "Occupational Safety and Health Standards."
7. Penelec Quality Assurance Specifications Manual PS-8.01C, Rev. 1, and Attachment 7.1.
8. Research Council on Structural Connections of the Engineering Foundation, "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," Approved November 13, 1985.
9. Steel Door Institute (SDI):
 - a. ANSI/SDI-100-85, " Recommended Specifications for Standard Steel Doors and Frames."
 - b. SDI-107-84, "Hardware on Steel Doors (Reinforcement Application)."
10. Steel Structures Painting Council (SSPC):
 - a. PA 1-82, "Shop, Field, and Maintenance Painting."
 - b. SP 1-82, "Solvent Cleaning."
 - c. SP 10-89, "Near-White Blast Cleaning."

6:03

MATERIAL REQUIREMENTS

Unless noted otherwise on the drawings all materials shall conform to requirements listed below.

1. Structural steel plates, shapes, and bars shall conform to ASTM A 36.
2. Structural grade bolts shall conform to ASTM A 307.
3. Structural tubes shall conform to ASTM A 500 Grade B.

4. Anchor bolts shall conform to ASTM A 36 or ASTM A 307 for headed bolts.
5. High strength bolts shall conform to ASTM A 325.
6. Nuts shall conform to ASTM A 563, Grade C.
7. Washers shall be hardened steel conforming to ASTM F 436.
8. Grating and grating fasteners shall be in accordance with Section 6:08.
9. Treads and tread fasteners shall be in accordance with Section 6:08.
10. Pipe handrail shall conform to ASTM A 501.
11. Welding Electrodes:

Electrodes and filler metal for all carbon steel welding processes shall produce a low-hydrogen deposit of 70,000 pounds per square inch minimum tensile strength with impact properties of 20 foot-pounds at -20° F. Welding electrodes and filler metal for welding carbon steel shall conform to the provisions of AWS D1.1, Table 4.1, for the type of steel to be welded.

12. Two monorail hoists shall be Cyclone Model "S" number CM646, 2000 pound capacity for 40 foot lift.
13. Two trolleys shall be Flyer chain hoist type, 2000 pound capacity for 6 inch I-beam mounting.
14. Weather enclosure shall be in accordance with Section 6:10.

6:04

CONNECTIONS

All connections shall be detailed in accordance with the AISC "Manual of Steel Construction, Allowable Stress Design." Each bolted connection shall have at least two bolts.

6:04.1

Axial force members (braces, truss verticals, and truss diagonals) shall be detailed for the forces shown on the drawings. Beam connections shall be detailed as noted on the drawings. Special connections shall be detailed as shown on the drawings. Where weld size, plate thickness, or other information is not shown on the drawings for connections, the SUBCONTRACTOR shall provide the details necessary to complete the WORK.

6:04.2 Shop assembly connections may be either welded or bolted. Field connections between members furnished as part of this WORK shall be bolted. Field connections to existing steel shall be welded unless shown otherwise on the drawings. All bolted connections shall be made with high strength bolts unless noted otherwise on the drawings or as described herein. The following items shall be bolted with structural grade bolts with hexagonal nuts:

1. All beams marked "Removable" on the drawings.
2. Stairways, landings, and ladders.

6:04.3 High strength bolt connections shall be in accordance with "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" issued by the Research Council on Structural Connections of the Engineering Foundation. All high strength bolted connections shall be provided with load indicating washers and pretensioned unless noted otherwise.

6:04.4 All welding shall comply with the requirements of the AWS D1.1 for the type of steel to be welded.

6:04.5 All welds shall be sound throughout and thoroughly fused. All flux covered welds shall be chipped and wire brushed.

6:04.6 The SUBCONTRACTOR'S erection drawings shall detail clearly and explicitly all field connections so that the steel may be erected safely and properly.

6:04.7 Columns shall be milled to bear at splice, cap, and base plates.

6:04.8 Toe plates and curb angles shall be shop welded to members unless shown otherwise on the drawings.

6:05 FABRICATION REQUIREMENTS

Fabrication requirements shall be in accordance with the provisions of the codes, standards, and specifications listed in Section 6:02, with the following additions:

1. Prior to detailing and fabrication the SUBCONTRACTOR shall verify existing field conditions and dimensions of interfaces with existing construction as noted on the drawings and as necessary to complete the WORK. BECHTEL shall be notified immediately in writing of any deviations. The SUBCONTRACTOR shall detail and fabricate the WORK as necessary to accommodate the existing conditions and dimensions. Reasonable dimensional adaptability shall be provided as required for field assembly and erection.

2. Structural steel shall be kept clean; handling shall be performed in a manner to minimize damage to steel shapes.
3. Unless otherwise noted, tolerances shall comply with the AISC references listed in Section 6:02-1.a and 6:02-1.b, except that for welded structural members, Section 3 of AWS D1.1 shall govern.

6:06

ERECTION REQUIREMENTS

Erection requirements shall be in accordance with the provisions of the codes, standards, and specifications listed in Section 6:02, with the following additions:

1. Holes shall not be made or enlarged by thermal cutting to correct fabrication errors. Holes necessary for field fabrication shall be made by punching or drilling.
2. Unless noted otherwise, tolerances shall comply with the AISC references listed in Section 6:02-1.a and 6:02-1.b, except that for welded structural members, Section 3 of AWS D1.1 shall govern.
3. All gas-operated cutting (if authorized by PENELEC), welding equipment, and operations shall be in accordance with NFPA 51B.

6:07

PAINTING

6:07.1

Surfaces to be Painted:

All surfaces of structural members shall be shop painted in the following prescribed manner, except at areas of field welding, when the surface will be in contact with concrete, or when designated to be galvanized. Areas of field welding shall be field painted in the following prescribed manner.

6:07.2

Preparation of Surfaces:

1. Surface preparation of steel for painting after fabrication shall be in accordance with SSPC SP 10 "Near-White Blast Cleaning" except wet blasting shall not be used. Oil and grease shall be removed in accordance with SSPC SP 1, "Solvent Cleaning".
2. Special care shall be given to cleaning around, bolts, edges, and corners of members and in pockets, angles, and out-of-the-way places.

3. Insofar as possible, painting of cleaned surfaces shall be accomplished on the same day, and no more surface shall be cleaned than can be painted on the same day.

6:07.3

Paint:

1. Prime paint:

One of the following brands of epoxy polyamide primer, or equal, containing at least 90 percent zinc in the dry film, shall be used:

- a. Aquapon Zinc Rich 97-670 as manufactured by PPG Industries.
- b. Zinc Clad 7 as manufactured by Sherwin Williams Company. 06702.
- c. Where the finish coat will be Safety Yellow color, the prime paint shall be PPG Industries "Multiprime" 97-684 or Sherwin Williams "Kem-Chromic Universal Primer" B50WZ1.

2. Finish Paint:

- a. High build chlorinated rubber paint: PPG 97-420, Sherwin Williams Series B63E14, or Ameron Amercoat 524, or equal.
- b. Safety Yellow Finish Paint: PPG 97-3/98 or Sherwin Williams B67T304/B60V3.

6:07.4

Application:

All paint shall be mixed and applied in accordance with SSPC PA-1, "Shop, Field, and Maintenance Painting," except as modified below:

1. Under no circumstances shall painting be continued should the temperature fall below 50 degrees F or the relative humidity exceed 85 percent.
2. All welds shall be stripe painted with the shop paint, using a brush, prior to the steel receiving its full shop coat. This stripe coat need not be fully dried prior to application of the full shop coat. The width of the stripe coat shall be such that it extends at least one inch beyond either edge of the weld.
3. Paint shall be applied as recommended by the paint manufacturer. All lap marks shall be concealed.

4. Each paint coat shall have a minimum wet film thickness of 3.5 mils or a minimum dry film thickness of 2.2 mils. This film thickness shall be the minimum thickness of any one reading and not an average of several readings. The film thickness shall not be so great as to permit the paint to run or sag or otherwise be detrimental to the handling of the materials, or the appearance, or service life of the paint.
5. All surfaces in contact shall be painted two coats before bolting or welding together in the shop, and surfaces which will be inaccessible after assembly shall also be painted with two shop coats.
6. The color of the paint utilized shall match as close as practical to similar steel items existing at the plant. The SUBCONTRACTOR shall submit samples of proposed paint colors to PENELEC for final selection prior to use.

6:08 GRATING AND TREADS

6:08.1 Grating shall be the rectangular welded type having 3/16 inch thick bearing bars, of depth as specified on the drawings, spaced 1-3/16 inch on centers, with cross bars spaced not more than 4 inch on centers and welded into the bearing bars. All grating shall be in accordance with ASTM A 569 and shall be hot-dip galvanized after fabrication in accordance with ASTM A 123. All fabrication including cutouts and banding shall be completed before galvanizing. Grating shall be neatly cut and banded around unsupported openings. Banding shall form a curb 6 inches high, unless otherwise noted on the drawings. Grating at the head of stairs shall be provided with checkered plate nosing welded to the grating.

6:08.2 All grating panels shall be removable and bars of adjacent panels shall be in line. Grating fasteners shall consist of 1/4 inch diameter threaded type 304 stainless steel welding studs of proper length and including flux and arc shields with stainless steel hexagonal nuts and 14 gauge hot-dipped galvanized saddle clips fitting between and locking over the bearing bars. Four clips shall be provided for panels under 10 feet long and six clips shall be provided for panels 10 feet and longer.

6:08.3 Stair treads shall be galvanized to match the floor grating. Treads shall have 1 inch by 3/16 inch bearing bars and checkered plate nosing. Treads shall be fitted with stainless steel bolts and nuts for connection to stringers.

6:09 HANDRAIL

6:09.1 Handrail shall be pipe, made of welded construction with 1-1/4 inch diameter Sch 40 rails and Sch 80 posts. Rails and post joints shall

be welded and ground smooth. Maximum spacing of posts shall be 6'-0". Centerline of mid rail shall be 1'-9" above the finished floor, and centerline of the top rail shall be 3'-6" above the floor. Any rails which project beyond the last post shall have a return rail between top and mid rail. Rails shall not project more than 1'-8" beyond the post.

6:09.2 Handrail shall be fabricated with rails and posts shop welded and shipped in sections as long as practicable to minimize field welding. Field splices shall have interior sleeves and shall be located in the rails and not at the posts. All welding electrodes for field welding shall be furnished by the SUBCONTRACTOR. All handrail framing to structural steel shall have attachment plates as shown on the drawings.

6:09.3 All handrail shall be shop painted in accordance with Section 6:07 of this Specification with a Safety Yellow color paint.

6:10 WEATHER ENCLOSURE

A weather enclosure shall be provided as described herein and as shown on the drawings. The weather enclosure shall be constructed and finished in a neat workmanlike manner. The weather enclosure shall consist of the following components.

1. Structural steel, plates and connections as shown on the drawings.
2. Galvanized corrugated sheet metal siding and roof shall be ASTM A 526, G90, and mill phosphatized.
3. Hollow metal door, frame, and hardware.
 - a. Door shall be Steel Door Institute (SDI) SDI-100 Grade I, standard duty, 1-3/4 inch thick flush face with factory applied rust inhibitive primer, polyurethane core, reinforced for hardware per SDI-107.
 - b. Door frame shall be SDI-100 Grade I, steel, standard duty, knockdown type with 3 countersunk anchor bolts per jamb and reinforcing hardware per SDI-107. Provide miscellaneous metal framing to accept door as required.
 - c. Door latch set shall be Sargent "6 line" standard duty cylindrical lock with dull chrome finish, style "LB" rose and knob, passage function.
 - d. Hinges shall be 1-1/2 pair of Stanley half mortise steel number BC1920, primer painted.

4. Window shall be Acorn (Building Components Inc.) series 2000 (HS-C-30) sliding aluminum window with frame, no thermal break, 2 inch frame depth, clear anodized finish, with 1/8 inch glass, no insect screen.
5. Wall and Roof insulation (weather shelter only)
 - a. Wall and roof insulation for the weather shelter shall be Owens Corning type CW-225 with foil reinforced kraft paper vapor barrier facing, R-13, 3 inch thickness. Install with foil side facing towards interior of shelter.
 - b. Attach insulation to the interior surface of the corrugated metal roof and siding with impaling studs adhered to face of siding on 12 inch horizontal by 18 inch vertical centers with 2-part quick set epoxy adhesive. Install nuts after impaling insulation.

6:11 PERSONNEL REQUIREMENTS

For all carbon steel welding, welders shall be qualified in accordance with AWS D1.1, Chapter 5, Parts A, C, and E and Penelec Quality Assurance Specifications Manual PS-8.01C.

6:12 INSPECTION AND TESTS

1. All materials used in the WORK shall be tested in accordance with and certified to conform to the applicable ASTM and/or AWS specifications.
2. All welds shall be 100 percent visually inspected and the results documented.
3. All material shall be subject to inspection by BECHTEL prior to release for shipment.

6:13 HANDLING, DELIVERING, RECEIVING, UNLOADING, AND STORING

1. Material shall be delivered with temporary bracing, as required, to maintain its shape during transportation, storage, and handling. Packaging, marking, and delivery shall be in accordance with ASTM A 700.
2. All specified materials shall be received, unloaded, inspected, stored, and handled by the SUBCONTRACTOR. Materials shall be stored on platforms, skids, or other supports, and protected from weather as required so as to prevent degradation prior to erection.

SECTION VII
FURNISHING AND DELIVERY OF CONCRETE

7:01 SCOPE

7:01.1 Description of Work:

This Section includes technical requirements for producing and furnishing concrete to designated locations at the jobsite.

7:01.2 Items Included:

This Section includes the following items:

1. Qualifications and certification of all required materials.
2. Supplying all materials required to produce the specified concrete.
3. Providing and qualifying design mixes.
4. Storage of materials.
5. Mixing and delivery of concrete.
6. Furnishing material for qualification and in-process testing.
7. Supply of grout.

7:01.3 Items Not Included:

The following items are not included in this Section:

1. In-process concrete testing will be by PENELEC.
2. Placement of concrete and grout.

7:02 APPLICABLE CODES AND STANDARDS

The following are referenced in this Section.

1. American Concrete Institute (ACI):
301-89, "Specification for Structural Concrete for Buildings."
2. American Society for Testing and Materials (ASTM):
 - a. C 33-90, "Standard Specification for Concrete Aggregates."

- b. C 94-90, "Standard Specification for Ready-Mixed Concrete."
 - c. C 109-88, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)."
 - d. C 127-88, "Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate."
 - e. C 128-88, "Standard Test Method for Specific Gravity and Absorption of Fine Aggregate."
 - f. C 131-89, "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine."
 - g. C 150-89, "Standard Specification for Portland Cement."
 - h. C 191-82, "Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle."
 - i. C 260-86, "Standard Specification for Air-Entraining Admixtures for Concrete."
 - j. C 451-89, "Standard Test Method for Early Stiffening of Portland Cement (Paste Method)."
 - k. C 494-86, "Standard Specification for Chemical Admixtures for Concrete."
 - l. C 535-89, "Standard Test Method for Resistance to Degradation of Large- Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine."
 - m. C 618-A-89, "Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete."
 - n. C 1107-Rev. A-89, "Standard Specification for Packaged Dry Hydraulic-Cement Grout (Nonshrinkable)."
 - o. E 329-90, "Standard Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction."
3. Building Code Officials and Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.

7:03 MATERIAL REQUIREMENTS

7:03.1 General:

All materials for concrete shall comply with Chapter 2 of ACI 301, except as noted herein.

7:03.2 Cement:

1. Cement shall comply with ASTM C 150 Type II, except as noted herein.
2. ASTM C 150 cement shall contain a maximum alkali content of 0.6 percent of $(\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O})$, unless aggregates are shown to be nonreactive in accordance with ASTM C 33, Appendix XI.
3. Individual test samples shall exhibit strengths of at least 90 percent of the average compressive strength of the cube strength when tested in accordance with ASTM C 109. The compressive strength of 2 inch test cubes made from the cement used for production shall be at least 90 percent of the average compressive strength established in the certification or the qualification test program.
4. Cement shall have a minimum 50 percent final penetration for false set in accordance with ASTM C 451.
6. Seven-day mill test strength results shall be submitted prior to use in concrete.

7:03.3 Fine Aggregates:

1. Fine aggregates shall be natural or manufactured sands that conform to the requirements of ASTM C 33, except as noted herein.
2. Fine aggregate shall have a minimum specific gravity of 2.60 (saturated surface dry basis), when tested in accordance with ASTM C 128.
3. Paragraphs 6.2.2, 6.2.3, 7.2, and 7.3 of ASTM C 33 shall not apply without written authorization from PENELEC.

7:03.4 Coarse Aggregates:

1. Coarse aggregates shall be gravel, crushed gravel, or crushed stone meeting the requirements of ASTM C 33 for Class Designation 4S, except as modified herein.

2. Paragraph 10.3 of ASTM C 33 shall not apply without written authorization from PENELEC.
3. Unless authorized otherwise, coarse aggregate shall have a minimum specific gravity of 2.60 (saturated surface dry basis) and a maximum absorption of 1.55 when tested in accordance with ASTM C 127.
4. When aggregates are tested for abrasion loss using either ASTM C 131 or ASTM C 535, abrasion losses at 20% of the specified number of rotations shall not exceed 10%.

7:03.5 Admixtures:

1. Air-entraining admixtures shall conform to the requirements of ASTM C 260. Air-entraining admixtures MB-AE-10 and MB-VR-Standard by the Master Builders Division of the Martin Marietta Corporation meet these requirements.
2. Water-reducing densifiers shall conform to the requirements of ASTM C 494, Type A. Type D may be substituted only with prior written authorization from PENELEC. Water reducing admixtures Pozzolith 344N (Type A) and Pozzolith 300R (Type D) by the Master Builders Division of the Martin Marietta Corporation meet these requirements. High range water reducing admixtures shall not be used.
3. Calcium chloride or admixtures (except fly ash) containing more than trace amounts of calcium chloride, chlorides, sulfides, or nitrates shall not be used.
4. Admixtures other than those specified herein shall not be used unless authorized by PENELEC in writing.

7:03.6 Water and Ice:

Water and ice for mixing shall be clear and clean. If it contains quantities of substances which discolor it or make it smell or taste unusual or objectionable or cause suspicion, it shall not be used unless service records of concrete made with it or other information indicates that it is not detrimental to the quality of the concrete. Water shall be subject to the following acceptance criteria:

1. Compressive strength of concrete shall be at least 90 percent of the compressive strength of cubes made with distilled water in accordance with ASTM C 109.
2. Time of set shall be from 1 hour less to 1-1/2 hours more than the time set of cubes made with distilled water, in accordance with ASTM C 191.

7:03.7 Fly Ash:

1. Fly ash shall conform to ASTM C 618 for Class C or F fly ash. In addition, conformance to ASTM C 618 Table 2A, "Supplementary Optional Physical Requirements", shall be required. Fly ash in storage for a period longer than 6 months after testing shall be retested for fineness.
2. Fly ash shall be obtained from a single plant having an established reputation for producing uniform, high quality fly ash.

7:03.8 Nonshrink Grout:

Nonshrink grout shall comply with ASTM C 1107.

7:03.9 Storage of Materials:

1. Cement shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants.
2. Aggregate stockpiles shall be arranged and used in a manner to avoid segregation and to prevent contamination with other materials or with other sizes of like aggregates. Tests to determine conformance to cleanliness and grading requirements shall be performed on samples secured from aggregates at the point of batching. Frozen or partially frozen aggregates shall not be used.
3. Sand stockpiles shall be allowed to drain to ensure a relatively uniform moisture content throughout.
4. Admixtures shall be stored in such a manner as to avoid contamination, evaporation, or damage. For those used in the form of suspensions or nonstable solutions, agitating equipment shall be provided to assure thorough distribution of the ingredients. Liquid admixtures shall be protected from freezing and from temperature changes which would adversely affect their characteristics.
5. Fly ash shall be stored in such a manner as to preclude it being confused with cement and to allow representative samples for testing to be readily obtained and tested.

7:03.10 Documentation:

All proposed material certifications and test results shall be submitted for information.

7:04 CONCRETE MIX PROPORTIONING, MIXING, AND PRODUCTION

7:04.1 Concrete Mix Proportioning:

Concrete mixes shall be prepared for each concrete class required for the WORK, including each variation in cement, aggregate size, fly ash, and admixtures. The mixes shall utilize actual materials intended for the site concrete and shall consist of the concrete classes listed in Table 7-2 and as shown on the drawings.

1. The selection of proportions for each design mix shall be in accordance with Chapter 3 of ACI 301, using either Method 1 (trial mixes) or Method 2 (historical data). Method 3 (using the water-cement ratio versus strength table - Section 3.10) shall not be used. Fly ash shall be used to replace 15 percent to 27 percent by weight Portland cement.
2. Where special placement techniques (e.g., pumping, tremmie, caissons, superplasticized mixes) are required, a separate design mix taking these special requirements into account shall be prepared in accordance with Section 7:04.1-1 herein.
3. The cementitious content (cement plus fly ash) of concrete shall not be less than 376 pounds per cubic yard nor more than 658 pounds per cubic yard without prior written authorization from PENELEC.

Maximum Aggregate Size (in) Cement, lb per Cubic Yard

3/4

540

4. A water-reducing admixture shall be used in the production concrete, unless otherwise authorized. The quantity to be added shall be as required by the mix design and in accordance with the manufacturer's recommendations. The controlling temperatures and the method of mixing shall conform to the manufacturer's recommendations for use of their product.
5. Concrete shall be air entrained in accordance with the following table:

<u>Nominal Coarse Aggregate Size (in)</u>	<u>ASTM Size Number</u>	<u>Air Content, % By Volume</u>
3/4	67	4-8

6. The water:cement ratio shall not exceed 0.45 by weight.

7. Concrete shall be proportioned to have a slump of 4 inches or less. A tolerance of up to 1 inch above the 4 inches shall be allowed for individual batches provided the average for the last 10 batches is 4 inches or less.
8. The mix design shall be submitted for information accompanied by a statement that the mix design complies with this Section.
9. When required by PENELEC, sufficient material samples (aggregates, cement, admixtures, and water if necessary) shall be provided to PENELEC or PENELEC'S Testing Laboratory for the purpose of making six standard 6" by 12" compressive strength cylinders. The materials shall be from the same sources as those proposed to be used in the WORK.
10. The strength level of concrete delivered to the jobsite will be considered satisfactory if the average of three consecutive in-process strength test results equal or exceed the specified strength f'c, and no individual strength test result falls below the specified strength f'c by more than 500 psi.

7:04.2

Mixing and Production of Concrete:

1. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as provided otherwise herein. Plant equipment and facilities shall conform to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.
2. Scales for weighing concrete ingredients shall be accurate when in use within ± 0.4 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.
3. Operation of batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances:
 - a. Cement ± 1 percent of cement content
 - b. Water ± 3 percent of water content
 - c. Aggregates ± 2 percent of aggregate content or per Section 8.2 of ASTM C 94
 - d. Admixtures ± 3 percent of admixture content

4. Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.
5. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time, and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rated capacity and the recommended revolutions per minute and shall be operated in accordance therewith.
6. Mixers with a rated capacity of 1 cubic yard or larger shall conform to the requirements of the Plant Mixer Manufacturers Division of the Concrete Plant Manufacturers Bureau.
7. Except as provided in Section 7:04.2.8 below, batches of 1 cubic yard or less shall be mixed for not less than 1 minute. The mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof.
8. Shorter mixing time may be permitted provided performance tests made in accordance with Section 11.3.2 of ASTM C 94 indicate that the time is sufficient to produce uniform concrete. Mixing time of concrete shall not be reduced without prior written authorization from PENELEC.
9. Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed. At least three-quarters of the required mixing time shall take place after the last of the mixing water has been added.
10. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixer blades shall be replaced when they have lost 10 percent of their original height.
11. Air-entraining admixtures and other chemical admixtures shall be charged into the mixer as solutions and shall be measured by means of an acceptable mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

12. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.
13. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first.
14. Water may be added at the delivery point if neither the maximum permissible water cement ratio and water content for that design mix nor the maximum slump is exceeded. The additional water shall be incorporated by mixing for at least 35 revolutions at mixing speed. Water added at the plant shall be the minimum to achieve the proper mix so as to provide a tolerance for adding water in the field to control slump.
15. The proportion of water in each batch shall be adjusted to compensate for the moisture content of the aggregates and liquid admixtures and thereby maintain water quantities within the limits of the design mix. Adjustment shall be on the basis of tests conducted on material contained in the batch hoppers. Tests shall be performed at least at the start of the mixing day and midway through the day.
16. Nonagitating equipment shall not be used to deliver concrete without prior written authorization from PENELEC.
17. Concrete delivery temperatures for massive concrete (i.e. greater than 3'-0" in the least dimension) shall be maximum 65° F and minimum 45° F. For non-massive concrete sections the delivery temperatures shall be maximum 90° F and minimum 50° F. The minimum delivery temperature shall be 55° F.
 - a. In hot weather, if required, the ingredients shall be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of the mixing water if, due to high temperature, low slump, flash set, or cold joints are encountered.
 - b. In cold weather, if water or aggregate is heated above 100° F, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be mixed with water or with mixtures of water and aggregate having a temperature greater than 100° F.

7:04.3

Batch Tickets:

Two copies of the batch tickets shall accompany every truck load of concrete and shall contain at least the following items:

1. Name of ready mix batch plant.
2. Serial number of ticket.
3. Date.
4. Truck number.
5. Name of purchaser.
6. Name and location of job.
7. Class of concrete.
8. Amount of concrete in cubic yards.
9. Time loaded or time of first mixing of cement and aggregates.
10. Type and amount of cement.
11. Type and amount of admixtures.
12. Amount of water and ice added, including wash water, if any, at the batch plant.
13. Total free water on aggregates (water in addition to surface-saturated dry condition).
14. Water, if any, added by truck operator from the truck water tank.
15. Weight of fine and coarse aggregates, after adjustment for moisture content.
16. Signature of ready-mix representative.

One copy of the batch ticket shall be furnished to PENELEC and one copy shall be furnished to PENELEC's testing technician. Concrete arriving at the site not accompanied by two copies of a batch ticket containing all of the above data will be refused by PENELEC.

7:05 QUALIFICATION TESTS OF MATERIALS

7:05.1 General:

1. New qualification tests of representative samples of materials to be used in the project shall be mandatory unless recent qualification tests on materials from the same source are available. Test requirements are summarized in Table 7-1 of this Section. Tests shall be conducted by a testing laboratory meeting the requirements of ASTM E 329.
2. Qualification test results shall be submitted for review and shall include all tests indicated by the controlling specification or specified herein to assure compliance and shall be accompanied by a statement that the material complies with this specification.
3. Material test results and certification shall be on file before the material is used for the production of concrete. Material test results and certifications shall be available for review by BECHTEL and PENELEC or PENELEC'S representative. Copies shall be available for BECHTEL and PENELEC or PENELEC'S representative.
4. When required by PENELEC, qualification verification testing will be conducted by a testing agency for aggregates and water. Additionally, in-process materials testing will be conducted by a testing agency. Testing and inspection shall be facilitated by the following:
 - a. Furnish any necessary labor to assist the designated testing agency in obtaining and handling samples at the batch plant.
 - b. Advise the designated testing agency sufficiently in advance of the operations to allow for completion of in-process tests and for the assignment of personnel.

