

## **SECTION 33 13 00**

### **SANITARY WORK PRACTICES AND DISINFECTION OF WATER UTILITY DISTRIBUTION**

#### **PART 1 – GENERAL**

##### **1.01 SUMMARY**

- A. This Specification Section: summarizes requirements sanitary construction practices that Contractor must follow to minimize potential contamination of the drinking water system. Details are also included for cleaning, draining, dechlorination, disinfection and testing of drinking water components and facilities associated with the construction of these facilities or impacts to existing facilities as a result of construction.

##### **1.02 SCOPE OF WORK**

- A. All construction tasks to add or modify drinking water facilities must be implemented using sanitary protocols to prevent or remove contaminants prior to facility startup. Contaminants include, but are not limited to, fuels, hazardous materials, chemicals and solvents, radioactive materials, construction materials and debris, dirt, microorganisms, surface water runoff, groundwater, rodents, vectors, birds and other animals that may degrade drinking water quality.
- B. The Contractor shall be responsible for sanitary work practices and the cleanup of all drinking water components and facilities affected by the work, before they are put into operation.
- C. The Contractor shall post a sign that would be visible for everyone who are within the work perimeter to implement the Sanitary Practice Protocol.
- D. The Contractor shall be responsible for draining and dechlorination of any water following initial limited gravity draining performed by the City. Water may be a result of leaks, intrusion and other sources from components and facilities affected by the work. The Contractor shall be responsible for compliance with all regulations related to the discharge of water, including obtaining and adhering to all necessary permits and keeping all correspondence and records available to the City Representative.
- E. Unless otherwise specified, City will perform initial gravity draining, soak testing, disinfection, dechlorination, flushing, sample collection and water quality testing of all pipelines 24 inches in diameter and smaller and water storage facilities affected by the work. The City Representative will contact regulatory agencies for discharges related to initial draining, flushing and disinfection.

### **1.03 REFERENCES**

The Contractor shall use the latest edition of the following references:

- A. American National Standard Institute (ANSI) / National Sanitation Foundation International (NSF) Standard 60 and 61 for Drinking Water System.
- B. American Water Works Association (AWWA) Standards:
  - 1. C651 (Disinfecting Water Mains)
  - 2. C652 (Disinfection of Water-Storage Facilities)
  - 3. C653 (Disinfection of Water Treatment Plants)
  - 4. C654 (Disinfection of Wells)
- C. Title 22 of California Code of Regulations (Title 22), including California Waterworks Standards (Division 4, Chapter 16).
- D. Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> Edition, as published by the American Public Health Association.
- E. Other standards as directed by City Representative.

### **1.04 SUBMITTALS**

- A. Not less than 60 days prior to the commencement of work on any facilities, the Contractor shall submit to the City Representative proof of ANSI/NSF Standard 61 certification for materials, lubricants and products that will result in its contact with the drinking water per Article 2.3 and meet “Indirect Additives” requirements under Article 7 of Title 22 California Waterworks Standards. Testing and certification is required to be from one of the ANSI accredited organizations. The indirect additives must be used within their specific ANSI/NSF61 certification requirements.
- B. Not less than 60 days prior to the commencement of work on any facilities, the Contractor shall submit to the City Representative a “Sanitary Work Practices Plan” describing the procedures for work involving components, equipment, tools, structures and work areas with the potential for direct contact with drinking water. The Sanitary Work Practices Plan shall describe the Contractor’s plan to minimize contamination of the components and facilities during transportation, storage and construction. The Sanitary Work Practices Plan shall address the following requirements:
  - 1. Minimizing physical contamination of the internal surfaces of the existing and newly installed drinking water system components.

