J-U-B COMPANIES | THE LANGDON GROUP | GATEWAY MAPPING INC.

J·U·B ENGINEERS, INC.

ADDENDUM NO. 6

DATE: September 3, 2025
FROM: Matt Filla, PE, on behalf of the Town of Palisade
TO: All Bidders of Record
RE: Sewer Transfer Project

All Bidders of Record responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. Question: "Where specifically is dewatering water to be discharged when we cannot discharge into the canal?"

   Response: Dewatering discharge locations must be in accordance with COG080000 General Permit.

2. Question: "Where is the expected contractor staging area located?"

   Response: Sections of Riverbend Park may be used for limited staging at the Town's discretion. Additionally, the properties owned by Wilcox (3333 E 3/4 Rd) and Vanlandingham (641 35 1/2 Rd) have expressed openness to staging. This coordination shall be performed by the Contractor post-award.

3. Question: "What are the existing roadway pavement sections to be removed?"

   Response: Our quantity estimations assume 5" of asphalt and 9" of aggregate base course. However, existing sections shall be matched and the actual quantities installed shall be paid for.

4. Question: "How is work along the canal defined? Specifically, how is the setback requirement defined to stay clear of the yellow-billed cuckoo?"

   Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

5. Question: "Can pump station work occur between April 1st and July 15th?"

   Response: Yes. The April 1st to July 15th restriction applies to areas within 1/2 mile of yellow-billed cuckoo critical habitat which is located in Riverbend Park (work is restricted from STA 176+60 to 283+00).

6. Question: "Will environmental inspections connected to examining nesting sites be required? If so, who is to provide?"

Response: The Contractor will be required to provide a qualified biologist for such work. A "Wildlife Biologist" pay item has been added to the project.

7. Question: “Where specifically is concrete encasement of water mains required? How many should be included in pricing?”

   Response: Assume six locations for encasement according to Detail 2 Sheet C-506 (STA 117+62, STA 122+34, STA 198+54, STA 263+33, STA 268+59, STA 282+65).

8. Question: “Please provide clarity on how grape trellises are to be reestablished. Who is to reseed grapes? What is specifically required of the contractor to reestablish grape fields? Please provide specifications.”

   Response: At Parcel 294105100103, after removal of the necessary grape plants, the grape trellises shall be removed, salvaged, stockpiled, and replaced after construction in the vicinity (or replaced in-kind if unsalvagable). Reseeding of the grape plants is not the responsibility of the Contractor, as the grape bushes are identified as "to be removed by project" only, and not "replaced by project." For reference, a photo of a portion of the trellis is included below.

9. Question: “Please clarify work required to fill canal belly on C-218? Can the limits of the canal belly modification be shown? Can a detail be provided?”

   Response: Significant ponding during non-irrigation season occurs in this vicinity of the canal (see below winter aerial photograph) and this work seeks to decrease this ponding. Canal

inverts at Stations 193+00 and 200+00 shall be surveyed by Contractor, and the low points in the canal shall be filled so that there is a constant grade between these two Stations. Based on our preliminary assumptions, this work involves an estimated quantity of 1,226 CY of fill material based on an assumed area of 0.38 acres and an assumed average depth of fill of 2', but the actual work performed shall be paid for based on unit price per CY.

10. Question: “What is the flow and flow direction of existing sanitary sewer shown on sheets C-225 and C-226?”

    Response: The sewer line shown on sheet C-225 is abandoned, but it previously flowed from restrooms at interior of park out to the east, toward the lagoon headworks. The flow to MH-66 comes from the north and proceeds to the Town of Palisade's lagoons to the southwest.

11. Question: “Has the Owner secured a permit for the work in the designated wetlands?”

    Response: Yes, Nationwide Permit Verification SPA-2025-086 has been obtained from the U.S. Army Corps of Engineers.

12. Question: “Who is responsible for removing and restoring property Owner livestock pens and their appurtenances?”

    Response: In the C-400 Drawings, anything identified as "to be removed and replaced by project" (or similar wording) means it is the responsibility of the Contractor. Anything identified as "to be addressed under relocation" (or similar wording) means it is the responsibility of the property owner. For example, Parcel 294312108005 has six farm gates that the landowner will move as they are "to be addressed under relocation." As another example, Parcel 294312108004, has six corral panels that will be moved by landowner but then put back into place by Contractor.

13. Question: “Who is responsible for removing property Owner junk in the path of installation?”

    Response: In the C-400 Drawings, rubbish and debris (such as tires, wood piles, old equipment, etc.) are identified as to be "Addressed under relocation." This means that the landowner is responsible for removal/relocation of such items prior to construction.

14. Question: “What depth of aggregate replacement on private property should be priced? What material should be priced?”

    Response: 6" depth of material that matches existing.

15. Question: “Some of the existing trees to be replaced are noted as fruit trees. Are the specific species of fruit trees that are required? For example, some are noted as ‘apple tree’. What kind of ‘apple tree’ needs to be replanted?”

    Response: No fruit trees are to be replaced by the Contractor. In the C-400 Drawings, fruit trees are identified as "to be removed by project." This means that the Contractor shall remove these items (if necessary), but does not need to replace them as the landowners have already been compensated for replacement. As noted in the measurement and payment description of item "Property Removals and Restoration", the Contractor's means and methods will dictate the extent necessary for removal, salvage, replacement, and restoration. For example, Contractor may elect to operate in a smaller footprint and not disturb certain fruit trees if unnecessary. This applies to other similar items within the "Property Removals and Restoration" pay item and was intended to reduce the impact on the private property while allowing Contractor flexibility in work space.

16. Question: “Does the Owner or its agents have specific knowledge of any unusual or perhaps unclear restoration items or circumstances that the contractor should specifically be aware of when pricing the bid?”

    Response: Restoration items and circumstances have been identified in the Drawings. The C-400 Drawings contain the unique restoration items/circumstances for each individual private property as agreed upon with the landowners.

17. Question: “What is the approximate height of the overhead high voltage power lines?”

    Response: Overhead power lines were not surveyed for height. This is the responsibility of the Contractor to determine.

18. Question: “Who is responsible for approving wetlands restoration?”

    Response: Contractor shall abide by the reseeding or site restoration requirements and Owner will approve that this work conforms with specifications.

19. Question: “Several locations note ‘remove and replace irrigation system’. Could clarity be provided on these? Are these irrigation services or landscape type sprinkler systems?”

    Response: These are landscape type sprinkler systems.

20. Question: “The Sewer Main is located along the centerline of Road F. Can Road F be fully closed (except for local access)?”

    Response: Mesa County Road and Bridge Department has stated the following: "We are comfortable letting a contractor close F Road for the construction and just keeping it open to local traffic. With the correct plan it is definitely something we would consider and allow."

21. Question: “When is the gas main relocation on 34 Road expected to occur?”

    Response: Xcel has stated that six weeks notice will be needed prior to relocating this gas line.

22. Question: “Can a detail of the guardrail be provided?”

Response: If Contractor determines that guardrail removal and replacement is required in order to complete the work, match existing.

23. Question: “Relocating the bee hive. Can you indicate what the property owner wants? Is that something I need to hire a beekeeper for or is the property owner a beekeeper and will do it themselves?”

    Response: This item is indicated in the C-400 drawings as "to be addressed under relocation." Items in the C-400 drawings that are identified in this way are not a responsibility of the Contractor and will be performed prior to construction by the landowner or others. Please note that the Property Removals and Restoration measurement and payment description states the following: "Does not include any items designated as to be addressed under relocation, as such items are not part of the Project and are for the Contractor's information only."

24. Question: “Is any documentation required to be submitted with the bid to show compliance with Article 19.05 - Small, Minority and Women’s Businesses?”

    Response: No.

25. Question: “Refer to Bid Form for Construction Contract, Article 2 – Attachments to Bid. Please provide the following forms that are shown as required to be submitted with our bid, as they are not included in the specifications: 2.01.B - List of Proposed Subcontractors, 2.01.C - List of Proposed Suppliers, 2.01.H - Manufacturers’ Certification letter of compliance”

    Response: It will be up to the Contractor's discretion for providing the list of Proposed Subcontractors and list of Proposed Suppliers. Please see RUS Bulletin 1780-26 Attachment A.3 and A.4 for Certification of Compliance.

26. Question: “Refer to Advertisement for Bid, Instructions to Bidders Paragraph: This paragraph instructs us to provide successfully completed projects similar in nature in a separate sealed envelope. Should the Qualification Statement and its supporting attachments also be provided within this separate envelope, or should the Qualification Statement and its supporting attachments be attached to the rest of our bid response?”

    Response: Any information documenting prior experience and qualifications shall be provided in a separate envelope.

27. Question: “Time restrictions are described in 01100-1.4D. Do any of these time restrictions apply to the sewer lift station?”

    Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

28. Question: “In reference to the timing restriction for agricultural properties as described in 01100-1.4D-2, which properties are classified as agricultural?”

    Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

29. Question: “Several Bid Items are not described in 01250-Measurement and Payment (Items #6, 9-11, 13-20, etc.). Please confirm if this is done intentionally or if measurement and payment for those items can be found elsewhere.”

    Response: Measurement and payment descriptions are only provided for non-standard items. Measurement for these items will be made based on units described in C-410, and installation requirements are provided throughout the project specifications and CDOT Standards.

30. Question: “Will an extension to the bid date be considered?”

    Response: The bid dates have been modified with Addendum #4.

31. Question: “Please clarify which specification(s) are to be followed for lift station/pigging station piping and fittings (material, flange, coating, and lining).”

    Response: Technical Section 3: Sitework shall cover this work.

32. Question: “In reference to the ‘Table of Contents – Valve Types’ in 43 30 00 Hydraulic Process Valves, is the table of contents simply a general listing of valve types or is it a project-specific list? In other words, do ARV-1, ARV-2, etc. correspond directly to ARV-1, 2, etc. on the Drawings?”

    Response: That is correct, not all of the valves listed in section 43 30 00 are necessarily included in the project. Please refer to the drawings for the required valves.

33. Question: “Under Section 01100, Part 1.4(D), it states that “Excavation activities along the GVIC canal must take place while the canal is fully drained of water” with an anticipated working window of November 20th through March 15th . a. Can you provide station numbers for the sections considered “along the GVIC canal” or provide an offset from edge of canal wherein work can be performed outside of the November to March window? b. Alternatively, can the bidder elect to supply a dewatering plan that would allow excavation outside of the November to March window? If this is an option, can you please clarify how/where such dewatering discharges may occur? c. Is subsurface excavation at the lift station limited to the November to March window? If so, can you define any other limitations that may be placed on the General Contractor outside of the November to March window?”

    Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

34. Question: “Has any water quality testing been performed on near-surface groundwater (~50’ or shallower from the surface) to determine water quality parameters (TDS, Chlorides, sulfates, biologicals, etc.)? a. Does the engineer or municipality have reason to believe that such waters can or cannot be discharged into surface ditches during dewatering provided such water has had sediments removed to or below dischargeable limits? b. In the event contaminated or otherwise non-compliant water, provided such contamination is not the result of sediments created during excavation, is encountered, how will the Owner address this, or should the bidder make allowances for the disposal of such waters?”

    Response: No water quality testing has been performed as part of this project. Dewatering discharge must be in accordance with COG080000 General Permit.

35. Question: “Part 103.13, page 267 of 1012 of the Specifications document notes that water may not discharge to the canal “…when the canal is full.” a. Can you provide a clearer definition of “…when the canal is full” as water elevations may vary? b. Wherein discharge to the canal may not occur due to elevation, can you clarify where other discharges may occur such as to municipal ditches, private irrigation ditches or other locations?”

    Response: Canal being full is intended to mean when the canal is in operation. Please see below table showing approximate canal opening/closing dates based on flow measurement data at the Grand Valley Canal diversion (from https://dwr.state.co.us/Tools/Stations). All dewatering dischage shall be in accordance with COG080000.

YEAR	Last Day Zero Flowrate	First Day Zero Flowrate
2024	April 2nd	November 1st
2023	April 8th	October 31st
2022	March 23rd	November 3rd
2021	April 3rd	November 5th
2020	April 5th	November 5th
2019	March 31st	November 5th
2018	April 1st	November 8th
2017	April 3rd	November 1st
2016	April 4th	November 1st
2015	March 31st	November 2nd
2014	April 1st	November 1st

36. Question: “From our review of the project, bypass pumping will only be required for tie-ins at Stations 10+00 and 282+82. a. For each location, can you please provide estimated i. Bypass intercepting location ii. Flow iii. Suction lift (feet) iv. Discharge head (static head) v. Discharge point and distance from pump”

    Response: See attached Clifton Sanitation District Bypass Exhibit and Town of Palisade Bypass Exhibit.

37. Question: “For the access road outlined on Sheets C-211 through C-218 (Stations 123+50 through 198+00), can you confirm that this road will remain as a permanent road and does not require removal after completion of pipe installation and surface remediation. b. For the access road through Riverbend Park (Sheets C-219 to C-226, Stations 204+00 to 263+00), can you clarify: i. Between station locations, is the access road to follow the GVIC Canal rather than the pipeline route? In certain areas, such as between Stations 223+00 and 231+20, the pipeline does not follow the existing road surface but rather is approximately 50’ or more south of the road. ii. Can you please confirm that the access road and all improvements required for the proposal will remain permanently and not require removal once construction is complete”

    Response: The access road will remain as a permanent road (no removal required). Within Riverbend Park, the access road will follow the GVIC canal rather than the pipeline alignment and the provided estimated quantities for Unclassified Excavation (Canal Road Surface) and Canal Road Surface (9" Thick Class 6 ABC) are based on this.

38. Question: “In the geotechnical report, Boring “B-Lift Station” is shown to a depth of 26.3’ below ground surface (BGS). However, per Detail #1 on S-501, excavation is shown to at least 4649.5’,

a depth of 30’ BGS. Can you provide any additional information regarding the anticipated materials and ground conditions that should be expected below the 26.3’ BGS horizon? ”

Response: We anticipate the gravels to extend to 30+ feet. Shale bedrock will be present below the gravels; however, typically the gravels are 20+ feet thick.

39. Question: “Sheet C-512, Details 3 – Can you please provide a thickness for the concrete headwall anchor that is to be constructed?”

    Response: The concrete headwall anchor shall be 12" thick.

40. Question: “Sheet C-512, Detail 4 – It can be deduced that the horizontal dimension of the headwall anchor is 9 feet (7’ plus 1’ on each side overlap). However, a total vertical dimension cannot be determined as only a partial vertical dimension (5’) is noted. Can you please provide the intended overall vertical dimension?”

    Response: The intended overall vertical dimension of the concrete headwall anchor is 8'. This can be more clearly seen in Detail 3 Sheet C-512 (along with 2' of structural backfill).

41. Question: “Sheet C-401, Parcel 294312100126 – 2 separate items are noted as “Dirt” (5,900 and 4,808 sq. feet, respectively) with the remarks “To be removed & replaced by the project.” Can you provide additional information and/or clarification, such as total volume of “dirt”, that will allow a better understanding of the mitigation efforts required for these items? ”

    Response: On Sheet C-401, Parcel 294312100126, each "dirt" item and quantity represents the square footage of existing dirt surface within the permanent and temporary easement as noted, and would require removal in accordance with Note #2 such that existing conditions are restored upon completion of the work. As noted in the measurement and payment description of item "Property Removals and Restoration", the Contractor's means and methods will dictate the extent necessary for removal, salvage, replacement, and restoration. For example, Contractor may elect to operate in a smaller footprint and not disturb the dirt in the temporary easement (or some portion thereof). This applies to other similar items within the "Property Removals and Restoration" pay item and was intended to reduce the impact on the private property while allowing the Contractor flexibility in work space.

42. Question: “While it is clear that items such as the lift station itself (inclusive of all CIP structures, pigging vault, fence, and generator & pad) are part of Item 12 “Lift Station”, it is unclear which, if any, portions of the gravity and/or force main piping & manholes within the fence boundary are to be included as part of this pay item. Can you please provide clarification on what items you expect to be costed within Item 12?”

    Response: Regarding gravity/force main piping and manholes, the "Lift Station" pay item shall include everything between the 8" DI/PVC Joint Restraint Coupling downstream of the pigging station (Detail A Sheet C-501) and Manhole 25 (including piping from lift station to MH-25 and MH-25 appurtenances)(Detail 1 Sheet C-502).

43. Question: “Are injectables such as acrylite, polyurethane or cementitious grouts acceptable for use in the subsurface for water and/or ground control?”

Response: Such technologies shall be permitted for construction of the lift station and must be certified to NSF 61. If applied for soil stabilization for the lift station excavation, there must be a sealed engineering plan supporting the use of these technologies.

44. Question: "Sheet C-506, Detail 1 depicts "Typical Trench Detail." Within the parameters of this job and using the detail provided, this equates to a maximum trench width of 3 feet (36") for the 18" gravity main and 39" for the short portion of 21" gravity main. While such dimensions are possible on shallow, unshored sections, deeper, shored portions of the pipelines demand larger dimensions to accommodate shoring boxes and equipment.
    a. Can you provide clarification on anticipated trench width, inclusive of shoring equipment dimensions, throughout the pipeline route and with respect to depth?
    b. In regards to the pay items affected by trench width, such as backfill, haunching materials, and granular stabilization materials, can you provide clarification as whether or not the quantities on the Basis of Bid reflect anticipated trench widths?"

    Response: The width indicated in the "Typical Trench Detail" can be disregarded where shoring is required. Our estimated quantities are conservative and assume a 6' trench width (edge to edge, in which space shoring equipment must fit) for gravity sewer sections (even where it is shallow) and 4' trench width for force main. Asphalt-related quantities are also estimated based off these trench widths and in accordance with the pavement replacement details shown in Detail 1 Sheet C-506.

45. Question: "Certain notes, such as the one on Sheet C-205 where the pipeline crosses 33 ¾ Road, note a trench width of 6'.
    a. Is the noted "6 foot width" measured from edge of trench to edge of trench with a 12" offset to edge of pavement on either side? Or is this measured from edge of pavement to edge of pavement? With the depth of the gravity line nearly 15' below existing grade, a minimum of 6' width as measured from edge of trench to edge of trench will be required to accommodate shoring equipment. Can you provide clarity regarding this, and other similar situations along the pipeline route?
    b. In regard to MH-14 on Sheet C-205, as well as similar other manholes located along the route, a 6' wide trench will not facilitate our needs for installation of a 60" diameter precast manhole. Shoring will require an excavation of approximately 10' x 10', far exceeding the noted 6' width. Can you please clarify anticipated excavation limits for this and similar manhole structures?
    c. In reference to Items (a) and (b) above, can you provide revision or clarification to the affected bid items or provide guidance to the bidder as how to proceed with such variances to the plan?"

    Response: Yes, the noted 6' trench width (or 4' where noted) is edge of trench to edge of trench (in which space shoring equipment must fit) and applies to the pipeline, while manhole excavation is assumed to be 10'x'10'. The estimated quantities for asphalt removal and replacement are based on the noted trench width (6' or 4') plus the additional width as indicated in Detail 1 Sheet C-506. For example, the estimated asphalt quantities around manholes in paved areas are based on a 12'x12' full depth removal and a 14'x14' T-Top. Please note, the estimated trench quantities are conservative, as a 6' trench width was assumed for even the very shallow gravity sewer sections and Imported Trench Backfill is assumed at a conservative 75% along the project.

46. Question: “Contractor is requesting more information regarding the relocation of existing utilities. Is there a map showing the existing utilities to be relocated and their new alignment?”

    Response: The gas main on 34 Road is anticipated to be relocated into the west shoulder of the road.

47. Question: “Contractor has identified the restricted working times due to the Yellow-Billed Cuckoo bird. Is there a map of potential avian locations within the project boundaries?”

    Response: Yellow-billed cuckoo critical habitat is located in Riverbend Park and work is restricted within 1/2 of this (work is restricted from STA 176+60 to 283+00).

48. Question: “Contractor is requesting an update to the provided Bid Tab. Will an item be added for wildlife biologist for the onsite wildlife?”

    Response: A pay item for wildlife biologist will be added.

49. Question: “Contractor acknowledges estimates are not to conform to BABA and determination will be made following notice of award. Contractor is requesting the anticipated budget for this project.”

    Response: The budget threshold triggering BABA is unknown at this time.

50. Question: “There are two details for cut off walls. Can owner provide locations of where which cut off wall is required?”

    Response: Flowfill cutoff walls are required where indicated in the profile views ("Flowfill Cutoff Wall") of Sheets C-202, C-203, C-210, C-211, and C-218. Standard cutoff walls (indicated as "Cutoff Wall") shall be used at all other locations.

51. Question: “Is there any requirement for bypass pumping required for the conflict manhole?”

    Response: Bypass pumping requirement will be based on flow within the ditches, which is dependent on location, time of year, and weather.

52. Question: “Is there any warranty required on the private property items that are the removed and replaced?”

    Response: Standard warranty applies.

53. Question: “Contractor is requesting the addition of a bid item addressing the removal and replacement of private property items.”

    Response: Removal and replacement of private property items is addressed under the pay item "Property Removals and Restoration."

54. Question: “Will debris on private property be moved by time of construction?”

Response: In the C-400 Drawings, rubbish and debris (such as tires, wood piles, old equipment, etc.) are identified as to be "Addressed under relocation." This means that the landowner is responsible for removal/relocation of such items prior to construction.

55. Question: “Contractor is requesting if item will be added to the bid tab for hazardous material removal and disposal regarding the shooting range?”

    Response: The shooting range as indicated on Sheet C-204 is the landowner's small, private facility. The landowner has requested all excess material generated from excavation to be deposited on their property, therefore no removal or disposal is necessary at this location.

56. Question: “Is contractor to include an allowance of fruit bearing vegetation on private property? Has town negotiated the replacement of these items with landowners?”

    Response: No fruit trees are to be replaced by the Contractor. In the C-400 Drawings, fruit trees are identified as "to be removed by project." This means that the Contractor shall remove these items (if necessary), but does not need to replace them as the landowners have already been compensated for replacement.

57. Question: “Contractor is requesting information regarding Detail #1 on sheet C-509. Is cathodic protection required for the conflict manhole?”

    Response: Cathodic protection will not be required at conflict manholes.

58. Question: “Contractor is requesting more information regarding the systems integration. Has the owner already contracted out the systems integration? Or are they looking for proposal for system integration to be included within this proposal?”

