Request for Proposal: Hilltop HVAC and DHW Retrofit

Scranton Housing Authority
400 Adams Ave, Scranton, PA 18510

Published March 4, 2025

Section 1 - Request for Quotation and Instructions to Bidders

1. Request

(a) A firm bid for a **TURNKEY Installation**, retrofit and upgrade including associated design and permitting, is requested for the work described in the accompanying documents.

(b) The **Proposal Form, Section 2** (bid) shall be submitted electronically no later than 4:00 PM, EST, on March 31, 2025 to the following electronic addresses:

- jcapp@scrantonhousing.net (John Cappelloni, Deputy Executive Director, 570.348.4403)

(c) Bids received electronically after the stated time, and date without prior request and approval of extension of time, will not be accepted.

(d) In the event that you wish to decline to bid, please notify John Cappelloni at the email addresses listed above.

(e) Price shall be valid through December 31, 2025.

(f) The anticipated schedule of this RFP is as follows:

- 3/4/25 - RFP Release
- 3/10/25, 4:00 EST - Written Questions Due to jcapp@scrantonhousing.net
- 3/17/25 - Question Responses Issued
- 3/31/25, 4 pm EST - Proposal Form (bid) Due

If you would like to schedule a site walk, please reach out to John Cappelloni at jcapp@scrantonhousing.net, 570.348.4403 or Mike Morrison at 570.862.7185 between 3/4/25 and 3/28/25

2. Bid Preparation

(a) Bid must be written on company letterhead

(b) **Proposal Form** shall be **filled** out and submitted in accordance with the requirements outlined in the documents.

(c) The quotation shall be regarded as having been made with full knowledge of conditions and requirements. Bidders shall thoroughly examine and be familiar with Bid Documents; failure or omission of any Bidder to examine any form, instrument, addendum, or other document sent to and received by Bidder during the bid period shall in no way relieve Bidder from any obligation with respect to their quotation or to the subcontract. The submission of a quotation shall constitute evidence of compliance with this section.

(d) Quotations must be executed in the exact legal title or name of the Bidder, and the Bidder's business address and telephone number shall be given. In addition:

- If the quotation is made under an assumed or fictitious trade name, there shall be stated the names and respective resident addresses of all parties interested.
- If the Bidder is a partnership, the names and resident addresses of all parties interested.
- If the Bidder is a corporation, the state of incorporation shall be given.

(e) **All tax** should be included in pricing and reflected on the **Proposal Form** (bid)

(g) Use of Union Pipe Fitters is required for all piping work on this project.

(h**) The Scope of Work – Section 3** is a critical component of the pricing bid and shall be **completely** reviewed and referenced in accordance with the requirements outlined in these documents.

3. Bid Documents

The following items are enclosed with this request for quotation and comprise the sum total of the Bid Documents for this project, less addenda.

- Request for Proposal and Instructions to Bidders **(SECTION 1 this document)**
- Proposal Form **(SECTION 2 this document)**
- Scope of Work **(SECTION 3 this document)**
- Attachment A – MEP Drawings from 2001 Hilltop Boiler Decentralization Project
- Attachment B – Google Drive Link to Hilltop Photo Log
- Attachment C – Contract Documents, General Conditions for Construction HUD 5370, Instructions to Bidders for Contracts HUD-5369, Representations, Certifications, & Other Statements of Bidders HUD-5369A
- Attachment D – Project Specifications

4. Codes, Standards and Reference Documents

The work shall be performed in full accordance with the applicable provisions of the following:

1) Appropriate regulatory agencies and codes.
2) Local building departments and governing authorities.
3) Encroachment permits (if applicable).

5. Contract Documents

The Bidder's attention is directed to Attachment C – Contract Documents, General Conditions for Construction HUD 5370, Instructions to Bidders for Contracts HUD-5369, Representations, Certifications, & Other Statements of Bidders HUD-5369A for a description and listing of the Contract Documents.

6. Contract Documents to be Executed by the Successful Bidder

(a) Immediately after notice of award, Scranton Housing Authority shall issue the successful Bidder a Letter of Intent or PO stating the agreed upon compensation for the successful Bidder that is the selected subcontractor for the supply and installation of the project scope.

(b) Scranton Housing Authority will require the successful Bidder to furnish bonds covering the faithful Performance of the Subcontract and Payment of all obligations arising thereunder in such form and amount as Scarnton Housing Authority may prescribe and with such sureties as may be acceptable to Scranton Housing Authority. The cost of premiums shall be borne by the subcontractor and shall be included in the total quoted price.

7. Interpretations

(a) If a Bidder is in doubt as to the meaning of any section or part of the Bid Documents, he shall contact the individual listed in Paragraph 1(b) above.

(b) If a Bidder's question results in interpretations, deletions or additions to the Bid Documents, an Addendum will be issued and e-mailed to all Bidders. A follow-up telephone call will be made to each Bidder as well.

8. Site Visits

Please alert the individual listed in Section 1 (b) of this RFQ above if a site visit is needed prior to the bid due date.

9. General

(a) Time is of the essence and the successful Bidder shall have equipment on the job site and commence work in accordance with the start date on the Project Schedule.

(b) It is the Bidder's responsibility to provide all labor, materials, equipment and other facilities required to complete the work as there will be NO Change Orders issued unless "Substantial" increase to Scope has taken place. The Bidder shall be fully responsible for Pre and Post measurements including checkout and verification of their work. In the event any deficiencies or defects are discovered after the work is turned over to Scranton Housing Authority, then such deficiencies and/or defects shall be expeditiously corrected at the Bidder's expense.

(c) Upon notification of award, the subcontractor shall cooperate with Scranton Housing Authority in the preparation of a progress schedule (which will replace the Preliminary Schedule supplied at Bid Time along with the Proposal Form).

(d) Available work hours will be discussed and agreed upon with Scranton Housing Authority.

(e) Contractor Badges will be required to be worn when crew members are on Scranton Housing Authority property. These badges will be supplied by the Contractor. Crew members without badges displayed may be asked to leave the grounds/property until badge is displayed on the crew member.

Section 2 - Proposal Form

The Bidder shall submit his quotation on his company letterhead, following exactly the format shown herein.

Gentlemen:

We the undersigned, acknowledge receipt of the Bid Documents listed in Section 1 of your Request for Proposal **Hilltop HVAC and DHW Retrofit** dated **3/4/2025**.

We also acknowledge receipt of the following addenda and supplements to the Bid Documents and have included the costs associated therewith in our lump sum price. (List documents. If none, write "None".)

In strict compliance therewith we submit our Proposal:

A. Subcontracts

The proportion of Bidder's work to be performed by lower tier subcontractors is approximately _____% of the total work. (If none, write "None".)

State of PA Labor

The proportion of Bidder's work to be performed by Pennsylvania State Labor is approximately _____ % of the total work. (If none, write "None".)

B. **Experience, Ability and Intent**

We assert that we have the full knowledge and experience as well as the necessary available equipment and manpower to perform the work as required by the Contract Documents. We will place at the disposal of the work our skills and ability as subcontractor and mechanic. We will provide a sufficient number of skilled workers, under proper supervision with adequate equipment, so that the work will be completed in the most expeditious workmanlike manner.

C. **Base Bid Breakdown – Guaranteed Maximum Price (GMAX)**

This section is only included to summarize the bid. **BIDDERS CAN FILL OUT EITHER OR BOTH OF THE TWO OPTIONS BELOW.**

Option 1 – Hilltop Hydronic Retrofit Option

Costs	**Labor**	**Material**	**Subcontract**	**Totals**
Hilltop Hydronic Retrofit Option				
Total Base Bid Costs				
OH & Profit				
Total Base Bid Price				
Bonds				
Total Base Bid (including bonds)				

Option 2 – Hilltop Forced Air Retrofit Option

Costs	**Labor**	**Material**	**Subcontract**	**Totals**
Hilltop Forced Air Retrofit Option	_____	_____	_____	_____
Total Base Bid Costs	_____	_____	_____	_____
OH & Profit	_____	_____	_____	_____
Total Base Bid Price	_____	_____	_____	_____
Bonds	_____	_____	_____	_____
Total Base Bid (including bonds)	_____	_____	_____	_____

D. **Bonds**

If awarded this work, Bidder agrees to deliver to Scranton Housing Authority with the executed Subcontract Agreement Performance Bond and Labor and Material Bond as security for the faithful performance of the contract and/or for the payment of all persons performing labor or furnishing materials in connection therewith.

Name of Surety:_____

E. **Extra Work**

Our time and material formula which may be used to price change or additions to the work that may be authorized or directed by Scranton Housing Authority are as follows:

(1) Straight Time _____

(2) Payroll Taxes _____

(3) Overhead _____%

(4) Profit _____%

(5) Insurance _____%

(6) Equipment Rentals _____

(7) Materials – at cost plus % _____

(8) Premium Time _____

F. **Insurance**

If awarded this work, Bidder agrees to furnish prior to start of work at site an Insurance Certificate showing evidence of compliance with the requirements established by the Subcontract Agreement, including the required endorsement on the reverse side of the Certificate, and further agrees that if Bidder subcontracts any of the work, Bidders subcontractor(s) will comply with the insurance requirements and furnish his certificate. Errors & Omissions Insurance of $5M will be required as described in the Purchase Order Documents.

G. **Codes, Standards and Reference Documents**

The work shall be performed in full accordance with the applicable provisions of the following:

- PA and Scranton Jurisdictional Codes, bid doc narrative and specifications

H **Time of Completion**

Bidders must indicate below the calendar days required to perform the work. All schedules are subject to negotiation and agreement prior to contract award and all subcontractors will be required to perform their work in accordance with the overall schedule as directed by Scranton Housing Authority.

Calendar Days After Notice to Proceed:

Design: _____
Procurement: _____
Installation: _____
Commissioning: To be provided by a third party

I. **Scranton Housing Authority Contract Terms**

Attachment C - Contract Documents, General Conditions for Construction HUD 5370, Instructions to Bidders for Contracts HUD-5369, Representations, Certifications, & Other Statements of Bidders HUD-5369A will be used for contract terms. The bidder warrants that this pricing proposal is inclusive of all terms and conditions in these documents.

J. **Pricing Narrative** (Below or via attachment, please provide any pricing notes, assumptions, or approach data)

K. **Understanding and Certification**

We agree not to alter or withdraw our bid for a one hundred and eighty (180) day period from the day set for receiving the bids.

We understand and agree that Scranton Housing Authority reserves the right to reject any and all bids and to make an award to other than the low Bidder.

We herein certify that we and all our lower tier subcontractors will comply with all of the safety regulations and working rules while working on this project.

Submitted By:

_____	_____
(Name)	(Company Name)
_____	_____
(Title)	(Address)
_____	_____
(Date)	(City, State, Zip)

We are incorporated under the laws of the State of _____.

Our license number is _____.

Section 3 – Scope of Work

Scranton Housing Authority (SHA) is requesting a design build contract to replace the space heating and domestic hot water system at Building 25 located at Hilltop Manor. SHA is requesting prices for two different design approaches:

A. Option 1 - Hydronic (Boiler and Piping) Retrofit Option with a Water Conservation Valve Add
B. Option 2 - Forced Air (Furnace) Retrofit Option with a Water Conservation Valve Add

Bidders can use **Section 2 – Proposal Form** to provide a price on one or both of the options above.

While the selected contractor is expected to provide full design build services, this scope of work document outlines performance specification requirements for each option.

Existing Building Condition Description

Heating for the residences at Hilltop Manor is provided by hot water baseboard radiators. The radiators are served by decentralized boiler plants in each building. Each plant has a two-stage atmospheric boiler rated at 600 MBH capacity in a constant primary configuration with an indirect water heater for domestic hot water. Two primary 1/2 HP pumps serve the boiler, and a 1/12 HP pump circulates hot water to the indirect domestic hot water sidearm. The boiler plant is controlled by a Tekmar 262 controller and stages the controls based upon a call from the domestic hot water tank or a single zone sensor in the space. These systems are 25+ years old.

Domestic hot water is provided by the hot water plant via a 95-gallon Triangle Tube indirect water heater in each building. The storage set point is 120F. A 1/20 HP recirculation pump is controlled by an aquastat located in the mechanical room.

Please see Attachment A – MEP Drawing from 2001 Hilltop Boiler Decentralization Project for more details on the current space heating, domestic hot water, and hydronic piping systems. See Attachment B – Google Drive Link to Hilltop Photo Log for photo documentation of these systems.

The table below provides shell dimensions for typical hot water baseboard radiator convectors found in apartments. Convector unit data should be field verified by contractors for bidding purposes.

Radiators						
Building #	**Building Type**	**Unit #**	**Bedrooms**	**Location**	**Dimensions**	**Piping Diameter (in)**
10	A	820	2	Kitchen	44 x 20 x 6	1/2
10	A	820	2	Living Room	48 x 20 x 6	1/2
10	A	820	2	Bathroom	20 x 16 x 6	1/2
10	A	820	2	Bedroom #1	40 x 20 x 6	3/4
10	A	820	2	Bedroom #2	48 x 20 x 6	3/4
15	B	133	3	Kitchen	44 x 20 x 6	1/2
15	B	133	3	Living Room	48 x 20 x 6	1/2
15	B	133	3	Bathroom	20 x 16 x 6	1/2
15	B	133	3	Bedroom #1	40 x 20 x 6	3/4

15	B	133	3	Bedroom #2	48 x 20 x 6	3/4
15	B	133	3	Bedroom #3	48 x 20 x 6	3/4
33	C	101	1	Stairs	32 x 28 x 6	1/2
33	C	101	1	Kitchen	48 x 20 x 6	3/4
33	C	101	1	Living Room	56 x 20 x 6	3/4
33	C	101	1	Bathroom	20 x 16 x 6	1/2
33	C	101	1	Bedroom #1	40 x 20 x 6	3/4

The table below provides a representative list of major boiler room equipment currently at the site.

Representative Boiler Room Equipment						
Building #	**Building Type**	**Tag**	**Service**	**Make**	**Model #**	**Capacity**
24	A	B-24	Space Heat	HydroTherm	MR-600BPV	600 MBH
24	A	ST-24	DHW Storage	Triangle Tube	TR-100	95 Gal
24	A	P-24-1	Space Heat	Bell & Gossett	105089	1/2 HP
24	A	P-24-2	Space Heat	Bell & Gossett	105089	1/2 HP
24	A	P-24-3	DHW	Bell & Gossett	NRF-22	1/25 HP
24	A	P-24-4	DHW Recirculation	Bell & Gossett	NBF-22	1/25 HP
26	B	B-26	Space Heat	HydroTherm	MR-600BPV	600 MBH
26	B	ST-26	DHW Storage	Triangle Tube	Smart 80	70 Gal
26	B	P-26-1	Space Heat	Bell & Gossett	105089	1/2 HP
26	B	P-26-2	Space Heat	Bell & Gossett	105089	1/2 HP
26	B	P-26-3	DHW	Bell & Gossett	NRF-33	1/15 HP
26	B	P-26-4	DHW Recirculation	Bell & Gossett	NBF-22	1/25 HP
21	C	B-21	Space Heat	HydroTherm	MR-600BPV	600 MBH
21	C	ST-21	DHW Storage	Triangle Tube	Smart 80	70 Gal
21	C	P-21-1	Space Heat	Bell & Gossett	105089	1/2 HP
21	C	P-21-2	Space Heat	Bell & Gossett	105089	1/2 HP
21	C	P-21-3	DHW	Bell & Gossett	NRF-22	1/25 HP
21	C	P-21-4	DHW Recirculation	Bell & Gossett	NBF-22	1/25 HP
1	D	B-1	Space Heat	HydroTherm	MR-600BPV	600 MBH
1	D	ST-1	DHW Storage	Triangle Tube	Smart 80	70 Gal
1	D	P-1-1	Space Heat	Bell & Gossett	105089	1/2 HP
1	D	P-1-2	Space Heat	Bell & Gossett	105089	1/2 HP

1	D	P-1-3	DHW	Bell & Gossett	NRF-22	1/25 HP
1	D	P-1-4	DHW Recirculation	Bell & Gossett	NBF-22	1/25 HP
31	E	B-31	Space Heat	HydroTherm	MR-600BPV	600 MBH
31	E	ST-31	DHW Storage	Triangle Tube	Smart 80	70 Gal
31	E	P-31-1	Space Heat	Bell & Gossett	105089	1/2 HP
31	E	P-31-2	Space Heat	Bell & Gossett	105089	1/2 HP
31	E	P-31-3	DHW	Bell & Gossett	NRF-22	1/25 HP
31	E	P-31-4	DHW Recirculation	Bell & Gossett	NBF-22	1/25 HP

Option 1 – Hydronic Retrofit Option Scope of Work

The requested scope of work is for (1) building, Building 25, located at Hilltop.

The existing space heating boilers shall be replaced with a new condensing boiler plant right-sized for the row type home building. A new indirect DHW heating system with dedicated DHW pumps for each boiler shall be installed to produce domestic hot water at 140F. This includes a mixing valve in each building to temper DHW to 120F for scald protection prior to distribution to the units.

The new system scope should include the following:

- A new space heating condensing boiler plant, right-sized for the building. Load calculations shall be provided to the Owner's Commissioning Agent for review prior to ordering equipment. **The boilers shall be current generation Lochinvar Knights.** Alternate boiler selections need to be called out in the bid and approved by the owner. Boilers shall have a minimum efficiency performance of 94% AFUE.
- New space heating hydronic piping re-run throughout the units. This includes piping run through the crawl spaces/basements and the exposed piping run through the units. All heating hot water piping should be insulated per local code requirements or 2021 IECC requirements, whichever is greater. The exposed piping in units shall be copper or steel with faced fiberglass pipe insulation with PVC cover. Piping in other locations, such as the crawl space, can be high temp insulated PEX if rated for the system hot water temperature (180F minimum). It is the responsibility of the contractor to specify and install piping that is rated for long term use with the expected system water temperatures. If other materials are used, this shall be called out in the bid and approved by the owner.
- New high efficiency space heating pumps shall have ECM motors or be installed with variable frequency drives (VFDs) to allow variable speed operation. The new pumps shall be engineered to meet the system flow and pressure requirements.
- Reutilize existing convector units currently installed.
- There shall be a supply and return isolation valve per apartment.
- Provide all necessary electrical from the newer electrical service within the boiler rooms.
- The new boiler control system shall be installed to operate the boilers and pumps with the following sequence of control:

- *Enable boilers when the outside air temperature falls below 62 F (adj.) and there is a call for heat from one of the associated zones. Disable boilers when outside air temperature rises above 65 F (adj.). Stage and modulate boilers using the manufacturer's controls to meet the HWST setpoint. System pumps to be controlled by boiler plant controls.*
- *The HWST Setpoint shall be reset according to a linear outdoor air reset schedule in which the design hot water temperature, 180 F (adj.), is delivered at the design outdoor air condition, 0 F (adj.), and a lower, 140 F (adj.) HWS is delivered at the high outdoor air temperature, 60 F (adj.).*
- *Boiler plant shall only call for heat if one of the zones calls for heat or if there is a call for domestic hot water. Controls shall be capable of a domestic hot water priority override.*
- *Each boiler shall have a dedicated DHW circulation pump serving the indirect storage tanks. This will allow one or more boilers to serve the DHW at a separate temperature than boilers serving the space heating system simultaneously.*
- *Boiler controllers shall be capable of remote zone setpoint adjustment located within the boiler rooms and taken out of the residence hands.*

- The Contractor shall coordinate and program the boiler plant controls. The Contractor shall document all installed setpoints, provide documentation to the owner, and fully train the Owner on setpoint adjustment.
- The contractor shall provide a new indirect DHW heating system. The system shall be adequately sized/designed to meet the demand of the units. The system should be able to meet the design hot water requirements with boiler temperatures of 160F or less for system efficiency. The indirect DHW heater should be located within the existing boiler rooms.
- Contractor should train Owner personnel on how to operate the boiler controls and adjust setpoints.
- The Contractor shall be responsible for the design and construction of the installation in its entirety and shall secure the services of qualified professionals as required to complete this scope of work. Project design documents, including load calculations and equipment submittals, shall be provided to the commissioning agent and owner for approval before equipment is ordered.
- The Contractor shall provide a full and operational system including but not limited to the electrical work and associated controls.
- Include in the price an extended warranty for 10 years on major boiler components for Lochinvar Knight, DHW equipment, and piping.
- The Contractor shall secure all permits and inspections required for demolition and installation.
- A manufacturer approved technician shall execute boiler equipment startup per manufacturer guidelines and warranty requirements. The Contractor shall provide documentation of startup to the Owner.
- The Contractor shall work with and assist the Owner's Commissioning Agent in commissioning the boiler and DHW plant operation.
- Pricing should assume that the Housing Authority has the right to salvage any existing equipment they desire. This should be coordinated with the housing authority prior to demolition.

The following performance-based specification sections are related to this scope of work (note: some information in the specifications may relate to other scopes of work and may not be germane to this scope of work):

- 013300 – SUBMITTAL PROCEDURES
- 014000 – QUALITY REQUIREMENTS
- 017823 – OPERATION AND MAINTENANCE DATA
- 017900 – DEMONSTRATION AND TRAINING
- 019113 – GENERAL COMMISSIONING REQUIREMENTS
- 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 231123 – FACILITY NATURAL-GAS PIPING
- 232113 – HYDRONIC PIPING
- 232116 – HYDRONIC PIPING SPECIALTIES
- 232123 – HYDRONIC PUMPS
- 235216 – CONDENSING BOILERS

Please see the Attachment D - Project Specifications for the full specification set.

Option 2 – Forced Air (Furnace)

Install a new condensing furnace (minimum 95% AFUE) in each dwelling unit. Installation will include new hard ductwork for both supply and return air path as necessary. **Supply air shall be ducted to each space in apartments, in adequate amounts to meet room heating loads.** Scope shall also include a new thermostat, with brand and location to be approved by owner.

As part of this scope, the contractor shall provide a new tankless domestic water heating system in the boiler room. The system shall be adequately sized/designed to meet the demand of the units.

The space heating and domestic hot water equipment at the administration building are excluded from this scope.

The new system scope should include the following:

- A new condensing furnace right-sized for each dwelling unit, with two-stages of operation and a minimum efficiency rating of 95% AFUE. **The furnace Basis of Design shall be current generation Trane or York.** Alternate selections need to be called out in the bid and approved by the owner.
- The Contractor shall be responsible for the design and construction of the installation in its entirety and shall secure the services of qualified professionals as required to complete this scope of work. Project design documents, including heating load calculations and equipment submittals, shall be provided to the commissioning agent and owner for approval before equipment is ordered.
- New space heating ductwork throughout. This may include ductwork run through the crawl spaces/basements and the units. **Supply air shall be ducted to each space in apartments, in adequate amounts to meet room heating loads.**
- Existing convector units and hydronic heat piping shall all be abandoned in place.
- The Contractor shall provide a full and operational system including but not limited to the electrical work and associated controls. Provide all necessary electrical from the newer electrical service within the boiler rooms.
- Provide proper venting for condensing furnaces. The combustion air and flues shall be engineered to meet manufacturer's requirements and code. Flue paths should be approved by the owner prior to installation.

- Provide a thermostat and associated wiring per installed furnace. Location and brand should be submitted to the owner for approval prior to ordering equipment.
- A new tankless domestic water heating system in the boiler room. **The water heater Basis of Design shall be current generation Navien**. Alternate selections need to be called out in the bid and approved by the owner. Tankless equipment shall have a minimum efficiency performance of 94% AFUE.
- Include in the price an extended warranty for 10 years on furnace and domestic hot water equipment.
- The Contractor shall secure all permits and inspections required for demolition and installation.
- A manufacturer approved technician shall execute boiler equipment startup per manufacturer guidelines and warranty requirements. The Contractor shall provide documentation of startup to the Owner.
- The Contractor shall work with and assist the Owner's Commissioning Agent in commissioning the boiler and DHW plant operation.
- Pricing should assume that the Housing Authority has the right to salvage any existing equipment they desire. This should be coordinated with the housing authority prior to demolition.

The following performance-based specification sections are related to this scope of work (note: some information in the specifications may relate to other scopes of work and may not be germane to this scope of work):

  - 013300 – SUBMITTAL PROCEDURES
  - 014000 – QUALITY REQUIREMENTS
  - 017823 – OPERATION AND MAINTENANCE DATA
  - 017900 – DEMONSTRATION AND TRAINING
  - 019113 – GENERAL COMMISSIONING REQUIREMENTS
  - 221116 – DOMESTIC WATER PIPING
  - 223400 – FUEL-FIRED DOMESTIC WATER HEATERS
  - 233113 – METAL DUCTS
  - 235416 – GAS-FIRED FURNACES

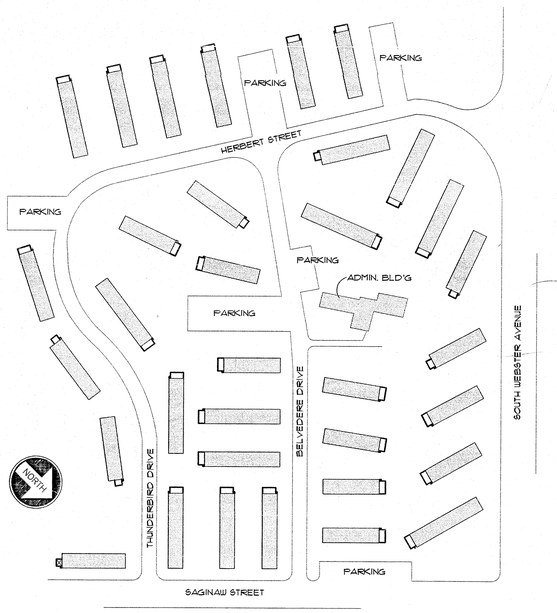
Please see the Attachment D - Project Specifications for the full specification set.

HIGHLAND ASSOCIATES
ARCHITECTURE
ENGINEERING
INTERIOR DESIGN

Scranton Housing Authority

400 Adams Avenue
Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor



LOCATION MAP
SCALE: N.T.S.

Highland Center
102 Highland Ave.
Clarks Summit
Pennsylvania
1 8 4 1 1
Phone: 570.586.4334
Fax: 570.586.5990

LIST OF DRAWINGS

MECHANICAL

ELECTRICAL

COMMONWEALTH OF PENNSYLVANIA
KEVIN H. SMITH
ENGINEER
22541E

Patrick J. Tobin

11/6/02
CONSTRUCTION DOCUMENTS

CS

NOTE:

INFORMATION ON THIS DRAWING INCLUDING PIPE SIZES AND HEATING HOT WATER DISTRIBUTION SCHEME HAS BEEN EXTRACTED FROM THE SCRANTON HOUSING AUTHORITY RECORD DRAWINGS PREPARED BY "GILBOY AND O'MALLY", CONSULTING ENGINEERS, SCRANTON, PA. (DATED : AUGUST 15, 1952). INFORMATION INCLUDED ON THIS DRAWING AS IT RELATES TO GAS PIPING SYSTEM HAS BEEN TAKEN FROM DWG PREPARED FOR THE SCRANTON HOUSING AUTHORITY BY MR. FRANK FOLEY, P.E., (PA. REG. # 16B-K) DATED :3/3/91.

SITE PLAN - EXISTING GAS LINES / PIPING

SCALE: 1"=40'-0"

NORTH

- EXISTING PIPING SIZE SCHEDULE -

LINE BETWEEN		HEATING SYSTEM H.W. SUPPLY	HEATING SYSTEM H.W. RETURN	DOMESTIC H.W. SUPPLY	DOMESTIC H.W. RETURN
OLD BOILER HOUSE	12-A	4"	4"	2 1/2"	1"
12-A	11-A	4"	4"	2 1/2"	3/4"
11-A	10-A	3"	3"	2"	3/4"
10-A	9-A	2 1/2"	2 1/2"	1 1/2"	1/2"
12-A	33-C	3"	3"	2"	3/4"
33-C	34-C	2"	2"	2"	3/4"
OLD BOILER HOUSE	4-B	4"	4"	2 1/2"	1"
4-B	3-B	3"	3"	2"	3/4"
3-B	2-B	2 1/2"	2 1/2"	1 1/2"	3/4"
2-B	1-D	2"	2"	1 1/4"	1/2"
4-B	14-A	3"	3"	2"	3/4"
14-A	15-B	2"	2"	1 1/4"	1/2"
14-A	13-A	2"	2"	1 1/2"	1/2"
OLD BOILER HOUSE	22-C	4"	4"	2 1/2"	1"
22-C	23-A	3"	3"	2"	3/4"
23-A	24-A	2"	2"	1 1/2"	1/2"
22-C	5-C	4"	4"	2"	3/4"
5-C	6-B	3"	3"	2"	3/4"
6-B	7-B	3"	3"	1 1/2"	3/4"
7-B	8-A	2"	2"	1 1/2"	1/2"
OLD BOILER HOUSE	21-C	6"	6"	2 1/2"	1"
21-C	25-B	4"	4"	2 1/2"	1"
25-B	26-B	4"	4"	2 1/2"	3/4"
26-B	27-A	4"	4"	2 1/2"	3/4"
27-A	28-A	3"	3"	2 1/2"	3/4"
28-A	29-A	3"	3"	2"	3/4"
29-A	30-A	2 1/2"	2 1/2"	1 1/2"	1/2"
OLD BOILER HOUSE	20-A	6"	6"	2 1/2"	1"
20-A	19-C	4"	4"	2 1/2"	1"
19-C	17-B	4"	4"	2 1/2"	3/4"
17-B	18-B	2"	2"	1 1/4"	1/2"
17-B	16-A	3"	3"	2 1/2"	3/4"
16-A	31-E	3"	3"	2"	3/4"
31-E	32-C	2"	2"	1 1/2"	1/2"

- SITE PLAN SYMBOLS -

SYMBOL	MEANING
	DENOTES EXISTING BOILER ROOM AND CHIMNEY LOCATION.
	DENOTES EXISTING GAS PIPING CURB VALVE
	DENOTES FRONT OF EXISTING HOUSING UNIT
	DENOTES EXISTING PIPING ENTRY POINT TO CRAWL SPACES FOR HEATING HOT WATER SUPPLY AND RETUN, DOMESTIC HOT WATER AND HOT WATER RECIRCULATING PIPING FROM CENTRAL BOILER PLANT
	EXISTING UNDERGROUND CONDUIT CONTAINING : -EXISTING DOMESTIC HOT WATER SUPPLY LINE -EXISTING DOMESTIC HOT WATER RECIRCULATING LINE -EXISTING HOT WATER RETURN LINE FROM HEATING SYSTEM -EXISTING HOT WATER SUPPLY LINE TO HEATING SYSTEM
SIZE — GAS	-EXISTING NATURAL GAS LINES

UNIT HEATER SCHEDULE

TAG	TYPE	CFM	MBH	GPM	WPD FT. H_2O	MOTOR RPM	MOTOR H.P.	MOTOR VOLTAGE	MFGR / MODEL	R/NOUT SIZE	REMARKS
UH-1	HORIZ. HW	820	523	53	23	1050	1/30	120V-1Ø	BEACON/MORRIS MODEL #3B-72 (OR EQUAL)	1¼"	
UH-2	HORIZ. HW	820	543	61	24	1050	1/20	120V-1Ø	BEACON/MORRIS MODEL #3B-84 (OR EQUAL)	1¼"	

STARTER AND DISCONNECT BY MECHANICAL CONTRACTOR.

INTAKE FAN SCHEDULE

TAG	TYPE	CFM	ESP IN. H_2O	BHP	HP	VOLTAGE	RPM	SONES	MFGR / MODEL	REMARKS
IF-1	IN-LINE CENTRIFUGAL	500	.375	.030	1/4	120-1Ø	1250	9.0	"GREENHECK" SQ-90 (OR EQUAL)	T-STAT CONTROL

PROVIDE WITH HANGER BRACKETS AND NEOPRENE ISOLATORS.
STARTER AND DISCONNECT BY MECHANICAL CONTRACTOR.

EXPANSION TANK SCHEDULE

TAG	SYSTEM	APPROX. SYSTEM VOL. GAL.	SYSTEM TEMP. RANGE °F MIN.	MAX.	PREV FILL PRESSURE # TANK PSIG	MINIMUM VOLUME GALLONS	MINIMUM ACCEPTANCE VOL. GAL.	TANK TYPE	MANUFACTURER MODEL
ET-1	HEATING HOT WATER	140	50°	180°	12	7.8	2.5	HORIZONTAL	BELL AND GOSSETT, D-15 (OR EQUAL)
ET-2	DOMESTIC HOT WATER	—	50°	140°	12	14	11.3	DIAPHRAGM	BELL AND GOSSETT, PTA-30V (OR EQUAL)
ET-3	HEATING HOT WATER	151	50°	180°	12	10.1	2.5	HORIZONTAL	BELL AND GOSSETT, D-20 (OR EQUAL)

PUMP SCHEDULE

TAG	SERVICE	TYPE	GPM	HEAD (FT.)	HP	RPM	VOLTS	MFGR / MODEL
P-1	HOT WATER SPACE HEATING	IN-LINE CIRCULATOR	40	12	1/2	1750	120V-1Ø	BELL & GOSSETT, MODEL # PD35-5 (OR EQUAL)
P-2	HOT WATER SPACE HEATING	IN-LINE CIRCULATOR	40	12	1/2	1750	120V-1Ø	BELL & GOSSETT, MODEL # PD35-5 (OR EQUAL)
P-3	FILL / MAKE-UP	IN-LINE CIRCULATOR	5	10	1/20	1750	120V-1Ø	BELL & GOSSETT, MODEL # NRF-22 (OR EQUAL)
P-4	HEATING HOT WATER CIRCULATOR	IN-LINE CIRCULATOR	10	7	1/2	1750	120V-1Ø	BELL & GOSSETT, SERIES 1210, # 10-B (OR EQUAL)
P-5	HOT WATER SPACE HEATING	IN-LINE CIRCULATOR	24	10	1/4	1750	120V-1Ø	BELL & GOSSETT, SERIES 60, MODEL # 6415 (OR EQUAL)
P-6	HOT WATER SPACE HEATING	IN-LINE CIRCULATOR	24	10	1/4	1750	210V-1Ø	BELL & GOSSETT, SERIES 60, MODEL # 6415 (OR EQUAL)

STARTER AND DISCONNECT BY MECHANICAL CONTRACTOR.

BOILER SCHEDULE

TAG	TYPE	MBH INPUT	MBH NET IBR OUTPUT	BOILER H.P.	NATURAL GAS CONSUMPTION	ELECTRICAL DATA VOLTS/PHASE	WATER CONTENT (GAL.)	NUMBER OF MODULES	MFGR / MODEL
B-1	ATMOSPHERIC	600	411	14.34	600,000 CFH	120V-1Ø	14 GAL.	2	HYDROTHERM MR-600B (OR EQUAL)

INDIRECT WATER HEATER SCHEDULE

TAG	INNER TANK CAPACITY (GALLONS)	OUTER TANK WORKING PRESSURE	BOILER OUTPUT BTUH	1ST HOUR RECOVERY (GAL.)	CONTINUOUS FLOW (GAL.)	PEAK FLOW (GAL/10 MIN.)	SQ. FT. HEATING SURFACE	MFGR / MODEL
UH-1	55	45 PSI	375,000	576	360	160	34	TRIANGLE TUBE, TR-100 (OR EQUAL)
UH-2	36	45 PSI	110,000	130	160	55	18	TRIANGLE TUBE, TR-36 (OR EQUAL)

HIGHLAND ASSOCIATES
ARCHITECTURE
ENGINEERING
INTERIOR DESIGN

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Clarks Summit
Pennsylvania
18411
Phone: 570.586.4334
Fax: 570.586.5990

REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN H. SMITH ENGINEER

DRAWING TITLE:

SITE PLAN : EXISTING UNDERGROUND PIPING SYSTEMS

DRAWN BY:	CHECKED BY:
CP	JBN / RJG
DATE: 11/26/02	PROJECT NO: 2001-429

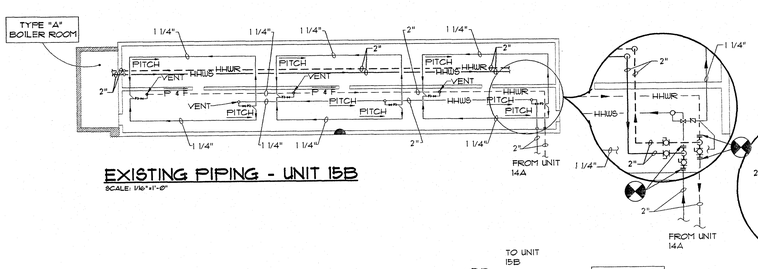
DRAWING NO:

M-1

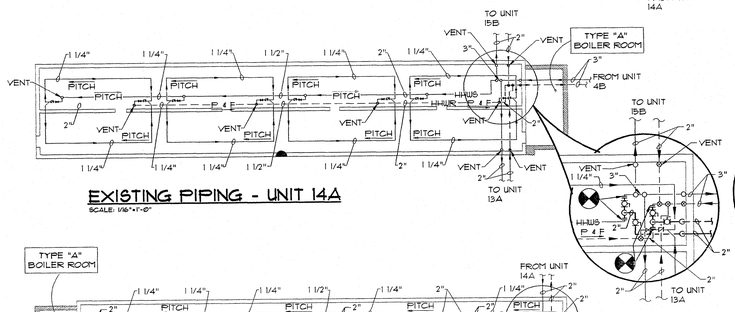
CAD FILE: 429-M PLOT DATE: 11/26/02

GENERAL NOTE

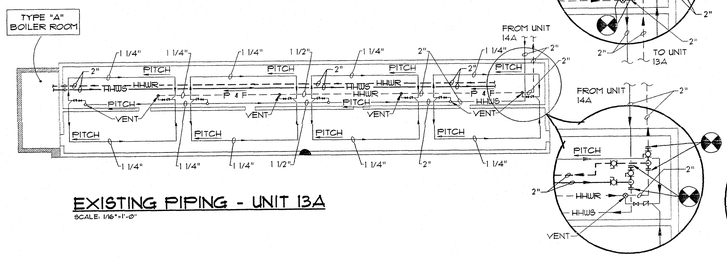
WITH THE EXCEPTION OF CEILING CONSTRUCTION, ALL BOILER ROOMS INDICATED ON THIS DRAWING (TYPES "A" AND "B") HAVE BEEN PREVIOUSLY BUILT BUT HAVE NOT BEEN "FIT UP" WITH MECHANICAL OR ELECTRICAL SYSTEMS.



