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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | September 30, 2009 | Review/update of the document “Related Sections” |
| 3 | April 10, 2013 | Final Draft – Consolidated Comments Spec Update Project |
| 4 | June 17, 2013 | Finalized for Legal Review. Incorporation of new Commissioning and Computerized Maintenance Management System Data Requirements Specification cross references. |
| 5 | May 21, 2014 | Revised to incorporate Legal Services’ comments (AV) |
| 6 | July 15, 2014 | Amended to reflect changes related to commissioning specification and name change (AV) |
| 7 | September 24, 2014 | Updated, Finalized Specification – Reference eDOCS #1029458-v5 (AV) |
| **8** | **March 2, 2015** | **Updated, Finalized Specification – Legal Reference eDOCS # (AV)** |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GEneral

## Scope of Work

### The work of this Section covers the supply, installation and testing of polyvinyl chloride liners for the Sodium Hypochlorite, Sodium Bisulphite, Ferrous Chloride, Alum and Hydrofluosilicic Acid Tanks including liners, and lined leak-free connections to piping, valves, sight tubes, instrumentation and tank covers of suitable material as described in this Section.

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Summary of Applicable Cross Referenced Sections:

#### Section 01300 – Submittals

#### Section 01425 – Computerized Maintenance Management System Data Requirements

#### Section 01430 – Operation and Maintenance Data

#### Section 01640 – Manufacturers’ Services

#### Section 01810 – Equipment Testing and Facility Commissioning

#### Section 06100 – Rough Carpentry and Drawings

#### Section 09900 – Painting and Protective Coatings

#### Section 11010 – Equipment General Requirements

#### [Product requirements for [item]... for installation under this Section.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

## Submittals

### Submit shop drawings of all layouts and details of the tank liners, tank covers, and appurtenances.

### Shop drawings will be processed in accordance with Section 01300 - Submittals.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

## If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.]

# PRODUCTS

## Chemical Properties

### The following list of chemical properties is given for information only:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SYSTEM | CHEMICAL | pH | TEMP | SPECIFIC GRAVITY |
| Sodium Hypochlorite | 12% NaOCl by mass | 11~11.2 | ambient | 1.12 |
| Sodium Bisulphite | 25% NaHSO3 by mass | 3.0~4.2 | ambient | 1.19 |
| Ferrous Chloride  Aluminum Sulphate  Hydrofluosilicic Acid | 18~28% FeCl2 by mass;  10% Fe by mass | <1.0  2.0  <1.0 | ambient  <50 C  ambient | 1.25  1.35  1.24 |

## Manufacturers

### Where a manufacturer’s standard equipment name and/or model number is listed, the equipment system shall be provided as modified to conform to the performance, functions, features, and materials of construction as specified in this Section.

## Chemical Tanks

### Each chemical concrete storage tank shall have the following features:

#### Vent pipe connection stub ([     ] mm) on top of a tank cover made of a suitable material and liner.

#### Overflow pipe connection stub ([     ] mm) to the side of the concrete tank wall and liner.

#### Fill pipe connection stub ([     ] mm) on top of a tank cover made of a suitable material and liner top.

#### Sight tube made of flexible tubing (chemically compatible with the stored liquid chemical) with a suitable scale in "litres", attached to the side of the concrete tank wall and liner.

#### [     ] mm square access opening on top of a tank cover made of a suitable material and liner top. A level measuring scale shall be affixed to the tank adjacent to the sight tube.

#### Flange connection stub for ultrasonic level sensor ([     ] mm) on top of a tank cover made of a suitable material and liner top. The connection stub shall be located at a suitable distance away from the tank side wall so as to eliminate reflected beam interferences on the ultrasonic transducer.

#### Drain pipe connection stub ([     ] mm) on the concrete tank and liner side wall.

#### Liner leakage detection connection stub ([     ] mm) at the bottom of concrete tank side wall (no connection to liner).

#### All equipment (tank) data as defined in Section 01430 -Operation and Maintenance Data shall be in an electronic format suitable for upload to the Region’s CMMS (Maximo). Refer to Section 01425 - Computerized Maintenance Management System Data Requirements.