    Response: SCADA integration will be by Clifton Sanitation District. They have an in-house integrator.

59. Question: “Contractor is requesting information about existing water main to be replaced. Can the existing water main be shut off for duration of removals and replacements?”

    Response: Waterline can be shutdown for the duration of the replacement. Coordinate shutdown with Clifton Water District.

60. Question: “Contractor is requesting the depths of which the Piezometers were installed to. Are we to assume a depth below the measured ground water depths?”

    Response: The piezometers were installed to the following depths: - F Rd & 34 Rd = 20', Lift Station = 28', 35 1/2 Rd = 20', Canal Crossing = 16'.

61. Question: “Contractor is requesting CAD files be shared for earthwork estimating purposes. Can owner provide CADs?”

    Response: CAD files will be provided to the contractor after award of this project, however will not be provided during the bidding process.

62. Question: “Contractor is requesting confirmation on the AIS requirements for the project. Do the AIS requirements fall into the same category as the USDA's BABA requirements? To say contractors should not bid AIS requirements and if desired they will be negotiated into the contract of the awarded contractor?”

    Response: AIS requirements are mandatory to the project.

63. Question: “The roof panels are called out to be 16" MBCI metal panels but does not specify thickness. MBCI comes in 22 or 24 gauge steel. Please confirm thickness for the MBCI panels.”

    Response: Details on 2 & 3 Sheet S-510 call out 26 gage, however 24 gage is acceptable.

64. Question: “Gutters and downspouts are called out as pre-finished aluminum. Please confirm gutters and downspouts do not need to match the metal panel material and should be priced as aluminum.”

    Response: Intent is to match metal panel color, however the colors can be coordinated with the Owner's approval.

65. Question: “Can specifications be included in a forthcoming addendum for the Refrigerated Composite Sampler? I understand that needs to be an Emerald Coast or equal, but it would provide a benefit to have more detail specifications and requirements on that.”

    Response: Yes, see specification Section 11 53 23 Refrigerated Composite Sampler.

66. Question: “I understand Addendum #03 addressed the Odor Control System manufacturer switch, and forthcoming addendum will update the necessary D, E and M drawings. Would it be possible for that addendum to include Odor Control Specifications as well? That way we can double check the package the manufacturers or reps send us to the specification.”

    Response:

    The Vapex and Heartland manufacturers have coordinated their system design and proposals with the Owner and Engineer. Please contact the manufacturer representatives for specifics on their proposals.

    Heartland Oxygen Generator System:

    - *HOX-060-3 oxygen generation system (indoor unit - no built in AC)*
    - *Control Box*
    - *120 Gallon O2 Tank*
    - *Contact Heartland Oxygen Systems, LLC for proposal:*
        - *Derek Eltiste, President & Owner*
          derek@heartlandoxygen.com
          Phone: 913-522-2500

    Vapex Ozone System:

    - *Nano ozone generation system (indoor unit – no built in AC)*
    - *Qty. 2 drop-down nozzles to be installed in wet well*

- *¾" potable water supply to unit – will require PRV on the water service line to keep pressure between 25-75psi.*
- *Contact Coombs Hopkins for proposal:*
  - *Jason Morgan, Sales Engineer*
    jmorgan@chcwater.com
    Office: 303-477-1970
    Cell: 801-691-4000

67. Question: "Please confirm per D-101 thru D-303, applicable KN #20, #25 and #39 SS pipe is to be 316SS."

    Response: 304SS is acceptable.

68. Question: "Per D-301/KN #37 and Detail D-05100/D-501, please confirm if the vent piping should be a 4" minimum as called out in note #3 of the detail, or if a larger size is required."

    Response: Please provide 6" diameter ventilation pipe.

69. Question: "Per D-301/KN#5, please specify what type of flex tubing is to be ran from the Air Release Assy to the sump."

    Response: PTFE tubing. However, Sch 80 PVC is also acceptable.

70. Question: "Please confirm local Utility is providing the Utility Transformer and Utility Meter. If possible, please confirm anticipated timeframe when these items will be ready and set by Utility."

    Response: Xcel will be providing the transformer and meter. Anticipated timeframe is a couple months from the time the service application is submitted to Xcel (this will not be done until after Award and coordination with Contractor on desired timing).

71. Question: "Please confirm if Flygt is to supply the pump VFD aloing with the VFD Control Panel."

    Response: Yes, Flygt will be providing the pump VFD and VFD Control Panels. Please contact Bret Bernarding, the Flygt pump representative, for details on the pump control panels. Bret Bernarding can be reached at bbernarding@cogentcompanies.com, 303-524-6930 (Direct), or 816-221-0650 (Main).

72. Question: "Section 40 95 00 (Programmable Logic Controllers) references related section such as 26 29 23 - Variable Frequency Drives. There is not 26 29 23 Variable Frequency Drive specification, please provide."

    Response: Please contact Bret Bernarding, the Flygt pump representative, for details on the pump control panels. Bret Bernarding can be reached at bbernarding@cogentcompanies.com, 303-524-6930 (Direct), or 816-221-0650 (Main).

73. Question: "It is unclear what type of underground or duct bank is necessary for the Lift Station site plan. Specifically at the transformer and generator to the Lift Station, please provide clarity or detail."

Response: Underground conduit information is listed in the Wire Schedule on Sheet E3-1 below the one-line diagram. Basis of design conduit is Schedule 80 PVC in any area subject to physical damage and Schedule 40 PVC where permitted.

74. Question: “C-212 profile depicts the 18" Sewer Line to connect to the Lift Station Wet Well as SDR-35 PVC with no pipe material type transition. D-101 depicts the Lift Station connection to the Lift Station as 18" D.I. Pipe. Please confirm where the transition is and applicable details, or if the connection is to follow C-212 with SDR-35 pipe material.”

    Response: This pipe is to be DI and the Contractor should reference detail C-02123 on Sheet C-503 for the pipe to structure transition between those structures.

75. Question: “Please confirm that the pipe material type from the Lift Station Dry Well Pump Discharge to the Pigging Station is to be DI Pipe. It appears as such per D-101, but it is not clear from C-212 profile.”

    Response: Yes, this is to be DI pipe.

76. Question: “Would it be possible to have the pre-bid sign in sheet posted prior to the addendum?”

    Response: Pre-Bid sign-in sheet has been uploaded to BidNet.

77. Question: “Do we need to provide a temp docking station as note #6 on plan sheet E3-1 states? ”

    Response: Due to the nature of the usage and the function of the generator as Emergency (NEC 700), yes a docking station for a temporary generator is required. It would be basically a manual transfer switch to "disconnect" the permanent generator and "connect" the temporary generator so that the Emergency backup is always available.

78. Question: “Who is responsible for the CCTV inspection of the new sewer line?”

    Response: The contractor shall be responsible for performing final CCTV inspection of sanitary sewer line. The owner/engineer will oversee inspection/review.

79. Question: “Who is responsible for the deflection testing of the new line?”

    Response: The contractor shall be responsible for performing deflection testing of sanitary sewer line. The owner/engineer will oversee inspection/review.

80. Question: “I see the plan sheets and specs talk about flushing the new line. It doesn't mention jet cleaning if the new line. Is jet cleaning required and if so, is it the responsibility of the GC?”

    Response: Jet cleaning won't be required as part of the standard testing/cleaning requirement.

81. Question: “On page #116 of the specs, section 7.19 'Delegation of Professional Design Services', does this section refer to submittals and shop drawings or something more? Please clarify the intent of this section.”

Response: This section is used when a construction contract expressly assigns to the contractor responsibility for the final design (and construction) of a specific element of the completed, functioning project. This will apply to submittals that require a licensed design professional.

82. Question: “Bid Item #56 says 'Weekly Newsletter', while section 01250 Measurement and Payment of the specs, paragraph 1.4.DD.2 says, 'to prepare and distribute bi-monthly newsletters'. Is it weekly or bi-monthly?”

    Response: Newsletters shall be provided every other week.

83. Question: “Bid Item #56, in section 01250 of the specs paragraph 1.4.DD.2, it talks about who is supposed to get newsletters. Is the requirement of 'adjacent to the ROW and where work is being performed on the public roadways' inclusive of all houses in these areas to get a newsletter every time? Or is there some sort of area in relation to the current work zone that should get newsletters each time? Depending on the requirements there could be upwards of 1000 homes that get a newsletter. If all 1000 homes get a newsletter every week, bid item #56 could be a very high number. ”

    Response: Newsletters shall be provided to properties along the alignment that will be impacted by construction within the next month of construction.

84. Question: “Plan sheet C218 at approximate Sta. 198+40 it says to 'Remove & Replace Wingwall (in kind)', this matches with Bid Item #7. Is there a detail of how the Wingwall should be constructed?”

    Response: Contractor shall match existing wingwall design and materials. No design has been provided. Please see photo below of existing structure.

85. Question: “Plan sheet C512, detail 3 shows the Headwall Connection construction requirements. At what station does this Headwall get constructed?”

    Response: Detail 3 Sheet C-512 applies to Detail 2 Sheet C-301, which is at approximate STA 140+25.

86. Question: “In the summary section, 01100, of the specifications, paragraph 1.4.D.3 says that there is to be no work along the GVIC Canal when it has water in it. Does this mean that there is no work to be preformed within a certain distance from the canal? Or no work at all no matter what the distance is? I ask this because between Sta. 221+00 and Sta. 245+00 there is between 60' to 210' distance from the canal. ”

    Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

87. Question: “How close to the wetlands can we get during nesting season? 50'? 100'? How close?”

    Response: Wetland areas do not necessarily relate to yellow-billed cuckoo nesting. Yellow-billed cuckoo critical habitat is located in Riverbend Park and work is restricted within 1/2 mile of this (work is restricted from STA 176+60 to 283+00).

88. Question: “Addendum #3, the answer to question #2 says that the pump control panels are to be provided by the pump manufacturer. Where can I find the specifications to the requirements of the pump control panels?”

    Response: Contact Bret Bernarding, the Flygt pump representative, for details on the pump control panels. Bret Bernarding can be reached at bbernarding@cogentcompanies.com, 303-524-6930 (Direct), or 816-221-0650 (Main).

89. Question: “Addendum #3, the answer to question #4 talks about the insurance requirements. Can you please explain the reasoning for the excessive limits of $10 million general aggregate. Contractors typically see limits of up to $5 million on larger projects, but $10 million is much less common compared to other projects.”

    Response: After conferring with the Owner's Attorneys, this value will remain at $10,000,000.

90. Question: “Is it possible to get a more complete Measurement and Payment section, 01250, of the specs that gives a complete list of all the bid items?”

    Response: Measurement and payment descriptions are only provided for non-standard items. Measurement for these items will be made based on units described in C-410, and installation requirements are provided throughout the project specifications and CDOT Standards.

91. Question: “Does there need to be temporary power at the Lift Station site for construction?”

    Response: No. Since this a new lift station there is nothing that needs to be powered during construction.

92. Question: “Does either CSD or the Town have a place to take the Unclassified Excavation export material? Or, does it become the property of the GC?”

    Response: This material becomes property of the Contractor.

93. Question: “Would Contech’s A-2000 PVC pipe meeting the ASTM F 949 and F 794 Sewer Pipe specification be considered and acceptable alternative to the SDR35 for the Palisades Sewer Line Transfer Project?”

    Response: Please refer to Addendum #2.

94. Question: “Bid items #13 & #14- PVC restrained pipe, are you wanting something like C900 DR14 Certalok or Eaglelok? If not please clarify “restrained Joint”.”

    Response: Pipe shall be restrained to prevent separation due to internal thrust effects. Pipe restraint method shall be up to contractor's means and methods.

95. Question: “Bid items #15-#18- Restrained bends, are you wanting MJ DI fittings (epoxy coated per spec UU-4 of 26) with lug restraint like EBAA Megalug or Star Grip? If not please clarify “restrained bend”. -Epoxy coating…verify epoxy coating is wanted and not a sewer coating like P401?”

Response: Pipe shall be restrained to prevent separation due to internal thrust effects. Pipe restraint method shall be up to contractor's means and methods. Epoxy coating shall be used per project specifications.

96. Question: "Bid item #23- Bid schedule shows qty 28, I only find 25? Is there any fitting connections to existing service pipe needed? Or just cap and marker per detail, meaning connect to existing pipe is by others?"

    Response: There are 28 Sewer Service Stub-Outs. Stub-outs will not be connected to any existing pipe as there are no existing sewer services (stub-outs are intended for future use). Stub-outs shall be capped and marked for future connection by others.

97. Question: "Are you paying for stored materials? Are you expecting to purchase the full qty of PVC pipe at the beginning of the project?"

    Response: There is no pay item for stored materials. Contractor's means and methods shall determine quantity and timing of pipe purchase.

98. Question: "Also, as noted in the specs IPS PVC pressure pipe will be accepted, what pressure rating?"

    Response: Pipe class requirements can be found in plan and profile sheets of plans.

99. Question: "Bid #4, 16" A/C replacement- Will Hymax or an equal restrained coupling be accepted in place of the solid sleeves?"

    Response: Yes.

100. Question: "Addendum #2 says 12ga tracer wire for the sewer main but the plans say to use 10ga for the force main, so are you wanting 2 different wire gauges on the same pipeline? Also the main shows grounding rod but the force main shows actual test stations, again 2 different details on the same pipeline?"

    Response: 12ga is acceptable for all tracer wire. The force main shall have test stations and gravity sewer shall have ground rods at the manholes.

101. Question: "There is a reference in specifications to 40 06 00 Pipe and Fittings, but I was unable to find that spec section. Will these specifications be included in an addendum? Will the Ductile Iron, Stainless Steel, and joint accessories be included in that spec section?"

    Response: See Technical Section 2: Sitework, Section 102.7 for pipe specification outside of the lift station site. See Attached Tech Spec 40 06 00 Pipe and Fittings. This specification is intended for only pipe installed inside the lift station site.

    - *PVC01 - Drain from vault to wet well*
    - *PVC02/03 - Reference Section 102.7 in Tech Specs Section 2 for PVC gravity sewer*
    - *PVC04/05 - Reference Section 102.7 in Tech Specs Section 2 for PVC pressure pipe*
    - *PVC10 - Ozone piping*
    - *PE - Not Used*
    - *DI02 - All DI process pipe in lift station*
    - *SST01 - Wet well bypass pipe*

102. Question: “Per the details on sheet C-301, are we to include new 12" SDR drain line with drain Crossing and the removal of the existing lines?”

Response: Yes, removal of existing pipes and installation of new pipes shall be included in the Drain Crossings pay item.

103. Question: “Also, on sheet C-301: the supply and installation of the pit run materials- Are these aggregates included in the drain crossing or are the materials included in the bid item #42 Pit Run Fill?”

Response: The pit run backfill shown on Sheet C-301 shall be paid for with the Pit Run Fill pay item and these quantities are included in the estimated quantity. The Drain Crossings pay item states that it does not include pit run fill material.

104. Question: “Can you provide a typical year dates ie: 10/31-4/01? When canal is fully drained?”

Response: Please see below table showing approximate canal opening/closing dates based on flow measurement data at the Grand Valley Canal diversion (from https://dwr.state.co.us/Tools/Stations).

YEAR	Last Day Zero Flowrate	First Day Zero Flowrate
2024	April 2nd	November 1st
2023	April 8th	October 31st
2022	March 23rd	November 3rd
2021	April 3rd	November 5th
2020	April 5th	November 5th
2019	March 31st	November 5th
2018	April 1st	November 8th
2017	April 3rd	November 1st
2016	April 4th	November 1st
2015	March 31st	November 2nd
2014	April 1st	November 1st

105. Question: “Does Yellow-Billed Cuckoo restriction dates effect whole project work area or just certain areas? Construction of lift station?”

Response: The yellow-billed cuckoo restriction applies to areas within ½ mile of yellow-billed cuckoo critical habitat which is located in Riverbend Park (work is restricted from STA 176+60 to 283+00).

106. Question: “Can you define stationing of agricultural properties that have 11/01-3/31 restrictions?”

Response: Clarification to this question will be provided in a subsequent addendum to be issued by 9/5/2025.

107. Question: “Can you provide us a manufacturer name of the polymer manholes?”

Response: Armorock is an example of a polymer concrete manhole manufacturer and they were also in attendance at the pre-bid meeting.

108. Question: “Under which bid item should the cutoff and Flow-Fill Cutoff Walls be included?”

    Response: These cutoff walls shall be incidental to gravity sewer installation and force main installation.

109. Question: “Can you recheck quantity of 5’ Dia polymer Manholes? #9, #24, #26, & #66= 4 each”

    Response: Three is correct. MH-24 is the Force Main Discharge Manhole which will be paid for separately.

110. Question: “What is expected for the Bid Item “Erosion Control (CIP)? Silt fence or straw wattles for both sides of temporary ROW-whole project length?”

    Response: Per General Note #14 on Sheet G-003, the Contractor shall be responsible for preparation of stormwater pollution prevention plan and obtaining all necessary stormwater permits.

111. Question: “Will erosion control measures such as silt fence be necessary for work on 35road, F road and Canal access road?”

    Response: Per General Note #14 on Sheet G-003, the Contractor shall be responsible for preparation of stormwater pollution prevention plan and obtaining all necessary stormwater permits.

112. Question: “Can 34 Road & F Road be closed for construction of pipeline and reconstruction of road?”

    Response: Mesa County Road and Bridge Department has stated the following: "We are comfortable letting a contractor close F Road for the construction and just keeping it open to local traffic. With the correct plan it is definitely something we would consider and allow."

113. Question: “What is the required final width of canal road which receives Class 6 Roadbase?”

    Response: The canal road shall be 10' wide according to Detail 2 Sheet C-509.

114. Question: “What is the current flow rate for the existing sewer line that needs to be by-pass?”

    Response: Flows at MH-66 can vary between a daily average of 100-200 GPM. Flows at MH-1 are unknown, but that manhole receives flow from 40 houses and Mt. Garfield Middle School.

115. Question: “Under which pay item should de-watering be included?”

    Response: Dewatering shall be incidental to gravity sewer installation, force main installation, and construction of the lift station.

116. Question: “Both the lift station (sheet D-508) and the pigging station (Sheet C-501) shows a drain line to the wet well. Sheet C-101 & Sheet C-212 however does Not show wet well. Can you provide details and location of wet well?”

    Response: Please see the D Sheets for the wet well layout and details. Attached is sheet C-101 marked up with additional clarification on the location of the drain lines and wet well.

117. Question: “On sheet C-506 of the plans, detail 1, it shows a maximum width of 3 feet for an 18” pipe. This width will also be the width of the stabilization material, if needed. Section 13.03 of the Standard General Conditions state that actual quantities will be paid. Will stabilization material payment be limited to the maximum trench width as shown in the detail? Also, the same detail shows fabric, if needed and directed by the engineer. There is no bid item for the fabric. How will this be paid, if needed?”

    Response: Stabilization material will be paid according to the actual quantity used, per weight tickets. The estimated quantity of 21,435 tons is based on a conservative assumption of 6' width for gravity sewer sections and 4' width for force main sections, at a thickness of 2' and 100% use throughout the project. Fabric is not anticipated to be used. If fabric is used, a unit price will be negotiated at that time.

118. Question: “Plan notes show trench width of 6’ for gravity sewer and 4’ for force main. Assuming this is the anticipated asphalt removal width, if additional asphalt is removed beyond these limits, will the additional cost of removal and replacement be the responsibility of the contractor?”

    Response: The estimated quantities for asphalt removal and replacement are based on the noted trench width (6' or 4') plus the additional width as indicated in Detail 1 Sheet C-506. For example, Removal of Asphalt Mat (Full Depth) quantity is based on trench width plus 1' on each side. As another example, T-Top Mat pavement is based on trench width plus 2' on each side. Additionally, along 34 Road where trench is near west edge of road, our estimated quantities assume removal of the small extra distance to existing edge of asphalt. Also, please note that manhole excavation has been estimated at 10'x10', with 12'x12' full depth asphalt removal and 14'x14' T-Top area factored into the estimated quantities.

119. Question: “How will lump sum bid items be paid for during construction of the project? Will they be prorated and a portion paid based on percent complete of the item or percent complete of the project on the monthly pay estimates?”

    Response: Lump Sum pay items without an agreed upon Schedule of Values may be paid upon a Percent Complete amount where reasonable and appropriate.

120. Question: “Will materials on hand be paid for? Pipe and equipment suppliers will want paid for materials once delivered. Due to the size of the project, they will want to drop ship entire order and not break up into smaller shipments over a 2 year period.”

    Response: There is no pay item for stored materials. Contractor's means and methods shall determine quantity and timing of pipe purchase.

121. Question: “I have a question about DD. "Preparation and Distribution of Newsletter". You state: to all properties traversed by the project and all properties adjacent to the ROW, where work is

being performed on public roadways. According to the GIS system, that's about 1,000 addresses. If you are requesting a newsletter to be sent out bi-monthly (2 times per month) that's 2,000 mailers per month? OR is the bi-monthly newsletter only sent to those properties that are affected by the work being done at the time of the newsletter? I am trying to get a gauge on how many mailed newsletters are going to be needed for the entirety of the project, and to be able to assign a cost to this. The wording is unclear about how many properties get the bi-monthly newsletter. If it's the entire length of the project EVERY time or only the areas affected at the time of each newsletter."

Response: Newsletters shall be provided every other week to properties along the alignment that will be impacted by construction within the next month.

122. Question: "Would the Cretex Pro Ring be approved as an equal to the concrete grade rings for this project? The City of Grand Junction has approved of this item being used in previous projects. I have attached information about the ring below. We are CDOT approved as well and have even done a demo about a year and a half ago. I also have attached information on the epoxy coating that is called out in the specs for the manholes as well. I included the mortar that would be used for manhole rehab before placing the epoxy coating on if needed. Will these be viewed for possible approval on this project?"

    Response: Yes, Cretex Pro Rings would be accepted for this project.