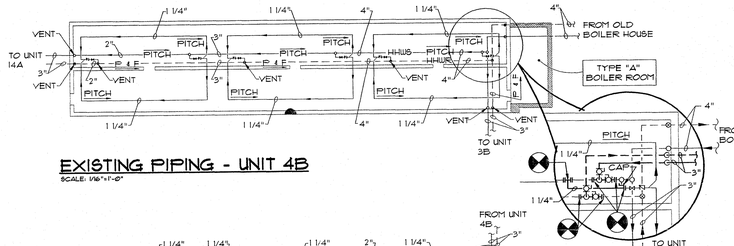
EXISTING PIPING - UNIT 15B
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 14A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 13A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 4B
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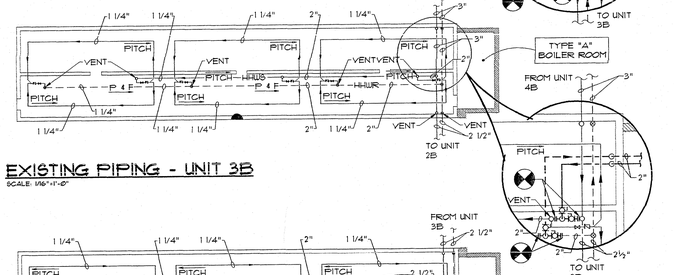

EXISTING PIPING - UNIT 3B
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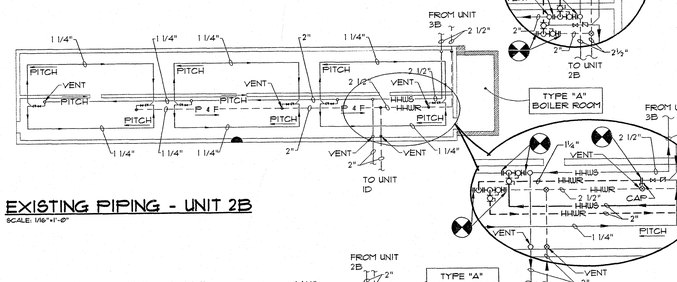

EXISTING PIPING - UNIT 2B
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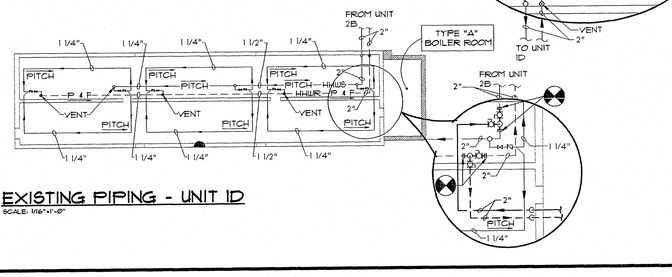
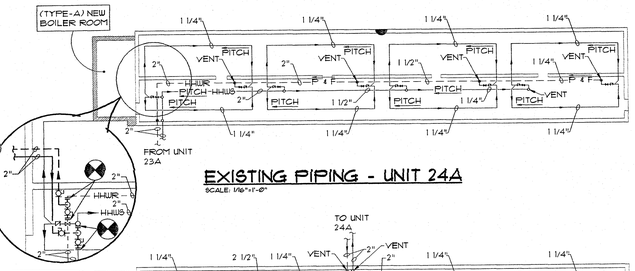
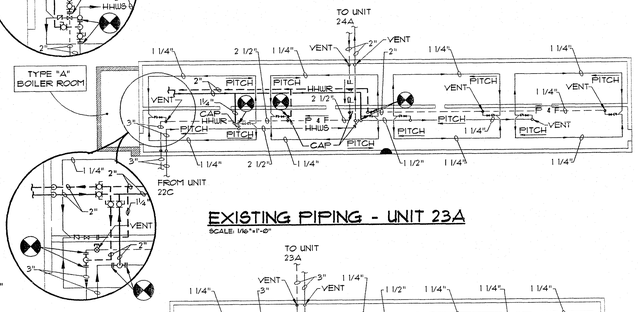


EXISTING PIPING - UNIT 1D
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 24A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 23A
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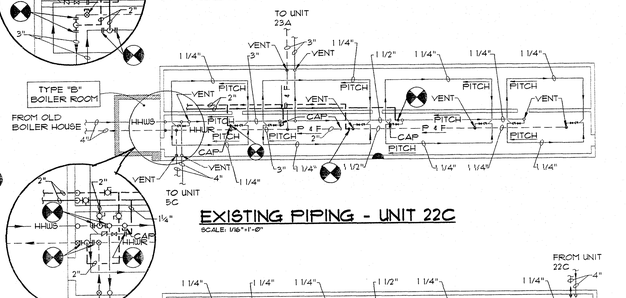
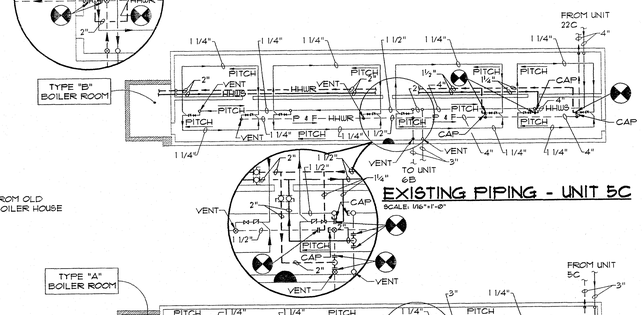
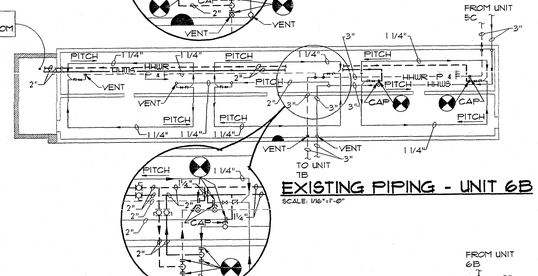


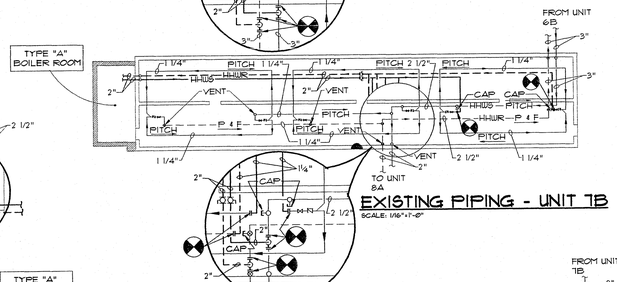
EXISTING PIPING - UNIT 22C
SCALE: 1/16"=1'-0"



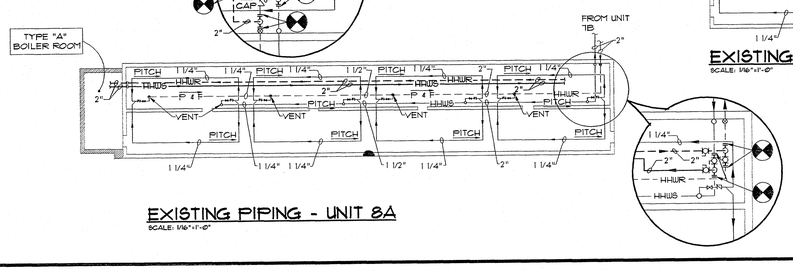
EXISTING PIPING - UNIT 5C
SCALE: 1/16"=1'-0"



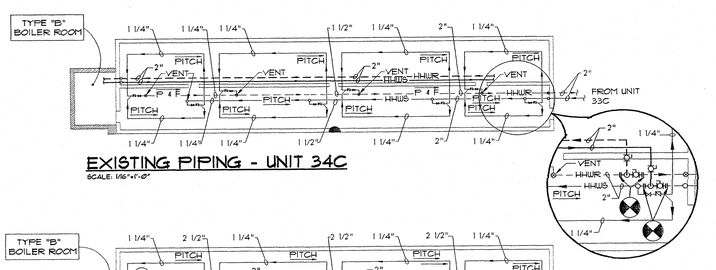
EXISTING PIPING - UNIT 6B
SCALE: 1/16"=1'-0"



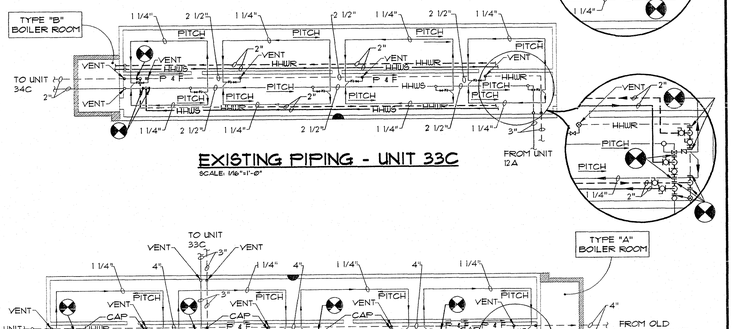
EXISTING PIPING - UNIT 7B
SCALE: 1/16"=1'-0"



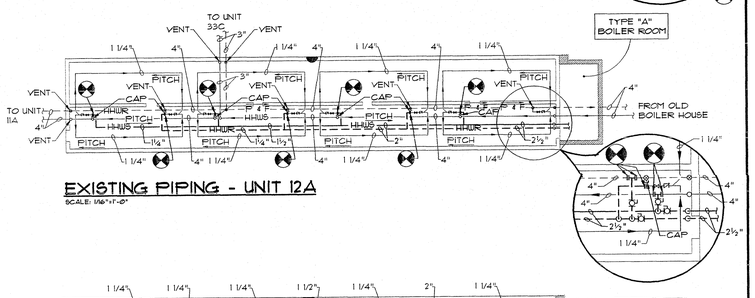
EXISTING PIPING - UNIT 8A
SCALE: 1/16"=1'-0"



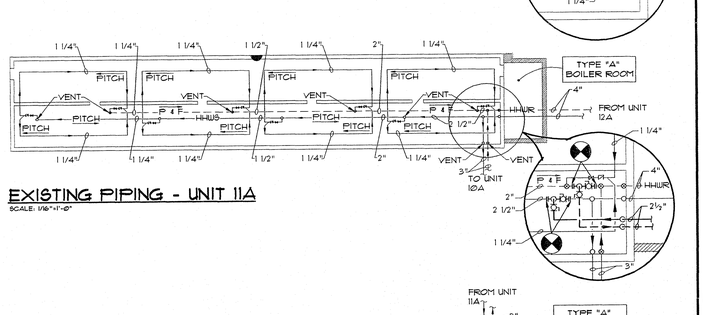
EXISTING PIPING - UNIT 34C
SCALE: 1/16"=1'-0"



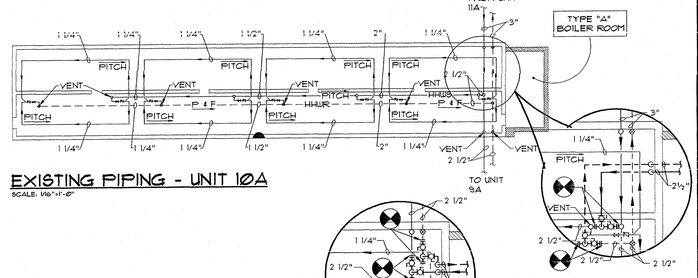
EXISTING PIPING - UNIT 33C
SCALE: 1/16"=1'-0"



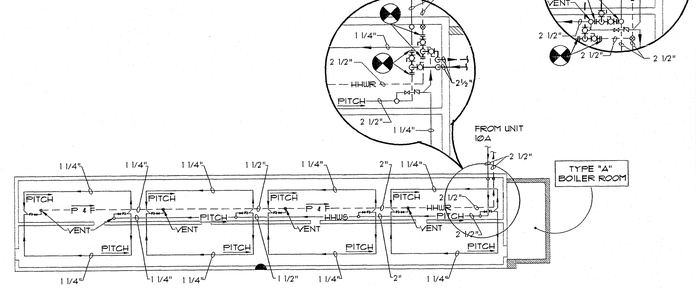
EXISTING PIPING - UNIT 12A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 11A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 10A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 9A
SCALE: 1/16"=1'-0"

NOTE:

INFORMATION ON THIS DRAWING INCLUDING PIPE SIZES AND HEATING HOT WATER DISTRIBUTION SCHEME HAS BEEN EXTRACTED FROM THE SCRANTON HOUSING AUTHORITY RECORD DRAWINGS PREPARED BY "GILBOY AND O'MALLY", CONSULTING ENGINEERS, SCRANTON, PA. (DATED : AUGUST 15, 1952).

● DENOTES FRONT OF BUILDING

HIGHLAND ASSOCIATES
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ENGINEERING
INTERIOR DESIGN

Highland Center
102 Highland Ave.
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Fax: 570.586.5990

REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA
LICENSED
KEVIN H. SMITH
ENGINEER
22501-E
REGISTERED PROFESSIONAL ENGINEER

DRAWING TITLE:

EXISTING CRAWL SPACE PLANS : HOUSING UNIT HEATING SYSTEM

DRAWN BY:	CHECKED BY:
CP / JJW	JBN / RJG
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

M-2

CAD FILE: 1429-02 PLOT DATE: 11/06/02

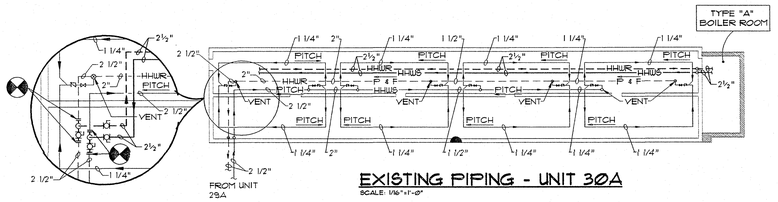
GENERAL NOTE

WITH THE EXCEPTION OF CEILING CONSTRUCTION, ALL BOILER ROOMS INDICATED ON THIS DRAWING (TYPES "A" AND "B") HAVE BEEN PREVIOUSLY BUILT BUT HAVE NOT BEEN "FIT UP" WITH MECHANICAL OR ELECTRICAL SYSTEMS.

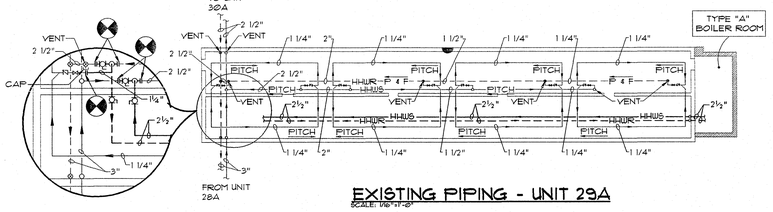
NOTE:

INFORMATION ON THIS DRAWING INCLUDING PIPE SIZES AND HEATING HOT WATER DISTRIBUTION SCHEME HAS BEEN EXTRACTED FROM THE SCRANTON HOUSING AUTHORITY RECORD DRAWINGS PREPARED BY "GILBOY AND O'MALLY", CONSULTING ENGINEERS, SCRANTON, PA. (DATED : AUGUST 15, 1952).

DENOTES FRONT OF BUILDING



EXISTING PIPING - UNIT 30A
SCALE: 1/16"=1'-0"



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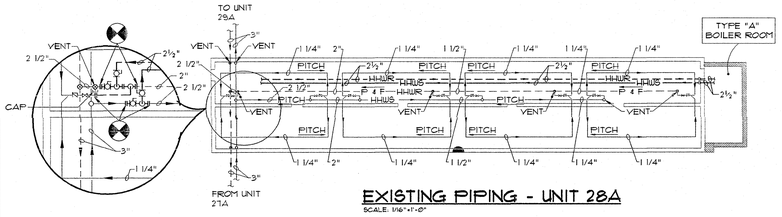
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 28A
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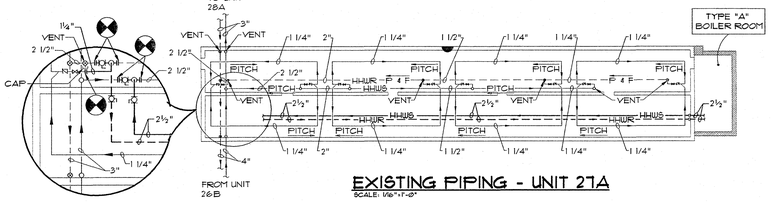
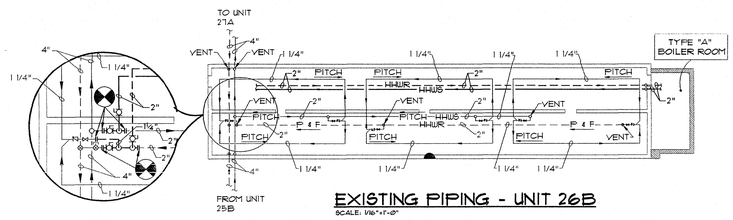
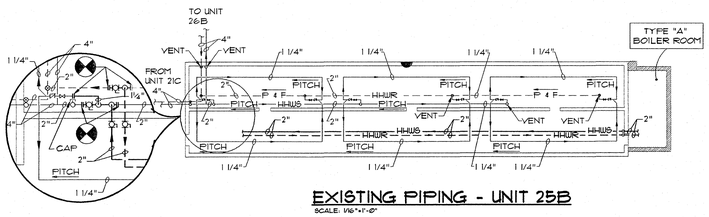


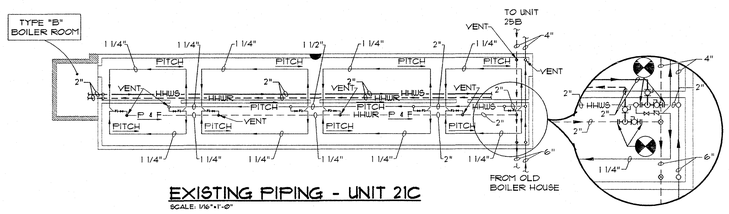
EXISTING PIPING - UNIT 27A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 26B
SCALE: 1/16"=1'-0"

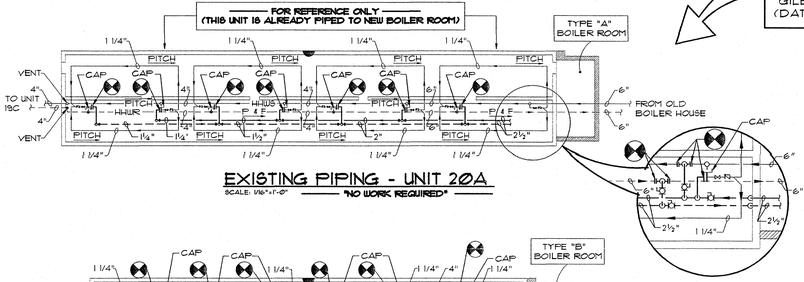


EXISTING PIPING - UNIT 25B
SCALE: 1/16"=1'-0"

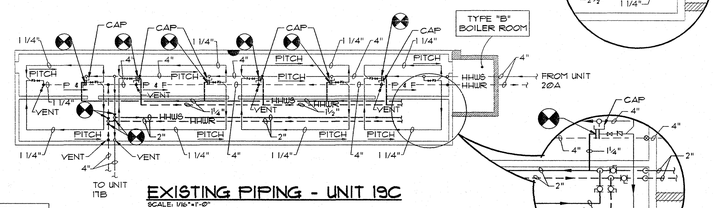


EXISTING PIPING - UNIT 21C
SCALE: 1/16"=1'-0"

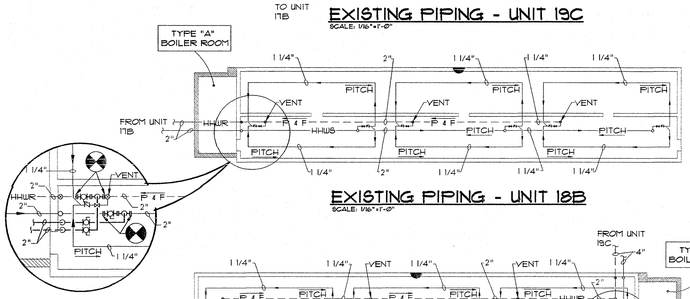
FOR REFERENCE ONLY
(THIS UNIT IS ALREADY PIPED TO NEW BOILER ROOM)



EXISTING PIPING - UNIT 20A
SCALE: 1/16"=1'-0" — "NO WORK REQUIRED"



EXISTING PIPING - UNIT 19C
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 18B
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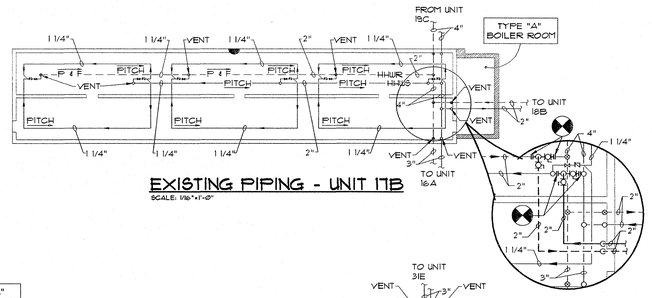
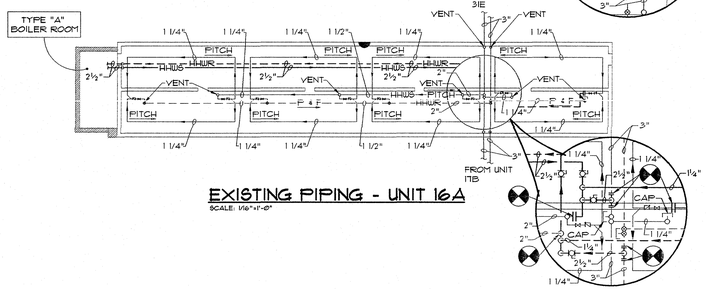
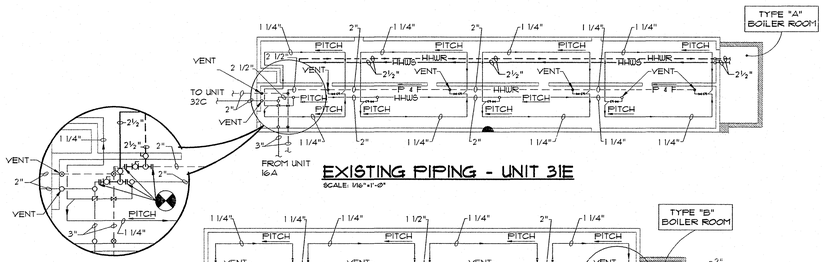


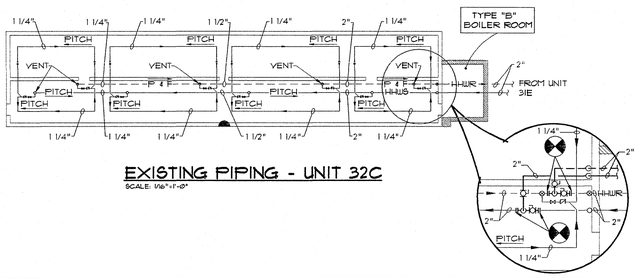
EXISTING PIPING - UNIT 17B
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 16A
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 31E
SCALE: 1/16"=1'-0"



EXISTING PIPING - UNIT 32C
SCALE: 1/16"=1'-0"

HIGHLAND ASSOCIATES
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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA
REGISTERED
PROFESSIONAL
KEVIN H. SMITH
ENGINEER
22611
REGISTERED PROFESSIONAL ENGINEER

DRAWING TITLE:

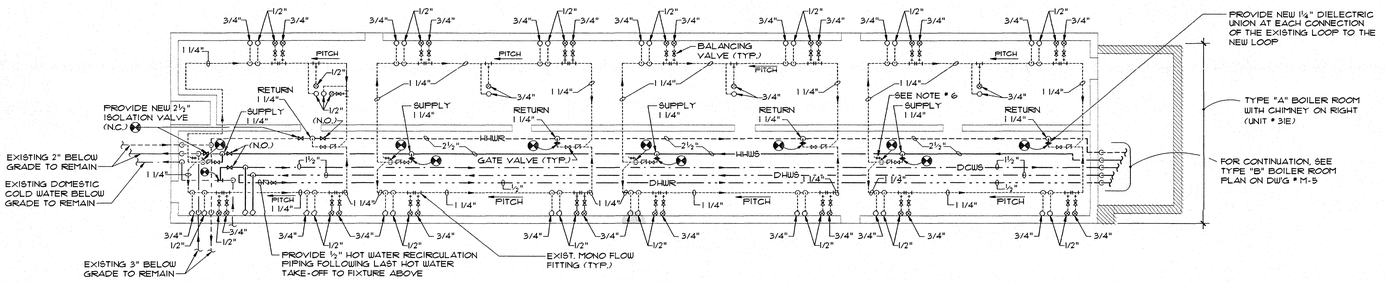
EXISTING CRAWL SPACE PLANS : HOUSING UNIT HEATING SYSTEM

DRAWN BY:	CHECKED BY:
CP / JJW	JBN / RJG
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

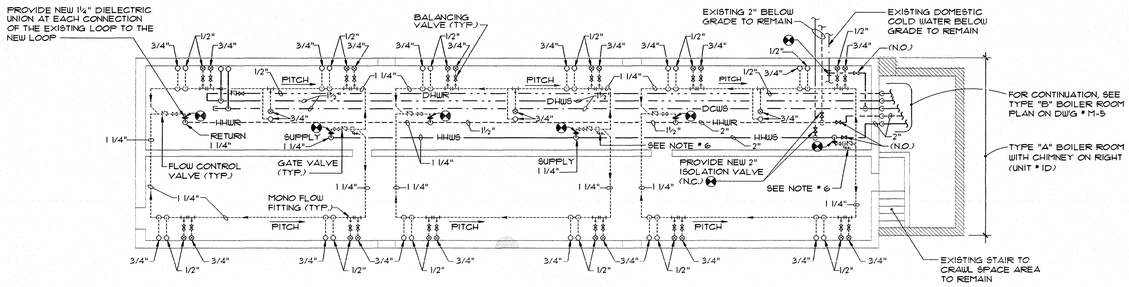
M-3

CAD FILE: 1429-M3 PLOT DATE: 11/06/02



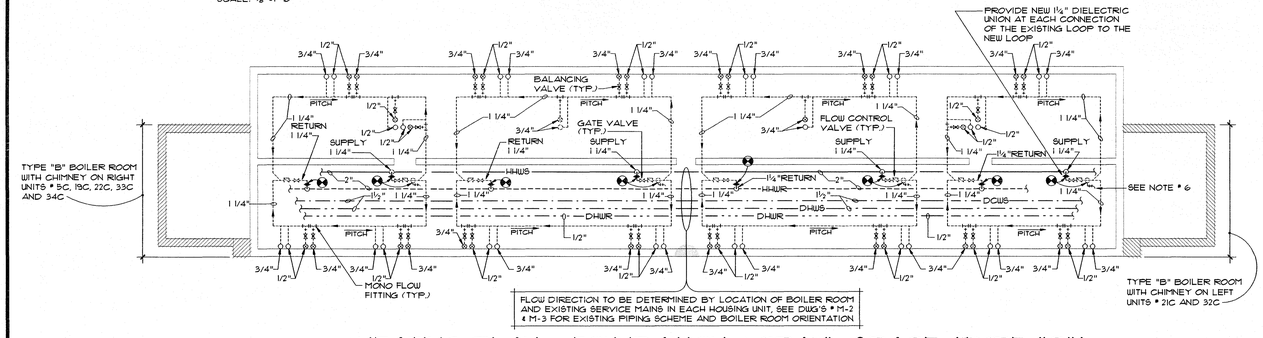
HEATING PLAN - FOUNDATION / CRAWL SPACE (TYPE "E")

SCALE: ⅛"=1'-0"



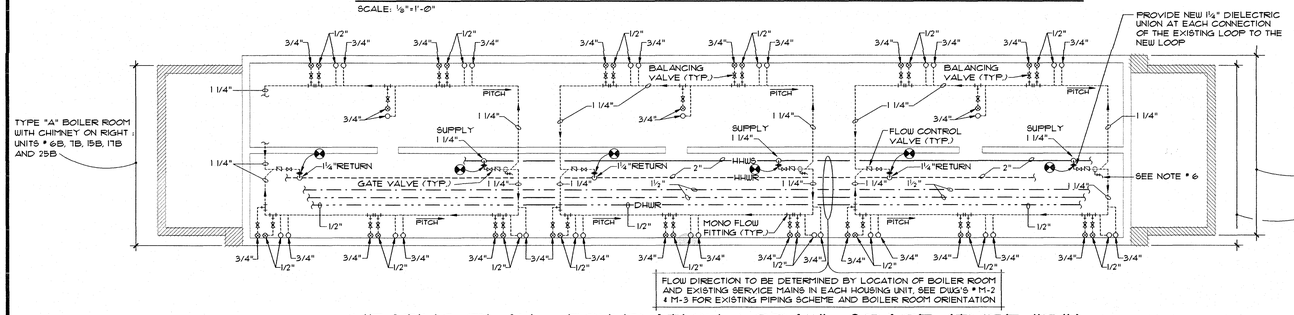
HEATING PLAN - FOUNDATION / CRAWL SPACE (TYPE "D")

SCALE: ⅛"=1'-0"



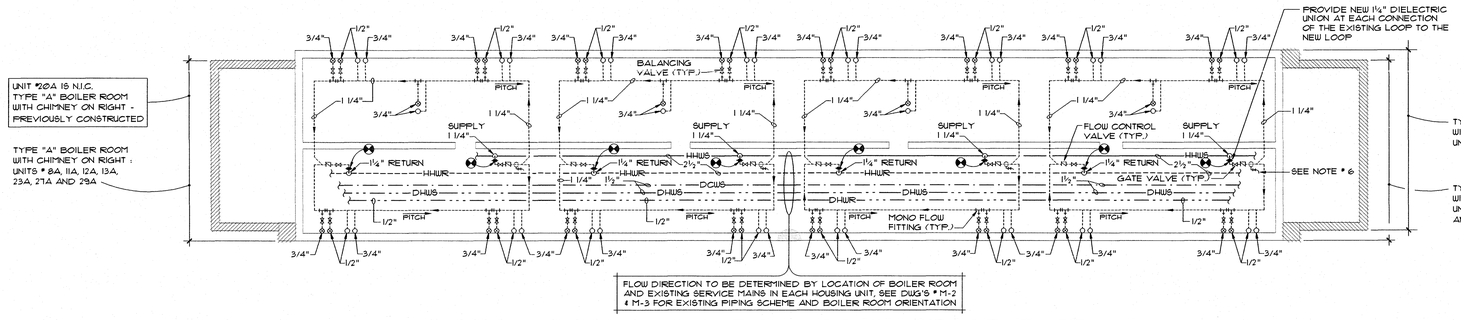
HEATING PLAN - FOUNDATION / CRAWL SPACE (TYPE "C")

SCALE: ⅛"=1'-0"



HEATING PLAN - FOUNDATION / CRAWL SPACE (TYPE "B")

SCALE: ⅛"=1'-0"



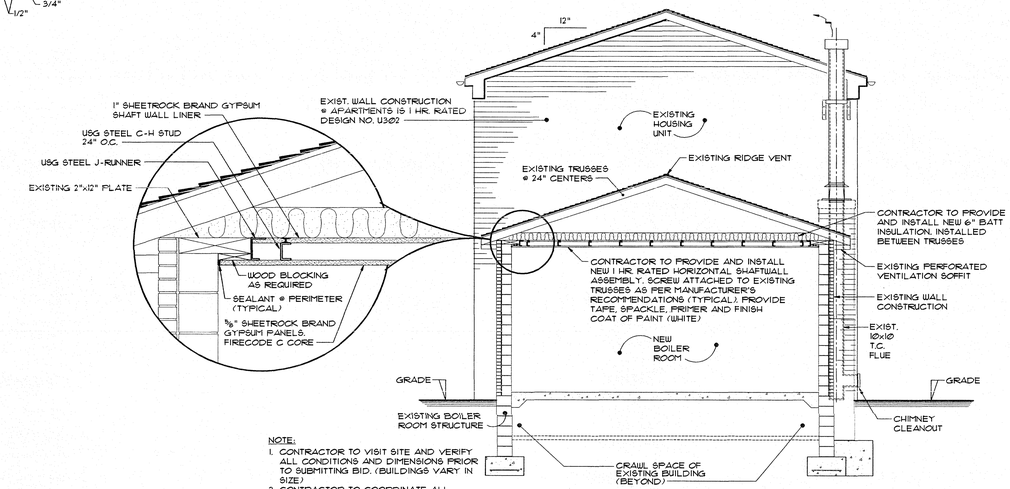
HEATING PLAN - FOUNDATION / CRAWL SPACE (TYPE "A")

SCALE: ⅛"=1'-0"

NOTES:

1. FOR EXISTING ZONED PIPING RUNS FROM CENTRAL BOILER HOUSE TO INDIVIDUAL HOUSING UNITS SEE DWG * M-1.
2. PITCH PIPE 1"-40'-0" MIN. IN DIRECTION AS INDICATED BY ARROWS.
3. PIPING IN CRAWL SPACES FOR EACH BUILDING TYPE ARE SHOWN AS A GENERAL LAYOUT. FOR A MORE ACCURATE ORIENTATION OF PIPING SEE DRAWINGS M-2 & M-3.
4. THE OWNER HAS PRE-PURCHASED A SUBSTANTIAL QUANTITY OF COPPER PIPING AND FITTINGS FOR INSTALLATION UNDER THIS PROJECT. SEE SPECIFICATIONS FOR LOCATION AND QUANTITY OF MATERIAL.
5. CRAWL SPACE HEIGHT VARIES-FIELD VERIFY PRIOR TO SUBMITTING QUOTES.
6. CONTRACTOR SHALL PROVIDE A ¾" HOSE BIBB ON THE HOT WATER HEATING LOOP PIPING TO EACH APARTMENT UNIT FOR EMERGENCY DRAINAGE.

DENOTES FRONT OF BUILDING

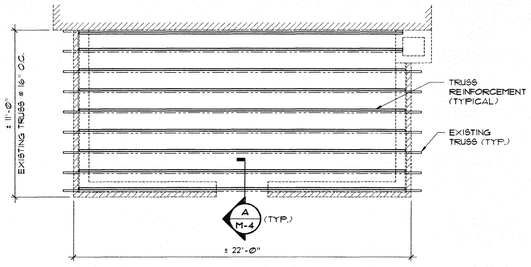


NOTE:

1. CONTRACTOR TO VISIT SITE AND VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO SUBMITTING BID. (BUILDINGS VARY IN SIZE)
2. CONTRACTOR TO COORDINATE ALL HANGERS, FASTENERS, WIRING, PIPING, ETC. WITH ALL TRADES.
3. DO NOT BLOCK VENTS WITH NEW INSULATION.

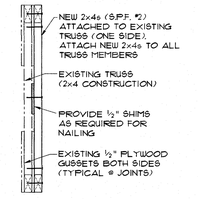
TYPICAL SECTION @ BOILER BUILDINGS

SCALE: 1/4" = 1'-0"



EXISTING ROOF FRAMING PLAN - BOILER ROOM "A"

SCALE: ¼"=1'-0"



NOTE: ALL NEW 2x4s TO BE ATTACHED WITH 10 PENNYNAILS @ 12" O.C. (MAX.)

A M-4 SECTION @ TRUSS REINFORCEMENT

SCALE: 1"=1'-0"

PIPING LEGEND

SYMBOL	MEANING
DHWS	DOMESTIC HOT WATER HEATING SUPPLY PIPING
DHWR	DOMESTIC HOT WATER HEATING RECIRC. PIPING
DCWS	DOMESTIC COLD WATER SUPPLY PIPING
HHWS	HOT WATER HEATING SUPPLY PIPING
HHWR	HOT WATER HEATING RETURN PIPING

HVAC LEGEND

SYMBOL	MEANING
DHWS	DOMESTIC HOT WATER HEATING SUPPLY PIPING
DHWR	DOMESTIC HOT WATER HEATING RECIRC. PIPING
DCWS	DOMESTIC COLD WATER SUPPLY PIPING
HHWS	HOT WATER HEATING SUPPLY PIPING
HHWR	HOT WATER HEATING RETURN PIPING
G	NATURAL GAS PIPING
	BALL VALVE
	UNION
	DOMESTIC HOT WATER HEATING SUPPLY PIPING
	PRESSURE REDUCING VALVE
	CHECK VALVE
	BALANCING VALVE
	TRIPLE DUTY VALVE
T	SPACE TEMPERATURE SENSOR
	DENOTES FRONT OF BUILDING
	PRESSURE RELIEF VALVE
	THERMOMETER AND PRESSURE GAUGE

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN H. SMITH ENGINEER 22541-E

DRAWING TITLE:

HOUSING UNIT CRAWL SPACE PIPING INSTALLATION PLANS

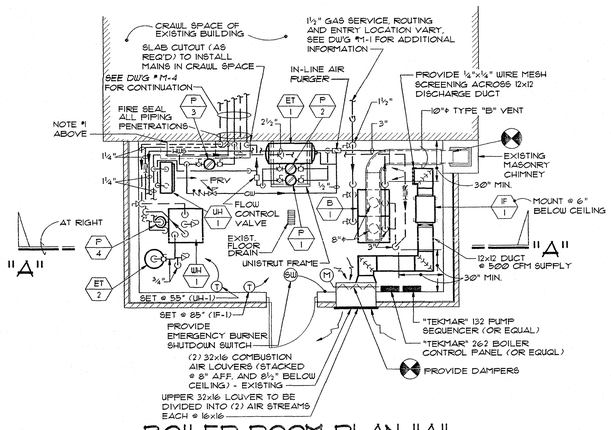
DRAWN BY:	CHECKED BY:
CP / JJW	JBN / RJG
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

M-4

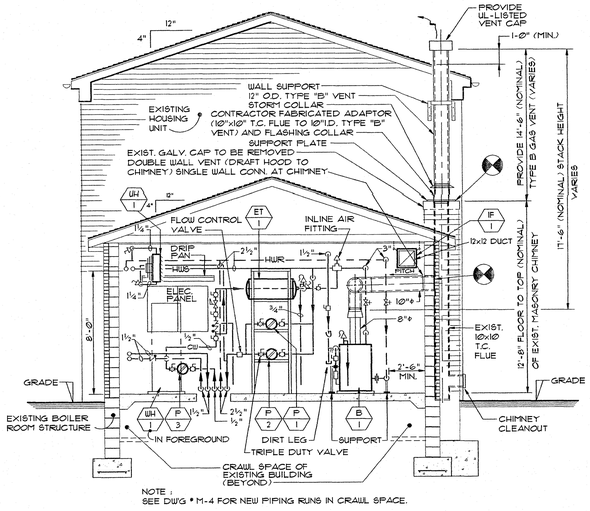
CAD FILE: 1429-M4 PLOT DATE: 11/06/02

NOTE #1 : ELECTRICAL PANEL AND DRIP PAN (SOME LOCATIONS) SEE DWG # E5-1 FOR ELECTRICAL PANEL LOCATIONS.



BOILER ROOM PLAN "A"

SCALE: ¼"=1'-0"



NOTE :
SEE DWG # M-4 FOR NEW PIPING RUNS IN CRAWL SPACE.

BOILER ROOM CROSS SECTION "A"

SCALE: ¼"=1'-0"

BOILER ROOM PLAN AND PIPING CONFIGURATIONS.

TYPE "A" BOILER ROOM FOR HOUSING UNITS # 1D, 2B, 6B, 7B, 8A, 11A, 12A, 13A, 15B, 16A, 17B, 20A, 23A, 24A, 25B, 27A & 29A TO BE PIPED AS PER TYPE "A" BOILER ROOM AS INDICATED ON THIS DRAWING.

TYPE "A" BOILER ROOM FOR HOUSING UNITS # 3B, 4B, 9A, 10A, 14A, 18B, 26B, 28A, 30A & 31E ARE SIMILAR TO PLAN, SECTION AND SCHEMATIC INDICATED ON THIS DWG EXCEPT PIPING IS OPPOSITE AS SHOWN.

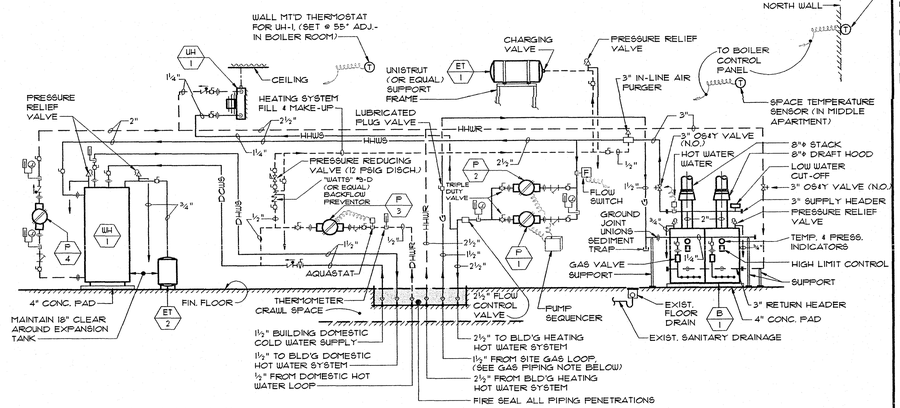
TYPE "A" BOILER ROOM SERVING HOUSING UNIT # 20A IS EXISTING. NO WORK TO BE PERFORMED ON THIS UNIT UNDER THIS CONTRACT.

NOTES: 1. REFER TO ELECTRICAL DRAWINGS FOR LOCATION OF ELECTRICAL PANELS. MECHANICAL CONTRACTOR SHALL MAINTAIN 30" CLEARANCE IN FRONT OF PANELS PER CODE. PROVIDE DRIP TRAY BELOW PIPING IN BOILER ROOMS WHERE PIPING IS RUN ABOVE PANELS.
2. DUE TO THE QUANTITY OF HOUSING UNITS THROUGH WHICH EXISTING HOT WATER HEATING MAINS (SERVING OTHER BUILDINGS) ARE RUN, COUPLED WITH THE FACT THAT BOILER ROOMS HAVE BEEN CONSTRUCTED ON THE OPPOSITE END OF HOUSING UNITS HAVING SIMILAR FLOOR PLANS, THE CONTRACTOR SHALL INSTALL MAIN PIPING RUNS THROUGH CRAWL SPACES WITHOUT DECREASING PIPE SIZE. TYPE "A" HOUSING UNITS SHALL BE PIPED WITH 2½" HHWS AND HHWR MAINS, TYPE "B" AND "C" UNITS SHALL BE PIPED WITH 2" HHWS AND HHWR MAINS

TYPE "A" BOILER ROOM

NOTE

ALL AQUASTATS, SENSORS, BOILER CONTROLS, THERMOSTATS, PUMPS AND EQUIPMENT TO BE PROVIDED BY THE MECHANICAL CONTRACTOR. WIRING AND CALIBRATION BY ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL INSTALL BOILER CONTROL PANEL AND PUMP SEQUENCER (FURNISHED BY MECH. CONT.).

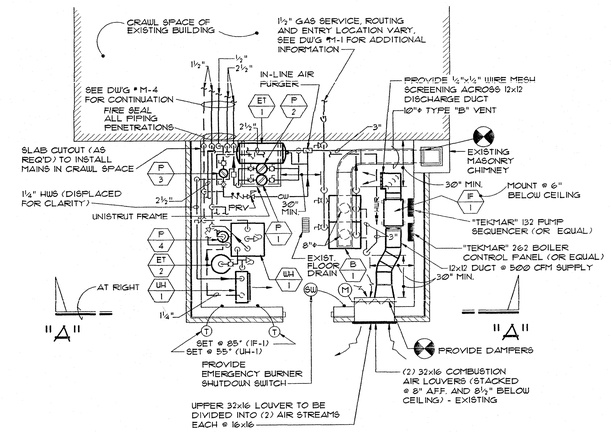


GAS PIPING NOTE :

MECHANICAL CONTRACTOR SHALL VERIFY LOCATION OF EXISTING CURB VALVE AND RELIEF VALVE. UNDER THIS CONTRACT, MECHANICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING TO CONNECT EXISTING CAPPED GAS SERVICE PIPING TO NEW MODULAR BOILER AS INDICATED ON THIS DRAWING.

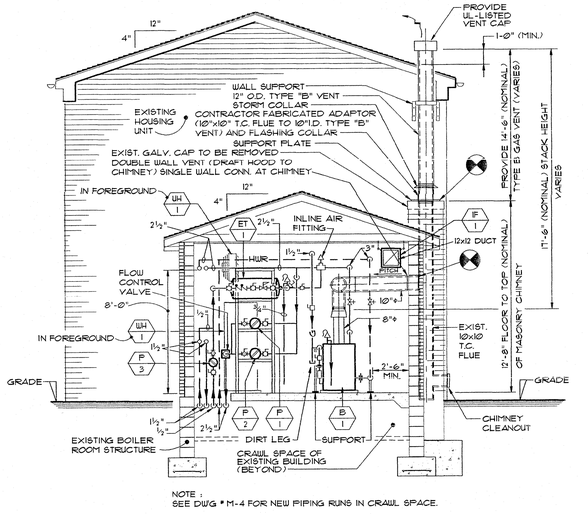
SCHEMATIC DIAGRAM : BOILER ROOM PIPING

NOT TO SCALE



BOILER ROOM PLAN "B"

SCALE: ¼"=1'-0"



NOTE :
SEE DWG # M-4 FOR NEW PIPING RUNS IN CRAWL SPACE.

BOILER ROOM CROSS SECTION "A"

SCALE: ¼"=1'-0"

BOILER ROOM PLAN AND PIPING CONFIGURATIONS.

TYPE "B" BOILER ROOM FOR HOUSING UNITS # 5C, 19C, 22C, 33C & 34C TO BE PIPED AS PER TYPE "B" BOILER ROOM AS INDICATED ON THIS DRAWING.

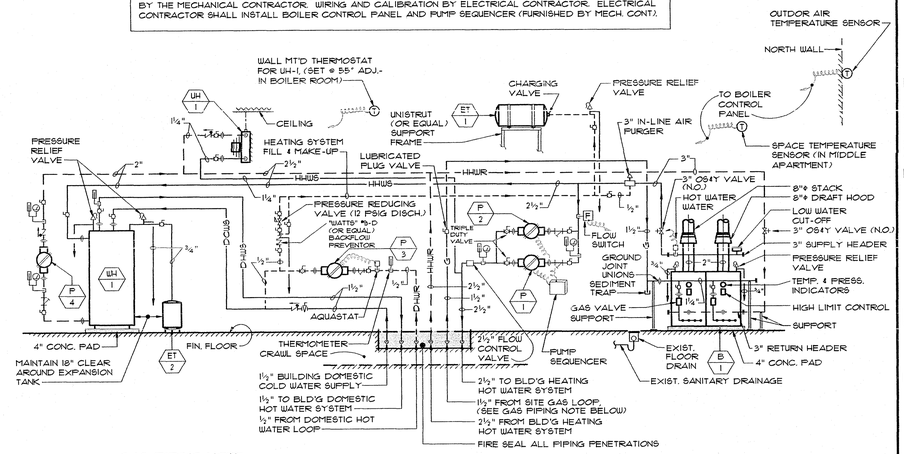
TYPE "B" BOILER ROOM FOR HOUSING UNITS # 21C & 32C ARE SIMILAR TO PLAN, SECTION AND SCHEMATIC INDICATED ON THIS DWG EXCEPT PIPING IS OPPOSITE AS SHOWN.

