

21.0 Potable Water Treatment System

This Section 21 includes the requirements for the Potable Water Treatment System wWork for the EJMT DPHT Design Build Project. This wWork shall be completed in accordance with the Contract Documents.

The Colorado Department of Transportation (CDOT) owns and operates a potable water treatment system (PWSID #CO0210009) serving the EJMT complex. The system is a non-transient, non-community, surface water treatment plant rated to serve a population of 50. The EJMT complex has two existing drinking water treatment systemsplants, one on in each portal of the tunnel. Both treatment systems draw raw water from an 8" fire water supply line that is fed by a 120,000-160,000 gallon water storage tank located outside the west EJMT portal. The 8" fire water line feeds two separate 3" lines that supply the bag filtration and chlorine disinfection systems. Both treatment facilities have miscellaneous isolation valves, pressure reducing valves (PRV), instrumentation, tanks, etc. CDOT estimates the flow rates to the west and east portals of EJMT to be 3,000 GPD and 2,000 GPM, respectively. The water storage tank provides 60 psi of pressure to the west side of the tunnel and 100 psi to the east. Work will take place inside the existing water treatment areas at each portal. The system currently is in compliance with Colorado Department of Public Health and Environment (CDPHE) potable water system regulations. However, it requires upgrades to meet CDOT's long term operational and life cycle objectives.

The existing domestic water supply for the East Portal is located within the walkway on the roadway of the eastbound bore. The existing water supply line is combined with the existing supply to the hydrants. A new domestic water supply shall be provided from the West Portal, originating in the existing water treatment room and interconnected via the plenum with the water treatment room located in the East Portal. New domestic water piping shall extend through the roadway and fan deck levels, traversing the tunnel through the westbound bore plenum space.

21.1 Administrative Requirements

21.1.1 Standards

The Contractor shall design and construct the Project in accordance with the requirements of the standards in the documents listed in Table 21-1 and those referenced in Book 3. The Contractor shall use the latest adopted edition at the time of the Proposal Due Date.

Table 21-1 Standards for Environmental

<u>Author or AgencyStandard</u>	<u>Title</u>
<u>CDPHEColorado Department of Public Health and Environment (CDPHE) Policy #5CDPHE</u>	<u>CDPHE Policy #5 - Design Criteria for Potable Water System</u>

<u>Author or Agency Standard</u>	<u>Title</u>
<u>Colorado Department of Public Health and Environment (CDPHE) Regulation #11</u>	<u>CDPHE Regulation #11 - Primary Drinking Water Regulations</u>
<u>International Code Council (ICC)</u>	<u>International Plumbing Code, 2018</u>
<u>ICC</u>	<u>International Mechanical Code, 2018</u>
<u>National Fire Protection Association (NFPA)</u>	<u>NFPA 502 Standard for Road Tunnels, Bridges, and Other Limited Access Highways</u>
<u>American Water Works Association</u>	<u>C600 Installation of Ductile Iron Mains and Their Appurtenances</u>
<u>NSF 61 National Sanitation Foundation (NSF)</u>	<u>NSF 61 - Drinking Water System Components</u>

~~National Sanitation Foundation (NSF) NSF 61 - Colorado Department of Public Health and Environment () CDPHE Regulation #11 - CDPHE CDPHE Policy #5 -~~

21.2 Design Requirements

~~The Colorado Department of Transportation (CDOT) owns and operates a potable water treatment system (PWSID #CO0210009) serving the Eisenhower Johnson Memorial Tunnel complex. They system is a non-transient, non-community, surface water treatment plant rated to serve a population of 50. The system currently is in compliance with Colorado Department of Public Health and Environment potable water system regulations. However, it requires upgrades to meet CDOT's long term operational and life cycle objectives.~~

~~The Contractor shall permit, design, construct, and commission improvements to the existing water treatment system at EJMT. The improvements are intended to allow CDOT to provide safe and reliable drinking water service to the existing facilities as well as future capacity within the complex. The improvements shall be designed to provide the most cost-effective capital- durable and reliable system that reduces CDOT long term operations and maintenance costs and O&M outcomes.~~