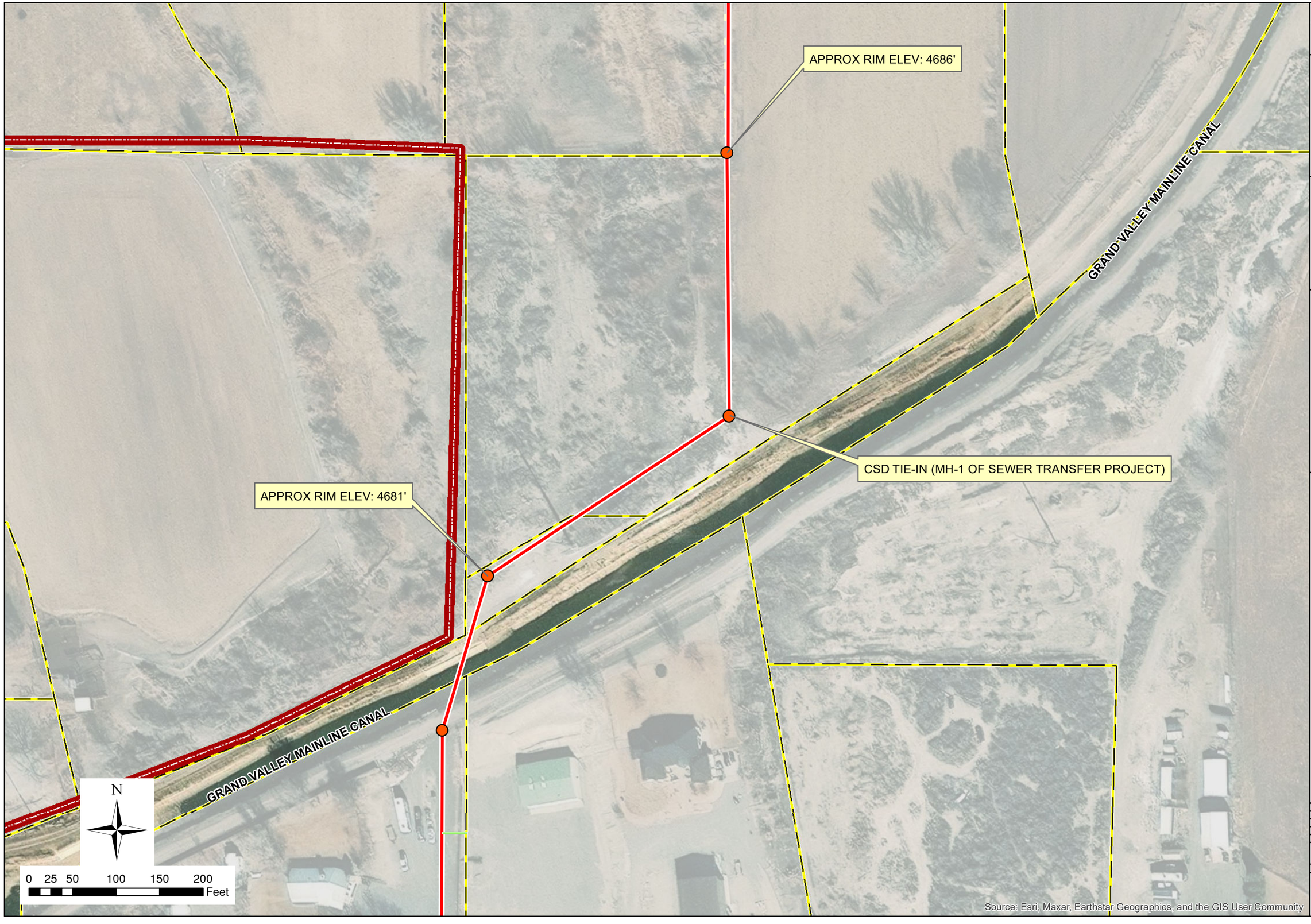
Please make note of the following bid document modifications:

1. Bid Form for Construction Contract (C410) shall be deleted and replaced with the attached updated version.
2. Certain specifications in Technical Section 3 shall be revised by the attached updated specifications. Specifications not modified by the attached updated specifications remain valid.

The original solicitation for the project noted above is amended as noted. All other conditions of the subject remain the same.

Respectfully,

Matt Filla, PE
Project Engineer – Lead, J-U-B Engineers, Inc.



J-U-B ENGINEERS, INC.

J-U-B ENGINEERS, INC.
305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

ADDENDUM #6

NO.	DESCRIPTION	BY	APP'L	DATE
REVISION				

TOWN OF PALISADE
SEWER TRANSFER LINE

CLIFTON SANITATION DISTRICT BYPASS EXHIBIT

FILE: 81-18-024_2025_CIPP_Mapbook
JUB PROJ. #: 81-18-024, 160
DRAWN BY: EWS
DESIGN BY: EWS
CHECKED BY: BG
1/2 INCH
AT FULL SIZE, IF NOT 1/2 INCH, SCALE ACCORDINGLY
LAST UPDATED: 2025-04-03
SHEET NUMBER:

J-U-B ENGINEERS, INC.
305 Main Street
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

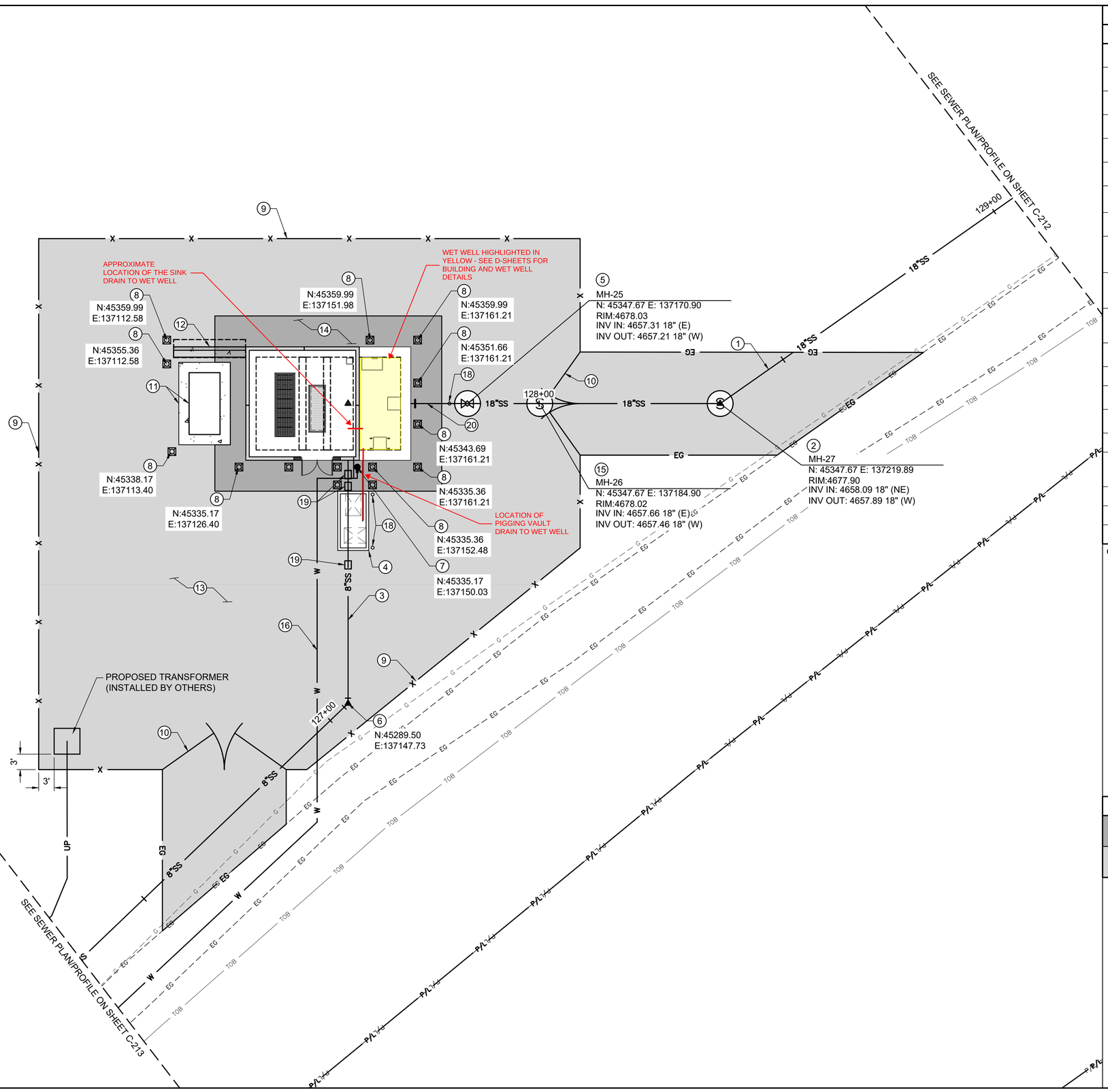
ADDENDUM #6

NO.	DESCRIPTION	REVISION BY	APP'L	DATE

TOWN OF PALISADE
SEWER TRANSFER LINE

TOWN OF PALISADE BYPASS EXHIBIT

FILE: 81-18-024_2025_CIPP_Mapbook
JUB PROJ. #: 81-18-024, 160
DRAWN BY: EWS
DESIGN BY: EWS
CHECKED BY: BG
1/2 INCH
AT FULL SIZE, IF NOT 1/2 INCH, SCALE ACCORDINGLY
LAST UPDATED: 2025-04-03
SHEET NUMBER:



KEYNOTE TABLE

NUMBER	DESCRIPTION
1	18" PVC GRAVITY INFLUENT, SEE CIVIL PLAN/PROFILE SHEETS.
2	GRAVITY SEWER INFLUENT MANHOLE, SEE CIVIL PLAN/PROFILE SHEETS.
3	8" PVC C900 FORCEMAIN, SEE CIVIL PLAN/PROFILE SHEETS.
4	INSTALL TRAFFIC RATED PIG LAUNCHING STATION PER DETAIL 1/C-501.
5	INSTALL MANHOLE WITH 18" PLUG VALVE PER DETAIL 1/C-502.
6	INSTALL 8" PVC 45° BEND W/ MEGALUG RESTRAINTS, SEE SHEET C-212.
7	INSTALL 1 ½" TYPE PH-1 - LEVER OPERATED, SURFACE MOUNTED NON-FREEZE YARD HYDRANT, SEE DETAIL D-15200/D-507.
8	INSTALL BOLLARD, SEE DETAIL C-02160/C-503.
9	INSTALL 6' GALVANIZED STEEL CHAIN LINK FENCE W/ BEIGE SLAT SOURCE PRIVACY LINK PRIVACY SLATS (OR ENGINEER APPROVED EQUAL), SEE DETAIL C-02200/C-503.
10	INSTALL 6' GALVANIZED STEEL CHAIN LINK GATEW/ BEIGE SLAT SOURCE PRIVACY LINK PRIVACY SLATS (OR ENGINEER APPROVED EQUAL) AND 180 DEGREE SWING RADIUS, SEE DETAIL C-0200/C-503.
11	INSTALL GENERATOR ON CONCRETE GENERATOR PAD, SEE TYPICAL CONCRETE GENERATOR PAD 9/S-901.
12	INSTALL BUILDING HEIGHT CMU WALL PER STRUCTURAL DRAWINGS.
13	GRAVEL SURFACE W/FABRIC, SEE DETAIL C-02190/C-503.
14	6-WIDE CONCRETE SIDEWALK, SEE DETAIL C-02150/C-503.
15	BYPASS GRAVITY MANHOLE, SEE CIVIL PLAN/PROFILE SHEETS.
16	INSTALL 1 1/2" WATER SERVICE
17	SHALLOW SWALE FLOWLINE EXTENTS. FIELD FIT SMOOTH TRANSITION BETWEEN FLOWLINE AND FG SURFACE TO PREVENT STANDING WATER AND TO DISPERSE FLOWS ACROSS SURFACE.
18	SINGLE ANODE TEST STATION, SEE DETAIL 2/C-502
19	PIPE TO STRUCTURE TRANSITION, SEE DETAIL C-02122/C-503
20	FLEXIBLE CONNECTION AT BUILDING, SEE DECTAIL C-02123/C-503

GENERAL NOTES:

1. SEE D-SHEETS FOR LIFT STATION PLANS, SECTIONS, AND DETAILS.
2. ALL WORK SHALL BE IN CONFORMANCE WITH THE LATEST CLIFTON SANITATION DISTRICT SPECIFICATIONS AND J-U-B ENGINEERING SPECIFICATIONS. IN THE CASE OF CONFLICT, THE MORE STRINGENT SPECIFICATION SHALL APPLY.
3. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES AND BE RESPONSIBLE FOR DAMAGE TO EXISTING UTILITIES AND IMPROVEMENTS AS A RESULT OF THE CONTRACTOR'S CONSTRUCTION ACTIVITIES.
4. CONTRACTOR SHALL OBTAIN APPROVAL FROM THE OWNERS REPRESENTATIVE PRIOR TO BACKFILLING OVER UTILITIES.
5. STRUCTURAL, ARCHITECTURAL, MECHANICAL, HVAC, AND ELECTRICAL/INSTRUMENTATION COMPONENTS ARE NOT ALL SHOWN. COORDINATE WORK WITH RELATED TRADES TO AVOID CONFLICTS.
6. INSTALL DRAIN LINE AND CLEANOUTS IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE COLORADO PLUMBING CODE OR THE LOCAL GOVERNING ORDINANCE.
7. CONTRACTOR SHALL MEET EXCAVATION, BACKFILL, COMPACTION, AND DEWATERING REQUIREMENTS OF THE GEOTECHNICAL REPORT BY HUDDLESTON-BERRY (BHET) DATED AUGUST 9, 2024

HATCH LEGEND

	6' WIDE SIDEWALK, SEE DETAIL C-02150/C-503
	GRAVEL SURFACE W/ FABRIC, SEE DETAIL C-02190/C-503

0 10 20
SCALE IN FEET

J-U-B ENGINEERS, INC.
J-U-B ENGINEERS, INC.
305 S. Main Street
Unit 6
Palisade, CO 81526
Phone: 970.208.8508
www.jub.com

BID SET

COLORADO LICENSED
MATTHEW W. FILLA
60906
7/21/2025
PROFESSIONAL ENGINEER

NO.	DESCRIPTION	BY	APR.	DATE
	REVISION			

SEWER TRANSFER PROJECT
TOWN OF PALISADE

CIVIL SITE PLAN

FILE : 81-23-029_C-101X
JUB PROJ. # :81-23-029
DRAWN BY: WVD
DESIGN BY: AMN
CHECKED BY: GMV / MWF
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 7/21/2025

SHEET NUMBER:
C-101

Plot Date:7/21/2025 5:56 PM Plotted By: Matt Filla
Date Created:6/12/2025 \\JUB\CENTRAL\CLIENTS\CO\PALISADE\PROJECTS\81-23-029_SEWERTRANSFER\DESIGN\CAD\SHEET\GENERAL\81-23-029_C-101X.DWG

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Town of Palisade
175 East 3rd Street
Palisade, CO 81526

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. Required Bidder Qualification Statement with supporting data;

G. If Bid amount exceeds $100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants, and Loans.

H. Manufacturers' Certification letter of compliance with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference for all equals or substitutes approved by Addenda for American Iron and Steel products as provided in these Contract Documents.

BASIS OF BID—LUMP SUM BID AND UNIT PRICES

2.02 *Deleted*

2.03 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization (7%)	LS	1	$	$
2	Remove Existing Pipe	LF	970	$	$
3	Removal of Manhole	EA	1	$	$
4	16" A.C. Pipeline Replacement	LS	1	$	$
5	Wetland Protection and Restoration	SY	1,345	$	$
6	Piezometer Abandonment	EA	4	$	$
7	Remove and Replace Wingwall (In-Kind)	LS	1	$	$
8	Pipeline Plugging	EA	13	$	$
9	Removal of Asphalt Mat (Full-Depth)	SY	5,340	$	$
10	Removal of Asphalt Mat (Planing)	SY	1,359	$	$
11	Unclassified Excavation (Canal Road Surface)	CY	4,431	$	$
12	Lift Station	LS	1	$	$
13	8" PVC Restrained Joint Force Main (DR-14 C900) (Includes Type A Bedding and Haunching Material)	LF	4,001	$	$
14	12" PVC Restrained Joint Force Main (DR-14 C900) (Includes Type A Bedding and Haunching Material)	LF	20	$	$
15	8" 11.25 Degree Restrained Bend	EA	2	$	$
16	8" 22.5 Degree Restrained Bend	EA	2	$	$
17	8" 45 Degree Restrained Bend	EA	1	$	$
18	12"x8" Restrained Reducer	EA	1	$	$
19	21" Gravity Sewer Pipe (SDR-35 PVC) (Includes Type A Bedding and Haunching Material)	LF	102		
20	18" Gravity Sewer Pipe (SDR-35 PVC) (Includes Type A Bedding and Haunching Material)	LF	23,118	$	$
21	Sewer Service Stub-Out	EA	28	$	$
22	Sanitary Sewer Basic MH 60" Dia	EA	60	$	$
23	MH Barrel Section D>5' 60"	VLF	290	$	$

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
24	Force Main Discharge Manhole (MH-24) (Polymer Concrete)	LS	1	$	$
25	MH Coating	VLF	590	$	$
26	Polymer Concrete MH 60” Dia	EA	3	$	$
27	Polymer Concrete MH Barrel Section D>5’ 60”	VLF	17	$	$
28	Polymer Concrete MH 72” Dia	EA	1	$	$
29	Polymer Concrete MH Barrel Section D>5’ 72”	VLF	15	$	$
30	Storm Drain Conflict Structure	EA	2	$	$
31	Riverbend Irrigation Structure	LS	1	$	$
32	Drain Crossings	EA	2	$	$
33	Driveway Gate	EA	9	$	$
34	Fence Gate	EA	8	$	$
35	Canal Road Surface (9" Thick Class 6 ABC)	Ton	7,957	$	$
36	Aggregate Base Course (Class 6) (9" Thick) (For Paved Areas)	Ton	2,397	$	$
37	Hot Bituminous Pavement (3" Thick) (Grading SX, PG 64-22) (One 3" Lift)	Ton	884	$	$
38	Hot Bituminous Pavement (T-Top Mat) (2" Thick) (Grading SX, PG 64-22) (One Lift)	Ton	739	$	$
39	Granular Stabilization Material (Type B) (Crushed Rock) (24" Thick Min.) (Includes haul and disposal of unsuitable excavated material) (Assumed Unit Weight = 138 lbs/ft3) (Assumed 2' Thick, 100%)	Ton	21,435	$	$
40	Imported Trench Backfill (Class 3) (Includes haul and disposal of unsuitable excavated material) (Assumed material unit weight = 133 lbs/ft3) (Assumed 75%)	Ton	57,449	$	$
41	Canal Crossing	LS	1	$	$
42	Pit Run Fill	Ton	1,592	$	$
43	Canal Wall Soil Replacement	CY	1,533	$	$
44	Property Removals and Restoration	LS	1	$	$
45	Riverbend Park Removals and Restoration	LS	1	$	$
46	Erosion Control (Complete-in-place)	LS	1	$	$
47	Portable Sanitary Facility	EA	3	$	$
48	Concrete Washout Facility	EA	3	$	$

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
49	Stabilized Construction Entrance	EA	3	$	$
50	Dust Abatement	Day	300	$	$
51	Bypass Pumping	LS	1	$	$
52	Pavement Marking Paint	GAL	72	$	$
53	Construction Surveying (Includes As-Built Drawings)	LS	1	$	$
54	Traffic Control Plan	LS	1	$	$
55	Traffic Control (Complete in Place)	LS	1	$	$
56	Preparation and Distribution of Weekly Newsletter	LS	1	$	$
57	Potholing	HR	80	$	$
58	Quality Control Testing	LS	1	$	$
59	Minor Contract Revisions	LS	1	$ 250,000	$ 250,000
60	Wildlife Biologist	HR	8	$	$
Total of All Unit Price Bid Items					$

B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

2.04 *Total Bid Price (Lump Sum and Unit Prices)*

Total Bid Price (Total of all Lump Sum and Unit Price Bids)	$

ARTICLE 3—*DELETED*

ARTICLE 4—*DELETED*

ARTICLE 5—TIME OF COMPLETION

5.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

5.02 *Deleted*.

5.03 *Deleted*.

5.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 6—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

6.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

6.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

6.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 7—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

7.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work*, including all Domestic Preference requirements*.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and

procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

7.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

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TOWN OF PALISADE

PALISADE SEWER TRANSFER

TECHNICAL SECTION 3:
LIFT STATION TECHNICAL SPECIFICATIONS
(DIVISIONS 01 TO 46)

BID SET
Addendum No. 6

July 2025

Funded By:
Town of Palisade
USDA Rural Development

Prepared By:
J-U-B Engineers, Inc.
305 Main Street
Palisade, CO 81526
Project No. 81-23-029

For:
Town of Palisade
175 E. 3rd Street, P.O. Box 128
Palisade, CO 81526
970-464-5602

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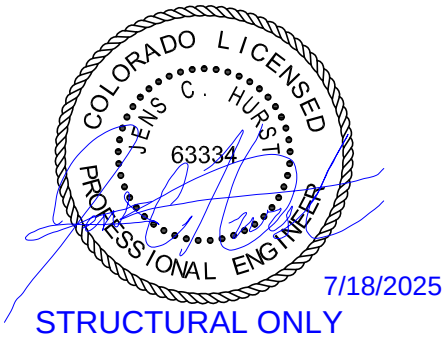
TOWN OF PALISADE

PALISADE SEWER TRANSFER
TECHNICAL SPECIFICATIONS

RESPONSIBLE PARTIES FOR TECHNICAL SPECIFICATIONS

 Divisions 22 & 23	 Division 40
 Division 26	 7/18/2025 STRUCTURAL ONLY

ALL CONSTRUCTION AND MATERIAL SHALL BE IN ACCORDANCE WITH THESE CONTRACT DOCUMENTS, INCLUDING ALL APPLICABLE SECTIONS OF THE CLIFTON SANITATION DISTRICT CONSTRUCTION STANDARDS AVAILABLE AT WWW.CLIFTONSANITATION.COM. ANY CONSTRUCTION AND MATERIAL NOT EXPLICITLY IDENTIFIED IN THE CONTRACT DOCUMENTS OR THE CLIFTON SANITATION DISTRICT CONSTRUCTION STANDARDS SHALL BE IN ACCORDANCE WITH THE MOST RECENT EDITION PUBLISHED BY THE AMERICAN PUBLIC WORKS ASSOCIATION (APWA).