NOTES: 1. REFER TO ELECTRICAL DRAWINGS FOR LOCATION OF ELECTRICAL PANELS. MECHANICAL CONTRACTOR SHALL MAINTAIN 30" CLEARANCE IN FRONT OF PANELS PER CODE. PROVIDE DRIP TRAY BELOW PIPING IN BOILER ROOMS WHERE PIPING IS RUN ABOVE PANELS.
2. DUE TO THE QUANTITY OF HOUSING UNITS THROUGH WHICH EXISTING HOT WATER HEATING MAINS (SERVING OTHER BUILDINGS) ARE RUN, COUPLED WITH THE FACT THAT BOILER ROOMS HAVE BEEN CONSTRUCTED ON THE OPPOSITE END OF HOUSING UNITS HAVING SIMILAR FLOOR PLANS, THE CONTRACTOR SHALL INSTALL MAIN PIPING RUNS THROUGH CRAWL SPACES WITHOUT DECREASING PIPE SIZE. TYPE "A" HOUSING UNITS SHALL BE PIPED WITH 2½" HHWS AND HHWR MAINS, TYPE "B" AND "C" UNITS SHALL BE PIPED WITH 2" HHWS AND HHWR MAINS

TYPE "B" BOILER ROOM

NOTE

ALL AQUASTATS, SENSORS, BOILER CONTROLS, THERMOSTATS, PUMPS AND EQUIPMENT TO BE PROVIDED BY THE MECHANICAL CONTRACTOR. WIRING AND CALIBRATION BY ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL INSTALL BOILER CONTROL PANEL AND PUMP SEQUENCER (FURNISHED BY MECH. CONT.).



GAS PIPING NOTE :

MECHANICAL CONTRACTOR SHALL VERIFY LOCATION OF EXISTING CURB VALVE AND RELIEF VALVE. UNDER THIS CONTRACT, MECHANICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING TO CONNECT EXISTING CAPPED GAS SERVICE PIPING TO NEW MODULAR BOILER AS INDICATED ON THIS DRAWING.

SCHEMATIC DIAGRAM : BOILER ROOM PIPING

NOT TO SCALE

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

DRAWING TITLE:

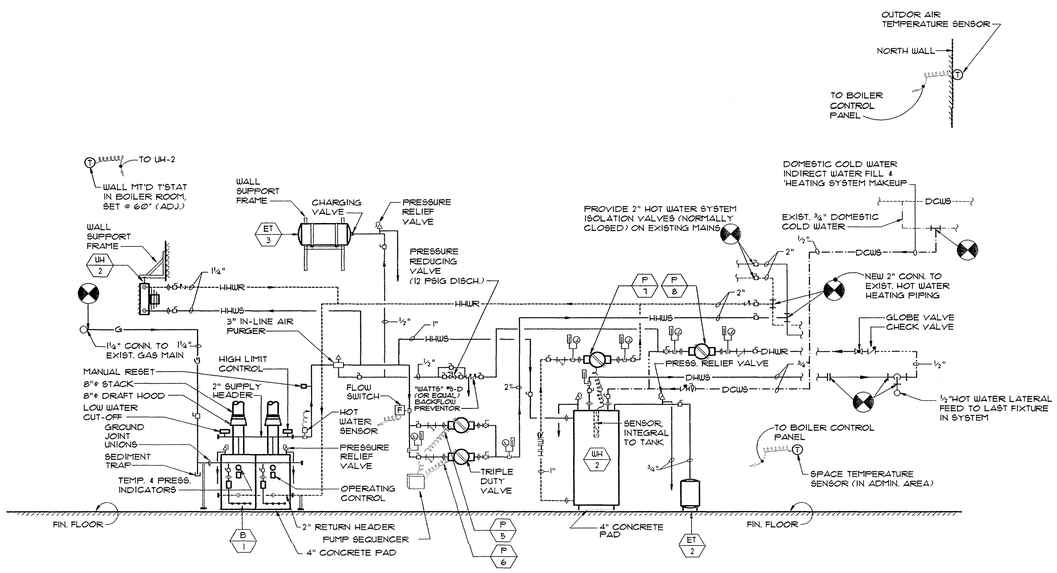
BOILER ROOM PLANS, SECTIONS AND SCHEMATICS

DRAWN BY:	CHECKED BY:
CP / JJW	JBN / RJG
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

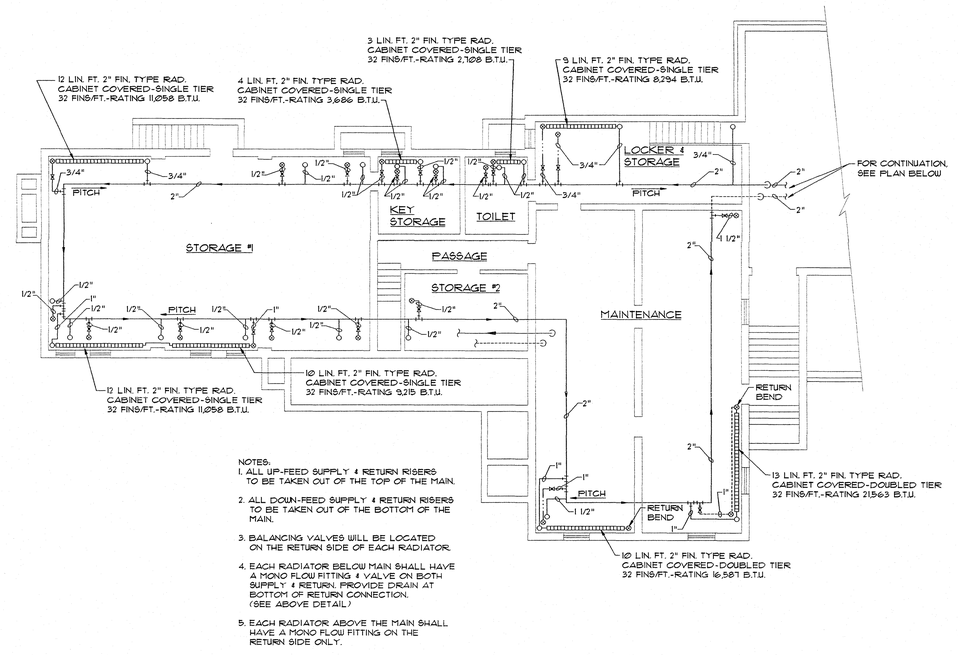
M-5

CAD FILE: 429-M5 PLOT DATE: 11/06/02



SCHEMATIC DIAGRAM : ADMIN. BLD'G BOILER ROOM PIPING

NOT TO SCALE

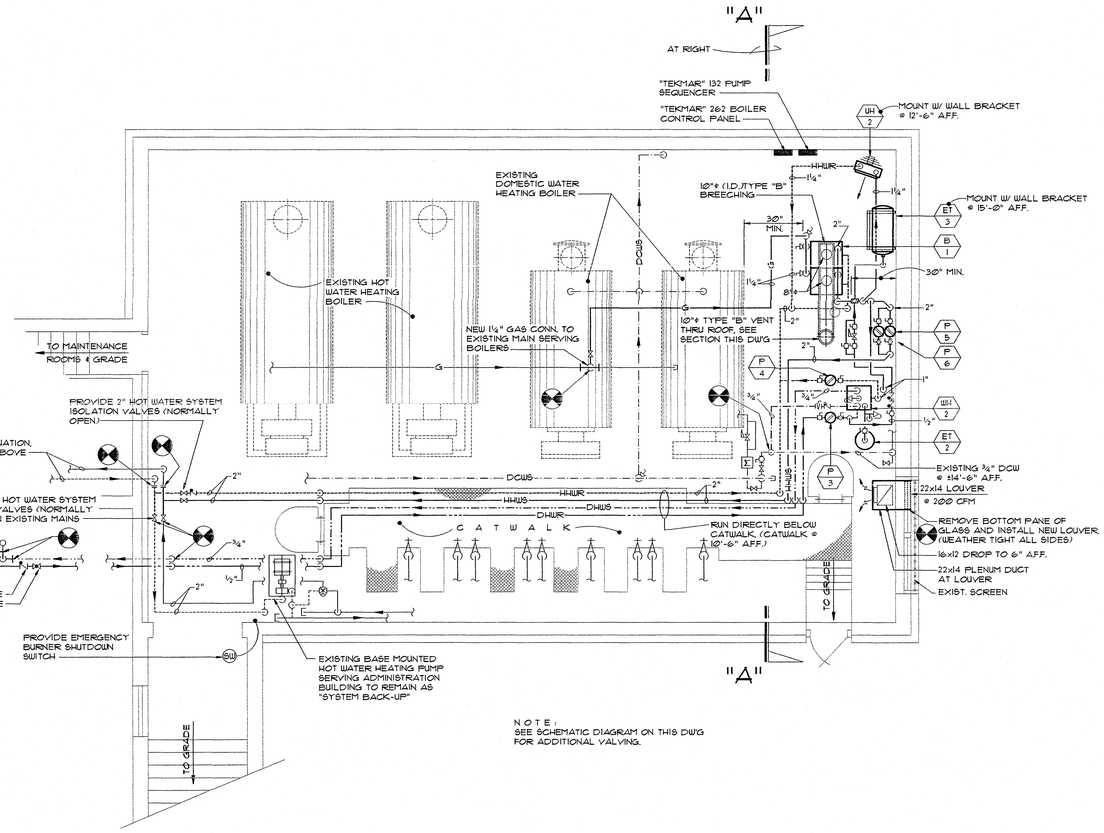


NOTES:

1. ALL UP-FEED SUPPLY & RETURN RISERS TO BE TAKEN OUT OF THE TOP OF THE MAIN.
2. ALL DOWN-FEED SUPPLY & RETURN RISERS TO BE TAKEN OUT OF THE BOTTOM OF THE MAIN.
3. BALANCING VALVES WILL BE LOCATED ON THE RETURN SIDE OF EACH RADIATOR.
4. EACH RADIATOR BELOW MAIN SHALL HAVE A MONO FLOW FITTING & VALVE ON BOTH SUPPLY & RETURN. PROVIDE DRAIN AT BOTTOM OF RETURN CONNECTION. (SEE ABOVE DETAIL)
5. EACH RADIATOR ABOVE THE MAIN SHALL HAVE A MONO FLOW FITTING ON THE RETURN SIDE ONLY.

HEATING PLAN - BASEMENT / FLOOR PLAN ADMINISTRATION BUILDING EXISTING HEATING HOT WATER DISTRIBUTION SYSTEM

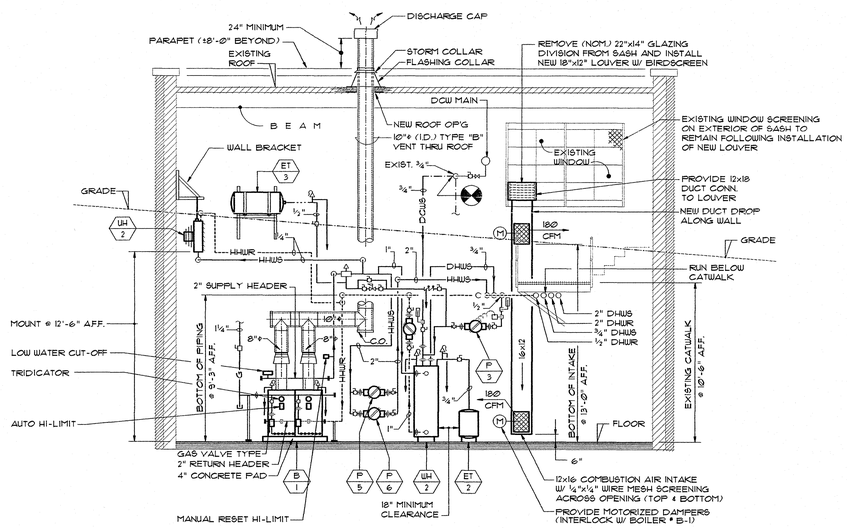
SCALE: ⅛"=1'-0"



NOTE.
SEE SCHEMATIC DIAGRAM ON THIS DWG FOR ADDITIONAL VALVING.

BOILER ROOM FLOOR PLAN - ADMINISTRATION BUILDING

SCALE: ¼"=1'-0"



SECTION "A"-"A"

SCALE: ¼"=1'-0"

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN H. SMITH ENGINEER 22541-E

DRAWING TITLE:

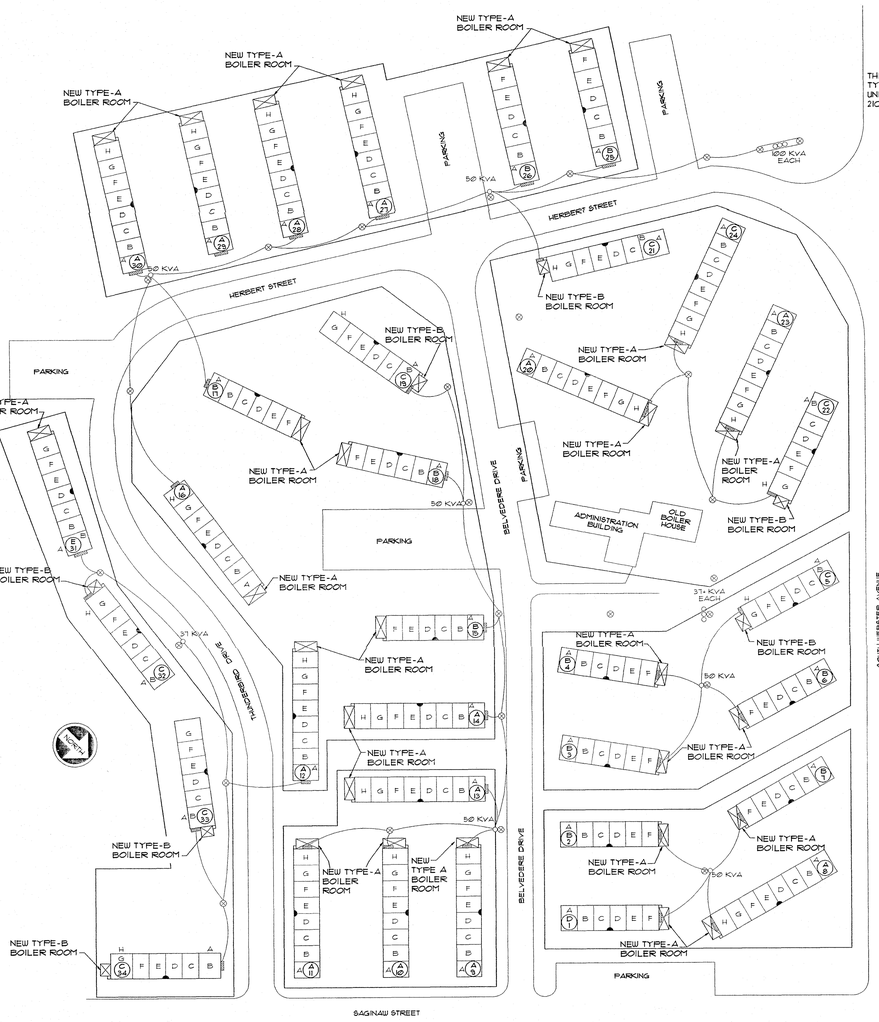
ADMINISTRATION BUILDING BOILER ROOM PLANS, SECTIONS & SCHEMATICS

DRAWN BY:	CHECKED BY:
CP	JBN / RJG
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

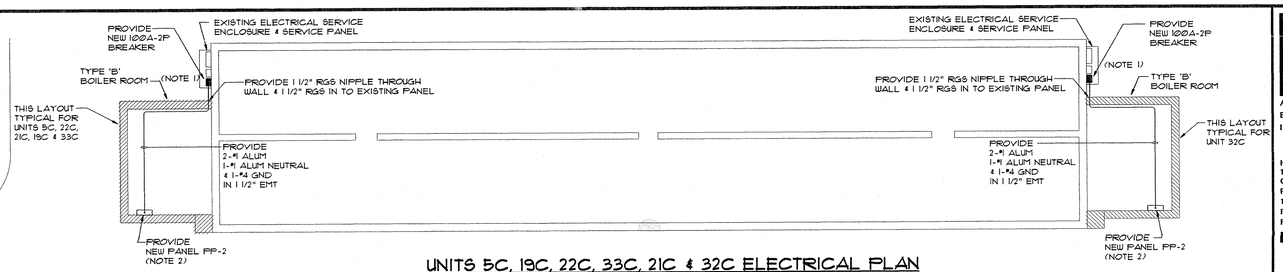
M-6

CAD FILE: 1429-P6 PLOT DATE: 11/06/02



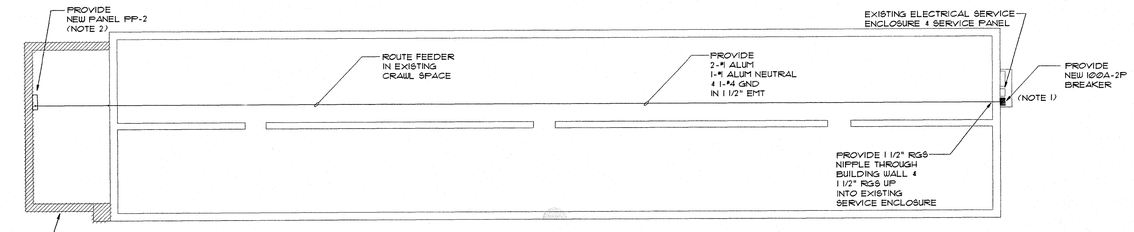
ELECTRICAL SITE PLAN (NOTE 4)

SCALE: 1"=60'-0"



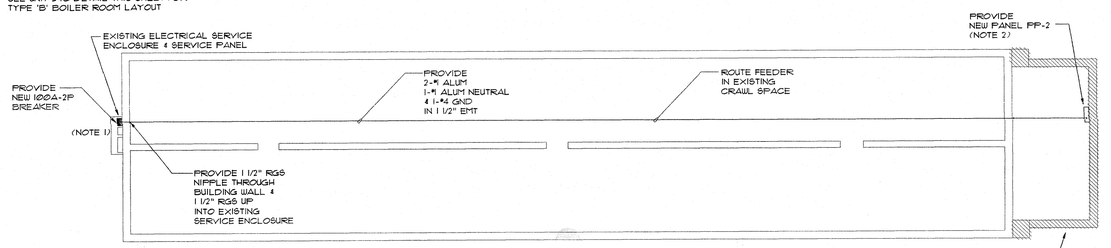
UNITS 5C, 19C, 22C, 33C, 21C & 32C ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



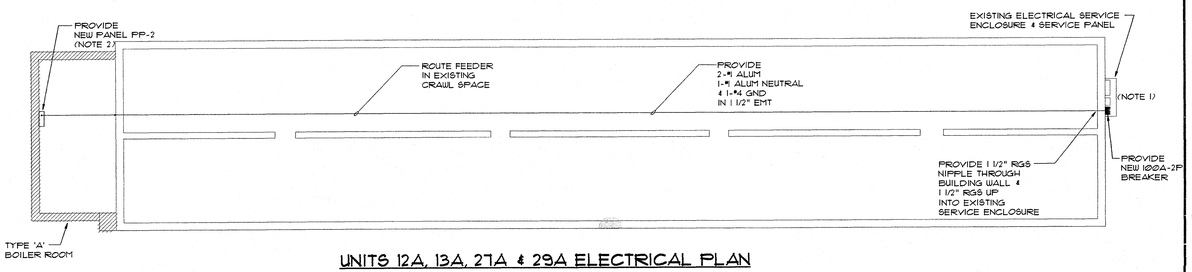
UNITS 15B, 17B, 25B & 34C ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



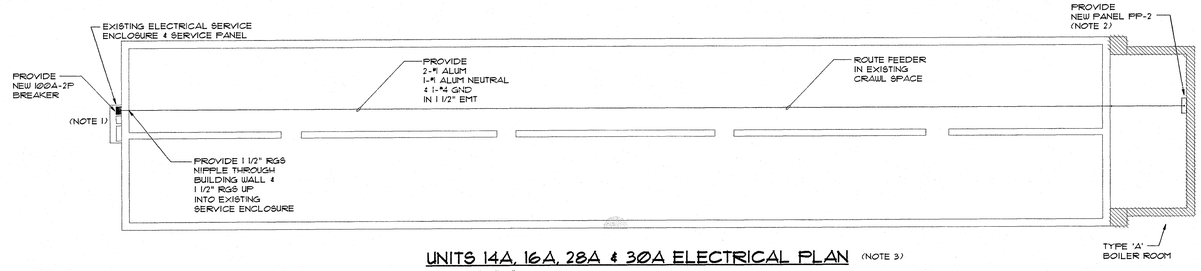
UNITS 18B & 26B ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



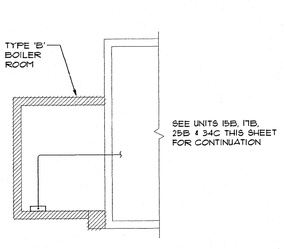
UNITS 12A, 13A, 27A & 29A ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



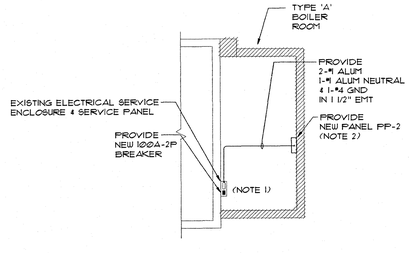
UNITS 14A, 16A, 28A & 30A ELECTRICAL PLAN (NOTE 3)

SCALE: 1/8" = 1'-0"



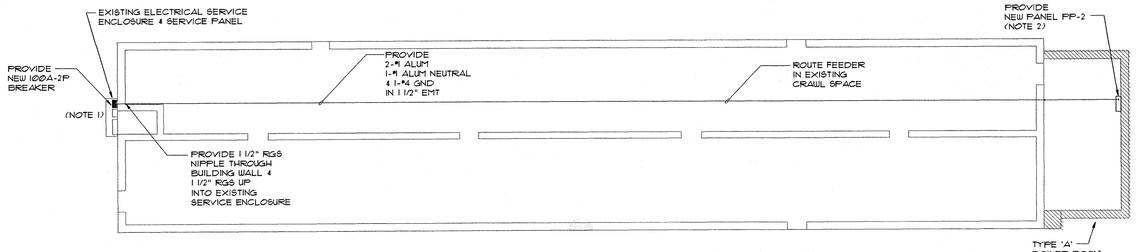
UNIT 34C ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



UNITS D1, B2, B3, B4, B6, B7, A8, A9, A10, A11, A20, A23, C24 ELECTRICAL PLAN (NOTE 5)

SCALE: 1/8" = 1'-0"



UNIT 31E ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1) SEE NEW ONE-LINE DIAGRAM, SHEET E-1 FOR INTERCONNECTION DETAILS.
2) SEE PANELBOARD SCHEDULE, SHEET E-1 FOR NEW PANELBOARD RATINGS, BOILER ROOM POWER & CONTROL PLANS
3) UNIT A16 BOILER & CONROL PLAN IS IDENTICAL EXCEPT IT IS OPPOSITE HAND
4) SEE SHEET E-1 FOR POWER & CONTROL AND LIGHTING PLANS FOR TYPE A & TYPE B BOILER ROOMS
5) B6, A8, A9 & A10 ARE OPPOSITE HAND

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN H. SMITH ENGINEER 22540 E

DRAWING TITLE:

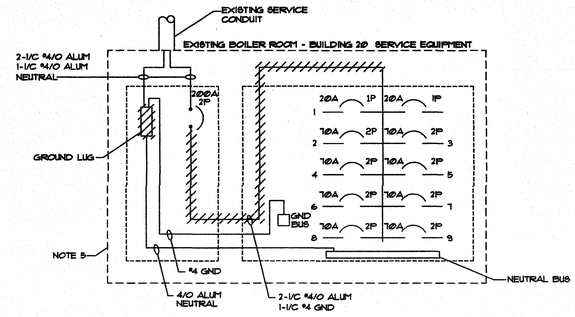
ELECTRICAL SITE PLAN & BUILDING TYPE ELECTRICAL PLANS

DRAWN BY:	CHECKED BY:
SAS	KB
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

ES-1

CAD FILE: 429-ES PLOT DATE: 11/06/02



EXISTING ONELINE DIAGRAM (TYPICAL)

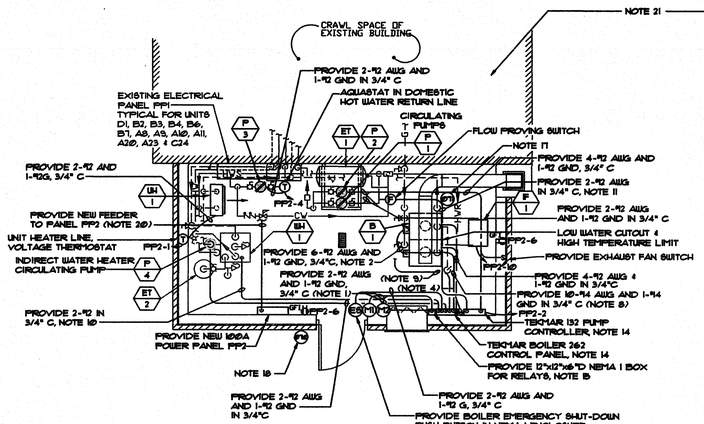
N.T.S.

EXISTING PANELBOARD SCHEDULE

DESIGNATION:	MAINS: 225A MAIN BREAKER	VOLTAGE: 120/240V, 1Ø 3W	LOCATION: BOILER RM - BLDG 2Ø	SINGLE PANEL ■
PP 1	TYPE: GE NLAB	MINIMUM O.C. DEVICE	FED BY:	DOUBLE PANEL □□
	O.C. DEVICE:	INTERRUPTING RATING: 22,000A	MOUNTING:	COMMON COVER □□

CKT NO	POLE	TRIP	WIRE	G	C	LOAD	KVA Ø A	KVA Ø B	KVA Ø C	LOAD	C	G	WIRE	TRIP	POLE	CKT NO
1	1	20	12	12		HOUSE LIGHTING	— —	— —	— —	SUMP PUMP						
2	2	70	6	6		APARTMENT A	— —	— —	— —	APARTMENT B	6	6	70	1		3
4	2	70	6	6		APARTMENT C	— —	— —	— —	APARTMENT D	6	6	70	1		5
6	2	70	6	6		APARTMENT E	— —	— —	— —	APARTMENT F	6	6	70	1		7
8	2	70	6	6		APARTMENT G	— —	— —	— —	APARTMENT H	6	6	70	1		9

(TYPICAL)

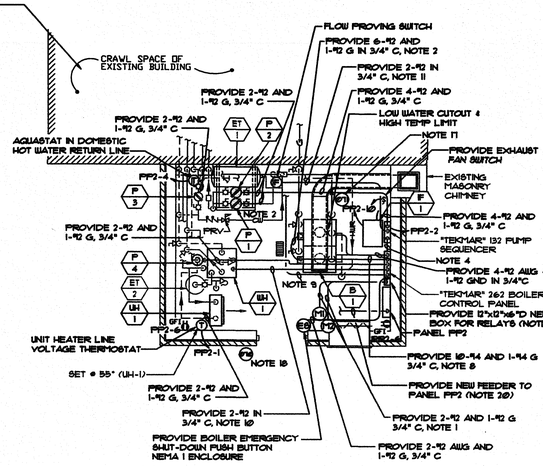


NOTE:
TYPE 'A' PLAN CONFIGURATION FOR HOUSING UNITS 1D, 2B, 6B, 7B, 8A, 11A, 12A, 13A, 15B, 16A, 17B, 20A, 23A, 24A, 25B, 27A, & 28A TO BE WIRED AS INDICATED ON THIS DRAWING.

HOUSING UNITS 3B, 4B, 9A, 10A, 14A, 18B, 26B, 28A, 30A & 31E SHALL BE WIRED SIMILARY EXCEPT EQUIPMENT IS TO BE INSTALLED OPPOSITE HAND.

BOILER ROOM 'A' - POWER & CONTROL PLAN

SCALE: 1/4" = 1'-0"

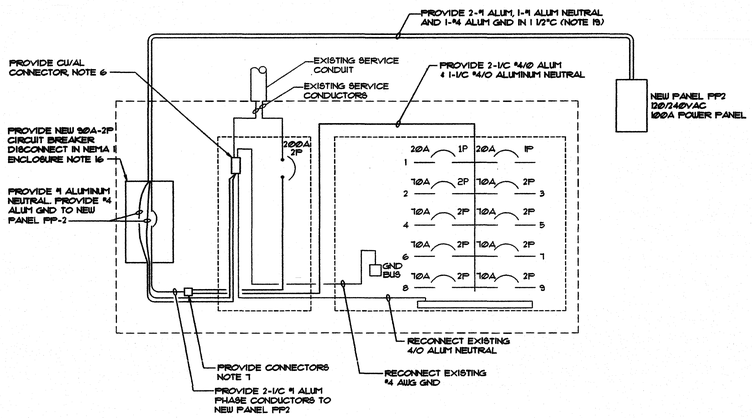


NOTE:
TYPE 'B' PLAN CONFIGURATION FOR HOUSING UNITS 5C, 19C, 22C, 33C, & 34C TO BE WIRED AS INDICATED ON THIS DRAWING.

HOUSING UNITS 21C & 32C SHALL BE WIRED SIMILARY EXCEPT EQUIPMENT IS TO BE INSTALLED OPPOSITE HAND.

BOILER ROOM 'B' - POWER & CONTROL PLAN

SCALE: 1/4" = 1'-0"



NEW ONE-LINE DIAGRAM - (TYPICAL)

N.T.S.

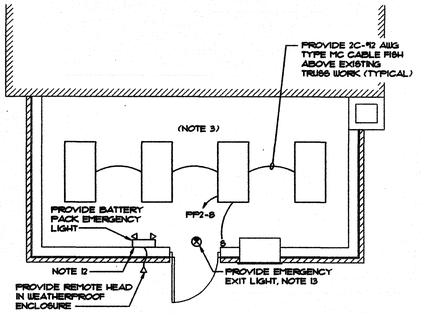
PANELBOARD SCHEDULE

DESIGNATION:	MAINS: 100A MAIN LUG ONLY	VOLTAGE: 120/240V, 1Ø 3W	LOCATION: BOILER RM	SINGLE PANEL ■
PP 2	TYPE: SQUARE D NQOD	MINIMUM O.C. DEVICE	FED BY: EXISTING PANEL PP1	DOUBLE PANEL □□
	O.C. DEVICE: NONE	INTERRUPTING RATING: 22,000A	MOUNTING: SURFACE	COMMON COVER □□

CKT NO	POLE	TRIP	WIRE	G	C	LOAD	KVA Ø A	KVA Ø B	KVA Ø C	LOAD	C	G	WIRE	TRIP	POLE	CKT NO
1	1	20	12	12	3/4	UNIT HEATER	1	10	— —	BOILER 262 & PUMP 132 CONTROL	3/4	12	12	20	1	2
3	1	20				SPARE	— —	— —	1	FILL/MAKE-UP PUMP #3	3/4	12	12	20	1	4
5	1	20	12	12	3/4	EMERGENCY LIGHTING	— —	— —	25	36 RECEPTACLE	3/4	12	12	20	1	6
7	1	20				SPARE		18	— —	— — LIGHTING	3/4	12	12	20	1	8
9	1	20				SPARE	— —	— —	25	— — EXHAUST FAN EF-1	3/4	12	12	20	1	10
11	1	20				SPARE	— —	— —	— —	SPARE				20	1	12
13								— —	— —	— —						14
15							— —	— —	— —							16
17							— —	— —	— —							18
19								— —	— —	— —						20

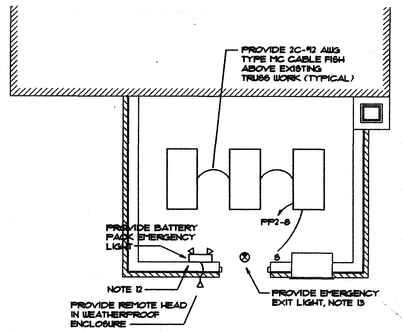
LEGEND

———	EXISTING EQUIPMENT	S	SINGLE POLE SWITCH
//////	EQUIPMENT TO BE REMOVED	GFI	GROUND FAULT RECEPTACLE
———	NEW EQUIPMENT PROVIDED BY ELECTRICAL CONTRACTOR		CONDUIT DROP
M	MOTORIZED DAMPER		NORMALLY OPEN CONTACT
	MOTORS		NORMALLY CLOSED CONTACT
X X	EQUIPMENT DESIGNATION		COIL OR SOLENOID
	NEW LIGHTING FIXTURE		THERMOSTAT
			NORMALLY CLOSED SWITCH
		X	TERMINAL BLOCK
	CIRCUIT BREAKER		FUSE



BOILER ROOM 'A' - LIGHTING PLAN

SCALE: 1/4" = 1'-0"



BOILER ROOM 'B' - LIGHTING PLAN

SCALE: 1/4" = 1'-0"

ABBREVIATIONS

A	AMP
AL	ALUMINUM
ALUM	ALUMINUM
AWG	AMERICAN WIRE GAUGE
B	BOILER
C	CONDUCTOR
CU	COPPER
CW	COLD WATER
D	DEEP
ET	EXPANSION TANK
G	GAS
GND	GROUND
HW	HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
KVA	KILOVOLT AMP
M	MOTOR
N.T.S.	NOT TO SCALE
RGS	RIGID GALVANIZED STEEL CONDUIT
UH	UNIT HEATER
WH	WATER HEATER

NOTES:

1. PROVIDE CONTROL WIRING TO INTERLOCK COMBUSTION AIR LOUVERS MOTORIZED ACTUATORS WITH MODULAR BOILERS. ACTUATORS SHALL OPERATE TO STROKE LOUVERS TO FULL OPEN POSITION UPON START UP OF EITHER BOILER. SEE BOILER CONTROL SCHEMATIC, SHEET E-2.
2. PROVIDE CONTROL POWER TO MODULAR BOILERS FROM TEKMAR CONTROLLER. PROVIDE INTERLOCK AND CONTROL WIRING PER TEKMAR CONTROL SYSTEM REQUIREMENTS AND HYDROTHERM BOILER REQUIREMENTS.
3. PROVIDE 3 LAMP SURFACE MOUNTED FIXTURE COOPER MODEL NUMBER 2M-332A-D2ØV-EE8I OR EQUAL.
4. PROVIDE INTERLOCK AND CONTROL WIRING BETWEEN TEKMAR 262 BOILER CONTROL PANEL AND TEKMAR PUMP CONTROLLER. SEE BOILER CONTROLLER SCHEMATIC DIAGRAM SHEET E-2.
5. REMOVE SERVICE DISCONNECT SWITCH LOAD SIDE CONDUCTORS. DISCONNECT NEUTRAL AND GROUNDING CONDUCTOR FOR REUSE.
6. CONNECT EXISTING PANEL PP-1 NEUTRAL, EQUIPMENT GROUND AND NEW PANEL PP-2 NEUTRAL AND EQUIPMENT GROUND TO EXISTING SERVICE NEUTRAL (GROUNDED CONDUCTOR). BOND EXISTING 200A SERVICE DISCONNECT ENCLOSURE.
7. TAP PANEL PP-1 FEEDER CONDUCTORS FOR FEEDER TO NEW POWER PANEL PP-2 IN EXISTING SERVICE ENCLOSURE.
8. PROVIDE BOILER GAS VALVE CONTROL WIRING. SEE BOILER CONTROLLER SCHEMATIC SHEET E-2.
9. PROVIDE 3/4" CONDUIT AND 2 CONDUCTOR #18AWG THERMOSTAT WIRING TO LOCATION IN DWELLING UNIT DESIGNATED BY THE HOUSING AUTHORITY FOR Ø11 WALL PLATE THERMOSTAT.
10. PROVIDE CIRCUIT FROM INDIRECT WATER HEATER THERMOSTAT TO BOILER CONTROLLER.
11. PROVIDE CIRCUIT FROM FLOW PROVING SWITCH TO BOILER CONTROLLER.
12. PROVIDE COOPER SURE LITE XR-II EMERGENCY FIXTURE OR EQUAL WITH 6X-7-WBX REMOTE HEAD.
13. PROVIDE COOPER CCX-11-RWH OR EQUAL EXIT LIGHT.
14. CONTRACTOR SHALL INSTALL TEKMAR BOILER 262 CONTROL AND TEKMAR 132 PUMP CONTROL PANELS INCLUDING ALL CONTROL WIRING AND CHECK-OUT. CONTROL PANELS WILL BE PROVIDED BY THE MECHANICAL CONTRACTOR FOR INSTALLATION BY THE ELECTRICAL CONTRACTOR.
15. CONTRACTOR SHALL PROVIDE CONTROL TRANSFORMER, FUSE BLOCK, FUSES, RELAYS, ENCLOSURE AND ALL WIRING AS REQUIRED FOR A COMPLETE WORKING SYSTEM AS INDICATED IN THE BOILER CONTROL SCHEMATIC. TRANSFORMER VA CAPACITY SHALL BE DETERMINED BY HYDROTHERM BOILER AND TEKMAR MANUFACTURER'S REQUIREMENTS.
16. PROVIDE 100A-2P SQUARE D TYPE FA CIRCUIT BREAKER IN NEMA 1 ENCLOSURE OR EQUAL.
17. PROVIDE 3/4" CONDUIT AND 2 CONDUCTOR #18 AWG THERMOSTAT WIRING TO BOILER RETURN TEMPERATURE SENSOR Ø11.
18. PROVIDE 3/4" CONDUIT AND 2 CONDUCTOR #18 AWG THERMOSTAT WIRING TO OUTDOOR AIR SENSOR Ø10.
19. SEE SHEET E6-1 FOR NEW PP2 PANEL FEEDER CONDUIT TYPE.
20. SEE NEW ONE-LINE DIAGRAM THIS SHEET FOR FEEDER DETAILS. SEE SHEET E6-1 FOR CONTINUATION.
21. EQUIPMENT INCLUDING PUMPS, UNIT HEATER, BOILERS, FLOW SWITCHES, AQUASTATS, DAMPER MOTORS, WATER HEATER & INTAKE FAN ARE PROVIDED BY THE MECHANICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL POWER & CONTROL WIRING INCLUDING TERMINATIONS & START UP SUPPORT.

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN H. SMITH — ENGINEER — 22641-E

DRAWING TITLE:

ELECTRICAL POWER, CONTROL & LIGHTING PLANS

DRAWN BY:	CHECKED BY:
SAS/SMB	KB
DATE:	PROJECT NO:
11/06/02	2001-429

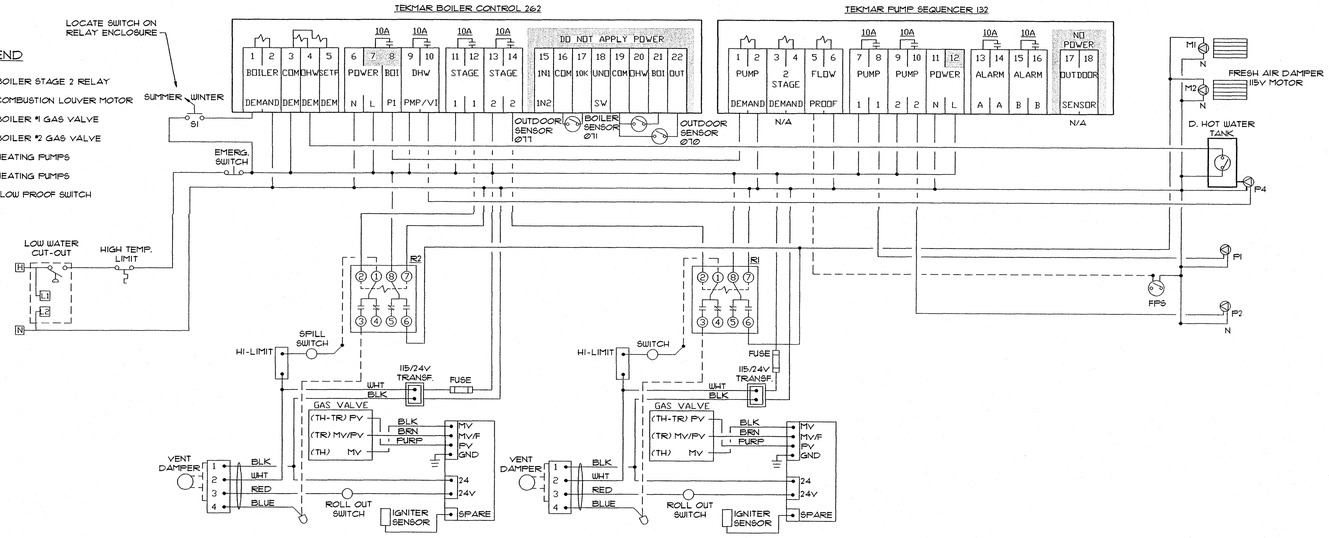
DRAWING NO:

E-1

CAD FILE: 1429-E1 PLOT DATE: 11/06/02

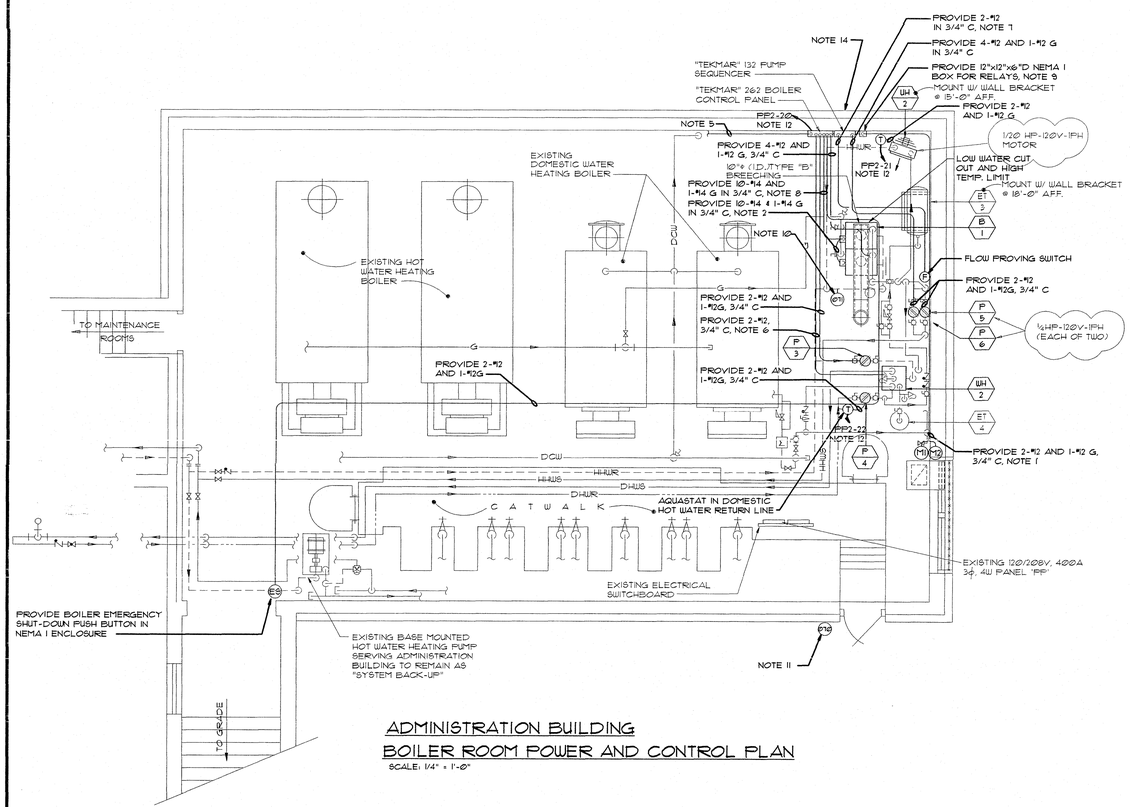
SCHEMATIC LEGEND

F1	FLOW PROVING SWITCH	R2	BOILER STAGE 2 RELAY
T1	SPACE THERMOSTAT	M	COMBUSTION LOUVER MOTOR
A	DHW HIGH LIMIT	B1	BOILER #1 GAS VALVE
S1	SUMMER/WINTER SWITCH	B2	BOILER #2 GAS VALVE
T2	DHW THERMOSTAT	P1	HEATING PUMPS
R1	BOILER STAGE 1 RELAY	P2	HEATING PUMPS
P3	DHW PUMP BOILER WATER	FPS	FLOW PROOF SWITCH



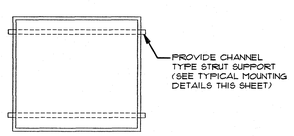
BOILER CONTROLLER SCHEMATIC

N.T.S.