7:05.2 Cement shall be tested to meet the requirements of ASTM C 150 and Section 7:03.2 herein.

7:05.3 Aggregates shall be tested to meet the requirements of ASTM C 33 and Sections 7:03.3 and 7:03.4 herein. When required by PENELEC, sufficient aggregate samples shall be provided to PENELEC'S testing laboratory (samples will be sampled and transported by PENELEC'S testing laboratory) for the purpose of independent verification testing.

7:05.4 Admixtures shall be certified as complying with either ASTM C 260 or ASTM C 494, with the following additional requirements:

1. The air-entraining tests shall be conducted with the same brand and type cement to be used for the project.
2. Where optional use of admixture type is allowed, certification shall be obtained for each type that is expected to be used.

7:05.5 The water source shall be stated on a certification. If necessary, water shall be tested to meet the requirements of Section 7:03.6 herein. When required by PENELEC, sufficient water samples shall be provided to PENELEC'S testing laboratory (samples will be sampled and transported by PENELEC'S testing laboratory) for the purpose of independent verification testing.

7:05.6 Frequency of in-process testing shall be once for the first 50 cubic yards of concrete placed and once every 150 cubic yards thereafter but a minimum of once per day. Sufficient materials and assistance in sampling materials shall be provided.

7:06 SUBMITTALS

Submittals required by this section are given Appendix E.

TABLE 7-1
REQUIRED QUALIFICATION TESTS

	<u>Material</u>	<u>Test For</u>	<u>Test Method</u>
1.	Concrete aggregates	Compliance with ASTM C 33*	As referenced in ASTM C 33
2.	Cement	Compliance with ASTM C 150*	As referenced in ASTM C 150
3.	Admixtures	Compliance with ASTM C 260 and/or C 494*	Manufacturer's certification
4.	Fly ash	Compliance with ASTM C 618*	As referenced in ASTM C 618
5.	Water	Compliance with Section 7:05.5 herein	As given in Section 7:03.6 herein

*As amended by this Section.

TABLE 7-2
CONCRETE CLASSES

<u>Concrete Class</u>	<u>Design Strength</u>	<u>Age at Design Strength</u>	<u>Cement Type</u>	<u>ASTM C 33 Gradation</u>
Foundation Piers & Grade Caps	4,000 psi	28 Days	II	67
Miscellaneous concrete WORK as shown on the drawings	4,000 psi	28 Days	II	67

SECTION VIII
CONCRETE REINFORCING STEEL

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SECTION VIII
CONCRETE REINFORCING STEEL

8:01 SCOPE

8:01.1 Description of WORK:

This Section includes technical requirements for detailing, furnishing, fabricating, delivering, receiving, unloading, inspecting, providing temporary storage facilities, storing material, cleaning, and placing reinforcing steel, as shown on the drawings for the area described in the Section for Placement of Concrete.

8:01.2 Items Included:

This Section includes the following:

1. Furnishing and fabricating all reinforcing steel.
2. Providing all material certification and shop inspections.
3. Tagging, loading, and shipping all materials.
4. Furnishing and fabricating necessary supporting bars, chairs, and bolsters.
5. Providing bar support location drawings and support details.
6. Detailing of all reinforcing steel and supports.
7. Receiving, unloading, inspecting, providing temporary storage facilities, and storing material at the jobsite.
8. Cleaning, installing, placing, and tying reinforcing steel in positions shown on the drawings.
9. Installing all bar supports, chairs, and bolsters.

8:01.3 Items Not Included:

The following items are not included in this Section:

Supplying and installing embedded items such as sleeves, pipe, conduits, anchors, and anchor plates

8:02

APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. American Society for Testing and Materials (ASTM):
 - a. A 185-88, "Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement."
 - b. A 497-89, "Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement."
 - c. A 615-89, "Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement."
 - d. A 700-90, "Standard Practices for Packaging, Marking and Loading Methods for Steel Products for Domestic Shipment."
 - e. E 329-90, "Standard Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction."
2. Building Code Officials and Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.
3. Concrete Reinforcing Steel Institute (CRSI) MSP 1-90, "Manual of Standard Practice," (MSP).
4. Wire Reinforcement Institute, Inc., WWF-500, "Manual of Standard Practice - Welded Wire Fabric," Revised 3rd Edition, 1979.

8:03

MATERIAL REQUIREMENTS

1. Reinforcing steel shall be deformed bars in accordance with ASTM A 615, Grade 60, except as noted herein.
2. Tie wire shall be minimum 16-gage black, soft-annealed wire.
3. Bar support materials shall be Class 1, unless the drawings note otherwise, and shall conform to the requirements of MSP, Chapter 3.
4. Welded wire fabric (WWF) reinforcing steel shall be plain or deformed wire fabric, as noted on the drawings, in accordance with ASTM A 185 or A 497.

8:04 FABRICATION

1. Reinforcing steel shall be tagged and separated by size and grade. Tagging information shall be suitable to allow sorting, checking and placing.
2. Reinforcing steel shall be fabricated to the shapes shown on the fabricating and bending details. Unless otherwise shown on the drawings, all bending, hooks, and bar details shall conform to the tolerances defined in Figures 3 and 4 of Chapter 7 of the MSP.
3. Welded wire fabric reinforcing steel shall be furnished in flat sheets or rolls.
4. Detail drawings and placing schedules shall be prepared for all reinforcing steel. Reinforcing steel shall be fabricated in accordance with the detail drawings.

8:05 HANDLING AND DELIVERY OF MATERIAL

1. The finish and surface condition of reinforcing steel, as delivered to the jobsite, shall satisfy the requirements of the applicable ASTM reinforcing steel specifications.
2. Reinforcing bar material loaded for site shipment shall be separated by size and tagged with the fabricator's identification number.
3. Bundling and tagging shall be in accordance with Section 3, Chapter 7 of the MSP. Tags shall include related design drawing and placing schedule numbers.

8:06 UNLOADING AND STORAGE

1. Reinforcing steel shall be delivered, unloaded and stored by the SUBCONTRACTOR.
2. Reinforcing steel shall be inspected at the time of unloading to verify that the shipments are separated by size and tagged with the fabricators identification number and are in a condition suitable for placement.
3. Reinforcing steel shall be stored at the jobsite in groups of bars or shipments and shall be easily identifiable. Stored reinforcing steel shall be protected from rusting and accumulation of dust and dirt.
4. Storage shall be in an orderly fashion compatible with the placement sequence.

8:07

PLACEMENT

1. Reinforcing steel bars placement shall be in accordance with Chapter 8 of the MSP except as specified herein or otherwise shown on the drawings.
2. Reinforcing steel wire fabric placement shall be in accordance with the Manual of Standard Practice issued by the Wire Reinforcement Institute, Inc.
3. Precast concrete-brick bar supports may be used for supporting the reinforcement of slabs on the ground.
4. Reinforcing bars shall not be cut to permit positioning of the embedded items unless shown on the drawings. Relocation of the bars to allow positioning of embedments beyond the normal tolerance limits shall be done only with specific and prior written authorization by PENELEC.
5. Field bending of reinforcing shall not be allowed unless authorized.

8:08

INSPECTIONS AND TESTS

1. Qualification tests of representative samples of materials to be used in the project shall be mandatory unless certification documents are submitted which state conformance to the applicable ASTM specification. Tests shall be conducted by a testing laboratory meeting the requirements of ASTM E 329.
2. Qualifications tests shall include all tests indicated by the controlling specification or specified herein and shall be accompanied by a statement that the material complies with this Section.
3. Bar test specimens shall be full section in accordance with ASTM A 615. Wire fabric tensile test specimens shall be in accordance with ASTM A 82. Wire fabric shear test specimens shall be in accordance with ASTM A 185 or A 497.
4. All reinforcing steel provided shall be visually inspected to verify correct grade and size, specified tolerances, and cleanliness before shipment.
5. Material test results and certifications shall be on file before the material is used in the fabrication.

8:09

SUBMITTALS

Submittals required by this section are given in Appendix E.

**SECTION IX
PLACEMENT OF CONCRETE**

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SECTION IX
PLACEMENT OF CONCRETE

9:01 SCOPE

9:01.1 Description of Work:

This Section includes technical requirements for placing concrete in the following areas as specified herein and as shown on the drawings:

1. Duct support structure foundations.
2. Ladder landings.
3. As otherwise shown on the drawings.

9:01.2 Items Included:

This Section includes the following:

1. Designing of forms, falsework, and shoring.
2. Providing forms, falsework, shoring, and any required subgrade preparation.
3. Qualifying materials specified in this Section.
4. Placing embedded items.
5. Placing and consolidating concrete.
6. Finishing.
7. Curing and protecting concrete.
8. Repairing concrete surfaces as required subsequent to removal of forms.
9. Assisting in obtaining of samples for in-process testing.
10. Placement of grout.

9:01.3 Items Not Included:

The following items are not included in this Section:

1. Concrete supply and delivery.

2. In-process concrete testing will be by PENELEC.
3. Supply of embedded items.
4. Excavation, grading, and backfill.

9:02

APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. American Concrete Institute (ACI):
 - a. ACI 117-81, "Standard Tolerances for Concrete Construction and Materials."
 - b. ACI 301-89, "Specifications for Structural Concrete for Buildings."
 - c. ACI 305 R-89, "Hot Weather Concreting."
 - d. ACI 306 R-88, "Cold Weather Concreting."
 - e. ACI 306.1-87, "Standard Specification for Cold Weather Concreting."
 - f. ACI 309 R-87, "Guide for Consolidation of Concrete."
 - g. ACI 347 R-88, "Guide to Formwork for Concrete."
2. American Society for Testing and Materials (ASTM):
 - a. C 33-90, "Standard Specification for Concrete Aggregates."
 - b. C 171-69 (1986), "Standard Specification for Sheet Materials for Curing Concrete."
 - c. C 309-89, "Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete."
3. Building officials and Code Administrators (BOCA), "The BOCA National Building Code", Eleventh Edition, 1990.

9:03

MATERIAL REQUIREMENTS

Liquid membrane-forming curing compounds shall be materials conforming to the requirements of ASTM C 309 for Type 1 material, except that the required retention rate shall be achieved at the application rate to be used in the field.

9:04 FORMWORK

9:04.1 Formwork shall comply with the requirements of ACI 301, Chapter 4, except as revised herein.

9:04.2 Cast-in-place concrete shall be formed, including the sides of footings, foundation mats, and other portions of structures below grade.

9:04.3 Formwork design shall comply with the following:

1. The formwork shall be designed for the loads, lateral pressure, and allowable stresses outlined in Chapter 1 of ACI 347 and for design considerations, wind loads, allowable stresses, and other applicable requirements of the BOCA Building Code.
2. The maximum deflection of formed concrete surfaces exposed to view shall be $1/240$ of the span between structural members.
3. To maintain the specified tolerances, the formwork shall be cambered, if necessary, to compensate for anticipated deflections in the formwork prior to hardening of the concrete.

9:04.4 Materials for formwork shall comply with the following:

1. Form materials shall provide the finish defined in Section 9:07 herein.
2. Forms shall be thoroughly cleaned after each use.
3. Before placing of either the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an coating material that will effectively prevent absorption of moisture and prevent bond with the concrete, and will not stain the concrete surfaces. A field applied form release agent or sealer or a factory applied nonabsorptive liner may be used.
4. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Chamfer strips ($3/4$ inch) shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces, unless the drawings specify otherwise. Interior corners on such surfaces and the edges of formed joints will not require beveling unless required by the drawings.
5. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially

manufactured type. Nonstandard form accessories shall not be used unless authorized otherwise. Form ties shall be constructed so that the ends or end fasteners can be removed without causing spalling at the faces of the concrete.

9:04.5 Installation of formwork shall comply with the following:

1. Positive means of adjustment (wedges or jacks) of shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Forms shall be braced against lateral deflections.
2. Temporary openings shall be provided at the base of column pier forms and at other points where necessary to facilitate cleaning and inspection immediately before concrete is placed.
3. At construction joints where forms will be in contact with bare, hardened concrete, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 1 inch. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.
4. Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteract swelling of the forms.
5. Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check.
6. Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will be prevented.
7. Runways for moving equipment shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel.
8. Excess field-applied form coating material shall not be allowed to stand in puddles in the forms nor shall such coating be allowed to come in contact with hardened concrete against which fresh concrete is to be placed.

9:04.6 Formwork tolerances shall comply with the following:

1. The "as-built" condition of the existing construction shall be verified such that this WORK shall be within the tolerances specified herein.
2. Formwork shall be constructed to insure that the finished concrete surfaces will conform to the tolerances specified in ACI 117 except as shown on the drawings.

9:04.7

Form removal shall comply with the following:

1. When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.
2. Top forms of sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient strength to maintain integrity. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.
3. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.
4. Formwork for column piers and other parts not supporting the weight of the concrete shall not be removed until the concrete has been cured in accordance with Sections 9:08.3 and 9:08.4 herein for a minimum of either 24 hours or until field-cured cylinders indicate a compressive strength of 1,000 pounds per square inch.
5. Forms and shoring in the formwork, used to support the weight of concrete structural members, shall be removed in accordance with one of the following, unless the drawings note otherwise:
 - a. Forms shall not be removed until the concrete has been cured in accordance with Sections 9:08.3 and 9:08.4 herein for at least 14 days at a temperature of at least 50° F or for at least 10 days at a temperature of at least 70° F. These time periods are cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50° F or 70° F, respectively.
 - b. Forms shall not be removed until standard cylinders, field cured under identical conditions as the concrete they represent, reach at least 2/3 of f'c.

6. Reshoring shall not be permitted without prior written authorization by PENELEC.
7. Forms, form ties, and other materials shall be removed from spaces between structures unless the drawings show otherwise.
8. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameters or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 3/4 inch. When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
9. Repair of surface defects shall be in accordance with the following:
 - a. Tie holes shall be cleaned, thoroughly dampened, and filled solid with a patching mortar immediately after form removal. The patching mortar shall consist of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.
 - b. Surface defects shall be immediately brought to the attention of PENELEC and authorization shall be obtained prior to repair. The repair procedure shall include the following as a minimum:
 - (1) All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary, the edges shall be perpendicular to the surface or slightly undercut. No feather edges shall be permitted. The area to be patched and an area at least six inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately one part cement to one part fine sand passing a No. 30 mesh, mixed to the consistency of thick cream, and well brushed into the surface.

(2) The patching mix shall comply with Section 9:04.7.9.a.

(3) After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hour before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

c. All fins shall be completely removed.

d. Proprietary compounds for adhesion or as patching compounds may be used only with the prior written authorization of PENELEC. Use shall be in accordance with the manufacturer's recommendations.

9:05 JOINTS AND EMBEDDED ITEMS

9:05.1 Joints and embedded items shall be located and installed in accordance with Chapter 6 of ACI 301, except as noted herein.

9:05.2 Bonding, where required on the drawings, shall be achieved by one of the following:

1. Joints receiving an adhesive shall be prepared and adhesive applied in accordance with the manufacturer's recommendations.

2. Roughen the surface of the concrete in a manner which will expose the aggregate uniformly and not leave laitance, loosened aggregate particles, or damaged concrete surfaces. Aggregate shall be exposed without undercutting.

3. Use of the method in Section 9:05.2.2 above shall include the following:

a. The hardened concrete of construction joints between footings and column piers, and all others not mentioned below shall be damp immediately prior to placing of fresh concrete.

- b. The hardened concrete of horizontal construction joints in exposed work, horizontal construction joints in the middle of slabs shall be damp and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The fresh concrete shall be placed before the grout has attained its initial set.

- 9:05.3 Construction joints shall be either rough to a 1/4 inch amplitude or keyed in accordance with the following: Such keys shall have a minimum depth of 1-1/2 inches, a width of 1/3 the width of the joint, and shall be located in the center of the joint. A tolerance of +1/2 inch on the required width and +1/4 inch of the location of the key shall be permitted. The sides of the key shall be provided with a side slope not exceeding 1 in 6.
- 9:05.4 Construction joint locations shall be as shown on the drawings.
- 9:05.5 Except as noted herein or authorized otherwise, only items shown and located on the drawings shall be embedded in the concrete.
- 9:05.6 The exposed surface of all embedded items shall be kept clean and uncontaminated and shall be protected from damage resulting from construction activity. Specific requirements for embedded plates and anchor bolts shall be as follows:
1. The exposed surfaces of embedded plates shall be cleaned of all concrete after the stripping of forms.
 2. The threads of all anchor bolts shall be protected from rusting and damage.
 3. Bolts with thread damage shall be brought to the attention of PENELEC. Repair procedures shall be submitted for review and comment for repair of bolts which cannot be returned to their original undamaged condition by using a thread die having the same diameter as the bolt or by filing.
- 9:05.7 The displacement of embedded anchor bolts from their theoretical position shown on the drawings shall not exceed the following tolerances after concrete placement:
1. The projection of the anchor bolt from the concrete surface shall be within +1/4 inch of that required by the drawings.
 2. Any anchor bolt bent in excess of 5° shall be either repaired or replaced as directed. Repair procedures shall be submitted for review and comment.

3. The tolerance within and between anchor bolt groups shall be as follows:
 - a. 1/8 inch center-to-center of any two bolts within an anchor bolt group, where an anchor bolt group is defined as the set of anchor bolts which receive a single fabricated-steel shipping piece.
 - b. 1/4 inch center-to-center of adjacent anchor bolt groups.
 - c. Maximum accumulation of 1/4 inch per hundred feet along the established line of multiple anchor bolt groups, but not to exceed a total of 1 inch, where the established line is the actual field line most representative of the centers of the as-built anchor bolt groups.
 - d. 1/4 inch from the center of any anchor bolt group to the established line through that group.

9:05.8 Embedded items shall be checked for line and grade before and after the concrete is placed. Embedded items shall be located within +1/4 inch of the position shown. The plate surface shall be flush with the concrete surface unless the drawings note otherwise.

9:05.9 Repair of damaged embedded metals shall be permitted only to the extent authorized by PENELEC.

9:05.10 Anchor bolt sleeves shall be protected from water penetration and possible freezing.

9:05.11 Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

9:06 CONCRETE PLACEMENT REQUIREMENTS

9:06.1 Placement of concrete shall comply with ACI 301 Section 8, except as specified herein. Prior to placing concrete, the Pre-Placement Pour Card (Attachment IX to this Section) shall be completed and submitted.

9:06.2 Subgrade Preparation:

1. Semiporous subgrades shall be sprinkled sufficiently to eliminate suction, and porous subgrades shall be sealed in an acceptable manner.

2. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50° F long enough to remove all frost from the subgrade. Concrete shall not be placed on frozen ground.
3. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.
4. The subgrade for concrete shall be leveled and trimmed to the finish lines, and dimensions shown on the drawings and shall be free of debris and organic material.
5. Immediately before any concrete is placed on or against rock or mud slabs, the surface shall be cleaned of all dirt, gravel, boulders, scale, loose fragments, and other deleterious substances by air and/or water jet brooming.

9:06.3 Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

9:06.4 Formwork shall have been completed; snow, ice and water shall have been removed; reinforcement shall have been secured in place; expansion joint material, anchors, and other embedded items shall have been positioned; and the entire preparation shall have been acceptable prior to placing concrete.

9:06.5 Conveying Concrete:

1. Concrete shall not be deposited underwater.
2. Pumping equipment shall be of suitable kind with adequate pumping capacity. Pumping of concrete shall not be used without prior written authorization by PENELEC. The loss of slump in pumping or pneumatic conveying equipment may exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy. Prior to pumping concrete, the pump line shall be lubricated by pumping a mortar, consisting of the concrete mix without the coarse aggregate, through the line. If the mortar cannot be used on a construction joint, it shall be discarded. A working backup pump shall be available at the jobsite.
3. Samples for in-process testing of pumped concrete will be obtained from the discharge point of the truck.

4. The gravity free fall of concrete, where the discharge point is not embedded in the fresh concrete, shall not exceed 5 feet without prior written authorization.
5. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will insure that the required quality of the concrete is maintained.
6. Conveying equipment shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:
 - a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. An acceptable arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Belt-conveyed concrete shall be discharged into a hopper or through a baffle.
 - b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

9:06.6 Depositing Concrete:

1. Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as shown in the contract documents or as authorized in writing by PENELEC. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete.

2. Concrete shall be deposited in horizontal layers not exceeding 18 inches in loose thickness unless authorized otherwise.
3. Placing of concrete in supported elements shall not be started until the concrete previously placed in the supporting element is no longer plastic and has been in place at least 2 hours.
4. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation.
5. All concrete shall be consolidated by vibration so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators used shall be the largest size and the most powerful that can be properly used in the work, as described in Table 5.1.4 of ACI 309. They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. Vibrators shall penetrate a minimum of 6 inches into the previously placed layer. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the jobsite during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

9:06.7 Adverse Conditions and Protection:

1. Unless adequate protection is provided and written authorization is obtained from PENELEC, concrete shall not be placed during rain, sleet, or snow.
2. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.
3. When the temperature of the surrounding air is expected to be below 40° F during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed, shall be no lower than 55° F for sections less than 12 inches in any dimension nor 50° F for any other sections. When the mean daily outdoor temperature is less than 40° F, the temperature of the concrete shall be maintained between 50° F and 70° F for the required curing period. When necessary, arrangements

for heating, covering, insulating, or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

4. The temperature of non-mass concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and shall not exceed 90° F. When the temperature of the concrete exceeds 90° F, acceptable precautionary measures shall be put into effect. When necessary in hot weather, provisions for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of the placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow. When the temperature of the steel is greater than 120° F, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete.
5. Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5° F in any 1 hour or 50° F in any 24-hour period.
6. Concreting during cold weather shall comply with ACI 306.1. Concreting during hot weather shall follow those methods and means outlined in ACI 305R Report.

9:06.8 Adding Water:

If conditions warrant, water may be added to the mixer truck at the jobsite in accordance with the Section on furnishing concrete of these specifications. The amount of water added to the mixer truck shall be noted on all copies of the batch ticket.

9:07 CONCRETE FINISHES

9:07.1 For formed concrete surfaces not exposed to view, the finish shall be a rough form finish as follows:

Tie holes and defects shall be patched. Fins exceeding 1/4 inch in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

9:07.2 For formed concrete surfaces exposed to view, the finish shall be a smooth form finish as follows:

1. The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used.
2. Following form removal, patching, and fin removal, one of the following shall be done:

- a. Smooth Rubbed Finish:

Smooth rubbed finish shall be produced on newly hardened concrete no later than the day following form removal. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform color and texture can be produced. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.

- b. Grout Rubbed Finish:

No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the WORK progresses shall not be permitted. Mix 1 part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White portland cement shall be substituted for a part of the gray portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means. After the surface whitens from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

c. Mortar Floated Finish:

Remove forms at an early stage, within 2 to 3 days of placement where possible. Remove ties. Remove all burrs and fins. Mix one part portland cement and one part fine sand with sufficient water to produce a stiff mortar. Dampen wall surface. Apply mortar with firm rubber float or with trowel, filling all surface voids. Compress mortar into voids using a slow-speed grinder or stone. If the mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a fog sprayer. Produce the final texture with a cork float using a swirling motion.

- 9:07.4 For exterior platform steps and landings and for pedestrian ramps, the top surface shall be given a nonslip finish as follows:
- A non-metallic silica carbonate mineral aggregate shall be blended with portland cement in the proportions recommended by the manufacturer of the aggregate. The surface shall be given a float finish in accordance with Section 9:07 herein. Approximately two-thirds of the blended material for required coverage shall be applied to the surface by a method that ensures even coverage without segregation. Floating shall begin immediately after application of the first "dry shake." After this material has been embedded by floating, the remainder of the blended material shall be applied to the surface at right angles to application. The second application shall be heavier in any areas not sufficiently covered by the first application. A second floating shall follow immediately. After the selected material has been embedded by the two floatings, the operation shall be completed with a broomed, floated, or troweled finish, as designated in the drawings. The rate of application of the dry shake material shall not be less than 25 pounds per 100 square feet.
- 9:07.5 Tops of unformed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces.
- 9:08 CURING AND PROTECTION
- 9:08.1 Curing of concrete shall comply with ACI 301, Chapter 12, except as noted herein.
- 9:08.2 Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical damage, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to review and

comment by PENELEC. Hot and cold weather requirements are given in Section 9:06.7 herein.

9:08.3

For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:

1. Ponding or continuous sprinkling.
2. Application of absorptive mats or fabric kept continuously wet.
3. Application of sand kept continuously wet.
4. Continuous application of mist (not exceeding 150° F).
5. Application of waterproof sheet materials, conforming to ASTM C 171.
6. Application of other moisture-retaining covering.
7. Application of a curing compound conforming to ASTM C 309. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications.

9:08.4

Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured until the end of the time prescribed in Section 9:08.5 herein by one of the methods of Section 9:08.3 herein.

9:08.5

Curing in accordance with Sections 9:08.3 and 9:08.4 herein shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days.

Alternatively:

1. If tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength, f'c.

2. Moisture retention measures may also be terminated when the temperature of the concrete is maintained at least at 50° F for the same length of time that laboratory-cured cylinders, representative of the concrete in-place, require to achieve 85 percent of f'c.

If one of the curing procedures of Sections 9:08.3.1 and 9:08.3.2 herein is used initially, it may be replaced by one of the other procedures of Section 9:08.3 herein any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

9:08.6 During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction activities, by application of curing procedures, and by rain or running water. Structures shall not be loaded in such a way as to overload the concrete.

9:09 SUBMITTALS

Submittals required by this section are given in Appendix E.

**ATTACHMENT IX
PENELEC CONCRETE PREPLACEMENT CARD**

SITE: _____ DATE: _____
 POUR LOCATION: _____ SPEC. NO.: _____
 CONCRETE CLASS: _____ SUBCONTRACTOR: _____
 WORK ORDER: _____ PURCHASE ORDER: _____
 REQUISITION: _____

WORK ITEM

SIGNATURE AND DATE
RESPONSIBLE CRAFT SUPERVISOR

1. Sub-base as per drawing and specification
2. Formwork as per drawing and specification
3. Rebar as per drawing and specification
4. Embedded Items as per drawing and spec.
5. Joints as per drawing and specification

REMARKS (CONTRACTOR): _____

Verified Items 1 thru 5 above and found to be satisfactory and complete.

 Signature and Date
 (Senior Subcontractor
 Representative)

Inspected Items 1 thru 5 above and found to be satisfactory. Released for concrete order.