## Tank Liners

### See Contract Drawings for concrete tank dimensions, tank cover arrangement, pipe and instrument connections requirements.

### All tank liners shall be fully chemically compatible with the stored liquid chemical cited in the Process Narratives/Process Control Narratives included in the SCADA appendices.

### Provide [two 405# PVC] bag liners suitable for installation in the Sodium Hypochlorite concrete storage tanks.

### Provide [two 405# PVC] bag liners suitable for installation in the Sodium Bisulphite concrete storage tanks.

### Provide [two 297# PVC] bag liners suitable for installation in the Ferrous chloride concrete storage tanks.

### Provide two appropriate bag liners suitable for installation in the Alum concrete storage tanks.

### Provide two appropriate bag liners suitable for installation in the Hydrofluosilicic Acid concrete storage tanks.

### Provide bag type liners fabricated from sheets of PVC with minimum thickness of [     ] mm ([     ] inches) as manufactured by [Consultant to provide a list of acceptable manufacturers. List to also contain Approved Equivalent]. Provide liners that are suitable for a fill line surcharge of [     ] mm over top of the tanks.

### Design and make all joints in the bag liners such that joint integrity is at least equal to that obtained from the material being joined (The Quality of the joint between two liners shall be equivalent or greater in all properties to the un-joined liner material of the bag liners).

### Provide sufficient PVC material in both horizontal and vertical directions in each bag liner, to allow for the expansion and contraction of the material and to prevent bridging in the corners of the tank.

### Connect the bag liner around the top of the tank in such a manner as to prevent bulging or tearing of the liner.

### Supply the bag liner with outlets, level and other connections at the locations shown on the Contract Drawing.

### Supply protective sheets between the liner and the concrete walls with [insert number] layer(s) of polyethylene with each layer a minimum of [     ] mm ([     ] inches) thick. On the floor, there shall be [insert number] layer(s) of polyvinyl chloride with each layer a minimum of [     ] mm ([     ] inches) thick.

### Supply a repair kit for the tank liner and include swatches of the PVC materials, bonding compound and repair instructions.

### Coordinate the installation of tank liners with the concrete tank Subcontractor(s), as applicable.

## Wooden Covers

### Provide wooden covers in accordance with Section 06100 – Rough Carpentry and Drawings for each tank.

### Coordinate with the concrete tank contractor, if separate subcontracts are applicable.

### Provide coating on the interior and exterior of the covers in accordance with Section 09900 – Painting and Protective Coating. Colour to match the concrete tanks.

# EXECUTION

## Installation of Liners

### Before commencing the installation of bag liners, provide the services of the manufacturer's representative to inspect the interior surfaces of the tank to ensure that the surfaces are adequately prepared for the application of the liner in accordance with the manufacturer’s specifications.

### The Contractor shall ensure that the manufacturer's representative approves the retaining structure before the installation of liners is commenced and that the manufacturer’s representative will supervise the installation of the PVC liners.

## Leakage Testing of Tank Liner

### The Contractor shall ensure that each tank liner shall be visually inspected for leaks by the Consultant before it is installed in the tank in full compliance with the manufacturer’s recommendations. After the tank lining has been installed, the Contractor shall test the tank liner by filling the tank with water which shall be left for a minimum period of 48 hours. Repair and re-test the tank lining if any leakage is found. If any leaks are detected, the cause of the leak(s) shall be repaired in accordance with the manufacturer’s written recommendations. The tank shall be repaired and re-tested until no leaks are detected. The Contractor shall be responsible for any clean-up or remediation activities in the event of a tank failure. The Contractor shall be responsible for all costs associated with re-testing until no leaks are detected. All testing shall be performed in accordance with the manufacturer’s written procedures. The Contractor, assisted by the manufacturer’s representative, shall perform all functional testing and re-testing as required and submit a test report to the Consultant for review and to the Region for sign-off.

## Manufacturer’s Field Services

### The Contractor shall ensure that the manufacturer’s representative will be present at the Site for a minimum of 1 Person-day in accordance with Section 01640 - Manufacturer’s Services, and Section 01810 - Equipment Testing and Facility Commissioning, for installation assistance, inspection, testing, and the certification of proper installation.

### Commissioning activities shall be performed in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

**END OF SECTION**