~~EJMT existing portal that is located in the XX of the (WB/EB?) Tunnel and is located outside the west EJMT portal. The 8" fire water line feeds tthat supply. The miscellaneous valves, PRVs, instrumentation, tanks, etc. in the existing water treatment facilities shall be removed and replaced as necessary with the upgrades. sand east portals EJMT to be, respectively at each portal~~

~~CDOT will be adding additional land uses to the tunnel complex. The Contractor shall design the water treatment a-system to meet a 40 GPM instantaneous flow rate through the bag filters, UV system, and at each portal and 10,000 GPD demand to accommodate future CDOT needs growth at the EJMT., although it does not anticipate exceeding 10,000 GPD of demand.~~

~~The Contractor shall submit CDOT has developed aa water treatment basis of design concept report to CDOT for Acceptance that will allow provides for a simpler and more reliable water treatment system while also providing incorporating an additional treatment~~

barrier and redundancy provisions. The water treatment basis of design concept report involves shall include the following at a minimum:

- West Tunnel Portal Facility
 - Install three new Harmsco bag filter canisters that are compatible with Harmsco bag filter equipment
 - Install a new skid downstream of the bag filters consisting of (not a comprehensive list of all items):
 - Two UV reactors
 - Raw & finished water turbidimeters
 - Two flow meters
 - Sodium hypochlorite pump flow paced to flow meter
 - Chlorine residual meter
 - PLC/HMI that monitors system components and exports data via cellular modem
 - Any other items required for the system to function as intended and meet CDPHE redundancy requirements
 - Install disinfection contact piping for West tunnel plumbing
- East Tunnel Portal Facility:
 - Install a sodium hypochlorite feed pump flow paced off a flow meter
 - Install disinfection contact piping for east tunnel plumbing
 - Install a chlorine residual meter

A preliminary process flow diagram depicting this basis of design is provided in the Reference Documents. The following is a preliminary process flow diagram of the concept:

21.2.1 Piping and Materials

A new domestic water supply shall be provided from the West Portal, originating in the existing water treatment room and interconnected via the plenum with the water treatment room located in the East Portal. New domestic water piping shall extend through the roadway and fan deck levels, traversing the tunnel through the westbound bore plenum space.

All new piping and materials shall be suitable for domestic water use and in accordance with the International Plumbing Code, International Mechanical Code, NFPA 502, and NSF-61. The use of non-metallic piping is not permitted.

All new domestic water piping shall be independently supported from all other systems, including the existing fixed fire suppression system. New piping in the plenum shall not be installed on the plenum divider wall and shall not add additional loading to the plenum floor.

Piping shall be protected from freezing in all areas.

21.2.2 Design Deliverables

The Contractor shall include submit the following deliverables to CDOT for Acceptance:

21.2.2.1 CDPHE Construction Application

- A. Prepare a Construction Application Report as required by Colorado Department of Public Health and Environment (CDPHE) Policy #5, Design Criteria for Potable Water Systems and CDPHE Regulation # 11, Colorado Preliminary Drinking Water Regulations.
- B. The Construction Application shall address the applicable items in CDPHE Policy #5 Appendix B: Basis of Design Report Template, Drinking Water Design Submittal Safe Drinking Water Program.
- C. Any other applicable CDPHE regulations and policies.

21.2.2.2 Final (100% Level) Engineering Drawings Plan Package

The Contractor shall prepare fFinal (100% Level) engineering drawings that conform to the following:

- A. Drinking water process engineering
- B. Electrical and instrumentation engineering for the proposed equipment
- C. ~~Final engineering drawing set shall be signed and sealed by a professional engineer specializing in his or her respective discipline. The drawing set will generally include the following at a minimum: consist of the following documents and drawings (dependent on specifics of the final design)~~
 - a. Process Flow Diagram
 - b. Hydraulic Profile
 - c. Design Criteria & Equipment Summary
 - d. Demolition Plan
 - e. Treatment Building Process Equipment Layout
 - f. Treatment Building Process Equipment Elevations
 - g. Process Engineering Details
 - h. Instrumentation Plan with Control Strategy including remote access of PLC controls.
 - i. Pipe plan and profile drawings
 - j. Electrical Legend and One Line Diagram
 - k. Electrical Power Plan (for treatment equipment)
 - l. Electrical Schedules
 - m. Process and Instrumentation Diagrams

21.3 Construction Requirements:

The Contractor shall complete the installation in accordance with the Contract Documents.