 Signature and Date
 (PENELEC Site
 Representative)

Remarks (PENELEC Site Representative) _____

SECTION X
EXCAVATION, BACKFILL, PAVING, AND
CIVIL WORK

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SECTION X
EXCAVATION, BACKFILL, PAVING, AND
CIVIL WORK

10:01 SCOPE

10:01.1 Description of WORK:

This Section includes technical requirements for excavation, backfilling, paving, and civil WORK as specified herein and as shown on the drawings.

10:01.2 Items Included:

This Section includes but is nor limited to the following:

1. Excavation and shoring.
2. Dewatering, drainage, and structure protection.
3. Soil erosion and sedimentation control.
4. Backfill.
5. Temporary road, if required.
6. Paving.
7. Locating, excavating, relocating and repairing underground piping.
8. Providing temporary service in place of pipes during the time the pipes are inoperable.
9. Protection of existing structures, foundations, and underground items in the WORK area.

10:01.3 Items Not Included:

The following items are not included:

1. Furnishing and driving of piles is specified in Section XI.
2. Placement of concrete for pile caps is specified in Section IX.

10:02 APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. American Society for Testing and Materials (ASTM) D 1557-78, "Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. Rammer and 18 Inch Drop."
2. Pennsylvania Department of Transportation (Penn DOT), Form 408.
3. United States Department of Labor, Volume 37, Number 243, Part I, Subpart P entitled "Excavations, Trenching, and Shoring" of the Federal Register issued on December 16, 1972.

10:03 EXCAVATION

- 10:03.1 The SUBCONTRACTOR shall excavate, as required, for the construction of the foundations. The SUBCONTRACTOR shall perform all excavation of every description and of whatever substances encountered to the depths required for the foundations. All excavated material not required or unsuitable for backfill shall be removed and wasted or otherwise disposed of as directed by PENELEC.
- 10:03.2 Overexcavation under structural foundations shall be backfilled with concrete or brought back with load bearing fill.
- 10:03.3 Excavated materials are generally not suitable for fill. Excavated materials designated by PENELEC as suitable for fill or backfill, shall be stockpiled in nearby areas selected by the SUBCONTRACTOR a sufficient distance from trenches to prevent collapse and subject to the review and comment of PENELEC. Excavated materials not suitable for use as fill or backfill shall be disposed of off the site.
- 10:03.4 Existing facilities and foundations shall be protected by the SUBCONTRACTOR from any effects of the new excavation. Blasting shall not be allowed.
- 10:03.5 The SUBCONTRACTOR shall excavate, where necessary, outside of the proposed foundations or structures a sufficient distance to allow for bracing and shoring, dewatering, inspecting, removing forms, etc., and leave the excavation open until all installed work has been inspected by PENELEC. The maintenance, in good condition, of all open excavations shall be the responsibility of the SUBCONTRACTOR.
- 10:03.6 All excavations shall be performed to meet the minimum requirement specified in "Excavations, Trenching, and Shoring" by the Department of Labor.

10:03.7 The SUBCONTRACTOR shall provide a temporary unpaved road during the performance of the WORK if the existing road will be inaccessible due to WORK performed by the SUBCONTRACTOR.

10:03.8 The SUBCONTRACTOR shall hand excavate for locating and performing required work on three underground pipes as described in Section 10:06.

10:04 BACKFILL

10:04.1 Backfill Materials:

Fill shall consist of a sound, durable, crushed stone or gravel, and shall be well graded within the limits for PennDOT 2A material or as otherwise authorized by PENELEC. The uniformity coefficient (cu) of the material shall be at least 4. The material shall have a minimum dry unit weight of 130 pounds per cubic foot with a specific gravity of 2.65. Fill shall be placed under foundation and other areas requiring backfill shall be placed on the surface after all unstable soils are identified and removed. Fill shall extend beyond the perimeter of the foundation area for a minimum distance equivalent to the thickness of the fill.

10:04.2 Placement and Compaction Requirements:

1. Fill shall be placed in lifts not exceeding a loose thickness of 9 inches. Each fill lift shall be compacted to a minimum density equivalent to 95 percent maximum modified Proctor density in accordance with ASTM D 1557. Vibratory compaction is preferred.
2. The in-place field density shall be measured by a testing laboratory provided by PENELEC to document the construction. The test results will be reported to PENELEC for review and comment. Fill not meeting the minimum density requirements shall be recompacted until the requirements are met. The test laboratory shall also make mechanical analyses to determine the grain size distribution of the fill material. One test will be required for each 200 cubic yards (or 1,500 sq. ft of each lift or once per work shift, whichever, is more frequent) or as required by PENELEC.

10:04.3 Paving Subbase:

The WORK shall consist of subgrade preparation and aggregate subbase construction as shown on the reference drawings for those areas of paving which were damaged by the SUBCONTRACTOR.

1. Subgrade:

The subgrade shall conform to the requirements of Section 210, Penn DOT Form 408.

2. Aggregate Subbase:

The subbase shall consist of 6 inches of 3A aggregate and 4 inches of 2A on top of the 3A aggregate. The aggregate subbase material shall be placed on a dry well-compacted subgrade to the compacted depth shown on the reference drawings and shall conform to the requirements of Section 350 Penn DOT Form 408.

10:04.4 Laydown Area Subbase:

The WORK shall consist of aggregate subbase construction in the laydown area as required by the SUBCONTRACTOR in a location provided by PENELEC. The aggregate subbase shall consist of 3 inches of No. 2A aggregate, rolled and compacted. The aggregate subbase shall be placed on a dry well compacted subgrade. Some leveling of the subgrade shall be required prior to placing aggregate in order to insure the laydown area is level following placement of aggregate. Aggregate shall conform to the requirements of Section 350, Penn DOT Form 408.

10:05 PAVING

The SUBCONTRACTOR shall restore paving in the areas which were paved prior to the start of the WORK by the SUBCONTRACTOR. The SUBCONTRACTOR shall repair any paving damaged by the SUBCONTRACTOR during the performance of the WORK. The paving shall be restored to equal or better condition than existed prior to the WORK in accordance with Penndot Form 408 and existing reference drawings.

10:06 UNDERGROUND PIPING

The SUBCONTRACTOR shall locate three underground pipes (6, 8, and 10) inch diameter as shown on drawing E-387-006. Hand excavate and uncover piping. Isolate piping, modify, and relocate as required prior to driving piling. Provide temporary service during piping inoperation. Upon completion of piling, piping modification, and relocation verify pressure integrity of pipes and backfill as required for piping line specification 15K-1 as shown on drawing E-387-006.

10:07 DEWATERING, DRAINAGE, AND PROTECTION OF STRUCTURES

10:07.1 The SUBCONTRACTOR shall control the grading in the vicinity of structures so that ground surfaces are properly pitched to prevent water running into the excavated areas of the structures.

10:07.2 The SUBCONTRACTOR shall pump or otherwise remove any water which may be found in the excavation and shall provide all types of underdrains, dams, flumes, or other works necessary to keep the excavation entirely clear of water while foundations, or slabs on ground, are being laid. Newly laid WORK shall be protected from damage by water by methods subject to review and comment by PENELEC.

10:07.3 The SUBCONTRACTOR shall properly protect the excavated bottom to ensure a satisfactory foundation for the structure to be erected. The SUBCONTRACTOR shall employ construction methods which will not disturb the natural foundations, and will be responsible for and shall bear any additional cost resulting from the use of insufficient or improper construction procedure or methods.

10:07.4 The SUBCONTRACTOR shall keep the excavation properly and adequately sheeted and braced at all times during the process of the WORK. The SUBCONTRACTOR shall be responsible for any damage due to failure or insufficient sheeting or bracing. All regulations applicable to this WORK relating to protecting of life and property by sheeting and shoring shall be fully met.

10:07.5 All water shall be disposed of without damage to property, streams or rivers, other WORK of this contract, or collateral work.

10:08 SOIL EROSION AND SEDIMENTATION CONTROL

The SUBCONTRACTOR shall construct all earthworks in accordance with the following Soil Erosion and Sedimentation Control Plan:

1. Storm Water Handling:

Storm water at the site will be handled by utilizing dikes or ditches or straw bales around the excavated areas to minimize the amount of water to be handled in the excavations. Straw bales will also be placed around each drainage manhole in the area. The bales will be replaced when damaged or when required. The silt collected behind them shall be removed when it exceeds 6 inches in depth. Ground water and storm water in the excavation will be pumped to temporary settling basins on the site or to the existing ash ponds on the east side of the station.

2. Erosion Control Measures:

- a. The location of the project area is on an existing, generally flat, partially-paved area at Seward Station. The erosion control measures for this construction site will consist of diversion of storm water around the working areas and proper grading. Almost all of the earth removed is considered unsuitable and will be trucked to the ash disposal site.
- b. When the project has been completed all areas around the new facilities will be properly graded with paving. All storm water runoff at this time be collected in the yard catch basins and the average runoff from the 10-year, 24-hour storm will be handled in the waste treatment system.

10:09

SUBMITTALS

Submittals required in this section are given in Appendix E.

SECTION XI

PILING

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SECTION XI

PILING

11:01 SCOPE

11:01.1 Description of WORK:

This Section includes technical requirements for designing, fabricating, furnishing, delivering, driving and cutting H-section piles as specified herein and as shown on the drawings.

11:01.2 Items Included:

This Section includes but is not limited to the following:

1. Steel H-pile production piles as specified and shown on the drawings.
2. Steel H-pile test pile.

11:01.3 Items Not Included:

The following items are not included in this Section:

1. Furnishing and delivery of concrete for pile caps is specified in Section VIII.
2. Placement of concrete for pile caps is specified in Section IX.
3. Excavation and backfill is specified in Section X.

11:02 APPLICABLE CODES AND STANDARDS

The following are referenced in this Section:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges," September 1, 1986.
2. American Society for Testing and Materials (ASTM):
 - a. A 36/A 36M-89 "Standard Specification for Structural Steel"

- b. D 1143-81(1987) "Standard Test Method for Piles Under Static Axial Compressive Load."
3. American Welding Society (AWS) D1.1-90 "Structural Welding Code."

11:03

SITE INFORMATION

Data on indicated subsurface conditions are not intended as representations or warranties of continuity of such conditions. It is expressly understood that BECHTEL and PENELEC will not be responsible for interpretations or conclusions drawn therefrom by the SUBCONTRACTOR. The data are made available for convenience of the SUBCONTRACTOR.

1. Additional test boring and other exploratory operations may be made by the SUBCONTRACTOR at no additional cost to PENELEC.
2. The SUBCONTRACTOR shall protect structures, underground utilities and other construction from damage caused by pile driving operations. The SUBCONTRACTOR shall pre-excavate for piles if required, as herein specified or indicated on the drawings.
3. The SUBCONTRACTOR shall provide surveyed elevation bench marks on structures where directed by PENELEC before commencing work, when structures are adjacent to pile driving operations. The SUBCONTRACTOR shall record and report elevation of each bench mark after driving each pile and at least twice a day while pile driving is in progress. Should bench mark readings indicate displacement, the SUBCONTRACTOR shall halt driving operations until corrective action acceptable to PENELEC has been provided.
4. The SUBCONTRACTOR shall make provision to locate, relocate, modify, and replace buried pipes near pile foundations and provide temporary service to the plant as required until the pipes are restored as described in Section 10:06 of this Specification. Known existing buried utilities are as indicated on the drawings.

11:04

MATERIAL REQUIREMENTS

11:04.1

Steel H-Section Piles:

1. All piles shall be steel H-piles 10 x 42 with APC PRUYN No. 75750 points. Steel for H-piles and H-pile points shall conform to ASTM A 36.

2. Splices, where necessary or desirable, shall be made by an authorized procedure. They shall be made and installed as to insure good alignment of the spliced parts. Splices shall be designed to develop the full section of the piles and shall be butt-welded. Piles that are to be spliced shall be cut to mill tolerances.
3. At time of driving, piles shall conform to camber and sweep as permitted by allowable mill tolerances.

11:04.2 Driving Equipment:

1. Pile driving equipment shall be of a type generally used in standard pile driving practice, operated at manufacturer's specified rate, to develop required rated energy per blow.
2. Pile driving hammers shall be steam or air hammers developing an energy per blow of not less than 19,000 ft-lbs. The hammer shall be operated at all times at steam or air pressure and speed recommended by the manufacturer.
3. Hammer shall be equipped with cast steel or structural steel driving cap, with grooved base conforming to pile shape to prevent pile heads from upsetting excessively under extremely hard driving conditions. Bearing surfaces of grooves shall be kept true and smooth.
4. Fixed or rigid type pile driver leads shall be used that will hold the pile firmly in position and alignment, and in axial alignment with hammer. Leads shall be extended to within 2 feet of elevation at which the pile enters ground.
5. Equipment or driving method shall be modified as needed where interference with or damage to existing facilities may otherwise occur.

11:05 PILE DRIVING REQUIREMENTS

11:05.1 Pre-Driving Work:

1. Piles shall not be driven until earthwork in area which piles are to occupy has been completed, as follows:
 - a. Earth excavation will be stopped at an elevation of 6" to 12" above bottom of the pile cap before piles are driven. Final excavation of required elevation of pile cap bottoms will be done as part of earthwork, after piles have been driven and tested.

- b. Fills will be constructed and compacted to the elevation of grade indicated.
2. Each pile shall be marked with a horizontal line, at 1'-0" intervals, and the number of feet from pile point at 5'-0" intervals.
 3. Manual arc-welding shall be performed using shielded metal arc or submerged arc method, complying with AWS Standards.
 - a. The SUBCONTRACTOR shall use oxygen-gas or oxygen arc methods for field cutting of steel, complying with AWS D1.1.
 - b. For welded splices, surfaces to be welded shall be cleaned of rust, scale, oil, paint, and foreign material. Only pile members with identical cross-sections for splicing shall be used.
 - c. Splices shall be made before starting driving operations wherever possible. If a welded splice is required during driving operation, the splice shall be made when top of driven pile portion is at least 3'-0" above ground, to permit inspection of the welded connection during welding and during subsequent driving.
 - d. Splices shall be 100 percent butt welded, producing straight pile alignment through splice and developing full strength of pile in both bearing and bending.

11:05.2 Driving Piles:

1. General:

- a. Piles shall be continuously driven at locations shown on the drawings until refusal. Refusal shall be obtained when:
 - (1) There is a minimum of 20 blows per 1 inch increment for the last 3 inches of penetration.
 - (2) The minimum blow count is 20 blows when actual refusal (less than 1/16 inch observed increment) is reached.
- b. Driving should then cease, provided that the pile has been driven to a depth at which rock is estimated. Estimated rock elevation is 1055 feet. If the tip of the pile has not reached rock, an obstruction shall be

assumed and the method of disposition will be subject to review by Bechtel and PENELEC.

2. When driving piles in the vicinity of existing structures, foundations, high voltage lines, etc., caution shall be taken by the SUBCONTRACTOR to prevent damage to existing structures and equipment.
3. The SUBCONTRACTOR shall carefully maintain the center of gravity for each group or cluster of piles to conform to locations shown on the drawings.
4. Leads and pile shall be carefully plumbed before driving. Care shall be taken during driving to prevent and to correct any tendency of piles to twist or rotate.
5. When handling and driving long piles, precautions shall be taken to ensure against overstress or leading away from a true position when driving. Hammer and piles shall be supported in rigid leads that extend to within 2 feet of the elevation at which the pile enters the ground.
6. Piles shall be driven within the following maximum tolerances.
 - a. Location: 6" from location indicated for center of gravity of each single pile or pile groups.
 - b. Plumbness: Maintain 2" in 10'-0" from vertical, or a maximum of 4", measured when the pile is above ground, in leads.
7. The SUBCONTRACTOR shall provide pre-excavated holes for piles driven within 15'-0" of structures or underground utilities. Holes shall be drilled with a diameter slightly less than the largest cross-section dimension; exact size and depth shall be as required to produce satisfactory driving results. No pre-excavated holes shall be provided for the piles near the three underground pipes as described in Section 10:06.
8. Voids between pile and pre-excavated hole shall be backfilled, using satisfactory soil materials.
9. The SUBCONTRACTOR shall provide recorded instrument observations made during pile driving to determine whether driven pile has lifted from its original seat during driving of adjacent piles. If uplift occurs, affected piles shall be redriven to point elevation at least as deep as original point elevation with a driving resistance at least as great as original driving resistance.

10. Damaged piles, and piles driven outside required driving tolerances will not be accepted.
11. Piles rejected after driving shall be withdrawn and replaced with new piles meeting the specified requirements.
12. Additional pile or piles shall be driven where centerline deviation exceeds 3" and the redesign indicates the load on any pile exceeds 110 percent of design load.
13. Piles rejected after driving may be abandoned and cut-off, and additional piles driven to replace rejected units at designated locations when designated by PENELEC.
14. Spaces left by withdrawn piles, and that will not be filled by new piles, shall be solidly filled using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Fill shall be placed and compacted throughout length of space.
15. The tops of driven piles shall be cut-off, square with pile axis and at the elevations indicated. Excess materials shall be disposed of by the SUBCONTRACTOR in accordance with the requirements of Section II.

11:05.3 Withdrawing and Re-Driving Piles

1. Selected driven piles when directed by PENELEC, shall be withdrawn to determine condition of piles after driving.
2. Piles withdrawn for test and inspection, unless damaged or found not meeting specification requirements, shall be re-driven.
3. Withdrawing and re-driving of piles found to be satisfactory will be paid for in accordance with the SUBCONTRACT provisions for changes in work.
4. Piles shall be replaced with new piles meeting specification requirements.

11:06 FIELD QUALITY CONTROL

1. The SUBCONTRACTOR may be required to make load tests at locations PENELEC will designate. The test load shall be applied by an acceptable method. The proposed method shall be submitted for review and comment. Pile load test shall be conducted under the supervision of PENELEC.

2. Test pile, furnished and driven by the SUBCONTRACTOR to determine lengths of piles, may be located, cut off, and become part of foundation system provided they conform to specification requirements.
3. Test Piles Required:
 - a. If test piles are required, The SUBCONTRACTOR shall provide a single test pile.
 - b. The SUBCONTRACTOR shall use a 10 x 42 test pile driven with appropriate pile driving equipment operating at rated driving energy to be used in driving permanent piles.
 - c. Piles will be considered as driven to refusal when 5 blows of hammer are required to produce a total penetration of 1/4 inch or less.
 - d. The design load of each pile is 70 tons.
 - e. If test is required, test load shall be 140 tons.
 - f. Load and test piles which have been in place not less than 48 hours, to determine the load-settlement relationship of test piles under a vertical axial load, complying with ASTM D 1143.
 - g. Loads shall be applied in increments not exceeding 25 percent at allowable pile load.
 - h. Test loads shall be applied either by use of hydraulic jacks or by static loading. Use certified, calibrated jacks to develop the required test loads, maintain them, and release them in continuous operations. Anchor piles shall not be driven closer than 5 feet from any test pile.
 - i. Test loads shall be applied so that allowable load is reached in not less than 8 hours from start of load application. This load shall be maintained until no measurable settlement is observed in a period of 16 hours, or longer as may be required by local codes having jurisdiction. Subsequent loads shall not be applied until pile settlement becomes negligible.
 - j. After satisfactory allowable load testing, The SUBCONTRACTOR shall apply additional loads so that total test load is reached in not less than 8 hours. Total load shall be maintained until no measurable settlement

is observed in a period of 16 hours, or longer as may be required by local codes having jurisdiction.

- k. The SUBCONTRACTOR shall measure and record settlement immediately before and after each increment of test load is applied, and immediately before and 24 hours after total load is removed.
- l. The test pile will be considered as acceptable for stipulated bearing capacity if total net settlement, after deducting rebound, does not exceed 0.01" per ton of test load.
- m. The SUBCONTRACTOR shall prepare reports for each test pile, to include: Date of driving; test pile location; designation and dimensions of pile; pile point reinforcement and description, if any; total penetration; starting and finishing times, and total driving time; number of blows required for each foot of penetration, total number of blows, and resistance in blows per inch for the last 6 inches of driving.
- n. The SUBCONTRACTOR shall include with test pile reports a record of driving equipment used, to include: Hammer make and model number, stroke, weight of ram, and rated driving energy; driving cap weight and description; actual rate of operation of hammer during test pile driving.

11:07

HANDLING, DELIVERY, RECEIVING, UNLOADING, AND STORING

- 1. Except for piles to be used for test purposes, materials ordered or delivered to project site prior to verification of assumed pile length, will be at the SUBCONTRACTOR'S risk.
- 2. After pile lengths are verified, deliver materials to project site in such quantities and at such times to assure continuity of pile driving operations to project schedule.
- 3. Store piles in orderly groups above ground and blocked during storage to prevent distortion of members. Piles exhibiting variations beyond tolerance limits will be considered distorted and shall not be used in the work.

11:08

SUBMITTALS

Submittals required by this section are given in Appendix E.

APPENDIX A

PENELEC QUALITY ASSURANCE MANUAL SPECIFICATIONS

The terms as utilized in the following Specifications in Appendix A shall have the following meanings per the Purchase Order and Subcontract:

- a. OWNER shall mean PENELEC
- b. CONTRACTOR shall mean SUBCONTRACTOR.
- c. CONTRACT shall mean Purchase Order for all OFFSITE WORK and SUBCONTRACT for all ONSITE WORK in accordance with the definition of WORK as specified in Section I of this Specification.
- d. VENDOR shall mean SUBCONTRACTOR.

TITLE: **NONDESTRUCTIVE EXAMINATION PERFORMANCE REQUIREMENTS**PAGE 1 OF 1APPROVED: R. R. Brumby DATE: _____**1.0 PURPOSE**

The purpose of this specification is to establish the requirements for nondestructive examinations performed at Penelec facilities.

2.0 SCOPE

This specification shall apply to any organization performing nondestructive examinations at Penelec owned or operated stations.

3.0 DEFINITIONS

3.1 NDE - Nondestructive Examination

4.0 REFERENCES

4.1 Quality Assurance Manual - Section 9.0

5.0 RESPONSIBILITY

5.1 The contractor shall be responsible for fulfilling the requirements as set forth in this specification.

6.0 INSTRUCTIONS

6.1 The attachment(s) listed in Section 7.0 shall be included with the procurement documents (specification, purchase order, requisition, or bill of material), and shall be considered as part of that document.

7.0 ATTACHMENTS

7.1 Nondestructive Examination Performance Requirements

NONDESTRUCTIVE EXAMINATION PERFORMANCE REQUIREMENTS

- 1.0 All NDE Shall:
 - 1.1 Be performed in accordance with applicable section(s) of ASME, AWS, or any other applicable codes.
 - 1.2 Follow the acceptance criteria of the applicable section(s) of the Applicable Codes or a Penelec standard for non-code required NDE.
- 2.0 NDE personnel shall have current qualifications and certifications in accordance with the requirements of SNT-TC-1A.
- 3.0 Contractor shall submit applicable procedures, personnel qualifications and certification to the Penelec Quality Assurance Representative for review and record purposes, prior to performing work.
- 4.0 NDE Reports shall include as a minimum:
 - 4.1 Detailed description of the subject examined.
 - 4.2 Method and description of examination.
 - 4.3 Procedure used (include number) with revision number or date.
 - 4.4 Person(s) conducting examination and level of certification.
 - 4.5 Person issuing report and level of certification.
 - 4.6 Acceptance criteria used.
 - 4.7 Accept or reject status of item tested; if rejected, reason must be stated, and area of rejection clearly identified.
 - 4.8 Applicable Code(s).
- 5.0 NDE Reports shall be submitted within 24 hours after completion of each examination to the Penelec Site Quality Assurance Representatives, for review and distribution when applicable.
- 6.0 Work performed that is not in compliance with the applicable Code(s) or approved by Penelec Quality Assurance shall be reconducted at the Contractor's expense.
- 7.0 When performing radiographic inspections, a variable intensity film viewer and a densitometer must be available on-site for reviewing of all radiographic film by the owner or authorized inspector.
- 8.0 The owner reserves the right to perform NDE at its own discretion.

TITLE: CONTRACTED SERVICES - STRUCTURAL WELDING

PAGE 1 OF 1

APPROVED: *A. K. Bunting* DATE: 1/2-1/86**1.0** PURPOSE

The purpose of the specification is to establish the minimum requirements for welding to assure compliance with the applicable codes.

2.0 SCOPE

This specification shall apply to all contractors performing welding within the Penelec system not covered by the ASME Boiler and Pressure Vessel Code or the ANSI B31.1 Power Piping Code. Work under this specification shall be performed in accordance with AWS D1.1 Structural Welding Code, AWS B3.0 Standard and/or the Penelec Quality Assurance Manual. NOTE: The current issue of the code/standard applies.

3.0 DEFINITIONS

- 3.1 ASNT - American Society of Non-Destructive Testing
- 3.2 ASME B&PVC - American Society of Mechanical Engineers - Boiler and Pressure Vessel Code
- 3.3 AWS - American Welding Society
- 3.4 NDE - Non-Destructive Examination
- 3.5 PQR - Procedure Qualification Record
- 3.6 WPS - Weld Procedure Specification

4.0 REFERENCES

- 4.1 ANST-TC-1A, Current Edition
- 4.2 AWS D1.1 - Structural Welding Code
- 4.3 ASME Section IX - Requirements for Welding and Brazing Qualifications
- 4.4 AWS B3.0 - Welding Procedure and Performance Qualification

5.0 RESPONSIBILITY

- 5.1 The contractor shall be responsible for fulfilling the requirements as set forth in this specification.

6.0 INSTRUCTIONS

- 6.1 The attachment(s) listed in Section 7.0 shall be included with the procurement documents (specification, purchase order, requisition, or bill of material), and shall be considered as part of that document.

7.0 ATTACHMENTS

- 7.1 Specification for Contracted Services - Structural Welding.

CONTRACTED SERVICES - STRUCTURAL WELDING

- 1.0 Procedure Qualification Records and Welding Procedure Specifications:
- 1.1 Each CONTRACTOR shall have WPS's and supporting PQR's which conform to the rules of AWS D1.1 or B3.0.
 - 1.2 Prequalified procedures obtained from a recognized technical society or procedures qualified under ASME B&PVC Section IX rules are acceptable.
 - 1.3 CONTRACTOR'S PQR'S and WPS'S shall be subject to the review and approval of the OWNER'S Quality Assurance Representative.
- 2.0 Welder Qualifications shall comply with the following:
- 2.1 All welders performing work within the Penelec system shall be qualified under the rules and regulations of AWS D1.1 or B3.0. All welders shall be tested on Penelec property, and all bend tests or radiographic tests shall be conducted on Penelec property.
 - 2.2 Welders that were previously qualified under the rules of ASME B&PVC Section IX are not required to requalify under AWS D1.1 or B3.0 rules. However, the welders qualification shall be limited by the essential variables of AWS D1.1 or B3.0.
 - 2.3 CONTRACTOR'S shall have the option to use welder's previous qualification records, provided proof can be obtained by the contractor of the welder having welded in the previous six (6) months, and that the qualification test was conducted on Penelec property.
 - 2.4 Any welders who previously qualified for a contractor who performed work for Penelec in the past year, as determined from the date of contract award, and do not have current qualification papers available, may requalify for that contractor under the following conditions:
 - 2.4.1 Renewal of qualification for a specific welding process may be made by a single test joint on any thickness, position or filler metal which shall then qualify the welder(s) on any thickness, position or filler metal previously qualified for that process.
 - 2.4.2 Previous welding qualifications shall be fully documented to the satisfaction and approval of the OWNER.
 - 2.4.3 The original qualification test was conducted on Penelec property.
 - 2.4.4 The OWNER reserves the right to retest any welder.
 - 2.5 The CONTRACTOR'S welding technician shall obtain all necessary data required to complete the welder qualification papers prior to the start of welding.
 - 2.6 Copies of the Welder Performance Qualifications shall be submitted to Penelec Quality Assurance prior to the start of welding.