SECTION	RESPONSIBLE ENGINEER OR ARCHITECT	TITLE
DIVISION 01 – GENERAL REQUIREMENTS		
01 60 10	J-U-B	Design Requirements for Non-Structural Components and Non-Building Structures
01 65 00	J-U-B	Commissioning of Systems
01 70 00	J-U-B	Closeout Requirements
01 73 00	J-U-B	Installation, Operation, and Maintenance Manuals
DIVISION 03 – CONCRETE		
03 01 00	J-U-B	Maintenance of Concrete
03 10 00	J-U-B	Concrete Forms and Accessories
03 20 00	J-U-B	Concrete Reinforcement
03 30 00	J-U-B	Cast-In-Place Concrete
03 35 00	J-U-B	Concrete Finishing
03 39 00	J-U-B	Concrete Curing
03 41 00	J-U-B	Testing Concrete Structures for Watertightness
03 60 00	J-U-B	Grouting
DIVISION 04 – MASONRY		
04 01 00	J-U-B	Maintenance of Masonry
04 10 00	J-U-B	Mortar and Grout
04 30 00	J-U-B	Reinforced Unit Masonry
DIVISION 05 – METALS		
05 04 10	J-U-B	Hot-Dip Galvanizing
05 12 00	J-U-B	Structural Steel
05 50 00	J-U-B	Metal Fabrications
05 51 00	J-U-B	Metal Stairs
05 52 50	J-U-B	Aluminum Handrails and Railings
DIVISION 06 – WOOD, PLASTICS, & COMPOSITES		
06 10 00	J-U-B	Rough Carpentry
06 19 30	J-U-B	Plate Connected Wood Trusses
06 30 00	J-U-B	Wood Preservative Treatment
DIVISION 07 – THERMAL & MOISTURE PROTECTION		
07 11 13	J-U-B	Bituminous Damp Proofing
07 19 00	J-U-B	Water Repellents (Masonry)
07 21 00	J-U-B	Building Insulation
07 41 10	J-U-B	Metal Roof Panels
07 62 10	J-U-B	Sheet Metal Flashing and Trim
07 92 00	J-U-B	Joint Sealants – Architectural

SECTION	RESPONSIBLE ENGINEER OR ARCHITECT	TITLE
07 92 13	J-U-B	Sealants and Caulking
DIVISION 08 – OPENINGS		
08 71 00	J-U-B	Door Hardware
DIVISION 09 – FINISHES		
09 25 00	J-U-B	Gypsum Board
09 90 00	J-U-B	High Performance Coatings
09 91 00	J-U-B	Architectural Painting
DIVISION 11 – EQUIPMENT		
11 53 23	J-U-B	Refrigerated Composite Sampler
DIVISION 14 – CONVEYING SYSTEMS		
14 30 00	J-U-B	Monorail
DIVISION 22 – PLUMBING		
22 05 13	BHE	Common Motor Requirements for Plumbing Equipment
22 05 16	BHE	Expansion Fittings and Loops for Plumbing Piping
22 05 17	BHE	Sleeves and Sleeve Seals for Plumbing Piping
22 05 19	BHE	Meters and Gauges for Plumbing Piping
22 05 23	BHE	General Duty Valves for Plumbing Piping
22 05 29	BHE	Hangers and Supports for Plumbing Piping and Equipment
22 05 48	BHE	Vibration and Seismic Controls for Plumbing Piping and Equipment
22 05 53	BHE	Identification for Plumbing Piping and Equipment
22 07 16	BHE	Plumbing Equipment Insulation
22 07 19	BHE	Plumbing Piping Insulation
22 10 05	BHE	Plumbing Piping
22 10 06	BHE	Plumbing Piping Specialties
22 30 00	BHE	Plumbing Equipment
22 40 00	BHE	Plumbing Fixtures
DIVISION 23 – HEATING, VENTILATION, & AIR CONDITIONING		
23 05 13	BHE	Common Motor Requirements for HVAC Equipment
23 05 29	BHE	Hangers and Supports for HVAC Piping and Equipment
23 05 48	BHE	Vibration and Seismic Controls for HVAC Piping and Equipment
23 05 93	BHE	Testing, Adjusting, and Balancing for HVAC
23 07 13	BHE	Duct Insulation
23 07 16	BHE	HVAC Equipment Insulation
23 31 00	BHE	HVAC Ducts and Casings
23 33 00	BHE	Air Duct Accessories
23 34 13	BHE	Axial HVAC Fans

SECTION	RESPONSIBLE ENGINEER OR ARCHITECT	TITLE
23 34 16	BHE	Centrifugal HVAC Fans
23 34 23	BHE	HVAC Power Ventilators
23 37 00	BHE	Air Outlets and Inlets
23 40 00	BHE	HVAC Air Cleaning Devices
23 82 00	BHE	Convection Heating and Cooling Units
DIVISION 26 – ELECTRICAL		
26 05 05	BHE	Selective Demolition for Electrical
26 05 19	BHE	Low-Voltage Electrical Power Conductors and Cables
26 05 26	BHE	Grounding and Bonding for Electrical Systems
26 05 29	BHE	Hangers and Supports for Electrical Systems
26 05 33.13	BHE	Conduit for Electrical Systems
26 05 33.16	BHE	Boxes for Electrical Systems
26 05 53	BHE	Surface Raceways for Electrical Systems
26 05 73	BHE	Power System Studies
26 05 83	BHE	Wiring Connections
26 09 23	BHE	Lighting Control Devices
26 21 00	BHE	Low-Voltage Electrical Service Entrance
26 22 00	BHE	Low-Voltage Transformers
26 23 00	BHE	Low-Voltage Switchgear
26 24 13	BHE	Switchboards
26 24 16	BHE	Panelboards
26 24 19	BHE	Motor Control Centers
26 27 13	BHE	Electricity Metering
26 27 26	BHE	Wiring Devices
26 27 33	BHE	Power Distribution Units
26 28 13	BHE	Fuses
26 28 16.13	BHE	Enclosed Circuit Breakers
26 28 16.16	BHE	Enclosed Switches
26 32 13	BHE	Engine Generators
26 33 53	BHE	Static Uninterruptible Power Supply
26 36 00	BHE	Transfer Switches
26 36 33	BHE	Connection Cabinets for Portable Generator and Load Banks
26 43 00	BHE	Surge Protective Devices
26 51 00	BHE	Interior Lighting
26 56 00	BHE	Exterior Lighting
DIVISION 31 – EARTHWORK		

SECTION	RESPONSIBLE ENGINEER OR ARCHITECT	TITLE
31 05 16	J-U-B	Aggregate Materials
31 05 19	J-U-B	Geotextiles
31 10 00	J-U-B	Site Clearing
31 11 20	J-U-B	Soil Materials
31 22 13	J-U-B	Rough Grading
31 23 19	J-U-B	Dewatering
31 23 23	J-U-B	Backfilling for Structures
DIVISION 33 – UTILITIES		
33 05 60	J-U-B	Precast Concrete Utility Structures
DIVISION 40 – PROCESS INTERCONNECTIONS		
40 06 10	J-U-B	Pipe and Fittings
40 90 00	Browns Hill	Instrumentation and Controls
40 95 00	Browns Hill	Programmable Logic Controllers
DIVISION 43 – MATERIAL HANDLING EQUIPMENT		
43 05 10	J-U-B	Equipment General Provisions
43 25 04	J-U-B	Dry-Pit Submersible Wastewater Pumps
43 30 00	J-U-B	Hydraulic Process Valves

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SECTION 11 53 23
REFRIGERATED COMPOSITE SAMPLER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerated Composite Sampler.

B. Include all labor, materials, equipment, transportation and services required to furnish and install the miscellaneous specialties shown on the drawings and herein specified.

1.2 RELATED SECTIONS

A. Technical Specifications Section 01

B. Section 01 65 00 – Commissioning of Systems

C. Section 01 73 00 – Installation, Operation and Maintenance Manuals

D. Division 26 – Electrical

E. Division 40 – Process Interconnections

1.3 SUBMITTALS

A. Submit product data per Section 01.

B. Submit shop drawings showing equipment dimensions, weights, materials of construction and assembly.

C. Closeout Submittals: Operations and Maintenance Manual: Provide Equipment Operation and Maintenance Manuals to the Owner per Section 01 73 00.

D. Provide written copies of manufacturer's warranties on products described in this specification section.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacturing of the specified equipment, with a minimum of five (5) years documented experience.

1.5 WARRANTY

A. Equipment supplied under this section shall be warranted to be free from defects in workmanship, design, and materials for a period of one year from the date of Substantial Completion. If any part of the equipment should prove to be defective during the warranty period, the MANUFACTURER shall replace the part at no expense to the OWNER.

PART 2 PRODUCTS

2.1 REFRIGERATED COMPOSITE SAMPLER

A. Manufacturers: Provide refrigerated composite sampler meeting the requirements of this specification from one of the following manufacturers. Manufacturers meeting the requirements of this specification but not listed here may be considered in accordance with the Contract Documents and the Instructions to Bidders.

1. The WAVE™ as manufactured by Emerald Coast Manufacturing, Pensacola Florida 850-469-1142.

2. Engineer's pre-approved equal.

2.2 DESCRIPTION

A. The WAVE™ All-Climate cabinet shall be constructed of high impact and weatherable acrylic/abs body, fiberglass reinforced. All cabinet exterior surfaces shall be UV resistant. The sample containment door shall have a compressible gasket seal and positive mechanical latch. The controller and sample compartments shall be independently lockable. The sampler is suitable for use over a wide range of sampling applications with outstanding corrosion resistance. The refrigeration compartment shall be fully insulated and be able to maintain 4º C within the overall temperature range designed. The refrigeration module shall use 134A refrigerant and have a minimum 1/3 HP compressor with an evaporator fan to circulate the cabinet air. The refrigeration module shall be designed to slide in and out for easy replacement or repair. The cabinet shall be side vented for against the wall placement. All refrigeration lines are protected with phenolic resin coating. All refrigeration coils shall be equipped with an electrocoating system to provide superior corrosion protection. The evaporator coil shall receive an additional Fin-Kote 2 coating to enhance corrosion resistance in high-moisture environments. Cabinet ambient operating temperature range is -20º to 125º degrees F with heater. The inside cabinet temperature is adjusted and displayed on the touch screen. The average cabinet temperature will be shown on the display

B. The refrigerated sampler is suitable for composite sampling. The sampler shall use a single 5-gallon round LDPE polyethylene wide mouth container

C. The sampling system consists of a vacuum/pressure pump, valves integrally controlled by the sampler controller and an intermediate sampling chamber with non-contacting liquid sensor. Pre-purges and post purges are programmable from 1-140 seconds. Under program control, the sample line shall be purged before the sample is pulled through the sampling tube into the intermediate sampling chamber until the liquid is sensed and then the line will be purged again. The maximum vertical lift shall be 29 feet. The sample velocity shall be greater than 3.75 FPS @ 20 feet. The liquid sensor feature shall ensure that long horizontal runs will not affect sampler integrity or accuracy. The maximum horizontal run is 300 feet. Samplers utilizing peristaltic pumps will not be accepted.

D. The sampler shall be factory calibrated. This calibration shall be 7 different points within the range of 20 – 500 mL The calibration will not be affected by the tubing length, this calibration will be ± 3% of the first sample. A sample that requires field calibration and/or multiple samples to reach the correct sample size are not acceptable.

E. The sampler shall automatically adjust to the programmed sample size as programmed into the user interface.

F. The sampler shall utilize a non-contacting liquid sensing feed back to the controller to detect the presence of the liquid during the sample cycle. The liquid sensor is not affected by head height or tubing length. The sampler shall deliver a repeatable sample size, ± 1%. The sample size shall be programmable in one (1) mL increments from the touch screen. Samplers that count pump revolutions and program tubing information in the program is not acceptable.

G. The controller user interface shall consist of a 7" color multi-touch screen through which the user can enter data and scroll through various menus. The color multi-touch screen shall be a 1024 X 600-pixel, 1000 NIT, high-contrast backlit graphical LCD display. The user shall be able to use two fingers to enlarge the screen for easier viewing. The display shall use both text and graphics for user information. The user shall be supplied with a pass code protection feature by which unauthorized program changes and other controller administration features shall be locked against unauthorized access.

H. The sampler controller shall provide for automatic operation of up to eight sampler programs. The active sampling program shall be configurable for immediate start, delayed start, or time/date start. Delayed start shall allow for a preprogrammed delay of from 1 to 9999 minutes. The time/date feature shall prompt the user for entry of a real-time and calendar date at the time of each program initiation.

I. The sampler controller shall provide multiple features. The controller shall have the ability to pull a manual sample by touching manual on the screen without effecting the current programming. It shall have the ability to have weekly programming. It will be able to have a continuous or non-continuous option in the program.

J. A running program may be paused by a full container shut-off, a preprogrammed number of samples, a total elapsed run-time limit or manually. The full container shutoff shall consist of a float switch mounted inside the 5-gallon poly composite container.

K. The pre-programmed number of samples shall be a configurable feature of the active program.

L. The total elapsed time limit shall be a configurable parameter of the active program but shall base its time limits on the real-time clock within the sampler controller, independent of power losses during the active program time.

M. During program execution, samples shall be taken based on one of three programmable schedules: time, flow, or flow plus time. Timed sampling shall be based on either a fixed period in minutes or a random period. Flow sampling may be based on one of two input methods: pulses and 4-20 mA selectable under program control. Flow plus timed sampling shall allow for both timed and flow sampling systems to run concurrently with the first trigger resetting the other. A provision shall be made for flow sampling such that the user supplies flows in real-world units (gallons) without having to perform input source calculations. During program execution, a sample can be manually triggered without affecting the next scheduled sample.

N. The sampler controller shall incorporate a real-time clock with calendar functions, including leap-year. The real-time clock shall be guaranteed to run in the event of total power loss with an estimated life of ten years and shall be used to time-stamp archival records. This archive shall be a permanent record of significant sampling events including program start/stop, manual sampling, refrigeration temperature and each programmed sample acquisition. User shall be able to browse data directly from the touch screen without stopping the current running program.

O. The sampler controller shall be designed to preserve active running states in a non-volatile form during power outages. Program execution shall proceed as normal when power is resumed.

P. During the sampling cycle, the sample line shall be automatically air purged (1-140 sec) before and after each sample with the maximum of 20 PSI. The sample volume shall be programmable between 20-500 ml in 1 ml increments. The sample repeatability shall be nominally ± 1%. The sample strainer and lines shall have 3/8" opening and shall go through the sampling process without any restriction or size reductions.

Q. Data Logging: Time, Temperature(C), Type, Program, Source and Size.

R. Retries: Shall allow the user up to 4 attempts to collect a sample if no sample was detected. The feature is selectable from 0-4 attempts to obtain a sample. An alarm shall be tripped if the sample was unable to be pulled.

S. Rinse Cycle: Shall allow the user to precondition the intake line prior to sample acquisition. The cycles shall be user configurable to allow for varying sampling line lengths and conditions. Up to 4 rinses for each sample collection cycle.

T. Consecutive sampling feature shall be provided to allow the user to preprogram up to 24 consecutive samples for each single sampling event.

U. Alarm output shall be provided to supply a dry-contact relay closure to external equipment in the event of specific sampler controller conditions. The alarm will activate during any of the four conditions that exist. If the bottle is full, program ends and recycle activated, or temperature error.

V. The controller's electronics shall be protected in a totally sealed housing for corrosion and inclement weather. Electronics are located on top of the cabinet covered by a hinged lid. Circuit boards shall be conformal coated for protection from corrosion.

W. The unit shall operate from 115VAC 60 Hz power.

X. The sampling system may be optionally configured for the following three features: Quick Draw Sample, Auxiliary Sampling Output, and Contact Start

1. Quick draw sample allows an external input (Dry Contact) to trigger the sampler to pull an immediate sample.

2. Auxiliary sampling output shall be provided to supply a dry-contact relay closure to external equipment during any sampling cycle.

3. Contact Start input shall be provided to allow an external device to block or enable the sampling input (time, flow, or time + flow). The contact start input shall be further user configurable to be either an enable signal or a start signal. In the event of the enable signal configuration, the sampling input is enabled when the input is active and the internal controller counters are reset when the input is inactive. In the event of the start signal configuration, the sampling input is only blocked until the contact start input goes active for the first time

Y. Spare Parts shall be provided for routine maintenance and operation of sampler for the first two years of operation. Either the recommended schedule of maintenance per the O&M manual or actual historical experience, whichever is greater, will be used to calculate the required number of spare parts to be provided.

2.3 **ACCESSORIES**

A. Provide a non-mercury glass thermometer with a bottle filled with glass beads. Thermometer shall be Digi-Sense item # UX-08077-44.

B. Provide one stainless steel low-profile strainer

C. Provide 50 feet of 3/8” ID X 5/8” OD Heavy Wall PVC suction tubing

D. Provide a liquid level switch for bottle full option, comes with 5-gallon Nalgene bottle

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify adjacent work is complete and ready to receive products.

B. Securely install products at locations shown on the drawings or as directed by the Owner.

C. Install electrical and controls in accordance with the manufacturer’s recommendations and the electrical division of these Technical Specifications.

END OF SECTION

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SECTION 40 06 10
PIPE AND FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and Fitting Systems

B. Pipe Penetration Seals

C. Couplings

D. Mechanical Joint Restraints

E. Thrust Block

F. Hardware

G. Pipe Testing

H. Valve Boxes

I. Location Wire and Marking Tape

J. Appendix A – Pipe System Data Tables

1. PVC01 – Drain pipe to wet well

2. PVC02/03 – Reference Tech Spec 2, Section 102.7 for PVC gravity sewer

3. PVC04/05 – Reference Tech Specs 2, Section 102.7 for PVC pressure sewer

4. PVC10 – Ozone pipe

5. DI02 – All DI pipe in lift station

6. SST01 – Wet well bypass pipe

1.2 REFERENCES

A. ASTM D1330: Standard Specification for Rubber Sheet Gaskets

B. ASTM D5162: Standard Specification for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates

C. ASTM F2164: Standard Specification for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems using Hydrostatic Pressure

D. ASTM F2618: Standard Specification for Chlorinated Poly Vinyl Chloride (CPVC) Pipe and Fittings for Chemical Waste Drainage up to 220°F

E. International Building Code (IBC), current edition adopted by local jurisdiction.

F. Uniform Plumbing Code (UPC), current edition adopted by local jurisdiction.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittal Procedures.

B. Submit manufacturer's certification under provisions of Section 01 33 00 Submittal Procedures that product(s) meet or exceed the specified requirements.

C. Submit manufacturer's installation instructions.

D. Submit shop drawings for all piping four inches in diameter or larger. Shop drawings shall show accurate dimensions of the piping system to be provided including, but not limited to pipe, valves, fittings, connection points to equipment, support system, and appurtenances for all above ground or exposed piping systems. Drawings shall also show connection types. Piping less than four inches in diameter shall be routed as shown on the Plans and to avoid conflicts.

E. Submit restraint calculations for all below ground piping where mechanical restraint will not be provided. Reference Paragraph 2.19 herein.

F. Submit all testing results. Results shall clearly identify which pipe segment was tested (start and end point of piping run), pipe diameter, pipe length, and pipe material. Submitted test data shall include any calculations performed.

1.4 QUALITY ASSURANCE

A. Reference Section 01 40 00 Quality Assurance and Quality Control.

B. The Contract Documents represent the minimum acceptable standards for the Work. All Work shall conform fully in every respect to the requirements of the respective parts and sections of the Contract Documents. The entire unit shall be the Manufacturer's standard product, but shall be modified, redesigned, furnished with special features or accessories, made of materials or provided with finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the Contract Documents.

C. Fabrication shall be done in compliance with all applicable ASTM standards or equivalent international standards.

D. Welding

1. All welders and welding operators shall be qualified by an ASME-approved testing laboratory before performing any welding under this section.

Qualification tests shall be in accordance with Section IX, Article III of the ASME Boiler and Pressure Vessel Code. Welders and welding operators shall be qualified for making groove welds in Type 316L stainless steel pipe in position 6G for each welding process to be used. Welders must be certified and be able to provide proof that less than six months have elapsed since performing a qualified weld.

2. Qualification tests may be waived if evidence of prior qualification is deemed suitable by the Engineer. The manufacturer or Contactor shall retest any welders at any time the Engineer considers the quality of the welder's work substandard. When Engineer requests the retest of a previously qualified welder, the labor costs for the retest will be at the Owner's expense if the welder successfully passes the test. If the welder fails the retest, all cost shall be at the Contractor's sole expense, including any rework required due to substandard work, as defined by the Engineer.

1.5 PROJECT RECORD DOCUMENTS

A. Reference Section 01 70 00 Closeout Requirements.

B. Accurately record actual location of constructed pipe lines, valves, thrust blocks, support systems, and any other component of the piping system in relation to existing permanent benchmarks and/or improvements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 01 60 00 Product Requirements.

B. Unload, store, and load pipe in a manner that prevents shock, damage, or excessive exposure to sunlight and weather.

C. Coated pipe shall be shipped on padded bunks with nylon belt tiedown strips or padded banding.

PART 2 MATERIALS

2.1 GENERAL

A. All piping materials, fittings, solvents, primers, welds, or other products and appurtenances used for potable water applications must comply with NSF 61 and be certified Lead-Free.

B. Definitions

1. Pipe installation conditions:

a. Buried: from first exterior joint outside the structure and continuing below grade. Includes piping under slabs between other transition

points when in direct contact with the soil and piping encased in concrete or CDF that is not integrally connected to the structure.

b. Embedded: from first exterior joint outside of the structure to transition point where pipe becomes "inside/exposed" or "submerged". Includes piping passing through or embedded in concrete walls / slabs of structures, grout fills inside structures, masonry, etc.

c. Inside/Exposed: above slabs (within structures) or above grade (exterior) and exposed to air at all times. After transition from "embedded" or "buried".

d. Submerged: from top of wall downward in a liquid containing structure, after transition from "embedded" or “inside/exposed”.

2. Lining vs. coating:

a. Lining applies only to the interior of the pipe and associated appurtenances. Coating applies only to the exterior of the pipe and associated appurtenances.

