

# FORMAL BID

**FILE NO.:** 4020

**COMMODITY:** WATER DEPARTMENT CHEMICALS

**NAME OF BIDDER:**

**BIDDER'S FED. ID. OR SOCIAL SECURITY NO.:**

Item/Schedule

Term of Contract

Options

Perf Bond		Payment Bond		Insurance	
Yes	No	Yes	No	Yes	No

TO: Cynthia H. Griffin  
 Purchasing Agent  
 Cambridge City Hall  
 795 Massachusetts Avenue  
 Cambridge, MA 02139  
 PH: (617)349-4310 FX: (617)349-4008

The undersigned submits this sealed bid to provide the commodity or services identified above, described in the specifications herein and advertised in the **CAMBRIDGE CHRONICLE** on **THURSDAY, NOVEMBER 30, 2006**, which is to be opened and publicly read at the Office of the Purchasing Agent, City Hall, 795 Mass. Ave., Room 303, Cambridge, MA at 11:00 a.m. on **THURSDAY, DECEMBER 21, 2006**.

The undersigned certifies that this bid is made without collusion with any other person, firm or corporation making any other bid or who otherwise would make a bid. The undersigned agrees to furnish the commodity or services in strict accordance with the bid documents, which consist of this Formal Bid and all attachments hereto.

The envelope containing the bid must be labeled: "This envelope contains a bid for **WATER DEPARTMENT CHEMICALS** opened at 11:00 A.M. on **THURSDAY, DECEMBER 21, 2006**."

This bid process and the award of the contract are made in conformity with M.G.L. c. 30B, unless otherwise stated.

See other side of this form for General Terms and Conditions that shall become part of any Contract awarded through this Formal Bid.

**This bid includes addenda numbered:** \_\_\_\_\_

**SIGNATURE OF BIDDER:** \_\_\_\_\_

**TITLE OF SIGNATORY** \_\_\_\_\_

**ADDRESS OF BIDDER** \_\_\_\_\_

**TELEPHONE NUMBER** \_\_\_\_\_

**FAX NUMBER:** \_\_\_\_\_

Please check one of the following and insert the requested information:

- ( ) Corporation, incorporated in the State of: \_\_\_\_\_
- ( ) Partnership. Names of partners: \_\_\_\_\_
- ( ) Individual.

**NAME OF BIDDER:** \_\_\_\_\_

**GENERAL TERMS AND CONDITIONS**

**LAWS:** All deliveries shall conform in every respect with all applicable laws of the Federal government, Commonwealth of Massachusetts and City of Cambridge.

**EQUAL OPPORTUNITY:** The Vendor in the performance of the contract shall not discriminate on the grounds of race, color, religion, national origin, age or sex in employment practices or in the selection or retention of subcontractors, and in the procurement of materials or rental of equipment. The City may cancel, terminate or suspend the contract in whole or in part for any violation of this paragraph

**TAXES:** Purchases made by the City are exempt from the payment of Federal excise tax and the payment of Commonwealth of Massachusetts sales tax (except for gasoline) and any such taxes must not be included in the bid prices.

**QUANTITIES:** Unless otherwise stated, the quantities set forth herein are ESTIMATES ONLY. The City reserves the right to purchase the commodity(ies) specified in any amount less than the estimated amount.

**BID PRICES:** Bid prices shall include transportation and delivery charges fully prepaid to the City of Cambridge destination. Where the unit price and the total price are at variance, the unit price will prevail.

**DELIVERY AND PACKAGING:** Deliveries must be made in such quantities as called for in the purchase order and in the manufacturer's original packages. All deliveries must be **"inside" delivery with no assistance from City personnel. Tailgate deliveries will not be accepted.** Rejected material will be returned to the vendor at the vendor's expense.

**MODIFICATION OF BIDS:** Prior to bid opening, a bidder may correct, modify or withdraw its bid by making the request in writing prior to the time and date for the bid opening. All corrections and modifications must be delivered to the Purchasing Department in a sealed envelope indicating that it contains a modification or correction of the original bid submitted for the particular commodity and indicating the time and date of the bid opening.