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- 2.7 The OWNER shall issue a picture identification card to each qualified welder. This card shall include the following:
- 2.7.1 Appropriate welding process qualified to perform.
 - 2.7.2 Distinction between open root and backing qualifications (i.e. add a "B" to the weld identification symbol for backing qualified tests).
 - 2.7.3 Company certified to weld for.
- 2.7 Only qualified heavywall welders shall weld on heavywall weldments. Stacking of lightwall welders on heavywall weldments is prohibited.
- 3.0 Welder qualification testing shall comply with the following:
- 3.1 The CONTRACTOR'S welding technician shall administer the Welder Qualification Tests.
 - 3.2 The OWNER reserves the right to witness or inspect any phase of the Welder Qualification Test.
 - 3.3 Test coupon may be fit and tacked in the flat position using tack welds no greater than 1/4" on length and at approximately 90° intervals around the coupon.
 - 3.4 The CONTRACTOR'S welding technician shall verify that root gaps meet the parameters of the applicable welding procedure specification.
 - 3.5 The CONTRACTOR'S welding technician shall verify that internal misalignment is less than 1/4 t, where t is the thickness of the coupon.
 - 3.6 Upon completion of fit-up and verification of the previous parameters, the coupon shall be tacked at the welding station into the designated position.
 - 3.7 Should the welding procedure specification require an inert gas purge, purge dams and connections may be completed prior to tacking the coupon in position.
 - 3.8 Once the coupon is tacked into position, it shall not be removed from that position until completion of the test.
 - 3.9 Internal gas purges shall be held for a minimum of three minutes prior to the start of welding, maintained until the completion of the root pass(es), and verified by the CONTRACTOR'S welding technician.
 - 3.10 The CONTRACTOR'S welding technician shall make periodic checks during the test to verify usage of the proper filler materials and techniques.
 - 3.11 All grinding, filing or brushing on the coupon after tacking shall be performed in the designated test position and is considered as part of the test.
 - 3.12 Grinding, filing or brushing of the root from the inside or backside of the coupon is prohibited.
 - 3.13 Failure to comply with Section 3.3, 3.11 or 3.12 will result in rejection of the test coupon.

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- 3.14 Upon completion of the test, the OWNER'S Quality Assurance Representative and the CONTRACTOR welding technician shall perform visual inspection of the test coupon prior to submittal for examination or testing. Failure to meet the following criteria shall result in rejection of the test coupon.
- 3.14.1 Lack of penetration.
 - 3.14.2 Excessive penetration exceeding 3/32" on the I.D.
 - 3.14.3 Surface undercutting exceeding 1/32".
 - 3.14.4 Crown reinforcement exceeding 3/16".
 - 3.14.5 Abrupt valleys between passes.
 - 3.14.6 Insufficient filler metal such that the weld surface is below the surface of the coupon.
 - 3.14.7 Excessive suck back exceeding 3/32" or 20% of the thinner of two sections being joined.
 - 3.14.8 The width of the weld cover pass shall not exceed 125% of the widest point of the weld bevel.
 - 3.14.9 Burning through the backing ring or plate (when used).
- 3.15 Radiographic examination or bend test acceptance criteria shall be as per AWS D1.1.
- 3.16 Upon acceptance of the coupon by means of visual examination, it shall be steel stamped with the contractor's identification letters, the welder's security number, and the appropriate weld type identification letter before being submitted for radiographic examination or bend testing (Example: CE 017 I). Weld type identification shall be as follows: I for Inconel, C for Carbon Steel and S for Stainless Steel.
- 4.0 If the coupon is cut and bent, the bent section shall be tied or tack welded together to maintain traceability.
- 5.0 CONTRACTOR shall furnish Material Test Reports, Certificate of Compliance or typical deposit analyses for any appropriate material which shall become an intricate part of the final weld.
- 6.0 CONTRACTOR Weld Technician shall comply with the following:
- 6.1 A fulltime weld technician shall be employed for each shift.
 - 6.2 Weld technician's duties shall include, but not be limited to, the following:
 - 6.2.1 Supervise Welder Qualification Testing.
 - 6.2.2 Involvement in welder assignments.
 - 6.2.3 Supervise material control.
 - 6.2.4 Inspection of welding and related activities.
 - 6.2.5 Maintain applicable documentation.
 - 6.3 All welding technicians shall be certified AWS Welding Inspectors.

- 7.0 CONTRACTORS shall supply their own codes and reference standards as specified in the Contract.
- 8.0 Filler Metal Control requirements are:
- 8.1 Low-hydrogen and stainless steel electrodes shall be stored, at a minimum temperature of 250° F, in central or portable storage ovens once removed from the hermetically sealed containers.
 - 8.2 Portable rod ovens shall be utilized at each work area.
 - 8.3 Low-hydrogen and stainless steel electrodes shall be rebaked per manufacturer's recommendations if exposed to atmosphere for a period of longer than four (4) hours.
 - 8.4 Filler metal utilized for GTAW welding shall be flag-tagged on both ends of the wire indicating wire classification.
- 9.0 Non-Destructive Examination shall comply with the following:
- 9.1 The NDE personnel shall have qualifications and certification in accordance with the requirements of ASNT-TC-1A.
 - 9.2 CONTRACTOR shall submit procedures, personnel qualifications and certification to the OWNER'S to Quality Assurance Representative for review and approval.
 - 9.3 The OWNER reserves the right to perform non-destructive examinations at its own discretion.
 - 9.4 100% of all finished welds shall be visually inspected and inspection results documented.
 - 9.5 Visual inspection shall be conducted prior to any other NDE that may be performed.
- 10.0 Post weld heat treatment shall be done using the Electric Resistance Method utilizing strip chart recorders. Other methods of heat treatment shall not be used without approval of the OWNER'S Quality Assurance Representative.
- 11.0 The CONTRACTOR shall submit to the OWNER'S quality Assurance Representative a documentation package containing all documentation required by this specification.
- 12.0 Certain work performed that is not covered by the aforementioned codes, such as welding done by insulators and electricians shall be covered under this specification. The OWNER shall determine what work requires certified welders.
- NOTE: The requirements for providing welding technicians are minimum requirements; additions or modifications to these requirements, if necessary, will be addressed in the body of the specification itself.

TITLE: **GENERAL REQUIREMENTS FOR VALVES, FITTINGS, FLANGES**

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APPROVED: RR [Signature] DATE: 5/2/92**1.0 PURPOSE**

The purpose of this specification is to establish general Quality Assurance requirements for ordering valves, fittings, flanges or similar components.

2.0 SCOPE

This specification shall apply to valves, fittings, flanges or similar component ordered within the Penelec system for ASME/ANSI Code work. This specification may not apply in certain cases to specialty items.

3.0 DEFINITIONS

- 3.1 ANSI - American National Standards Institute
- 3.2 ASME - American Society of Mechanical Engineers
- 3.3 ASTM - American Society for Testing and Materials
- 3.4 MSS - Manufacturers Standardization Society of the Valve and Fitting Industry
- 3.5 Specialty Item - Valves and fitting that fall under ANSI B31.1 (1989 Edition) paragraph 107.1 (B) and 115.

4.0 REFERENCES

- 4.1 ASME B&PV Code Section II
- 4.2 ASTM Forging Specification A105, A182, A350
- 4.3 ANSI B16.5, B16.10, B16.11, B31.1, B16.34
- 4.4 MSS - SP25, SP84
- 4.5 ASTM Casting Specification A216, A217, A351
- 4.6 ASTM Wrought Steel Specification A234, A403, A420

5.0 RESPONSIBILITY

- 5.1 The vendor shall be responsible for fulfilling the requirements as set forth in this specification.
- 5.2 The requisitioner shall be responsible for completing all essential ordering information in 6.0.

6.0 INSTRUCTIONS

- 6.1 The attachment listed in Section 7.0 shall be included with the procurement documents (specification, purchase order, requisition or bill of material) and shall be considered as part of that document).
- 6.2 Purchase orders for forged products shall include the following information:
- 6.2.1 Name of Forging
 - 6.2.2 ASTM/ASME specification number and grade
 - 6.2.3 Size and pressure class or geometry
 - 6.2.4 Quantity
 - 6.2.5 Test report if required
 - 6.2.6 Supplementary requirements, if any
- 6.3 Purchase orders for cast products shall include the following information:
- 6.3.1 A description of the casting
 - 6.3.2 Grade of Steel
 - 6.3.3 Options in the specification
 - 6.3.4 Any supplementary requirements
- 6.4 Purchase orders for wrought products shall include the following information:
- 6.4.1 Quantity
 - 6.4.2 Description of Fitting
 - 6.4.3 Grade destinations of steel
 - 6.4.4 Seamless or welded construction
 - 6.4.5 Supplementary requirements, if any

7.0 ATTACHMENTS

- 7.1 General Requirements for Forged Valves, Fittings and Flanges
- 7.2 General Requirements for Cast Valves, Fittings and Flanges
- 7.3 General Requirements for Wrought Fittings and Flanges

PENNSYLVANIA ELECTRIC COMPANY

Attachment 7.1

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GENERAL REQUIREMENTS FOR FORGED VALVES, FITTINGS AND FLANGES

- 1.0 All forged valves, fittings, flanges or similar piping components shall comply with ASTM Standard A105, A182 or A350. If no ASTM specification is referenced, the Penelec Purchasing Agent shall be notified.
- 2.0 Substitute material is prohibited unless authorized in writing by the Penelec Purchasing Agent.
- 3.0 Required marking:
 - 3.1 All valves, fittings, flanges and similar components shall be marked in accordance with the proper ASTM/ANSI specification and shall include as a minimum:
 - 3.1.1 Manufacturer's symbol or name
 - 3.1.2 Heat number or manufacturer's heat I.D. number
 - 3.1.3 The service rating or schedule number
 - 3.1.4 ASTM designation number and grade
 - 3.1.5 Size

The markings shall be forged or legibly stamped on each forging or attached tag and in such a position as not to injure the usefulness of the forging.
 - 3.2 Small item markings:
 - 3.2.1 In cases where the items is too small to be marked (i.e.; bushings, plugs, etc.), they shall be packaged and the container shall be marked as noted in 3.1 above.
- 4.0 When Grade 11 or Grade 12 valves, fittings or flanges are specified, they are to be furnished as Grade 11b or 12b with .15% maximum carbon content.
- 5.0 All valves shall comply with the latest issue of ANSI 16.34, and MSS-SP25.

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Attachment 7.1

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- 6.0 All valves are required to be supplied with a "Certificate of Compliance" which must include the following information:
- 6.1 Manufacturer's name
 - 6.2 Country of origin
 - 6.3 ASTM number and grade
 - 6.4 Size
 - 6.5 Pressure rating
 - 6.6 Figure number/model number
- 7.0 The valve manufacturer shall note any special warning and installation guidelines--tags or plates must be attached to or accompany each valve specifying appropriate action.
- 8.0 Threaded valves which are machined to make socket weld valves will not be accepted.
- 9.0 valve manufacturers shall have a documented Quality Assurance program which, as a minimum, meets the requirements of ASME B&PVC Section I, Appendix A-300 (less authorized inspection).
- 10.0 This specification may be modified or waived for speciality items when authorized in writing by the Purchasing Agent. These items include compression fittings and certain instrumentation valves.

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Attachment 7.2

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GENERAL REQUIREMENTS FOR CAST VALVES, FITTINGS AND FLANGES

- 1.0 All cast valves, fittings, flanges or similar piping components shall comply with ASTM Standard A216, A217 or A351. If no ASTM specification is referenced, the Penelec Purchasing Agent shall be notified.
- 2.0 Substitute material is prohibited unless authorized in writing by the Penelec Purchasing Agent.
- 3.0 All castings shall be marked in accordance with the proper ASTM specification (A-703) and shall include as a minimum:
 - 3.1 Casting grade
 - 3.2 Heat number identification
 - 3.3 Manufacturer's I.D. number or symbol

Markings shall be in such a position as not to injure the usefulness of the casting.

- 4.0 All valves shall comply with the latest issue of ANSI 16.34 and MSS-SP25 and SP84.
- 5.0 All valves are required to be supplied with a "Certificate of Compliance" which must include the following information:
 - 5.1 Manufacturer's name
 - 5.2 Country of origin
 - 5.3 ASTM number and grade
 - 5.4 Size
 - 5.5 Pressure rating
 - 5.6 Figure number/model number
- 6.0 The valve manufacturer shall note any special warning and installation guidelines--tags or plates must be attached to or accompany each valve specifying appropriate action.

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Attachment 7.2

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- 7.0 The valve manufacturer or supplier shall state whether or not valve body repair was performed. If valves are not purchased directly from the manufacturer, the supplier will procure this information from the manufacturer before shipment to Penelec. Repair by welding, when allowed, shall be in accordance with ASME Section IX, with non-destructive examination reports and stress relief data submitted with shipment when applicable.
- 7.1 This applies to valves size 6 inch or larger and 1500 # class or greater.
- 8.0 Butt weld valves of class #4500 made of A217-WC9 material should be manufactured to ANSI B16.34 "Special Class" requirements.
- 9.0 Threaded valves which are machined to make socket weld valves will not be accepted.
- 10.0 Valve manufacturers shall have a documented Quality Assurance program which, as a minimum, meets the requirements of ASME B&PVC Section I, Appendix A-300 (less authorized inspection).

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Attachment 7.3

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GENERAL REQUIREMENTS FOR WROUGHT FITTINGS AND FLANGES

- 1.0 All wrought fittings, flanges or similar piping components shall comply with ASTM Standard A234, A403 or A420. If no ASTM specification is referenced, the Penelec Purchasing Agent shall be notified.
- 2.0 Substitute material is prohibited unless authorized in writing by the Penelec Purchasing Agent.
- 3.0 All valves, fittings, flanges and similar components shall be marked in accordance with the proper ASTM/ANSI specification and shall include as a minimum:
 - 3.1 For butt welding fittings:
 - 3.1.1 Manufacturer's name or trademark
 - 3.1.2 Schedule of min. wall thickness
 - 3.1.3 Size
 - 3.1.4 Material grade
 - 3.1.5 Heat number or heat identification
 - 3.2 For threaded or socket welding fittings:
 - 3.2.1 Manufacturer's name or trademark
 - 3.2.2 Pressure class or schedule
 - 3.2.3 Material grade

Markings shall be in such a position as not to injure the usefulness of the casting.

TITLE: MARKING OF ASBESTOS FREE INSULATION

PAGE 1 OF 1

APPROVED: K R [Signature]DATE: 3/2/90**1.0 PURPOSE**

The purpose of this specification is to standardize the requirements for the purchase and installation of asbestos free insulation.

2.0 SCOPE

This specification shall apply to any insulation supplied or installed at any Penelec owned or operated station.

3.0 DEFINITIONS

3.1 Asbestos Free Insulation - Any form of insulating material such as formed pipe insulation, block insulation, blanket insulation or cementous mortar that contains absolutely no asbestos fibers.

4.0 REFERENCES

4.1 Environmental Affairs Asbestos Procedure EP-8

5.0 RESPONSIBILITY

5.1 The vendor/contractor or Penelec maintenance group shall be responsible for fulfilling the requirements as set forth in this specification.

6.0 INSTRUCTIONS

6.1 The attachments listed in Section 7.0 shall be included with the procurement documents (specification, purchase order, requisition or bill of material) and shall be considered as part of that document.

7.0 ATTACHMENTS

7.1 Marking of Asbestos Free Insulation

7.2 Asbestos Free I.D. Tags

PENNSYLVANIA ELECTRIC COMPANY

Attachment 7.1

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MARKING OF ASBESTOS FREE INSULATION

- 1.0 All insulating materials used at Penelec owned or operated facilities are to contain no asbestos.
 - 1.1 This applies to insulating materials purchased by Penelec or supplied by contractors as part of repair contracts.
 - 1.2 The cartons/packages for all insulating materials shall be properly marked by the manufacturer indicating that the material is asbestos free.
- 2.0 All asbestos free pipe and block insulation must be properly identified by the following method:
 - 2.1 The material shall be made a single color, other than white, and shall be solid throughout (i.e., green, pink).
- 3.0 Penelec will not accept any asbestos free insulation which contains zeolite (hydrated aluminum silicates such as chabazite, erionite or ferrierite).
 - 3.1 All cartons/packages of insulation must state the nature of the material and certify that zeolite is not used to manufacture the insulation.
- 4.0 During installation of the material, the contractor or Penelec maintenance group will be required to mark the area using a Penelec standard system for identification.
 - 4.1 After the insulation has been installed on the piping, the beginning and end of the area is to be wrapped with a 2 1/2" wide adhesive tape. Also, this tape is to be installed every three feet between the end markings.
 - 4.1.1 This tape is to be a purple color and will be supplied by Penelec.
 - 4.1.2 In addition to the tape, an I.D. tag shown in Attachment 7.2 is to be installed at each end of the insulated area. The arrows on the tags are to be properly oriented to indicate the asbestos free area.
 - 4.1.2.1 The tags are a bright yellow with black letters.
 - 4.1.2.2 The tags will be supplied by Penelec.

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Attachment 7.1

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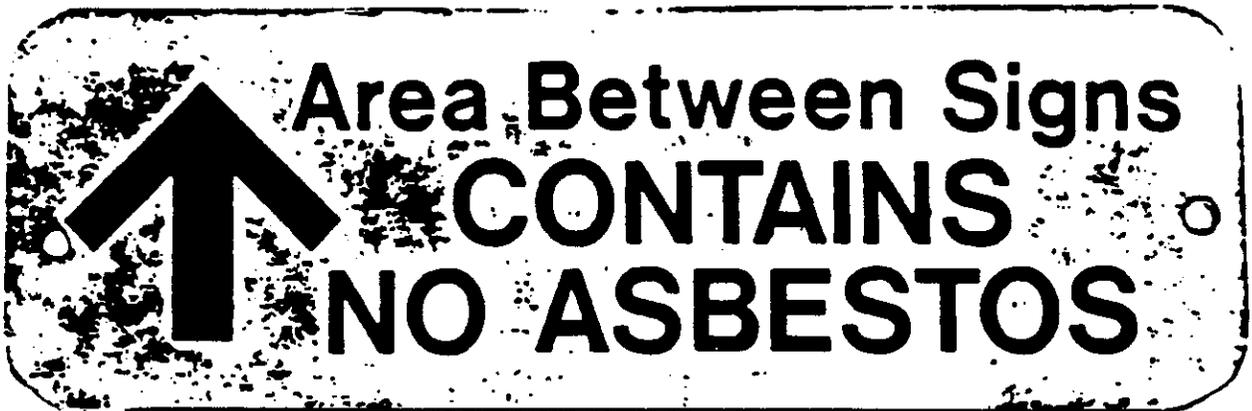
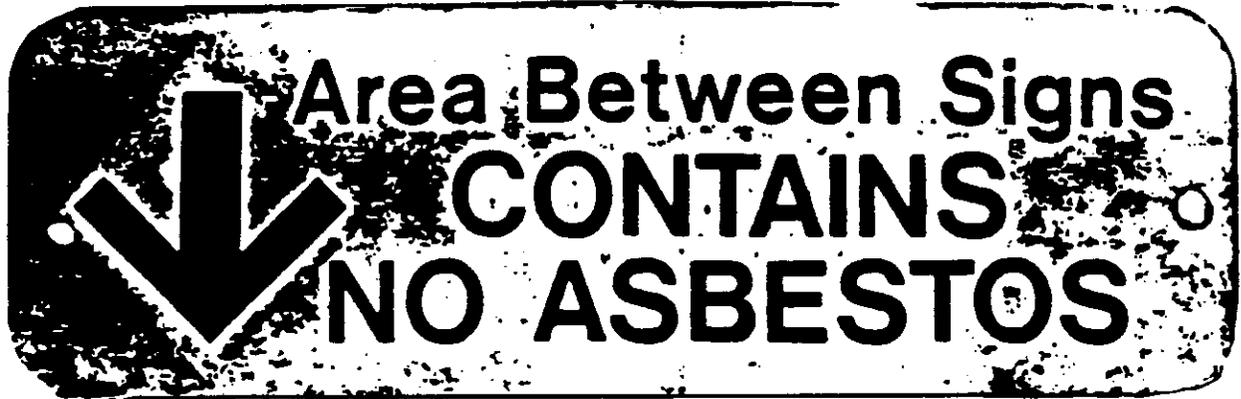
- 4.2 When the insulation is to be installed on other than piping, it is to be identified by using the tags shown in Attachment 7.2.
- 4.2.1 The tag is to be attached to the surface of the insulated area by rivets, tacks, screws, etc.
 - 4.2.2 The tags should be attached along the borders of the area insulated with the arrows properly oriented to show the asbestos free area.
 - 4.2.3 The tags will be supplied by Penelec.

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Attachment 7.2

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ASBESTOS FREE I.D. TAGS



Actual Size

Color: Yellow
Letters: Black

TITLE: CONTRACTED SERVICES - ELECTRICAL INSTALLATIONS

PAGE 1 OF 2

APPROVED

R.R. [Signature]

DATE

4/26/88**1.0 Purpose**

The purpose of this specification is to establish the minimum Quality Assurance requirements for the installation of electrical equipment and systems.

2.0 Scope

This specification shall apply to contractors installing electrical equipment and systems within the Penelec system.

3.0 Definitions

- 3.1 NEC - National Electrical Code
- 3.2 NESC - National Electrical Safety Code
- 3.3 CQAR - Contractor Quality Assurance Representative

4.0 References

- 4.1 Penelec Quality Assurance Manual
- 4.2 Specification GDE-JTWN-943 - "General Requirements and Installation Details for Electrical Construction"
- 4.3 National Electrical Code (NFPA 70)
- 4.4 National Electrical Safety Code (ANSI C2)
- 4.5 Penelec Quality Assurance Specification PS-8.01C "Welding of Structural Steel"

5.0 Responsibilities

- 5.1 The contractor shall be responsible for fulfilling the requirements as set forth in this specification.

6.0 Instructions

- 6.1 The attachments listed in Section 7.0 shall be included with the installation procurement documents (specification, bill or material or purchase requisition) and shall be considered as part of that document.

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Pennsylvania Electric Company is a member
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QUALITY ASSURANCE SPECIFICATIONS MANUAL

GAS: PS-11.01

REVISION: 0

DATE: 06/30/88

TITLE: CONTRACTED SERVICES - ELECTRICAL INSTALLATIONS

PAGE 2 OF 2

7.0 Attachments

- 7.1 Specification for Contracted Services - Electrical Installations
- 7.2 Electrical Inspection Record

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CONTRACTED SERVICES - ELECTRICAL INSTALLATION

- 1.0 The CONTRACTOR shall implement a Quality Assurance Program which as a minimum shall meet the requirements set forth in this specification.
 - 1.1 The CONTRACTOR shall have established methods to control the following:
 - 1.1.1 Material
 - 1.1.2 Calibration of measuring and test equipment
 - 1.1.3 Inspection
 - 1.1.4 Testing
 - 1.1.5 Welding
 - 1.1.6 Documentation
 - 1.1.7 Nonconformances
 - 1.2 The CONTRACTOR shall have copies of applicable codes, standards or procedures at the job site.
 - 1.3 The CONTRACTOR shall designate a Contractor Quality Assurance Representative (CQAR) who shall be responsible for monitoring the quality aspects of the job and who shall enforce the implementation of all OWNER or CONTRACTOR quality requirements.
 - 1.3.1 The CQAR shall not be the job superintendent.
 - 1.3.2 The CQAR shall have a minimum of 5 years experience in electrical construction.
 - 1.3.3 Resumes of the prospective candidate shall be submitted to the owner's Quality Assurance Department at least one week before mobilization.
- 2.0 The CONTRACTOR'S material control program shall assure the following:
 - 2.1 Material is properly identified with name plates, tags or labels.
 - 2.2 Any required material documentation is maintained.
 - 2.3 Material is adequately stored, handled and installed in accordance with the equipment manufacturer's or owner's specifications.
- 3.0 The CONTRACTOR shall only use measuring and test equipment that is in good working order and properly calibrated.
 - 3.1 As a minimum, the following equipment shall be calibrated:
 - 3.1.1 Torque wrenches
 - 3.1.2 V-O-M meters
 - 3.1.3 Dynamometers (for measurement of cable pulling tensions)

- 3.2 Calibrations shall be traceable to the National Bureau of Standards.
- 3.3 The OWNER reserves the right to request any calibration documentation as well as recalibration of any measuring and test equipment that the owner suspects is deficient.
- 4.0 The CONTRACTOR shall verify through inspection by the CQAR the following:
 - 4.1 Measuring and test equipment is properly calibrated with National Bureau of Standards traceability.
 - 4.2 Physical damage of equipment (i.e. paint, dents, cracks, etc.).
 - 4.3 Equipment is clean on inside and outside.
 - 4.4 Equipment is properly leveled, aligned and secured.
 - 4.5 Bolted connections, either electrical or mechanical, are torqued in accordance with the vendor's recommendations.
 - 4.6 Wiring and cables are properly trained, supported and secured.
 - 4.6.1 Cable raceways are continuous without unsupported drops.
 - 4.6.2 Cables do not exert any excess force on terminations.
 - 4.6.3 Fire barriers installed at floor and wall penetrations.
 - 4.7 Equipment is properly grounded in accordance with NEC Article 250.
 - 4.8 Equipment, raceways, cables and wiring are properly identified.
 - 4.9 Witness of any critical tests.
- 5.0 The CONTRACTOR shall verify through testing the following:
 - 5.1 Control and power cable continuity checks.
 - 5.2 Rotation of rotating equipment.
- 6.0 The CONTRACTOR shall perform welding on any structural members (including uni-strut) in accordance with QA specification PS-8.01C.
- 7.0 The CONTRACTOR shall provide the following documentation:
 - 7.1 Any specified material certifications.
 - 7.2 Any specified equipment performance or test data.
 - 7.3 Any specified personnel certifications or resumes.
 - 7.4 Inspection records.
 - 7.4.1 Inspection records shall be in a format similar to the example shown in Attachment 7.2
 - 7.4.2 Inspection records shall be submitted to the owner's QA representative at least 1 day prior to OWNER start-up and test activities.

