



**Bid 622**  
**Rancho Campana High School HVAC Modernization Project for Oxnard  
Union High School District**

**ADDENDUM #3**

Dated: June 12<sup>th</sup>, 2020

*All interested parties seeking to submit responses to the Oxnard Union High School District's Bid #622 shall execute the certification at the end of this addendum and shall attach the addendum to the documents submitted to the District.*

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The Oxnard Union High School District hereby amends Bid622 Rancho Campana High School HVAC Modernization Project as follows:

- 1) **Question: Pages 23 20 16-4 and 23 20 16-5 of the attached spec section 23 20 16 (Attachment A) indicates metal underground piping, but the HVAC drawings indicate the Niron polypro piping. Please clarify.**

**Answer:** All of the underground 4-pipe system is supposed to be the Niron Polypro piping per the drawings. Kindly ignore the attachment K in Bid Addendum #2.

**BIDDER'S CERTIFICATION**

I acknowledge receipt of the foregoing Addendum #3 and accept all conditions contained herein.

**Dated:** \_\_\_\_\_ **BIDDER:** \_\_\_\_\_  
(Company/Entity)

**By:** \_\_\_\_\_ **Printed Name:** \_\_\_\_\_  
(Authorized representative signature)

**Title:** \_\_\_\_\_

# Attachment A

**SECTION 23 20 16**  
**UNDERGROUND HVAC PIPING**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. Section Includes: Underground piping systems for heating, ventilating and air conditioning systems. Systems include, but are not limited to, the following:
1. Chilled Water Piping System.
  2. Hot Water Heating Piping System.
  3. Condenser Water Piping.
- B. Related Requirements:
1. Division 01: General Requirements.
  2. Section 23 05 00: Common Work Results for HVAC.
  3. Section 23 05 13: Basic HVAC Materials and Methods.
  4. Section 23 05 53: HVAC Identification.
  5. Section 23 20 13: HVAC Piping.
  6. Section 31 23 23: Excavation and Fill for Utilities.

1.2 REFERENCES

- A. ASTM International:
1. ASTM A47 – Standard Specification for Ferritic Malleable Iron Castings.
  2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  3. ASTM A105 - Standard Specification for Carbon Steel Forgings for Piping Applications.
  4. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  5. ASTM A181 - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
  6. ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

7. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
  8. ASTM B32 - Standard Specification for Solder Metal.
  9. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
  10. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  11. ASTM F2389-17A: Pressure-Rated Polypropylene (PP) Piping Systems
  12. ASTM D2657-07: Heat Fusion for Polypropylene Pipe & Fittings
  13. ASTM D2774-12: Underground Installation of thermoplastic Pressure Piping
  14. ASTM F1668-16: Construction Procedures for Buried Plastic Pipe
- B. American National Standard Institute (ANSI) and The American Society for Mechanical Engineers (ASME):
1. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose, Inch.
  2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
  3. ANSI/ASME B16.9 - Factory Made Wrought Butt-welding Fittings.
  4. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

### 1.3 SUBMITTALS

- A. Provide submittals in accordance with Division 01, Sections 23 05 00, and 23 05 13.
- B. Provide Shop Drawings with dimensioned piping layout and details of expansion loops, elbows, anchor points, building or manhole entry points and other pertinent information required to verify layout, intent and type of materials are in accordance with this Section. Prefabricated pipe units shall be dimensioned and numbered to fit actual Work with field verified conditions prior to start of factory fabrication.
- C. The CONTRACTOR shall indicate location and depth of all installed fittings, in addition to the as-built drawing content required in accordance with Section 01 77 00.

### 1.4 QUALITY ASSURANCE

- A. Refer to Sections 23 05 00 and 23 05 13.
- B. The Contractor shall be present to inspect delivered pipe and fittings, shall ensure that piping and associated jacketing is not damaged and shall verify that pipe and fittings are properly stored. The CONTRACTOR shall repair and/or replace damaged materials.
- C. The Pipe and fittings manufacturer's representative shall provide the installing Contractor with on-site training and installer certification in the fusion welding methods, and the

operation of fusion machines, as well as the proper handling of pipe and fittings on site for quality control.