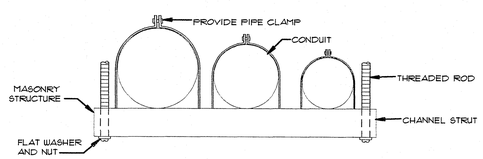
ADMINISTRATION BUILDING
BOILER ROOM POWER AND CONTROL PLAN

SCALE: 1/4" = 1'-0"



TYPICAL ENCLOSURE/JUNCTION BOX MOUNTING DETAIL

N.T.S.

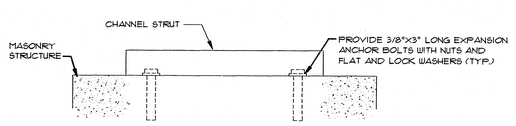


TYPICAL CONDUIT TO STRUT MOUNT

N.T.S.

TYPICAL JUNCTION BOX TO STRUT MOUNT

N.T.S.



TYPICAL CHANNEL STRUT TO STRUCTURE MOUNT

N.T.S.

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. WORK UNDER THIS CONTRACT COMPRISES OF PROVIDING ALL LABOR, MATERIALS, EQUIPMENT, TRANSPORTATION, SCAFFOLDING, RIGGING, TOOLS AND RELATED ITEMS AND SUBCONTRACT WORK FOR A COMPLETE OPERATING ELECTRICAL SYSTEM AND INCLUDES BUT IS NOT LIMITED TO:

1. OBTAINING ALL PERMITS AND APPROVALS FROM AUTHORITIES WHERE APPLICABLE.
2. REMOVALS, ALTERATIONS, RELOCATIONS AND CONNECTIONS TO EXISTING SYSTEMS.
3. IDENTIFICATION.
4. CUTTING AND PATCHING.
5. GUARANTEE.
6. SHOP DRAWINGS.
7. MAINTENANCE MANUALS.
8. TESTING AND ADJUSTMENTS.
9. CLEAN-UP.
10. FEEDERS, PANELBOARDS AND CIRCUIT BREAKERS.
11. WIRING DEVICES.
12. GROUNDING SYSTEM.
13. LIGHTING AND POWER BRANCH CIRCUIT CONDUIT AND WIRING.
14. CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS.
15. DISCONNECT SWITCHES.
16. LIGHTING FIXTURES AND LAMPS.
17. FUSES.
18. EMERGENCY AND EXIT LIGHTING.
19. NEC REQUIRED FIELD MARKINGS.
20. LIGHTING CONTROLS.
21. COORDINATION WITH OTHER TRADES.
22. CONTROL WIRING AND START UP SUPPORT.

1.2 EXECUTION OF WORK

A. IT IS THE INTENT OF THE DRAWINGS AND SPECIFICATIONS TO PROVIDE A COMPLETE WORKABLE SYSTEM READY FOR THE OWNER'S OPERATION. ANY ITEM NOT SPECIFICALLY SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS, BUT NORMALLY REQUIRED TO CONFORM WITH THE INTENT, ARE TO BE CONSIDERED A PART OF THE CONTRACT.

B. ALL MATERIALS FURNISHED BY THE CONTRACTOR SHALL BE NEW AND UNUSED AND FREE FROM DEFECTS. ALL MATERIALS USED SHALL BEAR THE UNDERWRITER'S LABORATORY, INC. LABEL.

C. KEEP A SUITABLE FORCE OF MEN ON THE JOB AT ALL TIMES, TO COMPLY WITH THE JOB PROGRESS SCHEDULE, UNTIL THE COMPLETION OF ALL ELECTRICAL CONSTRUCTION.

D. COORDINATE THE LOCATIONS OF ALL ELECTRICAL EQUIPMENT WITH THE EQUIPMENT OF OTHER TRADES, OWNER FURNISHED EQUIPMENT AND THE BUILDING CONSTRUCTION.

E. COMPLY WITH THE LATEST RULES AND REGULATIONS OF THE NATIONAL ELECTRICAL CODE, THE NATIONAL ELECTRICAL SAFETY CODE, ALL NFPA CODES, THE RULES SET FORTH BY THE UTILITY COMPANIES SERVING THIS SITE AND ALL OTHER NATIONAL, STATE OR MUNICIPAL CODES APPLICABLE TO THIS PROJECT.

1.3 EXAMINATION OF SITE

A. PRIOR TO THE SUBMITTING OF BIDS, THE CONTRACTOR SHALL VISIT THE SITE OF THE JOB AND SHALL FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE PROPOSED INSTALLATION AND SHALL MAKE PROVISIONS AS TO THE COST THEREOF. FAILURE TO COMPLY WITH THE INTENT OF THIS PARAGRAPH WILL IN NO WAY RELIEVE THE CONTRACTOR OF PERFORMING ALL NECESSARY WORK SHOWN ON THE DRAWINGS.

1.4 CUTTING AND PATCHING

A. WHERE CUTTING, CHANNELING, CHASING OR DRILLING OF FLOORS, WALLS, PARTITIONS, CEILINGS OR OTHER CONSTRUCTION IS NECESSARY FOR PROPER INSTALLATION, THE WORK SHALL BE DONE CAREFULLY TO PRESERVE THE INTEGRITY OF THE CONSTRUCTION. PATCH AND REPAIR ALL HOLES TO THEIR ORIGINAL CONSTRUCTION, FIRE RATING AND FINISH.

1.5 MOUNTING HEIGHTS

A. MOUNTING HEIGHTS LISTED ARE TO THE CENTER OF THE DEVICE AND WHEREVER APPLICABLE THE MOUNTING HEIGHT SHALL FALL WITHIN THE RANGES GIVEN IN THE LATEST PUBLICATION OF ADA.

1. SWITCHES - 42 INCHES (OR MATCH EXISTING)
2. DISCONNECTS AND CONTROLLERS - 60 INCHES
3. EXIT LIGHTS - TWO INCHES ABOVE TOP OF DOOR OR CEILING MOUNT NOT TO EXCEED 10 FEET ABOVE FINISHED FLOOR. SUSPEND WHERE NECESSARY TO COMPLY.
4. RECEPTACLES 24".

1.6 CLEANING UP

A. CONTRACTOR SHALL TAKE CARE TO AVOID ACCUMULATION OF DEBRIS, BOXES, CRATES, ETC., RESULTING FROM THE INSTALLATION OF HIS WORK. CONTRACTOR SHALL REMOVE FROM THE PREMISES EACH DAY ALL DEBRIS, BOXES, ETC., AND KEEP THE PREMISES CLEAN, SUBJECT TO THE ENGINEER'S INSTRUCTIONS, WHICH SHALL BE PROMPTLY CARRIED OUT.

B. CONTRACTOR SHALL CLEAN UP ALL FIXTURES AND EQUIPMENT AT THE COMPLETION OF THE PROJECT.

1.7 DEFINITIONS

A. "PROVIDE" MEANS TO SUPPLY, PURCHASE, INSTALL, CONNECT, TEST AND TURN OVER TO THE OWNER, COMPLETE AND READY FOR OPERATION, THE PARTICULAR WORK REFERRED TO.

B. "INSTALL" MEANS TO SET IN PLACE, FASTEN, JOIN, ATTACH, CONNECT, TEST AND TURN OVER TO THE OWNER COMPLETE AND READY FOR OPERATION, THE PARTICULAR WORK REFERRED TO.

C. "FURNISH" MEANS TO PURCHASE AND SUPPLY ALL MATERIALS, EQUIPMENT, TESTING, ACCESSORIES AND ALL OTHER ITEMS CUSTOMARILY REQUIRED FOR THE PROPER AND COMPLETE APPLICATION FOR THE PARTICULAR WORK REFERRED TO.

D. "CONCEALED" MEANS EMBEDDED IN MASONRY OR OTHER CONSTRUCTION, INSTALLED WITHIN WALL CONSTRUCTION OR INSTALLED ABOVE SUSPENDED CEILINGS.

1.8 RECORD DRAWINGS

A. DURING CONSTRUCTION, KEEP A SET OF BLUEPRINTS AT THE SITE AND RECORD ALL DEVIATIONS BETWEEN THE WORK SHOWN ON THE CONTRACT DOCUMENTS AND THAT WHICH IS ACTUALLY INSTALLED.

B. UPON COMPLETION OF THE INSTALLATION AND ACCEPTANCE BY THE OWNER, OBTAIN A SET OF MYLAR REPRODUCIBLES, TRANSFER THE ABOVE INFORMATION TO THE REPRODUCIBLES AND DELIVER THEM TO THE ARCHITECT FOR REVIEW. IF ACCEPTABLE, TRANSMIT TO THE OWNER THE REPRODUCIBLES. THE COST FOR MYLAR REPRODUCIBLES AND FOR MAKING THE REQUIRED CHANGES SHALL BE BORNE BY THE CONTRACTOR.

1.9 SHOP DRAWINGS

A. PREPARE AND SUBMIT SHOP DRAWINGS FOR MATERIALS AND SYSTEMS LISTED HEREIN. SHOP DRAWINGS MAY BE IN THE FORM OF STANDARD MANUFACTURERS CATALOG CUTS.

B. SUBMIT SHOP DRAWING FOR THE FOLLOWING EQUIPMENT AND SYSTEMS:

1. LIGHTING FIXTURES.
2. PANELBOARDS.
3. TRANSFORMERS.
4. DEVICES.
5. WIRE AND CABLE.
6. DISCONNECTS.
7. CONDUIT.
8. CONNECTORS.

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REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

COMMONWEALTH OF PENNSYLVANIA
KEVIN N. SMITH
ENGINEER
22541-E
REGISTERED PROFESSIONAL

DRAWING TITLE:

ELECTRICAL PLAN, DETAILS & SPECIFICATIONS

DRAWN BY:	CHECKED BY:
SMB	KB
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

E-2

CAD FILE: 429-E2 PLOT DATE: 11/06/02

1.10 GUARANTEE

A. SUBMIT A SINGLE GUARANTEE STATING THAT ALL PORTIONS OF THE WORK ARE IN ACCORDANCE WITH CONTRACT REQUIREMENTS. GUARANTEE ALL WORK AGAINST FAULTY AND IMPROPER MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE BY THE OWNER. OBTAIN SIMILAR GUARANTEES FROM SUBCONTRACTORS, MANUFACTURERS, SUPPLIERS AND SUBTRADE SPECIALISTS.

1.11 MAINTENANCE MANUAL

A. PROVIDE MANUFACTURERS LITERATURE FOR ALL ITEMS OF EQUIPMENT PROVIDED UNDER THIS CONTRACT AS REGULARLY PUBLISHED BY THE EQUIPMENT MANUFACTURER FOR PROPER PREVENTATIVE AND COMPREHENSIVE MAINTENANCE AND ORDERING OF REPLACEMENT PARTS.

1.12 IDENTIFICATION

A. PROVIDE FIXED IDENTIFICATION OF ALL DISTRIBUTION EQUIPMENT AND CONDUCTORS IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

B. UNLESS OTHERWISE NOTED, NAMEPLATES SHALL BE BLACK LAMACOID PLATES WITH WHITE ENGRAVED UPPER CASE LETTERS ENCLOSED BY WHITE BORDER ON BEVELED EDGE.

C. ALL NAMEPLATES MUST BE ENGRAVED AND MUST BE SECURED WITH RIVETS, BRASS OR CADMIUM PLATE SCREWS. THE USE OF DYMO TAPE OR THE LIKE IS UNACCEPTABLE.

D. LETTERING HEIGHTS UNLESS OTHERWISE NOTED MUST BE AS FOLLOWS:

ITEM	LETTERING HEIGHT
PANELBOARDS & LOAD CENTERS	1/2"
DISCONNECT SWITCHES	1/2"
WALL PLATES	1/8"
MOTOR CONTROLLERS	1/4"

E. CABLE TAGS MUST BE FLAMEPROOF SECURED WITH FLAMEPROOF NON-METALLIC CORD.

F. DISTRIBUTION EQUIPMENT SHALL BEAR THE NAME AND NUMBER WHICH THEY ARE ASSIGNED AS INDICATED ON THE DRAWINGS AND THE EQUIPMENT WHICH THEY SERVE.

G. MANUFACTURERS STAMPED METAL TAGS SHALL BE AFFIXED TO ALL DISTRIBUTION EQUIPMENT STATING VOLTAGE, PHASE, FREQUENCY, KW, HP, KVA, BIL, AMPACITY, CATALOG NUMBER, ORDER NUMBER AND ALL OTHER PERTINENT INFORMATION.

H. PANELBOARDS SHALL BE PROVIDED WITH NEAT, TYPEWRITTEN DIRECTORIES IDENTIFYING THE DEVICES SERVED AND ROOM NAMES AND NUMBER AND SHALL BE MOUNTED UNDER A TRANSPARENT SHIELD ON THE DOOR.

I. FURNISH AND INSTALL CABLE TAGS ON EACH CABLE WHICH ENTERS A PULLBOX, ENCLOSURE, AND AT TERMINATIONS. MARK TAGS WITH TYPE WRITTEN INSCRIPTION NOTING THE LOAD SERVED TYPE AND SIZE OF CABLE, AND THE OVERCURRENT DEVICE PROTECTING THE CABLE.

1.13 TESTING, INSPECTIONS AND CERTIFICATIONS

A. PRIOR TO TURNING OVER ELECTRICAL SYSTEMS TO THE OWNER, THE CONTRACTOR SHALL COMPLETELY TEST ALL SYSTEMS AND SHALL CERTIFY THAT ALL SYSTEMS HAVE BEEN TESTED AND ARE IN SAFE AND COMPLETE WORKING ORDER.

B. PERFORM THE FOLLOWING TESTS OR INSPECTIONS:

1. TEST ALL WIRING FOR SHORTS, OPENS OR GROUNDS.
2. TEST ALL CIRCUIT BREAKERS, SWITCHES, OR OTHER CONTROL DEVICES.
3. TEST ALL RECEPTACLES FOR PROPER POLARITY AND GROUND.
4. TEST ALL LIGHTING AND SWITCHES FOR PROPER OPERATION. ASSURE THAT ALL LAMPS ARE WORKING AND BALLASTS ARE "QUIET".
5. TEST ALL MOTORS FOR PROPER ROTATION AND OPERATION.
6. TEST ALL THREE PHASE FEEDERS AND CIRCUITS FOR PROPER SEQUENCE.
7. TEST ALL CONTROL SYSTEMS FOR PROPER OPERATION.

1.14 PENETRATIONS AND FIRE SEALS

A. PROVIDE FIRE SEALS AT ALL CABLE AND CONDUIT PENETRATIONS THRU FIRE RATED WALLS, FLOORS, CEILINGS OR OTHER CONSTRUCTION. REFER TO THE ARCHITECTURAL DRAWINGS FOR RATINGS.

B. FIRE SEALING MATERIAL SHALL CONSIST OF A PRE-MANUFACTURED BARRIER OR PRE-MIXED PUTTY AS MANUFACTURED BY NELSON ELECTRIC, CROUSE-HINDS COMPANY OR APPROVED EQUAL.

1.15 EQUIPMENT CONNECTIONS AND COORDINATION

A. THE CONTRACTOR SHALL RUN CONDUIT AND WIRING AND MAKE FINAL CONNECTIONS TO EQUIPMENT PROVIDED UNDER THE HVAC, PLUMBING, AND GENERAL PARTS OF THIS CONTRACT. PRIOR TO ROUGHING-IN, THE CONTRACTOR SHALL REVIEW THE SHOP DRAWINGS OR OBTAIN PERTINENT INFORMATION TO VERIFY THE TYPE OF CONNECTION REQUIRED AND PROVIDE SAME. WHERE DISCONNECTS ARE REQUIRED AND ARE NOT PROVIDED AS PART OF THE EQUIPMENT, THEY SHALL BE PROVIDED BY THIS CONTRACTOR.

B. FOR EQUIPMENT WHICH IS CORD AND PLUG CONNECTED, PROVIDE AN OUTLET TO MATCH THE PLUG ON THE EQUIPMENT. VERIFY SIZE AND TYPE OF PLUG REQUIRED PRIOR TO PURCHASE AND INSTALLATION.

C. CONTRACTOR SHALL PROVIDE ALL POWER AND CONTROL EQUIPMENT, WIRING AND RACEWAYS NECESSARY TO PROVIDE A COMPLETE FUNCTIONAL SYSTEM.

PART 2 - PRODUCTS

2.1 MATERIALS

A. UNLESS SPECIFICALLY STATED OTHERWISE ON THE DRAWINGS, ALL MATERIALS SHALL BE NEW AND SHALL BEAR A UL. LABEL WHERE STANDARDS HAVE BEEN ESTABLISHED BY UL. FOR SUCH EQUIPMENT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. FOLLOW THE MANUFACTURERS INSTRUCTIONS FOR INSTALLING, CONNECTING AND ADJUSTING ALL EQUIPMENT. PROVIDE ALL SPECIAL SUPPORTS, CONNECTIONS, WIRING AND ACCESSORIES NECESSARY FOR A COMPLETE INSTALLATION.

B. USE MECHANICS, SKILLED IN THEIR TRADE FOR ALL WORK.

C. KEEP ALL EQUIPMENT CLEAN AND PROTECTED BEFORE AND AFTER INSTALLATION.

SECTION 16110

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 REGULATORY REQUIREMENTS

A. MATERIALS: UL AND NEC APPROVED FOR THE APPLICATION INTENDED.

1.2 SYSTEM DESCRIPTION

A. PERFORMANCE REQUIREMENTS

1. PROVIDE CONDUIT SYSTEMS FOR WIRING AS INDICATED ON THE DRAWINGS.

PART 2 - PRODUCTS

2.1 CONDUIT

A. ELECTRICAL METALLIC TUBING (EMT): THINWALL, ELECTRICALLY WELDED COLD ROLLED STEEL CONDUIT, GALVANIZED INSIDE AND OUT BY ELECTRO GALVANIZED PROCESS. BAKED CLEAR ELASTIC ENAMEL COATING IN AND OUT.

1. EMT CONDUIT SHALL BE USED FOR ALL BRANCH CIRCUITRY AND SHALL BE INSTALLED EXPOSED ON MASONRY WALLS AND CEILINGS.

B. FLEXIBLE METAL CONDUIT: FORMED OF ONE CONTINUOUS LENGTH OF SPIRALLY WOUND STEEL STRIP.

1. USE FOR: FINAL INTERIOR CONNECTIONS TO EQUIPMENT ND LIGHT FIXTURES LOCATED IN WET AREAS OR RIGID GALVANIZED STEEL (RGS) SHALL BE USED FOR ALL SWEEPS ENTERING FOUNDATION WALL LENGTH NOT TO EXCEED 6'-0".
2. USE LIQUID-TIGHT IN WET AREAS AND WHERE SUBJECTED TO MOISTURE.

C. FURNISH AND INSTALL LAY-IN TYPE WIREWAY AS SHOWN ON THE PLANS. WIREWAY SHALL BE UNDERWRITERS' LABORATORIES LISTED AS WIREWAY OR AUXILIARY GUTTER.

1. WIREWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH UNDERWRITERS' LABORATORIES STANDARD UL 870 FOR WIREWAYS, AUXILIARY GUTTERS AND ASSOCIATED FITTINGS. EVERY COMPONENT INCLUDING LEGNTHS, CONNECTORS AND FITTINGS SHALL BE UL LISTED. PROVISIONS SHALL BE INCLUDED IN THE CONSTRUCTION TO ALLOW SCREWING THE HINGED COVER CLOSED WITHOUT THE USE OF PARTS OTHER THAN THE STANDARD LENGTHS, FITTINGS AND CONNECTORS. IT SHALL BE FOSSIBLE TO SEAL THE COVER IN THE CLOSED POSITION WITH A SEALING WIRE.
2. WIREWAY SHALL BE SUITABLE FOR LAY-IN CONDUCTORS CONNECTOR COVERS SHALL BE PERMANENTLY ATTACHED SO THAT REMOVAL IS NOT NECESSARY TO UTILIZE THE LAY-IN FEATURE.
3. ALL SHEET METAL PARTS SHALL BE PROVIDED WITH A RUST INHIBITING PHOSPHATIZING COATING AND GRAY BAKED ENAMEL FINISH ALL HARDWARE SHALL BE PLATED TO FREVENT CORROSION. ALL SCREWS INSTALLED TOWARD THE INSIDE SHALL BE PROTECTED BY SPRING NUTS OR OTHERWISE GUARDED TO PREVENT WIRE INSULATION DAMAGE.
4. ALL LENGTHS, CONNECTORS AND FITTINGS SHALL BE UNDERWRITERS' LABORATORIES LABELED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE AND AS SHOWN ON THESE PLANS. UNDERWRITERS' LABORATORIES LISTING OF LENGTHS WITHOUT LISTING OF CONNECTORS OR FITTINGS IS NOT ACCEPTABLE.

2.2 CONDUIT FITTINGS

A. METALLIC TUBING FITTINGS: COMPRESSION TYPE GALVANIZED MALLEABLE IRON OR STEEL, WATER AND CONCRETE TIGHT. CONNECTORS WITH NYLON INSULATED THROATS AT CABINETS, BOXES AND GUTTERS. INDENTOR OR SET SCREW TYPE FITTINGS WILL NOT BE ALLOWED.

B. FLEXIBLE METAL CONDUIT FITTINGS: SQUEEZE OR SCREW TYPE GALVANIZED MALLEABLE IRON, ALUMINUM OR STEEL WITH NYLON INSULATED THROATS.

C. LIQUID-TIGHT FLEXIBLE CONDUIT FITTINGS: GALVANIZED MALLEABLE IRON, ALUMINUM OR STEEL, WITH WATERTIGHT GASKETS, "O" RING AND RETAINER, AND NYLON INSULATED THROATS.

2.3 OUTLET BOXES

A. MATERIAL, SIZE AND INSTALLATION: COMPLY WITH NEC, ARTICLE 370.

1. ACCEPTABLE MANUFACTURERS

A. RACO
B. STEEL CITY
C. APPLETON

B. PROVIDE THE FOLLOWING:

1. SURFACE MOUNTED WALL OUTLETS:

A. SINGLE OUTLET: 2-1/2" DEEP HANDY BOX RACO NO. 674.
B. TWO OUTLETS, 4" SQUARE BY 2-1/2" DEEP BOX RACO NO. 232 OR 233.

3. SWITCH OUTLETS IN DOOR JAMBS: PARTITION BOXES, RACO NO. 426 FOR SINGLE SWITCH.

A. TWO SWITCHES: RACO NO. 426 TWO GANG TANDUM BOX.
B. THREE SWITCHES: RACO NO. 428 THREE GANG TANDUM BOX.

2.4 PULL AND JUNCTION BOXES

A. CONSTRUCTION, SIZES AND INSTALLATION: COMPLY WITH NEC, ARTICLE 370.

B. PULL AND JUNCTION BOXES NOT SPECIFICALLY DESCRIBED IN NEC, ARTICLE 370. FABRICATE OF HEAVY GAUGE GALVANIZED STEEL WITH SCREW COVERS, BRASS SCREWS AND HARDWARE WITH ENAMEL FINISH.

2.6 HANGERS AND SUPPORTS

A. PROVIDE CONDUIT HANGER AND SUPPORT DEVICES OF APPROVED TYPE FOR METHOD OF SUPPORTING REQUIRED.

1. INCLUDE: STRUCTURAL STEEL MEMBERS, SUSPENSION RODS, CONDUIT CLAMPS, EXPANSION SHIELDS, BEAM CLAMPS AND WELDING PINS.
2. FINISH: GALVANIZED FINISH OR OTHER APPROVED CORROSION RESISTANCE FINISH.

B. PROVIDE HANGERS AND SUPPORTS AS FOLLOWS:

1. WHERE SINGLE OR MULTIPLE RUN OF CONDUIT IS ROUTED ON SURFACE OF STRUCTURE: USE CONDUIT CLAMPS MOUNTED ON UNISTRUT CHANNEL TO MAINTAIN NOT LESS THAN 1" CLEARANCE BETWEEN CONDUIT AND STRUCTURE.
2. WHERE SINGLE RUN OF CONDUIT IS SUSPENDED FROM OVERHEAD, USE SPLIT RING CONDUIT CLAMP SUSPENDED BY STEEL DROP ROD.
3. ANY FORM OF STRAP IRON OR WIRE HANGERS WILL NOT BE ACCEPTED.
4. MAXIMUM HANGER AND SUPPORT SPACING: IN ACCORDANCE WITH NEC, SECTIONS 348-12, 346-12 AND 348-12.

C. ANCHOR HANGERS AND SUPPORTS TO STRUCTURE AS FOLLOWS:

1. ANCHORED TO STRUCTURAL STEEL: BEAM CLAMPS AND/OR STEEL CHANNELS AS REQUIRED BY STRUCTURAL SYSTEM.
2. ANCHORED TO METAL DECK: SPRING CLIPS OR APPROVED WELDING PINS.

A. MAXIMUM PERMISSIBLE LOAD ON EACH HANGER: NOT TO EXCEED 50 POUNDS.

3. THE USE OF EXPLOSIVE FORCE HAMMER ACTUATED, BOOSTER ASSIST OR SIMILAR ANCHORING DEVICE WILL NOT BE PERMITTED WITHOUT PRIOR APPROVAL OF THE ARCHITECT.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

A. MINIMUM SIZE CONDUIT: 3/4" TRADE SIZE.

3.2 OUTLET BOX INSTALLATION

A. INSTALL FOR ALL FIXTURES, SWITCHES, RECEPTACLES AND OTHER DEVICES.

B. INSTALL WHERE REQUIRED TO FACILITATE INSTALLATION OF THE WIRING.

3.4 HANGER AND SUPPORT INSTALLATION

A. INSTALL FOR ALL CONDUIT AND BOXES.

B. DO NOT ATTACH CONDUIT AND BOXES TO OR SUPPORT FROM MECHANICAL PIPES, PLUMBING PIPES OR SHEET METAL DUCTS.

3.5 WIREWAY INSTALLATION

A. ALL CONNECTORS SHALL BE SLIP-IN TYPE WITH SELF RETAINED MOUNTING SCREWS. ALL HANGERS SHALL BE TWO-PIECE WITH HOOK TOGETHER FEATURE TO PREMIT PREASSEMBLY OF WIREWAY AND HANGER BOTTOM PLATE BEFORE HANGING ON PRE-INSTALLED UPPER BRACKET.

SECTION 16120

WIRES AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES WIRES, CABLES, AND CONNECTORS FOR POWER, AND LIGHTING SYSTEMS RATED 600 VOLTS AND LESS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

1. WIRE AND CABLE: ALPHA, BELDEN, CABLEC, ROME, SOUTHWIRE OR APPROVED EQUAL.
2. CONNECTORS FOR WIRES AND CABLE CONDUCTORS: AMP, BUCHANAN, BURNDY GOULD, IDEAL, GEDNEY, SCOTCH, T & B OR APPROVED EQUAL.
3. INSULATING MATERIALS: RAYCHEM, SCOTCH OR APPROVED EQUAL.

2.2 WIRES AND CABLES

A. GENERAL: PROVIDE WIRE AND CABLE SUITABLE FOR THE TEMPERATURE, CONDITIONS AND LOCATION WHERE INSTALLED. MATERIALS SHALL BE FREE FROM DEFECT OR DAMAGE.

B. CONDUCTORS:

1. PROVIDE STRANDED COPPER CONDUCTORS FOR ALL WIRES AND CABLES.

C. CONDUCTOR SIZE:

1. FEEDERS AND BRANCH CIRCUITS MINIMUM #12 AWG.

D. INSULATION:

1. #12-10 IS TYPE THHN/THWN.
2. #8 AND LARGER IS TYPE THHN/THWN OR XHHW.

E. CABLES:

1. PROVIDE MC CABLE ONLY FOR LIGHTING CIRCUITS AS INDICATED ON THE DRAWINGS.
2. PROVIDE THERMOSTAT CABLE IN ACCORDANCE WITH NEC ARTICLE 725 REMOTE CONTROL & SIGNALING CIRCUITS.

2.3 CONNECTORS FOR CONDUCTORS

A. PROVIDE UL-LISTED FACTORY-FABRICATED, SOLDERLESS METAL CONNECTORS OF SIZES, AMPACTIY RATINGS, MATERIALS, TYPES AND CLASSES FOR APPLICATIONS AND FOR SERVICES INDICATED. USE CONNECTORS WITH TEMPERATURE RATINGS EQUAL TO OR GREATER THAN THOSE OF THE WIRES UPON WHICH USED.

1. CONDUCTORS #8 AWG AND LARGER SHALL USE COMPRESSION CRIMP CONNECTORS.
2. CONDUCTORS #10 AWG AND SMALLER MAY USE EITHER COMPRESSION CRIMP OR TWIST ON PRESSURE CONNECTORS.

2.4 INSULATING MATERIALS FOR CONDUCTORS

A. PROVIDE INSULATING MATERIALS, TAPES, SLEEVES, COMPOUND AND FILLERS WHICH MEET OR EXCEED THE VOLTAGE AND TEMPERATURE.

1. VINYL TAPE SHALL BE 7 MIL6 THICK, RATED FOR 600V FROM 118 TO 105 DEG C.
2. RUBBER TAPE SHALL BE 30 MILS THICK, RATED FOR 600V, AND BE SELF FUSING.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. USE THE FOLLOWING WIRING METHODS AS INDICATED:

1. WIRE: INSTALL ALL WIRE IN RACEWAY.

3.2 INSTALLATION OF WIRES AND CABLES

A. PROVIDE INDIVIDUAL PHASE AND NEUTRAL CONDUCTORS FOR EACH CIRCUIT, EXCEPT WHERE INDICATED ON THE DRAWING. A COMMON GROUND WIRE SHALL BE PULLED FOR EACH CIRCUIT. A COMMON GROUND WIRE SHALL BE PULLED FOR EACH RACEWAY. NO MORE THAN THREE (3) PHASE WIRES, ONE (1) NEUTRAL AND ONE (1) GROUND WIRE OCCUPY THE SAME CONDUIT UNLESS SPECIFICALLY CALLED FOR ON THE DRAWINGS.

3.3 FIELD QUALITY CONTROL

A. PRIOR TO ENERGIZING, CHECK INSTALLED POWER WIRES AND CABLES WITH 500 VDC MEGOHM METER TO DETERMINE INSULATION RESISTANCE LEVELS TO ASSURE REQUIREMENTS ARE FULFILLED.

1. PHASE TO PHASE, PHASE TO NEUTRAL, PHASE TO GROUND SHALL EXCEED 1 MEGOHM.
2. NEUTRAL TO GROUND SHALL BE 3 OHMS OR LESS.

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. GENERAL: PROVIDE WIRING DEVICES AS DESCRIBED HEREIN AND AS SHOWN ON THE DRAWINGS.

1.2 STANDARDS

A. EXCEPT AS MODIFIED BY GOVERNING CODES AND BY THE CONTRACT DOCUMENTS, COMPLY WITH THE LATEST APPLICABLE PROVISIONS AND LATEST RECOMMENDATIONS OF THE FOLLOWING:

1. SWITCHES

A. FEDERAL SPECIFICATION STANDARD WS-896E.

2. RECEPTACLES

A. NEMA STANDARD WD-1, 3.2 THROUGH 3.10.
B. UL STANDARD 498 FEDERAL SPECIFICATION WC596-D.
C. ANSI

PART 2 - PRODUCTS

2.1 CATALOG NUMBERS AND APPROVED MANUFACTURERS

A. DEVICES LISTED BELOW ARE BY HUBBELL. EQUIVALENT DEVICES AS MANUFACTURED BY PASS & SEYMOUR, ARROW-HART, GENERAL ELECTRIC, SLATER & LEVITON ARE ACCEPTABLE. ALL DEVICES SHALL BE OF THE SAME MANUFACTURER. CONFIRM THE DEVICE AND DEVICE PLATE

B. SWITCHES - SINGLE POLE SNAP SWITCH

C. GFI RECEPTACLES

1. HUBBELL OR EQUAL

D. FACEPLATES

1. HUBBELL, STEEL COVER PLATES OR EQUAL.

2.2 SWITCHES

A. PROVIDE HEAVY DUTY, SPECIFICATION GRADE, FLUSH MOUNTING, QUIET-OPERATING AC TYPE, WITH TOGGLE OPERATOR, HEAT-RESISTANT PLASTIC HOUSING AND SELF GROUNDING METAL STRAP. SILVER ALLOY CONTACT, RATED 20A AT 120-277V AND CAPABLE OF FULL CAPACITY ON TUNGSTEN OR FLUORESCENT LAMP LOAD. DESIGN FOR SIDE OR BACK WIRING WITH UP TO NUMBER 10 WIRE. VERIFIED BY UL TO MEET OR EXCEED FEDERAL SPECIFICATION WS-896E.

2.3 GFI RECEPTACLES

A. PROVIDE 3-POLE NEMA AND ANSI STANDARD TYPE, WITH BRONZE CONTACTS THAT ACCEPT PLUG WITH 2 PARALLEL BLADES AND 1 GROUNDING BLADE. HEAT-RESISTANT, THERMOPLASTIC BASE WITH IMPACT RESISTANT, NYLON FACE. TWO GROUNDING SCREWS. BREAK-OFF TERMINALS FOR 2-CIRCUIT WIRING. RATED 20 AMPERES AT 125-VOLT ELECTRICAL ALTERNATING CURRENT.

PART 3 - EXECUTION

3.1 SWITCHES

A. MOUNT SWITCHES VERTICALLY WITH THE "ON" POSITION ON TOP, UNLESS NOTED OR SPECIFIED OTHERWISE.

B. CAREFULLY COORDINATE THE LOCATION OF SWITCHES TO INSURE LOCATIONS AT THE STRIKE SIDE OF DOORS.

3.2 RECEPTACLES

A. UNLESS OTHERWISE NOTED, MOUNT RECEPTACLE VERTICALLY WITH U-SHAPED GROUND POSITION ON BOTTOM.

3.4 GENERAL INSTALLATION

A. ALL DEVICES SHALL BE SURFACE-MOUNTED EXCEPT AS OTHERWISE NOTED ON THE DRAWINGS.

B. LOCATIONS

1. COMPLY WITH LAYOUT DRAWINGS FOR GENERAL LOCATIONS
2. RELOCATE OUTLETS OBVIOUSLY PLACED IN A LOCATION OR MANNER NOT SUITABLE TO AND ACCESS AS A RESULT OF EQUIP. LAYOUT.

C. MOUNTING HEIGHTS AS SPECIFIED AND AS INDICATED ON THE DRAWINGS, OR 18" ABOVE FINISHED FLOOR.

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Boiler Plant Decentralization for Hilltop Manor

SEALS:

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SECTION 16160

PANELBOARDS

PART 1 - GENERAL

1.1 STANDARDS

EXCEPT AS MODIFIED BY GOVERNING CODES AND BY THE CONTRACT DOCUMENTS, COMPLY WITH THE LATEST APPLICABLE PROVISIONS AND THE LATEST APPLICABLE RECOMMENDATIONS OF THE FOLLOWING:

A. UL, STANDARDS #50 AND #67.

B. FEDERAL SPECIFICATIONS W--P-115A TYPE II, CLASS I, AND W-C-375B

C. NEMA /STANDARD PB-1-1971

1.2 SUBMITTALS

A. SUBMIT MANUFACTURER'S CATALOG CUTS FOR ALL NEW PANELBOARDS.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. 120/240 VOLT CIRCUIT BREAKER PANELBOARDS ARE TO BE EQUAL TO SQUARE D TYPE NQOD AND QO TYPE LOAD CENTERS.

2.2 PANELBOARDS IN GENERAL

A. PROVIDE PANELBOARDS CONSISTING OF AN ASSEMBLY OF BRANCH CIRCUITS SWITCHING AND PROTECTIVE DEVICES NUMBER AND SIZE OF THESE BRANCH CIRCUIT DEVICES AS INDICATED BY THE CIRCUITING, ON THE DRAWINGS, AND IN THE SCHEDULES. LOCATIONS OF CIRCUIT BREAKERS SHALL BE AS INDICATED IN THE SCHEDULES.

B. PANELBOARDS SHALL BE COMPRISED OF A RIGID REMOVABLE ASSEMBLY OF COPPER BUS AND INTERCHANGEABLE BOLTED BRANCH CIRCUIT DEVICES. BUSES SHALL BE ARRANGED IN SEQUENCE OR DISTRIBUTE PHASING SO THAT MULTIPOLE CIRCUIT BREAKERS CAN REPLACE ANY GROUP OF SINGLE POLE BREAKERS OF THE SAME SIZE.

C. PANELBOARDS SHALL BE PROVIDED WITH GROUND BUS AS INDICATED ON THE DRAWINGS.

D. PANELBOARDS SHALL BE PROVIDED WITH A BOLT-ON GROUND CONNECTOR TO INSIDE OF THE ENCLOSURE. DOOR SHALL BE PROVIDED FOR SURFACE OR FLUSH MOUNTING (AS INDICATED), LOCKS (ALL KEYED ALIKE), AND A DIRECTORY FOR TOTAL NUMBER OF POLES.

E. PANELBOARDS SHALL BE PPROVIDED WITH PLASTIC MOLDED CASE CIRCUIT BREAKERS IN A COMPLETELY SEALED ENCLOSURE WITH TOGGLE TYPE OPERATING HANDLE AND CLEAR INDICATION OF TRIP AMPERE RATING ON/OFF INDICATION. THERMAL MAGNETIC, TRIP FREE, TRIP INDICATING, QUICK MAKE, QUICK BREAK WITH INVERSE TIME DELAY CHARACTERISTICS AND SINGLE HANDLE SHALL BE PROVIDED FOR MULTIPOLE BREAKERS.

F. CIRCUIT BREAKERS SHALL BE MOLDED CASE SIZED AS INDICATED, 10,000A INTERRUPTING CAPABLE. BREAKERS SHALL BE UL LISTED AND CONFORM TO NEMA STANDARD AB1 AND FEDERAL SPECIFICATION W-C-375B/GEN.

PART 3 - EXECUTION

3.1 INSTALLATION

A. PANELBOARDS SHALL BE MOUNTED AT 6 FEET, 6 INCHES TO TOP MAXIMUM UNLESS OTHERWISE NOTED. SURFACE PANELBOARDS SHALLBE A MINIMUM OF 1 INCH OFF OF THE WALL ON CHANNELS AND FLUSH MOUNTED SHALL MAINTAIN FIRE INTEGRITY OF THE WALL. A NAMEPLATE SHALL BE PROVIDED ALONG WITH A COMPLETE PANEL SCHEDULE INDICATING ALL LOADS INACCORDANCE WITH 16060. PROVIDE GROUNDING AND BONDING JUMPERS PER SECTION 16450.

SECTION 16410

CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 OVERCURRENT PROTECTIVE DEVICES

A. MOLDED-CASE CIRCUIT BREAKER: NEMA AB1, SQUARE D FA OR EQUAL.

1. CHARACTERISTICS: FRAME SIZE, TRIP RATING, NUMBER OF POLES AND AUXILIARY DEVICES AS INDICATED AND INTERRUPTING CAPACITY RATING EQUAL TO 18,000A MAINIMUM.

2. APPLICATION LISTING: APPROPRIATE FOR APPLICATION, INCLUDING TYPE SWD FOR SWITCHING FLUORESCENT LIGHTING LOADS AND TYPE HACR FOR HEATING, AIR-CONDITIONING, AND REFRIGERATING EQUIPMENT.

PART 2 - PRODUCTS

2.1 ACCESSORY COMPONENTS AND FEATURES

A. ACCESSORY SET: PROVIDE CIRCUIT BREAKER IN NEMA 1 ENCLOSURE.

PART 3 - EXECUTION

3.1 INSTALLATION

A. INSTALL AS INDICATED IN ACCORDANCE WITH NEC AND MANUFACTURER'S REQUIREMENTS.

SECTION 16181

FUSES

PART 1 - GENERAL

1.1 REGULATORY REQUIREMENTS

A. UNDERWRITER'S LABORATORIES, UL:

1. ALL FUSES LISTED AND LABELED BY UL.

2. UL 198R: CLASS R FUSES.

3. UL 198.6 & 198.2 SUPPLEMENTARY PROTECTION.

PART 2 - PRODUCTS

2.1 FUSES

A. BUSS FNQ OR EQUAL FOR CONTROL TRANSFORMERS.

B. ALL FUSES, PRODUCTS OF THE SAME MANUFACTURER

C. ACCEPTABLE MANUFACTURERS:

1. BUSSMAN MFG. DIV.

2. GOULD SHAWMUT

PART 3 - EXECUTION

3.1 INSTALLATION

A. DO NOT INSTALL FUSES UNTIL EQUIPMENT IS READY TO BE ENERGIZED.

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. GENERAL: PROVIDE A LOW IMPEDANCE GROUNDING SYSTEM IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND THE N.E.C.