- 7.5 Six (6) copies of instruction manuals and parts lists for CONTRACTOR furnished equipment.
- 7.6 Any required as-built drawings to document any deviations from established drawings and specifications.
- 8.0 The CONTRACTOR shall control nonconformances to specifications, drawings or procedures as follows:
 - 8.1 Nonconformances shall be considered as any deviation from the specification or drawings or defect which can affect the performance of the involved equipment or system.
 - 8.1.1 Any deviations which can be properly corrected without violating the specification or drawings while using owner-approved procedures or methods shall not be considered a nonconformance.
 - 8.2 All nonconformances shall be reported to the OWNER by the CQAR in writing within 24 hours of their detection.
 - 8.3 The CONTRACTOR shall resolve to the satisfaction of the OWNER all nonconformances, including those issued to the CONTRACTOR by the OWNER, in a timely and judicious manner.
- 9.0 The CONTRACTOR shall interface with the OWNER'S quality assurance or start-up and test activities.
 - 9.1 The CONTRACTOR shall supply required support to the OWNER'S start-up and test activities as directed by the OWNER'S representative.
 - 9.2 The CONTRACTOR shall provide access for the OWNER'S quality assurance group to any work activities or specified documentation.

1.0 Measuring and Test Equipment

<u>Name</u>	<u>Serial No.</u>	<u>Application</u>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Contractor Tests

<u>Test</u>	<u>Date</u>	<u>Tester</u>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

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APPENDIX B

PENELEC SPECIFICATION GDE-JTWN-943

The terms as utilized in the following Specification in Appendix B shall have the following meanings per the Purchase Order and SUBCONTRACT:

- a. OWNER shall mean PENELEC.
- b. CONTRACTOR shall mean SUBCONTRACTOR.
- c. CONTRACT shall mean Purchase Order for all OFFSITE WORK and SUBCONTRACT for all ONSITE WORK in accordance with the definition of WORK as specified in Section I of this Specification.
- d. VENDOR shall mean SUBCONTRACTOR.

SPECIFICATION #GDE-JTWN-943

SPECIFICATION TITLE: GENERAL REQUIREMENTS AND INSTALLATION
DETAILS FOR ELECTRICAL CONSTRUCTION

DATE: APRIL 7, 1989

(SUPERSEDES PREVIOUS ISSUE DATED 8/30/88)

Generation Design Engineering
Pennsylvania Electric Company
Johnstown, Pennsylvania



Reviewed by: (Design Mgr.) RC. Himes Date: 4/7/89
(Q.A. Manager) W. B. Thomas Date: 4/7/89

SECTION I

GENERAL REQUIREMENTS AND INSTALLATION DETAILS
FOR ELECTRICAL CONSTRUCTION

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SECTION I

GENERAL REQUIREMENTS AND INSTALLATION DETAILS FOR ELECTRICAL CONSTRUCTION

1:01 Scope

This attachment covers general technical requirements for electrical construction at power plant facilities operated by the Pennsylvania Electric Company. These requirements supplement the electrical technical section of the Specifications from which this attachment is referenced. The applicable portions of this attachment shall become a part of the WORK requirements; however, it may contain requirements and information which do not apply to the actual scope of WORK for the project involved. The following items are covered by this document:

1. Preconstruction Requirements:
 - a. Work authorization.
 - b. Quality Assurance Program.
2. Identification of equipment and nameplate requirements.
3. Protection of electrical equipment and insulation.
4. Installation of the following including any fabrication requirements:
 - a. Terminal blocks.
 - b. Chases and openings.
 - c. Miscellaneous steel structures.
 - d. Electrical boxes and enclosures.
 - e. Electrical conduit.
 - f. Cable tray, wireway.
 - g. Cable, conductors and terminations.
 - h. Lighting fixtures and receptacles.
 - i. Grounding.

5. Shop prime painting and touchup painting.
6. Testing, adjusting and cleaning electrical equipment.

1:02 General

- 1:02.1 The points of connection and termination of the electrical WORK to be included herein are shown on the Drawings or stated in the referencing Specification. Should any doubt arise as to such points of connection and termination, the question shall be referred to the OWNER. Where such cases are referred to him, the OWNER will decide as to where the CONTRACTOR shall terminate the wiring, and his decision will be final and binding.
- 1:02.2 The Drawings for the WORK to be performed indicate the general arrangement desired. Exact location and details of construction may be modified as circumstances may require when so directed by the OWNER.
- 1:02.3 The Drawings shall not be considered as complete erection drawings. They do not indicate every fitting, junction box, outlet, etc., which shall be required to complete the job. The CONTRACTOR shall prepare field drawings, as required, for the use of his mechanics, to ensure proper installation.
- 1:02.4 The CONTRACTOR shall not change the basic design of the electrical systems as shown on the Drawings.

1:03 Work Authorization

Prior to performing any electrical work on the station equipment, the CONTRACTOR shall complete a Work Authorization form. The following steps shall be followed in completing the Work Authorization form:

1. The CONTRACTOR and the OWNER shall prepare the Work Authorization form outlining the scope of WORK. The CONTRACTOR and the OWNER will review the layout, circuit schedule and wiring diagrams prior to the CONTRACTOR starting the project.
2. The OWNER'S representative will assist the CONTRACTOR in safety tagging, isolation points and caution areas.
3. The Work Authorization form shall then be reviewed and approved by the Station Maintenance (Technical at Conemaugh, Homer City and Keystone Stations) Superintendent.
4. The OWNER'S representative will then isolate and tag the system and sign the Work Authorization form.

5. A copy of the signed Work Authorization form will be presented to the CONTRACTOR permitting him to begin his WORK.
6. The OWNER'S representative will be available for consultation and will indirectly supervise the CONTRACTOR'S WORK.
7. Any change in the scope of WORK, as described on the Work Authorization form, must be approved by the Station Maintenance (or Technical, if applicable) Superintendent.
8. If discrepancies with the approved drawings are found, all WORK shall cease and the CONTRACTOR and the OWNER'S representative shall investigate the discrepancies.

1:04 Identification of Equipment

- 1:04.1 The CONTRACTOR shall identify all circuits, conduits, conductors, terminal blocks, terminal points, and electrical apparatus as designated in the conduit and cable schedule and wiring drawings or as directed by the OWNER.
- 1:04.2 Identification shall be made at the time equipment is installed and shall be by permanent tags as follows:
1. Conduits shall be tagged with brass numbering checks attached to conduits with 14-gage (AWG) solid copper wire.
 2. Cables shall be tagged with fiber marking discs attached to cables with fiberglass cord or Thomas & Betts "Ty-Raps."
 3. Individual conductors shall be tagged with white preprinted plastic conductor sleeves (preferred) or adhesive strips.
 4. Cable routing shall be designated on fire-resisting linen tags. Tags shall be of flexible, tear-resistant material and completed with a waterproof ink.
- 1:04.3 Conduit and cable markers shall be die stamped with the appropriate circuit numbers by the CONTRACTOR, and individual conductors shall be labeled with the wire markings as shown on the wiring design drawings. All identification materials and equipment shall be furnished by the CONTRACTOR. A-c and d-c distribution cabinets, lighting cabinets, miscellaneous cabinets, etc., shall be furnished with nameplates. Circuit directories in these cabinets shall be typewritten by the CONTRACTOR.
- 1:04.4 Nameplates:
1. The CONTRACTOR shall provide nameplates for all electrical equipment which is required to be permanently identified, such as panelboards, junction boxes and control cabinets, except where the equipment is furnished with nameplates.

2. Nameplates shall be 1 inch by 3 inches or larger in size and shall be made up of two laminated black plastic sheets bonded with a middle sheet of white plastic. One of these black plastic sheets shall be engraved with characters not less than 1/4-inch high to the depth of the white plastic. The descriptions and designations engraved on the nameplate shall be as indicated on the Drawings, or where not shown, as directed by the OWNER.
3. The nameplate shall be fastened to the equipment with No. 2-56 by 3/16-inch Parker Kalon self-tapping, cadmium-plated, Type F, binding head screws.

1:05 Protection

In addition to the protection of electrical material and equipment, the CONTRACTOR shall, when considered necessary by the OWNER, provide, install, service, and maintain lamps, heaters and trickle current charging to the designated electrical equipment for protection of insulation from moisture penetration. This service shall include all required tools, labor, and supervision necessary and incidental thereto.

1:06 Terminal Blocks

Terminal blocks shall be 600 volt, heavy-duty, sectional terminal blocks, flat base for direct mounting. Terminal blocks shall be Buchanan Catalog #221, General Electric Co. #CR151A2, or as indicated on the Drawings or specified otherwise. Sliding link (fused or switch type) terminal blocks shall be provided for Programmable Logic Controllers (PLC) and other special control type applications.

1:07 Chases and Openings

- 1:07.1 Cutting, drilling, and punching of openings in buildings for passage of conduit, cable trays, or other equipment shall be performed in the field by the CONTRACTOR subject to the approval of the OWNER. Wall openings shall be minimized in size and quantity. Openings in exterior walls shall be sealed as well as possible.
- 1:07.2 Where steel reinforcing members required for openings are not indicated, they shall be properly sized, furnished and installed by the CONTRACTOR.
- 1:07.3 Cutting and patching of openings required after new walls are constructed shall be at the CONTRACTOR'S expense.

1:07.4 Where entrance is made by the CONTRACTOR into pressurized or air-conditioned rooms with conduit, cable tray or cable either through slots or sleeves provided for that purpose or through openings drilled or cut by the CONTRACTOR, these openings shall be sealed to reduce the air leakage from the rooms and so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resisting rated walls, partitions, floors, or ceilings shall be fire-stopped to maintain the fire-resistant rating. Thomas & Betts "Flame Safe" fire stop compound, or equal, shall be installed. During construction, penetrations when left unattended shall be sealed with a temporary fire stop material made specifically for that purpose.

1:08 Miscellaneous Steel Structures

1:08.1 Included hereunder are conduit racks and supports for miscellaneous enclosures, boxes, cabinets, housings, etc. These structures shall be fabricated from steel shapes, plates, bars, rods, etc., of standard section and painted after fabrication and/or from galvanized "Unistrut" with accessory members and fittings.

1:08.2 Fabrication shall be in accordance with typical Drawing details for structures such as conduit racks. Supports for miscellaneous enclosures, braces, cabinets, housings, etc., shall be fabricated in a neat, substantial, and approved manner. Where supports will be fabricated in the absence of drawings, the OWNER shall approve the structural support which the CONTRACTOR proposes to fabricate, both with regard to the type of construction and size of the members.

1:08.3 Structures shall be erected level, plumb, square, free from twists and at correct grade. The CONTRACTOR shall perform all incidental fitting, drilling, bolting, anchoring, and welding required to make structural connections and to complete the installation in a neat and workmanlike manner. Slag shall be chipped from welds. The welds shall be touched-up with an approved paint primer.

1:09 Boxes and Enclosures

1:09.1 Included hereunder are pull boxes, junction boxes, terminal boxes and outlet boxes. The foregoing will be representative of a varied assortment of material not specifically included elsewhere in this Specification.

1:09.2 The CONTRACTOR shall secure the boxes and enclosures in place, exercising appropriate care in handling. The design location of most of the smaller enclosures and boxes of this group will require supports above or below floor levels. However, some of the larger units may rest upon or be fastened to finished floor or curbs in floors. The location and sizes of the boxes and enclosures are shown on the various Drawings. Terminal boxes shall be mounted approximately 5 feet from box center line to the floor.

1:09.3 The CONTRACTOR shall furnish and install all required electrical boxes and enclosures. The boxes shall be erected level, plumb, and properly aligned. The boxes shall present a satisfactory appearance. They shall be securely attached to supports in an approved manner. The CONTRACTOR shall perform all drilling, welding, shimming and bolting required for attachment to supports. Where removal of contents is required to install boxes, the contents shall be put back to complete the installation.

1:09.4 Boxes and enclosures shall be provided with Neoprene (or approved equivalent) gaskets and hinged or captive covers with nonferrous screws. Each box shall have the box number or other identification clearly indicated on the front cover with an engraved nameplate per Section 1:04.4 and on the back of the front cover by stencilling or with self-adhesive 2" black numerals and letters on a yellow background. Terminal blocks shall be mounted vertically to the inside-back of the box unless the Drawings show otherwise. Conduit entrances shall be made in the side or bottom; no top entrances shall be permitted. Outdoor boxes shall be NEMA Type 4 watertight construction. Indoor boxes shall be NEMA 12 dusttight construction. Hoffman Engineering or approved equivalent enclosures shall be used. CONTRACTOR-fabricated enclosures shall not be permitted unless approval for specific boxes and enclosures is obtained from the OWNER.

1:10 Electrical Conduit

1:10.1 The CONTRACTOR shall install all conduit required for the WORK. The conduit and cable schedule will list the size, kind and length of conduit to be run. The length of conduit listed shall be checked before installation. The conduit shall be galvanized rigid-thick wall steel conduit in accordance with specifications and dimensions for standard thick wall hot-dipped galvanized conduit, as set forth in Federal Specification WW-C-581d(3). Fittings shall be threaded type.

1:10.2 Galvanized rigid-thick wall threaded conduit shall be installed for power and control. The minimum size conduit to be used shall be 3/4 inch, except where the Drawings show otherwise.

1. Nylon or plastic fish tapes shall be used to prevent scoring the interior coating and walls of the conduit.
2. Only sharp dies, preferable self-cleaning type with a tooth rake of about 35 degrees, and approved cutting oil shall be used for cutting threads on rigid conduit.

- 1:10.3 The size of the conduit to be used for the various runs shall be as noted on the Drawings. All conduit ends shall be covered with capped bushings, wood plugs, or other approved means until the cable is pulled. Conduit openings into NEMA rated enclosures shall be permanently sealed with sealing compound after cables have been pulled in such a manner to maintain the NEMA rating of the enclosure.
- 1:10.4 Flexible "Sealtite" steel conduit with PVC jacket shall be used only where indicated on the Drawings.
- 1:10.5 Plastic conduit, rigid heavy wall schedule 40 polyvinyl chloride (PVC) may be used in areas as shown on the Drawings or approved by the OWNER. The plastic conduit shall be used only in an unenclosed outdoor and subsurface applications. Thin wall PVC conduit, concrete encased, may be used in certain applications.
- 1:10.6 All conduit for lighting and receptacle branch circuits to be installed in offices and service buildings will be thin wall, steel conduit (EMT) electrogalvanized on the outside and enameled on the inside and conforming to Federal Specification WW-T-860b. Rigid galvanized steel conduit is to be used for lighting and receptacle branch circuits within the generating stations.
- 1:10.7 No more than four 90-degree bends will be allowed in any run of conduit. Where more bends are required, a pull box shall be installed.
- 1:10.8 Conduits shall be neatly run and evenly spaced with conduits in parallel when in ducts or banks. All field bends required shall be uniform, long radius sweeps, bent on a suitable bender without flattened cross sections on bends. Conduit shall be cut in an approved manner. Burrs shall be carefully removed with file, butt reamer, or other approved means. Conduit runs shall consist of all required condulets, couplings, Ericksons and other fittings. Conduit and fittings shall provide full thread engagement, structural rigidity and low electrical resistance to ground across joints. Arrangement of conduit and boxes shall be such that the conductors may be removed and replaced at any future time.
- 1:10.9 The CONTRACTOR shall be responsible for installing all necessary supports so that conduits will be properly aligned, level and plumb, and present a satisfactory appearance. Conduits shall be securely attached to supports in a good and approved manner, and the CONTRACTOR shall perform all required drilling, welding, bolting, etc.
- 1:10.10 Metallic conduit connections to metal enclosures shall be made with threaded hubs (Myers Scru-Tite or Equal) unless the Drawings show otherwise. The hubs and nuts shall be in firm contact with metal surfaces to provide low electrical resistance to ground across joints. All open conduit ends shall have bushings unless other terminations are required. Weep holes shall be drilled in low points of conduit runs and pull boxes where directed by the OWNER.

1:10.11 Conduit links between permanent structures and terminal boxes on equipment requiring rapid replacement by spare equipment in case of failure, shall consist of flexible steel conduit. Flexible conduit shall also be placed as a connecting link in other applications such as motor conduits and instrument conduits, where shown on the Drawings or when directed by the OWNER. Where "Sealtite" flexible conduit is used, the special grounding bushing furnished shall be used.

1:11 Cable Tray and Wireway

1:11.1 Power and control cable systems shall be ladder-type cable trays. Instrumentation tray shall be solid cable tray as indicated on the Drawings. The cable trays shall be steel, heavy-duty and hot-dipped galvanized after fabrication. Support rungs shall be 9 inches for power and control cables.

1:11.2 Wireway for indoor areas shall be NEMA Type 12 dusttight and oiltight construction; weather-exposed wireways shall be NEMA Type 4 watertight and oiltight construction.

1:11.3 Cable trays and wireways shall be assembled with the highest standards of workmanship. The CONTRACTOR shall not install any cable tray or wireway that is not smooth and free of burrs, etc., which might damage cable.

1:11.4 The joint closure between sections of cable trays shall be accomplished by a reliable fast method using self-aligning bolts and nuts, or other means approved by the OWNER. This joint closure shall be capable of carrying the specified load without exceeding the specified maximum deflection.

1:11.5 Cable trays used for 600 volt and above power and control cables, which pass through floors, platforms, or areas indicated as hazardous on the Drawings, shall have a cover from the floor to 6 feet above the floor.

1:11.6 Instrument trays (solid tray) shall have a flat tray cover their entire length. All tray covers, where indicated on the Drawings, shall be securely fastened with proper hardware after installation of all cables. The type of tray covers to be used shall be as follows:

1. Outdoor: Peaked (power and control).
2. Indoor, outdoor vertical risers and all fittings: Flat.

The minimum radius for curved trays shall be as follows:

1. 12-inch radius for instrumentation cable.
2. 24-inch radius for 600-volt power and control cable.
3. 36-inch radius for 15-kV cable.

- 1:11.7 In other than horizontal runs, cables shall be fastened securely to the transverse members of the cable trays. Sufficient quantities of cable clamps in sizes to clamp cables with varying diameters shall be provided by the CONTRACTOR.
- 1:11.8 Cable tray hangers and supports shall be supplied by the CONTRACTOR and shall be erected level, plumb, square, free from twists and at correct grade. No skews or weaves in tray alignment will be permitted. The CONTRACTOR shall perform all incidental cutting, fitting, drilling, bolting, anchoring, and welding required to make structural connections and to complete the installation in a neat and workmanlike manner. Slag shall be chipped from welds and welds touched-up with an approved paint primer.
- 1:11.9 Lines and grades will be maintained by the CONTRACTOR at or near joints where trays change direction, and support locations along tray runs shall be per manufacturer's recommendations. In all cases, cable trays shall be supported at intervals required for firm support and neat alignment. In no case shall supports be placed at intervals exceeding 10 feet.
- 1:11.10 While trays are intended to be installed where shown on the Drawings, it may be determined before a particular tray section has been installed that change in line or grade will be required where- upon the trays and supports shall be installed in accordance with required changes. These changes must be approved by the OWNER.
- 1:11.11 Clips to anchor tray support members shall be attached to concrete by expansion bolts. They shall be attached to building steel by continuous fillet welds in accordance with the manufacturer's recommendation. Tray systems shall be suitably braced against movement in longitudinal as well as transverse direction.
- 1:11.12 Exposed edges of expanded metal fabric or other sharp edges will not be permitted in tray system. Where lengths of tray or prefabricated fittings are field cut, ends shall be finished either by installation in tray clamps or by suitable tray edge binding, tack-welded in place in a neat and approved manner. Cut ends shall be painted with a cold galvanizing paint.
- 1:11.13 In some instances during the cable tray installation, it may be necessary to cut and bind the sides or bottom of trays for cable entrance into enclosures. Where cuts are made, binding shall be installed on cut edges. Smooth round bends shall be made. Edges of trays approaching bends shall be flared to form smooth, round corners.
- 1:11.14 Expansion splice plates shall be used on outdoor trays where indicated on the Drawings.

- 1:11.15 The CONTRACTOR shall be responsible for installing all tray barriers as shown on the Drawings. The CONTRACTOR shall also be responsible for clearly indicating with self-adhesive 3" black numerals and letters on a yellow background the voltage that the cable tray will carry and any tray number that is applicable as shown on the Drawings. The identification shall be applied at both ends and at intervals not exceeding 50 feet.
- 1:11.16 Wireways shall be installed on the lines and grades as per the Drawings using Vendor-supplied standard sections, elbows, tees, connectors, and other fittings as required to achieve a complete, finished system. Oil-resistant gaskets shall be positioned between flanges of all sections and fittings. In all cases, wireway shall be supported at intervals required for firm support and neat alignment.
- 1:12 Installation of Cable
- 1:12.1 The kind and size of cable to be used for the various circuits, as well as the size of conduit, where required, is listed on the Drawings. Listed also in the conduit and cable schedule will be the estimated total length of cable and conduit for various circuits. The length of cable listed in the conduit and cable schedule shall be checked before cutting and pulling the cable. The conduit, into which cable is to be pulled, is indicated on the Drawings by circuit designations.
- 1:12.2 All wire and cable will be delivered to the job in standard coils on reels with approved tag noting length, wire size, insulation type, and manufacturer's name; will be suitably protected from weather and damage during storage and handling; and shall be in first-class condition when installed.
- 1:12.3 Cables shall be installed in an orderly arrangement with a minimum of interlacing and shall be racked in cable racks or trays in passing through manholes. In manholes or handholes, pull boxes or junction boxes having any dimensions over three feet, all conductors shall be cabled and/or racked in an approved manner. Care shall be taken to avoid sharply bending or kinking conductors, damaging insulation or stressing cable beyond the manufacturer's recommendations during pulling. Cable shall be protected from absorption of moisture, both before and after pulling, subject to the direction of the OWNER.
- 1:12.4 Multiconductor copper cable with overall jacket for 480-volt circuits and 120-volt ac control circuits shall be laid in cable trays in any quantity up to the limit of the capacity of the trays.
- 1:12.5 Cable attachments for pulling shall be patent cable grips or other devices subject to the approval of the OWNER. Difficult pulling is not anticipated. However, if unduly difficult pulling occurs, the CONTRACTOR shall check pull required and suspend pulling until further procedure has been approved by the OWNER. Maximum pull

tension shall not exceed the manufacturer's recommended value for the cable when measured by a tension dynamometer. A wire pulling compound approved by the cable manufacturer shall be utilized to facilitate pulling of cables. Grease or other materials harmful to insulation shall not be used. Care shall be exercised in the pulling of jacketed cable to avoid damage to the cable jacket.

- 1:12.6 Cable shall be formed to avoid sharp bends over edges of conduit bushings upon entering or leaving boxes or cabinets, and to avoid bearing against edges of trays or enclosures and supports when entering or leaving trays or enclosures. Insulated wiring to terminals and terminal boards shall be formed and neatly cabled or clamped, using Ty-Raps at approximately six-inch intervals between conduit and terminals.
- 1:12.7 Where outlet box, cabinet, metal clad switchgear, control board, panel or other terminal points for cable are equipped with cable or wiring troughs or gutters, the CONTRACTOR shall pull sufficient length of each cable to permit the neat arrangement of all entering cables. Leads shall be formed and cabled or clamped as each conductor is brought to its terminal connection.
- 1:12.8 The minimum radius to which an insulated conductor should be bent during installation is eight times the overall maximum diameter of the cable. Single conductor shielded conductors should not be bent less than twelve times overall cable diameter. This shall apply whether the bend is a permanent one or a temporary one made during the course of construction. In those cases where this is not practicable, the OWNER shall approve the radius to be used.
- 1:12.9 Splices will not be permitted except where called for by the Drawings or where permitted by the OWNER. Splices, where permitted, shall be made in a neat, workmanlike and approved manner by men specialized in this class of WORK. Splices shall be made by the CONTRACTOR for each type of wire and/or cable in accordance with instructions issued by the cable manufacturer or by the OWNER. Insulated cable shall have conductor insulation stepped and bound or penciled for recommended distances back from splices before splicing, in order to provide a long leakage path. Insulation equal to that on the spliced conductors shall be applied at each splice after the splicing is completed. In baring conductors for splices, special care shall be taken to avoid nicking strands. Splices shall not be made in tray or conduit.
- 1:12.10 At cable terminal points where the conductor and cable insulation will be terminated, the termination shall be made in a neat, workmanlike and approved manner by men specialized in this class of WORK. Particular attention shall be given to higher voltage conductor terminations. Terminations shall be made by the CONTRACTOR for each type of wire or cable in accordance with instructions issued by the cable manufacturer. Connections at motor leads and

other connections to insulated leads, current transformers or busses shall be covered and taped in a manner appropriate to the class of insulation on the conductor. The taping shall extend over the terminal connector fitting and the terminal of the conductor to the device. All irregular connections and surfaces shall be plastered smooth with insulating compound before taping.

- 1:12.11 Power cables shall be terminated with T&B connectors, to be furnished by the CONTRACTOR except where terminals are being furnished as a part of the equipment or otherwise provided. T&B 54,000 series compression connectors shall be used for all 600-volt power cables along with the recommended crimping tools.
- 1:12.12 Terminations and splices may be made using pre-packaged, heatshrinkable type kits. All materials shall be clean and of recent manufacture. The terminations and splices shall be made in accordance with the termination manufacturer's instructions with tools and heating equipment approved by the manufacturer and the OWNER.
- 1:12.13 Control, metering and instrument cable terminations shall be made in accordance with the wiring diagrams. The CONTRACTOR shall install solistrand insulated ring tongue type connectors with proper crimping tools to terminate all control, metering and instrument cables.
- 1:12.14 Conductors shall be checked for continuity at both ends in order to determine if connections have been made in accordance with the wiring diagrams. Polarity or phasing shall be checked before connections are made. Correction of polarity, phasing, rotation, and connections shall be made at no additional cost to the OWNER and shall be in accordance with the instructions of the OWNER.
- 1:12.15 The internal wiring of the electrical and mechanical miscellaneous cabinets to be installed will be complete and in most cases will be brought to terminal blocks to which the external connections will be made. There will be a few cases in which the external connections will be made directly to the instrument or device. In general, the cables will leave the cable trays and run to the terminal blocks provided.
- 1:12.16 Vertical runs of cable shall be supported by Kellems grips except where the horizontal supporting run is 50% greater in length than the vertical drop.
- 1:12.17 For OWNER-furnished wire and cable, the CONTRACTOR shall be responsible for maintaining control of cable inventory and storage so that the remaining quantity of the various sizes and kinds of cables furnished by the OWNER shall be known at all times. The records of cables received, used and unused shall be submitted to the OWNER as requested.