3. Restraint:

a. Mechanical restraint: requires the use of an appurtenance or a specific joint type to physically prevent the separation of a joint within the pipe system. Joint types which qualify as mechanical restraint include flanged, socket/solvent welded, butt/fusion welded, welded, threaded, grooved, or Vanstone flanged. Specific mechanical joint restraint appurtenances are described in the pipe system data tables.

b. Soil restraint: sufficient pipe length is provided either side of a joint such that the friction between the soil and the pipe is sufficient to prevent joint separation under the testing conditions for the piping system. A separate appurtenance or specific joint type is not required to physically hold the joint together.

c. Reference Paragraph 2.19 herein for additional information.

4. Wall spools vs. sleeves:

a. Wall spools: connect directly to the process piping and directly convey the process liquid or gas.

b. Wall sleeves: provide an opening for the process pipe to pass through. The annular space between the sleeve and the process pipe shall be filled as required by the Plans.

c. Reference the Plans and Paragraphs 2.6 and 2.7 herein for additional information.

2.2 PIPE SCHEDULE

A. The Pipe Schedule is included in the Plans.

2.3 PIPE MATERIAL, JOINTS, AND FITTINGS

A. Reference the appendices for product data tables.

B. Reference Section 40 05 20 Double Containment Piping for single and double-wall containment chemical piping.

C. Filed modification of fittings is not acceptable.

D. All threaded joints shall utilize PTFE tape.

2.4 GASKETS

A. Reference the appendices for product data tables.

2.5 COUPLINGS

A. Reference the appendices for product data tables.

2.6 WALL SPOOLS

A. Wall spools shall incorporate a statically cast thrust collar ring, which is positions to accommodate cast-in-place concrete placements, as shown on the Plans.

B. ANSI/AWWA C150 and C151, ductile iron with connection end type compatible with connecting piping and valving and coordinated with shop drawings and Plan requirements.

C. Minimum lay length 24 inches or as shown on drawings. 350 minimum working pressure,

D. Lining shall be epoxy to match pipe system DI02.

E. Coating shall be as follows:

CONDITION	COATING SYSTEM REQUIRED[A]
Completely embedded in concrete.	System D-1, "Metal, Concrete Encased"
Partially embedded in concrete and extending into a liquid-containing structure. Includes spools which are partially buried, partially embedded in concrete, and partially extended into a liquid containing structure.[B]	System C-1, "Submerged and Intermittently Submerged Metal"
Partially embedded in concrete and extending into a structure that does not contain liquid. This includes spools which are partially buried, partially embedded in concrete, and partially extended into a non-liquid containing structure.	System B-1, "Interior Metal and Piping, Non-Submerged"
Partially embedded in concrete and extending outside of a structure and are exposed only to air	System A-1, "Exterior Metal and Piping, Non-Submerged"

[A]See Section 09 96 00 High Performance Coatings for additional information.

[B] Unless specifically allowed by the Engineer, all spools which extend into a liquid-containing structure shall be coated with System C-1 even if they are above the maximum water surface elevation.

2.7 WALL SLEEVES

A. Reference the Plans for wall sleeve material and construction requirements.

2.8 PIPE PENETRATION SEALS

A. All modular mechanical penetration seals shall be Model S-316 Link-Seal as manufactured by Garlock, or approved equivalent.

1. Seal Element Material: EPDM synthetic rubber; ASTM D20000 M3 BA 510
2. Hardware shall be 316 SS
3. Seal shall be watertight
4. Seal size shall accommodate inlet piping and sleeve opening
5. Backfill remaining annular space with non-shrink, waterproof grout where indicated on the Plans.

B. Manhole adaptors as called out on the Plans shall be KOR-N-SEAL as manufactured by NPC, Inc. or approved equivalent.

1. Adaptor must meet ASTM C923 specifications.

2. Seal shall provide a flexible watertight seal of the pipe to the manhole or concrete structure. No adhesives or lubricants shall be employed in the installation of the connector into the manhole.

3. All hardware shall be stainless steel. Stainless steel elements of the connector shall be totally non-magnetic Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless. The work screw for tightening the steel band shall be torqued by a break-away torque wrench and set for 60-70 inch/lbs.

4. The connector shall be of a size specifically designed for the pipe material and size being installed.

2.9 THRUST BLOCKS

A. Concrete for thrust blocks shall conform to Section 03 30 00 Cast-in-Place Concrete of these Specifications.

B. Reference the Plans for additional thrust block requirements.

2.10 HARDWARE

A. Unless otherwise shown or specified:

1. All buried nuts, bolts, and washers shall be zinc plated for corrosion protection.

2. Mechanical joint T-bolts shall be lugged (Corten style). All bolts shall be manufactured in accordance with ANSI/AWWA C111/A21.11.

3. Exposed, embedded, or submerged nuts, bolts, and washers shall be 304 or 316 stainless steel.

4. During assembly of interior piping, provide aluminum based anti-seize lubricant on all bolt threads.

2.11 VALVE BOXES

A. Provide adjustable cast iron valve boxes and lid, as shown on the Plans.

B. Provide PVC plastic valve lid insert (beneath the lid) to retain gravel and debris from entering the valve box.

1. Manufacturer: Sealing Systems, Inc. Valve Box Inserts, or equal.

2.12 PIPE SADDLE TAPS

A. For ductile iron pipe, 2- to 30-inch diameter: Ford Style FC202 with double-wide stainless steel band and fusion epoxy coated body, ROMAC Style 202S, or approved equivalent. 150 psi minimum working pressure. Hardware shall be stainless steel.

B. For PVC, CPVC, or polyethylene pipe, 12-inch diameter and smaller, and for chemical service: Spears Manufacturing Company Schedule 80 Clamp-on Saddles or approved equivalent. O-rings shall be compatible with pipe contents. Hardware shall be stainless steel. 150 psi minimum working pressure. Provide socket or threaded outlet connection as required by connecting pipe system. All components of the saddle shall be compatible with the chemical(s) utilized within the process piping.

C. For PVC pipe, up to 30-in diameter, for non-chemical service: Ford Style FC202 with double-wide stainless steel band and fusion epoxy coated body, ROMAC Style 202S, or approved equivalent. 150 psi minimum working pressure. Hardware shall be stainless steel.

D. For stainless steel pipe, Schedule 10S to Schedule 40: ROMAC Style 306 or approved equivalent. All metal components, including hardware, shall be 304 stainless steel. Gasket shall be NBR or as required for compatibility with the process liquid. Saddle shall meet the requirements of ANSI/AWWA C800. Minimum working pressure of 150 psi.

2.13 HOT TAPPING SLEEVE

A. Hot tapping shall only be provided where specifically noted on the Plans or as otherwise deemed acceptable by the Engineer.

B. Hot tapping style stainless steel sleeve shall have a minimum working pressure rating of 150 psi. Sleeves shall be sized to the outside diameter of the existing pipe to be tapped with a water outlet size as called out on the Plans. Fasteners shall be Type 304, Grade 18-8, stainless steel, and be a minimum size of ¾ inch. Tightening nuts shall be positioned on the flange side of the tapping sleeve. Flanges shall conform to AWWA C207, Class D, with 150 lb. drill hole pattern, and be stainless steel, Grade 18 8, Type 304. Gasket material shall be approved for potable water service per NSF standards. Product manufacturer shall be Ford FAST style tapping sleeve, Romac tapping sleeve, or approved equivalent.

2.14 PIPE CAPS

A. Provide mechanically restrained MJ or flanged ductile iron end caps for pipe abandonment, or where specifically noted on the Plans. Pipe caps shall be coated to match the adjacent pipe system. Caps shall meet the requirements of ASTM A536, ANSI/AWWA C153/A21.53, and ANSI/AWWA C111/A21.11.

2.15 LOCATING WIRE AND MARKING TAPE

A. All buried piping shall have marking tape and locating wire. Provide a valve box at pipe termination point for accessing locating wire.

B. Locating Wire:

1. Locating wire used in open trench construction shall be #12 AWG high strength copper clad steel with minimum 450 lb. break load. Wire shall be insulated with high density polyethylene (HDPE) insulation intended for direct bury. Minimum thickness shall be 30 mil. Insulation shall be color coded as described herein.

    a. Manufacturer: Copperhead 1230-HS or equal

2. Wire connectors shall be specifically manufactured for use in underground locate wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion and shall be installed in a manner so as to prevent any uninsulated wire exposure. Non-locking friction fit, twist on (aka wire nuts), or taped connectors are prohibited.

    a. Manufacturer: Copperhead Snakebite Locking Connectors or equal

C. Contractor shall demonstrate correct installation to the engineer by performing a locate/conductivity test for each pipe run.

D. Marking Tape:

1. Material: 75 mm (3 inch), 4 mil polyethylene.

2. Color: marking tape shall be color-coded as described herein.

3. Labeling: Label marking tape with the designated pipe use as described herein using 1-1/2 inch minimum black lettering in all capital letters.

    a. All natural gas, electric power lines, communication/signal lines, potable water, non-potable water, and air lines shall be labeled as such.

    b. Chemical lines shall be custom labeled to reflect the actual chemical contained within the piping. Submit proposed labeling to Engineer for review.

    c. All other process pipe types shall be labeled as “SEWER”.

E. Color Code:

1. Natural gas: yellow

2. Electric power lines: red

3. Communication or signal lines: orange

4. Potable water: blue

5. Non-potable water: purple

6. Chemical: white

7. Air: yellow

8. All other piping: green

2.16 PIPE INSULATION AND JACKETING

A. Match existing insulation and jacketing where connecting to existing systems.

B. Underground Piping:

1. Unless specifically noted otherwise, all buried piping that has less than 4-ft of cover based on final grade shall be provided with DOW Highload 40 insulation in sufficient thickness to equate to 4-ft of bury.

2. Where specifically denoted on the Plans, provide cellular glass pipe insulation. Jacketing shall be precut to fit the contour of the surface to which it is to be applied. Precut sections shall allow for 2-inch overlap. All laps shall be sealed with a glove coat of manufacturer's seal coat. Butt straps shall be identical in all respects and appearance to the basic jacket material. Insulation thickness, and number of layers required, shall be as recommended by the manufacturer to maintain the required temperature noted on the Plans.

a. Manufacturer: Owens Corning FOAMGLAS insulation pipe shells with Owens Corning "PITTWRAP HS Jacketing" or equal.

C. Exterior Exposed and Interior Exposed Piping Insulation

1. Protection against freezing: All exterior exposed piping shall be provided with electric heat trace and insulation unless specifically noted otherwise.

2. Interior exposed piping shall only be provided with insulation where specifically denoted on the Plans.

3. Insulation Requirements:

a. Where operating temperatures are between 0- and 850-degress Fahrenheit, provide performed fiberglass pipe insulation with factory applied all-service vapor-retarder jacket with a self-sealing longitudinal closure lap and butt strips. Insulation thickness, and number of layers required, shall be as recommended by the manufacturer to maintain the required temperature as noted on the Plans. Where nested insulation is utilized, the exposed ends of the insulation shall be coated in mastic. Install in accordance with all manufacturer's requirements and recommendations.

i. Manufacturer: JM Micro-Lok HP, Owens Corning SSL II, or equal.

b. Where flanges, couplings, elbows, tees, or valves prevent the nesting of pipe insulation from creating a continuous seal, provide molded PVC covers. PVC is required to provide a vapor barrier for non-continuously sealed nested insulation under metal jacketing systems.

i. Manufacturer: Zeston 2000/300 fittings, or equal

D. Exterior Exposed and Interior Exposed Piping Insulation Jacket

1. All exterior exposed piping shall be jacketed with an Aluminum, PVC, or stainless-steel jacket, as noted on the Plans.

2. Provide protective jacketing over interior exposed insulation where specifically noted on the Plans.

a. Material:

i. Aluminum: Johns Manville Aluminum Jacket with Ell-Jacs Aluminum Elbow Covers

ii. Stainless Steel: Johns Manville stainless steel Jacket with Ell-Jacs Stainless-Steel Elbow Covers

iii. PVC: UV resistant Zeston 30 mil PVC Jacketing with Zeston 2000/300 fittings, or equal.

2.17 DIELECTRIC UNIONS AND INSULATION FLANGES

A. Dielectric unions or insulating flanges shall be used to separate all dissimilar metal pipe connections and wherever buried ferrous metal pipe transitions to above grade.

2.18 LUBRICANTS

A. Pipe lubricants shall be supplied by the pipe manufacturer. No substitutes for lubricants from other manufacturers will be allowed.

2.19 RESTRAINT

A. Provide restrained joints, unless otherwise specified.

B. Acceptable types of restraint include:

1. Fittings (regardless of location): All fittings shall be restrained by mechanical joint restraint.

2. Valves (regardless of location): All valves shall be restrained by mechanical joint restraint.

3. Dead Ends (regardless of location): All dead ends (e.g., caps, blind flanges…etc.) shall be restrained by mechanical joint restraint.

4. Couplings (regardless of location): All couplings shall be restrained by mechanical joint restraint unless specifically noted otherwise.

    a. For buried pipe, straight coupling joints shall be mechanically restrained unless the coupling does not fall within the required minimum restrained length on both sides of the joint. Where mechanical restraint is required, provide external restraint appurtenance.

5. Buried or Embedded Pipe:

    a. Thrust Blocks: Provide thrust blocks under all buried valves and at other locations specifically indicated on the Plans.. Thrust blocks shown at fittings, valves, and dead ends shall be provided in addition to mechanical joint restraint.

        i. Provide bearing area against undisturbed earth.

        ii. Place thrust blocks such that fitting can be removed at a later date without damage to the pipeline.

        iii. Place concrete so no concrete touches the nuts and bolts of the fitting or valve, and the nuts and bolts can be removed and replaced without removing any concrete.

        iv. Reference the Plans for additional requirements.

    b. Mechanical Restraint: provide mechanical restraint appurtenance at all joints within the calculated minimum restrained length.

    c. Restraint by Soil Friction: restraint due to soil friction is sufficient for all pipe-to-pipe joints outside of the calculated minimum restrained length.

    d. Minimum Restrained Length: The minimum restrained length is a calculated distance from the end of a fitting, valve, or dead end (e.g., cap, blind flange…etc.) for which all joints must be mechanically restrained. Unless otherwise required by local, state, or federal codes and regulations, the minimum restrained length shall be as follows:

        i. For horizontal pipes with four feet of cover and a test pressure of 150 psi, the minimum restrained length shall be as shown in the following table:

Pipe Size (in)	Minimum Restrained Length					
	Fitting Angle				Valve or Dead End	Branch of Tee[a]
	11.25°	22.5°	45°	90°		
4	2	3	5	12	38	0
6	2	4	7	17	53	0
8	3	5	9	22	68	2
10	3	5	11	25	80	14
12	3	6	13	30	93	28
14	4	7	14	33	104	40
16	4	8	16	37	116	52
18	4	9	17	41	126	63
20	5	9	19	44	137	74
24	5	11	21	51	155	93
30	6	12	25	60	180	119
36	7	14	28	68	202	142
42[b]	6	12	25	59	122	89
48[b]	7	13	27	64	131	99

(a) Note, either side of the tee run shall be fully restrained with a mechanical restraint appurtenance for a minimum of 10 feet.

(b) Assumes pipe is ductile iron. If alternate material is used, Contractor shall submit revised minimum restrained length calculations for review by the Engineer.

e. Where the excavation/trench extends into an area that has groundwater at any time of the year, the minimum restrained lengths do not apply, and all joints and fittings shall be fully restrained utilizing mechanical restraint appurtenances.

f. Contractor shall provide additional mechanical restraint appurtenances for pressure testing purposes. Specifically, where plugs are installed for pressure testing, a dead end is created and all joints within the minimum required restrained length from this plug shall be

mechanically restrained. Contractor shall leave the restraints in place upon completion of the pressure test.

g. Where valves, fittings, or other appurtenances are added to an existing pipeline, the Contractor shall mechanically restrain the existing joints for the minimum required restrained length on all sides of the new component.

h. All joints between a tee and a hydrant/hose bibb shall be fully restrained utilizing mechanical restraint appurtenances regardless of the distance between the tee and the hydrant/hose bibb.

i. Listed lengths are based on a test pressure of 150 psi. To compute the length for a different test pressure for bends, valves, or dead ends, use the following equation, where all lengths shall be rounded up to the nearest foot:

$$Length = \left(\frac{Test\ \ Pr\,e\,ssure}{150}\right)\ (Table\ Value)$$

For tees, consult the Engineer for the minimum required restrained length at different test pressures.

j. Listed lengths assume a well graded condition with little to no fines. If conditions are different, verify minimum restrained lengths with supplier.

k. Contractor shall submit calculations for minimum restrained lengths for the following scenarios, at minimum:

i. Non-horizontal pipe installations

ii. Test pressures greater than 150 psi

iii. If the pipe is wrapped in plastic

iv. Bury depth is less than four feet

v. For 42” and 48” pipe, if the pipe material is not ductile iron

vi. For each expansion or contraction (i.e., reducers) in the piping

l. Where the minimum required restrained length is greater than the straight length of pipe available, Contractor shall notify Engineer as alternate means of restraint (e.g., thrust block, thrust collar with anchors…etc.) are required. Contractor shall provide alternate means of restraint at no additional cost to the Owner.

i. For tees where the straight run of piping on the branch is insufficient to provide the minimum restrained length, the

straight run of piping on either side of the tee run may require a longer minimum restrained length than 10 feet. Contractor shall notify the Engineer and provide mechanical restraint appurtenances for the length determined by the Engineer for all sides of the tee at no additional cost to the Owner.

6. Interior, Exposed, and Submerged Pipe:

a. Mechanical Restraint: provide mechanical restraint at all joints.

C. All mechanical restraint appurtenances shall be coated with fusion bonded epoxy, unless specifically noted otherwise.

PART 3 EXECUTION

3.1 GENERAL

A. Pipe and associated appurtenance shall be installed in accordance with good trade practice and in strict accordance with the manufacturer's instructions, recommendations, and requirements. The methods employed in the handling and placing of pipe, fittings, and equipment shall be such as to ensure that after installation and testing they are in good condition, as determined by the Engineer.

B. When pipe installation is not progress, block or plug all openings not actively undergoing connection/installation to prevent debris and wildlife from entering the piping.

C. All pipe and fitting joints shall be restrained. Reference Paragraph 2.19 of this Specification.

3.2 EXAMINATIONS

A. Verify excavation meets the requirements of Section 31 23 16 Excavation.

B. Verify that excavations are to required alignment, grades, dry, and not over excavated.

C. Verify that excavation will allow a minimum pipe cover as shown on the Plans and as described elsewhere in the Specifications.

1. Where specific pipe elevations are not stated and new piping is to be connected to existing pipelines which have less than the minimum required cover: connect to existing pipeline and angle pipe, as necessary, to achieve cover requirements.

2. Where specific pipe elevations are provided, if the cover is less than four feet, provide insulation as described in this Section.

D. Verify materials delivered to the site meet the requirements of these Technical Specifications. Examine materials for defects or damage. Defective or damaged products shall not be incorporated into the Work.

E. Examine existing piping locations and structures where connections are to be made. Notify Engineer of any discrepancies.

F. Verify equipment locations. Notify Engineer, prior to ordering parts, if modifications are required to properly connect the piping to the equipment.

3.3 NATURAL GAS PIPING INSTALLATION

A. Install in accordance with local gas codes and requirements, including the gas provider's requirements for materials, trenching, backfilling, testing, etc.

3.4 PLUMBING INSTALLATION: WATER AND DRAIN PIPING

A. Install horizontal runs at a minimum slope of 1/8-inch per foot, unless noted otherwise, and in accordance with local plumbing codes.

3.5 COMPRESSED AIR (INSTRUMENT AIR) PIPING INSTALLATION

A. Routing of instrument air piping is the responsibility of the Contractor in conformance with Contract Documents. Air piping shall be routed to prevent conflict with all other components of the Work. Piping and fittings must conform to ASME B31.1.

B. Piping and fittings must meet the design temperature, pressure, and environment of the system.

C. Horizontal pipe runs should be installed at a grade of at least one inch per 100 feet and drain valves should provide at low points.

D. Provide isolation ball valves at all branch lines and at each instrument.

E. Provide fittings, pipe hangars, brackets, clamps, dielectric unions, etc. as necessary to route piping to point of use.

F. Contractor is required to provide adequately sized piping/tubing as required to operate the instruments on each branch line. Unless otherwise indicated, provide ½-inch diameter minimum for a line serving a single instrument; 1-inch diameter minimum for any line serving two or more instruments.

G. Unless otherwise noted for underground installation use HDPE or stainless-steel materials.

H. Unless otherwise noted for aboveground installation should use Stainless steel, painted copper, or aluminum.

I. Air-flush all lines prior to connection to instruments or valves.

J. Tubing:

1. Provide HDPE or Polypropylene ½-inch OD x 3/8-inch ID poly tubing between instrument isolation valve and the instrument or valve. Poly tubing shall be no

longer than 3 ft and shall have adequate slack to allow disconnection from the instrument or valve.

2. Contractor shall route tubing such that access to valves, process piping, equipment and electrical components is not limited or obstructed.

3.6 BURIED AND EMBEDDED PIPE INSTALLATION

A. All connections with existing piping or components shall be potholed and checked for material, size, connection type, and space available for connection prior to making the connection. Contractor shall provide all parts necessary for the connection at no additional cost to the Owner. Contractor shall submit verification to the Engineer of all potholes confirming that no conflicts exist, and that Contractor has all parts and equipment required for the connection readily available onsite. Verification shall be submitted at least 24 hours in advance of the planned connection date and time.

B. Contractor shall coordinate all outages and/or shutdowns required for connecting to existing piping currently in use per Section 01 32 17 Work Sequence.

C. Remove all water from excavation.

D. Install pipe in accordance with the manufacturer's recommendations and requirements.

E. Utilize proper tools for cutting and beveling pipe ends. Join pipe using manufacturer's recommended tools designed for this task.

F. Clean and prepare pipe joint using manufacturer's recommended gasket and lubricant.

G. Utilize proper tools to complete joint. For bell and spigot pipe, assure that the plain end is inserted "home" in the bell.

H. Assure that no dirt or other foreign material is allowed in the pipeline. Plug all pipe ends with watertight plugs when leaving the pipe unattended.

I. Complete trenching and backfilling for utilities in accordance with Section 31 23 33 Backfilling and Compacting for Utilities.

J. Install pipe fittings so a constant alignment and grade is achieved through all the pipe and fittings between the elevations stated on the Drawings.

K. Install pipelines to the alignments and grades shown on the Drawings.

L. Properly align pipe perforated slots in trench.

M. Enter and exit through structure walls, floors, and ceilings by using penetrations and seals as shown on the Drawings.