1. WHETHER OR NOT INDICATED ON DRAWINGS, PROVIDE CONTINUOUS GROUND PATH FOR ALL ELECTRICAL CIRCUITS FROM POINT OF UTILIZATION BACK TO SOURCE THROUGH GROUND WIRES, BONDED METALLIC CONDUIT RUNS, AND RELATED ITEMS.

1.2 STANDARDS

A. EXCEPT AS MODIFIED BY GOVERNING CODES AND BY THE CONTRACT DOCUMENTS, COMPLY WITH THE LATEST APPLICABLE PROVISIONS AND LATEST RECOMMENDATIONS OF THE FOLLOWING:

1. UNDERWRITERS LABORATORY STANDARD NO. UL. 467.

2. ANSI C-1 1978.

3. IEEE STANDARDS NO. 142-1982 AND NO. 80.

4. NATIONAL ELECTRICAL SAFETY CODE.

5. NFPA.

6. FEDERAL INFORMATION PROCESSING STANDARDS, PUBLICATION #94.

PART 2 - PRODUCTS

2.1 MATERIALS

A. GROUND CABLES: BARE OR GREEN COLOR CODED, INSULATED, ANNEALED STRANDED TINNED COPPER WIRE AS INDICATED ON DRAWINGS; INSULATED WIRE TO CONFORM WITH REQUIREMENTS OF SECTION 16120.

B. MECHANICAL CONNECTORS: TIN-PLATED ALUMINUM ALLOY, UL APPROVED AND STAMPED FOR USE WITH COPPER CONDUCTORS.

2.2 GENERAL

A. FURNISH AND INSTALL ELECTRICAL GROUNDING SYSTEMS AS INDICATED ON THE CONSTRUCTION DOCUMENTS AND AS SPECIFIED HEREIN.

B. GROUNDING SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITIES, NEC SECTION 250, AND SUBJECT TO THE APPROVAL OF THE ARCHITECT/ENGINEER.

C. ALL GROUND WIRES AND BONDING JUMPERS SHALL BE STRANDED COPPER INSTALLED IN CONDUIT. ALL GROUND WIRES SHALL BE WITHOUT JOINTS AND SPLICES OVER ITS ENTIRE LENGTH.

D. EACH SYSTEM OF CONTINUOUS METALLIC PIPING AND DUCTWORK SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEC SECTION 250.

E. MECHANICAL EQUIPMENT SHALL BE BONDED TO THE BUILDING EQUIPMENT GROUNDING SYSTEM. THIS SHALL INCLUDE BUT IS NOT LIMITED TO, MOTORS, PUMPS, CONTROLS AND DEVICES.

F. CONDUITS AND PORTIONS OF METALLIC PIPING AND DUCT SYSTEMS WHICH ARE ISOLATED BY FLEXIBLE CONNECTIONS, INSULATED COUPLINGS, ETC., SHALL BE BONDED TO THE EQUIPMENT GROUND WITH A FLEXIBLE BONDING JUMPER, OR SEPARATE GROUNDING CONDUCTOR.

G. METAL RACEWAYS, CABLE ARMOR, CABLE SHEATH, ENCLOSURES, FRAMES, FITTINGS AND OTHER METAL NONCURRENT-CARRYING PARTS THAT ARE TO SERVE AS GROUNDING CONDUCTORS SHALL BE EFFECTIVELY BONDED WHERE NECESSARY TO ASSURE ELECTRICAL CONTINUITY AND THE CAPACITY TO CONDUCT SAFELY ANY FAULT CURRENT LIKELY TO BE IMPOSED ON THEM. ANY NONCONDUCTIVE PAINT, ENAMEL, OR SIMILAR COATING SHALL BE REMOVED AT THREADS, CONTACT POINTS, AND CONTACT SURFACES OR BE CONNECTED BY MEANS OF FITTINGS SO DESIGNED AS TO MAKE SUCH REMOVAL UNNECESSARY.

H. A SEPERATE EQUIPMENT GROUND CONDUCTOR SHALL BE RUN IN ALL FEEDER AND BRANCH CIRCUITS.

2.4 RECEPTACLES

A. RECEPTACLES SHALL BE GROUNDED TO THE OUTLET BOX BY MEANS OF A BONDING JUMPER BETWEEN THE OUTLET BOX AND THE RECEPTACLE GROUNDING TERMINAL.

2.5 TOGGLE SWITCHES

A. PROVIDE GROUNDING CLIP ON EACH TOGGLE SWITCH. MOUNT OVER DEVICE MOUNTING STRAP SUCH THAT CONTACT IS MADE BETWEEN MOUNTING STRAP, SCREW, FACEPLATE AND OUTLET BOX.

B. PROVIDE DEVICES WITH GROUND SCREW WHERE REQUIRED BY LOCAL AUTHORITIES AND BOND THIS WITH #10 CONDUCTOR TO ASSOCIATED OUTLET BOX.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GROUND CONDUCTORS

1. SIZE AS SHOWN ON DRAWINGS OR AS REQUIRED BY NEC TABLE 250-95.

2. WHERE GROUND CABLES ARE REQUIRED, INSTALL INSULATED COPPER GROUND CONDUCTORS IN STEEL CONDUIT.

3. WHERE GROUND CABLE IS PROTECTED BY METALLIC CONDUIT, BOND CABLE TO CONDUIT AT BOTH ENDS.

4. CONNECT GROUND CONDUCTORS IN CABLES AND IN CONDUIT TO APPROPRIATE GROUND BUSES (AS IN DISTRIBUTION PANELBOARDS) OR DIRECTLY TO METALLIC ENCLOSURE IF NO GROUND BUS IS PROVIDED.

B. CONDUIT ATTACHMENT TO ELECTRICAL EQUIPMENT

1. GROUND CONDUITS TO METAL FRAMEWORK OF ELECTRICAL EQUIPMENT WITH DOUBLE LOCKNUTS OR GROUNDING BUSHINGS AND BONDING JUMPERS UNLESS OTHERWISE NOTED.

2. INSTALL BONDING JUMPERS AT ALL ELECTRICAL EQUIPMENT TO PROVIDE CONTINUOUS GROUND RETURN PATH THROUGH CONDUIT.

3. INSTALL NEC APPROVED BONDING JUMPERS ACROSS EXPANSION FITTINGS BETWEEN CONDUIT SECTIONS FOR GROUND PATH CONTINUITY.

4. WHERE MOTORS OR OTHER UTILIZATION EQUIPMENT ARE CONNECTED TO ELECTRICAL SYSTEM WITH FLEXIBLE CONDUIT, GROUND BY ONE OF FOLLOWING:

A. FLEXIBLE METAL CONDUIT ALONE IF LENGTH IS 6 FEET OR LESS, CONDUIT IS TERMINATED IN FITTING APPROVED FOR PURPOSE, AND CIRCUIT CONDUCTORS CONTAINED THEREIN ARE PROTECTED BY OVERCURRENT DEVICES RATED AT 20 AMPERES OR LESS.

B. EXTERNAL JUMPER ACROSS FLEXIBLE CONDUIT.

C. FLEXIBLE CONDUIT CONTAINING INTEGRAL GROUND WIRE.

C. RECEPTACLES AND SWITCHES

1. INSTALL BONDING JUMPERS BETWEEN OUTLET BOX AND RECEPTACLE GROUNDING TERMINAL EXCEPT WHERE CONTACT DEVICE OR YOKE IS PROVIDED FOR GROUNDING PURPOSES AND IS APPROVED FOR THE PURPOSE.

D. WIREWAYS: INSTALL GROUNDING JUMPERS FOR BONDING BETWEEN WIREWAY AND OTHER PANELBOARDS, CONDUIT, AND AT ANY OTHER POINT WHERE SOLID CONNECTION WOULD OTHERWISE NOT BE PROVIDED IN SUPPORTING SYSTEM TO INSURE CONTINUOUS GROUND.

E. PANELBOARDS: INSTALL BONDING JUMPERS INSIDE (IF POSSIBLE) ALL PANELBOARDS TO BOND FEEDER CONDUIT TO PANELBOARDS, EXCEPT GROUND PANELBOARDS CONTAINING BRANCH CIRCUITS EACH HAVING LESS THAN 150 AMPERES CURRENT CARRYING CAPACITY WITH TWO STANDARD LOCKNUTS AND BUSHINGS, ONE INSIDE AND ONE OUTSIDE, RUN UP WRENCH TIGHT.

F. SHEET METAL BOXES

1. INSTALL BONDING JUMPERS INSIDE (IF POSSIBLE) ALL SHEET METAL BOXES CONTAINING ONE OR MORE FEEDERS WITH CURRENT CARRYING CAPACITY OF 150 AMPERES OR GREATER, TO BOND ONE CONDUIT WITH ANOTHER.

2. GROUND BOXES CONTAINING BRANCH CIRCUITS ONLY OR FEEDERS EACH LESS THAN 150 AMPERES CURRENT CARRYING CAPACITY, WITH TWO STANDARD LOCKNUTS AND BUSHINGS, ONE INSIDE AND ONE OUTSIDE, RUN UP WRENCH TIGHT.

SECTION 16500

LUMINAIRES AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION SHALL INCLUDE FIXTURES, LAMPS, AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION AS SHOWN AND SPECIFIED.

1. FLUORESCENT LIGHTING FIXTURES.

2. LAMPS

3. BALLASTS

4. EXIT FIXTURES

1.2 DELIVER, STORAGE AND HANDLING

A. DELIVER INTERIOR LIGHTING FIXTURES IN FACTORY-FABRICATED CONTAINERS OR WRAPPINGS, WHICH PROPERLY PROTECT FIXTURES FROM DAMAGE. DO NOT STORE OUTSIDE OR WHERE SUBJECT TO MOISTURE.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LIGHTING FIXTURES AND LAMPS. ALL MISSING, DAMAGED, OR DEFECTIVE PARTS SHALL BE REPLACED PRIOR TO ACCEPTANCE BY OWNER.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. LIGHT FIXTURES SHOWN ON THE DRAWINGS INDICATES THE TYPE AND QUALITY OF LIGHTING FIXTURES REQUIRED.

B. LIGHTING FIXTURES AND LAMPS

1. GENERAL

A. LIGHTING FIXTURES SHALL BE FURNISHED AS SHOWN ON THE DRAWINGS . LAMPS SHALL BE FOR ALL FIXTURES.

B. LIGHTING FIXTURES SHALL CARRY INSPECTION LABEL OF THE UNDERWRITER'S LABORATORIES, INC.

C. UNPAINTED FIXTURE PARTS SHALL BE EITHER ANODIZED ALUMINUM, NON-CORROSIVE GRADE STAINLESS STEEL OR AN ACCEPTABLE EQUIVALENT OF NON-CORROSIVE MATERIAL.

C. FLUORESCENT BALLASTS

1. SHALL BE ELECTRONIC ENERGY EFFICIENT FOR USE WITH T-8 LAMPS.

2. SHALL BE RATED FOR USE ON 120 VOLTS, OR AS NOTED ON DRAWINGS.

3. SHALL BE PROVIDED WITH SUITABLE PROTECTION INTEGRAL WITH BALLASTS AND CONFORMING TO REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (CLASS "P"). BALLASTS SHALL HAVE AN "A" SOUND RATING.

D. EXIT FIXTURES

1. SHALL MEET THE REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION .

PART 3 - EXECUTION

3.1 COORDINATION

A. COORDINATE WITH OTHER ELECTRICAL WORK, AS WELL AS, OTHER TRADES AS APPROPRIATE TO PROPERLY INTERFACE INSTALLATION OF INTERIOR LIGHTING FIXTURES.

3.2 INSTALLATION OF LIGHTING FIXTURES

A. INSTALL LIGHTING FIXTURES AT LOCATIONS AND HEIGHTS AS INDICATED, AND IS IN ACCORDANCE WITH FIXTURE MANUFACTURER'S WRITTEN INSTRUCTIONS, AND AS INDICATED ON DRAWINGS.

B. EXTEND CIRCUITS TO LIGHTING FIXTURES VIA EMT AND BOXES WITH FLEXIBLE METALLIC CONDUIT FOR MC CABLE FIXTURE TAP FROM BOX TO EACH FIXTURE.

C. INSTALL CONTROLS AND SWITCHES AS SHOWN ON DRAWINGS.

E. PROVIDE FIXTURES AND/OR FIXTURE OUTLET BOXES WITH HANGERS TO PROPERLY SUPPORT FIXTURE WEIGHT.

G. FASTEN FIXTURES SECURELY TO INDICATED STRUCTURAL SUPPORTS.

I. SECURELY SUPPORT ALL LIGHTING FIXTURES, HANGERS, RACEWAY AND JUNCTION BOXES FROM BUILDING STRUCTURAL MEMBERS.

3.3 FIELD QUALITY CONTROL

A. REPLACE DEFECTIVE FIXTURES AND BURNED OUT LAMPS PRIOR TO ACCEPTANCE BY OWNER.

3.4 ADJUSTING AND CLEANING

A. CLEAN INTERIOR LIGHTING FIXTURES OR DIRT AND CONSTRUCTION DEBRIS UPON COMPLETION OF INSTALLATION. CLEAN FINGERPRINTS AND SMUDGES FROM LENSES.

B. REMOVE AND REPLACE WITH NEW ALL BROKEN LENSES OR GASKETS OF FIXTURES DAMAGED BEFORE FINAL ACCEPTANCE AT NO ADDITIONAL EXPENSE TO OWNER.

HIGHLAND ASSOCIATES
ARCHITECTURE
ENGINEERING
INTERIOR DESIGN

Highland Center
102 Highland Ave.
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18411
Phone: 570.586.4334
Fax: 570.586.5990

REVISION NO:

PROJECT TITLE:

Scranton Housing Authority

400 Adams Avenue • Scranton, PA 18510

Boiler Plant Decentralization for Hilltop Manor

SEALS:

DRAWING TITLE:

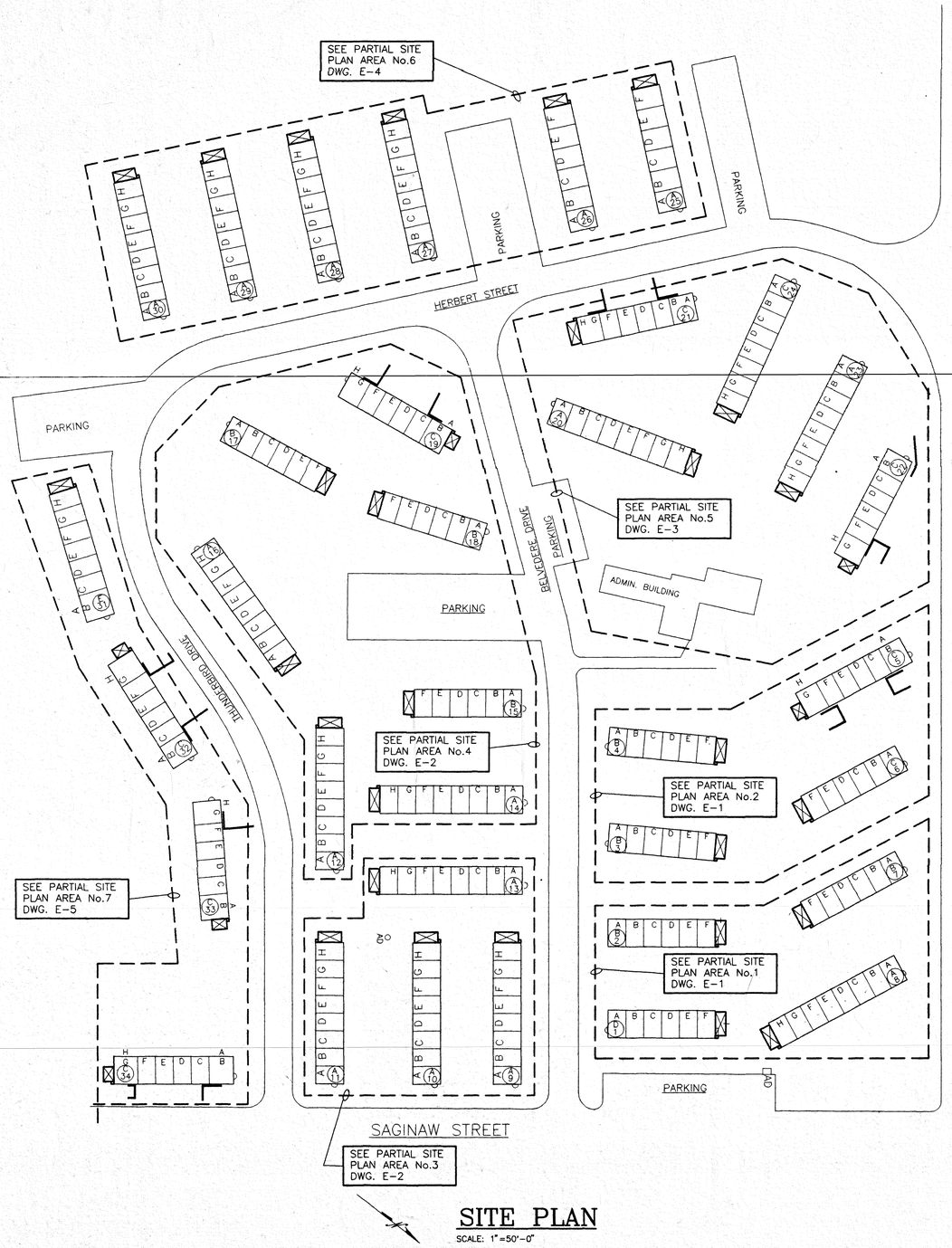
ELECTRICAL SPECIFICATIONS

DRAWN BY:	CHECKED BY:
SMB	KB
DATE:	PROJECT NO:
11/06/02	2001-429

DRAWING NO:

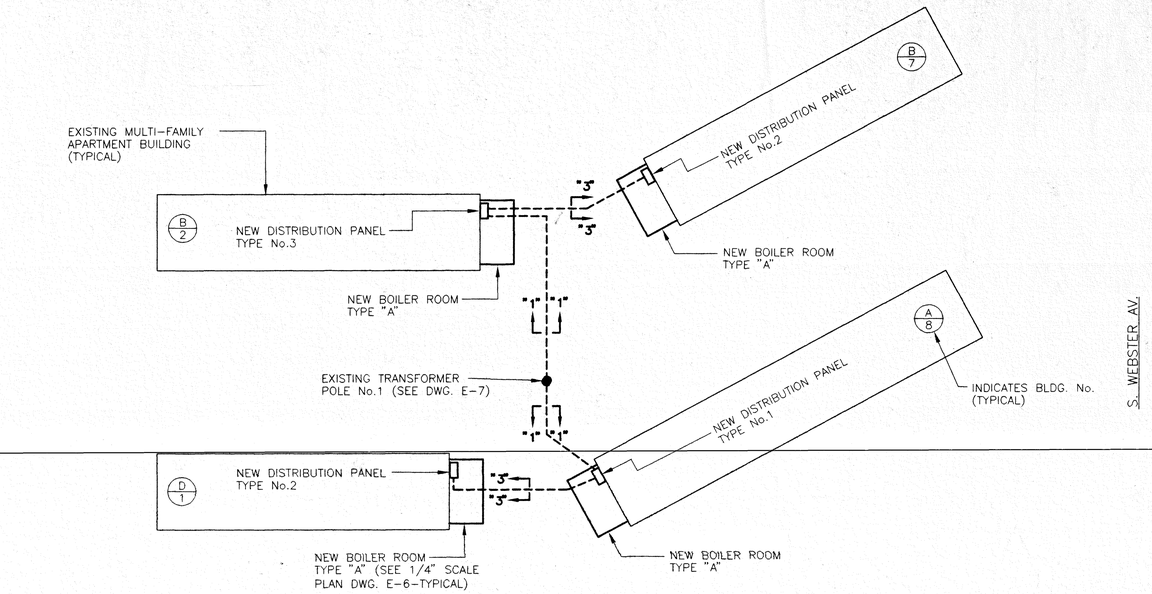
E-4

CAD FILE: 1429-E4 PLOT DATE: 11/06/02



SITE PLAN

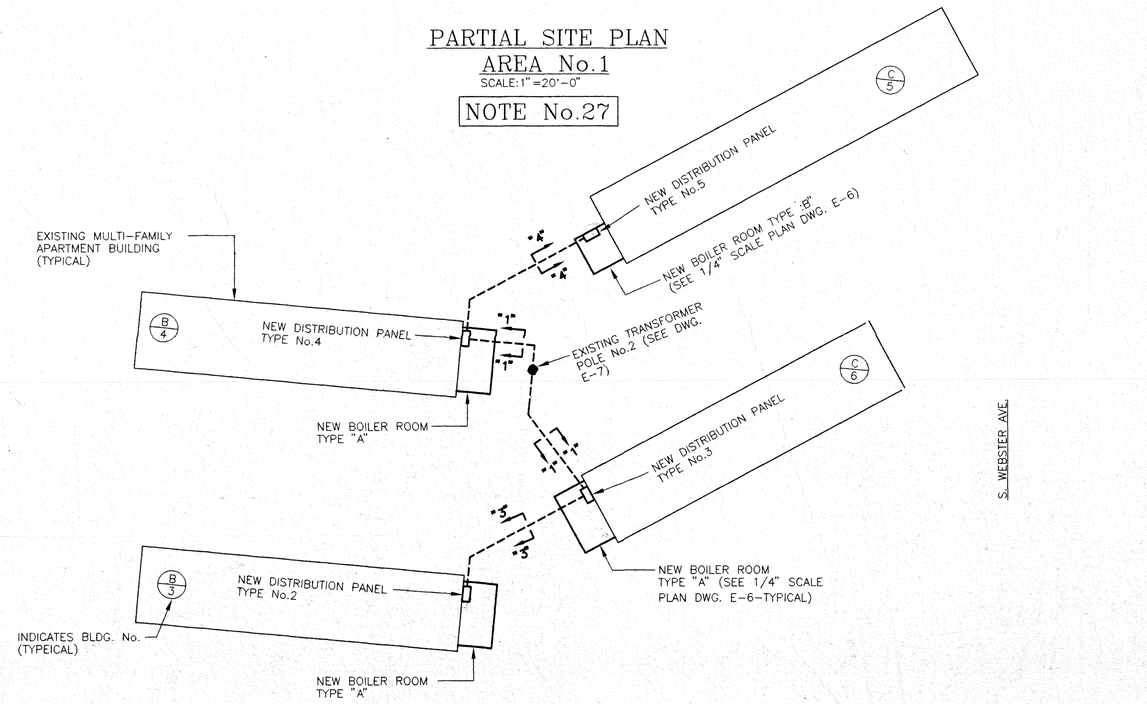
SCALE: 1"=50'-0"



PARTIAL SITE PLAN AREA No.1

SCALE:1"=20'-0"

NOTE No.27



PARTIAL SITE PLAN AREA No.2

SCALE:1"=20'-0"

NOTE No.27

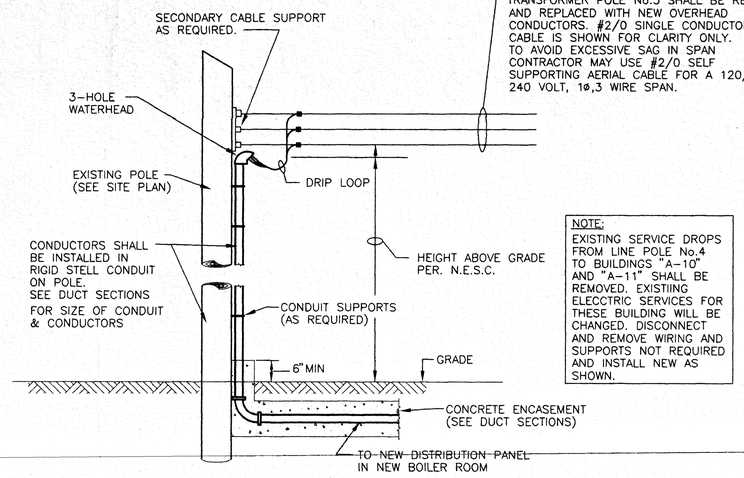
SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: SITE PLAN-HILLTOP MANOR

PROJECT: DECENTRALIZING BOILER PLANTS HEATING AND VENTILATING SYSTEMS FOR HILLTOP MANOR (PA-3-2) AND VALLEY VIEW TERRACE (PA-3-1)

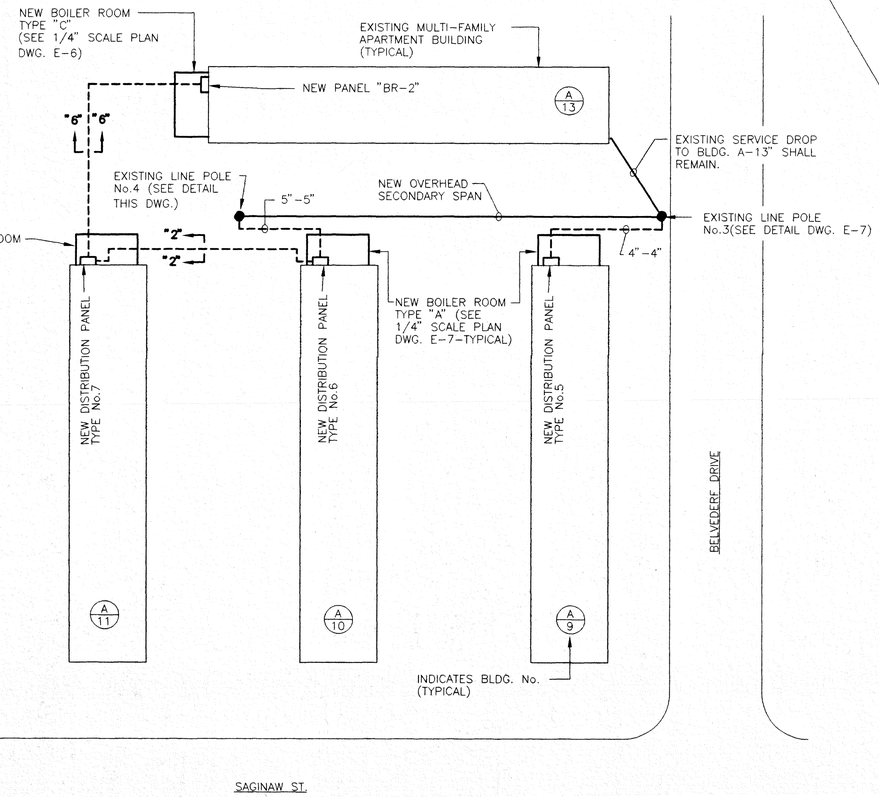
PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
CHECKED BY JWF
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-1 OF 10



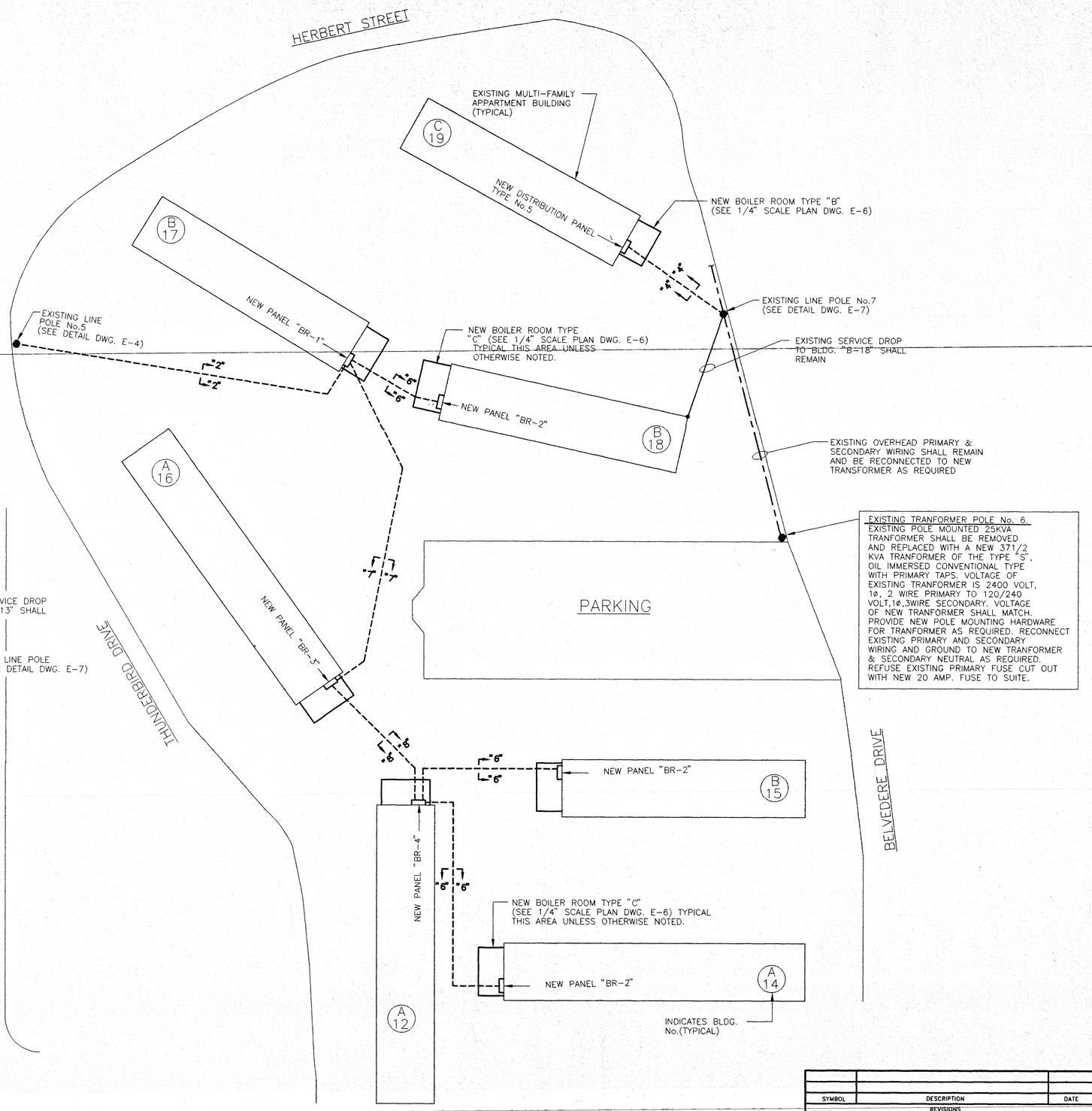
NOTE:
EXISTING SERVICE DROPS FROM LINE POLE No.4 TO BUILDINGS "A-10" AND "A-11" SHALL BE REMOVED. EXISTIING ELECCTRIC SERVICES FOR THESE BUILDING WILL BE CHANGED. DISCONNECT AND REMOVE WIRING AND SUPPORTS NOT REQUIRED AND INSTALL NEW AS SHOWN.

EXISTING LINE POLE DETAIL
POLE No.4
N.T.S.



PARTIAL SITE PLAN
AREA No.3
SCALE: 1"=20'-0"

NOTE No.27



EXISTING TRANFORMER POLE No. 6.
EXISTING POLE MOUNTED 25KVA TRANFORMER SHALL BE REMOVED AND REPLACED WITH A NEW 371/2 KVA TRANFORMER OF THE TYPE "S", OIL IMMERSED CONVENTIONAL TYPE WITH PRIMARY TAPS. VOLTAGE OF EXISTING TRANFORMER IS 2400 VOLT, 1ø, 2 WIRE PRIMARY TO 120/240 VOLT,1ø,3WIRE SECONDARY. VOLTAGE OF NEW TRANFORMER SHALL MATCH. PROVIDE NEW POLE MOUNTING HARDWARE FOR TRANFORMER AS REQUIRED. RECONNECT EXISTING PRIMARY AND SECONDARY WIRING AND GROUND TO NEW TRANFORMER & SECONDARY NEUTRAL AS REQUIRED. REFUSE EXISTING PRIMARY FUSE CUT OUT WITH NEW 20 AMP. FUSE TO SUITE.

PARTIAL SITE PLAN
AREA No.4
SCALE: 1"=20'-0"

NOTE No.27

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

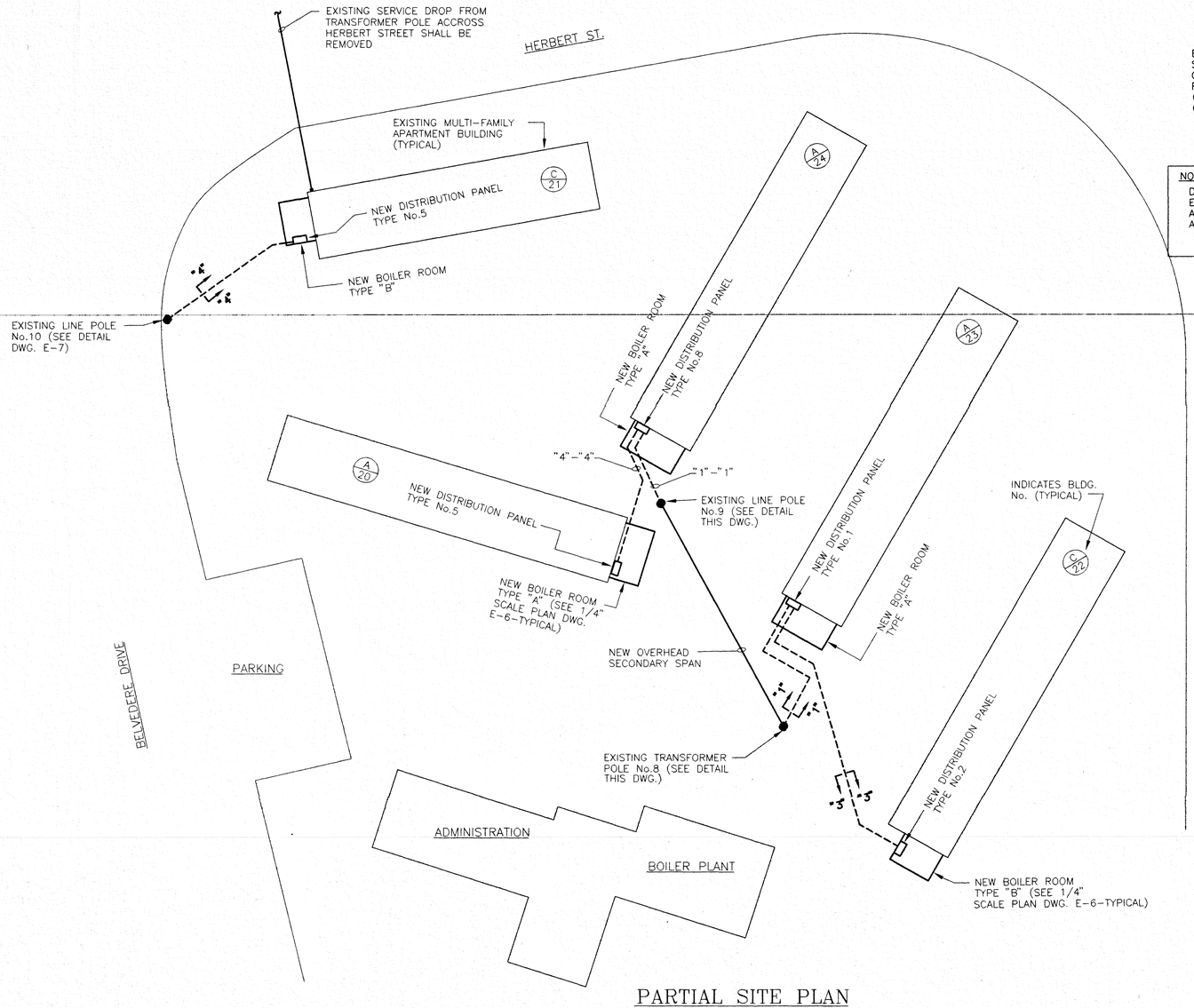
TITLE: PARTIAL SITE PLANS

DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA-3-2) AND
VALLEY VIEW TERRACE (PA-3-1)

PROJECT

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-2 OF 10



PARTIAL SITE PLAN
AREA No.5
SCALE: 1"=20'-0"

NOTE No.27

EXISTING POLE MOUNTED 25KVA TRANSFORMER SHALL BE REMOVED AND REPLACED WITH A NEW 50KVA TRANSFORMER OF TYPE "S", OIL IMMERSED CONVENTIONAL TYPE WITH PRIMARY TAPS. VOLTAGE OF EXISTING TRANSFORMER IS 2400 VOLT, 1ø, 2 WIRE PRIMARY TO 120/240 VOLT, 1ø, 3 WIRE SECONDARY. VOLTAGE OF NEW TRANSFORMER SHALL MATCH. *PROVIDE NEW POLE MOUNTING HARDWARE* FOR TRANSFORMER AS REQUIRED.

EXISTING SECONDARY SPAN TO EXISTING POLE No.9 SHALL BE REMOVED AND REPLACED WITH NEW OVERHEAD CONDUCTORS. #2/0 SINGLE CONDUCTOR CABLE IS SHOWN FOR CLARITY ONLY. TO AVOID EXCESSIVE SAG IN SPAN CONTRACTOR MAY USE #2/0 SELF SUPPORTING AERIAL CABLE FOR A 120/240 VOLT, 1ø, 3 WIRE SPAN.

3 1/C#2/0 WP COPPER SECONDARY

EXISTING PRIMARY WIRING SHALL REMAIN AND BE RE-CONNECTED TO NEW *TRANSFORMER AS REQUIRED. EXISTING* PRIMARY FUSE CUT-OUTS SHALL REMAIN AND SHALL BE RE-FUSED WITH NEW 30 AMP. FUSES TO SUITE.

EXISTING POLE (SEE SITE PLANS)

MAINTAIN EXISTING TRANSFORMER AND NEUTRAL GROUND AND RE-CONNECT AS REQUIRED. ALSO MAINTAIN EXISTING PRIMARY GROUND.

SECONDARY CABLE SUPPORT AS REQUIRED.

3-HOLE WEATHERHEAD

DRIP LOOP

CONDUIT SUPPORTS (AS REQUIRED)

CONDUCTORS SHALL BE INSTALLED IN RIGID STEEL CONDUIT ON POLE. SEE DUCT SECTIONS FOR SIZE OF CONDUIT & CONDUCTORS

HEIGHT ABOVE GRADE PER. N.E.S.C.

6"MIN

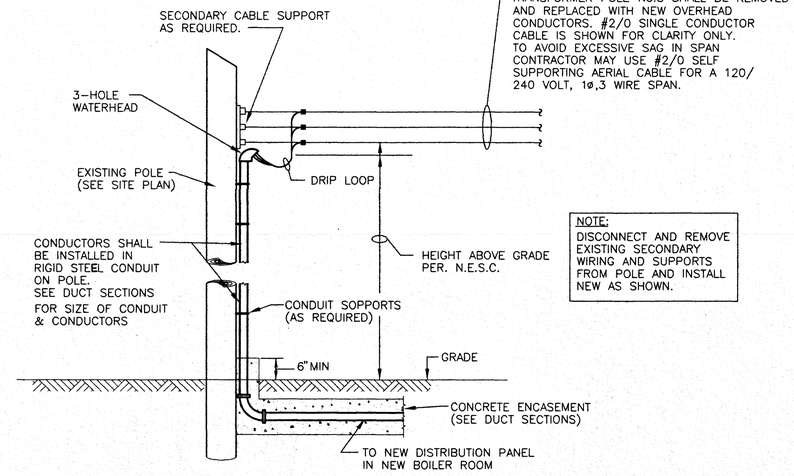
GRADE

CONCRETE ENCASEMENT (SEE DUCT SECTIONS)

TO NEW DISRIBUTION PANEL IN NEW BOILER ROOM

NOTE:
DISCONNECT AND REMOVE EXISTING SECONDARY WIRING AND SUPPORTS FROM POLE AND INSTALL NEW AS SHOWN

EXISTING TRANSFORMER POLE DETAIL
POLE No.8
NOT TO SCALE:



EXISTING LINE POLE DETAIL
POLE No.9
N.T.S.