- 1:12.18 The cable reels shall be kept in a secured storage area separate from the main construction area until the cable is to be pulled. All empty reels shall be promptly returned to the storage area.
- 1:12.19 If additional cable is required, the CONTRACTOR shall advise the OWNER of the size, type and quantity not less than 6 weeks in advance of its requirements.
- 1:12.20 Cables will be furnished in maximum lengths and reel sizes available. The CONTRACTOR shall be responsible for cutting the cable in adequate lengths to suit the needs of each circuit listed on the circuit schedule. Rereeling of cutoff lengths for handling during installation shall be part of the routine WORK. Rigid inventory control shall be provided to insure efficient utilization of the cable furnished to the CONTRACTOR.
- 1:12.21 In general, cable for this installation will be 600-volt stranded tinned-copper, with FR-EP or XLPE insulation with or without grounding conductors, twisted and covered with a neoprene, CPE or Hypalon overall jacket. Cables constructed with polyvinyl chloride (PVC) are unacceptable.
- 1:12.22 The CONTRACTOR shall keep a daily record of cables terminated, checked, and ready for OWNER'S check out. This shall be performed by daily marking one set of the cable schedule sheets and the one-line wiring diagrams, noting thereon the date when the respective WORK was performed. This set of cable schedule sheets and one-line wiring diagrams shall be kept in the CONTRACTOR'S office and shall be available to the OWNER at all times.
- 1:13 Lighting Fixtures and Receptacles
- 1:13.1 Lighting fixtures, mounting brackets, switches and 120-, 208- and 480-volt receptacles of the various types specified on the Drawings shall be installed in an approved workmanlike manner in accordance with the Drawings and NFPA 70.
- 1:13.2 Lighting fixtures, as shown on the Drawings, are not intended to show mounting details, but are intended to show the assemblies of standard catalog parts required to make up the entire fixtures.
- 1:13.3 Mounting details will not in all cases be shown by the Drawings. Where the cataloged fixture bases are provided with mounting holes, fixtures shall not obtain sole support from connection conduit or conduit fittings. The CONTRACTOR shall install expansion bolts in masonry to install the fixture or shall install other support as may be consistent with best installation practices.
- 1:13.4 Any conductor used solely for equipment grounding purposes shall be color coded green and shall not be used for any purpose other than grounding.

- 1:13.5 Splices shall be made in outlet, pull or junction boxes. Splices in conduit, conduit fittings and cable trays shall not be permitted. Splicing of wires from 12-gage (AWG) up to and including 8-gage (AWG) shall be made with pressure-type, solderless splicing connectors which shall be installed on the wires by means of a proper crimping tool making three or more indentations per connector. The connectors shall be insulated with vinyl insulating caps and shall be as manufactured by Buchanan Electric Products Company or approved equivalent.
- 1:13.6 The CONTRACTOR shall install all lighting fixtures, photocells and contactors (provided by OWNER unless noted otherwise), excluding lamps as shown on the Drawings and as set forth in the specification fixture schedule. All fixtures and lamps shall be installed in place, wired, connected, tested and left in a satisfactory operating condition.
- 1:13.7 Each fixture, receptacle and switch installed shall be complete with all appurtenances, such as ballasts and individual lighting fixture transformers shown as part of the assemblies on the lighting fixture detailed drawings.
- 1:13.8 Wire and cable for feeder and branch circuits shall meet all relevant ASTM specifications and shall be supplied by the CONTRACTOR unless noted otherwise. The conductors will be soft-drawn copper (stranded) and will have cross-linked polyethylene insulation.
- 1:14 Grounding
- 1:14.1 The CONTRACTOR shall install all copper bar, cable, braids, ground rods, connectors, supports, connections and clamps for the grounding system. Materials shall be as shown on the Drawings. Additional details concerning the installation shall be given under the Detailed Specification.
- 1:14.2 Metal raceways, metal enclosures of electrical devices, switchboard enclosures, transformer frames and equipment shall be completely grounded in an approved manner and in accordance with the latest edition of the National Electric Code, Article 250. The necessary conduit, conductors, clamps, connectors, etc., for the grounding system shall be furnished, installed and connected by the CONTRACTOR.
- 1:14.3 Bonding between service equipment, raceways, boxes, electrical equipment, etc., shall be done in order to ensure electrical continuity of the grounding conduit. Cable trays shall be bonded to their associated switchgear ground buses and to entrance conduit to form a continuity to ground. Pull boxes, expansion joints and flexible conduit shall have jumpers to insure continuity in rigid conduit systems.

- 1:14.4 Each cable tray system shall be solidly grounded at both ends to the ground bus or to building steel which is effectively connected to the ground grid. Where specified, a continuous grounding conductor shall be run along one outside tray flange and secured at approximately 5'-0" intervals with an approved clamp or fastener to insure continuity of the tray grounding.
- 1:14.5 The location of the ground bus and structures and equipment to be grounded is shown on the Drawings. All exposed noncurrent carrying metal parts of fixed equipment that can become energized under abnormal conditions shall be interconnected by conductors to provide an adequate path for ground-fault current to flow from any possible line-to-ground fault to the appropriate terminal at the system's source.
- 1:14.6 All necessary trenching and backfilling shall be performed by the CONTRACTOR, unless otherwise noted.
- 1:14.7 Grounding connections that will eventually be embedded in concrete or buried in earth shall be made with either brazed connections using the thermite weld process or with compression connectors specifically manufactured for this application. The manufacturer's instructions shall be thoroughly carried out whenever connections are made by means of thermite welding.
- 1:14.8 An application of No-ox-Id shall be applied to all copper and steel parts where copper to steel connections are made.
- 1:14.9 The complete system, in general, shall have a resistance to the ground of less than 3 ohms, and in no case shall it exceed 25 ohms to ground per NFPA 70.
- 1:14.10 The ground conductor shall in no case be held in place with Ty-Raps, but will be supported every 10' by an approved metal clamp.
- 1:14.11 Unless noted otherwise, the minimum wire size to be used for grounding shall be 2-gage (AWG) bare stranded soft-drawn copper cable.
- 1:15 Painting
- 1:15.1 The CONTRACTOR shall clean and touch-up or refinish factory finished surfaces of electrical equipment furnished by him which are marred or soiled during the construction period.
- 1:15.2 Where electrical equipment, conduits, boxes, etc., have been removed or installed by the CONTRACTOR, cutting or welding, the surface appearance of all damaged areas should be restored. This should include priming and one (1) coat of finish paint, unless otherwise directed by the OWNER.
- 1:15.3 All unprimed support steel shall be primed and painted to match existing steel.

1:16 Testing, Adjusting and Cleaning

1:16.1 Upon completion of the WORK, all component parts, both singularly and as a whole, shall be adjusted and left in satisfactory operating condition. All testing equipment shall be furnished by the CONTRACTOR. All parts of the wiring system, including switches and other auxiliaries, shall be tested and proven free of unwanted grounds or other defects. Defects shall be corrected at no cost to the OWNER. All overload devices, including equipment supplied under other contracts, shall be set and adjusted to suit load conditions.

1:16.2 All measuring and test equipment shall be in good working order and properly calibrated.

1:16.3 All parts of the installation, including panelboards, etc., shall be cleaned, dusted or washed, and adjusted to the satisfaction of the OWNER. Where required, a manufacturer's representative shall be present to start equipment and instruct personnel.

1:17 Quality Control

1:17.1 The CONTRACTOR shall implement a Quality Assurance Program which meets the requirements set forth in Quality Specification PS-11.01, "Contracted Services - Electrical Installation."

1:17.2 The OWNER'S Quality Assurance Department reserves the right to inspect all WORK and witness testing for acceptance to the Specifications and Drawings.

1:17.3 The CONTRACTOR is responsible for any rework resulting from unsatisfactory WORK.

1:17.4 The OWNER'S Quality Assurance Department reserves the right to specify welding and burning requirements contained in Quality Specification PS-8.01C, "Contracted Services Structural Welding", relative to structural components such as supports for cable trays and conduit racks.

APPENDIX C
WORK SCHEDULE

The dates below shall be utilized for bidding purposes and planning the WORK. Final dates will be established by PENELEC.

<u>Description</u>	<u>Start Date</u>	<u>Completion Date</u>
Demolition and Removal	04-20-91 (12:01 a.m.)	04-27-91 (11:59 p.m.)
Duct Fabrication		03-22-91
Structural & Misc. Steel Fabrication		03-18-91
Foundation Installation		03-18-91
Duct Support Structure Erection		03-28-91
Duct Extension Erection (Including Duct Insulation)		04-17-91
Platforms, Weather Enclosure, & Misc. Steel Erection (not associated with Boiler tie-in)		04-17-91
Boiler tie-in (Including Duct Insulation)	04-20-91 (12:01 a.m.)	04-27-91 (11:59 p.m.)
Platforms, & Misc. Steel Erection (associated with Boiler tie-in)	04-20-91 (12:01 a.m.)	04-27-91 (11:59 p.m.)

NOTE: P2 schedule must be submitted with Proposal, outage related portion must be Bid three (3) shifts per day, 8 hours per shift, SUBCONTRACTOR shall specify shifts per day on all nonoutage work.

Project Planning Requirements - P2 Schedule Requirements

A. The SUBCONTRACTOR shall submit with his proposal three (3) copies of the following:

1. A detailed schedule of work in time-phased precedence network form, the minimum requirements for which are listed in Section B below;
2. Manpower loading tables or curves by craft, week, and shift for the duration of work;
3. Manpower assignments by craft for each activity.

B. Minimum Requirements of Schedule

1. Precedence network shall represent true logic (assuming no manpower constraints). This network, after consideration of manpower constraints, shall be submitted in a time-phased format with the Proposal. Activity durations shall be in hours; for example, see Exhibit 1.

2. Listing of crafts to be identified for manpower loading and manpower assignments for activities is presented in Exhibit 2. Manpower loading tables by craft, week, and shift are shown in Exhibit 3.

3. Activity Breakdown:

Activity breakdown must be given for the following unless doing so results in activity durations of less than eight (8) hours.

- a. Location of work (for example, ash hoppers A, B, C, and D);
- b. Type of work being done (for example, cut tubes, prep tubes, fit tubes, weld tubes, etc.);
- c. Equipment being worked on (for example, primary, secondary, tertiary rifflers).

4. Activity Durations:

No activity duration shall exceed two (2) days.

Examples:

One (1) eight (8) hour shift per day:	Max duration 16 hours
Two (2) eight (8) hour shifts per day:	Max duration 32 hours
Three (3) eight (8) hour shifts per day:	Max duration 48 hours

C. Planner Requirements

The following is a summary listing of some of the major responsibilities and requirements which a SUBCONTRACTOR Planner needs to fulfill during PENELEC scheduled outages.

Even though some SUBCONTRACTORS do not specifically require a planner, this should not infer that these requirements do not need to be met. If a planner is not required, it will be the Project Superintendent or Project Manager's responsibility to fulfill the requirements.

1. Firm Price (LSB) Scheduling

Provide PENELEC outage planning with a signed-off Proposal schedule two weeks prior to the start of the work.

Provide outage planning with written requests and attend necessary meetings to discuss any required schedule changes.

Provide recovery plans in writing when requested if firm price work falls behind schedule.

2. T&M (Extra) Inspection Reports

Estimate extra work within 24 hours after receipt of inspection report. Obtain superintendents' input and approval on estimate.

Develop a CPM type schedule (no bar charts) for extra work within 24 hours after receipt of inspection report. Obtain superintendents' input and approval on schedule. The schedule must contain logic ties, start dates, manpower loading durations, and anticipated shifts/day and days/week.

Investigate work details, price material/rentals, determine manpower availability, schedule and arrange for supporting services, and coordinate approved workscope with other work groups as necessary.

Monitor actual cost expenditures and advise Contractor Services and Outage Planning if additional funding is required. This should be done prior to overspending the original estimate. Provide reasons why additional funding is required.

3. Daily Reports

Provide descriptive and pictorial information which will indicate the amount of work accomplished vs the total amount of work which needs to be done. Indicate problem areas if delays occur.

- Arrange and order the report by specification section, piece of equipment, work location, and/or T&M inspection report number.

- (Examples of previous outage reports are available from the PENELEC Outage Planning Dept.).
- Progress should be up to date as of the previous shift.

Deliver report to Contractor Services and Outage Planning (2 copies total) by no later than 9:00 a.m. daily. This may require the Planner to alter his starting time or obtain assistance from others on an off shift.

Discuss report data with Contractor Services and Outage Planning if requested. Assist PENELEC personnel in completing Project/2 update sheets if requested.

D. General

1. The site planning personnel shall have a minimum of one (1) year's experience in precedence network scheduling for the type of work being done by the contractor.
2. Float on activities shall be a common resource for the outage (project). The owner reserves the right to insist that the SUBCONTRACTOR meet intermediate dates within the "original schedule" to complete the work.
3. Requests by SUBCONTRACTOR for changes to network logic or "original schedule" shall be accompanied by a written explanation of circumstances forcing such a change. These changes, if approved, shall not relieve the SUBCONTRACTOR from meeting original outage milestones unless approved by the owner.
4. The SUBCONTRACTOR must also provide within one (1) working day a schedule for any additional work assigned during the course of the job. This schedule shall meet all the requirements listed in Section B. Acceptance of original work shall not relieve the SUBCONTRACTOR from meeting the "original schedule" for lump sum work unless approved by PENELEC.
5. Upon award of agreement, the planner(s) and superintendent(s) the SUBCONTRACTOR plans to have on site shall review, resolve PENELEC comments, and initial the "original schedule."
6. If requested, the SUBCONTRACTOR shall provide update and/or progress information on forms provided for input into PENELEC's computerized scheduling system.
7. Any actual and/or projected deviation from the "original schedule" shall be reviewed and reconciled by the SUBCONTRACTOR's site superintendent. The corrective action to be taken by the superintendent to bring the project back on "original schedule"

shall be documented by the SUBCONTRACTOR's planner to the owner's satisfaction before 9:00 a.m. of the following work day.

8. If requested, the SUBCONTRACTOR shall provide a written schedule summary report upon completion of the project identifying overall problems in meeting the schedule and recommendations for performance of future projects.

APPENDIX D

SOIL AND ROCK CLASSIFICATION

The following sheets contain the soil and rock classification for borings in the area of the new CZD duct modification foundations. The location of the borings are shown on drawing C-787-100.

SOIL AND ROCK CLASSIFICATION SHEET

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: Pa. Drilling COORDINATES _____
 DRILLER: Clyde Gollihue
 CLASSIFIED BY: W.J.S./R.E.L. DATE: _____

SHEET 1 OF 3
 DRILL HOLE NO. 12
 ELEVATION 1083.33
 GWL 0 HRS 6.0
 24 HRS _____

Depth Ft.	Sample No.	SPT Blows/ 6 in.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.								
		Run	Core									
						Black fly ash & fill						
1	2	6	11									
2	6	7	7									
3	9	7	7									
5	4	12	7	4								
5	3	2	1									
6	2	1	2			Wet @ 6.0 feet						
10	7	2	1	1		Brown f. sandy clay, v.moist, medium to stiff						
8	2	3	3									
9	8	30	31			Silty fine to med. sand and gravel with sandstone fragments and small boulders, compact						
10	50	35	2	R								
15												
11	34	34	59	4								
12	60	31	36	59	3							
20	13	56	49	3	-							
14	28	46	33	40								
15	36	56	38	-								
25	16	51	49	2	R	Multicolored near bottom						

GILBERT ASSOCIATES, INC.
 SOIL AND ROCK CLASSIFICATION SHEET

SHEET 3 OF 3
 DRILL HOLE NO. 14
 ELEVATION 1084.13
 GWL 0 HRS 11.6
 24 HRS 7.7

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: Pa. Drilling COORDINATES _____
 DRILLER: Clyde Gollihue
 CLASSIFIED BY: W.J.S./R.E.L. DATE: 3-8-73

Depth Ft.	Sample No.	SPT Blows/ 6 in.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	%	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems etc.
		6	12	18						Range	Grain	
										Size	Shape	
										Core	Rec.	
Run	Core											
0												
2						See previous sheet						
4							96	72	10.0	9.6		
6									56.0			
						T.D. @ 56.0'						

GILBERT ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 3
 DRILL HOLE NO. 15
 ELEVATION _____
 GWL 0 HRS 16.0
 24 HRS _____

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: Pa. Drilling COORDINATES _____
 DRILLER: Frank Horton
 CLASSIFIED BY: R.E.L. DATE: 6-21-73

Depth Ft.	Sample No.	SPT Blows/ 6 In.				Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems etc.		
		6	12	18	24						Range Size	Grain Shape			
											Core	Rec.			
											Run	Core			
0		6	12	18	24										
5							COAL PILE								
10															
12.0							Black bottom ash & fly ash								
14.0	1	12	4	6	7										
15							Mottled brown and gray sandy clay, stiff, moist								
	2	8	9	11	12										
	3	6	8	10	10										
20															
20.5	4	10	8	12	10										
							Brown sandy clay w/fine gravel								
	5	36	38	40											
							Brown sand and gravel w/sandstone fragments, compact								
	6	38	42	47											
							Sandstone boulder								

GILBERT ASSOCIATES, INC
SOIL AND ROCK CLASSIFICATION SHEET

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: Pa. Drilling COORDINATES _____
 DRILLER: Frank Horton
 CLASSIFIED BY: P.T.L. DATE: 3-11-73

SHEET 2 OF 3
 DRILL HOLE NO. 15
 ELEVATION _____
 G.W. @ HRS. 10.0
 24 HRS _____

Depth Ft.	Sample No.	SPT Blows/ 6 in.				Feet	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	% b.t.s.-C.G.K.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18	24						Range Size	Grain Shape	
		Core	Run	Core	Core								
25		6	12	18	24	25.0							
	7	22	23	30	85	27.0	Brown sand & gravel, compact						
	8	9%	-	-			Sand, gravel & boulders						
30	9	5%	-	-		30.0							
	10	100	-	-			Brown sand & gravel w/cobbles						
	11	38	50	-		31.2							
35	12	100	37	50		36.5	Brown coarse sand and gravel, compact						
						37.6	Med. gray clay sh., v. high. broken & weath., soft			36.5		Top of rock	
						39.2	Lt. gray sandy silty shale, sl. to mod. broken, medium hd.	100	15	5.0	5.0	Top of competent rock	
40						40.5	Lt. gray clay shale, med. hd., sl. bkn.						
						42.5	Lt. gray sandstone, siltstone, & shale, interbedded med. hd. to hard			41.5			
						44.6	Med. gray clay shale, tr. carb. sh., sl to highly broken & weath., soft to med. hd.	100	43	5.0	5.0		
45						46.0	Med. gray siltstone w/ thin SS stringers, mod. hd. to hard, thin bedded			46.5			
						48.0	Dk. gray to black clay shale, hard, slightly broken	89	29	5.5	4.9		

GILBERT ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 4
DRILL HOLE NO. 17
ELEVATION 1085.9
GWL 0 HRS 13.3
24 HRS 7.5
48 HRS 7.2

PROJECT: Seward W.O. 044569-001 SITE AREA _____
CONTRACTOR: PA Drilling COORDINATES _____
DRILLER: Clvde Gollihue
CLASSIFIED BY: WJS DATE: 3/2/73

Depth Ft.	Sample No.	SPT Blows/ 6 in.	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	%	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.	
							R.Q.D.	Range		Grain
								Size		Shape
25		6 12 18								
30					Light gray, soft, broken and weathered clay shale					
						27.0				
						0 0	1.5	0		
							28.5			
						50 0	1.0	0.5		
							29.5			
33.6					Light gray sandy siltstone, thinly bedded, partly broken	78	15	5.5	4.3	top of competent rock
33.8										
35					Light gray clayey sandy siltstone thinly bedded, max pc 0.7 partly weathered 33.8 to 54.0 slightly broken to 39.0'					
							35.0			
						98	27	4.0	3.9	
							39.0			
40						98	52	4.5	4.4	
							43.5			
45					Dark gray to black clayshale some slickensides, medium hard, weathered seam 48:8 to 49.0 clay max pc 0.4'	88	41	6.0	5.3	
							49.5			

GILBERT ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 3 OF 4

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: PA Drilling COORDINATES _____
 DRILLER: Clyde Gollihue
 CLASSIFIED BY: WJS DATE: 9/10/79

DRILL HOLE NO. 17
 ELEVATION 1085.9
 C.W.L. HRS 15.3
 24 HRS 7.5
 48 HRS 7.2

Depth Ft.	Sample No.	SPT Blows/ 6 In.	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	% R.O.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.	
							Range	Grain		
							Size	Shape		
							Core	Rec.		
						REC	Run	Core		
59		6 12 18								
				58.9	Dark gray interbedded silty shale and shaley siltstone. max pc 0.8 many pieces .6 to .8	96	66	5.5	5.3	
								55.07		
						100	90	5.0	5.0	
								60.07		
				61.6	Coal hard and shiny, some bony					
				63.2						
				65.4	Dark gray to black clay shale some slickensides	99	70	10.0	9.9	
					Dark gray silty clay shale good rock max pc 2.0' broken 79.6 to 80.0'. slightly weathered along bedding planes between 76.0 and 80.0' no evidence of slumping or duetto mining					
								70.07		
						100	87	10.0	10.0	

GILBERT ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 4 OF 4
 DRILL HOLE NO. 17
 ELEVATION 1085.9
 SWL DEPTH 12.2
 48 HRS 7.2

PROJECT: Seaward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: PA Drilling COORDINATES _____
 DRILLER: Clyde Gollihue
 CLASSIFIED BY: MS DATE: 3/2/70

Depth Ft.	Sample No.	SPT Blows/ 6 In.	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	p.c. p.s.c.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
							Range Size	Grain Shape	
75		6 12 18							
78					Dark gray silty clay shale, good rock	100	87	10.0	10.0
					td @ 80.0 feet			80.0	

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2
 DRILL HOLE NO. 18
 ELEVATION 1081.85
 C.W.L. 0 HRS 9.0
 24 HRS 9.25

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: PA Drilling COORDINATES _____
 DRILLER: Frank Horton
 CLASSIFIED BY: WJS DATE _____

Depth Ft.	Sample No.	SPT Blows/ 6 in.				ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem etc.		
		6	12	18	24						Range Size	Grain Shape			
											Core	Rec.			
											Run	Core			
						1.0	Asphalt and base material								
	1	18	12	6	8		Brown sandy clay, coal and fly ash and bottom ash, moist								
	2	4	2	7	28										
5						5.5									
	3	21	12	14	15		Brown and gray mottled sandy clay and silt, stiff								
	4	12	10	10	14	8.5									
10						10.0	Brown and gray silty clay and fine gravel, stiff								
	5	9	16	18			Brown sand and gravel w/sandstone pieces, carbon lenses, very moist, compact								
	6	18	12	7		12.5									
	7	62	36	31	12		Brown coarse sand and gravel, pieces decomposed coal, compact, very moist								
15															
	8	15	18	35	50	16.0									
	9	39	35	-			Brown silty sand and gravel, heavy boulders, compact								
	10	75	2	2											
20						20.0									
						21.0	Decomposed sandstone								
							Gray shale, very badly broken and weathered								
						23.0									
							Gray, badly broken and weathered, soft clay shale				23.7				

GILBERT ASSOCIATES, INC
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2

PROJECT: Seward W.O. 044569-001 SITE AREA _____

DRILL HOLE NO. 18

CONTRACTOR: PA Drilling COORDINATES _____

ELEVATION 1081.85

DRILLER: Frank Horton

G.W. DEPTH 9.0

CLASSIFIED BY: _____

DATE: 3/1/70

C.A. NO. _____

Depth Ft.	Sample No.	SPT Blows/ 6 in.	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	% d ₅₀ -G ₅₀	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems etc.
								Range Size	Grain Shape	
								Core	Rec.	
								Run	Core	
25		6 12 18								
30						94 0		5.0	4.7	
								28.07		
				31.0	Top of sound rock <u>7</u>	98 0		4.0	3.9	
					Light gray, thinly bedded, medium hard, shaly siltstone			37.07		
35						92 21		5.0	4.6	
				34.0						
				37.0	Dark gray to black clay shale bony			37.07		
				37.5	Coal - black coal and bony					
				38.2	Black slickensided fossil cl shale					
				38.6	Coal and bony					
40					Dark gray silty shale medium hard w/streaks of fine grained sandstone, thinly bedded	100 56		5.0	5.2	rock adequate below 31.0'
								42.07		
45						100 60		5.0	5.2	
								42.07		
					td @ 47.0 feet					

GILBERT ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2
DRILL HOLE NO. 19
ELEVATION 1082.55
GWL 0 HRS 10.5
24 HRS 9.5

PROJECT: Seward w.o. 044569-001 SITE AREA _____
CONTRACTOR: PA Drilling COORDINATES _____
DRILLER: Frank Horton
CLASSIFIED BY: WJS DATE: 3/1/73

Depth Ft.	Sample No.	SPT Blows/ 6 in.				Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	% R.O.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem, etc.
		6	12	18	24					Range Size	Grain Shape	
								REC	Run	Core		
						1.0	Asphalt and base material					
	1	8	18	34			Fly ash, sand and gravel					
	2	26	31	18		4.0						
	5	3	6	6	8		Mottled brown and gray sandy clay, soft					
	4	4	4	3	4							
						8.0						
	5	4	7	6	7		Brown sandy silt and clay, soft					
						10.0						
	6	3	4	19	30		Brown sand and gravel w/sandstone pieces, trace silt and clay, compact, slightly moist					
	7	15	18	16	-	13.0						
	8	8	3	4	10		Brown silty fine sand, some gravel					
						15.0						
	9	1	7	12	23	16.0						
							Brown multicolored silty sand and gravel w/sandstone boulders, trace clay, compact					
	10	2	2									
	11	2	2						18.0			
	20							71	3.5	2.5		
									21.5			
	12	65	2	2								
	25					25.0						

GRIFFIN ASSOCIATES, INC.
SOIL AND ROCK CLASSIFICATION SHEET

PROJECT: Seward W.O. 044569-001 SITE AREA _____
 CONTRACTOR: PA Drilling COORDINATES _____
 DRILLER: Frank Horton
 CLASSIFIED BY: WJS DATE: 3/7/88

SHEET 2 OF 2
 DRILL HOLE NO. 19
 ELEVATION 1082.55
 O-L O HRS 10.5
 24 HRS 9.5

Depth Ft.	Sample No.	SPT Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	% +5.0-5.0 REC	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems etc.
		6	12	18					Range	Grain	
									Size	Shape	
									Core	Rec.	
Run	Core										
25											
30						Light gray badly broken and weathered clay shale, soft w/ pieces medium hard	97.0	7.0	6.8		
								32.07			
					33.0						
36						Light to medium gray, medium hard, shaly siltstone thinly bedded	100	3.0	4.0	Top of sound rock	
								36.07			
					38.8						
					39.7	Black slickensided shale					
40					40.1	Coal - black - hard	100	35	8.0	8.0	
					40.8	Black bony and clay shale					
					41.0	Coal, hard, broken					
						Dark gray, medium hard shale w/light gray sandstone streaks thinly bedded					
						48.0 to 49.0 - soft black shale but adequate in place					
								44.07			
45							100	4.0	5.0	5.0	
					49.0						
								49.07			