2. Preventing chemical and biological contamination (e.g. oil, grease, residual lubricants, dirt, cross contamination, wastewater, etc.).
  3. Preventing the introduction and loss of foreign materials (construction debris, dirt, garbage, construction material, tools, etc.) into the drinking water system.
  4. Preventing the ingress of vandals or wildlife (birds, rodents, animals, insects etc.) into the drinking water system.
  5. Preventing the intrusion of non-drinking water into the pipelines, tanks and appurtenances. Non-drinking water sources include, but are not limited to, surface water runoff, rain water, contaminated drinking water, groundwater, etc.
  6. Post-construction cleanup that may include localized spray or swab disinfection of the components and facilities upon completion of work.
  7. Cleanup and disinfection of the components as a preventive measure as directed by the City Representative. If disinfection of the facility is to be performed by the Contractor, the Contractor's plan shall include:
    - (a) Disinfectant name and concentration
    - (b) Proposed disinfection method.
    - (c) A diagram showing all pipes including the length, valves and appurtenances to be disinfected, as well as the sampling, monitoring and chemical injection locations.
    - (d) Flushing velocity and flow calculations.
    - (e) Calculations for disinfectant quantity to be used.
    - (f) Sampling Plan
    - (g) Material Safety Data Sheets (MSDS) for the disinfectant to be used.
  8. Description of sanitary controls established by the Contractor in accordance with AWWA Standards.
- C. Not less than 60 days prior to the commencement of dechlorination, the Contractor shall submit to the City Representative a "Draining, Dechlorination and Monitoring Plan" for compliance with regulatory requirements.
1. The Plan shall include information on personnel, equipment, instruments, chemicals, sampling locations, and procedures related to the calibration of instruments, monitoring, notification and recordkeeping.
  2. The Contractor shall also provide the City Representative with an estimate

of the water volume and time period for the discharge.

3. Refer to Article 3.2 for draining and dechlorination.

- E. The Contractor shall show timelines on the project schedule for all cleaning, draining, dechlorination and disinfection activities.
- F. Dechlorination monitoring records as described in Article 3.2, or as directed by the City Representative.
- G. If disinfection is required to be performed by the Contractor, the Contractor shall submit disinfection monitoring records including location, chemical name, concentration, dosage, contact time, and other records as directed by the City Representative.
- H. Communications, permits, and records with Regulatory Agencies.

## **PART 2 – PRODUCTS**

### **2.01 COMPONENTS**

- A. All chemicals, materials, and/or products that are used in construction/ installation and that will be in contact with drinking water are collectively described as drinking water system components (hereinafter the component or components). These include, but are not limited to, process media, protective coating and lining materials, sealants, lubricants and adhesive compounds.

### **2.02 FACILITIES**

- A. All equipment, pipelines, valves, fittings, pumps, wells, mechanical devices, and storage tanks that are used for treatment, conveyance, and/or storage of drinking water are collectively described as drinking water system facilities (hereinafter the facility or facilities).

### **2.03 INDIRECT ADDITIVES**

- A. All components and facilities that are supplied by the Contractor such as materials, lubricants, and products (e.g. valves, pumps, fittings) in the production, treatment or distribution of drinking water that will result in its contact with the drinking water are required to be certified as meeting the specifications of ANSI/NSF61 and meet California Waterworks Standards. It includes, but is not limited to, process media (carbon, sand), protective materials (coatings, linings, liners), joining and sealing materials (solvent cements, welding materials, gaskets, lubricating oils), pipes and related products (pipes, tanks, fittings), and

mechanical devices used in treatment/ transmission/ distribution systems (pumps, valves, chlorinators, separation membranes).

There are three ways to comply with the California Waterworks Standards for Indirect Additives. They are listed below in the preferred order:

1. All Components: The entire material, lubricant, or product is certified as meeting the specifications of ANSI/NSF61. The Contractor shall submit proof of ANSI/NSF61 certification for the entire material, lubricant, or product to the City Representative for acceptance.
  2. All Wetted Components: If the entire material, lubricant, or product is NOT certified as meeting the specifications of ANSI/NSF61, then all wetted components that may result in its contact with drinking water are required to be ANSI/NSF61 certified. The Contractor shall submit a list of all wetted components, manufacturers of the components, materials of construction, and proof of ANSI/NSF61 certification for the components to the City Representative for review and acceptance. The contractor shall collect data for each wetted component and associated certification in a timely manner taking into account that information gathering for each component may be a time consuming process.
  3. Some or No Components/Waiver: If ANSI/NSF61 certified materials cannot be used or if there are no certified alternatives, then the Contractor shall submit justification with supporting information that demonstrates equivalent public health protection for use of the proposed product to the City Representative for review and waiver by SFPUC and California Department of Public Health (CDPH). In order to demonstrate the same level of public health protection, CDPH may require leach tests or other criteria on a case-by-case basis for the material or product, which can be a complex and time consuming process that should be accounted for by the Contractor. CDPH will need 30 days to review justification package; however, CDPH regulatory review timelines can be unpredictable at the time of submittal and there are risks that CDPH may deny the approval request.
- B. “All Components” compliance method for the entire material, lubricant, or product (valves, pumps etc.) provides clear regulatory compliance and is the best option as it eliminates chances of delay (some of which may be classified as Avoidable Delay) associated with further reviews and CDPH approval.
- C. The Contractor shall comply with ANSI/NSF61 regulatory requirements as specified in Articles 1.3 and 2.3, obtain complete ANSI/NSF61 certification documentation, and provide timely submittals to the City Representative for acceptance not less than 60 days prior to the commencement of work on any facilities to avoid any schedule delays. If ANSI/NSF61 certified materials are

available, but the Contractor fails to procure and install ANSI/NSF61 certified materials, or fails to provide complete NSF61 certification documentation, then the Contractor shall be responsible for schedule delays and related overhead expenses associated with corrective actions and with any necessary regulatory approvals. Such schedule delays will be classified as Avoidable Delays under the Contract Documents.

- D. If ANSI/NSF61 certified materials are not feasible or if certified materials do not exist, then the contractor shall provide timely submittals with workable alternative solutions to the City Representative for review and acceptance not less than 60 days prior to the commencement of work on any facilities to avoid any schedule delays. This will also require review and approval by CDPH as specified in Article 2.3 (A) (3). The Contractor shall implement mitigation measures and meet regulatory requirements as directed by the City Representative. The Contractor shall be responsible for the cost of any extended overhead as a result of non-compensable schedule extension. In no event will delays associated with review and approval by CDPH entitle Contractor to a compensable time extension.

## **PART 3 – EXECUTION**

### **3.01 SANITARY WORK PRACTICES**

- A. The Contractor shall exercise due care and implement sanitary work practices as described hereunder to prevent physical, chemical, biological and animal contamination of all components and facilities.
- B. The Contractor shall establish sanitary controls in accordance with AWWA Standards C651 (most recent edition) Section on “PREVENTIVE AND CORRECTIVE MEASURES DURING CONSTRUCTION.”
- C. The Contractor shall be responsible for implementation of its Sanitary Work Practices Plan at all times.
- D. All materials stored on site shall be kept in a clean and undamaged condition. Hazardous materials shall be stored at least 25 feet away, or as directed by the City Representative, from all drinking water facilities (in service or out of service), on grounds where surface drainage slopes away from drinking water facilities and away from areas of standing water. All temporary human waste collection systems (i.e. “Portapotties”, or holding tanks) shall be kept a minimum of 25 feet away, or as directed by the City Representative, from any drinking water storage or conveyance system, and will be placed in a manner that will prevent any leakage from contaminating any part of the components/facilities storage or conveyance system.

Pipelines, valves and other appurtenances shall be kept capped, wrapped or

housed to prevent unsanitary conditions, rust, animal nesting and other contamination hazards. Plugs of rags, wood, cotton, or similar materials are not acceptable.