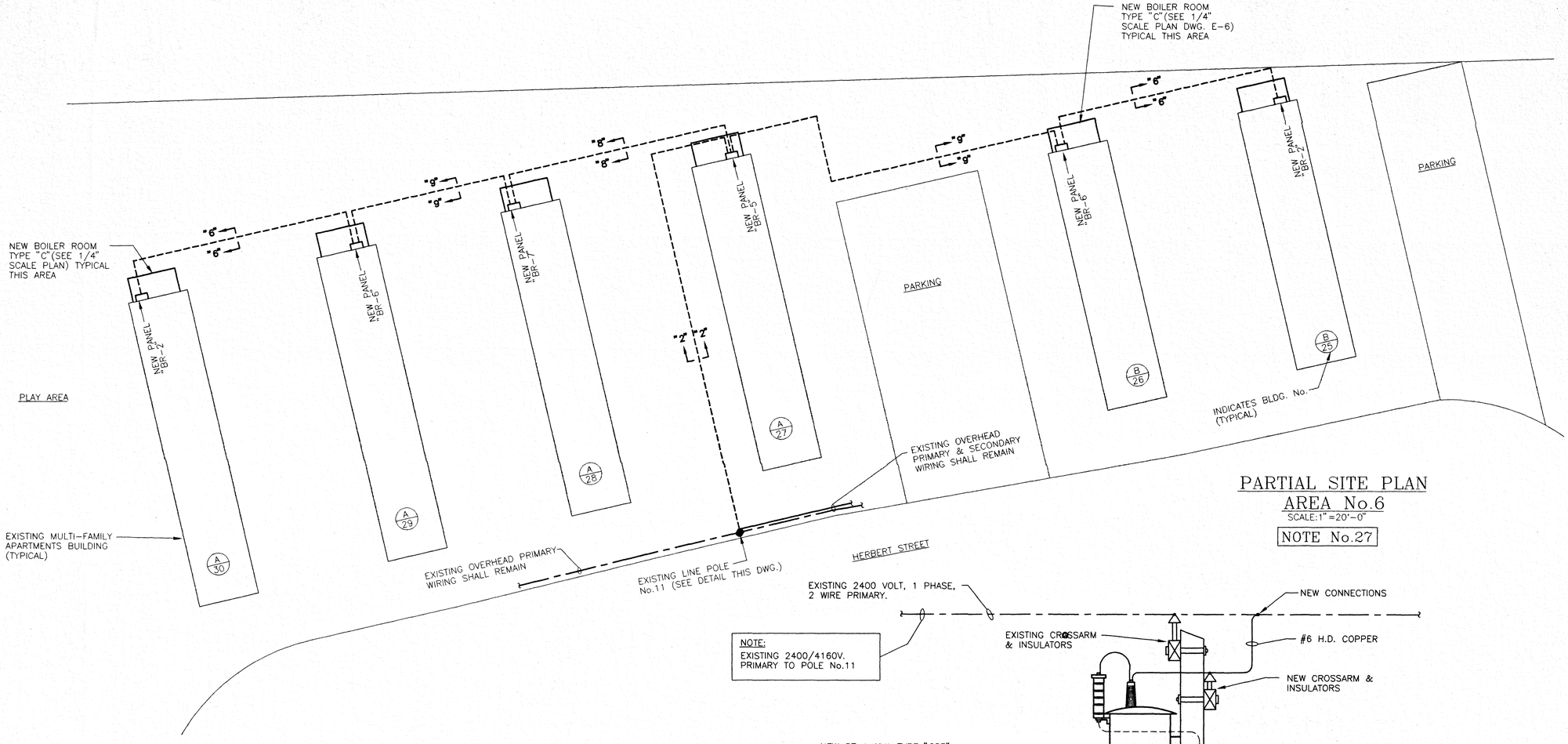
SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PARTIAL SITE PLAN AND DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA-3-2) AND
VALLEY VIEW TERRACE (PA-3-1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

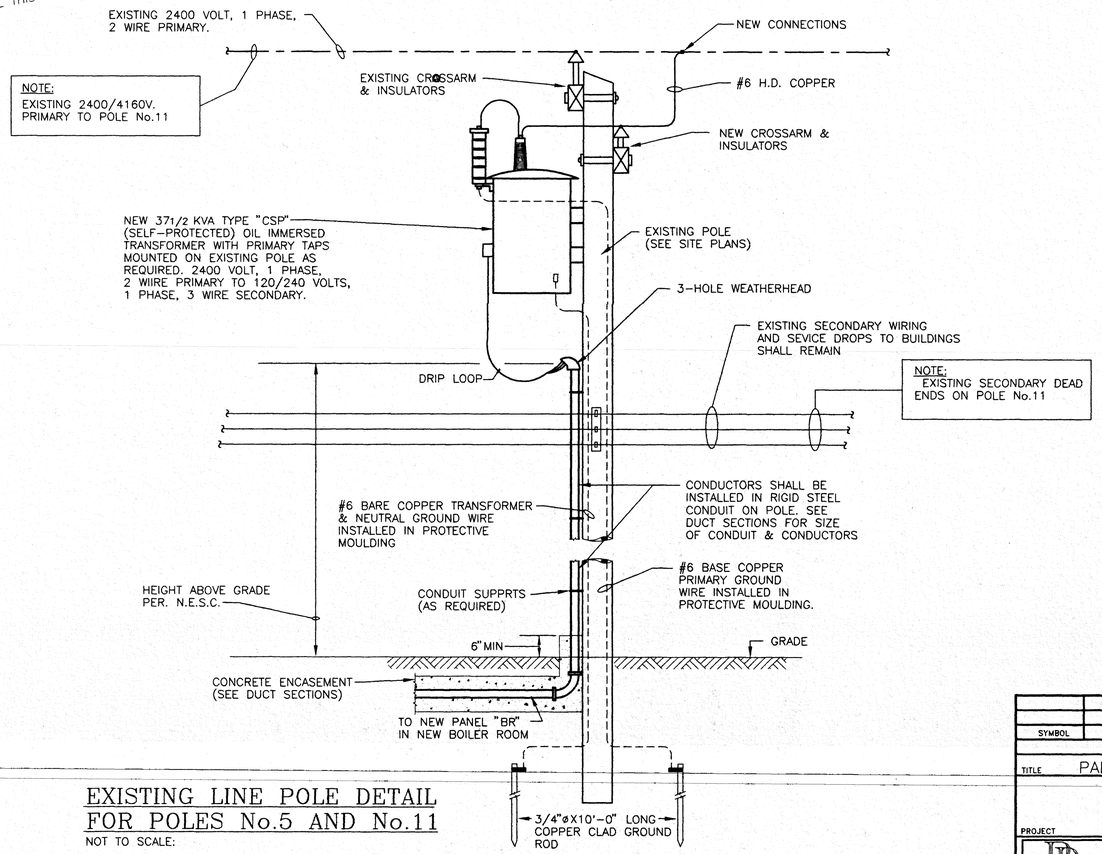
DRAWN BY CSK
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-3
OF 10



PARTIAL SITE PLAN AREA No.6

SCALE: 1" = 20'-0"

NOTE No.27



EXISTING LINE POLE DETAIL FOR POLES No.5 AND No.11

NOT TO SCALE:

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PARTIAL SITE PLAN AND DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS HEATING AND VENTILATING SYSTEMS FOR HILLTOP MANOR (PA-3-2) AND VALLEY VIEW TERRACE (PA-3-1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
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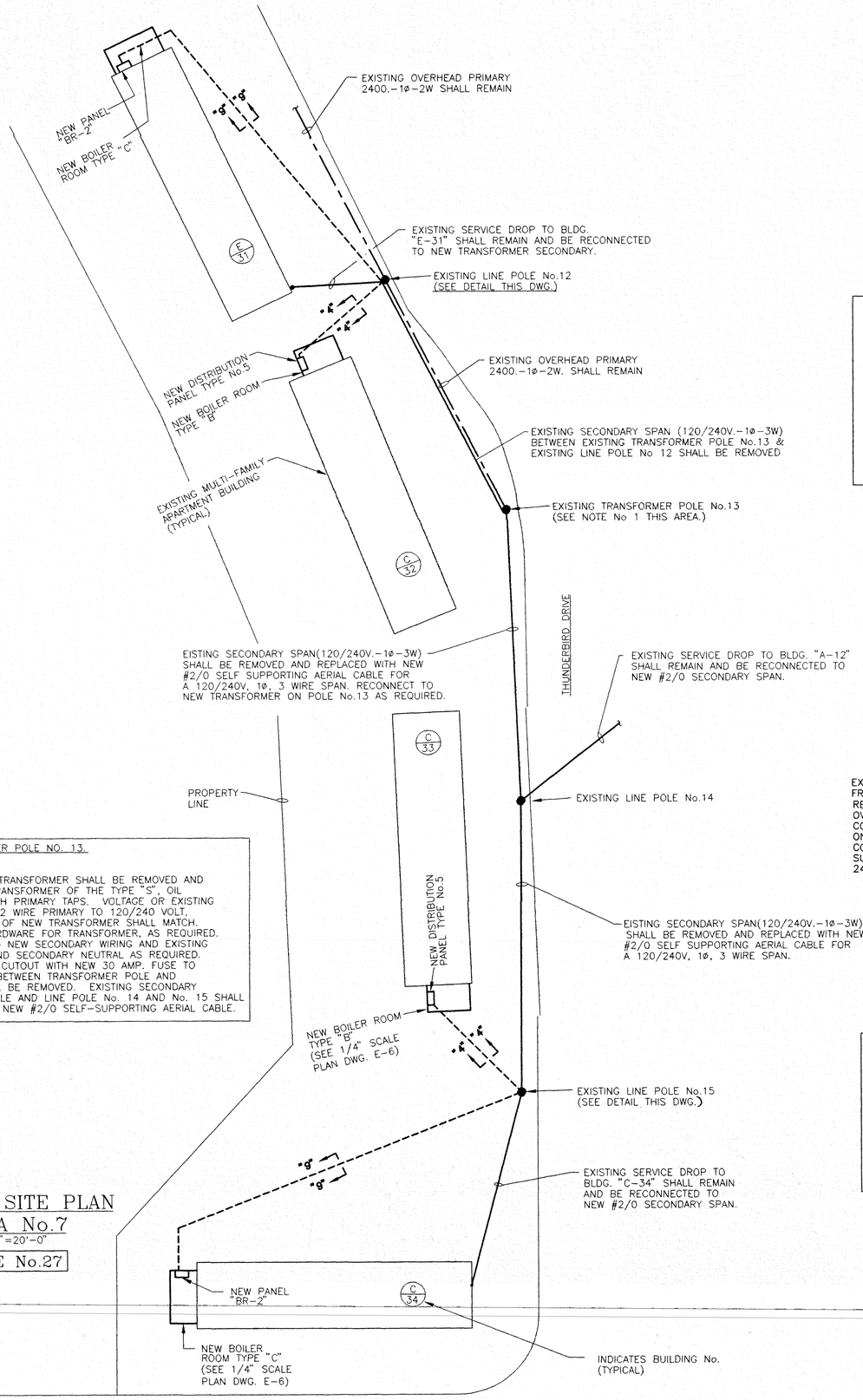
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-4 OF 10



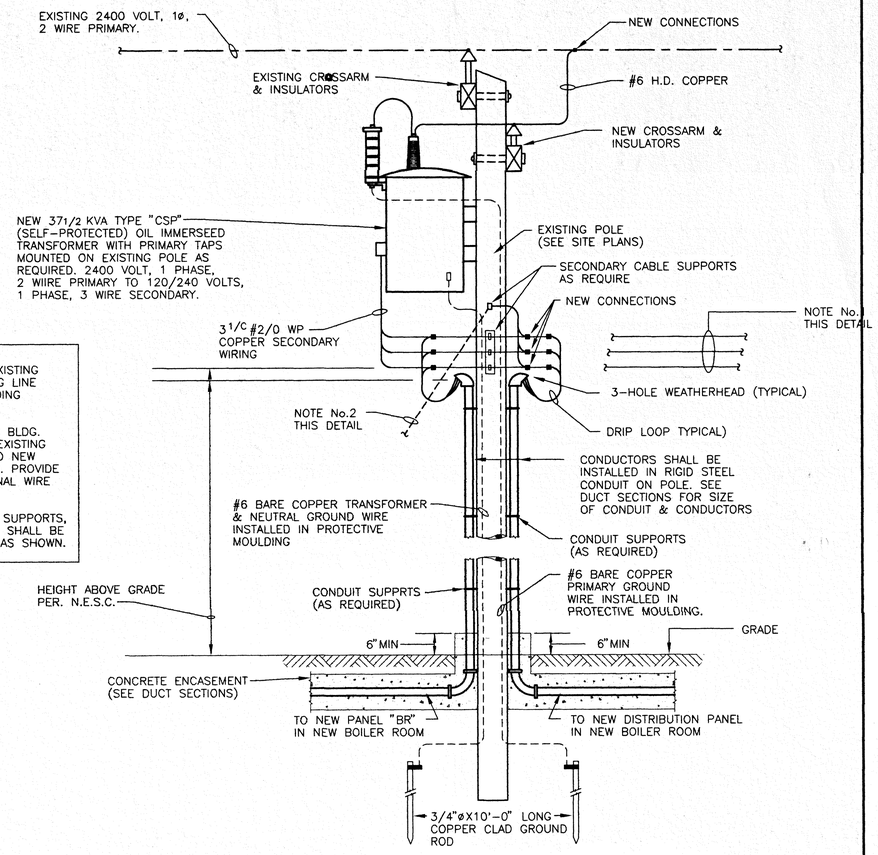
PARTIAL SITE PLAN
AREA No.7
SCALE:1"=20'-0"

NOTE No.27

NOTE No.1- EXISTING TRANSFORMER POLE NO. 13.

EXISTING POLE MOUNTED 25 KVA TRANSFORMER SHALL BE REMOVED AND REPLACED WITH A NEW 50 KVA TRANSFORMER OF THE TYPE "S", OIL IMMERSED CONVENTIONAL TYPE WITH PRIMARY TAPS. VOLTAGE OR EXISTING TRANSFORMER IS 2400 VOLT, 1ø, 2 WIRE PRIMARY TO 120/240 VOLT, 1ø, 3-WIRE SECONDARY. VOLTAGE OF NEW TRANSFORMER SHALL MATCH. PROVIDE NEW POLE MOUNTING HARDWARE FOR TRANSFORMER, AS REQUIRED. RECONNECT EXISTING PRIMARY AND NEW SECONDARY WIRING AND EXISTING GROUND TO NEW TRANSFORMER AND SECONDARY NEUTRAL AS REQUIRED. RE-FUSE EXISTING PRIMARY FUSE CUTOUT WITH NEW 30 AMP. FUSE TO SUIT. EXISTING SECONDARY SPAN BETWEEN TRANSFORMER POLE AND EXISTING LINE POLE NO. 12 SHALL BE REMOVED. EXISTING SECONDARY SPANS BETWEEN TRANSFORMER POLE AND LINE POLE No. 14 AND No. 15 SHALL BE REMOVED AND REPLACED WITH NEW #2/0 SELF-SUPPORTING AERIAL CABLE.

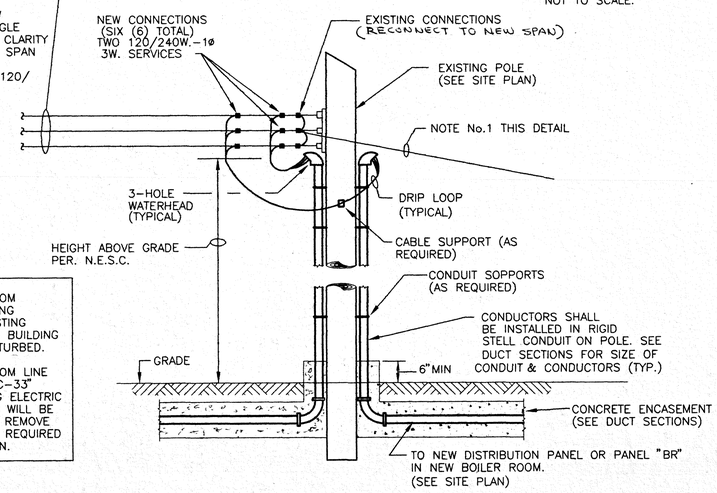
NOTES:
1. EXISTING SECONDARY SPAN BETWEEN EXISTING TRANSFORMER POLE No.13 AND EXISTING LINE POLE No.12 SHALL BE REMOVED INCLUDING ALL HARDWARE NOT REQUIRED.
2. EXISTING SECONDARY SERVICE DROP TO BLDG. "E-31" SHALL BE DISCONECTED FROM EXISTING SECONDARY SPAN AND RECONNECTED TO NEW TRANSFORMER SECONDARY AS REQUIRED. PROVIDE NEW MOUNTING HARDWARE AND ADDITIONAL WIRE AS REQUIRED.
3. EXISTING SECONDARY SERVICE DROP & SUPPORTS, FROM POLE No.12 TO BLDG. No."C-32" SHALL BE REMOVED AND NEW SERVICE INSTALLED AS SHOWN.



EXISTING LINE POLE DETAIL
POLE No.12
NOT TO SCALE:

EXISTING SECONDARY SPAN FROM LINE POLE No.14 SHALL BE REMOVED AND REPLACED WITH NEW OVERHEAD CONDUCTORS. #2/0 SINGLE CONDUCTOR CABLE IS SHOWN FOR CLARITY ONLY. TO AVOID EXCESSIVE SAG IN SPAN CONTRACTOR MAY USE #2/0 SELF SUPPORTING AERIAL CABLE FOR A 120/240 VOLT, 1ø,3 WIRE SPAN.

NOTE:
1. EXISTING SERVICE DROP FROM LINE POLE No.15 TO BUILDING "C-34" SHALL REMAIN. EXISTING ELECTRIC SERVICE FOR THIS BUILDING DOES NOT HAVE TO BE DISTURBED.
2. EXISTING SERVICE DROP FROM LINE POLE No.15 TO BUILDING "C-33" SHALL BE REMOVE. EXISTING ELECTRIC SERVICE FOR THIS BUILDING WILL BE CHANGED. DISCONNECT AND REMOVE WIRING AND SUPPORTS NOT REQUIRED AND INSTALL NEW AS SHOWN.



EXISTING LINE POLE DETAIL
POLE No.15
N.T.S.

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PARTIAL SITE PLAN AND DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS HEATING AND VENTILATING SYSTEMS FOR HILLTOP MANOR (PA-3-2) AND VALLEY VIEW TERRACE (PA-3-1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
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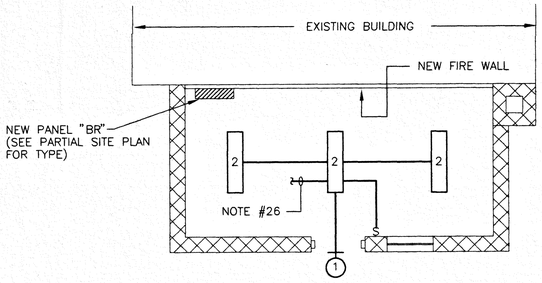
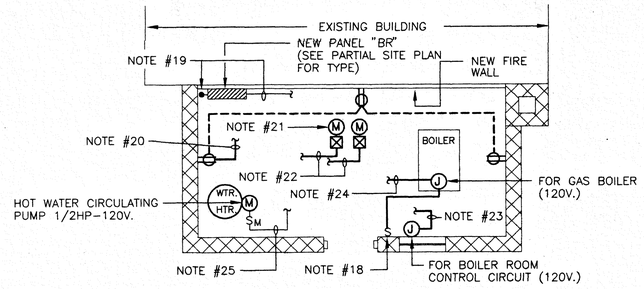
SCALE AS NOTED
DATE 3-16-15
DRAWING NO. E-5
OF 10



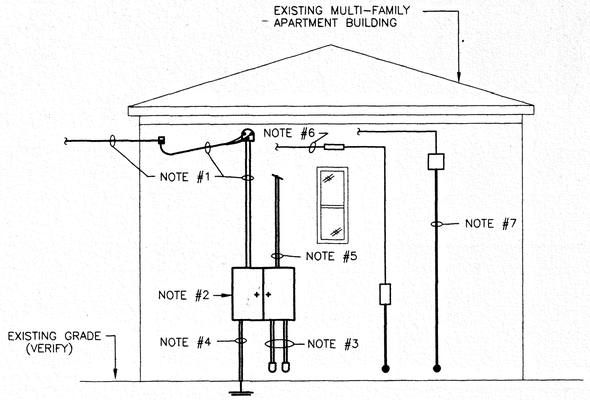
NEW BOILER ROOM PLAN–TYPE "C" – LIGHTING

SCALE: 1/4"=1'–0"



NEW BOILER ROOM PLAN–TYPE "C" – POWER

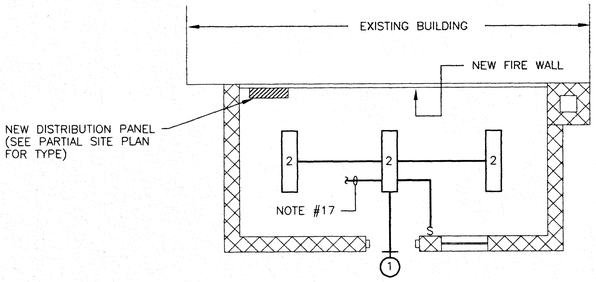
SCALE: 1/4"=1'–0"



NOTE:
NEW BOILER ROOM CONSTRUCTION MAY NOT AFFECTE ALL SERVICES SUCH AS ELECTRIC, TELEPHONE OR CABLE T.V. ON ALL BUILDINGS. THE CONTRACTOR SHALL CHECK IN FIELD AND VERIFY WHICH SERVICE WILL BE AFFECTED AND THEN HE SHALL APPLY EXISTING CONDITIONS AS APPLICABLE.

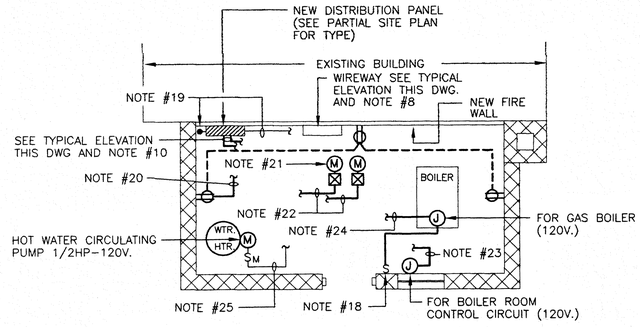
TYPICAL ELEVATION–END WALL OF BUILDING
SHOWING
EXISTING CONDITIONS

N.T.S.



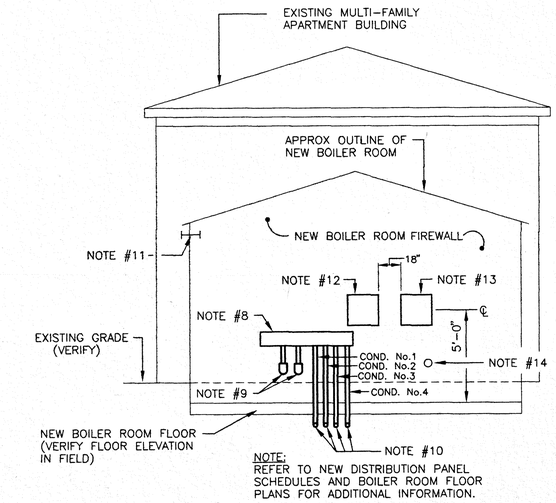
NEW BOILER ROOM PLAN–TYPE "A" – LIGHTING

SCALE: 1/4"=1'–0"



NEW BOILER ROOM PLAN–TYPE "A" – POWER

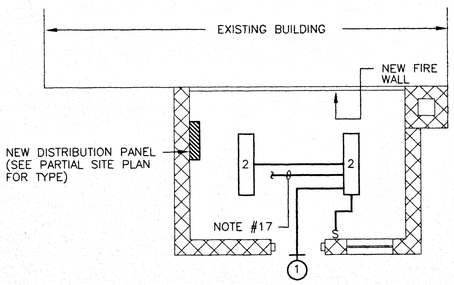
SCALE: 1/4"=1'–0"



NOTE:
REFER TO NEW DISTRIBUTION PANEL SCHEDULES AND BOILER ROOM FLOOR PLANS FOR ADDITIONAL INFORMATION.

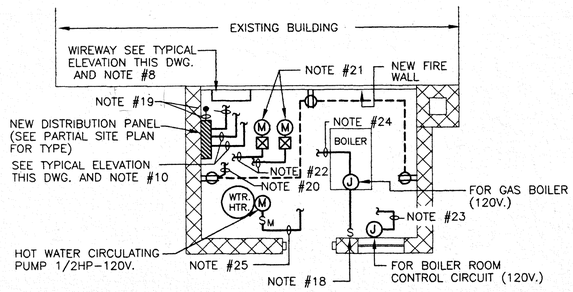
TYPICAL ELEVATION–INSIDE REAR WALL OF NEW BOILER ROOM
SHOWING
NEW WORK

N.T.S.



NEW BOILER ROOM PLAN–TYPE "B" – LIGHTING

SCALE: 1/4"=1'–0"



NEW BOILER ROOM PLAN–TYPE "B" – POWER

SCALE: 1/4"=1'–0"

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PLAN AND DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA–3–2) AND
VALLEY VIEW TERRACE (PA–3–1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

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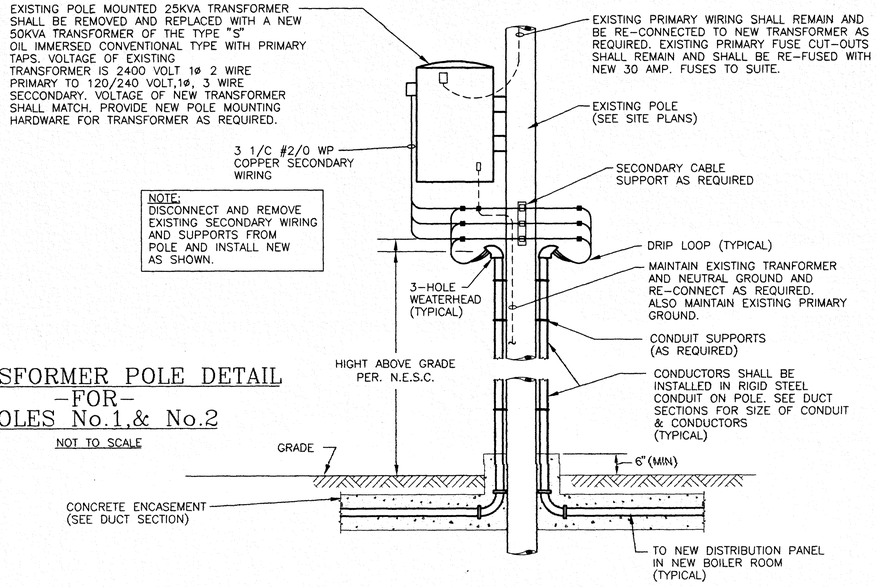
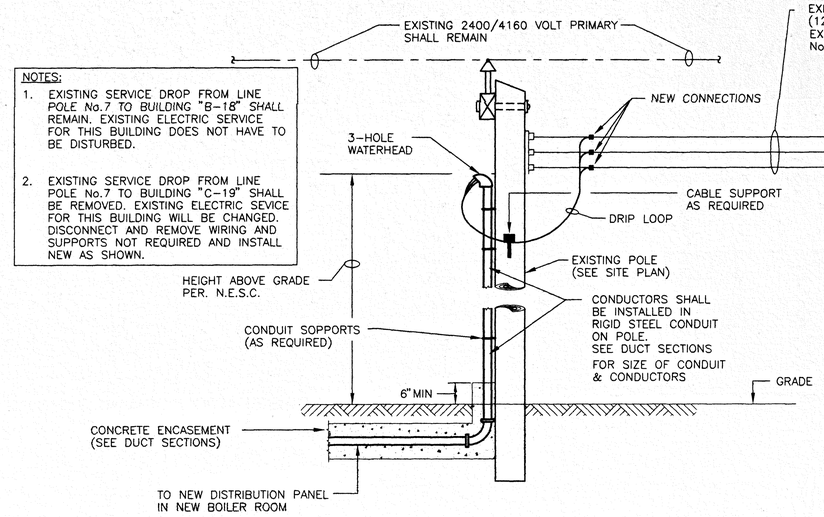
SCALE AS NOTED
DATE 3-16-88
DRAWING NO. E–6 OF 10



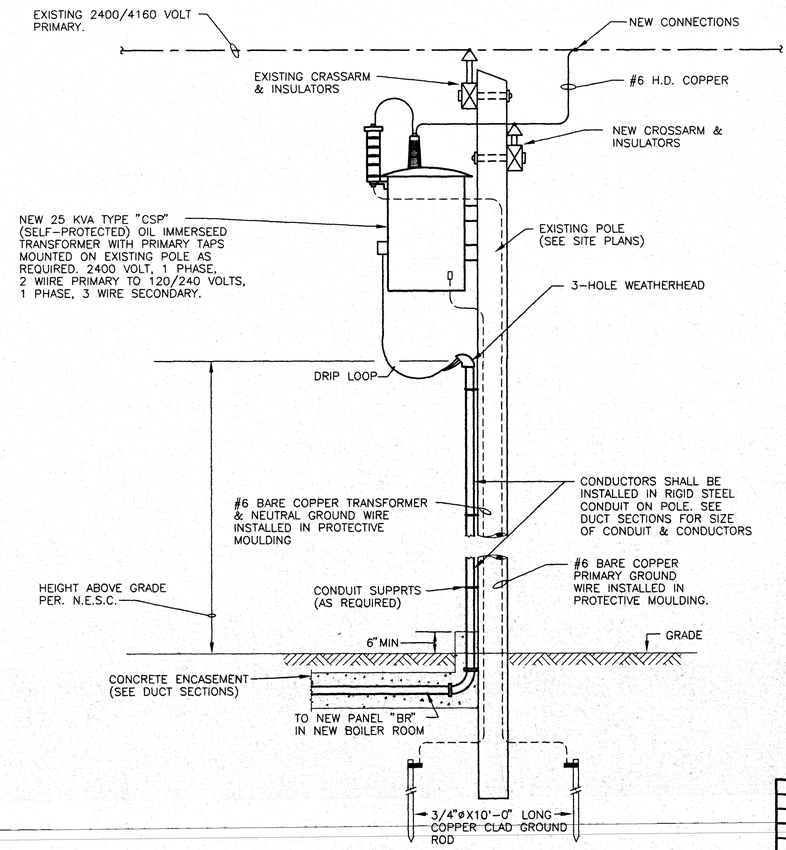
TRANSFORMER POLE DETAIL
-FOR-
POLES No.1,& No.2

NOT TO SCALE



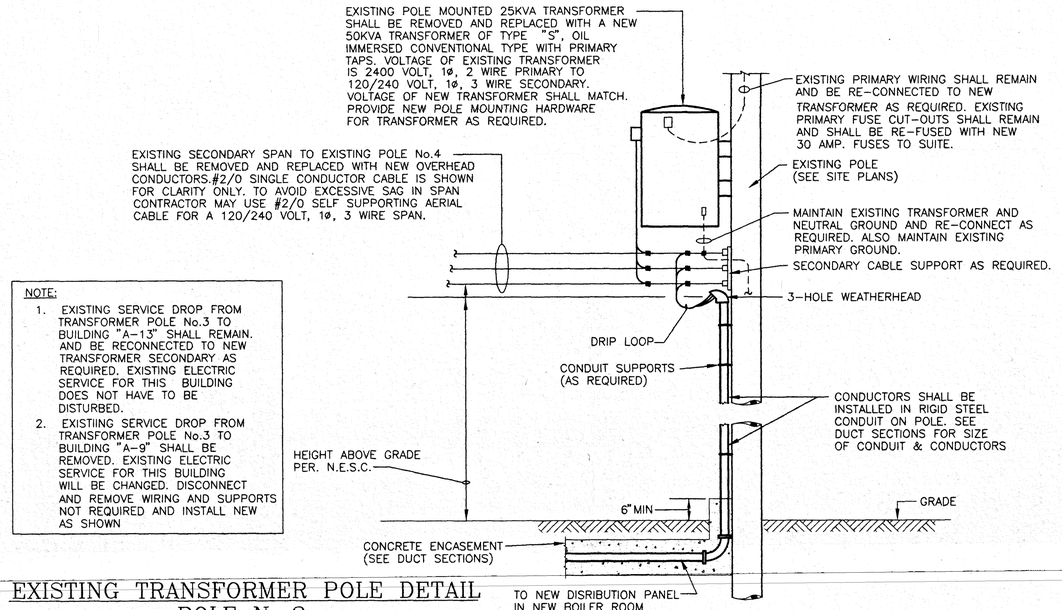
EXISTING LINE POLE DETAIL
POLE No.7

N.T.S.



EXISTING LINE POLE DETAIL
POLE No.10

NOT TO SCALE:



NOTE:
1. EXISTING SERVICE DROP FROM TRANSFORMER POLE No.3 TO BUILDING "A-13" SHALL REMAIN. AND BE RECONNECTED TO NEW TRANSFORMER SECONDARY AS REQUIRED. EXISTING ELECTRIC SERVICE FOR THIS BUILDING DOES NOT HAVE TO BE DISTURBED.
2. EXISTIING SERVICE DROP FROM TRANSFORMER POLE No.3 TO BUILDING "A-9" SHALL BE REMOVED. EXISTING ELECTRIC SERVICE FOR THIS BUILDING WILL BE CHANGED. DISCONNECT AND REMOVE WIRING AND SUPPORTS NOT REQUIRED AND INSTALL NEW AS SHOWN

EXISTING TRANSFORMER POLE DETAIL
POLE No.3

NOT TO SCALE:

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: POLE DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS HEATING AND VENTILATING SYSTEMS FOR HILLTOP MANOR (PA-3-2) AND VALLEY VIEW TERRACE (PA-3-1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY WAS
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-7 OF 10

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.1

MAINS: MAIN BREAKER 300 AMP.–2POLE BUS CAPACITY: 300 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG'S "A8" &"A–23"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	175	BUILDING No.D1 OR C22,	3	2/0	——	2"
2 THRU 9	2	60	EIGHT (8) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
10 & 11	1	20	HOUSE CIRCUITS				
12	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
13	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
14	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
15	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
16	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
17	1	20	GAS BOILER	2	12	#12	1/2"
18	1	20	CIRCULATING PUMP	2	12	#12	1/2"
19 & 20	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.2

MAINS: MAIN BREAKER 175 AMP.–2POLE BUS CAPACITY: 200 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "D1","B7","B3"&"C22"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1 THRU 6	2	60	SIX (6) APARTMENT PANELS	SEE TYPICAL ELEVATION NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
7 & 8	1	20	HOUSE CIRCUITS				
9	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
10	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
11	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
12	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
13	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
14	1	20	GAS BOILER	2	12	#12	1/2"
15	1	20	CIRCULATING PUMP	2	12	#12	1/2"
16 & 17	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.3

MAINS: MAIN BREAKER 300 AMP.–2POLE BUS CAPACITY: 300 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "B2"&"B6"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	175	BUILDING No.D1 "B7", OR "B3"	3	2/0	——	2"
2 THRU 7	2	60	SIX (6) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
8 & 9	1	20	HOUSE CIRCUITS				
10	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
11	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
12	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
13	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
14	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
15	1	20	GAS BOILER	2	12	#12	1/2"
16	1	20	CIRCULATING PUMP	2	12	#12	1/2"
17 & 18	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.4

MAINS: MAIN BREAKER 300 AMP.–2POLE BUS CAPACITY: 300 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "B4"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	200	BUILDING No.C5	3	3/0	——	2"
2 THRU 7	2	60	SIX (6) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
8 & 9	1	20	HOUSE CIRCUITS				
10	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
11	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
12	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
13	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
14	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
15	1	20	GAS BOILER	2	12	#12	1/2"
16	1	20	CIRCULATING PUMP	2	12	#12	1/2"
17 & 18	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.5

MAINS: MAIN BREAKER 200 AMP.–2POLE BUS CAPACITY: 200 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "C5","A9","C19","A20","C21"&"C33",

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1 THRU 8	2	60	EIGHT (8) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
9 & 10	1	20	HOUSE CIRCUITS				
11	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
12	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
13	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
14	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
15	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
16	1	20	GAS BOILER	2	12	#12	1/2"
17	1	20	CIRCULATING PUMP	2	12	#12	1/2"
18 & 19	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.6

MAINS: MAIN BREAKER 350 AMP.–2POLE BUS CAPACITY: 400 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A10"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	225	BUILDING No.A11	3	4/0	——	2"
2 THRU 9	2	60	EIGHT (8) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
10 & 11	1	20	HOUSE CIRCUITS				
12	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
13	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
14	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
15	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
16	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
17	1	20	GAS BOILER	2	12	#12	1/2"
18	1	20	CIRCULATING PUMP	2	12	#12	1/2"
19 & 20	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.7

MAINS: MAIN BREAKER 225 AMP.–2POLE BUS CAPACITY: 225 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A11"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	60	PANEL "BR" IN BLDG. "A–13"	3	6	——	2"
2 THRU 9	2	60	EIGHT (8) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
10 & 11	1	20	HOUSE CIRCUITS				
12	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
13	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
14	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
15	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
16	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
17	1	20	GAS BOILER	2	12	#12	1/2"
18	1	20	CIRCULATING PUMP	2	12	#12	1/2"
19 & 20	1	20	SPARES	——	——	——	——

PANEL SCHEDULE– NEW DISTRIBUTION PANEL TYPE No.8

MAINS: MAIN BREAKER 300 AMP.–2POLE BUS CAPACITY: 300 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A–24"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS No.	CONDUCTORS SIZE	CONDUCTORS GRD.	CONDUIT SIZE
1	2	200	BUILDING No."A22"	3	3/0	——	2"
2 THRU 9	2	60	EIGHT (8) APARTMENT PANELS	SEE TYPICAL ELEVATION–NEW WORK AND NOTE No.10 FOR CONDUCTOR & CONDUIT SIZE			
10 & 11	1	20	HOUSE CIRCUITS				
12	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
13	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
14	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
15	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
16	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
17	1	20	GAS BOILER	2	12	#12	1/2"
18	1	20	CIRCULATING PUMP	2	12	#12	1/2"
19 & 20	1	20	SPARES	——	——	——	——

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PANEL SCHEDULES

DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA–3–2) AND
VALLEY VIEW TERRACE (PA–3–1)

PROJECT

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E–8
OF 10

PANEL SCHEDULE–"BR–1"

MAINS: MAIN BREAKER 225A.–2P. BUS CAPACITY: 225 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "B17"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	60	PANEL "BR" IN BLDG. "B–18"	3	6	——	2"
2	2	150	PANEL "BR" IN BLDG. "A–16"	3	1/0	——	2"
3	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
4	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
7	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
8	1	20	GAS BOILER	2	12	#12	1/2"
9	1	20	CIRCULATING PUMP	2	12	#12	1/2"
10 & 11	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–2"

MAINS: MAIN BREAKER 60A.–2P. BUS CAPACITY: 70 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A13","B18","B15","A14", "B25",A30" &"C34"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
2	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
3	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
4	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
5	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
6	1	20	GAS BOILER	2	12	#12	1/2"
7	1	20	CIRCULATING PUMP	2	12	#12	1/2"
8 & 9	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–3"

MAINS: MAIN BREAKER 150A.–2P. BUS CAPACITY: 150 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A16"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	125	PANEL "BR" IN BLDG. "A–12"	3	1	——	2"
2	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
3	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
4	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
7	1	20	GAS BOILER	2	12	#12	1/2"
8	1	20	CIRCULATING PUMP	2	12	#12	1/2"
9 & 10	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–4"

MAINS: MAIN BREAKER 125A.–2P. BUS CAPACITY: 125 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A12"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	60	PANEL "BR" IN BLDG. "B–15"	3	6	——	2"
2	2	60	PANEL "BR" IN BLDG. "A–14"	3	6	——	2"
3	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
4	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
7	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
8	1	20	GAS BOILER	2	12	#12	1/2"
9	1	20	CIRCULATING PUMP	2	12	#12	1/2"
10 & 11	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–5"

MAINS: MAIN BREAKER 225A.–2P. BUS CAPACITY: 225 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A27"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	125	PANEL "BR" IN BLDG. "A–28"	3	1	——	2"
2	2	100	PANEL "BR" IN BLDG. "B–26"	3	3	——	2"
3	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
4	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
7	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
8	1	20	GAS BOILER	2	12	#12	1/2"
9	1	20	CIRCULATING PUMP	2	12	#12	1/2"
10 & 11	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–6"

MAINS: MAIN BREAKER 100A.–2P. BUS CAPACITY: 100 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "B26" &"A–29"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	60	PANEL "BR" IN BLDG. "B–25"OR "A–29"	3	6	——	2"
2	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
3	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
4	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
7	1	20	GAS BOILER	2	12	#12	1/2"
8	1	20	CIRCULATING PUMP	2	12	#12	1/2"
9 & 10	1	20	SPARES	——	——	——	——

PANEL SCHEDULE–"BR–7"

MAINS: MAIN BREAKER 125A.–2P. BUS CAPACITY: 125 A.

VOLTAGE: 120/240V.–1ø–3W A.I.C. RATING: 10,000 A. (MIN.)

MOUNTING: SURFACE LOCATION: BLDG. "A28"

CIRCUIT No.	POLES	TRIP SETTING AMPS.	ITEM BEING SERVED	CONDUCTORS			CONDUIT SIZE
				No.	SIZE	GRD.	
1	2	100	PANEL "BR" IN BLDG. "A–29"	3	3	——	2"
2	1	20	BOILER ROOM LIGHTING	2	12	#12	1/2"
3	1	20	BOILER ROOM RECEPTECLES	2	12	#12	1/2"
4	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
5	2	40	HEATING SERVICE PUMP	2	10	#10	1/2"
6	1	20	CONTROL CIRCUIT	2	12	#12	1/2"
7	1	20	GAS BOILER	2	12	#12	1/2"
8	1	20	CIRCULATING PUMP	2	12	#12	1/2"
9 & 10	1	20	SPARES	——	——	——	——

L E G E N D

2	LIGHTING FIXTURE No. DENOTES TYPE. SEE NOTE No. 16
⊢①	LIGHTING FIXTURE No. DENOTES TYPE. SEE NOTE No. 15
▬▬	INDICATES NEW CONSTRUCTION.
⊖	DUPLEX RECEPTACLE 24 A.F.F.
- - - - - -	WIRING INSTALLED IN OR BELOW FLOOR SLAB OR UNDERGROUND DUCT BANK.
———	WIRING INSTALLED CONCEALED IN CEILING OR WALL.
S	SINGLE POLE SWITCH 54" A.F.F.
WP	WEATHERPROOF
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
SM	MOTOR PROTECTIVE SWITCH
NEC	NATIONAL ELECTRICAL CODE
NESC	NATIONAL ELECTRICAL SAFETY CODE
S.H.A.	SCRANTON HOUSING ATHORITY
Ⓙ	JUNCTION BOX
Ⓜ	MOTOR LOCATION
⊠	*MOTOR STARTER PROVIDED UNDER* MACHANICAL CONTRACT AND INSTALLED BY ELECTRICAL CONTRACTOR

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: PANEL SCHEDULES & LEGEND

PROJECT: DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA–3–2) AND
VALLEY VIEW TERRACE (PA–3–1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-78
DRAWING NO. E–9 OF 10

ELECTRICAL WORK NOTES:

1. WHERE NEW UNDERGROUND SERVICE IS BEING INSTALLED, AS INDICATED ON THE DRAWINGS, THE EXISTING OVERHEAD SERVICE DROP CONDUCTORS SHALL BE DISCONNECTED FROM TRANSFORMER POLE AND REMOVED. ALSO, THE SERVICE ENTRANCE CONDUCTORS IN CONDUIT SHALL BE REMOVED. ALL SUPPORTING HARDWARE ON BUILDING RELATIVE TO SERVICE SHALL BE REMOVED, AND ALL HOLES SHALL BE PATCHED.

2. EXISTING METAL CABINET WITH HINGED DOORS CONTAINING ENCLOSED MAIN CIRCUIT BREAKER FOR BUILDING AND SEPARATE PANELBOARD FOR APARTMENT FEEDERS, AND HOUSE CIRCUITS SHALL BE REMOVED. THE ENCLOSED CIRCUIT BREAKER AND PANELBOARD SHALL BE TURNED OVER TO THE "SCRANTON HOUSING AUTHORITY" (SHA) AND BECOME THEIR PROPERTY.

3. EXISTING CONDUITS WITH APARTMENT PANEL FEEDERS AND HOUSE CIRCUITS. REMOVE ONLY THAT PORTION OF CONDUITS AND WIRING NOT REQUIRED TO MAKE CONNECTIONS TO THE NEW WIREWAY AND CONDUCTORS THEREIN. SEE TYPICAL ELEVATION FOR NEW WORK. VERIFY EXACT LOCATIONS OF CONDUITS IN THE FIELD.

4. EXISTING SERVICE ENTRANCE GROUND SHALL BE REMOVED. THIS GROUND MAY BE RE-USED IF ALL REQUIREMENTS OF THE N.E.C. ARE SATISFIED.

5. WHERE REQUIRED, INSTALL JUNCTION BOX IN EXISTING HOUSE CIRCUIT ABOVE NEW BOILER ROOM ROOF AND RE-ROUTE FROM JUNCTION BOX WITH NEW CONDUIT AND WIRING TO NEW DISTRIBUTION PANEL AND CONNECT TO SPARE 20A, 1P CIRCUIT BREAKER. RE-CONNECT EXISTING WIRING TO NEW IN JUNCTION BOX, AS REQUIRED.