**REJECTION OF BIDS:** The City reserves the right to reject any and all bids if it is in best interest of the City to do so.

**AWARD OF CONTRACT:** Contract(s) will be awarded within forty-five days of the bid opening unless award date is extended by consent of all parties concerned.

**INDEMNITY:** Unless otherwise provided by law, the Vendor will indemnify and hold harmless the City against any and all liability, loss, damages, costs or expenses for personal injury or damage to real or tangible personal property which the City may sustain, incur or be required to pay, arising out of or in connection with the performance of the Contract by reason of any negligent action/inaction or willful misconduct by the Contractor, its agents, servants or employees

**TERMINATION OF CONTRACT:** Except as otherwise provided in the Articles of Agreement, the City may terminate the contract upon seven days notice.

**ASSIGNABILITY:** The Vendor shall not assign, sell, subcontract or otherwise transfer any interest in this contract without the prior written consent of the City.

**MATERIAL SAFETY DATA SHEETS:** Pursuant to M.G.L. c. 111F, ss. 8, 9, and 10, any vendor who receives a contract resulting from this invitation agrees to submit a Material Safety Data Sheet for each toxic or hazardous substance or mixture containing such substance when deliveries are made. The vendor agrees to comply with all requirements set forth in the pertinent laws above.

**NAME OF BIDDER:** \_\_\_\_\_

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**\* These forms must be submitted with the bid.**

Introduction

Quality Requirements\*

Bid Submission Requirements\*

Insurance Requirements

Chemicals Price Proposal Sheet\*

Lox Price Proposal Sheet\*

Vendor Chemical Bid Data Sheet\*

American with Disabilities Act/ Tax Compliance/Anti Collusion\*

SOP CM1	General Chemical Purchase Specifications
SOP CM2	General Chemical Delivery Requirements
SOP CM1.1	Aluminum Sulfate – Purchase Specifications
SOP CM 2.1	Aluminum Sulfate – Delivery Acceptance Requirements
SOP CM 1.2	Aqua Ammonia – Purchase Specifications
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SOP CM 1.3	Polyaluminum Chloride (PAC) – Purchase Specification.
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SOP CM 1.5	Fluoride – Hydrofluosilicic – Purchase Specifications
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SOP CM 1.6	Potassium Hydroxide – Purchase Specifications
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SOP CM 1.7	Potassium Permanganate – Purchase Specifications
SOP CM 2.7	Potassium Permanganate – Delivery Acceptance Requirements
SOP CM 1.8	Section not used
SOP CM 2.8	Section not used
SOP CM 1.9	Section not used
SOP CM 2.9	Section not used
SOP CM 1.10	Sodium Bisulfite – Purchase Specifications
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SOP CM 1.11	Sodium Hypochlorite – Purchase Specifications
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SOP CM 1.12	Calcium Hypochlorite – Purchase Specifications
SOP CM 2.12	Section not used

**NAME OF BIDDER:** \_\_\_\_\_

FILE NO 4020 – **WATER DEPARTMENT CHEMICALS** – FILE NO 4020 – THURSDAY, DECEMBER 21, 2006 @ 11:00 AM.

SOP CM 1.13 Polymer 1.13-1 through 1.13-3  
SOP CM 2.13 Section not used

Living Wage Ordinance

Sample Copy of Contract

NAME OF BIDDER: \_\_\_\_\_

TO: Cynthia H Griffin, Purchasing Agent  
City Hall, Cambridge MA 02139

The undersigned hereby proposes to furnish **WATER DEPARTMENT CHEMICALS** and deliver to the Cambridge Water Department, its requirements of the following chemicals for a period of one year, all in accordance with the attached specifications and following proposal schedule.

Up to two awards will be made for each chemical as a result of this formal bid. Prices must remain FIRM during the entire contract period.

Contract will be awarded within forty-five days of the bid opening, unless award date is extended by consent of all parties concerned.