**APPENDIX E
DATA REQUIREMENTS AND SUBMITTAL SCHEDULE**

Specification Section	Document Description	Permission to Proceed Required		Requirement			
		Yes	No	For Review and Comment		For Record	
				Submittal Schedule	Quantity Required	Submittal Schedule	Quantity Required
1:02.2	Work Schedule	X		Note 1&3	4BC	N/A	N/A
1:03.4	Document List		X	Note 1	4BC	Note 4	4BC
1:03.8-1&2	Record Drawings and Sketches labeled "mark-up"		X	N/A	N/A	Note 4	1MY, 1SP & 5BL
2:03.1	Inventory List of Items to be Removed	X		Note 1	4BC	Note 4	4BC
2:03.7	Demolition Plan & Removal Procedure	X		Note 1	4BC	Note 4	4BC
3:01.2-1	Detail & Erection Drawings & Procedures	X		Note 2	1SP&5BL	Note 4	1MY, 1SP & 3BL
3:01.2-9 & 3:08-1	Mill Test Reports & Material Certifications		X	N/A	N/A	Note 3	4BC
3:06.2	Erection Schedule	X		Note 1	1SP&5BL	Note 4	1MY, 1SP & 3BL
3:08.2-b	Weld Maps		X	N/A	N/A	N/A	1MY, 1SP & 3BL
3:08.2-d	Repair Procedure	X		Note 2	4BC	Note 4	4BC
4:01.2-5	Shop Detail & Erection Drawings	X		Note 2	1SP&5BL	Note 4	1MY, 1SP & 3BL
5:01.2-3	Shop Detail & Erection Drawings	X		Note 2	1SP&5BL	Note 4	1MY, 1SP & 3BL
5:03.3-1	Duct jacketing color samples	X		Note 2	1	N/A	N/A
6:01.1-2	Shop Detail & Erection Drawings	X		Note 2	1SP&5BL	Note 4	1MY, 1SP & 3BL
6:01.1-9 & 6:12-1	Mill Test Reports & Material Certifications		X	N/A	N/A	Note 3	4BC
6:07.4-6	Paint Samples	X		Note 2	1	N/A	N/A
7:03.10	Source of Each	X		Note 2	4BC	Note 4	4BC
7:03.10	Material Certification and Test Results (Production)		X	N/A	N/A	Note 3	4BC
7:04.1-2	Special Placement Mix Design	X		Note 2	4BC	Note 3	4BC
7:04.1-8	Concrete Mix Design	X		Note 2	4BC	Note 4	4BC
7:04.2-1	Batch Plant Certification	X		Note 2	4BC	Note 4	4BC
7:04.3	Batch Ticket		X	N/A	N/A	Note 3	2BC

**APPENDIX E
DATA REQUIREMENTS AND SUBMITTAL SCHEDULE**

Specification Section	Document Description	Permission to Proceed Required		Requirement			
		Yes	No	For Review and Comment		For Record	
				Submittal Schedule	Quantity Required	Submittal Schedule	Quantity Required
7:01-2 & 7:05	Concrete Material and Qualification Test Results	X		Note 2	4BC	Note 4	4BC
8:03-1 & 8:03-4 & 8:08-5	Material Certification and Test Results		X	N/A	N/A	Note 4	4BC
8:04-4	Drawings and Schedules	X		Note 2	1SP&BL	Note 4	1MY, 1SP & 3BL
9:04.7-9-b	Repair Procedure	X		Note 2	4BC	Note 4	4BC
9:06.1	Concrete Preplacement Card	X		Note 3	4BC	Note 4	4BC
9:08.2	Curing Methods and Materials	X		Note 2	4BC	Note 4	4BC
10:04	Fill Compaction Test Results		X	N/A	N/A	Note 4	4BC
10:06	Pipe Pressure Integrity Test Results	X	X	Note 3	4BC	Note 4	4BC
11:06.3-m	Load-Bearing Test Report	X		N/A	N/A	Note 4	4BC
11:03.3 & 11:05.2	Driving Records & As-built locations of piles	X	X	N/A	N/A	Note 4	4BC

- Note 1: Submit prior to start of work
 Note 2: Submit prior to fabrication
 Note 3: Submit with each shipment
 Note 4: Submit for record

SUBMITTAL ADDRESSES

Notes 1, 2 and 4

Bechtel Corporation
 P.O. Box 139365
 San Francisco, CA 94119

Attn: J. Z. Abrams
 MC 50-15-C60

Note 3

Pennsylvania Electric Company
 Seward Station
 Seward, PA

Attn: Construction Manager
 CZO-Project

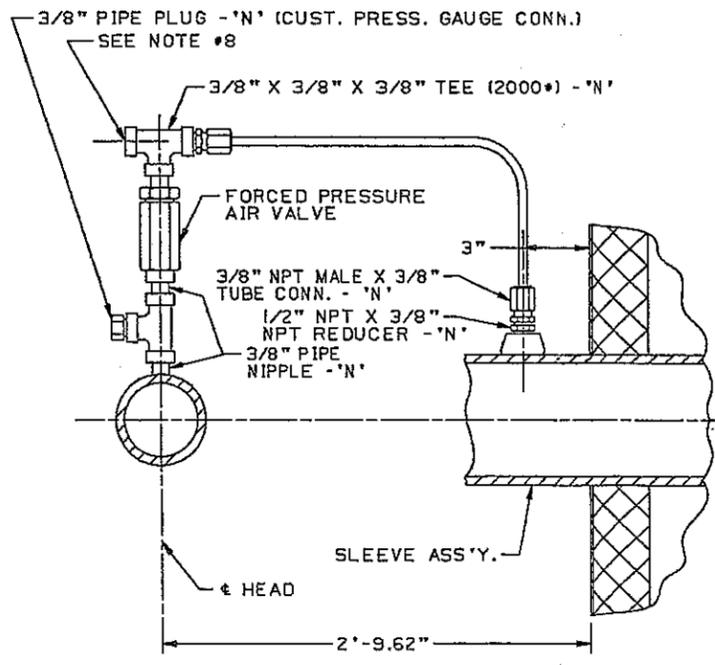
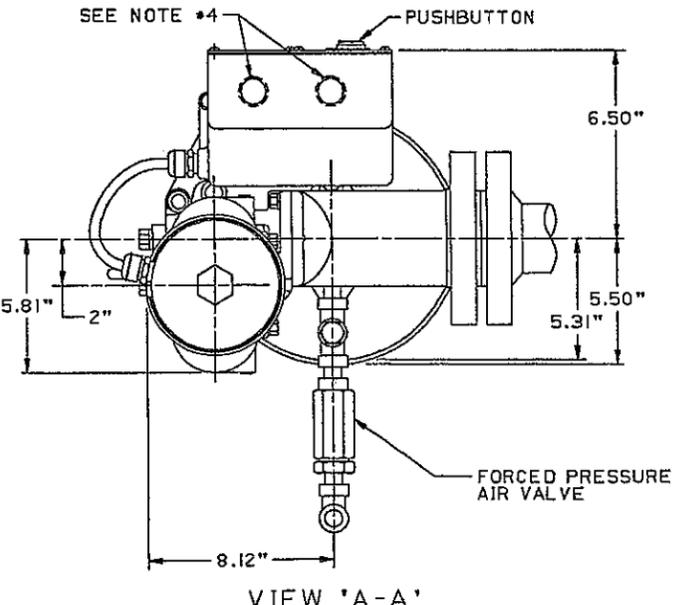
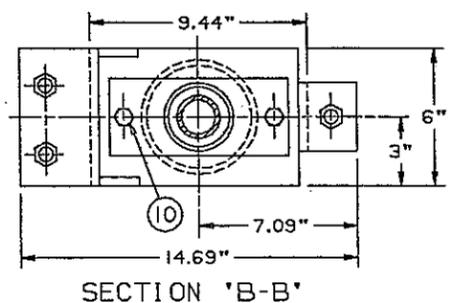
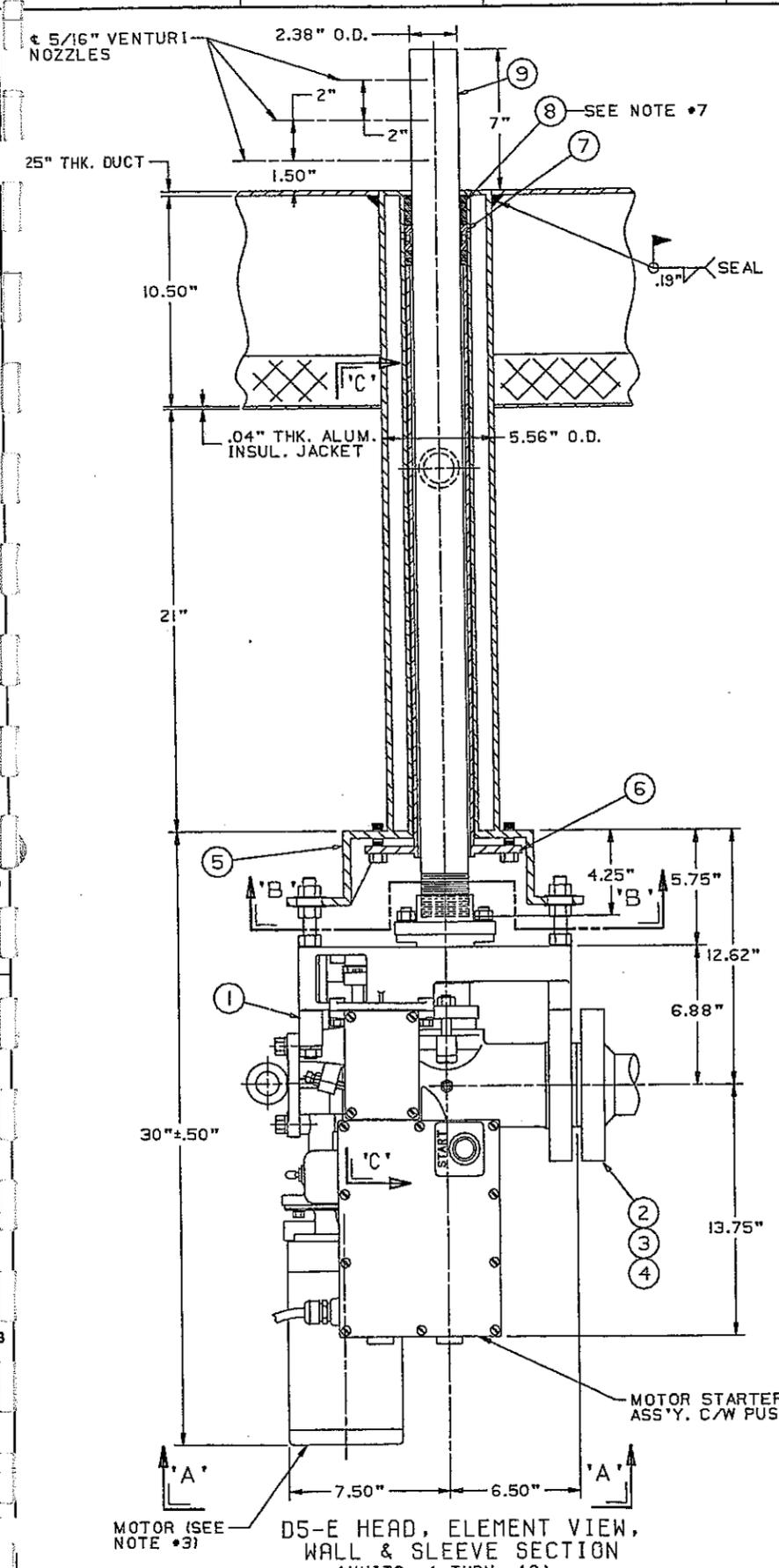
Note 5

Pennsylvania Electric Company
 1001 Broad Street
 Johnstown, PA

Attn: S. Higgins

Legend: BC = Bond Copies
 BL = Blue Lines
 MY = Washoff Mylar
 SP = Sepia

APPENDIX F
DRAWINGS LIST IN SECTION 1:03



BILL OF MATERIAL PER ONE BOILER			
PART NO. D5E		OPTION LIST	
ITEM NO.	QTY.	PART NO.	DESCRIPTION
2	10	065361	2.50" X 7.50" - 600# B.W. COMPANION FLANGE
3	10	268792	GASKET
4	80	041546	STUDS & NUTS
5	10	335412	SLEEVE ASSEMBLY
6	10	335413	PACKING GLAND ASSEMBLY
7	10	288770	LANTERN RING
8	60	279109	PACKING
9	10	335414	HYVULOY ELEMENT ASSEMBLY
10	20	002775	1/2" X 1-1/2" L.G. HEX HEAD CAP SCREW

- NOTES:
- FOR GENERAL NOTES & REFERENCE DRAWINGS, SEE DWG. E-335408.
 - ITEMS MARKED 'N' NOT FURNISHED BY COPES-VULCAN.
 - MOTOR WIRED FOR 460 VOLT, 3 PHASE, 60 HERTZ (1/8 H.P.).
 - 1" N.P.T. CUSTOMER CONNECTIONS (POWER & CONTROL).
 - ALL DIMENSIONS ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
 - SOOT BLOWERS SUITABLE FOR 65°C (149°F) MAXIMUM AMBIENT TEMP. EXCEPT FOR OVERLOAD HEATERS ON MOTOR STARTERS WHICH MAY REQUIRE CHANGING FOR AMBIENTS OVER 52°C (126°F).
 - 4 - PACKING RINGS INSTALLED BEFORE AND 2 - RINGS AFTER LANTERN RING (ITEM #7).
 - CUST. AIR CONNECTION TO BE MAINTAINED AT .50" W.G. ABOVE FURNACE PRESSURE. AIR CONSUMPTION RATE IS APPROXIMATELY 0.5 S.C.F.M..

COPES-VULCAN
 One of the White Consolidated Industries
 LAKE CITY IERIE CO., PA. U.S.A.

**SEWARD STATION
 BOILER 15**

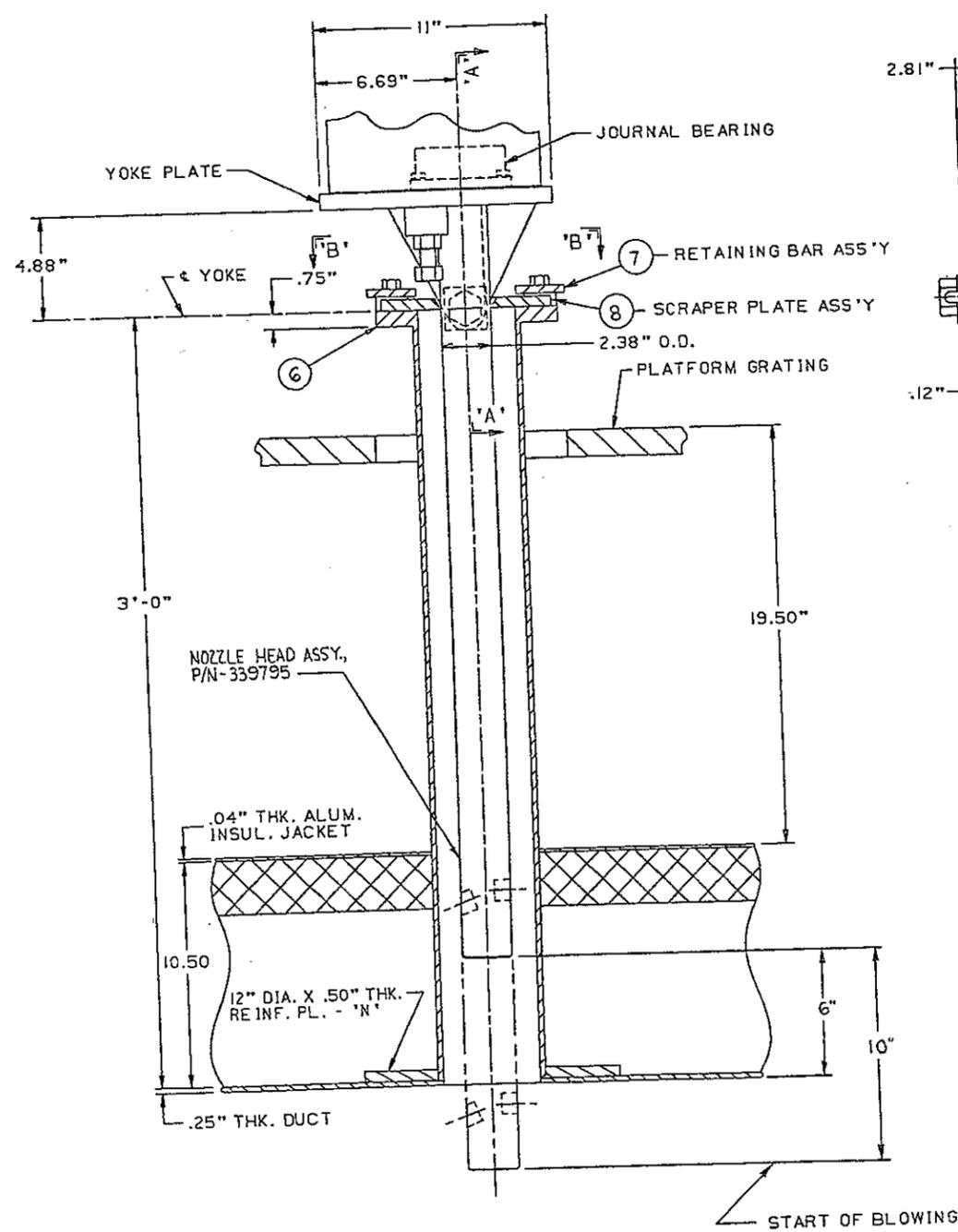
D5-E ROTARY VIEWS

DFTSMN RMG DATE 2-22-91 DSGN _____ DATE _____
 CHECKED TJM DATE 3-15-91 MFG _____ DATE _____
 APP'D JMS DATE 3-15-91 WELD/QC _____ DATE _____

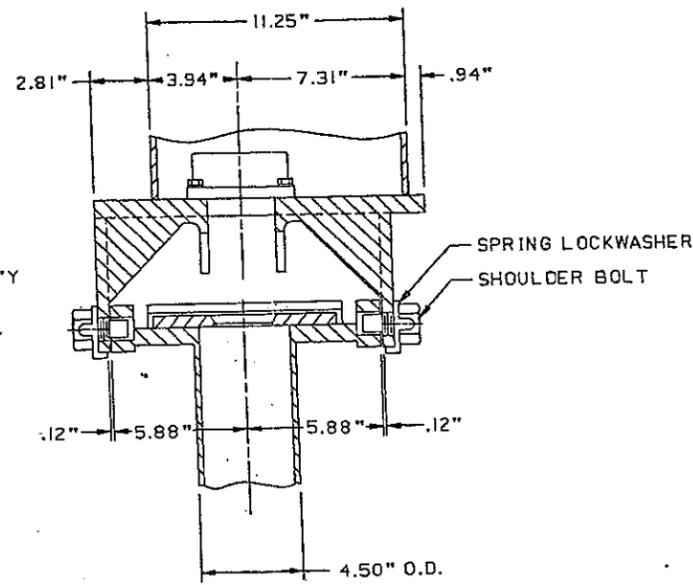
REPRO FROM D-328093
 SCALE 3"-1'-0" DWG. NO. D-335409
 PART CODE 6

NO	DATE	REVISIONS	BY	ECH	CHK	NO	DATE	REVISIONS	BY	ECH	CHK	NO	DATE	REVISIONS	BY	ECH	CHK
1	3-13-91	REV'D. PER BECHTEL MK'D. OF 3-6-91.	RMG		TJM												
2	3-12-92	UNITS #7 THRU #10 WERE "FUT." UPDATED VIEWS & B/M ACCORDINGLY PER C.V. JOB #9233-65432	DJO		TJM												

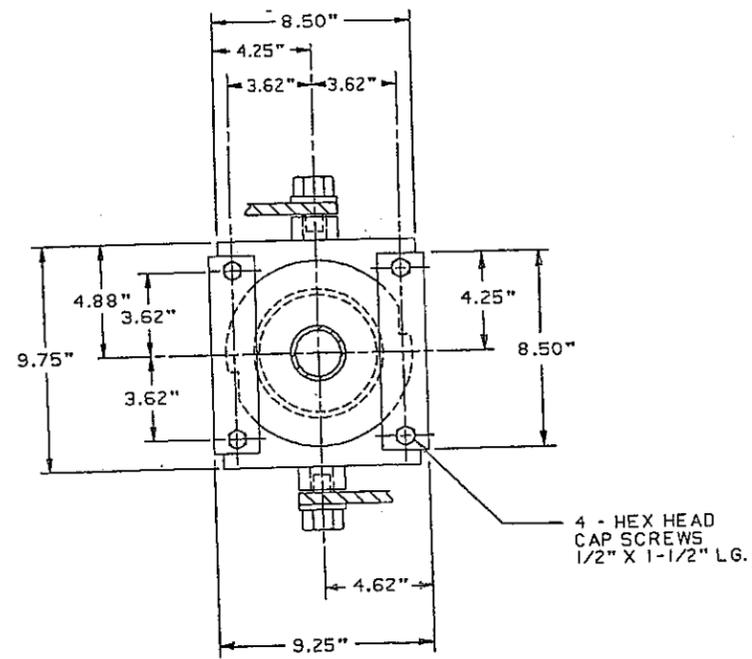
SBA.D5.EM-P-A.D-335409
 COMPUTER GRAPHICS FILENAME
 THIS DRAWING WAS PRODUCED BY ELECTRONIC METHODS. DO NOT REVISE MANUALLY.



WALL & SLEEVE SECTION
(UNITS #11 THRU #14)



PLAN SECTION 'A-A'
(LANCE OMITTED)



SECTION 'B-B'

NOTES:

1. FOR GENERAL NOTES AND REFERENCE DRAWINGS, SEE DRAWING E-335408.
2. ALL DIMENSIONS ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
3. FOR BILL OF MATERIAL AND T-20EV RETRACT VIEWS SEE DWG. D-339791.
4. ITEMS MARKED 'N' NOT BY C.V.

CONT. REF.: 9133-53384

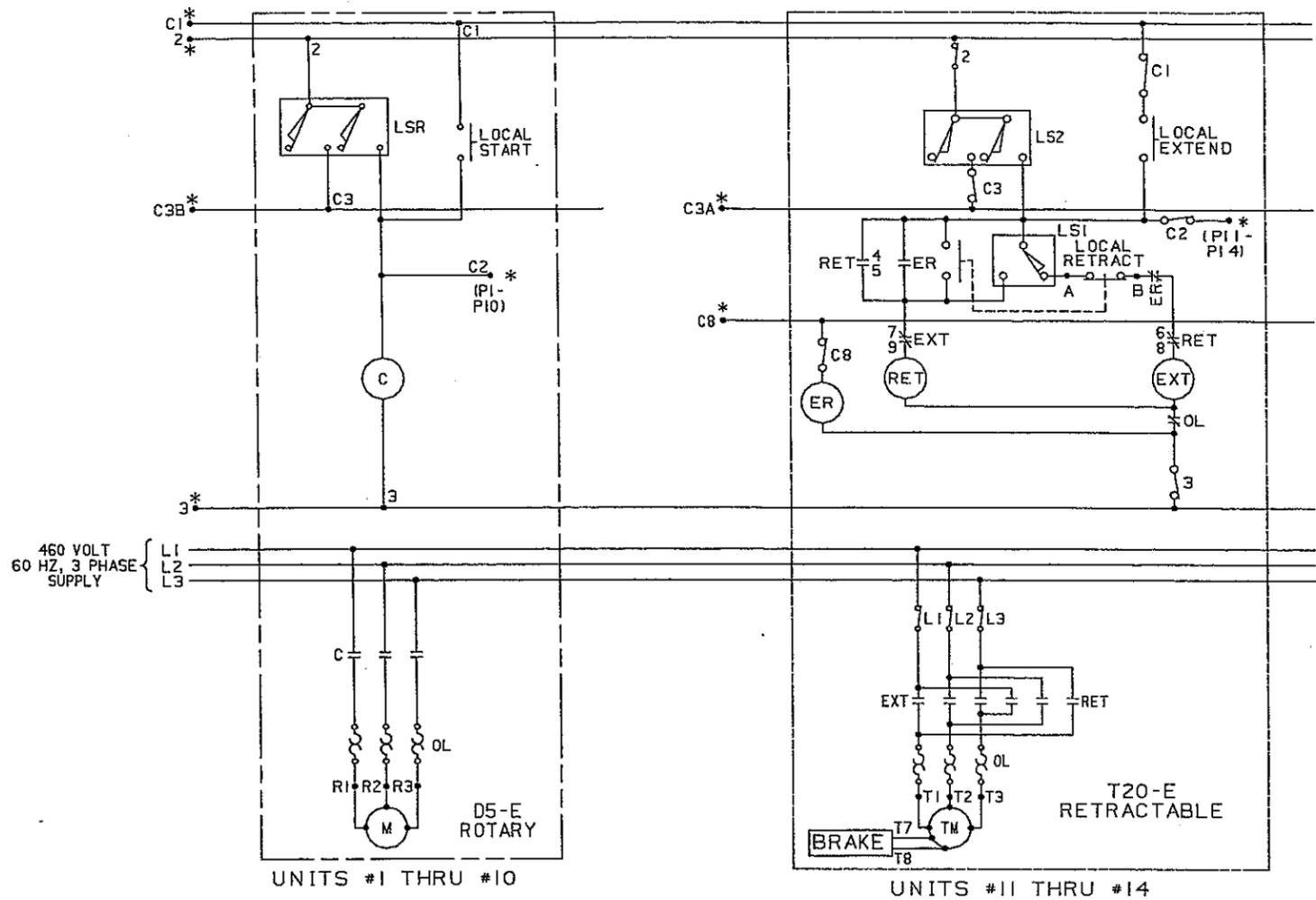

COPES-VULCAN
 One of the Waste Consolidated Industries
 LAKE CITY IERIE CO., PA. U.S.A.