- D. The Contractor shall routinely monitor that welding and installation practices are being performed in accordance with manufacturer's installation instructions and recommendations.
- E. Welding of Pipe and Qualifications of Welder shall be in accordance with Section 23 05 13: Basic HVAC Materials and Methods.
- F. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 23 05 13: Basic HVAC Materials and Methods.

## 1.5 PRODUCT HANDLING

- A. Comply with the requirements of Section 23 05 13.
- B. Verify that materials delivered to the site are undamaged.

Deliver piping with factory applied packaging or end caps. Packaging or end caps shall remain in place until piping is installed to prevent entrance of dirt, debris and moisture.

- C. Handle and store materials on site in accordance to manufacturer recommendations.
- D. Protect stored piping from moisture and dirt by elevating above grade.

## 1.6 COORDINATION

- A. Coordinate installation and related procedures with provisions of Section 23 05 00.

## 1.7 WARRANTY

- A. Manufacturer shall warrant materials for a period of five years starting at Substantial Completion.
- B. Polypropylene PP-RCT piping and preinsulated PP-RCT piping shall be warranted by the manufacturer for minimum of 30 years.
- C. CONTRACTOR shall remedy defects due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of three years from Substantial Completion.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Chilled Water, Condenser Water and Heating Hot Water, 1-1/4" inch and Larger Pipe and Fittings: Underground chilled water, condenser water and hot water supply and return piping that are pre-insulated, pre-fabricated type, composed of integral sealed units of outer jacket, polyurethane foam insulation, and fiberglass reinforced PP-RCT polypropylene carrier pipe.
  - 1. Carrier Pipe and Fittings: Seamless fiberglass reinforced Polypropylene PP-RCT pipe and fittings. ANSI/NSF 14, ANSI/NSF 61, ASTM F2389, ASTM F2023, CSA

B137.11, in SDR (wall thickness) sizes SDR 7.3, SDR 11, or SDR17, selected to meet the service temperature and pressure for each application.

2. Outer Jacket: Seamless Polypropylene PP-R having a minimum wall thickness meeting schedule 40 pipe dimensions..
3. Insulation: CFC free, rigid closed cell Polyurethane foam completely filling annular space between carrier pipe and outer jacket, having a "K" factor of 0.14 BTU/ (hour) (square foot) (degrees F/in) at 122 degrees F. Exposed insulation at unit ends shall be sealed with a factory-supplied fittings.
4. Fittings: Insulated fittings shall be factory preassembled or assembled from factory kits in the field, made up of PP-RCT fittings with PP-R polypropylene jacketing.
5. Field Joining Pipe and Fittings: Joining methods for preinsulated pipe and fittings may include butt-fusion, socket-fusion, and electrofusion methods in compliance with ASTM F1290-19 and ASTM D2657-07.
6. Preparation and installation of all field joints shall comply with the preinsulated piping manufacturer's approved installation instructions.
7. Thrust Blocks: Shall be sized and installed as recommended by the preinsulated pipe manufacturer.
8. Expansion Joints: Where indicated on Drawings, expansion joints and seismic connectors shall consist of annular corrugated [T316 stainless steel], or [Bronze] with a [T304 stainless steel], or [Bronze] braided cover, have a flanged connection to PP-RCT to the piping system.

B. Chilled Water, Condenser Water and Heating Hot Water, 2-inch and Smaller Pipe and Fittings: Underground chilled water, condenser water and hot water supply and return piping shall be pre-insulated, pre-fabricated type, composed of integral sealed units of HDPE (2" Size) and PVC (1-1/2" or smaller) outer jacket, polyurethane foam insulation, and seamless copper carrier pipe Type K manufactured by: Perma-Pipe Rovanco Copper Pipe System, Thermal Pipe Systems, Thermacore Copper-Therm, or equal.