Prior to bid opening, a bidder may correct, modify, or withdraw its bid by making the request in writing prior to the time and date of the bid opening. All corrections and modifications must be delivered to the Purchasing Department in a sealed envelope with a notation on the envelope indicating that it contains a modification or correction of the original bid submitted for the particular commodity and indicating the date and time of the bid opening.

**YOUR ATTENTION IS CALLED TO THE INSURANCE REQUIREMENTS LISTED HEREIN.**

A sample contract is attached hereto.

NOTE: In accordance with the City's recycling policy, these bid pages are printed on both sides.

**PLEASE SUBMIT YOUR BID IN DUPLICATE.**

Except as otherwise provided in Article V of the Articles Agreement, the City may terminate the contract upon seven (7) days' notice.

**The following information is voluntary. A response or lack of response will not affect the competitiveness/status of your bid.**

Minority/Women Business Status – Please indicate whether your business is SOWMBA (or another state) certified.  
YES NO

**Questions concerning the IFB must be submitted in writing by Wednesday, December 13, 2006. All questions can be faxed to the Office of the Purchasing Agent at 617-349-4008.**

**LIVING WAGE REQUIREMENTS**

The City of Cambridge has a Living Wage Requirement that establishes minimum hourly rates for all Personnel that work on any City contract. The City of Cambridge's Living Wage as of March 1, 2006 \$12.59 per hour. The Living Wage Requirements are attached.

**QUALITY REQUIREMENTS**

**A "NO" response or a failure to respond to any of the following Quality Requirements will result in a rejection of your bid.**

1. All chemicals bid have National Sanitation Foundation Standard 60 Approval or have been used for the treatment of potable water in the USA for five (5) years and have been used in a New England state or New York state for two (2) years.

YES NO

2. The vendor, a Manufacturer or Packager, has been engaged in the manufacture or sale of all chemicals bid to Municipal or private water companies for the production of potable water for a minimum of five (5) years.

YES NO

**NAME OF BIDDER:** \_\_\_\_\_

3. It is true that the bidder is currently not in Bankruptcy.

YES

NO

4. Bidder can provide, upon request, proof of financial solvency.

YES

NO

**BID SUBMISSION REQUIREMENTS**

**Failure to submit documents requested may result in the determination that your bid is non-responsive unless the City deems such failure to be a minor informality.**

1. Bidder complete and submit all information requested on vendor chemical data sheet and referenced on Manufacturer's Specification sheet for each chemical bid.
2. Successful bidder must furnish, with their signed contract, an insurance certificate in the amounts and coverage specified, with the City of Cambridge listed as ADDITIONAL INSURED AND CERTIFICATE HOLDER.

**INSURANCE REQUIRMENTS**

**Indemnification**

The contractor agrees to indemnify and save the City of Cambridge, harmless against any and all damages, costs and expenses which it may suffer or pay out of reason of any claims, actions, rights of action, in law or equity, arising out of performance of the work and resulting from injuries or damage occurring to, or caused in whole or in part by the contractor mover and any of his/her officers, employees or representatives or firm directly or indirectly engaged in moving by the contractor.

**Contractor's Insurance**

The contractor shall provide the City of Cambridge with insurance policies as stated below at the expense of the Contractor. **The insurance certificate must be written in the name of the City of Cambridge as an Additional Named Insured in order to protect the interest of the City from any liability which might be incurred against it as the result of any operation of the contractor, its subcontractors, or their employees.**

The insurance required shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or the following limits, whichever are greater.

Certificates must be presented to the City at the time the contract is signed by the Contractor.

The Contractor and all subcontractors waive subrogation rights against the City of Cambridge for all losses. EACH POLICY SHALL CONTAIN A 30-DAY NOTICE OF CANCELLATION, CHANGE OR NON- RENEWAL. NOTICE OF OCCURENCE is to be given to the City Manager, City of Cambridge, 795 Massachusetts Ave. Massachusetts Avenue, Cambridge, and Ma. 02139-3219.