**SEWARD STATION
BOILER 15**

**T-20EV SLEEVE VIEWS
(VERTICAL MOUNTED)**

REVISIONS															
NO	DATE	BY	CHK												

OFTSMN	KER	DATE 3-16-92	DSGN	DATE
CHECKED	TJM	DATE 3-23-92	MF6	DATE
APP'D		DATE	WELD/QC	DATE
MASTER ASSY		SUB ASSY		
JOB NO 9233-65431				
REPRO FROM D-325957				
PART CODE 6		SCALE 3'-1'-0"		DWG. NO. D-339792
				REV 0



SCHEMATIC

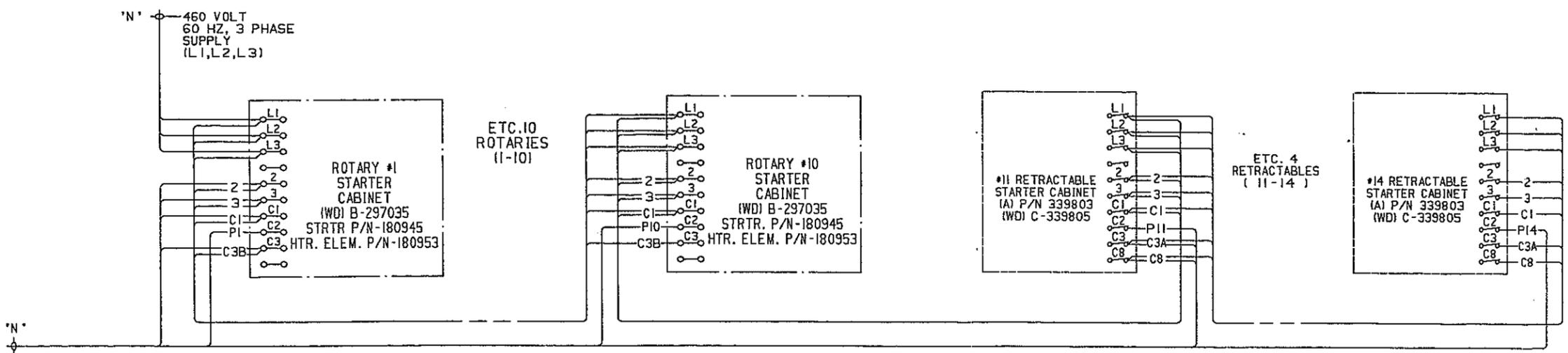
- NOTES:
- C - NON-REVERSING STARTER FOR ROTARY MOTION.
 - OL - THERMAL OVERLOAD RELAYS ON STARTERS FOR MOTOR PROTECTION.
 - M - ROTARY MOTOR
 - LSR - LIMIT SWITCH, TRIPPED WHEN ROTARY IS OPERATING.
 - C1 - START PERMIT FROM CONTROL PANEL
 - C2 - START SIGNAL AND FEED BACK TO CONTROL PANEL
 - C3 - IN SERVICE TO CONTROL PANEL
 - C8 - RETRACT SIGNAL TO CONTROL PANEL
 - 2,3 - 110 VOLTS 60 HZ 1 PHASE FROM CONTROL PANEL
 - EXT-RET - REVERSING STARTER FOR EXTEND-AND RETRACT MOTION.
 - TM - TRAVERSING MOTOR
 - LS1 - LIMIT SWITCH, TRIPPED MOMENTARILY IN THE FULLY EXTENDED POSITION.
 - LS2 - LIMIT SWITCH, TRIPPED WHEN RETRACTABLE IS FULLY RETRACTED.
 - ER - EMERGENCY RETRACT RELAY.
 - 'N' - NOT BY C.V.
- UNITS SHOWN WITH LIMIT SWITCHES IN 'AT REST' POSITION.

THIS DRAWING IS NOT INTENDED TO BE USED FOR CONSTRUCTION. IT ILLUSTRATES A TYPICAL WIRING ARRANGEMENT AND IS INTENDED ONLY AS A GUIDE IN PREPARING DETAILED PLANS FOR INSTALLATION OF INTERCONNECTING WIRING. IT SHOULD BE USED IN CONJUNCTION WITH THE SYSTEM SCHEMATIC WIRING DIAGRAM AND THE COMPONENT PHYSICAL WIRING DIAGRAMS TO DETERMINE ACTUAL WIRING ARRANGEMENT. ALL WIRING IS NOT BY C.V. UNLESS OTHERWISE NOTED

FIELD WIRING SHOULD BE ROUTED OR ARRANGED TO MINIMIZE INDUCED VOLTAGES (ELECTRO MAGNETIC INTERFERENCE) IN THE SOOTBLOWER CONTROL CIRCUITS. ROUTING UNSHIELDED SOOTBLOWER CONTROL CONDUCTORS IN THE SAME CONDUIT OR CABLE TRAY WITH HIGH VOLTAGES AND / OR HIGH CURRENT CARRYING CONDUCTOR MAY INDUCE SIGNIFICANT VOLTAGES. AN INDUCED VOLTAGE THAT CANNOT BE DISSIPATED BY 1/4 WATT 120,000 OHM RESISTOR IS EXCESSIVE.

* FOR CONTINUATION OF THESE POINTS, SEE DRAWING C-333724.

FOR LIST OF COMPLEMENTARY DRAWINGS, SEE DRAWING D-333723.



INTERCONNECTION (WIRING IS NOT BY C.V.)

WD.SCH.INT.R0-----D-333726
 COMPUTER GRAPHICS FILENAME
 THIS DRAWING WAS PRODUCED BY ELECTRONIC METHODS. DO NOT REUSE MANUALLY.

JOB NUMBERS:
 9233-65431 - T20-E
 9233-65432 - D5-E

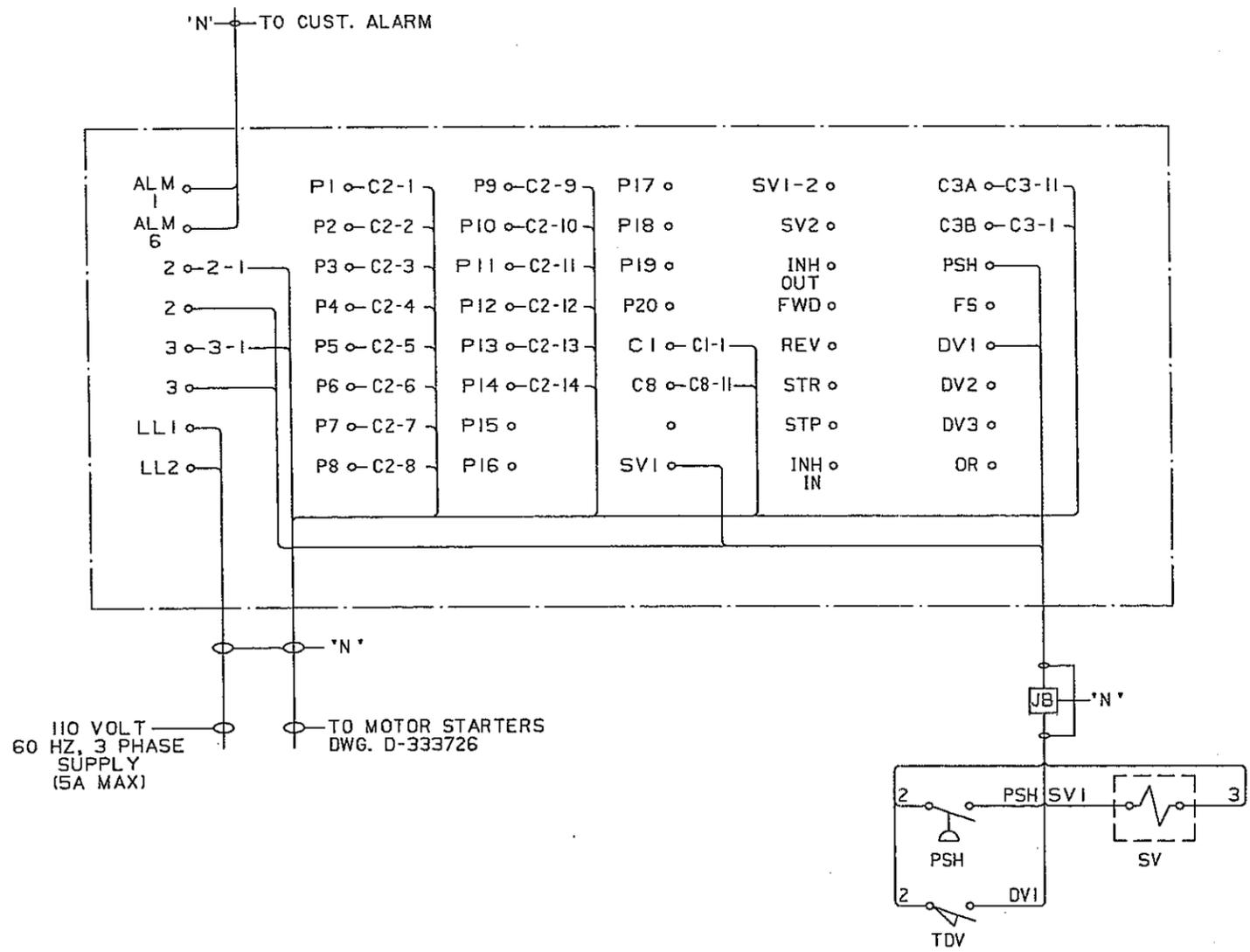
COPES-VULCAN
 One of the White Consolidated Industries
 LAKE CITY IERIE CO., PA. U.S.A.

SEWARD STATION BOILER 15

SCHEMATIC AND INTERCONNECTION WIRING DIAGRAM - BLOWERS

NO	DATE	REVISIONS	BY	ECN NO	CHK	NO	DATE	REVISIONS	BY	ECN NO	CHK	NO	DATE	REVISIONS	BY	ECN NO	CHK
1	3-10-91	ADDED (WD) B-297035 TO STARTER CABINET	MSD		AW												
2	3-10-92	ADDED UNITS 7 THRU 10 (D5-E) & 11 THRU 14 (T-20E)	MSD		AW												

MASTER ASSY	SUB ASSY	DATE	DATE
APP'D	DATE	DATE	DATE
REPRO FROM	DATE	DATE	DATE
PART CODE	SCALE	DWG. NO. D-333726	REV 2



- C1 - FIELD START PERMIT
- C2 - START/FEEDBACK LINES TO SOOT BLOWERS
- C3 - SOOT BLOWER OPERATING
- C8 - EMERGENCY RETRACT SIGNAL
- PSH - PRESSURE SWITCH
- TDV - THERMAL DRAIN VALVE
- SV - SOLENOID VALVE, ENERGIZE TO OPEN

'N' - NOT BY C.V.
 JB - JUNCTION BOX - 'N'
 FOR LIST OF COMPLEMENTARY DRAWINGS
 SEE DRAWING D-333723

WD.M20.EXT.D-333725
 COMPUTER GRAPHICS FILENAME
 THIS DRAWING WAS PRODUCED BY ELECTRONIC METHODS. DO NOT REVISE MANUALLY.

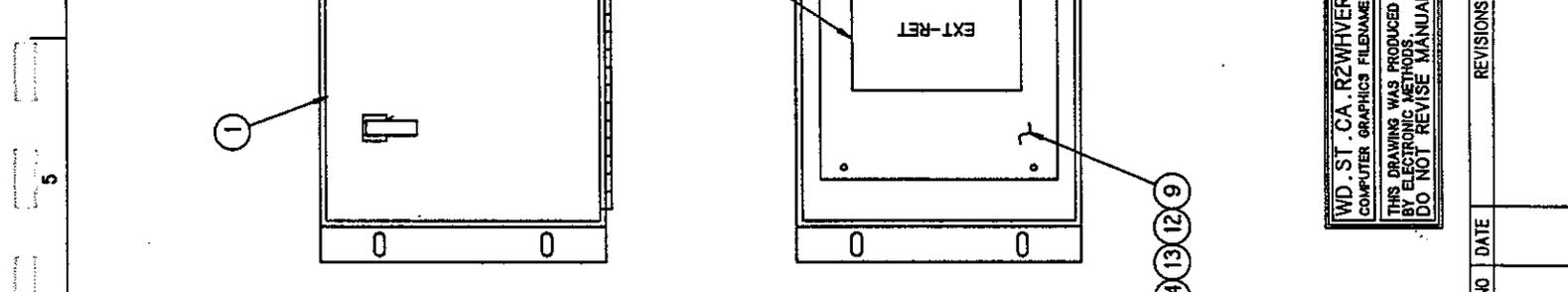
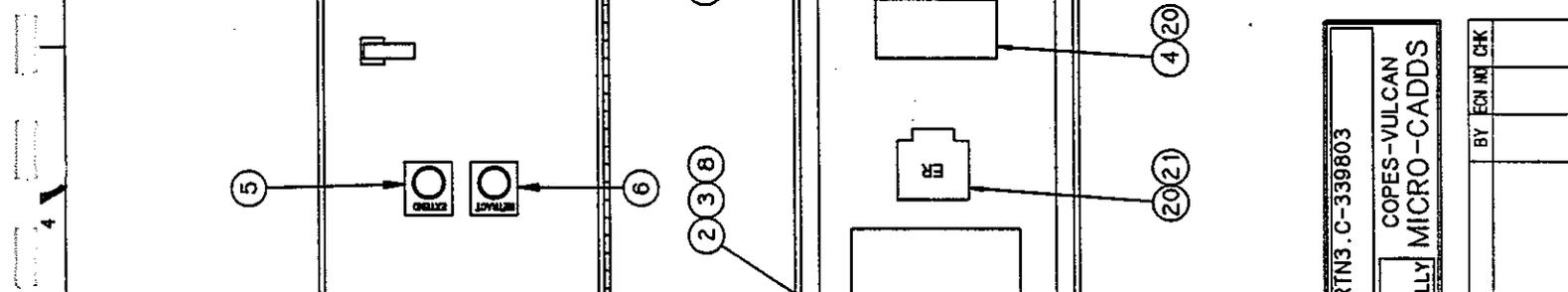
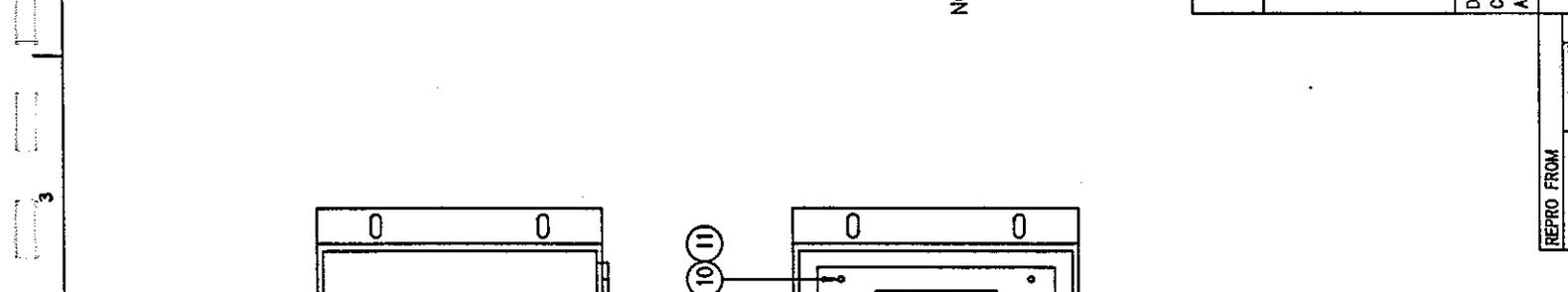
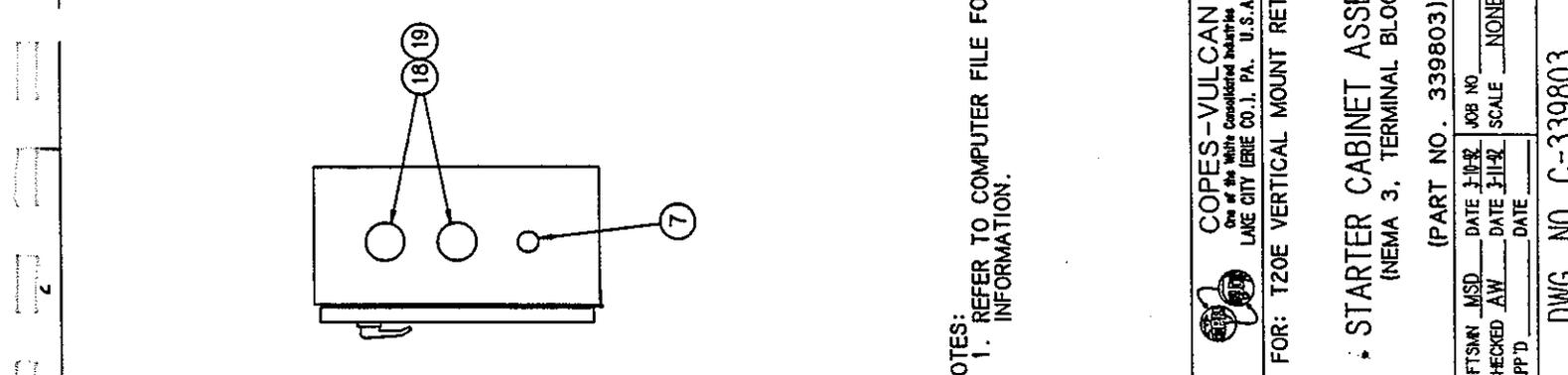
COPES-VULCAN
 One of the White Consolidated Industries
 LAKE CITY IERIE CO., PA. U.S.A.

**SEWARD STATION
 BOILER 15**

EXTERNAL WIRING DIAGRAM - PANEL

DFTSMN	MSD	DATE 2-28-91	DSGN	DATE
CHECKED	AW	DATE 3-5-91	MFG	DATE
JOB NO	9132-53385	APP'D	DATE	WEL.D/OC
REPRO FROM	PART CODE 6	SCALE	DWG. NO. D-333725	REV 2

NO	DATE	REVISIONS	BY	ECN NO	CHK	NO	DATE	REVISIONS	BY	ECN NO	CHK	NO	DATE	REVISIONS	BY	ECN NO	CHK
1	4-16-91	REV'D. TO DELETE SVI-2	MSD		AW												
2	3-9-92	REV'D. TO ADD UNITS 7 THRU 10 (D5-E) & 11 THRU 14 (T-20E)	MSD		AW												



NOTES:
1. REFER TO COMPUTER FILE FOR PART INFORMATION.

CORES-VULCAN
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

FOR: T20E VERTICAL MOUNT RETRACTABLE

STARTER CABINET ASSEMBLY
(NEMA 3, TERMINAL BLOCK)

(PART NO. 339803)

DFTSMN MSD DATE 1/1/82 JOB NO. _____
CHECKED AW DATE 1/1/82 SCALE NONE
APP'D DATE _____

DWG. NO. C-339803

REV 0

WD . ST . CA . R2WHVERTN3 . C-339803
COMPUTER GRAPHICS FILENAME

CORES-VULCAN
THIS DRAWING WAS PRODUCED
BY ELECTRONIC METHODS
DO NOT REVISE MANUALLY MICRO-CADDS

NO	DATE	REVISIONS	BY	CHK	NO	DATE	REVISIONS	BY	CHK

REPRO FROM _____ PART CODE _____

DATE: 5/05/92 TIME: 10:13:08
 PGM: R3DWGBM

COPEES-VULCAN
 CUSTOMER BILL OF MATERIAL

C/N= 002

PAGE 1

PARENT ITEM 339803

ITEM TYPE:IF

ASY, MSC, INT, N3, T20E, VERT, PB, ER DRAWING NO: C-339803 REV00

ITEM NO.	COMPONENT ITEM NO.	DESCRIPTION	ENGINEERING DRAWING NUMBER	QUANTITY PER	ITEM ALT UM TYP BOM
001	298482	CAB DETAIL	C-298482 REV00	1.	EA IR I
002	180943	STRTR		1.	EA IR I
003	180964	ELEM		3.	EA IR I
004	266186	BLOCK	M-266186 REV00	1.	EA IR I
005	197518	PB		1.	EA IR I
006	197519	PB		1.	EA IR I
007	078759	HUB		3.	EA IR I
008	090895	SCREW		3.	EA IR I
009	339804	PL	B-339804 REV00	1.	EA IR I
010	090913	NUT		4.	EA IR I
011	090914	WSHR		4.	EA IR I
012	090912	TY-RAP		1.	EA IR I
013	076766	TY-RAP		24.	EA IR I
014	035812	TERM		32.	EA IR I
015	035819	TERM		25.	EA IR I
016	050492	WIRE, #14AWG, BLACK, 600V, THHN		15.	LF IF I
017	051542	WIRE, #14AWG 19 STRND THHN, RED		30.	LF IF I
018	089339	HUB		2.	EA IR I
019	070373	CAPLUG		2.	EA IR I
020	090909	SCREW		6.	EA IR I
021	180950	RELAY	S-180950 REV00	1.	EA IR I

COMPLETE

10 9 8 7 6 5 4 3 2 1 0

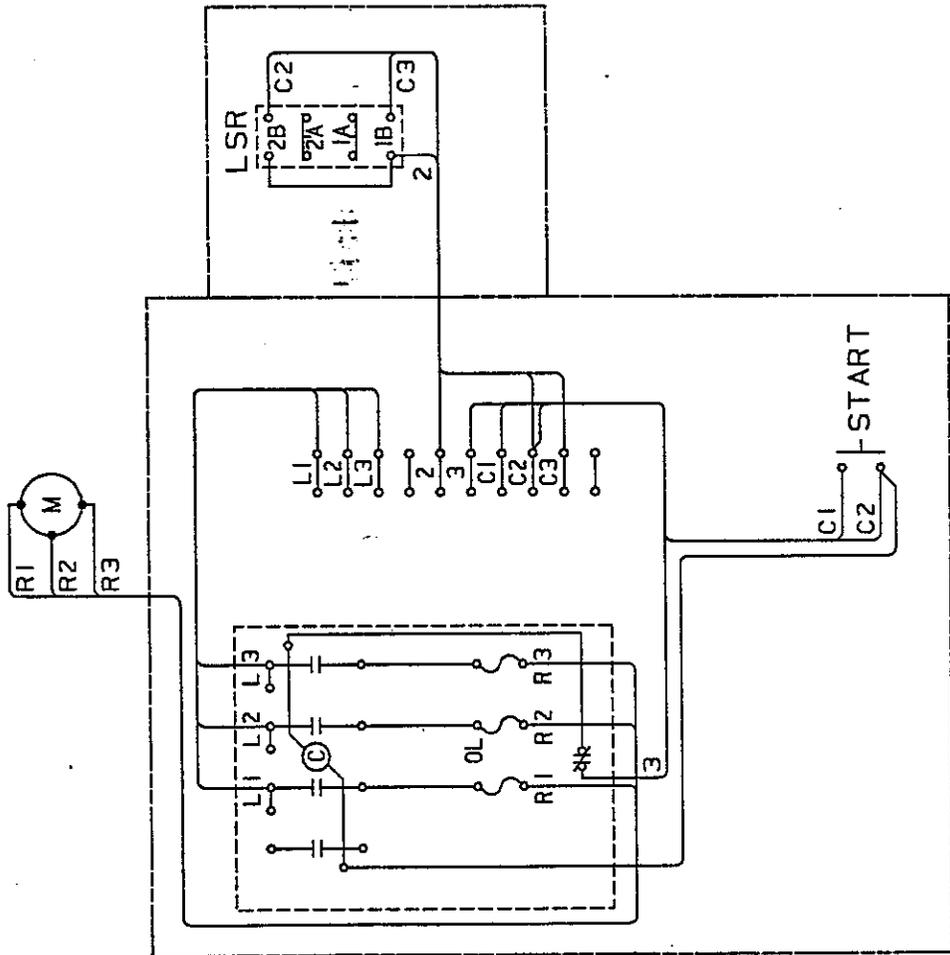
1

2

3

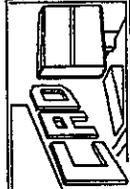
4

5



WD. ST. PHY. ROWH. B-297035
 COMPUTER GRAPHICS FILENAME

THIS DRAWING WAS PRODUCED
 BY ELECTRONIC METHODS. **COPE**
 DO NOT REVISE MANUALLY.



COPE-VULCAN
 One of the **Mills Consolidated Industries**
 LAKE CITY IERIE CO., PA. U.S.A.

**PHYSICAL WIRING DIAGRAM
 ROTARY WITH INTEGRAL
 MOTOR STARTER CABINET**

DFTSMN DO DATE 6-1-87 JOB NO _____
 CHECKED AW DATE 6-4-87 SCALE _____
 APP'D _____ DATE _____

DWG. NO. B-297035 REV 0

REPRO FROM _____ PART CODE _____

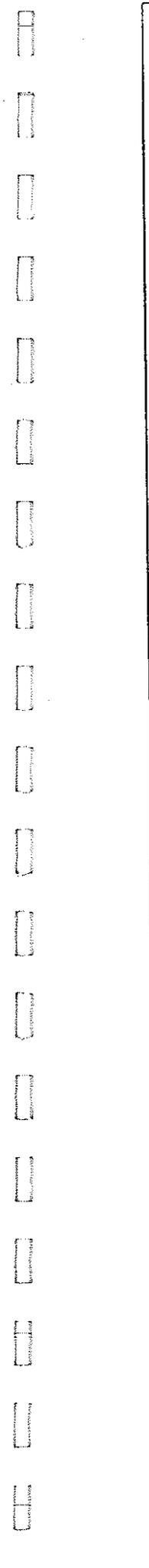
1

2

3

4

5





COPES-VULCAN
 Division of White Consolidated Industries
 LAKE CITY (ERIE CO.) PA. U.S.A.

STEAM CONSUMPTION DATA

CUSTOMER: SEWARD STATION BOILER 15	CUST. P.O. NO.: CV CONT. REF. NO. 9133-53384
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UNIT NUMBER	#1 - #10	#11 - #14
TYPE OF BLOWER	D5-E	T-20E RETRACT
GAS TEMP. (°F)		
NOZZLE QTY. - SIZE	(3) - .31"V.	(2) - .62"V.
BLOWING PRESS. (PSIG)	150	150
BLOWING RATE (PPH)	1,425	4,400
BLOWING TIME EACH (MIN.)	0.67	3.46
BLOWING ROTATION (°)	360	360
SPEED OF TRAVEL (RPM)	1.5 RPM	6.5
USE PER UNIT PER CYCLE (LBS)	16	254
TOTAL USE PER GROUP PER CYCLE (LBS)	160	1016

- NOTES: 1. BLOWING PRESSURE CAN BE REGULATED BY AN EXTERNAL ADJUSTING SCREW ON ALL MODEL 'D' HEADS.
 2. PRESSURES LISTED ARE TO BE CONSIDERED AS START-UP PRESSURES ONLY, AND NOT TO BE INTERPRETED AS FINAL. FREQUENCY OF BLOWER OPERATION, GRADE OF FUEL BURNED, AND BOILER OPERATION WILL AFFECT THESE PRESSURES.
 3. SOOT BLOWER ARRANGEMENT REF. SEE DRAWING E-335408.

2	3-12-91	UNITS #7 THRU #14 WERE "FUT." PER C.V. JOBS #9233-65431 & - 65432.	DJO	TJM	DFTSMN <u>RMG</u> DATE <u>2-28-91</u> CHECKED <u>TJM</u> DATE <u>3-15-91</u> APPD. <u>JMS</u> DATE <u>3-15-91</u>
1	3-13-91	REV'D. PER BECHTEL MK'D. OF 3-6-91.	RMG	TJM	DWG. NO. A-335436 REV. 2
REV.	DATE	DESCRIPTION	BY	CHK	