6. EXISTING TELEPHONE SERVICE SHALL BE REMOVED AND RE-ROUTED INTO NEW BOILER ROOM, AS REQUIRED BY "BELL ATLANTIC". THE CONTRACTOR SHALL INFORM "BELL ATLANTIC" OF THE PROGRESS OF THE PROJECT SO THAT THEY CAN MAKE PROVISIONS FOR RE-ROUTING THEIR CABLE WITHOUT INTERFERING WITH THE CONSTRUCTION. THE CONTRACTOR SHALL ALSO COOPERATE WITH "BELL ATLANTIC" SO THAT THE EXISTING CABLE AND EQUIPMENT INSIDE NEW BOILER ROOM WILL BE PROTECTED DURING THE CONSTRUCTION.

7. SIMILAR TO NOTE NO. 6, EXCEPT EXISTING TV CABLE IN CONDUIT SHALL BE RE-ROUTED BY "VERTO CABLE TV".

8. 6" X 6" (BY LENGTH AS REQUIRED) METAL WIREWAY WITH SCREW COVER. CONNECT NEW WIRING TO EXISTING IN WIREWAY AS REQUIRED. VERIFY EXACT LOCATION IN THE FIELD.

9. EXISTING CONDUITS WITH EXISTING APARTMENT PANEL FEEDERS AND HOUSE WIRING CIRCUITS SHALL REMAIN AND SHALL BE RE-CONNECTED TO THE NEW CIRCUITS IN WIREWAY, AS REQUIRED. RE-WORK CONDUITS AND WIRING, AS REQUIRED. RE-WORK CONDUITS AND WIRING, AS REQUIRED, SO THAT WIREWAY CAN BE INSTALLED ON NEW BOILER ROOM FIREWALL. VERIFY EXACT LOCATION IN THE FIELD.

10. FOUR (4) CONDUITS FROM NEW DISTRIBUTION PANEL IN BOILER ROOM WITH APARTMENT PANEL FEEDERS AND HOUSE CIRCUITS AS FOLLOWS:

    A. CONDUIT NO. 1: 6 #12 IN 1" CONDUIT. (TWO (2) 120 VOLT HOUSE CIRCUITS AND GROUNDS).

    B. CONDUIT NO. 2: 9 #4 AND 3 #10 GROUNDS IN 2" CONDUIT. (THREE (3) 120/240 VOLT, 1-PHASE, 3-WIRE APARTMENT PANEL FEEDERS AND GROUNDS).

    C. CONDUIT NO.3: 9 #4 AND 3 #10 GROUNDS IN 2" CONDUIT. (THREE (3) 120/240 VOLT, 1-PHASE, 3-WIRE APARTMENT PANEL FEEDERS AND GROUNDS).

    D. CONDUIT NO. 4: 6 #4 AND 2 #10 GROUNDS IN 1-1/2" CONDUIT. (TWO (2) 120/240 VOLT, 1-PHASE, 3-WIRE APARTMENT PANEL FEEDERS AND GROUNDS).

    * CONDUIT NO. 4 IS ONLY REQUIRED FOR BUILDINGS WITH 8 APARTMENTS.

    E. CONNECT NEW CIRCUITS TO EXISTING IN WIREWAY, AS REQUIRED.

    F. REFER TO NEW DISTRIBUTION PANEL SCHEDULES AND BOILER ROOM FLOOR PLANS FOR ADDITIONAL INFORMATION.

11. TWO (2) 1-1/2" CONDUIT SLEEVES WITH BUSHED ENDS (ONE (1) FOR TELEPHONE SERVICE AND ONE (1) FOR CABLE TV SERVICE) INSTALLED THROUGH BOILER ROOM WALL AT EAVES. VERIFY THIS WITH A/E AND SHA BEFORE INSTALLING.

12. 2' X 2' X 3/4" THICK PLYWOOD BACKBOARD FOR TELEPHONE EQUIPMENT. VERIFY EXACT LOCATION IN FIELD TO AVOID INTERFERENCES WITH NEW MECHANICAL EQUIPMENT AND PIPING. VERIFY THIS WITH A/E AND SHA BEFORE INSTALLING.

13. SIMILAR TO NOTE NO. 12 EXCEPT FOR CABLE TV EQUIPMENT.

14. 1-1/2 " CONDUIT SLEEVE WITH BUSED ENDS FROM BOILER ROM INTO BUILDING CRAWL SPACE FOR NEW TV CABLES. VERIFY EXACT LOCATION IN FIELD AND VERIFY WITH A/E AND SHA BEFORE INSTALLING.

15. TYPE NO. 1 LIGHTING FIXTURE SHALL BE AS MANUFACTURED BY LUMARK CATALOG NO. HPMP-PC-100-120V-LL-PE SIDE WALL MOUNTED OVER DOOR AS HIGH AS POSSIBLE.

16. TYPE NO. 2 LIGHTING FIXTURE SHALL BE AS MANUFACTURED BY METALUX CATALOG NO IA-2-40-120 SUITABLE FOR 2/40 WATT FLUORESCENT LAMPS. FIXTURE SHALL BE PENDENT MOUNTED AND LOCATED AS REQUIRED TO AVOID INTERFERENCES WITH PIPING, DUCT WORK, ETC.

17. HOME RUN TO NEW DISTRIBUTION PANEL FOR BOILER ROOM LIGHTING. SEE PANEL SCHEDULES.

18. SINGLE POLE "ON" - "OFF" SWITCH WITH RED PLATE MARKED IN WHITE LETTERS "GAS BURNER-EMERGENCY SWITCH". WHEN SWITCH IS IN "OFF" POSITION, BOILER CONTROL CIRCUIT SHALL BE DE-ENERGIZED AND BOILER WILL SHUT DOWN.

19. INSTALL COPPER GROUND WIRE CONNECTED TO GROUND ROD AND COPPER GROUND WIRE CONNECTED TO BUILDING MAIN WATER SERVICE ALL SIZED AND INSTALLED PER ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE.

20. SIMILAR TO NOTE NO. 17, OR NOTE NO. 26, EXCEPT BOILER ROOM RECEPTACLES.

21. TWO (2) HEATING SERVICE PUMPS, ONE ACTIVE AND ONE STAND-BY, 3HP - 230 VOLT, 1 PHASE.

22. SIMILAR TO NOTE NO. 17 OR NOTE 26, EXCEPT FOR HEATING SERVICE PUMPS.

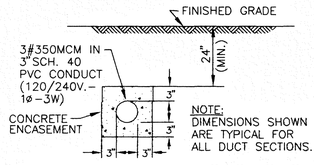
23. SIMILAR TO NOTE NO. 17, OR NOTE NO. 26, EXCEPT FOR BOILER ROOM CONTROL CIRCUIT.

24. SIMILAR TO NOTE NO. 17, OR NOTE #26, EXCEPT FOR GAS BOILER.

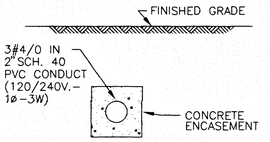
25. SIMILAR TO NOTE NO. 17, OR NOTE #26, EXCEPT FOR HOT WATER CIRCULATING PUMP.

26. HOME RUN TO NEW PANEL "BR" FOR BOILER ROOM LIGHTING. SEE PANEL SCHEDULES.

27. SIDEWALKS AND OTHER PAVED AREAS ARE NOT SHOWN. CONTRACTOR SHALL FIELD-VERIFY THE LOCATION OF SIDEWALKS AND OTHER PAVED AREAS IN THE FIELD, AND IF IT IS NECESSARY TO CUT OR DISTURB THESE AREAS FOR THE INSTALLATION OF THE UNDERGROUND WORK THE CONTRACTOR SHALL REPLACE OR RESTORE THE DISTURBED AREAS IN KIND. ALSO, THE CONTRACTOR SHALL CHECK AND FIELD-VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES BEFORE STARTING ANY EXCAVATION AND IF NECESSARY, SHALL RE-ARRANGE HIS WORK TO AVOID INTERFERENCES.



DUCT SECTION "1"-"1"
NOT TO SCALE



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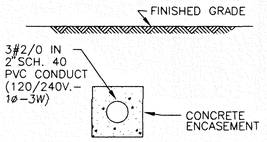

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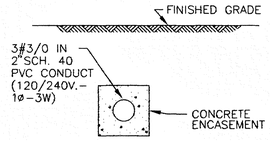

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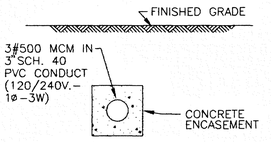

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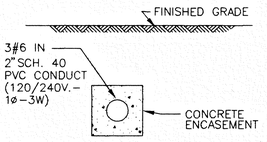
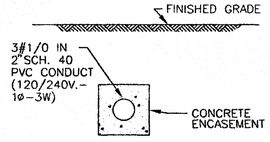
NOT TO SCALE



DUCT SECTION "6"-"6"
NOT TO SCALE



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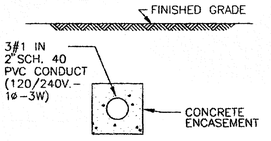
NOT TO SCALE



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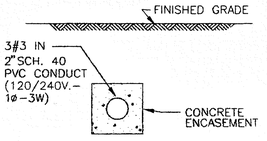

DUCT SECTION "9"-"9"
NOT TO SCALE

SYMBOL	DESCRIPTION	DATE
	REVISIONS	

TITLE: NOTES & DETAILS

PROJECT: DECENTRALIZING BOILER PLANTS
HEATING AND VENTILATING SYSTEMS
FOR HILLTOP MANOR (PA-3-2) AND
VALLEY VIEW TERRACE (PA-3-1)

PETERS DESIGN GROUP INC.
ARCHITECTURAL/ENGINEERING
301 NORTH MAIN AVENUE SCRANTON, PENNSYLVANIA

DRAWN BY CSK
CHECKED BY EJP
SCALE AS NOTED
DATE 3-16-98
DRAWING NO. E-10 OF 10

ATTACHMENT D – HILLTOP PHOTO LOG

https://drive.google.com/drive/folders/1-mHEKSqmrjyRjpzdnM6VcrBCDoVWV2E_

CONTRACT FOR

HVAC CONSTRUCTION

THIS AGREEMENT made this ____ day of _____, by and between_____ a corporation organized and existing under the laws of the state of Pennsylvania.

WITNESSETH, that the Contractor and the Scranton Housing Authority for the consideration stated herein mutually agree as follows:

ARTICLE 1, STATEMENT OF WORK. The contractor shall furnish all labor, materials, equipment and services and perform and complete all work required to furnish and install said work being described in the Documents as Proposal for Construction in strict accordance with the Project Manual entitled:

BOILER & HOT WATER HEATER REPLACEMENT
AT
HILLTOP MANOR
FOR

Scranton Housing Authority
400 Adams Avenue
Scranton, Pa. 18510

Also, and all Addenda thereto, numbered _____, respectively, all as prepared by _____., which said specifications, addenda and drawings are incorporated herein by reference and made part thereof.

ARTICLE 2. THE CONTRACT PRICE. The Scranton Housing Authority shall pay the Contractor for the performance of the Contract, in current funds, subject to additions and deductions as provided in the Contract Documents, the sum of

ARTICLE 3. CONTRACT DOCUMENTS. The contract shall consist of the following:

This Agreement
Conditions of the Contract (General, Supplementary and other conditions).
Performance Bonds
Bid Package
Labor and Material Payment Bond
The Project Manuel
All Drawings
All Addenda issued prior to the execution of the Agreement and
All modifications as agreed and signed by both parties during the course of the Contract.

This instrument, together with the other documents enumerated in this Article 3, which said other documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract. In the event that any provisions of any other component part, the provision of the component part first enumerated in Article 3, shall govern, except as otherwise specifically stated. The various provisions in Addenda shall be construed in the order of preference of the component part of the Contract, which each modifies.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in two (2) original counterparts the day and year first written above.

ATTEST_____ BY _____
Contractor Name

_____
Title

_____
Address

ATTEST_____ THE SCRANTON HOUSING AUTHORITY

_____
Contracting Officer

_____
Address

Print or type names beneath all signatures.

I, _____, certify that I am the _____of the corporation named as Contractor herein, that _____, who signed this contract on behalf of the Contractor, was then _____ of said corporation; that said contract was duly signed for in behalf of said corporation by Authority of its governing body, and is within the scope of its corporate powers.

(Corporate Seal)

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 1/31/2027)

Applicability. This form is applicable to any construction/development contract greater than $250,000.

Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding the accuracy of this burden estimate and any suggestions for reducing this burden can be sent to the Reports Management Officer, Office of Policy Development and Research, REE, Department of Housing and Urban Development, 451 7th St SW, Room 4176, Washington, DC 20410-5000. When providing comments, please refer to OMB Approval No. 2577-0157. This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 75. The form is required for construction contracts awarded by Public Housing Agencies (PHAs). The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, PHAs would be unable to enforce their contracts. Responses to the collection of information are required to obtain a benefit or to retain a benefit. The information requested does not lend itself to confidentiality. HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

1. Definitions

(a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.

(b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.

(c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.

(d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.

(e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.

(f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Terms and Conditions (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.

(g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.

(h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.

(j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.

(l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

(a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.

(b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [ ] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.

(c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.

(f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.

(g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.

(h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

(a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

(b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, **Schedule** engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.

(c) The Architect's duties and responsibilities may include but shall not be limited to:

(1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;

(2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;

(3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,

(4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

(a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.

(b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads;(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

(b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown" "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".

(d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

(h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.

(i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

(a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."

(b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.

(c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

(a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) Approval of equipment and materials.

(1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.

(3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.

(4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.

(5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

(6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.

(c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

(a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

(b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons;

(3) Prevent damage to property, materials, supplies, and equipment; and,

(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

(1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and

(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

(a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.

(b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

(d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

(e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

(f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.

(g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.

(h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels **Construction** when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.

(i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.

(j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

(k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

(a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contactor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of

(a) Definitions. As used in this clause -
(1) “Acceptance” means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
(2) “Inspection” means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
(3) “Testing” means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.

(d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer’s written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.

(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The PHA may conduct routine inspections of the construction site on a daily basis.

(g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.

(i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the **Construction** PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

(a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.

(b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defects of equipment, material, workmanship or design furnished by the Contractor.

(c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.

(d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.

(e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed in writing, for the benefit of the PHA; and,

(3) Enforce all warranties for the benefit of the PHA.

(g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

(h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.

(i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.

(j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

accordance with the terms and conditions of the

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

retain ten (10) percent of the amount of progress

(a) The PHA shall pay the Contractor the price as provided in this contract.

(b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.

(c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

(d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved

submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

(e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in

subcontract.

Name:

Title:

Date:

(f) Except as otherwise provided in State law, the PHA shall

payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.

(g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

(h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.

(i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.

(j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.

(k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

(a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.

(b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

(c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
(1) In the specifications (including drawings and designs);
(2) In the method or manner of performance of the work;
(3) PHA-furnished facilities, equipment, materials, services, or site; or,
(4) Directing the acceleration in the performance of the work.

(b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

(1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.

(2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.

(3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.

(g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.

(h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.

(i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.

(j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

(a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.

(c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.

(d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.

(e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.

(f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

(b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of $ _____ Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.

(b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the PHA in completing the work.

(c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for Convenience

(a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.

(b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.

(c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.

(d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

(a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:

(1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.

(2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than $ _____ [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

(3) Automobile Liability on owned and non -owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than $ _____ [Contracting Officer insert amount] per occurrence.

(b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.

(c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

(a) Definitions. As used in this contract -

(1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

(b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.

(c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

(d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.

(e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

(a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and

(e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor/ Seller agrees as follows:

(a) The Contractor/Seller shall not discriminate against any employee or applicant for employment because of of race color, religion, sex, sexual orientation, gender identity, disability, or national origin.

(b) The Contractor/Seller shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. Such action shall include, but not be limited to, (1) employment, (2) upgrading demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training,including apprenticeship

(c) The Contractor/Seller agrees to post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.
(d) The Contractor/Seller shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor/Seller, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
(e) The Contractor/Seller shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
(f) The Contractor/Seller shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
(g) The Contractor/Seller shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor/Seller shall permit

access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(h) In the event of a that the Contractor/Seller is in noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor/seller may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(i)The contractor/seller will include the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub[contractor/seller] or vendor. The [contractor/seller] will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions in cluding sanctions for noncompliance: Provided, however, that in the event the [contractor/seller] becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the [contractor/seller] may request the United States to enter into such litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 75 regulations.
(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 prioritization requirements and shall state the minimum percentages of labor hour requirements established in the Benchmark Notice (FR-6085-N-04).
(d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 75.
(e) Noncompliance with HUD's regulations in 24 CFR Part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
(f) Contracts, subcontracts, grants, or subgrants subject to Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 5307(b)) or subject to tribal preference requirements as authorized under 101(k) of the Native American Housing Assistance and Self-Determination Act (25 U.S.C. 4111(k)) must provide preferences in employment, training, and business opportunities to Indians and Indian organizations, and are therefore not subject to the requirements of 24 CFR Part 75.

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

(a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of **Acts** Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

(a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related

If the total amount of this contract exceeds $2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

(a) Minimum Wages.

(1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

(c) Payrolls and basic records.

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;

(B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

(g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

(h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.

(i) Certification of eligibility.

(1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause. DOL posts current fines at: https://www.dol.gov/whd/govcontracts/cwhssa.htm#cmp

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

(k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;

(b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or

(c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

(a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.

( ) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of $10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of $10,000 of the item both under and outside that contract.

U.S. Department of Housing and Urban Development

Office of Public and Indian Housing

Instructions to Bidders for Contracts Public and Indian Housing Programs

Instructions to Bidders for Contracts

Public and Indian Housing Programs

Table of Contents

1. Bid Preparation and Submission

(a) Bidders are expected to examine the specifications, drawings, all instructions, and, if applicable, the construction site (see also the contract clause entitled **Site Investigation and Conditions Affecting the Work** of the *General Conditions of the Contract for Construction*). Failure to do so will be at the bidders' risk.

(b) All bids must be submitted on the forms provided by the Public Housing Agency/Indian Housing Authority (PHA/IHA). Bidders shall furnish all the information required by the solicitation. Bids must be signed and the bidder's name typed or printed on the bid sheet and each continuation sheet which requires the entry of information by the bidder. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent shall be accompanied by evidence of that agent's authority. (Bidders should retain a copy of their bid for their records.)

(c) Bidders must submit as part of their bid a completed form HUD-5369-A, "Representations, Certifications, and Other Statements of Bidders."

(d) All bid documents shall be sealed in an envelope which shall be clearly marked with the words "Bid Documents," the Invitation for Bids (IFB) number, any project or other identifying number, the bidder's name, and the date and time for receipt of bids.

(e) If this solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.

(f) Unless expressly authorized elsewhere in this solicitation, alternate bids will not be considered.

(g) Unless expressly authorized elsewhere in this solicitation, bids submitted by telegraph or facsimile (fax) machines will not be considered.

(h) If the proposed contract is for a Mutual Help project (as described in 24 CFR Part 905, Subpart E) that involves Mutual Help contributions of work, material, or equipment, supplemental information regarding the bid advertisement is provided as an attachment to this solicitation.

2. Explanations and Interpretations to Prospective Bidders

(a) Any prospective bidder desiring an explanation or interpretation of the solicitation, specifications, drawings, etc., must request it at least 7 days before the scheduled time for bid opening. Requests may be oral or written. Oral requests must be confirmed in writing. The only oral clarifications that will be provided will be those clearly related to solicitation procedures, i.e., not substantive technical information. No other oral explanation or interpretation will be provided. Any information given a prospective bidder concerning this solicitation will be furnished promptly to all other prospective bidders as a written amendment to the solicitation, if that information is necessary in submitting bids, or if the lack of it would be prejudicial to other prospective bidders.

(b) Any information obtained by, or provided to, a bidder other than by formal amendment to the solicitation shall not constitute a change to the solicitation.

3. Amendments to Invitations for Bids

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date on the bid form, or (3) by letter, telegram, or facsimile, if those methods are authorized in the solicitation. The PHA/IHA must receive acknowledgement by the time and at the place specified for receipt of bids. Bids which fail to acknowledge the bidder's receipt of any amendment will result in the rejection of the bid if the amendment(s) contained information which substantively changed the PHA's/IHA's requirements.

(c) Amendments will be on file in the offices of the PHA/IHA and the Architect at least 7 days before bid opening.

4. Responsibility of Prospective Contractor

(a) The PHA/IHA will award contracts only to responsible prospective contractors who have the ability to perform successfully under the terms and conditions of the proposed contract. In determining the responsibility of a bidder, the PHA/IHA will consider such matters as the bidder's:

(1) Integrity;

(2) Compliance with public policy;

(3) Record of past performance; and

(4) Financial and technical resources (including construction and technical equipment).

(b) Before a bid is considered for award, the bidder may be requested by the PHA/IHA to submit a statement or other documentation regarding any of the items in paragraph (a) above. Failure by the bidder to provide such additional information shall render the bidder nonresponsible and ineligible for award.

5. Late Submissions, Modifications, and Withdrawal of Bids

(a) Any bid received at the place designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail, or if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the PHA/IHA that the late receipt was due solely to mishandling by the PHA/IHA after receipt at the PHA/IHA; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service - Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and observed holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the PHA/IHA is the time/date stamp of PHA/IHA on the proposal wrapper or other documentary evidence of receipt maintained by the PHA/IHA.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and Failure by a bidder to acknowledge receipt of the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the PHA/IHA will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice, or if authorized by this solicitation, by telegram (including mailgram) or facsimile machine transmission received at any time before the exact time set for opening of bids; provided that written confirmation of telegraphic or facsimile withdrawals over the signature of the bidder is mailed and postmarked prior to the specified bid opening time. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for opening of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

6. Bid Opening

All bids received by the date and time of receipt specified in the solicitation will be publicly opened and read. The time and place of opening will be as specified in the solicitation. Bidders and other interested persons may be present.

7. Service of Protest

(a) Definitions. As used in this provision:

"Interested party" means an actual or prospective bidder whose direct economic interest would be affected by the award of the contract.

"Protest" means a written objection by an interested party to this solicitation or to a proposed or actual award of a contract pursuant to this solicitation.

(b) Protests shall be served on the Contracting Officer by obtaining written and dated acknowledgement from —

[Contracting Officer designate the official or location where a protest may be served on the Contracting Officer]

(c) All protests shall be resolved in accordance with the PHA's/IHA's protest policy and procedures, copies of which are maintained at the PHA/IHA.

8. Contract Award

(a) The PHA/IHA will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the PHA/IHA considering only price and any price-related factors specified in the solicitation.

(b) If the apparent low bid received in response to this solicitation exceeds the PHA's/IHA's available funding for the proposed contract work, the PHA/IHA may either accept separately priced items (see 8(e) below) or use the following procedure to determine contract award. The PHA/IHA shall apply in turn to each bid (proceeding in order from the apparent low bid to the high bid) each of the separately priced bid deductible items, if any, in their priority order set forth in this solicitation. If upon the application of the first deductible item to all initial bids, a new low bid is within the PHA's/IHA's available funding, then award shall be made to that bidder. If no bid is within the available funding amount, then the PHA/IHA shall apply the second deductible item. The PHA/IHA shall continue this process until an evaluated low bid, if any, is within the PHA's/IHA's available funding. If upon the application of all deductibles, no bid is within the PHA's/IHA's available funding, or if the solicitation does not request separately priced deductibles, the PHA/IHA shall follow its written policy and procedures in making any award under this solicitation.

(c) In the case of tie low bids, award shall be made in accordance with the PHA's/IHA's written policy and procedures.

(d) The PHA/IHA may reject any and all bids, accept other than the lowest bid (e.g., the apparent low bid is unreasonably low), and waive informalities or minor irregularities in bids received, in accordance with the PHA's/IHA's written policy and procedures.

(e) Unless precluded elsewhere in the solicitation, the PHA/IHA may accept any item or combination of items bid.

(f) The PHA/IHA may reject any bid as nonresponsive if it is materially unbalanced as to the prices for the various items of work to be performed. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(g) A written award shall be furnished to the successful bidder within the period for acceptance specified in the bid and shall result in a binding contract without further action by either party.

9. Bid Guarantee (applicable to construction and equipment contracts exceeding $25,000)

All bids must be accompanied by a negotiable bid guarantee which shall not be less than five percent (5%) of the amount of the bid. The bid guarantee may be a certified check, bank draft, U.S. Government Bonds at par value, or a bid bond secured by a surety company acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. In the case where the work under the contract will be performed on an Indian reservation area, the bid guarantee may also be an irrevocable Letter of Credit (see provision 10, Assurance of Completion, below). Certified checks and bank drafts must be made payable to the order of the PHA/IHA. The bid guarantee shall insure the execution of the contract and the furnishing of a method of assurance of completion by the successful bidder as required by the solicitation. Failure to submit a bid guarantee with the bid shall result in the rejection of the bid. Bid guarantees submitted by unsuccessful bidders will be returned as soon as practicable after bid opening.

10. Assurance of Completion

(a) Unless otherwise provided in State law, the successful bidder shall furnish an assurance of completion prior to the execution of any contract under this solicitation. This assurance may be [Contracting Officer check applicable items] —

[ ] (1) a performance and payment bond in a penal sum of 100 percent of the contract price; or, as may be required or permitted by State law;

[ ] (2) separate performance and payment bonds, each for 50 percent or more of the contract price;

[ ] (3) a 20 percent cash escrow;

[ ] (4) a 25 percent irrevocable letter of credit; or,

[ ] (5) an irrevocable letter of credit for 10 percent of the total contract price with a monitoring and disbursements agreement with the IHA (applicable only to contracts awarded by an IHA under the Indian Housing Program).

(b) Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. Individual sureties will not be considered. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each contract bonded, and the States in which the company is licensed to do business. Use of companies listed in this circular is mandatory. Copies of the circular may be downloaded on the U.S. Department of Treasury website **http://www.fms.treas.gov/c570/index.html**, or ordered for a minimum fee by contacting the Government Printing Office at (202) 512-2168.

(c) Each bond shall clearly state the rate of premium and the total amount of premium charged. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond shall be on or after the execution date of the contract.

(d) Failure by the successful bidder to obtain the required assurance of completion within the time specified, or within such extended period as the PHA/IHA may grant based upon reasons determined adequate by the PHA/IHA, shall render the bidder ineligible for award. The PHA/IHA may then either award the contract to the next lowest responsible bidder or solicit new bids. The PHA/IHA may retain the ineligible bidder's bid guarantee.

11. Preconstruction Conference (applicable to construction contracts)

After award of a contract under this solicitation and prior to the start of work, the successful bidder will be required to attend a preconstruction conference with representatives of the PHA/IHA and its architect/engineer, and other interested parties convened by the PHA/IHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract (e.g., Equal Employment Opportunity, Labor Standards). The PHA/IHA will provide the successful bidder with the date, time, and place of the conference.

12. Indian Preference Requirements (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

(a) HUD has determined that the contract awarded under this solicitation is subject to the requirements of section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e(b)). Section 7(b) requires that any contract or subcontract entered into for the benefit of Indians shall require that, to the greatest extent feasible

(1) Preferences and opportunities for training and employment (other than core crew positions; see paragraph (h) below) in connection with the administration of such contracts or subcontracts be given to qualified "Indians." The Act defines "Indians" to mean persons who are members of an Indian tribe and defines "Indian tribe" to mean any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; and,

(2) Preference in the award of contracts or subcontracts in connection with the administration of contracts be given to Indian organizations and to Indian-owned economic enterprises, as defined in section 3 of the Indian Financing Act of 1974 (25 U.S.C. 1452). That Act defines "economic enterprise" to mean any Indian-owned commercial, industrial, or business activity established or organized for the purpose of profit, except that the Indian ownership must constitute not less than 51 percent of the enterprise; "Indian organization" to mean the governing body of any Indian tribe or entity established or recognized by such governing body; "Indian" to mean any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act; and Indian "tribe" to mean any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including

corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

(b) (1) The successful Contractor under this solicitation shall comply with the requirements of this provision in awarding all subcontracts under the contract and in providing training and employment opportunities.

(2) A finding by the IHA that the contractor, either (i) awarded a subcontract without using the procedure required by the IHA, (ii) falsely represented that subcontracts would be awarded to Indian enterprises or organizations; or, (iii) failed to comply with the contractor's employment and training preference bid statement shall be grounds for termination of the contract or for the assessment of penalties or other remedies.

(c) If specified elsewhere in this solicitation, the IHA may restrict the solicitation to qualified Indian-owned enterprises and Indian organizations. If two or more (or a greater number as specified elsewhere in the solicitation) qualified Indian-owned enterprises or organizations submit responsive bids, award shall be made to the qualified enterprise or organization with the lowest responsive bid. If fewer than the minimum required number of qualified Indian-owned enterprises or organizations submit responsive bids, the IHA shall reject all bids and readvertise the solicitation in accordance with paragraph (d) below.

(d) If the IHA prefers not to restrict the solicitation as described in paragraph (c) above, or if after having restricted a solicitation an insufficient number of qualified Indian enterprises or organizations submit bids, the IHA may advertise for bids from non-Indian as well as Indian-owned enterprises and Indian organizations. Award shall be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is -

(1) Within the maximum HUD-approved budget amount established for the specific project or activity for which bids are being solicited; and

(2) No more than the percentage specified in 24 CFR 905.175(c) higher than the total bid price of the lowest responsive bid from any qualified bidder. If no responsive bid by a qualified Indian-owned economic enterprise or organization is within the stated range of the total bid price of the lowest responsive bid from any qualified enterprise, award shall be made to the bidder with the lowest bid.

(e) Bidders seeking to qualify for preference in contracting or subcontracting shall submit proof of Indian ownership with their bids. Proof of Indian ownership shall include but not be limited to:

(1) Certification by a tribe or other evidence that the bidder is an Indian. The IHA shall accept the certification of a tribe that an individual is a member.

(2) Evidence such as stock ownership, structure, management, control, financing and salary or profit sharing arrangements of the enterprise.

(f) (1) All bidders must submit with their bids a statement describing how they will provide Indian preference in the award of subcontracts. The specific requirements of that statement and the factors to used by the IHA in determining the statement's adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement shall be rejected as nonresponsive. The IHA may require that comparable statements be provided by subcontractors to the successful Contractor, and may require the Contractor to reject any bid or proposal by a subcontractor that fails to include the statement.

(2) Bidders and prospective subcontractors shall submit a certification (supported by credible evidence) to the IHA in any instance where the bidder or subcontractor believes it is infeasible to provide Indian preference in subcontracting. The acceptance or rejection by the IHA of the certification shall be final. Rejection shall disqualify the bid from further consideration.

(g) All bidders must submit with their bids a statement detailing their employment and training opportunities and their plans to provide preference to Indians in implementing the contract; and the number or percentage of Indians anticipated to be employed and trained. Comparable statements from all proposed subcontractors must be submitted. The criteria to be used by the IHA in determining the statement(s)'s adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement(s), or that includes a statement that does not meet minimum standards required by the IHA shall be rejected as nonresponsive.

(h) Core crew employees. A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work is available. Bidders shall submit with their bids a list of all core crew employees.

(i) Preference in contracting, subcontracting, employment, and training shall apply not only on-site, on the reservation, or within the IHA's jurisdiction, but also to contracts with firms that operate outside these areas (e.g., employment in modular or manufactured housing construction facilities).

(j) Bidders should contact the IHA to determine if any additional local preference requirements are applicable to this solicitation.

(k) The IHA [ ] does [ ] does not [Contracting Officer check applicable box] maintain lists of Indian-owned economic enterprises and Indian organizations by specialty (e.g., plumbing, electrical, foundations), which are available to bidders to assist them in meeting their responsibility to provide preference in connection with the administration of contracts and subcontracts.

U.S. Department of Housing and Urban Development

Office of Public and Indian Housing

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Table of Contents

1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above.

_____ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[ ] [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding $50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [ ] is, [ ] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [ ] has, [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has, [ ] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding $100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

(a) Result in an unfair competitive advantage to the bidder; or,

(b) Impair the bidder's objectivity in performing the contract work.

[ ] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [ ] is, [ ] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [ ] is, [ ] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [ ] is, [ ] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

[ ] Black Americans	[ ] Asian Pacific Americans
[ ] Hispanic Americans	[ ] Asian Indian Americans
[ ] Native Americans	[ ] Hasidic Jewish Americans

8. Indian-Owned Economic Enterprise and Indian Organization Representation (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a) [ ] is, [ ] is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act.

(b) [ ] is, [ ] is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian tribe or entity established or recognized by such governing body. Indian "tribe" means any Indian tribe, band, group, pueblo, or

community including Native villages and Native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding $2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding $10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed $10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

(1) Obtain identical certifications from the proposed subcontractors;

(2) Retain the certifications in its files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding $100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [ ] is, [ ] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Previous Participation Certificate (applicable to construction and equipment contracts exceeding $50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." If the successful bidder does not submit the certificate with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate"

[ ] is, [ ] is not included with the bid.

13. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

_____
(Signature and Date)

_____
(Typed or Printed Name)

_____
(Title)

_____
(Company Name)

(Company Address)

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
1. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Owner's and Construction Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner, Commissioning Authority and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Owner and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner and Construction Manager.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:

    a. Project name.
    b. Date.
    c. Name of Construction Manager.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Location(s) where product is to be installed, as appropriate.
    l. Related physical samples submitted directly.
    m. Indication of full or partial submittal.
    n. Transmittal number.
    o. Submittal and transmittal distribution record.
    p. Other necessary identification.
    q. Remarks.

D. Options: Identify options requiring selection by Owner.

E. Deviations: Identify deviations from the minimum performance requirements on submittals.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Owner's and Construction Manager's action stamp.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.

a. Owner, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Or, submit electronic submittals via email as PDF electronic files.

a. Owner, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the minimum performance specifications or standard printed data.

1. Preparation: Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer, where required.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner, through Construction Manager, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Owner and Construction Manager will retain two Sample sets; remainder will be returned.

      1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

   a. PDF electronic file.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are required of Contractor, provide products and systems complying with the minimum performance indicated.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner and Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved.

3.2 OWNER'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Owner and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Owner and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Owner and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner and Construction Manager will forward each submittal to appropriate party.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

G. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction. Additional, experience shall mean having at least three to five years' experience with like or similar in type, size projects and with credible references

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Owner or Commissioning Authority.
2. Notify Owner and Commissioning Authority seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Owner and Commissioning Authority approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

1.6 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

B. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the project requirements.

D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and no later than 30 days following receipt of approved contractor submittals. Owner and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Owner's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Owner's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Commissioning Authority.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder. Highlight all installed model numbers. Provide an index of all project model numbers.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.

7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

F. Include name, phone numbers, and contact for the local reps who provided the equipment.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance

and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system. O&M Manuals are to be project specific and are not to include catalogs with multiple model numbers. All product data should be edited so as to provide only the information associated with the equipment provided on this project. All associated model numbers should be indexed and all non-relevant models shall be deleted. Include Name, phone numbers, and contact for the local reps who provided the equipment

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

END OF SECTION 017823

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. A manufacturer’s representative shall be present at a minimum of 1 training for each unique piece of equipment.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

F. A manufacturer’s representative will be present at all equipment training sessions.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

C. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

D. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. The Commissioning Plan prepared by the CxA contains requirements that apply to this Section.

1.2 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to specific systems, subsystems, and equipment being commissioned.

B. Owner has employed an independent Commissioning Authority (CxA). The Commissioning Authority is an independent and knowledgeable third party, hired to verify that the systems being commissioned work as intended. The Commissioning Authority will inform the Owner of the results of the Commissioning Process and provide suggestions, as necessary, to correct deficiencies in observed performance or installation.

C. The Commissioning Process is a quality-oriented process for achieving, verifying and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.

D. The Contractor is responsible for participation in the Commissioning Process as outlined in the Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections; the *Commissioning Plan*.

E. The *Commissioning Plan* provides specifics regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

F. The Contractor is responsible to furnish labor and materials sufficient to meet all requirements of building commissioning under this contract.

1.3 SYSTEMS-TO-BE-COMMISSIONED

A. Central Plant Retrofits and Optimization

B. Solar PV

C. Water Conservation Valves

D. There may be additional commissioning requirements in the Scranton Housing Authority EPC Phase III Investment Grade Audit. All requirements and ECMs listed in the Audit apply to this project.

1.4 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. Deficiency: Installation or remediation effort, or a portion thereof, that lacks in workmanship, quality and directly invalidates or compromises the energy performance of the energy conservation measure as identified in the *Scranton Housing Authority EPC Phase III Investment Grade Audit*.
   1. The Commissioning Authority and Owner shall be the sole authorities in determining what does or does not constitute as a deficiency in installation or remediation.

D. ECM: Energy Conservation Measure

E. Focused, Quality-Based Sampling: Commissioning effort intended to review a set percentage of typical installation and/or remediation efforts at a limited number of typical locations and types.

F. Functional Performance Testing (FPT): The testing of the dynamic function and operation of components, equipment and systems using manual (direct observation) and monitoring (data-logging/trending) methods.

G. Functional Performance Test procedure: A written protocol that defines methods, steps, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

H. M&V: Measurement and Verification

I. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

J. Pre-Functional Checklist (PFC): A form used by the Contractor to verify that appropriate components are onsite, ready for installation, correctly installed, set up, calibrated and functional.

K. Quality Based Sampling: A process for evaluating a sub-set (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.

L. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

M. TAB: Testing, Adjusting and Balancing.

N. Typical, Non-Major: Energy Conservation Measures that require multiple installations or remediates executed in a typical fashion with each individual installation representing a non-

major portion of a larger and major anticipated energy savings as described and identified in the *Scranton Housing Authority EPC Phase III Investment Grade Audit*.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
   1. Architect and engineering design professionals as required for complete implementation of ECMs.

B. Commissioning Coordinator Supervisor: The General Contractor shall provide a person with at least five (5) years of experience with the coordination of disciplines of construction. This person does not necessarily need to be fully dedicated to this role, but the Coordinator's responsibilities shall, at a minimum, include:
   1. Cx Coordination meetings.
   2. Cx Planning.
   3. Cx Scheduling.
   4. Cx Documentation.
   5. Communication with the Commissioning Authority.
   6. Coordination and completion of Cx-related corrective actions.
   7. Owner Training.

C. Members Appointed by Owner:

   1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
   2. Representatives of the facility user and operation and maintenance personnel.

1.6 DOCUMENT SUBMISSION REQUIREMENTS

A. Provide a comprehensive submittal log of all submittals to the Commissioning Authority prior to submission of any equipment submittals for review.
   1. From the submittal log, the Commissioning Authority will identify which submittals shall be presented to the CxA for review and comment.
   2. The Commissioning Authority shall receive and review the submittals concurrent with the Owner.

B. Master Construction Schedule: Coordinate with the CxA the scheduling of the commissioning process with regards to timing and duration of the commissioning tasks and milestones. Including but not limited to, equipment start-up; testing, adjusting and balancing; functional performance testing and Owner training sessions.

C. Submit a copy of Construction Meeting Minutes; Requests for Information (RFI); Requests for Proposals (RFP) for construction, engineering and architectural services; Change Orders (CO); etc. to the CxA as they occur.

D. Submit training session plans to the CxA for approval after receiving the approved submittal for systems. See Part 3 below for training plan requirements. CxA will coordinate Owner approval of submitted training plans.

E. Contractor is required to submit the operation and maintenance manuals to the CxA and Owner for review within two (2) weeks after receiving the approved submittal for systems. Following review and approval process, submit final operations and maintenance manuals no later than two (2) weeks prior to the commencement of training.

F. Submit completed Pre-Functional and Startup Checklists to CxA within a minimum of one (1) week prior to scheduled Functional Performance Testing.

G. Submit Functional Performance Testing schedule to the CxA at least two (2) weeks prior to the start of testing.

H. Submit the Test and Balance Execution Plan to the Owner and CxA for review and approval no later two (2) weeks prior to the commencement of balancing.

I. Submit the completed preliminary test and balance reports to the Owner and CxA for review and approval within one (1) week of completion of work; and prior to commencement of HVAC system Functional Performance Tests. Legible, hand written, field generated test and balance reports are considered acceptable preliminary reports. Provide written documentation that all deficiency items identified in the preliminary test and balance report(s) have been addressed, or provide a schedule identifying when each item will be addressed. This shall include a schedule for when any additional testing, adjusting and balancing will be completed following corrective measures being completed.

J. System Functional Performance Testing will start only after the successful balance report is reviewed and accepted.

1.7 OWNER'S RESPONSIBILITIES

A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
   1. Coordination meetings.
   2. Making personnel available for training in operation and maintenance of systems, subsystems, and equipment.
   3. Testing meetings.
   4. Inspection and review of mock-ups and installations.
   5. Demonstration of operation of systems, subsystems, and equipment.

1.8 CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

   1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

2. Cooperate with the CxA for resolution of issues recorded in the Issues and Benefits Log.
3. Attend commissioning team meetings held on an as needed basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept pre-functional checklists provided by the CxA.
6. Complete paper or electronic pre-functional checklists as Work is completed and provide to the Commissioning Authority prior to Functional Performance Testing.
7. Review and accept commissioning functional performance test procedures provided by the Commissioning Authority.
8. Complete commissioning functional performance test procedures.
9. Provide to the CxA copies of all submittals and shop drawings, manufacturer's literature, maintenance information or other information as may be needed for systems to be commissioned.
10. Provide the CxA with any requested documentation prior to, or in addition to, the O&M Manual submittals requirements outlined in other specification sections.
11. Assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings, or equipment documentation is not sufficient for writing detailed functional performance testing procedures.
12. Develop a full start-up and initial checkout plan using manufacturer’s start-up procedures and related specification sections.
13. Provide updates to all project documentation to reflect all supplemental instructions, addenda or other modifications to the Contract Documents. Updates and supplemental instructions must be posted to the master set of Contract Documents for review and reference by all contractors, sub-contractors, and system component suppliers, and for the CxA's use.
14. Provide qualified and trained personnel to participate in the commissioning process.
15. Review the Cx Plan, Cx Issues and Benefits Logs, and project correspondence. In a timely manner, respond to the CxA and address the identified issues.
16. Issue a written Notice of Readiness for each system to CxA upon completion of all systems work, start-up and Pre-functional Tests Checklists requirements by trade contractors.
17. Test all equipment and systems using the Functional Performance Test procedures *PRIOR TO DEMONSTRATING PROPER PERFORMANCE TO THE CXA*.
    a. Contractor is responsible for completing Functional Performance Testing. CxA is responsible for verifying Functional Performance Testing.
18. Operate equipment and systems as required for Functional Performance verification by CxA. This includes manipulating the temperature controls to execute the Functional Performance Test Procedures.
19. Participate in the fine-tuning or troubleshooting of system performance, if either of these measures becomes necessary.
20. Readiness
    a. It is the obligation of all parties to be prepared for commissioning activities. Prior to commencement of Functional Performance Testing the Contractor shall ensure completion of the following items as they relate to the equipment and/or system being commissioned:
        1) Permanent utility and central plant connection to the equipment/system.
        2) Completed equipment/system startup documentation has been delivered to the Commissioning Authority.
        3) Written notification from the responsible Contractor to the Commissioning Agent stating completion of equipment/system startup documentation
    b. It is at the sole discretion of the Commissioning Authority to begin Functional Performance Testing without one or more of the aforementioned items completed.