The Contractor shall maintain operation of the existing treatment system throughout construction or provide a temporary potable water supply that is equivalent, as determined by CDOT, to the existing system. The Contractor shall coordinate any treatment system shutdowns with CDOT per Book 2 Sections 1 and 18. Treatment shutdowns requests shall be submitted to CDOT for Approval a minimum of 7 Days in advance of the proposed shut down and shall not to exceed 24 hours in duration, unless otherwise Approved by CDOT. Alternatively, Contractor can provide alternate potable water

Abandon existing raw water connection line in place once new water treatment plants are tested and commissioned.

Testing and Commissioning:

As part of the contract, tThe Contractor shall test and commission the new water treatment system equipment. The testing and commissioning is will require shall include the following steps (at a minimum):

- Disinfect equipment as required by CDPHE regulations.
- Conduct pressure and acceptance testing (per AWWA C600) under the observation of CDOT.
- Provide a Testing and Commissioning Report detailing all results from the testing and commissioning process for CDOT Acceptance prior to placing new system into service.
- Provide operator training for equipment per manufacturer recommendations for CDOT personnel prior to Project Completion.
- Provide Operation & Maintenance Manual including As-Built drawings at the completion of commissioning and prior to Project Completion.
- Submit CDPHE construction completion certificate.
- Provide one year system warranty that begins at substantial completion.

21.4 Testing and Commissioning

21.4.1 Testing

21.4.1.1 Construction Acceptance Test

The Construction Acceptance Test shall be performed using the constructed system in the EJMT, at least 30 days prior to the Interim Acceptance of the Project. This test is in addition to any tests needing to be performed under NFPA 30, 70, 72, 110 and 502.

21.4.2 Commissioning

All mechanical, electrical, and software systems shall be tested as part of a complete commissioning program. Commissioning testing shall be performed in accordance with NFPA 13, 30, 72, 110 and 502.CDPHE and AWWA C600.

Commissioning tests shall include at a minimum the following elements:

- Component and equipment
- Communication links
- Status, control, alerts, and alarms
- Interfaces between subsystems
- Integration among new and existing subsystems

Commissioning shall be carried out by an independent third party commissioning agent with demonstrated experience in commissioning tunnel systems within the past five years. The Contractor shall complete commissioning of all systems for CDOT Acceptance prior to Interim Acceptance.

The ~~commissioning agent~~ Contractor shall prepare and submit a Commissioning Test Plan and Schedule for Approval to CDOT a minimum 9030 days before the start of any testing. The test plan shall be based on the technical specifications and performance characteristics of all devices, equipment, parts, assemblies, systems, subsystems, software and devices supplied and installed under this contract. Testing shall be carried out by the Contractor and witnessed and documented by ~~the commissioning agent.~~ CDOT.

All elements subject to testing shall be included in the testing schedule. ~~Weekly~~ commissioning meetings shall be held ~~beginning~~ 9015 days prior to the scheduled start of testing to review the status of the testing and planning for future tests.

All commissioning documentation shall be submitted to CDOT for Acceptance following testing and prior to Interim Acceptance.

21.4.3 Maintenance and Operations Training

The Contractor shall provide Maintenance and Operations training a minimum of 9030 days prior to Interim Acceptance. The Contractor shall provide a Maintenance and Operations Training Plan and Syllabus 30 days prior to beginning training for review by CDOT. The training shall be conducted by the manufacturer's technical service personnel or factory authorized representatives for all of the systems installed in the EJMT.