N. Pipes passing beneath or through structure footings/foundations shall have a flexible pipe coupling with longitudinal restraint at each location where a pipe leaves or passes

out from beneath a structure to accommodate potential differential settlement between the structure and pipe. Reference the Drawings for additional information.

3.7 INTERIOR, EXPOSED, AND SUBMERGED PIPING INSTALLATION

A. All connections with existing piping or components shall be checked for material, size, connection type, and space available for connection prior to making the connection. Contractor shall provide all parts necessary for the connection at no additional cost to the Owner. Contractor shall submit verification to the Engineer of all connection points confirming that no conflicts exist and that Contractor has all parts and equipment required for the connection readily available onsite. Verification shall be submitted at least 24 hours in advance of the planned connection date and time.

B. Contractor shall coordinate all outages and/or shutdowns required for connecting to existing piping currently in use per Section 01 32 17 Work Sequence.

C. All piping shall be fully supported at all times during and after installation. Equipment or other connected components shall not bear the weight of the piping. No strain shall be induced within the equipment during, or subsequent to, the installation of pipe work. Reference the Plans and Section 40 05 07 Pipe Supports for additional information.

D. Hanging of any pipe from another is prohibited.

E. In erecting the pipe, a sufficient number of unions or flanged joints shall be used to allow any sections or run of pipe to be disconnected without taking down adjacent runs. The Contractor shall provide additional pipe joints as necessary to facilitate delivery and construction of the piping components at no additional cost to the Owner. All additional joints shall be coordinated by the Contractor to prevent conflict with any component of the Work. Contractor shall submit the locations of additional joints to the Engineer for review for all pipes larger than 2-inch in diameter.

F. Flexible couplings shall be installed where shown on the Drawings. Additional flexible couples shall be provided for ease of installation or removal of the pipe at no additional cost to the Owner. Contractor shall coordinate to prevent conflict with any component of the work. Contractor shall submit the locations of additional flexible couplings to the Engineer for review for all pipes larger than 2-inch in diameter.

3.8 PIPE PENETRATION INSTALLATION

A. All penetrations shall be installed with the associated formwork prior to the concrete pour. Blockouts and pour-backs shall not be acceptable unless prior consent is received from the Engineer. Where allowed, blockouts and pour-backs may require additional Work which shall be at the Contractor’s soul expense.

3.9 PIPING INSULATION INSTALLATION

A. General: Pipe insulation shall be continuous and installed on all fittings and appurtenances unless specified otherwise. Installation shall be with full-length units of

insulation and using a single-cut piece to complete a run. Provide jackets for all pipe insulation.

1. Install material in accordance with the manufacturer's written instructions.

2. Locate insulation and cover seams in least visible locations.

3. Do not apply insulation until pipe tests and heat tracing is completed.

4. Do not apply insulation over flanged joints until piping has been brought up to operating temperature and flange bolts have been fully tightened.

5. Remove material such as rust, scale, dirt and moisture from surfaces to receive insulation.

6. Neatly finish insulation at supports, protrusions, and interruptions.

7. Provide insulated dual temperature with vapor retardant jackets with self-sealing laps. Insulate complete system.

8. Stagger joints on multi-layer insulation.

9. Mix mineral fiber thermal insulating cement with demineralized water when used on stainless steel surfaces.

B. Joints: Joints shall have adjacent sections tightly butted with jackets drawn tight and smoothly cemented down on all longitudinal and end laps. Jacket longitudinal laps shall overlap by at least 1-1/2”, unless noted otherwise by the manufacturer. Butt joints shall be sealed with pressure-sensitive vapor barrier tape.

1. Jacket laps, butt strips, and exposed ends of insulation shall be cement sealed using either adhesive or factory-applied, self-sealing system. Jacket laps shall be smooth and without fishmouths.

C. Laps: Unless noted otherwise by the manufacturer, self-sealing laps (1-1/2” minimum) and butt strips (3” minimum width) shall be used for sealing insulation joints. Staple with outward clinching staples on 4” centers on side laps and 4” on centers to both butted jackets for butt strips. If any open gaps occur, add staples and lagging adhesive or replace jacket totally.

1. For cold applications, provide lagging adhesive on all staples.

D. Insulation Support at Hangers:

1. For all piping 1-1/2” in diameter or larger, provide support shield between piping and hanger to prevent damage to the insulation. Shield shall be fabricated of 14-gauge stainless steel sheet metal, unless specifically noted otherwise. Insulation shields and inserts shall be not less than the following lengths.

1-1/2” to 2-1/2” pipe size	10” long
3” to 6” pipe size	12” long
8” to 10” pipe size	16” long
12” and larger pipe size	22” long

2. Provide vapor barrier per insulation manufacturer’s recommendations to prevent condensation.

E. Sleeves and Wall Chases: Insulation on pipes through walls and floors shall be full size and jacketed same as adjacent insulation. Provide a metal jacket over the insulation on pipe passing through sleeves in non-fire rated walls where caulking is required.

1. Where penetrating interior walls, extend the metal jacket 2 inches out on either side of the wall and secure on each end with a band.

2. Provide adequate support on vertical pipe to prevent slipping.

3.10 PIPING COLOR CODE AND IDENTIFICATION

A. General:

1. Unless required otherwise by the Engineer, all exposed process and building piping and accessories shall be identified and painted as specified herein and in conformance with this specification.

2. The following piping materials need not be completely painted with the basic identification color; colored bands may be provided instead for the following:

a. Stainless steel

b. Chrome-plated piping

c. Interior HDPE Chemical Piping

d. Interior PVC/CPVC Chemical Piping

3. Where piping is to be identified with colored bands, a three-band system shall be used. The background color, as identified on the pipe schedule, shall appear in the left and right-most bands, with the secondary color located in the center. For piping with only a single identifying color, a single colored band shall be provided.

4. All PVC piping that extends to the exterior of buildings/structures (i.e., exposed to UV/sunlight) shall be painted completely. Submit to coordinate color with process identification and architectural elements.

5. The entire exposed surface of all other piping and accessories shall be painted according to the color codes indicated in the pipe schedule.

B. Identification Labels:

1. Identify all exposed piping and all piping on each side of each valve; on each side of a branch; on both sides and adjacent to each wall and floor penetration, and at 15 feet on center (maximum spacing between labels).

2. All chemical piping shall be identified a minimum of two (2) times in each interior room.

3. Identification Label Requirements:

a. Name of service as shown on Plans

b. Flow direction arrows

c. Position identification so that it is readily visible from eye level.

d. Block letters neatly stenciled on the finished insulation or pipe with flat black or white enamel contrasting the background pipe color. Label/Text size shall be as noted below. In some instances, as an alternative to painting of identification, an adhesive decal pipe identification system may be acceptable upon review by the Engineer. Contractor shall submit product information for review by Owner and Engineer as an alternative to painted identification.

SIZE OF LETTERS / ARROWS	
Outside Diameter of Pipe or Covering	**Height of Stencil Letter**
¾" to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1¼"
8" to 10"	2½"
Over 10"	3½"

3.11 PRESSURE TESTING

A. Refer to the Pipe Schedule within the Plans for pipelines which shall be pressure tested, the testing pressure, and testing method.

B. Pressure testing and preparation for pressure testing shall not be done when the temperature is anticipated to be at or below 32°F. Confirm ambient temperatures with Engineer prior to beginning pressure test preparations.

C. Pressure testing shall not be done until all appurtenances required by the Contract Documents, including but not limited to valves, instruments, and pipe supports, have been installed.

D. Pressure taps for test plugs shall be ½-inch FNPT unless otherwise specified.

E. Assure that the trench is properly backfilled and compacted, and thrust blocking has cured for 28 days in order to prevent damage or pipe/fitting movement. Pressure testing shall occur prior to surface restoration and prior to any structure or portion thereof being constructed above the pipe. This may require the pipe to be pressure tested in segments. All pipelines shall pass pressure testing before completing surface repair. If the Contractor chooses to provide surface repair prior to achieving passing pressure tests for all pipes, the Contractor shall bear all costs associated with any additional surface repair which may be required.

F. Provide additional pipe restraint to obtain minimum required restrained length from pipe plugs. See Paragraph 2.19.

G. Remove all construction debris from piping prior to pressure testing. Flush all piping with potable water at a minimum velocity of 2.5 fps. Flushing activities shall continue until flush water appears clean and free of debris, in the opinion of the Engineer. Dispose of water per local, state, and federal requirements.

H. Test Methods:

1. Test Type: G (Gravity)

   a. Per International Plumbing Code if indicated on the Pipe Schedule.

   b. Hydrostatically test the pipeline to 25 psi.

2. Test Type: H (Hydrostatic)

   a. Pressure test HDPE pipe per ASTM F2164-02 “Field Leak Testing of Polyethylene (PE) Pressure Piping Systems using Hydrostatic Pressure”.

   b. For all other pipe materials, fill pipe with water to the pressure shown on piping schedule. Expel all air.

   c. Verify that, in a two-hour (2) test, the pipe does not leak in excess of the allowable leakage, as defined by the following formula:

$$Q = \frac{LD\sqrt{P}}{148{,}000}$$

Where:

Q = allowable leakage (gallons per hour)

L = length of pipe section being tested (feet)

D = nominal pipe diameter (inches)

P = average test pressure during the hydrostatic test (psi)

3. Test Type P (Pneumatic)

   a. Pneumatic testing shall only be allowed where specifically noted as acceptable by the Engineer.

   b. Pneumatic testing, where allowed, shall be per ISPWC Section 501 – Gravity Sewers, Paragraph 3.4.C with pressure as indicated on the Pipe Schedule

4. Certify test results meet these specifications and submit all results and Contractor's certification to the Engineer.

3.12 MANDREL DEFLECTION TESTING

A. If specified in the Pipe Schedule, provide mandrel deflection testing no sooner than 30 days after trench backfill and compaction is completed.

B. Deflection testing shall be conducted and all pipelines shall pass deflection testing before completing surface repair. If the Contractor chooses to provide surface repair prior to achieving passing deflection tests for all pipes, the Contractor shall bear all costs associated with any additional surface repair which may be required.

C. The maximum allowable deflection is to be 5.0% of the nominal pipe diameter.

D. Provide test mandrels with a diameter at least 95% of the actual inside diameter (ID) of the pipe. For pipes with controlled outside diameter, calculate the actual ID of the pipe by taking the average outside diameter (OD) as set by the ASTM standard and subtracting two (2) times the minimum wall thickness as set by the ASTM standard. For pipes with controlled inside diameter, use the ID set by the ASTM standard.

E. Pull the appropriate mandrel through the pipe using one of the following methods:

   1. Pull the mandrel through the pipe by hand. If the pipe will not allow the mandrel to pass, repeat the test from the opposite direction to determine the limits of failure. If the mandrel cannot pass through the entirety of the pipe, the pipe is considered to have failed the deflection test.

   2. As a part of the CCTV inspection, see Section 33 01 00 TV Inspection of Gravity Pipelines, pull the mandrel through the pipe by connecting it in front of the CCTV camera lens at a distance equal to the camera's focal length. Notify Engineer of time and date of test at least 24 hours prior to testing to allow for Engineer, at Engineer's discretion, to witness test. Provide tag line to reverse mandrel and camera should mandrel fail to pass through line. Perform test as a separate step from the CCTV inspection, where required, thus a separate DVD or digital video file record must be made of the mandrel test. Clearly mark tape identifying project name, mandrel test, and the pipe will not allow the mandrel to pass, repeat the test from the opposite direction to determine the limits of failure. If the mandrel cannot pass through the entirety of the pipe, the pipe is considered to have failed the deflection test.

F. Uncover and, if required by the Engineer, remove and reinstall new pipe sections for reaches with excessive deflection (i.e., which have failed the deflection test) or recompact bedding if, in the opinion of the Engineer, existing pipe is not damaged. Retest pipe after any repair work is completed. Do not reinstall damaged pipe.

G. The Owner may conduct additional deflection testing at their own cost prior to expiration of the warranty period. If a pipe is found to have excessive deflection (i.e., fail the deflection test) the Contractor shall uncover and provide new pipe that meets all requirements herein at no additional cost to the Owner. Contractor shall also provide additional testing of the replacement pipe until the pipe passes all required tests at no additional cost to the Owner. Do not reinstall damaged pipe.

3.13 LOCATING WIRE AND MARKING TAPE

A. Place locating wire and marking tape at the locations shown on the plans for the entire length of a pipeline. Repair all cuts and splices in accordance with the manufacturer's recommendations. Assure continuity of all locating wire before submitting final payment. Payment will not be made for pipe where the locating wire does not have electrical continuity.

3.14 DISINFECTION OF POTABLE WATER LINES

A. Provide disinfection of potable water lines in accordance with Section 33 01 11 Disinfection of Water Distribution Lines.

3.15 TOLERANCES FOR SEWER INTERCEPTOR INSTALLATION

A. The sewer interceptor pipe slope shall conform to the slope set forth in the plans. Reverse slope on gravity pipe is prohibited. Manhole flow channels that pond water are unacceptable. Line segments and manholes not meeting these tolerances shall be rejected and replaced at the Contractor’s expense.

B. The horizontal alignment of the pipeline shall conform to +/- 1-foot from true alignment shown on the plans. The pipeline shall also maintain the separation distance requirement from potable water lines shown on the Contract Documents. Line segments not meeting these tolerances and/or requirements shall be rejected and replaced at the Contractor’s expense.

C. The Contractor shall conduct quality control surveys, at each manhole and as needed throughout sewer interceptor installation, to ensure that project requirements and tolerances are satisfied.

APPENDIX A

Pipe System Data Tables

PVCO1

GENERAL DESCRIPTION:	Small-Diameter Gravity PVC Pipe		
SIZE:	Less than or equal to 12-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	PVC	
	MATERIAL STANDARD:	ASTM D1784 Cell Class 12454 ASTM D1785, Type I, Grade 1 (PVC1120)	
	SCHEDULE OR SDR:	Schedule 40	
	PRESSURE RATING OR CLASS:	130 PSI at 73°F	
PIPE JOINTS			
	TYPE:	Solvent weld	
		JOINT STANDARD:	ASTM D2855
		SOLVENT WELD CEMENT STANDARD:	ASTM D2564
		SOLVENT WELD PRIMER STANDARD:	ASTM F656
		PRESSURE RATING:	78 PSI at 73°F
GASKETS			
	N/A		
FITTINGS			
	MATERIAL:	PVC	
		MATERIAL STANDARD:	ASTM D1784 Cell Class 12454
	TYPE:	Socket	
		FITTING STANDARD:	ASTM D2466
		PRESSURE RATING:	78 PSI at 73°F
HARDWARE			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			
1.	Buried pipe shall be installed in accordance with ASTM F 1668.		
2.	Fabricated fittings are not permitted.		
3.	FNPT fitting shall have external stainless steel reinforcing band.		
4.	Solvent welds shall use solvent cement and solvent primer in accordance with the manufacturer's recommendations.		
5.	Sun damaged or discolored pipe is not acceptable.		

PVC01

GENERAL DESCRIPTION:	PVC SDR 35 Gravity Sewer Pipe		
SIZE:	4- through 15-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	PVC	
	MATERIAL STANDARD:	ASTM D3034, Cell Class 12454 or 12364	
	SCHEDULE OR SDR:	SDR 35	
	PRESSURE RATING OR CLASS:	Pipe Stiffness of 46 PSI	
PIPE JOINTS			
	TYPE:	Integral Bell Joint	
		JOINT STANDARD:	ASTM D3212
GASKETS			
	TYPE:	Elastomeric, factory installed	
		GASKET STANDARD:	ASTM F477
FITTINGS			
	MATERIAL:	PVC	
		MATERIAL STANDARD:	ASTM D3034 SDR 35
	TYPE:	Solvent Weld – See Note 3	
		FITTING STANDARD:	ASTM D 1784 cell class 12454-B
	TYPE:	Push-on Gasketed	
			ASTM D3212 and F1336
HARDWARE			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	N/A – Buried Piping		
NOTES			
1.	Buried pipe shall be installed in accordance with ASTM D2321.		
2.	Sun damaged or discolored pipe is not acceptable.		
3.	Solvent weld fittings shall only be utilized on pipe less-than or equal-to 15-inch nominal diameter. Cement and primer shall be compatible with the pipe material and the pipe contents. Solvent weld shall meet the criteria of ASTM D2855.		
4.	Suitable couplings complying with ASTM specifications shall be used for joining dissimilar pipes or two plain ends of similar pipe only where bell and spigot are not available.		

PVC02

GENERAL DESCRIPTION:	Large-Diameter Gravity PVC Sewer Pipe		
SIZE:	18- through 48-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	PVC	
	MATERIAL STANDARD:	ASTM F679	
	SCHEDULE OR SDR:	SDR 35	
	PRESSURE RATING OR CLASS:	Pipe stiffness of 46 PSI	
PIPE JOINTS			
	TYPE:	Integral Bell Gasket	
		JOINT STANDARD:	ASTM D3212
GASKETS			
	TYPE:	Rubber, factory installed	
		GASKET STANDARD:	ASTM F477
FITTINGS			
	MATERIAL:	PVC, gasketed	
		MATERIAL STANDARD:	ASTM D3034, SDR 35 Wall Thickness
		FITTING STANDARD:	ASTM F1336
HARDWARE			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	N/A – Buried Piping		
NOTES			
1.	Buried pipe shall be installed in accordance with ASTM D2321.		
2.	Sun damaged or discolored pipe is not acceptable.		

PVC03

GENERAL DESCRIPTION:	Small-Diameter Pressure PVC Pipe		
SIZE:	Less than or equal to 8-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	PVC	
	MATERIAL STANDARD:	ASTM D1785 Type 1, Grade 1 (PVC 1120)	
	SCHEDULE OR SDR:	Schedule 80	
	PRESSURE RATING OR CLASS:	250 PSI at 73°F	
PIPE JOINTS			
	TYPE:	Solvent Weld	
		JOINT STANDARD:	ASTM D2855
		SOLVENT WELD CEMENT STANDARD:	ASTM D2564, See Note 5
		SOLVENT WELD PRIMER STANDARD:	ASTM F656, See Note 5
		PRESSURE RATING:	150 PSI at 73°F
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	PVC	
		MATERIAL STANDARD:	ASTM D1784
	TYPE:	Socket, See Note 3	
		FITTING STANDARD:	ASTM D2467
		PRESSURE RATING:	150 PSI at 73°F
	TYPE:	Threaded, See Note 3	
		FITTING STANDARD:	ASTM D2464
		PRESSURE RATING:	125 PSI at 73°F
	TYPE:	Van Stone Flange, See Note 3	
		FITTING STANDARD:	ASTM D2467
		PRESSURE RATING:	150 PSI at 73°F
HARDWARE			
	Hardware shall be 304SST or as required to be chemically compatible with the liquid to be contained within the piping.		
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			
1.	Buried pipe shall be installed in accordance with ASTM F 1668 and ASTM D2774.		
2.	Piping, solvent cement, solvent primer, and all other appurtenances shall be certified ANSI/NSF-61 lead free for potable water service applications.		

GENERAL DESCRIPTION:	Small-Diameter Pressure PVC Pipe
SIZE:	Less than or equal to 8-inch nominal diameter
NOTES	
3.	Fitting types shall be as follows, unless specifically noted otherwise: a. Socket fittings shall be provided for all buried applications. b. Threaded fittings shall be provided only where specifically indicated on the plans, or as required for connection to system components. FNPT fitting shall have external SS reinforcing band. Threaded fittings shall not be allowed for sodium hydroxide applications. c. Flanged fittings shall be provided only where necessary to connect to valves or other appurtenances in the piping system. Socket unions shall be used preferentially to Van Stone flanges.
4.	Fabricated fittings are not permitted.
5.	For chemical service: solvent welds shall use a solvent cement and primer that are compatible with the chemical being conveyed in the specific process piping. Submit product information and chemical compatibility. Contractor is ultimately responsible for ensuring chemical compatibility.
6.	Clear PVC (where required on the Plans) shall be UV resistant SCH. 80, “Near Water Clear” as manufactured by Harvel, or approved equal.
7.	Sun damaged or discolored pipe is not acceptable.

PVC04

GENERAL DESCRIPTION:	Buried Pressure PVC Pipe		
SIZE:	4- through 48-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	PVC	
	MATERIAL STANDARD:	ANSI/AWWA C900, ASTM D1784 Class 12454	
	SCHEDULE OR SDR:	DR 25 (up to 48" diameter) DR 18 (up to 30" diameter and where specifically required)	
	PRESSURE RATING OR CLASS:	CL 165 PSI (up to 48" diameter) CL 235 PSI (up to 30" diameter and where specifically required)	
PIPE JOINTS			
	TYPE:	Bell and Spigot Ends	
		JOINT STANDARD:	ASTM D3139
		PRESSURE RATING:	165 PSI (unless specifically noted otherwise)
GASKETS			
	TYPE:	Rubber, factory installed	
		GASKET STANDARD:	ASTM F477
FITTINGS			
	MATERIAL:	Ductile Iron	
		MATERIAL STANDARD:	ANSI/AWWA C111/A21.11
	TYPE:	Mechanical	
		FITTING STANDARD:	ANSI/AWWA C110/A21.10 OR C153/A21.53
		PRESSURE RATING:	350 PSI (up to 24" diameter) 250 PSI (30"- 48" diameter)
HARDWARE			
	Hardware shall be 304SST or as required to be chemically compatible with the liquid to be contained within the piping.		
LINING (FITTINGS ONLY)			
	MATERIAL:	Ceramic epoxy Protecto 401 (amine cured Novalac Epoxy), as manufactured by Pacific States Cast Iron Pipe Company; 40 mils nominal dry film thickness. See Note 3 for Potable Water Applications.	