9. Carrier Pipe: ASTM B88, Type "K" seamless Copper tubing.
10. Outer Jacket (1-1/2" and Smaller Pipe): Seamless PVC plastic outer jacket extruded from Type I, Grade I, polyvinyl chloride, per ASTM D1784. See Table 1 for minimum wall thickness.
11. Outer Jacket (2" Pipe): Seamless High Density Polyethylene (HDPE) per ASTM D1248 and D3350. Type III, Category 5, Class C. No overwrap or sprayed jacketing will be allowed. See Table 1 for minimum jacket thickness.
12. Insulation: Polyurethane foam completely filling annular space between carrier pipe and outer jacket. In-place density shall be 1.9 to 2.1 pcf, with a "K" factor of 0.1 BTU/ (hour) (square foot) (degrees F/in) at 73 degrees F, and a closed cell content of 90 percent. Exposed insulation at unit ends shall be sealed with a factory-applied end seal. Minimum 1-inch thick insulation (nominal).
13. End Seals: Factory installed water tight end seals by the fitting and pipe manufacturer. Suitable for service ad pressure of the system. Surfaces shall be smooth and free of voids. "Painted on" end seals are not allowed.

14. Fittings: ANSI B16.22 wrought copper fittings. Soldered joints shall be provided with silver solder or brazing alloys with melting points at or above 1,100 °F. Tin-lead solders, with melting points less than 1,100 °F, are not permitted.
15. Field Joints: Carrier pipe ends shall be brazed, and insulated with pre-fabricated rigid insulating half shells covered by insulating jacket or injected insulation after installation of jacket. O-Ring fittings are not allowed.
16. Preparation and installation of all field joints shall be observed and approved by pre-insulated pipe manufacturer's authorized representative and Project Inspector.
17. Thrust Blocks: Suitably sized concrete thrust blocks shall be installed at changes in direction, both vertical and horizontal, changes in pipe size, dead ends, and valves.
18. Anchors: Where indicated on Drawings, install anchor plates attached to the carrier pipe and sealed to pipe jacketing per pipe manufacturer's recommendations.

A. Chilled Water, Condenser Water and Hot Water, 2-½-inch and Larger Pipe and Fittings: Underground chilled water, condenser water and hot water supply and return piping that are pre-insulated, prefabricated-pipe type, composed of integral sealed units of HDPE outer jacket, polyurethane foam insulation and schedule 40 seamless black steel carrier pipe manufactured by: Perma Pipe, Rovanco, Thermal Pipe Systems "Heat-Tite", Thermacor "Ferro-Therm", or equal.

1. Carrier Pipe: ASTM A53, Grade B, Schedule 40, seamless black steel pipe.
2. Outer Jacket: Seamless High Density Polyethylene (HDPE) per ASTM D1248 and D3350. Type III, Category 5, Class C. No overwrap or sprayed jacketing will be allowed. Tape shall not be allowed to serve as a jacket. The HDPE jacket shall be pressure tested for watertight integrity. See Table 1 for minimum jacket thickness.
3. Insulation: Polyurethane foam completely filling annular space between carrier pipe and outer jacket to a minimum thickness of 1 inch. In-place density shall be 1.9 to 2.1 0.14 BTU/ (hour) (square foot) degrees F/in) at 73 degrees F, and a closed cell content of 90 to 95 percent. Exposed insulation at unit ends shall be sealed with factory-applied end seal.
4. End Seals: Furnish factory installed watertight end seals by the jacket and carrier pipe manufacturer suitable for services and pressure of the system. Surfaces shall be smooth and free of voids. "Painted on" end seals are not be allowed.
5. Fittings: Factory fabricated and pre-insulated with polyurethane foam insulation. Insulation shall be protected with a HDPE jacket of same thickness and quality as that of straight units of pre-insulated pipe. Mitters on HDPE jacket at fittings shall be as strong as pipe outer jacket.
6. Joints: Standard weight, seamless steel; welding fittings ASTM A234 and ANSI/ASME B16.9.
7. Expansion Elbows and Loops: Prefabricated elbows, expansion loops and tees shall be furnished where expansion compensation is indicated on the Drawings. Pre-insulated fittings that must provide compensation for pipe expansion or contraction shall be installed in a suitably sized jacket and insulated with flexible polyurethane foam insulation. Straight units adjoining expansion fittings shall also be insulated with flexible polyurethane foam insulation to compensate for lateral

pipe movement. Expansion loops and elbows shall be properly designed in accordance with stress limits indicated by ANSI B31.1 Code for Pressure Piping.