- E. Prior to installation of any facilities and/or components, all plugs, caps, dirt, debris, grease, and foreign material shall be removed. If dirt, garbage, animals or other sanitary hazard has entered a pipeline, if the pipeline has become engulfed with standing water or rainwater, or disinfection of the components (e.g. valves, small pipe sections, taps etc.) is otherwise required prior to installation, the Contractor shall spray or swab the interior surface using a nominal 1% sodium hypochlorite solution as the disinfectant as directed by the City Representative. The solution should have at least 10,000 milligrams per liter (mg/L) chlorine concentration. For the purpose of preventing corrosion by the disinfectant, and upon request by the City Representative, the Contractor may need to rinse the interior surface with drinking water to remove the disinfectant after the disinfectant has been in contact with the surface for at least five (5) minutes.
- F. Once cleaned, all components and facilities shall be stored under controlled conditions to prevent re-contamination. If the City Representative finds unacceptable care or cleanliness of the components and facilities prior to installation or being put into service, the Contractor will be required to clean the components and facilities to the satisfaction of the City Representative. The Contractor shall be solely responsible for the cost of the required cleaning.
- G. If the Contractor is required to enter the interior of any in-service facility, all tools, equipment and boots shall be washed and cleaned to remove dirt, and disinfected with a nominal 200 mg/L sodium hypochlorite solution prior to entering the facility, or as directed by the City Representative. Material and tools may be rinsed with drinking water to remove residual disinfectant after 15 minutes of contact time, or as directed by the City Representative.
- H. The Contractor shall remove all dirt, dust, oil and foreign materials from all components and facilities after their installation and prior to the disinfection to the satisfaction of the City Representative.
- I. The Contractor shall be responsible to take all safety and precautionary measures, including safe handling of chemicals, safe operation of equipment/tools, and the use of appropriate personal protective equipment during and at the end of construction. The Contractor shall provide the City Representative with Material Safety Datasheets (MSDS) of all chemicals and other hazardous materials used by the Contractor at the site. The MSDS of all chemicals shall be kept on-site at all times for City Representative review.
- J. The Contractor shall notify the City Representative immediately of any suspected vandalism, sewage leak, contaminated soils, chemical spill or construction activity that could cause contamination or otherwise compromise the integrity of

the facilities.

### **3.02 DRAINING AND DECHLORINATION OF PIPELINES AND STORAGE FACILITIES**

- A. Prior to construction, City personnel will perform initial gravity draining of the pipelines and storage facilities to the extent possible without pumping. The Contractor shall be responsible for draining and/or pumping water that remains in the facility as a result of leaks, intrusion, or other sources, to pursue the contract work. The Contractor shall dechlorinate any water drained or pumped from the components or facilities prior to discharging to surface water or storm drainage according to his submittal and as directed by the City Representative.
- B. The City drinking water typically contains detectable total chlorine residual up to 4 mg/L and has an elevated pH up to 9.5. The discharge of water to a surface stream or creek may also cause turbidity in the receiving water to increase. Prior to discharging water, the Contractor shall be responsible for dechlorinating all water that is drained/pumped out of the facility. The Contractor shall treat, monitor and record all water discharges into storm drains, surface streams, or other locations not connected to a sanitary sewer to ensure compliance with all applicable City, Regional Water Quality Control Board (RWQCB) and local regulatory requirements. In addition, the City Representative may require the Contractor to monitor these parameters at a different frequency during unusual water quality conditions.

The RWQCB requirements are as follows:

- 1. The discharged water shall have non-detectable chlorine residual (<0.05 mg/L). The frequency of monitoring in the effluent shall be every 60 minutes for the duration of the discharge.
- 2. The pH of the discharged water shall be in the range of 6.5 to 8.5. If the discharge fails to meet this limitation additional samples may be collected in the receiving water stream to verify compliance with the pH standard. If the pH standard cannot be met in the receiving water then sampling should be conducted 50 feet upstream and downstream of the discharge to determine if the ambient pH has not been changed by more than 0.5 pH unit. If the standard still cannot be attained then further treatment prior to discharge is necessary. The frequency of monitoring in the effluent shall be every 60 minutes for the duration of the discharge.
- 3. To limit erosion when discharging to the receiving water a perforated pipe will be attached to the discharge line in the shape of a T (See SFPUC WS&TD SOP).