GENERAL DESCRIPTION:	Buried Pressure PVC Pipe	
SIZE:	4- through 48-inch nominal diameter	
COATING (FITTINGS ONLY)		
	MATERIAL:	Asphaltic coating per ANSI/AWWA C151/A21.51 and ANSI/AWWA C110/A21.10; 1 mil nominal dry film thickness.
MECHANICAL RESTRAINT APPURTENANCES		
	PRODUCT:	Wedge action joint restraint glands shall be rated at 350 psi with a 2:1 safety factor. Gland shall be fusion bonded epoxy coated, minimum dry film thickness 20 mils.
	PRODUCT:	PVC Bell and Spigot Push-On Pipe: EBAA Iron, Inc. Series 1900 or 2800 Megalug, or equivalent. Coat with Mega-Bond liquid thermoset epoxy coating per manufacturer's requirements.
	PRODUCT:	MJ Fittings: EBAA Iron, Inc. Series 2000PV or 2200 Megalug, or equivalent. Coat with Mega-Bond liquid thermoset epoxy coating per manufacturer's requirements.
NOTES		
1.	Buried pipe shall be installed in accordance with ASTM F 1668 and ASTM D2774.	
2.	Unless specifically noted otherwise, integral pipe color shall be blue for potable water, purple for non-potable water (i.e., utility water), and green for all other sewer or process services.	
3.	Protecto 401 shall not be used with potable water. Provided standard thickness cement-mortar lining following ANSI/AWWA C104/A21 for potable water applications. Provide Induron Ceramapure PL 90 lining when noted as epoxy-lined pipe/ fittings for potable water applications.	
4.	Sun damaged or discolored pipe is not acceptable.	

PVC10

GENERAL DESCRIPTION:	Pressure CPVC Pipe		
SIZE:	½- through 8-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	Chlorinated Polyvinyl Chloride (CPVC)	
	MATERIAL STANDARD:	ASTM D1784, Cell Classification 23447 ASTM F441, Type IV, Grade 1	
	SCHEDULE OR SDR:	Schedule 80	
	PRESSURE RATING OR CLASS:	250 PSI at 73°F	
PIPE JOINTS			
	TYPE:	Solvent Weld	
		JOINT STANDARD:	ASTM F439
		SOLVENT WELD CEMENT STANDARD:	ASTM F493, See Note 5
		SOLVENT WELD PRIMER STANDARD:	ASTM F656, See Note 5
		PRESSURE RATING:	250 PSI at 73°F
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	CPVC	
		MATERIAL STANDARD:	ASTM F439 ASTM D1784 Cell Classification 23447
	TYPE:	Socket, See Note 3	
		FITTING STANDARD:	ASTM F439
		PRESSURE RATING:	150 PSI at 73°F
	TYPE:	Threaded, See Note 3	
		FITTING STANDARD:	ASTM F439
		PRESSURE RATING:	125 PSI at 73°F
	TYPE:	Van Stone Flange, See Note 3	
		FITTING STANDARD:	ASTM F441
		PRESSURE RATING:	150 PSI at 73°F
HARDWARE			
	Hardware shall be 304SST or as required to be chemically compatible with the liquid to be contained within the piping.		
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		

GENERAL DESCRIPTION:	Pressure CPVC Pipe
SIZE:	½- through 8-inch nominal diameter
NOTES	
1.	Buried pipe shall be installed in accordance with ASTM F 1668 and ASTM D2774.
2.	Piping, solvent cement, solvent primer, and all other appurtenances shall be certified ANSI/NSF-61 lead free for potable water service applications.
3.	Fitting types shall be as follows, unless specifically noted otherwise: a. Socket fittings shall be provided for all buried applications. b. Threaded fittings shall be provided only where specifically indicated on the plans, or as required for connection to system components. FNPT fitting shall have external SS reinforcing band. Threaded fittings shall not be allowed for sodium hydroxide applications. c. Flanged fittings shall be provided only where necessary to connect to valves or other appurtenances in the piping system. Socket unions shall be used preferentially to Van Stone flanges.
4.	Fabricated fittings are not permitted.
5.	For chemical service: solvent welds shall use a solvent cement and primer that are compatible with the chemical being conveyed in the specific process piping. Submit product information and chemical compatibility. Contractor is ultimately responsible for ensuring chemical compatibility.
6.	Sun damaged or discolored pipe is not acceptable.

PE01

GENERAL DESCRIPTION:	Buried Small-Diameter High Density Polyethylene Pipe (HDPE)		
SIZE:	Less than or equal to 3-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	HDPE, PE 4710	
	MATERIAL STANDARD:	AWWA C901, ASTM F 714	
	SCHEDULE OR SDR:	DR 9 (minimum)	
	PRESSURE RATING OR CLASS:	250 PSI	
PIPE JOINTS			
	TYPE:	Socket Fusion Weld	
		JOINT STANDARD:	ASTM F2620
		PRESSURE RATING:	250 PSI
	TYPE:	Butt Heat Fusion Weld	
		JOINT STANDARD:	ASTM D3261
		PRESSURE RATING:	250 PSI
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	HDPE	
		MATERIAL STANDARD:	ASTM D3350, ASTM D3035
	TYPE:	Socket Fusion Weld	
		FITTING STANDARD:	ASTM D2683, ASTM D3035
		PRESSURE RATING:	250 PSI
	TYPE:	Butt Heat Fusion Weld	
		FITTING STANDARD:	ASTM D3261
		PRESSURE RATING:	250 PSI
HARDWARE			
	See Paragraph 2.10 of this Specification Section.		
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			
1.	Pipe shall conform to the outside-diameter dimensions for iron pipe size (IPS).		
2.	Brass compression couplings or pack joints with stainless steel inserts shall be provided in lieu of stainless steel where specifically noted on the Plans. Manufacturer shall be Ford, Mueller, or approved equal.		
3.	No joints, other than butt heat fusion weld joints, are allowed beneath building slabs and foundations.		
4.	Sun damaged or discolored pipe is not acceptable.		

PE02

GENERAL DESCRIPTION:	Buried Large-Diameter High Density Polyethylene Pipe (HDPE)		
SIZE:	4- through 36-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	HDPE	
	MATERIAL STANDARD:	AWWA C906, ASTM D3035, ASTM F714	
	SCHEDULE OR SDR:	DR 11 (minimum)	
	PRESSURE RATING OR CLASS:	200 psi (minimum)	
PIPE JOINTS			
	TYPE:	Butt Heat Fusion Weld	
		JOINT STANDARD:	ASTM D3261
		PRESSURE RATING:	250 PSI (DR 9); 200 PSI (DR 11)
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	HDPE, PE4710	
		MATERIAL STANDARD:	ASTM 3350
	TYPE:	Butt Heat Fusion Weld	
		FITTING STANDARD:	ASTM D3261
		PRESSURE RATING:	200 PSI (DR 11)
HARDWARE			
	See Paragraph 2.10 of this Specification Section.		
NOTES			
1.	Sun damaged or discolored pipe is not acceptable.		

DI01, DI02, DI03 & DI04

GENERAL DESCRIPTION:	Ductile Iron Pipe		
SIZE:	3- through 48-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	Ductile Iron	
	MATERIAL STANDARD:	ANSI/AWWA C150/A21.50 ANSI/AWWA C151/A21.51 (mechanical, grooved, and push-on joints) ANSI/AWWA C115/A21.15 (flanged)	
	SCHEDULE OR SDR:	See Note 2	
	PRESSURE RATING OR CLASS:	350 PSI, See Note 10	
PIPE JOINTS – See Note 4			
	TYPE:	Push-on (3”-36”)	
		JOINT STANDARD:	ANSI/AWWA C111/A21.11
		PRESSURE RATING:	350 PSI
	TYPE:	Mechanical (3”-24”)	
		JOINT STANDARD:	ANSI/AWWA C110/A21.10 OR C153/A21.53
		PRESSURE RATING:	350 PSI (3”-24”)
	TYPE:	Flanged (3”- 48”)	
		JOINT STANDARD:	ANSI/AWWA C115/A21.15 ANSI B16.1
		PRESSURE RATING:	250 PSI (minimum)
	TYPE:	Grooved (3”-36”)	
		JOINT STANDARD:	AWWA C606 (3”-24” diameter), See Note 11
		PRESSURE RATING:	150 PSI (minimum)
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS – See Note 4			
	MATERIAL:	Ductile Iron	
		MATERIAL STANDARD:	ANSI/AWWA C150/A21.50 ANSI/AWWA C151/A21.51 (mechanical, grooved, and push-on joints) ANSI/AWWA C115/A21.15 (flanged)
	TYPE:	Mechanical (4”-48”)	

GENERAL DESCRIPTION:	Ductile Iron Pipe		
SIZE:	3- through 48-inch nominal diameter		
FITTINGS – See Note 4			
		FITTING STANDARD:	ANSI/AWWA C110/A21.10 OR C153/A21.53
		PRESSURE RATING:	350 PSI
	TYPE:	Flanged (3”- 48”)	
		FITTING STANDARD:	ANSI/AWWA C115/A21.15
		PRESSURE RATING:	250 PSI (minimum)
	TYPE:	Grooved (3”-36”) – See Note 9	
		FITTING STANDARD:	AWWA C606, See Note 11
		PRESSURE RATING:	150 PSI (minimum)
HARDWARE			
	See Paragraph 2.10 of this Specification Section.		
LINING (PIPE AND FITTINGS)			
DI01			
	MATERIAL:	Cement mortar	
		MATERIAL STANDARD:	ANSI/AWWA C104/A21.4
DI02			
	MATERIAL:	Epoxy	
		MATERIAL STANDARD:	See Note 6
DI03			
	MATERIAL:	Glass Lining	
		MATERIAL STANDARD:	See Note 7.
DI04			
	MATERIAL:	Unlined	
		MATERIAL STANDARD:	N/A
COATING (PIPE AND FITTINGS)			
INSTALLATION CONDITION			
	BURIED:	Exterior coated with asphaltic coating. ANSI/AWWA C151/A21.51 and ANSI/AWWA C110/A21.10 ANSI/AWWA C153/A21.53; 1 mil.	
	EMBEDDED:	See Note 1.	
	INSIDE/EXPOSED:	See Note 1.	
	SUBMERGED:	See Note 1.	
MECHANICAL RESTRAINT APPURTENANCES			
	PRODUCT:	Mechanical Joints: EBAA Iron, Inc. Series 1100 Megalug or approved equivalent. Less than or equal 16” diameter – 350 psi rating, 2:1 safety factor. Greater than 16” diameter – 250 psi rating, 2:1 safety factor. Coat with Mega-Bond liquid thermoset epoxy coating per manufacturer’s requirements.	

GENERAL DESCRIPTION:	Ductile Iron Pipe	
SIZE:	3- through 48-inch nominal diameter	
	PRODUCT:	Push-On Pipe Joints (up to 24" diameter): Field-Lok gaskets as manufactured by US Pipe, SureStop 350 gaskets as manufactured by McWane Ductile, or approved equal. Gasket shall be from the same manufacturer as the pipe.
MECHANICAL RESTRAINT APPURTENANCES		
	PRODUCT:	Grooved Joints: Victaulic Grooved Coupling Style 31, with Grade M FlushSeal gasket, and primed with phenolic alkyd primer or as required to coordinate with pipe coating system.
NOTES		
1.	See Section 09 96 00 High Performance Coatings for coating requirements. See pipe schedule for color. Reference Paragraph 2.6 for clarification on coating systems to be used for various installation locations, in particular, locations where a single spool of pipe has multiple installation conditions.	
2.	Pipe class (i.e., wall thickness) shall be as required to accommodate the required joint type, working pressure, and test pressure. Reference the Pipe Schedule for test pressure requirements.	
3.	Where taps are shown on fittings, tapping bosses shall be provided.	
4.	Unless specifically noted otherwise, the following pipe and fitting joints shall be provided at the locations indicated: a. Buried: Push-on, Mechanical, or Flanged b. Embedded: Mechanical or Flanged c. Submerged: Flanged Inside/Exposed: Flanged or Grooved	
5.	Gray-iron threaded flanges shall not be permitted.	
6.	Protecto 401 shall not be used with potable water. Provide Induron Ceramapure PL 90 lining for potable water applications requiring epoxy lining.	
7.	Glass Lining Requirements for Ductile Iron Pipe and Fittings: i. Glass-lined ductile iron pipe shall be manufactured per ASTM B1000. ii. The glass lining applied to pipe and fittings shall be vitreous material that is hard, smooth, continuous, and formulated to prevent the adherence of grease in sludge and scum lines, and to resist the adherence of crystalline metal salt deposits (Struvite and Vivionite) to sludge and centrate lines. It shall be applied to properly prepared pipe and fittings using accepted industry standards, and shall be tested per applicable standards, including ASTM D-5162-01, NACE RP 0188-99, and SSPC Coating Manual, Volume 1, Section XIV. iii. Lining shall be U.S. Pipe SG-14, Fast Fabricators/Waterworks Manufacturing MEH-32, or approved equal. iv. The applicator shall have a minimum of 5 years of successful experience in the application of high temperature glass and porcelain coatings. v. The lining material shall consist of vitreous and inorganic material applied to the internal surfaces that have been prepared by blasting. The lining shall be applied in a minimum of two (2) coats, separately applied and separately fired. The items shall be exposed to a maturing	

GENERAL DESCRIPTION:	Ductile Iron Pipe
SIZE:	3- through 48-inch nominal diameter
	temperature of approximately 1400° F, at which point the vitreous and inorganic materials melt and fuse to the base metal, forming an integral molecular bond with the base metal surface. Subsequent coatings will be in similar manner, forcing an integral molecular bond with the base coat. The entire finished coating shall be a minimum of 10 mils (.010) and a maximum of 25 mils (.025") as tested with a micro test or other acceptable dry film thickness gauge. The finished lining shall be able to withstand a strain of 0.001 inch/inch (the yield point of the base metal) without damage to the glass. vi. The lining shall have a hardness of 5-6 on the MOHS scale, and a density of 2.5-3.0 grams per cubic centimeter as measured by ASTM D-792. The glass lining shall be capable of withstanding an instantaneous thermal shock of 350° F. differential without crazing, blistering or spalling. It shall be resistant to corrosion of between PH-3 and PH-10 at 125° F. There shall be no- visible loss of surface gloss to the lining after immersing a production sample in an 8 percent sulfuric acid solution at 148° F for a period of 10 minutes. When tested according to ASTM C-283, it shall show a weight loss of not more than 3 milligrams per square inch. vii. Per ASTM D-5162-01, NACE RP 0188-99, and SSPC Coating Manual, Volume 1, Section XIV, the glass lining shall be tested by “low voltage, wet sponge, non-destructive holiday detection unit,” with only isolated voids permitted due to casting anomalies and which represent less than 0.01 percent of the total glassed surface. Test procedure and acceptance criteria shall be per the attachment “MP-9.2, Porcelain Enamel Continuity Testing,” and documentation shall be furnished with each shipment of material listing the test results by identifying "mark or “tag” numbers. viii. For flanged and grooved piping, the finished glass lined pipe shall not deviate more than 0.01875 inch per foot of length from a centerline perpendicular to the square pipe end or flange face. For bell and spigot piping, the finished glass lined pipe shall not deviate more than 0.03125 inch per foot of length from a centerline perpendicular to the square pipe end. ix. Handle pipe according to lining manufacturer’s recommendations. x. Taps and welds shall be done before lining. Field cut and repair field cuts in accordance with manufacturer’s recommendations.
8.	Pipe manufacturer shall be McWane Ductile, U.S. Pipe, or approved equal.
9.	Mechanical grooved pipe couplings and fittings, as manufactured by Victaulic Company of America or approved equivalent. Grooved pipe couplings and fittings shall conform to the following requirements. Grooved end product manufacturer to be ISO-9001 certified. Grooved flange adapter: Coupling shall be a Victaulic Style 341 grooved flange adapter or approved equivalent. The coupling shall have a ductile iron body with nitrile gaskets or orange enamel coating and 316 SS bolts and nuts.
10.	All flanged ductile iron pipe shall be rated to 250 PSI, unless specifically noted otherwise. Where required, flanged pipe with a nominal diameter less than or

GENERAL DESCRIPTION:	Ductile Iron Pipe
SIZE:	3- through 48-inch nominal diameter
	equal to 24 inches shall be rated to 350 PSI by using a specialty gasket whose rating is supported by performance testing as described by AWWA C115.
11.	Pipe barrels shall conform to the requirements of ANSI/AWWA C151/A21.51 (minimum class 53, subject to manufacturing tolerances and additional wall thickness for larger diameters, as may be required).

SST01

GENERAL DESCRIPTION:	Large-Diameter Type 304L Stainless Steel Pipe		
SIZE:	2- through 30-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	304L Stainless Steel	
	MATERIAL STANDARD:	ANSI B36.19 ASTM A312, seamless pipe	
	SCHEDULE OR SDR:	10s	
	PRESSURE RATING OR CLASS:	150 PSI (minimum)	
PIPE JOINTS – See Note 5			
	TYPE:	Butt Weld – See Note 4	
		JOINT STANDARD:	See Note 4
		PRESSURE RATING:	150 PSI (minimum)
	TYPE:	Van Stone Flange	
		JOINT STANDARD:	Class 150 or Class 300 Van Stone type flanges with stainless steel stub ends, ASTM A240 Type 316L “as-welded grade”, conforming to MSS SP 43, wall thickness same as pipe.
		PRESSURE RATING:	150 PSI (minimum)
	TYPE:	Grooved	
		JOINT STANDARD:	AWWA C606
		PRESSURE RATING:	150 PSI (minimum)
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS – See Note 5			
	MATERIAL:	304L Stainless Steel, 10s	
		MATERIAL STANDARD:	ASTM A403, Grade WP304L, Class W
	TYPE:	Butt Weld – See Note 2, Note 4	
		FITTING STANDARD:	Dimension per MSS SP-43 and ANSI B16.9.
		PRESSURE RATING:	150 PSI (minimum)
	TYPE:	Grooved – See Note 3	
		FITTING STANDARD:	AWWA C606
		PRESSURE RATING:	150 PSI (minimum)
	TYPE:	Van Stone Flange	
		FITTING STANDARD:	Class 150 or Class 300 Van Stone type flanges with stainless steel stub ends, ASTM A240 Type 316L “as-welded grade”,

GENERAL DESCRIPTION:	Large-Diameter Type 304L Stainless Steel Pipe		
SIZE:	2- through 30-inch nominal diameter		
			conforming to MSS SP 43, wall thickness same as pipe.
		PRESSURE RATING:	150 PSI (minimum)
FITTINGS – See Note 5			
	TYPE:	Flange	
		FITTING STANDARD:	Type: Forged stainless steel, ASTM A182, Grade F316, lap joint flange with stainless steel stub end, ASTM A240, Type 316L, welded grade conforming to MSS-SP43; schedule and size to match pipe. Faced and drilled ANSI Class 150, 1/16-inch raised face.
HARDWARE			
	See Note 8.		
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			
1.	Pipe designated for vacuum service on the drawings shall be designed for and subject to full vacuum. Calculations showing that the selected wall thickness is acceptable for the service conditions shall be prepared and submitted. Minimum schedule 10S required.		
2.	Tees shall have no welds in the throat area and the crotch shall be reinforced with long radius design to eliminate sharp corners. Branch connections may include wrought tees or reducing tees, forged commercial welding branch fittings, extruded reducing branches, or weld-o-lets. Forged commercial welding branch fittings with butt welded outlet shall be stainless steel, in conformance with ASTM A182, Grade F316L, with schedule and material to match connected piping. No repair welding shall be performed on forged fittings without prior approval of the Engineer. Branches may be formed by an extrusion method (pulled) from pipe, where the extruded branch connections are less than 75 percent of the nominal diameter of the pipe. For extruded branch connections greater than 75 percent of the nominal diameter of the pipe, provide external reinforcing saddle strap if pipe working pressure is greater than 50 psi. Weld-o-lets may be used for connections up to 1/2-inch maximum. Construction shall match the connected pipe size, schedule, and FNPT outlet.		
3.	When used with Schedule 10S pipe, the groove shall be cut or rolled into a Schedule 40 spool piece to be welded to the pipe. The Schedule 40 spool piece		

GENERAL DESCRIPTION:	Large-Diameter Type 304L Stainless Steel Pipe
SIZE:	2- through 30-inch nominal diameter
	shall be taper bored at a 3:1 slope to provide a smooth transition of inside diameters. Machine grooves into pipe end (Schedule 40, minimum) in accordance with grooved fitting manufacturer's recommended dimensions, tolerances, and finishes. Roll cutting of grooves into piping will be permitted on minimum Schedule 40 pipe. The interior pipe wall shall be smooth and free of crevices, gouges, or other anomalies.
4.	Shop Fabricated Assemblies: • Shop fabricated assemblies shall be butt welded. • All welding shall be performed in the shop in accordance with the latest editions of Section IX of the ASME Boiler and Pressure Vessel Code and ASME Code for Pressure Piping, ASME B31.3 (normal service), as applicable. • All welds shall have 100 percent penetration. The internal weld bead shall be small, smooth and continuous with no crevices, pits or other voids. The external weld bead shall be well rounded, smooth and continuous with no anomalies. • All welded connections shall be parallel and perpendicular to the extent that the piping appears to be correct to the naked eye. • Procedure: o Pipe edges shall be prepared by machine cutting or shaping using an aluminum oxide blade. Beveled ends shall conform to the requirements of ANSI B16.9. o Clean weld joints and weld joint areas both before and after welding in accordance with ASTM A380 using stainless steel wire brushes or stainless steel wool. • Alignment: o Align ends to be joined within commercial tolerances on diameter, wall thickness, and out-of-roundness. o When joining pipes of different wall schedule, taper bore the interior of the larger schedule pipe to match the interior diameter of the connecting pipe with a maximum 1:3 slope. o Root opening at the joint shall be as stated in the procedure specification. • Welding: o The direct current, straight polarity, gas tungsten-arc (GTAW) process shall be used for all welding. Welding may be by manual GTAW or automatic (orbital) GTAW processes. o The inside of the pipe shall be purged with Argon gas during welding and while the weld is cooling to prevent oxidation of the weld. • Tack Welds: o All tack welds shall be made by a qualified welder. o All tack welds shall be made with welding rod the same as that used for the succeeding root pass. o Tack welds shall be small enough to be readily fused into the bead of the root pass.