8. Thrust Blocks: Suitably sized concrete thrust blocks shall be installed, when indicated on Drawings.
  9. Anchors: Prefabricated plate anchors shall be furnished where indicated on Drawings and shall consist of a steel plate welded to carrier pipe and sealed to outer jacket.
  10. Field Joints: Field joints between prefabricated units shall be installed in the following manner:
    - a. Split or full round HDPE sleeve shall be slid over end of unit before connection of carrier pipe. Connect carrier pipe and hydrostatically test as specified.
    - b. Center HDPE sleeves over joint area and hold in position with fiberglass tape, mix polyurethane foam components and pour into cavity according to instructions provided by manufacturer.
    - c. Trim cured polyurethane foam flush with jacket sleeve. Center heat-actuated shrink blanket over jacket sleeve and jacket of adjoining units to provide double layer protection. Using a soft orange flame from a propane torch, work flame from center toward one end, moving rapidly back and forth and around shrink blanket. Air pockets shall be removed and worked out from under shrink blanket. At field joints with expansion provisions, wrap pipe with flexible polyurethane foam insulation and hold in place with tape and complete joint in same manner per prior instructions.
    - d. Preparation and installation of field joints shall be observed and approved by the pre-insulated pipe manufacturer's authorized representative and the Project Inspector.
  11. Valves: Refer to Section 23 05 13: Basic HVAC Materials and Methods. Provide valve stem extension and valve boxes.
- B. Condensate Pipe and Fittings: Underground condensate return piping shall be pre-insulated, pre-fabricated pipe composed of integral sealed units of steel outer jacket, cellular glass or mineral wool insulation, and schedule 40 seamless black steel carrier pipe with welded joints as specified: Perma-Pipe MULTI-THERM 500, Rovanco Rhinocoat High Temp Conduit, Thermacor DUO-THERM "505", or equal.1. Outer Conduit: Welded steel casing. See Table 2 for minimum required wall thickness.
1. Outer Conduit Protection / Insulation:
    - a. 20 Mil Fusion bonded epoxy per ASTM D1763.
    - b. Interior surface of the outer conduit shall be corrosion resistant. Epoxy coating or other similar coating shall be installed.
    - c. One-inch Polyurethane Foam Insulation with 20 mil Fiberglass (FRP) Filament wound directly onto the foam insulation. The urethane foam shall meet ASTM C591, K = 0.14, density of 2 PCF and closed cell content of 90 to 95 percent.

- d. Cellular glass, mineral wool, or calcium silicate banded on carrier pipe with stainless steel band, K factor = 0.31 at 200 degrees F. Exposed insulation at unit ends shall be sealed with a factory-applied vapor barrier. Minimum 1 inch thick insulation (nominal).
2. Carrier Pipe:
    - a. ASTM A53, Grade B, schedule 40, seamless black steel pipe with beveled ends for welding.
  3. End Seals: Shall consist of a steel bulkhead plated, welded to the outer jacket where there is no anchor within 5 feet of a thermal end, provide gland seals with packed stuffing box and gland follower mounted on a steel plate, welded to the end of the exposed jacket.
  4. Fittings: Shall be factory fabricated and pre-insulated. Insulation shall be protected with a jacket of same thickness and quality as that of straight units of pre-insulated pipe.
  5. Expansion Elbows and Loops: Prefabricated elbows, expansion loops and tees shall be furnished where expansion is required on the Drawings. Pre-insulated fittings that must provide compensation for pipe expansion or contraction shall be installed in a suitably sized jacket and insulated with flexible insulation to compensate for lateral pipe movement.
  6. Thrust Blocks: Expansion loops and elbows shall be properly designed in accordance with stress limits indicated by ANSI B31.1 Code for Pressure Piping.
  7. Anchors: Prefabricated plate anchors shall be furnished and shall consist of a steel plate welded to carrier pipe and to outer jacket.
  8. Field Joints: Field joints shall be furnished only at straight sections. Preparation and installation of field joints shall be observed and approved by the pre-insulated pipe manufacturer's authorized representative and the Project Inspector.
    - a. Weld carrier pipe and hydrostatically test as specified.
    - b. Weld in place the outer jacket closure sleeve. Install the outer jacket protection/insulation. Seal the entire joint with a heat shrinkable sleeve.
    - c. Trim insulation flush with jacket sleeve.