4. The discharge shall not cause pollution, contamination, or nuisance. The discharge shall cause no scouring or erosion at the point where discharged water enters the receiving water.
- C. At no cost to the City, the Contractor shall provide all necessary equipment (for example tanks, pumps, valves, instruments, controls, chemicals) and qualified on-site personnel for managing and monitoring the water discharges. The Contractor shall notify the City Representative for inspection of the equipment set up prior to the commencement of draining and dechlorination.
- D. Total Chlorine residual must be monitored using EPA approved test methods, which can be found in the latest edition of Standard Methods for the Examination of Water and Wastewater or at the EPA website. The City typically uses Hach Pocket Colorimeter (DPD Method) for total chlorine residual monitoring during dechlorination. The test kit is available from Hach ([www.hach.com](http://www.hach.com)). Note that total chlorine and free chlorine are measured using different test kits.
- E. The Contractor shall, at no cost to the City, provide, configure and set up an appropriate dechlorination system using either a drip feed, or a metering pump feed of a nominal 25% sodium bisulfite solution, or other suitable chemicals approved by the City Representative.
- F. The Contractor shall, at no cost to the City, maintain pH levels while complying with other parameters specified in Article 3.2.B, by adjusting the flow rate of dechlorination chemical, or by using acid and/or alkali. Note that sodium bisulfite has some pH depression capability.
- G. The Contractor shall be responsible for all regulatory issues related to this discharge including obtaining, paying for, adhering to all permit terms and conditions and for keeping written records of any regulatory communication available for the City Representative. In the event of an accidental release of water discharges not meeting the RWQCB requirements specified in Article 3.2, the Contractor shall immediately notify the City Representative and take necessary actions to stop the discharge and correct the process to meet the discharge requirements. The Contractor shall provide relevant monitoring data and an estimate of the volume of water discharged that did not meet regulatory requirements.
- H. During all periods of discharge, the Contractor shall monitor and maintain records for verification that the water has been dechlorinated and pH adjusted to meet the RWQCB requirements specified in Article 3.2. The Contractor shall prepare and maintain a daily log of the monitoring and sampling results, in addition to completing the Discharge Monitoring Form (DMF) provided in this Section as Appendix 'A' and provide records of both the daily log and the DMF to the City Representative. The Contractor shall monitor and record all such discharges at a

frequency of not less than once per hour. The daily log, recorded in ink, shall include, but are not limited to: dates, time, sampler names, signatures, sample locations, discharge locations (including latitude and longitude), instrument and equipment calibration records, estimated discharge flow rates, chemical feed rates, total chlorine residuals and pH at upstream and downstream of the dechlorination points, turbidity and other parameters in accordance with Article 3.2. The Contractor shall also calculate the total volume of water discharged and total quantity of chemicals used on a daily basis.

- I. The Contractor shall provide the original copies of the previous day's monitoring logs to the City Representative by 10:00 AM the following calendar day.
- J. Where the Contractor plans to use a sanitary sewer for the discharge, the Contractor shall submit the request to the City Representative for prior review and acceptance prior to initiating the discharge. The Contractor shall provide detailed information regarding the sewer location, approved backflow devices, anticipated dates of the discharge, and approximate flow rates and volumes. If permission to use the sewer is granted by the City Representative, the Contractor shall comply with all local agency requirements, including schedule submittals, notifications, flow rate limits, applicable water quality standards, monitoring and pre-treatment requirements. The Contractor shall be responsible for all sewer related permitting and discharge issues and costs.