GENERAL DESCRIPTION:	Large-Diameter Type 304L Stainless Steel Pipe
SIZE:	2- through 30-inch nominal diameter
	○ Thoroughly clean tack welds with a stainless steel wire brush prior to the root pass to prevent pinholing or excessive porosity. ○ Tack welds, which have cracked, shall be completely removed prior to making the root pass. ○ Surface defects, which will affect the soundness of the weld, shall be removed, visually inspected, and re-welded. ○ Where permitted, branch connections shall be fitted and groove-welded in accordance with the details described and shown in Chapter V of ASME B31.3.
5.	For connections requiring field assembly: • Welded: Field welding of stainless steel piping connections will not be allowed. ○ Van Stone Flanges: Flanges shall be provided preferentially for all pipe-to-pipe joints. ○ Threaded: For connections to weld-o-let outlet for instrument or sample taps only. ○ Union Fittings: Where noted or shown. ○ Flanged: For connections to flanged devices, or where otherwise noted or shown. ▪ Type: Forged stainless steel, ASTM A182, Grade F316, lap joint flange with stainless steel stub end, ASTM A240, Type 316L, welded grade conforming to MSS-SP43; schedule to match pipe. ▪ Dimensions: To match connected piping, faced and drilled ANSI Class 150, 1/16-inch raised face, unless otherwise shown or required for connection to equipment. ○ Groove Fittings: Where noted or shown. ▪ LIQUID SERVICE: • *Style: Segmented and bolted. Victaulic, Style 77; or equal* • Victaulic Style 232S restrained flexible coupling with EPDM gasket ▪ AIR SERVICE: • *Victaulic Style 232S restrained flexible coupling with silicone gaskets suitable for use with air and rated to 300°F.*
6.	CLEANING, DESCALING, PICKLING AND PASSIVATING • All stainless steel piping, fabrications, fittings and assemblies shall be shop fabricated and shall be cleaned, descaled, pickled and passivated per ASTM A380-06, ASTMA967-05 and Ferroxyl Inspected per ASTM A967-05. ○ Pickling: Process shall be by immersion method. Spray methods shall not be allowed. Fabrication size shall be constructed and coordinated with the Pickle/Passivation process such that the fabrications can be completely immersed. Contact time shall be minimum of four hours.

GENERAL DESCRIPTION:	Large-Diameter Type 304L Stainless Steel Pipe
SIZE:	2- through 30-inch nominal diameter
	○ Passivation: Rinsing must be done directly following pickling so solution does not dry. Rinsing shall use water with chloride content less than 25 mg/L. Contact with air to create passive film on the surface. Repeat pickling/passivation process if foreign material or scale has not been removed. ○ Inspection: Provide written certification that all parts have been cleaned, pickled and passivated per referenced standards. Provide Ferroxyl testing per referenced standards. ○ Shipping and Handling: Cap/seal all openings prior to shipment. Place items on clean wood surfaces and handle with non-ferrous metals for lifting and restraining during shipment. Materials shall be shipped in an enclosed trailer, and shall be stored indoors at all times.
7.	The Contractor shall provide additional non-welded joints as necessary to facilitate transportation of the pipe system components as well as construction. The Contractor is solely responsible for locating joints to avoid conflict with all other components of the Work. Contractor shall indicate all non-welded joints as part of the shop drawing submittal.
8.	Flanged Joints: Type 304 or 316 stainless steel. ASTM A193, Grade B8M hex head bolts and washers; Grade B8M hex head nuts, or equivalent. Coordinate bolt length to meet flange and device requirements. Grooved Joints: Type 316 stainless steel. Grade B-8M, Class 2; coupling manufacturer's standard size and shapes.

SST02

GENERAL DESCRIPTION:	Small-Diameter Type 304L Stainless Steel Pipe		
SIZE:	½- through 3-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	304L Stainless Steel	
	MATERIAL STANDARD:	ANSI B16.13 ASTM A312 ASTM A999	
	SCHEDULE OR SDR:	Schedule 40	
	PRESSURE RATING OR CLASS:	150 PSI	
PIPE JOINTS			
	TYPE:	Threaded	
		JOINT STANDARD:	NPT
		PRESSURE RATING:	150 PSI
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	304L Stainless Steel, SCH 40	
		MATERIAL STANDARD:	ANSI B16.13 ASTM A312 ASTM A999
	TYPE:	Threaded	
		FITTING STANDARD:	NPT ANSI/MSS SP-114, ASTM A351
		PRESSURE RATING:	150 PSI
HARDWARE			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			

GALV01

GENERAL DESCRIPTION:	Galvanized Steel Pipe		
SIZE:	Less than or equal to 4-inch nominal diameter		
PIPING MATERIAL			
	MATERIAL:	Galvanized Steel	
	MATERIAL STANDARD:	ASTM A53, Type S, Grade B	
	SCHEDULE OR SDR:	Schedule 40	
	PRESSURE RATING OR CLASS:	150 PSI	
PIPE JOINTS			
	TYPE:	Threaded	
		JOINT STANDARD:	ANSI B16.3
		PRESSURE RATING:	150 PSI
	TYPE:	Flanged	
		JOINT STANDARD:	ANSI B16.1
		PRESSURE RATING:	150 PSI
GASKETS			
	See pipe schedule for gasket material selection.		
FITTINGS			
	MATERIAL:	Galvanized Malleable Iron, Class 150	
		MATERIAL STANDARD:	ANSI B16.3
	TYPE:	Flanged	
		FITTING STANDARD:	AWWA C207, Class D (hub style, slip-on) See Note 1
		PRESSURE RATING:	150 PSI
	TYPE:	Threaded	
		JOINT STANDARD:	ANSI B16.3
		PRESSURE RATING:	150 PSI
HARDWARE			
	See Paragraph 2.10 of this Specification Section.		
LINING			
	MATERIAL:	N/A	
		MATERIAL STANDARD:	N/A
COATING			
	See pipe schedule for color.		
	See Section 09 96 00 for coating requirements.		
NOTES			
1.	Flat faced or raised face to be compatible with connecting piping, ANSI B16.1 Standard.		

APPENDIX B

Gaskets

GASKETS

SBR			
	JOINT/FITTING TYPE:	Push-On, Mechanical, and Proprietary Joints	
		MATERIAL:	Vulcanized styrene butadiene rubber (SBR).
		STANDARD:	ANSI/AWWA C111/A21.11, unless otherwise noted.
	JOINT/FITTING TYPE:	Flanged – See Note 5	
		MATERIAL:	Full faced, ⅛-inch thick, red rubber (SBR), hardness 80 (Shore A), rated to 200° F
		STANDARD:	ANSI B16.21
EPDM			
	JOINT/FITTING TYPE:	Grooved, Flanged – See Note 5	
		MATERIAL:	Full faced, ⅛-inch thick, homogeneous black rubber (EPDM), hardness 60 (Shore A), rated to 300° F
		STANDARD:	ANSI B16.21
	JOINT/FITTING TYPE:	Grooved	
		MATERIAL:	EPDM
		STANDARD:	ASTM D2000 and AWWA C606
HALOGENATED BUTYL			
	JOINT/FITTING TYPE:	Grooved	
		MATERIAL:	Halogenated butyl, Grade M
		STANDARD:	ASTM D2000 and AWWA C606
VITON (FKM)			
	JOINT/FITTING TYPE:	Flanged – See Note 5	
		MATERIAL:	Fluoroelastomer, hardness 75 (shore A) – See Note 6
		STANDARD:	ANSI B16.21
PTFE			
	JOINT/FITTING TYPE:	Flanged – See Note 5	
		MATERIAL:	Polytetrafluoroethylene
		STANDARD:	ANSI B16.21
NOTES			
1.	Gasket pressure rating to equal or exceed the system test pressure.		
2.	Blind flanges shall include a gasket which covers the entire inside face.		
3.	Gaskets shall be compatible with temperature, pressure, and service of the pipe.		
4.	Gaskets shall be the standard product of the pipe manufacturer. Alternate gaskets shall only be provided if deemed acceptable by the Engineer.		

NOTES	
5.	Flanged gaskets shall be the high performance type satisfying the special requirements of ANSI/AWWA C111/A21.11 Appendix C, Sec. C.2 and have at least three bulb type rings molded into both faces of the gasket.
6.	For use with air piping, gaskets shall be rated to 400°F and 150 psi, unless specifically noted otherwise.

APPENDIX C

Couplings

COUPLINGS

TYPE 1		
	GENERAL DESCRIPTION:	Straight and Transition, between dissimilar or the same pipe material, buried installations
	USE WITH:	Steel, C900 PVC, and Ductile Iron
	SIZE:	2”- 24” nominal diameter, see Note 1
	PRESSURE RATING:	260 PSI
	MATERIAL:	Ductile iron, ASTM A536
	LINING:	Fusion bonded epoxy coating, AWWA C213
	COATING:	Fusion bonded epoxy coating, AWWA C213
	GASKET:	SBR ASTM D2000 MBA 710 unless specifically noted otherwise
	PRODUCT:	Romac Industries Style 501 or approved equivalent
	NOTES:	1. If coupling is located within the minimum restrained length, or where specifically noted on the Plans, provide external restraint harness Romac Series 600 (12-inch and smaller for ductile iron, 14-inch and larger for C900 PVC) to provide longitudinal restraint with vertical joint flexibility. Thrust blocks shall only be provided where specifically shown on the plans or where deemed acceptable by the Engineer. 2. Minimum sleeve length shall be 5” for 2”-18” nominal pipe size and 7” for >18” nominal pipe size.
TYPE 2		
	GENERAL DESCRIPTION:	Straight, restrained, between the same pipe material, buried installations
	USE WITH:	Ductile iron, steel, and C900 PVC
	SIZE:	12”- 48” (ductile iron), 12” (steel), and 12”-24” (C900 PVC)
	PRESSURE RATING:	12”-16” ductile iron: 350 PSI 18”-24” ductile iron: 250 PSI 30”-48” ductile iron: 150 PSI PVC: 150 PSI
	MATERIAL:	Body: beveled, flared, or formed carbon steel, AWWA C219
	LINING:	Fusion bonded epoxy coating, AWWA C213
	COATING:	Fusion bonded epoxy coating, AWWA C213
	GASKET:	14-24”: standard MJ gasket per ANSI/AWWA C111/A21.11 12” and 30”-48”: SBR ASTM D2000
	PRODUCT:	Romac FC400RG, or approved equivalent

	NOTES:	1. Provide Romac RomaGrip or mechanical joint retainer glands as required by the manufacturer. 2. Provide 7/8-9 roll thread, ductile iron restraining bolts per ASTM A536. 3. Provide heat-treated ductile iron restraining lugs per ASTM A536. 4. Provide 304 stainless steel nuts and bolts.
TYPE 3		
	GENERAL DESCRIPTION:	Reducing Coupling, buried installations
	USE WITH:	C900 PVC, Steel, Ductile Iron connections with reduction in size/change in materials, unrestrained
	SIZE:	14”- 48”
	PRESSURE RATING:	150 PSI
	MATERIAL:	Beveled, flared, or formed carbon steel with minimum yield of 30,000 PSI
	LINING:	Fusion bonded epoxy coating, AWWA C213
	COATING:	Fusion bonded epoxy coating, AWWA C213
	GASKET:	Nitrile Butadiene Rubber (NBR), AWWA C219 and ASTM D20000
	PRODUCT:	Romac Industries Style RC400 or approved equivalent
	NOTES:	1. Provide trackhead bolts, heavy hex nuts, 5/8” UNC rolled thread, high strength, low alloy corrosion-resistant steel per AWWA C111. Threads shall be protected with plastic caps on each bolt end.
TYPE 4		
	GENERAL DESCRIPTION:	Field Flange Adapter, exposed installations
	USE WITH:	Ductile Iron and Steel Pipe tested in accordance with AWWA C600 or ASTM D2774 and conforming to ANSI/AWWA C151/A21.51
	SIZE:	3” – 12”
	PRESSURE RATING:	3”-8”: 250 PSI 10”-12”: 200 PSI
	MATERIAL:	Ductile Iron, ASTM A536 Flanges: ANSI/AWWA C110/A21.10
	LINING:	Manufacturer’s standard high build epoxy, MEGA-BOND by EBAA Iron Inc. or approved equivalent.
	COATING:	Manufacturer’s standard high build epoxy, MEGA-BOND by EBAA Iron Inc. or approved equivalent.
	GASKET:	EBAA E-Z Flange Gasket (ductile iron pipe); Transition gasket as required by the manufacturer (steel pipe)
	PRODUCT:	EBAA Iron, Inc. Series 1000 E-Z Flange, or approved equivalent

	NOTES:	1. For interior/exposed applications only. Not for use on buried applications.
TYPE 5		
	GENERAL DESCRIPTION:	Restrained Flange Adapter, buried installation
	USE WITH:	Ductile iron, C900 PVC, steel, and HDPE Ductile Iron and Steel Pipe tested in accordance with AWWA C600, AWWA C605, or ASTM D2774
	SIZE:	3”-24” (ductile iron and PVC) 3”-12” (steel and HDPE) 30”-48” (ductile iron)
	PRESSURE RATING:	3”-16” ductile iron: 350 PSI 18”-24” ductile iron: 200 PSI minimum 30”-48” ductile iron: 150 PSI 4”-20” DR18 C900 PVC: 235 PSI 24” DR18 C900 PVC: 150 PSI 4”-24” DR25 C900 PVC: 165 PSI 3”-12” steel: 350 PSI 3”-12” DR11 HDPE: 160 PSI
	MATERIAL:	Ductile Iron, ASTM A536 Flanges: ANSI/AWWA C111/A21.11 with flange surface facing in accordance with ANSI/AWWA C207. ANSI B16.5 Class 150/125 drilling pattern.
	LINING:	Wetted parts: fusion bonded epoxy per ANSI/AWWA C213 External parts: fusion bonded epoxy per ANSI/AWWA C116/A21.16 Restraint Ring: Manufacturer’s standard high build epoxy, MEGA-BOND by EBAA Iron Inc. or approved equivalent.
	COATING:	Manufacturer’s standard high build epoxy, MEGA-BOND by EBAA Iron Inc. or approved equivalent.
	GASKET:	Provide transition gaskets where required by the manufacturer.
	PRODUCT:	EBAA Iron, Inc. Series 2100 MEGAFLANGE, or approved equivalent.
	NOTES:	1. Provide stainless steel hardware. 2. For buried installation only. 3. Set screw type grips are not acceptable.
TYPE 6		
	GENERAL DESCRIPTION:	Flanged Dismantling Joint, buried installations
	USE WITH:	Ductile iron, steel, PVC
	SIZE:	3”-48”
	PRESSURE RATING:	3”-12”: 175 PSI 14”-48”: 150 PSI
	MATERIAL:	Flanged Spool: AWWA Class D ring flange, compatible with ANSI Class 125 or 150 bolt

		circles. SCH 40 ASTM A53 (3”-12”); ASTM A36 carbon steel (14”-48”) End Ring and Body: ductile iron ASTM A536 (3”-12”); carbon steel ASTM A36 with AWWA C207 Class D flanges. Hardware: 304 SST Tie Rods: 304 SST, ASTM A193 gr B8 or B8M
	LINING:	Fusion bonded epoxy coating
	COATING:	Fusion bonded epoxy coating
	GASKET:	Water/sewer Service: NBR ASTM D2000 MBA810Z Air Service: Provide EPDM peroxide cured gasket when used with aeration piping (ALP or AHP). Gasket shall be suitable for use with temperatures up to 250°F.
	PRODUCT:	Romac Industries, Inc. Style DJ400 or approved equivalent
	NOTES:	N/A
TYPE 7		
	GENERAL DESCRIPTION:	Stainless Steel Pipe Couplings, interior/exposed installations
	USE WITH:	Steel, stainless steel
	SIZE:	3”-48”
	PRESSURE RATING:	Pressure rating shall be 1.5 times working pressure, unless specifically noted otherwise.
	MATERIAL:	316 SST or Carbon Steel, see Note 3
	LINING:	Fusion bonded epoxy (for carbon steel)
	COATING:	Fusion bonded epoxy (for carbon steel)
	GASKET:	Match pipe system gasket selection
	PRODUCT:	AWWA C227 Straub Flex Coupling or approved equivalent
	NOTES:	1. Coupling shall meet all applicable AWWA and NSF requirements. 2. Provide Romac AWWA M-11 harness restraint system, or approved equivalent, where external restraint or anchoring is not otherwise provided. 3. Galvanized components are not acceptable. 4. Provide stiffening ring as required by the manufacturer.
TYPE 8		
	GENERAL DESCRIPTION:	Mechanical Joint Adaptor, buried installations
	USE WITH:	Ductile iron pipe direct connections between MJ fittings and valves
	SIZE:	3”-36”

	PRESSURE RATING:	350 PSI (3”-24”) 250 PSI (30”-36”)
	MATERIAL:	Ductile Iron
	LINING:	Protecto 401 Epoxy
	COATING:	Epoxy
	GASKET:	N/A
	PRODUCT:	Foster Adaptor
	NOTES:	1. Provide stainless steel hardware

FLEXIBLE COUPLINGS

Type 20		
	GENERAL DESCRIPTION:	Single Sphere Flexible Coupling, interior/exposed installations
	USE WITH:	Flanged wastewater service pipe systems to accommodate axial compression and extension, lateral deflection, angular movement, and vibration
	SIZE:	4”-30”
	PRESSURE RATING:	See Note 1
	TEMPERATURE RATING:	265°F
	MATERIAL:	Elastomer (cover and tube): EPDM Flanges: 304 SST, freely rotating on the bellows
	LINING:	N/A
	COATING:	N/A
	GASKET:	N/A
	PRODUCT:	Proco Style 240 single sphere, or approved equivalent
	NOTES:	1. Pressure rating at the anticipated operating temperature shall be equivalent to the test pressure for the associated pipe system. Reference the Pipe Schedule for additional information. 2. Provide external limit/control rods to limit fitting expansion and contraction. 3. Rods and hardware shall be SST. 4. Couplings shall be installed within manufacturer's recommended piping misalignment limits. Expansion couplings shall not be used to correct pipe misalignment. 5. Pipe systems shall be fully supported either

		side of the flexible coupling. 6. Do not position against check or isolation valves.
Type 21		
	GENERAL DESCRIPTION:	Bellows Connector Expansion Joint, interior/exposed installations
	USE WITH:	For use with digester gas piping
	SIZE:	2”-12”
	PRESSURE RATING:	225 PSI at 150°F 110 PSI at 480°F
	TEMPERATURE RATING:	480°F
	MATERIAL:	All wetted parts: Stainless Steel Vanstone Flange: Carbon Steel ANSI 150#
	LINING:	N/A
	COATING:	N/A
	GASKET:	Neoprene Grommet
	PRODUCT:	Flexicraft Industries, Bellows Connector Expansion Joint, or approved equivalent
	NOTES:	1. Joints are to be provided with stainless steel drop-in liners and carbon steel covers. 2. Tie rods shall be included to prevent overextension of the expansion joints from pressure thrust loads. The number and size of the control rods shall be sufficient for the maximum system test pressure.
Type 22		
	GENERAL DESCRIPTION:	Reducing Expansion Joints, interior/exposed installations. See Note 1
	USE WITH:	Flanged wastewater service pipe systems to accommodate axial compression and extension, lateral deflection, angular movement, and vibration
	SIZE:	2”x1” to 18”x16”
	PRESSURE RATING:	See Note 2
	TEMPERATURE RATING:	250°F

	MATERIAL:	Elastomer (cover and tube): EPDM
	LINING:	N/A
	COATING:	N/A
	GASKET:	N/A
	PRODUCT:	Proco Style RE-231 (eccentric single wide-arch expansion joint), Proco Style RC-231 (concentric singe wide-arch expansion joint), or approved equal
	NOTES:	1. Provide eccentric or concentric expansion joint as denoted on the Plans. 2. Pressure rating at the anticipated operating temperature shall be equivalent to the test pressure for the associated pipe system. Reference the Pipe Schedule for additional information. 3. Provide external limit/control rods to limit fitting expansion and contraction. 4. Rods and hardware shall be SST. 5. Couplings shall be installed within manufacturer's recommended piping misalignment limits. 6. Pipe systems shall be fully supported either side of the flexible coupling. 7. Do not position against check or isolation valves.
Type 23		
	GENERAL DESCRIPTION:	Chemical Service Flexible Coupling, interior/exposed installations
	USE WITH:	Chemical service, PVC pipe system applications
	SIZE:	1.5"-36"
	PRESSURE RATING:	1.5"-6": 225 PSI 8"-12": 210 PSI 14"-20": 150 PSI 24"-36": 100 PSI (minimum)

	TEMPERATURE RATING:	250°F
	MATERIAL:	Cover: EPDM
	LINING:	PTFE
	COATING:	N/A
	GASKET:	N/A
	PRODUCT:	Proco Series 231/ET PTFE expansion joint, or approved equal
	NOTES:	1. Provide external limit/control rods to limit fitting expansion and contraction. 2. Rods and hardware shall be SST. 3. Couplings shall be installed within manufacturer's recommended piping misalignment limits. Expansion couplings shall not be used to correct pipe misalignment. 4. Pipe systems shall be fully supported either side of the flexible coupling. 5. Do not position against check or isolation valves.

QUICK CONNECT COUPLINGS

Type 40		
	GENERAL DESCRIPTION:	Twin cam arm actuated, male and female, locking
	USE WITH:	Chemical Systems
	SIZE:	½”-4”
	PRESSURE RATING:	See Note 1
	TEMPERATURE RATING:	200°F
	MATERIAL:	Glass-filled polypropylene or PVDF with EPDM
	LINING:	N/A
	COATING:	N/A
	GASKET:	Viton-A or Teflon gaskets as recommended for the chemical service by the manufacturer
	PRODUCT:	BANJO, Qianli, or approved equivalent
	NOTES:	1. Pressure rating at the anticipated operating temperature shall be equivalent to the test pressure for the associated pipe system. Reference the Pipe Schedule for additional information. 2. End Connections: NPT threaded or flanged to match piping connections. Hose shank for chemical installations. 3. Plugs and Caps: Female dust cap for each male end; male dust plug for each female end.
Type 41		
	GENERAL DESCRIPTION:	Twin cam arm actuated, male and female, locking
	USE WITH:	Sewage service
	SIZE:	½”-4”
	PRESSURE RATING:	150 PSI (minimum)
	TEMPERATURE RATING:	380°F (maximum)
	MATERIAL:	Stainless steel
	LINING:	N/A
	COATING:	N/A
	GASKET:	Buna N gaskets as recommended for the service by the manufacturer.

	PRODUCT:	OPW Kamlok or approved equal
	NOTES:	1. End Connections: NPT threaded or flanged to match piping connections. Hose shank quick connect coupler. 2. Plugs and Caps: Female dust cap for each male end; male dust plug for each female end.

END OF SECTION

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