If the aforementioned items will not be completed prior to the mutually agreed upon start date for Functional Performance Testing the Contractor may provide 48 hours notice. Failure of the Contractor to have the aforementioned items completed prior to the mutually agreed upon start date and failure to notify the Commissioning Authority within the aforementioned notification period will result in the Contractor being liable for all travel expenses incurred by Commissioning Agent which include all miles traveled and the time allocated for the Commissioning Authority to travel to and from the project site. Travel miles will be billed at the current year standard mileage rate as defined by the Internal Revenue Service. Hours for this travel will be billed at the nominal rate of $120 per hour.

1.9 CxA'S RESPONSIBILITIES

A. Organize and lead the Commissioning Team.

B. Provide and maintain Commissioning Plan.

C. Convene commissioning team meetings.

D. Provide project-specific construction pre-functional checklists and commissioning functional performance test procedures.

E. Verify the execution of commissioning process activities using focused, quality-based sampling. The sampling rate for typical, non-major installations and remediation is as defined in the Acceptance Procedures section of this specification. Verification will include, but is not limited to, equipment submittals, pre-functional checklists, training, operating and maintenance data, tests, and test reports. When a focused, quality-based sample does not meet the requirements of the minimum performance specifications, the CxA will report the deficiency in the Issues and Benefits Log.

F. Prepare and maintain the Issues and Benefits Log.

G. Prepare and maintain completed construction pre-functional checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all tools, services and instruments required to test and adjust equipment and to verify compliance.

B. Provide calibration documentation, dated less than one (1) year of the date of use, for all tools and instruments used during functional performance testing.

PART 3 - EXECUTION

3.1 COORDINATION

A. Review the Commissioning Plan.

B. Attend all commissioning coordination meetings.

C. Include commissioning activities in the Master Construction Schedule.
   1. The master scheduling process will include the designation of contractor personnel required to perform the Function Performance Tests and coordination of deferred testing due to season, tenant fit-out schedule, etc.

3.2 TRAINING

A. Provide training for hardware and major components as specified within related sections and in the *Commissioning Plan*.

B. The Contractor is responsible for training coordination, scheduling and ensuring that training is completed per contract specifications.

C. The CxA shall help facilitate and oversee the training planning process for commissioned equipment and systems, however, all responsibility for providing training content and delivery is the Contractor's per the contract documents, including this specification section.

D. No later than two (2) weeks following acceptance of equipment and system submittals, the responsible Contractor will submit written training session plans to the CxA for review and approval. There shall be one session plan for each specification section requiring training. Each session plan will consider the following elements:
   1. Equipment/systems covered in each training session
   2. Intended audience
   3. Location of training
   4. Objectives
   5. Subjects covered (description, duration of discussion, special methods, etc.)
   6. Duration of training for each subject
   7. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   8. Instructor and qualifications
   9. Option of three dates to hold the training session

E. The responsible Contractor works with the Commissioning Authority to develop an overall training plan (i.e., multiple training "sessions") for the commissioned systems.

F. The Contractors and vendors shall provide training. The Training Sessions provided by the responsible Contractors shall be customized for this project and reflect all the installed equipment and systems. Trainings of the materials, components, systems and equipment shall, at the minimum, incorporate the following items:
   1. Materials, components, systems and equipment
   2. Safety precautions and procedures.

3. Installation.
4. Operational features and functions.
5. Operational testing and diagnostics.
6. Preventive and predictive maintenance.
7. Service: Repair and replacement.
8. Operation and Maintenance manual content
9. Testing, adjusting, calibration and balancing.
10. Contractor furnished spare parts and extra materials.
11. Recommended “attic stock” inventory not furnished by contractor.
12. Specialty tool requirements.
13. Lubricants
14. Fuels.
15. Identification systems.
16. Automatic/manual control systems.
17. Hazards/Material Safety Data Sheets
18. Cleaning
19. Procurement of replacement parts
20. Warranty reviews including terms and conditions, points of contact, return material procedures, effective date, extended warranty options.
21. Maintenance agreements and similar continuing commitments.

G. Obtain written acceptance of the training session from the Owner. CxA will coordinate Owner approval of submitted training plans.

H. At a minimum, document performance of each training session with a form including the following. Submit completed forms to the CxA through the GC no later than one (1) week following acceptable completion of the training session.
1. Date of training
2. Sign-in sheet of attendees and their affiliation
3. Sign-off (acceptance) by CxA and Owner

I. Comply with requirements as specified in other specification sections.

3.3 EQUIPMENT START-UP AND EQUIPMENT ENERGIZATION

A. The Contractor will inform CxA at least 48 hours in advance of the scheduled on-site start-up or equipment energization. CxA reserves the right to witness the performance of any or all start-up/energization procedures.

B. Conduct start-up and energization with authorized personnel who are factory-trained on the equipment being started. These personnel shall document the startup procedure, adjustments made, and results achieved. Record this information according to the startup checklist requirements provided by the associated equipment/system manufacturer.

C. Provide documented start-up reports to the CxA. Reports shall be complete, legible, dated, and signed by the factory trained and authorized representatives performing the associated work for the various systems being commissioned within one week of start-up.

D. Subcontractor/Installers shall forward to the CxA through the General Contractor a list and schedule of specified startup reports.

3.4 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. The TAB contractor's test and balance engineer shall conduct a final inspection in the presence of Engineer and Commissioning Authority.
   1. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
   2. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
   3. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
   4. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
      a. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

D. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

E. If any portion of this specification section contradicts or duplicates requirements found elsewhere in the Contract Documents, the more stringent requirements shall apply.

3.5 ACCEPTANCE PROCEDURES

A. Prior to functional performance testing of each system, the CxA will observe and verify that the physical installation of components and systems being tested is substantially installed in accordance with the minimum performance requirements of the project specifications and the *Scranton Housing Authority EPC Phase III Investment Grade Audit*. As deemed necessary by the Owner and CxA, the CxA shall witness verification of operation for select typical, non-major installations and remediation as during observation and verification as part of the acceptance process. The number of observations and verifications will be approximately as follows:
   1. Major Equipment Retrofits: 100%
   2. Typical, Non-Major installations and remediation: Equipment mock-ups, and the greater of 2% or 30 installations and remediation for each typical, non-major installation and remediation measure type identified in the *Project Narrative*.
      a. For each ECM, if more than 10% of the Typical, Non-Major installations or remediation are found with deficiencies, then an additional 2% or 30 installations (a.k.a. second sampling group) shall be observed and verified. If more than 10%

of the second sampling group is found with deficiencies, then an additional 10% of installations or remediation (a.k.a. third sampling group) will be observed and verified. If more than 5% of the third sampling group is found with deficiencies, then each and every installation or remediation from that specific ECM shall be observed and verified.

b. If the initial focused, quality-based sampling for each ECM is found deficient, the Contractor shall be liable for all travel expenses and time incurred to observe and identify the second, third and fourth sampling groups for that ECM. Travel miles will be billed at the current year standard mileage rate as defined by the Internal Revenue Service. Hours will be billed at the nominal rate of $120 per hour.

B. Contractor's Tests:
1. Check system for proper installation, and adjust and calibrate to verify that system is ready to function as specified.
2. Check system elements to verify that they have been installed properly and that all connections have been made correctly.
3. Adjust discrete elements and sub-systems and check for proper operation.

C. The Contractor shall provide technicians and installers as required by the CxA during observation and verification. Technicians and installers shall be knowledgeable on the installation or remediation and proficient on the equipment, components and systems being observed and verified.

3.6 FUNCTIONAL PERFORMANCE TESTS

A. Objective of these tests is to demonstrate that systems are operating and complying with specified performance requirements. In general, the procedures will test the following parameters:
1. Operate each system through all modes of system, including individual interlocks and conditional control logic, all control sequences, both full-load and part-load conditions and simulation of all abnormal conditions for which there is a specified system or controls response.
2. Impose temporary upsets of systems, such as distribution fault, control loss, setpoint change, equilibrium upset and component failure at different operation loads to determine system stability and recovery time.

B. The Contractor shall satisfactorily execute the Functional Performance Tests prior to the CxA witnessing and verifying the test execution.

C. Functional Performance Tests will be witnessed and endorsed by the CxA upon satisfactory completion. The CxA will recommend acceptance of the systems or identify deficiencies requiring correction and re-testing.

D. The final project specific Functional Performance Test procedures will be prepared by the CxA following Contract Award.

E. The Contractor shall review and comment on the Functional Performance Tests developed by the CxA based on approved equipment submittals and Operations & Maintenance manuals. Provide feedback as to the efficiency of the procedures and possible alternate approaches to achieving the same results.

F. Provide personnel and equipment as required to perform the Functional Performance Tests during CxA verification.

G. Verification of all Functional Performance Tests for each system shall be completed prior to occupancy or partial occupancy of the building.

H. For systems where only a sample of the equipment is subjected to a Functional Performance Test, the failing Functional Performance Test will be retested and an additional sample equal in size to the previous sample will be subjected to the Functional Performance Test.

I. Corrective Measures: If acceptable performance cannot be achieved, identify the cause of the deficiency. If it is determined that the deficiency was caused by the system or component not being installed according to manufacturer's recommendations or Contract Documents, make necessary corrections. Repeat every check or test for which acceptable performance was not achieved after the necessary corrective measures have been completed. Repeat re-testing process until acceptable performance is achieved. Contractor will be allowed one retest after initial testing of the equipment. If the retest fails, subsequent retests will be performed at the Installation Contractor’s expense.

3.7 CORRECTIVE ACTIONS

A. Perform corrective actions for resolution of deficiencies found during any step of the commissioning process.

B. For functional performance testing, a deficiency is defined as equipment that does not function as expected and more than five (5) minutes is required to correct the problem in the field during the testing verification.

C. The time and expense of the CxA to witness repeat Functional Performance Testing that is a result of a deficiency of corrective action resolution shall be considered as additional cost to the Owner. The total sum of such costs shall be deducted from the final payment to the Contractor.

3.8 OCCUPANCY AND WARRANTY PHASE COMMISSIONING

A. The Contractor and CxA will complete seasonal Functional Performance Testing in accordance with the Cx Plan and the above requirements of this specification section. In general, the season functional performance testing will require reconvening the Cx Team (Construction, CxA and Owner) to test system performance during the opposite season from the original functional performance testing (e.g. heating systems testing if systems originally tested during summer).
   1. The Contractor shall anticipate a total of 2 optimization efforts in addition to the initial functional performance testing and any re-testing for each central plant retrofit. The intent is to adjust setpoints, review operation and test system modification to achieve optimized performance. The Contractor shall provide skilled technicians or manufacturer’s personnel as needed to optimize the central plant operation.

B. The Contractor and CxA will review building operation approximately 8-10 months after the Date of Substantial Completion along with the Owner's operations and maintenance staff. The review will include reviewing any open items identified on the Cx Issues/Benefits Log, trend analysis results as completed by the CxA and any known or potential warranty items.

C. The Contractor and CxA will document a plan, if required, for resolution or correction of outstanding commissioning issues. The plan will identify each issue separately, with an agreed upon resolution; deadline for implementation of corrective measures; party or parties responsible for corrective measures and any criteria required for owner acceptance of the corrective measure.

END OF SECTION 019113

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flow Management Valve

B. Related Requirements:

1. Section 220500 "Common Work Results for Plumbing."
2. Section 221116 "Domestic Water Piping" for water meters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for installation location.

1.3 INFORMATIONAL SUBMITTALS

A. Test and inspection reports.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 FLOW MANAGEMENT VALVES

A. Flow Management Valves
   1. Standard: ANSI 372
   2. Body: Acetron GP
   3. Shaft, Spring: Stainless Steel

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Flow Management Valves: Install with inlet and outlet shutoff valves. Install pressure gauges on inlet and outlet.

C. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

D. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

E. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

F. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

G. Drainage-Type, Trap-Seal Primer Device: Install as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 IDENTIFICATION

A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Flow Management Valves
5. Balancing valves.
6. Temperature-actuated, water mixing valves.
7. Wall hydrants.
8. Trap-seal primer device.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

D. Adjust each valve in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Test each valve according to authorities having jurisdiction and the device's reference standard.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Prepare test and inspection reports.

END OF SECTION 221119

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports - metal.
2. Pipe hangers - metal, trapeze type.
3. Strut support systems - rooftop mounted.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Rooftop-mounted strut support systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated Design Submittals: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication/assembly and design calculations for trapeze hangers.
2. Detail fabrication/assembly and design calculations for each type of strut support system, by the manufacturer's technical representative.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment are to withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 PIPE HANGERS AND SUPPORTS - METAL

A. Pipe Hangers and Supports - Steel:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washers made of steel.

2.3 PIPE HANGERS - METAL, TRAPEZE TYPE

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100 psi (688 kPa minimum compressive strength and vapor barrier.

B. For Trapeze or Clamped Systems: Insert and shield are to cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield are to cover bottom 180 degrees of pipe.

D. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Fastener System - Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities required for supported loads and building materials where used.

B. Fastener System - Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities required for supported loads and building materials where used.
   1. Indoor Applications: Zinc-plated or stainless steel.
   2. Outdoor Applications: Stainless steel.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

F. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000 psi (34.5 MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static loads within specified loading limits. Minimum static design load used for strength determination is to include weight of supported components plus 200 lb.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

B. Install lateral bracing with pipe hangers and supports to prevent swaying.

C. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers. Coordinate location of concrete inserts before concrete is placed.

D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

F. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Thermal-hanger shield inserts may be used as an option. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields are to span an arc of 180 degrees.

    a. Thermal-hanger shield inserts may be used as an option. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.

e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

G. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

H. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate in accordance with ASTM A36/A36M, carbon-steel shapes selected for loads being supported. Weld steel in accordance with AWS D1.1/D1.1M.

I. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

J. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick after concrete is placed and cured. Use installers that are licensed by powder-actuated tool manufacturer.
2. Install mechanical-expansion anchors after concrete is placed and completely cured.
3. Install fasteners in accordance with manufacturer's written instructions.

K. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

L. Equipment Support Installation:

1. Fabricate from welded-structural-steel shapes.
2. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
3. Grouting: Place grout under supports for floor-mounted equipment, and make bearing surface smooth.
4. Provide lateral bracing, to prevent swaying.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless steel pipe hangers and stainless steel or corrosion-resistant attachments for corrosive environment applications.

G. Use copper-plated pipe hangers and copper or stainless steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).

b. Medium (MSS Type 32): 1500 lb (680 kg).
c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Joining materials.
4. Manual gas shutoff valves.
5. Motorized gas valves.
6. Earthquake valves.
7. Pressure regulators.
8. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Piping specialties.
2. Corrugated, stainless steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot (1:50).
2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:

B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide purging and startup of natural-gas supply in accordance with requirements indicated:

1. Notify Building Manager no fewer than seven days in advance of proposed interruption of natural-gas service.

1.6 COORDINATION

A. Coordinate requirements for access panels and doors for valves installed and concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

B. Coordinate requirements for piping identification for natural-gas piping. Comply with requirements in Section 220553 "Identification of Plumbing Piping and Equipment."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 54.

B. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 5 psig (34.5 kPa).

C. Natural-Gas System Pressure within Buildings:

1. Single Pressure: More than 2 psig (13.8 kPa), but not more than 5 psig (34.5 kPa).

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Seismic Performance: Natural-gas piping system is to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. The term "withstand" means "the piping system will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the piping system will be fully operational after the seismic event."

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A234/A234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Corrugated, Stainless Steel Tubing: Comply with ANSI/IAS LC 1/CSA 6.26.

1. Tubing: ASTM A240/A240M, corrugated, Series 300 stainless steel.
2. Coating: PE with flame retardant.

a. Surface-Burning Characteristics: As determined by testing identical products in accordance with ASTM E84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1) Flame-Spread Index: 25 or less.
2) Smoke-Developed Index: 50 or less.

3. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
4. Striker Plates: Steel, designed to protect tubing from penetrations.
5. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections are to comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
6. Operating-Pressure Rating: 5 psig (34.5 kPa).

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated, stainless steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm).

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Seals: Nitrile.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Weatherproof Vent Cap:

1. Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.5 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig (862 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves NPS 1-1/4 to NPS 2 (DN 32 to DN 50) having initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig (862 kPa).
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
4. Service Mark: Initials "WOG" permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated brass.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Separate packnut with adjustable-stem packing threaded ends.
6. Ends: Threaded, flared, or socket as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
7. CWP Rating: 600 psig (4140 kPa).
8. Listing: Valves NPS 1 (DN 25) and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
7. CWP Rating: 600 psig (4140 kPa).
8. Listing: Valves NPS 1 (DN 25) and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
7. CWP Rating: 600 psig (4140 kPa).
8. Listing: Valves NPS 1 (DN 25) and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B584.
2. Plug: Bronze.
3. Ends: Threaded, socket, or flanged as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig (862 kPa).
6. Listing: Valves NPS 1 (DN 25) and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.6 EARTHQUAKE VALVES

A. Earthquake Valves, Maximum Operating Pressure of 5 psig (34.5 kPa): Comply with ASCE/SEI 25.

1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
2. Maximum Operating Pressure: 5 psig (34.5 kPa).
3. Cast-aluminum body with nickel-plated chrome steel internal parts.
4. NBR valve washer.
5. Sight windows for visual indication of valve position.
6. Threaded end connections complying with ASME B1.20.1.
7. Wall-mounting bracket with bubble level indicator.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description and rated pressure of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

B. Label and identify gas piping and pressure outside a multitenant building by tenant.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping in accordance with NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for preventing accidental ignition.

3.2 INSTALLATION OF OUTDOOR PIPING

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

C. Install fittings for changes in direction and branch connections.

D. Install pressure gauge upstream and/or downstream from each service regulator. Pressure gauges are specified in Section 230500 "Common Work Results for HVAC."

3.3 INSTALLATION OF INDOOR PIPING

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Do not install piping in concealed locations unless sleeved with the sleeve open at both ends.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Where installing piping above accessible ceilings, allow sufficient space for ceiling panel removal.

G. Locate valves for easy access. Do not locate valves within return air plenums.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install pressure gauge upstream and/or downstream from each line regulator. Pressure gauges are specified in Section 230500 "Common Work Results for HVAC."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

3.4 INSTALLATION OF VALVES

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

F. Do not install valves in return-air plenums.

3.5 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints in accordance with AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, and then use wrench. Do not overtighten.

G. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join in accordance with ASTM D2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

B. Install hangers with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for corrugated stainless steel tubing, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches (300 mm) of each fitting.

E. Support vertical runs to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of corrugated stainless steel tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 PIPING CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas-appliance equipment grounding conductor of the circuit powering the appliance in accordance with NFPA 70.

C. Where installing piping adjacent to appliances, allow space for service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

3.8 LABELING AND IDENTIFICATION

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Test, inspect, and purge natural gas in accordance with NFPA 54 and authorities having jurisdiction.
2. Natural-gas piping will be considered defective if it does not pass tests and inspections.

B. Prepare test and inspection reports.

3.10 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG (3.45 kPa) AND LESS THAN OR EQUAL TO 2 PSIG (13.8 kPa)

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

A. Aboveground, branch piping [**NPS 1 (DN 25)**] <**Insert pipe size**> and smaller is to be[**one of**] the following:

Verify, with authorities having jurisdiction, acceptability of corrugated stainless steel tubing before retaining first subparagraph below.

1. Corrugated stainless steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Annealed-temper copper tube with wrought-copper fittings and [**brazed**] [**flared**] joints.
3. Aluminum tube with flared fittings and joints.
4. Steel pipe with malleable-iron fittings and threaded joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

B. Aboveground, distribution piping is to be[**one of**] the following:

Authorities having jurisdiction may require welded steel pipe at different sizes and pressures. Verify size break and insert sizes to suit Project.

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

Practical size limit for copper is NPS 4 (DN 100) because joints are difficult to heat evenly for brazing. Type G copper tube is permitted in CSA B149.1.

3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

Retain "one of" option in paragraph below to allow Contractor to select piping materials from those retained.

C. Underground, below building, piping is to be[**one of**] the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

Retain both subparagraphs below for piping below building.

Indicate extent of containment conduit on Drawings. Containment conduit is required for piping under buildings.

3. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
4. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground portion of vent pipe and fittings with protective coating for steel piping.

3.11 ABOVEGROUND, MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter are to be one of the following:

1. One-piece bronze ball valve with bronze trim.
2. Two-piece bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller are to be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, bronze ball valves with bronze trim.
3. Bronze plug valve.

C. Valves in branch piping for single appliance are to be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. END OF SECTION 231123

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Plastic pipe and fittings.
4. Piping joining materials.
5. Transition fittings.
6. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product data.

B. Delegated Design Submittals:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors, alignment guides, and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, or BIM model, drawn to scale, indicating the items described in this Section, and coordinated with all building trades.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation are to be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig (689 kPa) at 180 deg F (82 deg C).
2. Chilled-Water Piping: 150 psig (1034 kPa) at 73 deg F (22 deg C.
3. Condenser-Water Piping: 150 psig (1034 kPa) at 73 deg F (66 deg C).

4. Makeup-Water Piping: 80 psig (552 kPa) 150 psig (1034 kPa) at 73 deg F (22 deg C) >.
5. Condensate-Drain Piping: 150 deg F (66 deg C.
6. Air-Vent Piping: 180 deg F (82 deg C.
7. Pressure-Relief-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: STM B88, Type K (ASTM B88M, Type A and ASTM B88, Type L (ASTM B88M, Type B).

B. Annealed-Temper Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) and ASTM B88, Type L (ASTM B88M, Type B).

C. DWV Copper Tube: ASTM B306, Type DWV.

D. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4 (DN 100).

E. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4 (DN 100).

F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Do not use solder joints on pipe sizes greater than NPS 4 (DN 100).

G. Cast-Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than NPS 4 (DN 100).

H. Wrought-Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4 (DN 100).

I. Grooved, Mechanical-Joint, Copper Tube Appurtenances:

1. Grooved-End Copper Fittings: ASTM B75 (ASTM B75M) copper tube or ASTM B584 bronze castings.
2. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting EPDM gasket rated for minimum 230 deg F (110 deg C) for use with ferrous housing, and steel bolts and nuts; 300 psig (2060 kPa) minimum CWP pressure rating.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A53/A53M black steel with plain ends; welded and seamless, Grade B, and schedule number as indicated in Part 3,"Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3, "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3, "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3, "Piping Applications" Article.

E. Grooved Mechanical-Joint Fittings and Couplings:

1. Joint Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47/A47M, Grade 32510 malleable iron; ASTM A53/A53M, Type F, E, or S, Grade B fabricated steel; or ASTM A106/A106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
2. Couplings: Ductile- or malleable-iron housing and gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

F. Steel Pipe Nipples: ASTM A733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F441/F441M, with wall thickness as indicated in "Piping Applications" Article.

1. CPVC Socket Fittings: ASTM F438 for Schedule 40 and ASTM F439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F437, Schedule 80.
3. CPVC Piping System: ASTM D2846/D2846M, SDR, pipe and socket fittings.
4. CPVC Tubing System: ASTM D2846/D2846M, SDR, tube and socket fittings.

B. PVC Plastic Pipe: ASTM D1785, with wall thickness as indicated in "Piping Applications" Article.

1. PVC Socket Fittings: ASTM D2466 for Schedule 40 and ASTM D2467 for Schedule 80.
2. PVC Schedule 80 Threaded Fittings: ASTM D2464.

2.5 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B32, lead-free alloys.

B. Flux: ASTM B813, water flushable.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

D. Solvent Cements for CPVC Piping: ASTM F493.

E. Solvent Cements for PVC Piping: ASTM D2564. Include primer in accordance with ASTM F656.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."

Q. Install air vents and pressure-relief valves in accordance with Section 232116 "Hydronic Piping Specialties."

R. Install unions in piping adjacent to valves, at final connections of equipment, and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Comply with requirements in Section 230500 "Common Work Results for HVAC" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join in accordance with ASTM D2846/D2846M Appendix.
3. PVC Pressure Piping: Join ASTM D1785 schedule number, PVC pipe, and PVC socket fittings in accordance with ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings in accordance with ASTM D2855.
4. PVC Nonpressure Piping: Join in accordance with ASTM D2855.

G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

H. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install hangers for with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.

F. Support vertical runs to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G. Support vertical runs to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

H. Support vertical runs of fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.4 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections are to be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230500 "Common Work Results for HVAC."

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.6 SYSTEM STARTUP

A. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping in accordance with ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure is to be capable of sealing against test pressure without damage to valve.
5. Install pressure-relief valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient-temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure is not to exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9.
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

END OF SECTION 232113

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydronic specialty valves.
2. Air vents.
3. Expansion tanks and fittings.
4. Air/dirt separators and purgers.
5. Strainers.
6. Flexible connectors.

1.2 ACTION SUBMITTALS

A. Product Data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data manuals.

1.4 QUALITY ASSURANCE

A. Pressure-relief and safety-relief valves and pressure vessels bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME BPVC, Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

1. Body: Bronze, ball or plug type with calibrated orifice or venturi.
2. Ball: Brass or stainless steel.
3. Plug: Resin.
4. Seat: PTFE.
5. End Connections: Threaded or socket.
6. Pressure Gauge Connections: Integral seals for portable differential pressure meter.
7. Handle Style: Lever, with memory stop to retain set position.
8. CWP Rating: Minimum 125 psig (860 kPa).
9. Maximum Operating Temperature: 250 deg F (121 deg C).

B. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

1. Body: Bronze or brass.
2. Stem Seals: EPDM O-rings.
3. Diaphragm: EPDM.
4. Low inlet-pressure check valve.
5. Valve Seat and Stem: Noncorrosive.
6. Valve Size and Capacity: As indicated on Drawings.
7. Operating Pressure: Factory set and field adjustable.

C. Diaphragm-Operated Pressure-Relief Valves: ASME labeled.

1. Body: Bronze or brass.
2. Stem Seals: EPDM O-rings.
3. Diaphragm: EPDM.
4. Valve Seat and Stem: Noncorrosive.
5. Valve Size, Capacity, and Operating Pressure: Comply with ASME BPVC, Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

D. Automatic Flow-Control Valves:

1. Body: Brass or ferrous metal.
2. Combination Assemblies: Include bronze or brass-alloy ball valve.
3. Identification Tag: Marked with zone identification, valve number, and flow rate.
4. Size and Capacity: For each application, provide a valve with rated capacity equal to or greater than capacity of device being served.
5. Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.

2.2 AIR VENTS

A. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

2.3 EXPANSION TANKS AND FITTINGS

A. Expansion Tanks with Direct Air/Water Interface:

1. Tank: Welded steel, rated for 125 psig (860 kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gauge glass. Tanks are factory tested after taps are fabricated and labeled in accordance with ASME BPVC, Section VIII, Division 1.

2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless steel ball check, 100 gal. (379 L) unit only; sized for expansion tank diameter. Provide tank fittings for 125 psig (860 kPa) working pressure and 250 deg F (121 deg C) maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125 psig (860 kPa) working pressure and 240 deg F (116 deg C) maximum operating temperature; constructed to admit air to expansion tank, drain water, and close off system.
4. Gauge Glass: Full height with dual manual shutoff valves, [**3/4-inch- (20-mm-)**] <**Insert dimension**> diameter gauge glass, and slotted-metal glass guard.

B. Diaphragm-Type ASME Expansion Tanks:

1. Tank: Welded steel, rated for 125 psig (860 kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled in accordance with ASME BPVC, Section VIII, Division 1.
2. Diaphragm: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

C. Bladder-Type ASME Expansion Tanks:

1. Tank: Welded steel, rated for 125 psig (860 kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled in accordance with ASME BPVC, Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

2.4 AIR/DIRT SEPARATORS AND PURGERS

A. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125 psig (860 kPa) minimum working pressure and 375 deg F (191 deg C) maximum operating temperature.
2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; flanged connections for NPS 2-1/2 (DN 65) and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

B. Air Purgers:

1. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
2. Maximum Working Pressure: 150 psig (1035 kPa).
3. Maximum Operating Temperature: 250 deg F (121 deg C).

2.5 STRAINERS

A. Y-Pattern Strainers:

1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless steel, or perforated stainless steel basket.
4. CWP Rating: 125 psig (860 kPa).

2.6 FLEXIBLE CONNECTORS

A. Stainless Steel Bellows, Flexible Connectors:

1. Body: Stainless steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

PART 3 - EXECUTION

3.1 INSTALLATION OF VALVES

A. Install calibrated-orifice balancing valve at each branch connection to return main.

B. Install calibrated-orifice, balancing valve in the return pipe of each heating or cooling terminal.

C. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

D. Install pressure-relief and safety-relief valves at hot-water generators and elsewhere as required by ASME BPVC. Pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME BPVC, Section VIII, Division 1, for installation requirements.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

1. Provide air outlet drain line full size of air outlet to floor drain or to other point indicated on Drawings.

B. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve full size of separator outlet; extend full size to nearest floor drain.

D. Install diaphragm- or bladder-type expansion tanks on the floor.

E. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION 232116

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Separately coupled, horizontally mounted, in-line centrifugal pumps.
2. Separately coupled, vertically mounted, in-line centrifugal pumps.
3. Separately coupled, base-mounted, end-suction centrifugal pumps.
4. Variable speed wet rotor pumps

B. Basis-of-design: Grundfos Magna 3

1.2 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 Separately Coupled, Horizontally Mounted, In-Line Centrifugal Pumps

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Flowserve Corporation.
4. Grundfos Pumps Corporation.
5. ITT Corporation; Bell & Gossett.
6. Mepco, LLC.
7. PACO Pumps.
8. Scot Pump; Div. of Ardox Corp.
9. TACO Incorporated.
10. Thrush Company Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, and threaded companion-flange or union-end connections.

2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, and keyed to shaft. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.

D. Motor: Single speed and resiliently mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   a. Efficiency: Premium efficient.

2.2 Separately Coupled, Vertically Mounted, In-Line Centrifugal Pumps

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Crane Pumps & Systems.
4. Flowserve Corporation.
5. ITT Corporation; Bell & Gossett.
6. Mepco, LLC.
7. PACO Pumps.
8. Peerless Pump Company.
9. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
10. TACO Incorporated.
11. Thrush Company Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted vertically.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange or union-end connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.

D. Shaft Coupling: Axially split spacer coupling.

E. Motor: Single speed and rigidly mounted to pump casing with lifting eyebolt and supporting lugs in motor enclosure.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   a. Efficiency: Premium efficient.

2.3 Separately Coupled, Base-Mounted, End-Suction Centrifugal Pumps

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American-Marsh Pumps.
2. Armstrong Pumps Inc.
3. Aurora Pump; Division of Pentair Pump Group.
4. Buffalo Pumps, Inc.
5. Crane Pumps & Systems.
6. Flowserve Corporation.
7. ITT Corporation; Bell & Gossett.
8. Mepco, LLC.
9. PACO Pumps.
10. Peerless Pump Company.
11. Scot Pump; Div. of Ardox Corp.
12. TACO Incorporated.
13. Thrush Company Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket.

5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

2.4 Variable Speed Wet Rotor Pumps

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Flowserve Corporation.
4. Grundfos Pumps Corporation.
5. ITT Corporation; Bell & Gossett.
6. Mepco, LLC.
7. PACO Pumps.
8. Scot Pump; Div. of Ardox Corp.
9. TACO Incorporated.
10. Thrush Company Inc.

B. Description: Factory-assembled and -tested, centrifugal, in-line wet rotor pump, with variable speed drive an integral product designed and built by the same manufacturer. The pump shall be labeled on the nameplate as having an Energy Efficiency Index (EEI) of no greater than 0.20.

C. Pump Construction:

1. Casing: Circulating pumps shall be constructed with either cast iron or stainless steel housings.
2. Impeller: Impellers will be constructed of a 30% glass-filled PES composite.
3. Pump Shaft: Stainless steel.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket.
5. Pump Bearings: Carbon graphite or Alumina ceramic.

D. Motor: Variable speed motor, cooled by pumped fluid, with Variable Frequency Drive (VFD).

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. Efficiency: Premium efficient.
4. The integrated VFD control shall utilize an energy optimization algorithm to minimize energy consumption by reducing the factory-set setpoint and adjust to system characteristics. This shall be accomplished without the need of any external sensors or input.

E. Control and Operation

The pump shall have the following control modes and operating modes:

1. During operation, the pump automatically reduces the factory-set setpoint and adjusts it to the actual system characteristic. Manual setting of the setpoint is not possible.
2. It shall be possible for the user to select a maximum flow that the pump shall not exceed in order to eliminate the need for additional throttling valves. The pump shall operate per selected control mode but will limit speed to not exceed the user specified flow limit.
3. The pump shall operate in the automatically adapting setpoint control mode with flow limit enabled.
4. Proportional Pressure – The head delivered shall be reduced from a manual setpoint linearly in accordance with decrease in flow demand in the system.
5. Constant Pressure – A manual set, constant head is maintained, irrespective of flow up to the maximum speed of the pump.

2.5 Pump Specialty Fittings

A. Suction Diffuser:

1. Angle pattern.
2. 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Triple-Duty Valve:

1. Not Allowed.

PART 3 - EXECUTION

3.1 Pump Installation

A. Comply with HI 1.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Equipment Mounting:

1. Install base-mounted pumps on cast-in-place concrete equipment base(s).

E. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and elastomeric hangers of size required to support weight of in-line pumps.

3.2 ALIGNMENT

A. Perform alignment service.

B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturers' written instructions.

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to pump, allow space for service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check valve and throttling valve with memory stop or triple-duty valve with memory stop on discharge side of pumps.

F. Install Y-type strainer, suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

END OF SECTION 232123

SECTION 235216 - CONDENSING BOILERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes gas-fired, fire-tube, water-tube, water-jacketed condensing boilers, trim, and accessories for generating hot water.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, and mounting attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

B. Delegated-Design Submittal: For each boiler.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period. Where "prorated" is indicated, the boiler manufacturer will cover the indicated percentage of cost of replacement parts. With "prorated" type, covered cost decreases as age of equipment increases.

1. Warranty Period for Fire-Tube Condensing Boilers:

a. Leakage and Materials: 10 years from date of Substantial Completion.
b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Prorated for five years from date of Substantial Completion.

2. Warranty Period for Water-Tube Condensing Boilers: 20 years from date of Substantial Completion.
3. Warranty Period for Water-Jacketed Condensing Boilers:

a. Leakage and Materials: Eight years from date of Substantial Completion.
b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Prorated for five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. Boilers shall have a minimum efficiency performance of 94% AFUE.

D. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N.

E. UL Compliance: Test boilers for compliance with UL 795. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

F. Mounting Base: For securing boiler to concrete base.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler pressure vessel, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when mounting base is anchored to building structure.

2.2 FORCED-DRAFT, FIRE-TUBE CONDENSING BOILERS

A. Description: Factory-fabricated, -assembled, and -tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water-heating service only.

B. Heat Exchanger: Nonferrous, corrosion-resistant combustion chamber.

C. Pressure Vessel: Carbon steel with welded heads and tube connections.

D. Burner: Natural gas, forced draft.

E. Blower: Centrifugal fan to operate during each burner firing sequence and to prepurge and postpurge the combustion chamber.

1. Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Motor Requirements for HVAC Equipment."

a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Gas Train: Combination gas valve with manual shutoff and pressure regulator.

G. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

2.3 WATER-TUBE CONDENSING BOILERS

A. Description: Factory-fabricated, -assembled, and -tested, copper-finned, water-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water-heating service only.

B. Heat Exchanger: Finned-copper primary and stainless-steel secondary heat exchangers.

C. Combustion Chamber: Stainless steel, sealed.

D. Burner: Natural gas, forced draft drawing from gas premixing valve.

E. Blower: Centrifugal fan to operate during each burner firing sequence and to prepurge and postpurge the combustion chamber.

1. Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Motor Requirements for HVAC Equipment."

a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Gas Train: Combination gas valve with manual shutoff and pressure regulator.

G. Ignition: Silicone carbide hot-surface ignition that includes flame safety supervision and 100 percent main-valve shutoff.

H. Integral Circulator: Cast-iron body and stainless-steel impeller sized for minimum flow required in heat exchanger.

2.4 WATER-JACKETED CONDENSING BOILERS

A. Description: Factory-fabricated, -assembled, and -tested, water-jacketed condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; water supply, return, and condensate drain connections; and controls. Water-heating service only.

B. Heat Exchanger: Stainless-steel primary and secondary combustion chamber.

C. Pressure Vessel: Carbon steel with welded heads and tube connections where not in contact with combustion or flue gases.

D. Burner: Natural gas, forced draft; swing-open front and burner observation port.

E. Blower: Centrifugal fan, forced draft. Include prepurge and postpurge of the combustion chamber.

1. Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Motor Requirements for HVAC Equipment."

a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Gas Train: Combination gas valve with manual shutoff and pressure regulator. Include 100 percent safety shutoff with electronic flame supervision.

G. Ignition: Electric-spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

2.5 TRIM

A. Aquastat Controllers: Operating, firing rate, and high limit.

B. Safety Relief Valve: ASME rated.

C. Pressure and Temperature Gage: Minimum 3-1/2-inch diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.

D. Boiler Air Vent: Automatic.

E. Drain Valve: Minimum NPS ¾ hose-end gate valve.

F. Circulation Pump: Non-overloading, in-line pump with split-capacitor motor having thermal-overload protection and lubricated bearings; designed to operate at specified boiler pressures and temperatures.

2.6 CONTROLS

A. New boiler plant controls shall be installed capable of the following suggested sequence of operation. Final programming, operation, and optimization are the responsibility of the installing contractor.

1. Boiler Plant Enable: The boiler plant shall be disabled when the Outside Air Temperature (OAT) is greater than 65F (Adj.).
2. Boiler Cascade Control:
    a. Single Boiler Operation: The boiler plant controller shall modulate the firing rate of the lead boiler to achieve the Heating Water Supply Temperature (HWS) Setpoint. The boiler plant controller shall have a short cycle prevention sequences and it shall be enabled (approaches vary by manufacturer) to ensure a minimum burn time of 20 minutes (Adj.) with one boiler firing at minimum fire. The controller shall have
3. Heating Water Supply Temperature Setpoint Control: The HWS Setpoint shall be reset according to a linear outdoor air reset schedule in which the design hot water temperature, 180F (Adj.), is delivered at the design outdoor air condition, 0F (Adj.), and a lower, 160F (Adj.) HWS is delivered at the high outdoor air temperature, 60F (Adj.) The contractor shall be responsible for tuning these setpoints to provide the minimum HWS while still meeting the loads.
4. The boiler plant controller shall be equipped with an outdoor air temperature sensor located in an appropriate shaded located on the North Side of the building that ensures accurate outdoor air temperature measurement.

B. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

1. High Cutoff: Manual reset stops burner if operating conditions rise above maximum boiler design temperature.
2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
3. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
4. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

2.7 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

1. House in NEMA 250, Type 1 enclosure.
2. Wiring shall be numbered and color coded to match wiring diagram.
3. Install factory wiring outside of an enclosure in a metal raceway.
4. Provide each motor with overcurrent protection.

2.8 VENTING KITS

A. Kit: As specified by manufacturer.

B. Combustion-Air Intake: As specified by manufacturer.

2.9 CONDENSATE-NEUTRALIZATION UNITS

A. Description: Factory-fabricated and -assembled condensate-neutralizing capsule assembly of corrosion-resistant plastic material with threaded or flanged inlet and outlet pipe connections. Device functions to prevent acidic condensate from damaging grain system. It is to be piped to receive acidic condensate discharged from condensing boiler and neutralize it by chemical reaction with replaceable neutralizing agent. Neutralized condensate is then piped to suitable drain.

B. Capsule features:

1. All corrosion-resistant material.
2. Suitable for use on all natural gas and propane boilers.
3. Includes initial charge of neutralizing agent.
4. Neutralizing agent to be easily replaceable when exhausted.
5. Inlet and outlet pipe connections.

C. Capsule Configuration:

1. Low-profile design for applications where boiler condensate drain is close to the floor.
2. Easily removed and opened for neutralizing agent replacement.
3. Multiple units may be used for larger capacity.

2.10 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

B. Test and inspect factory-assembled boilers, before shipping, according to 2010 ASME Boiler and Pressure Vessel Code.

2.11 PIPE INSULATION

A. All HVAC and DHW piping shall be insulated per the requirements of all applicable codes. In particular, all heating water piping in the boiler room shall be insulated with a preformed fiber

glass pipe insulation, complying with ASTM C 547, Class 3 (to 850°F), rigid, molded pipe insulation, noncombustible.

1. Thermal Conductivity ("k"): 0.23 Btu•in/(hr•ft2•°F) at 75°F mean temperature (0.033 W/m•°C at 24°C) per ASTM C 518.
2. Maximum Service Temperature: 850°F.
3. Rated 25/50 per ASTM E 84, UL 723 and NFPA 255.

B. Pipes shall be spaced to allow for full insulation and to permit access for operation and servicing of valves and equipment.

C. Minimum Heating Water Pipe Insulation Schedule:

Fluid Design Operating Temperature Range °F	Mean Rating Temperature	Nominal Pipe Diameter (in.)				
		1" and Less	1-1/2" - 2"	2-1/2" - 3"	4" - 8"	8" and Larger
141-200°F	125	1.5	1.5	2.0	2.0	2.0
105-140°F	100	1.0	1.0	1.5	1.5	1.0

2.12 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

E. Locate pipe labels in mechanical rooms:

1. Near each valve and control device.
2. Near each branch connection. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of 15 feet along each run in mechanical rooms.

PART 3 - EXECUTION

3.1 BOILER INSTALLATION

A. Equipment Mounting:
   1. Comply with requirements for vibration isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
   2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232113 "Hydronic Piping Specialties."

E. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.

F. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

G. Install piping from safety relief valves to nearest floor drain.

H. Boiler Venting:

   1. Install flue venting kit and combustion-air intake.
   2. Utilize vent and intake duct material, size, and configuration as indicated in boiler manufacturer's instructions and to comply with UL 1738.
   3. Connect boiler vent full size to boiler connections.
   4. Comply with requirements in Section 235123 "Gas Vents."
   5. Comply with all boiler manufacturer's installation instructions.

I. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

    a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
    b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Boiler will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 235216