### **3.03 DISINFECTION OF CONVEYANCE FACILITIES (PIPELINES AND ASSOCIATED APPURTENANCES)**

- A. After installation of conveyance facilities and field tests by the Contractor, the City may perform a soak test if new coatings, linings, sealants, or other chemicals may have been introduced or used by the Contractor as part of the work or if during the course of the project, contaminants are suspected of being introduced into the drinking water facilities. This soak test is for water quality testing that the Contractor's work must pass prior to disinfection. City personnel may also perform a localized preliminary disinfection inside the conveyance facilities prior to soak tests and full scale disinfection. The Contractor may also be required to perform a localized preliminary disinfection, if necessary, as instructed by the City Representative.
- B. In performing disinfection of a valve, City personnel may need access to both sides of the valve. The Contractor shall be responsible for keeping the valve open and the pipeline dry during the preliminary disinfection. This preliminary disinfection process is estimated to take about four (4) hours at each location. The City Representative will notify the Contractor at the completion of the preliminary disinfection process.
- C. Prior to putting these facilities into service, the City will perform a full-scale disinfection of the conveyance facilities in accordance with the AWWA Standards

and the City's internal disinfection procedures.

- D. The Contractor shall notify the City Representative not less than **5 weeks** prior to a facility being ready for disinfection. The Contractor shall coordinate construction activities to facilitate the disinfection conducted by City personnel. The Contractor shall provide access, support and equipment, as needed, to assist City personnel in completing the disinfection.
- E. The Contractor shall plan the work schedule by taking into consideration the time required by City personnel for disinfection, which typically includes filling, disinfecting, flushing, dechlorinating, and taking water samples from the disinfected facilities for bacteriological analysis and residuals management. Although the estimated time required for disinfecting each pipeline segment may be up to 5 business days, depending upon size and length of pipe, the actual time required for the completion of disinfection and bacteriological testing may vary depending on site conditions. It is the Contractor's responsibility to plan ahead of construction schedule and coordinate with the City Representative to allow sufficient time for SFPUC personnel to complete the disinfection work.
- F. After completion of disinfection, the City Representative will arrange for City personnel to collect water samples for bacteriological analysis. The passing criteria for satisfactory disinfection of the components and facilities is that all water samples shall indicate the absence of total coliform bacteria. Any sample result that shows positive for total coliform is considered a failed test.
- G. If the Contractor is required to perform the preliminary and final disinfection of the conveyance facilities as part of the Contract work, the Contractor shall follow the same procedures as described in Articles 3.3 above for the disinfection work performed by City personnel.
- H. The City Representative will be responsible for contacting the governing regulatory agencies on all matters related to the disinfections and related environmental discharges.

### **3.05 WATER QUALITY TESTS AND REMEDIAL MEASURES**

- A. Water quality tests include soak tests and bacteriological tests. The Contractor may be required to perform these tests if directed by the City Representative. In that event, the Contractor shall be responsible for all the materials and labor to conduct these tests.
- B. The City is responsible for collecting appropriate water samples upon completion of soak tests and bacteriological tests. Samples will be analyzed for the appropriate contaminants and bacteriological parameters by the City.

- C. If any of the water quality tests fails, the Contractor shall, at no cost to the City, take appropriate remedial measures, as determined by the City Representative, to ensure that the components and facilities pass the specified water quality tests. These remedial measures may include, but are not limited to, aeration utilizing a compressor with an oil separator, draining/cleaning/refilling the component and/or facility, re-application of coating or sealant, or any combination of these and other remedial measures as determined by the City Representative. It is presumed that any failure to pass the specified water quality tests is due to foreign constituents introduced into the facility by the Contractor and/or by improper application of coating/sealing materials.
- D. Upon the Contractor's completion of all required remedial measures, the City Representative will reschedule disinfection of the facility, if necessary, and the specified water quality tests as described above.
- E. Disinfection and water quality testing of the components and facilities shall be repeated until all water samples pass the specified water quality tests. All costs and time associated with assuring that the facility passes the specified water quality tests are the sole responsibility of the Contractor.
- F. Facilities shall not be placed into service unless the required water quality tests pass to the satisfaction of the Water Quality Engineer.
- G. The City is not responsible for the Contractor's loss as a result of any delays in project completion due to the failure of the initial and repeat water quality tests.

**END OF SECTION**

(See Appendix 'A' on following page)