The Contractor shall include in the training; operation instructions, theory of operation, system description, preventive maintenance procedures, troubleshooting and repair of all equipment specified herein. The Contractor shall include with the training all material and manuals required for each participant. Dedicated systems

training for CDOT system administrators shall cover computer systems, hardware, communication networks, and software systems.

21.4.4 Manuals and Documentation

The Contractor shall provide Maintenance and Operations Manual to CDOT for review and Approval 42030 days prior to Interim Acceptance. The Contractor shall provide five printed and bound copies and one electronic copy in native editable format of the final Maintenance and Operations Manual within 9030 days after CDOT Approval. The Maintenance and Operations Manual shall include catalog cuts, final as-built shop drawings, hardware and software instruction manuals for all systems supplied and installed, stored on USB memory, equipment maintenance, and recommended spare parts. Interim Acceptance of Systems will not be provided until the Maintenance and Operations Manual has been Approved.

The Maintenance and Operations Manual shall include a complete parts list. The parts list shall include a list of all parts supplied under the Contract, down to the lowest level part or assembly that is user-replaceable. The parts list shall include part numbers, description, system application or use, manufacturer, and supplier. The parts list shall identify sole-source and propriety parts. For all sole-source and proprietary parts, compatible or alternative parts shall be identified. The estimated service life of parts that have a service life less than 30 years shall be identified.

The Maintenance and Operations Manual shall include a complete consumable supplies list. The supplies list shall include a list of all materials required for routine maintenance of the equipment supplied under the Contract. The supplies list shall include material name, description, function, application rate and frequency, manufacturer, and supplier.

A CDPHE construction completion certificate shall be provided to CDOT for Acceptance prior to Interim Acceptance.

21.5 Deliverables

At a minimum, the Contractor shall submit the following to CDOT for Review, Approval, and/or Acceptance:

Table 21-2: Deliverables by the Contractor

<u>Deliverable</u>	<u>Review, Acceptance or Approval</u>	<u>Schedule</u>
<u>Water Treatment Basis of Design Concept Report</u>	<u>Acceptance</u>	<u>Within 60 Days after NTP1</u>
<u>CDPHE Construction Application</u>	<u>Review</u>	<u>With RFC Documents</u>
<u>Water Treatment System shutdown requests</u>	<u>Approval</u>	<u>7 Days prior to shutdown</u>

<u>Deliverable</u>	<u>Review, Acceptance or Approval</u>	<u>Schedule</u>
<u>Commissioning Test Plan and Schedule</u>	<u>Approval</u>	<u>30 Days prior to start of testing</u>
<u>Testing and Commissioning Report</u>	<u>Acceptance</u>	<u>Prior to placing system in to service After testing and prior to Interim Acceptance</u>
<u>Maintenance and Operations Training Plan and Syllabus</u>	<u>Review</u>	<u>30 Days prior to training</u>
<u>Maintenance and Operations Manual</u>	<u>Review</u>	<u>30 Days prior to Interim Acceptance</u>
<u>CDPHE Construction Completion Certification</u>	<u>Acceptance</u>	<u>Prior to Interim Acceptance</u>

~~The existing domestic water supply for the East Ventilation building is located within the walkway on the roadway of the South bore. The existing water supply line is combined with the existing supply to the hydrants. A new domestic water supply shall be provided from the West Ventilation building, originating in the existing water treatment room and interconnected with the water treatment room located in the East Ventilation building. New domestic water piping shall extend through the roadway and fan deck levels, traversing the tunnel through the North bore plenum space.~~

~~Modifications to the existing water treatment plant are required to improve the functionality of the system. This may include additional piping to increase chlorination time and upgrading the existing filters.~~

~~21.1 Piping and Materials~~

~~All new piping and materials shall be suitable for domestic water use and in accordance with the International Plumbing Code, International Mechanical Code and NFPA 502. The use of non-metallic piping is not permitted.~~

~~All new domestic water piping shall be independently supported from all other systems, including the existing fixed fire suppression system. New piping in the plenum shall not be~~

~~installed on the plenum divider wall and shall not add additional loading to the plenum floor.~~

~~Piping shall be protected from freezing in all areas.~~