## 2.2 MINIMUM THICKNESS OF HDPE JACKETS

TABLE 1	
Pipe Size (Inches)	Jacket Thickness (Inches)
2	0.070
2-1/2	0.070
3	0.080

4	0.080
5	0.100
6	0.100
8	0.120
10	0.120
12	0.170
14	0.200

### 2.3 MINIMUM WALL THICKNESS OF STEEL OUTER JACKET

TABLE 2	
Jacket Size (Inches)	Jacket Thickness (Gage)
6-26	10
28-36	6
38-42	4

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Refer to Section 23 05 13: Basic HVAC Materials and Methods.
- B. Refer to Section 23 20 13: HVAC Piping.
- C. Installation shall be in accordance with manufacturer's instructions.
- D. Manufacturer's technical representative shall provide the installing Contractor with on-site training and installer certification in the fusion welding methods, and the operation of fusion machines, as well as the proper handling of pipe and fittings.
- E. Individuals installing and welding or fusing pipe and fittings shall have been trained by the manufacturer, and shall certification documentation of that training.
- F. Inspections and Tests:
  - 1. Welding Inspection: In accordance with Section 23 05 13.
  - 2. Pressure Testing: In accordance with Section 23 05 13 and following:
    - a. Test at 200 psi. Maintain test pressure for at least 4 hours, observed by the Project Inspector, to prove tightness without leaks.

- b. Testing of fiberglass reinforced Polypropylene PP-RCT piping systems shall in accordance with the manufacturer's instruction.
  - 3. Field Joint Inspection:
    - a. Verify installation of insulation at all field joints. Installation of field applied insulation and jackets shall be observed by the Project Inspector.
  - 4. Video Recording of Underground Installation:
    - a. Prior to backfill, the CONTRACTOR shall video record the entire extent of the underground piping installation. The video recording shall also note depths, and locations of fittings.
    - b. The video recording shall be developed on a 12 cm, DVD disk, or Flash Drive. Provide three copies of the recording to the Project Inspector for approval by the ARCHITECT, prior to backfill.
    - c. Provide one copy of the recording within the underground piping "as-built" drawing submittal package.
- G. Backfill: For excavation, fill, import and export of materials refer to Section 31 23 23, Excavation and Fill for Utilities.
  - 1. Immediately after piping is installed in trench, a partial backfill shall be provided in middle of each unit leaving joints exposed for inspection before hydrostatic tests. After all thrust blocks are installed, a hydrostatic test shall be performed.
  - 2. After hydrostatic testing, final backfill of selected earth shall be hand-packed and hand-tamped to 12-inch minimum over top of jacket. Remainder of backfill shall be free of large boulders, rocks over 6-inch in diameter, frozen earth, or foreign matter. Do not furnish wheeled or tracked vehicles for tamping of backfill.
- H. Detectable Warning Tape: Provide and install detectable marking tape along buried piping per Section 23 05 53, HVAC Identification.

### 3.2 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off of Project site.

### 3.3 PROTECTION

- A. Protect the Work of this Section until Substantial Completion.

### 3.4 DEMONSTRATION AND TRAINING

- A. The CONTRACTOR shall provide a minimum of two (2) hours of demonstration and training to District Maintenance and Operations Personnel covering the following items:
  - 1. Field joint preparation and installation.
  - 2. Installation of field applied insulation.

3. Installation and repair of Polypropylene PP-RCT pipe and fittings, and HDPE & PVC jackets.
4. Testing of installed field joints to ensure water tight installation.

**END OF SECTION 23 20 16**