INSURANCE POLICIES MUST COVER THE ENTIRE CONTRACT PERIOD INSURANCE POLICIES

INSURANCE POLICIES MUST COVER THE ENTIRE CONTRACT PERIOD

- |    |                              |             |
|----|------------------------------|-------------|
| A. | Owner's Protective Liability |             |
|    | Each Occurrence              | \$1,000,000 |
|    | Aggregate                    | \$1,000,000 |
| B. | Commercial General Liability |             |
|    | General Aggregate            | \$1,000,000 |

NAME OF BIDDER: \_\_\_\_\_

Products Completed Operations Aggregate	\$1,000,000
Personal Injury and Advertising Limit Each Occurrence	\$1,000,000 \$1,000,000
C. Automotive For all owned, non-owned, hired and Leased Vehicles Each Occurrence Combined Single Limit	\$1,000,000
- Or-	
Bodily Injury- each person	\$1,000,000
- each accident	\$1,000,000
Property damage- each occurrence	\$ 500,000
D. Umbrella	
Combined single limit	\$1,000,000
General Aggregate	\$1,000,000
E. Worker's Compensation	
Coverage A	STATUTORY
Coverage B Each Accident	\$ 100,000
Disease- Policy Limit	\$ 500,000
Disease- Employee	\$ 100,000
F. Full Replacement Valuation for Damaged or Missing Items No depreciation shall apply.	\$ 50,000

The Contractor may purchase and maintain excess liability insurance in the umbrella form in order to satisfy the limits of liability required for the insurance to be purchased and maintained in accordance with the requirements set forth above (in addition to the umbrella limits required). Evidence of such excess liability shall be delivered to the City of Cambridge in the form of a certificate indicating the policy numbers and limits of liability of all underlying insurance. The City of Cambridge must be an additional insured on any such umbrella policy. The City of Cambridge reserves the right, at its sole discretion, to amend the insurance requirements set forth above. Failure of the contractor to provide and continue in force such insurance shall be deemed a material breach of contract and shall operate as an immediate termination thereof.

**PRICE PROPOSAL**

The City will make multiple awards for each chemical listed below. Awards will be made up to the two responsible, responsive bidders offering the lowest price for each chemical.

All drums, totes, pails used for the delivery of any chemical to the Cambridge Water Department shall remain the property of the vendor and will be removed at the vendor's expense. All costs associated with this requirement are to be included in the bid price.

All bidders shall submit pricing in the format requested.

**CHEMICALS**

Chemical Item #	AWWA Reference	Estimated Usage	Maximum Delivery Quantity	Proposed Delivery Quantities	Cost per Gallon or Pound	Container Deposit	Total Bid Value (estimated usage times bid price).
Alum (80% Al <sub>2</sub> O <sub>3</sub> ) CM 1.1	B403a-90	300,00 Gallons	5000 Gallons		gallon		
Aqueous Ammonia 29% CM1.2	NA	10,000 Gallons	1,000 Gallons		gallon		
Polyaluminum Chloride CM1.3	B408-93	120,000	See CM2.3		gallon		
Fluoride Hydrofluorosilicic Acid 25% CM 1.5	B-703-00	33,000 Gallons	1,200 Gallons		gallon		
Potassium Hydroxide 45% total Alkalinity as KOH CM 1.6	B511-00	200,000 Gallons	5,000 Gallons		gallon		
Potassium Permanganate CM 1.7	B603-98	30-55 Pound Drums	5 – 55 Pound Drums		pound		
Sodium Bisulfite CM 1.10b	NSF 60&61	2-55 gallon drums	1-55 gallon drums		gallon		
Sodium Hypochlorite 15% CM 1.11	B300-99	150,00 Gallons	6,000 Gallons		gallon		
Sodium Hypochlorite 15% CM 1.11b	B300-99	30-55 gallon drums	10-55 gallon drums		gallon		
Calcium Hypochlorite CM1.12	B300-99	2-100 lb Drum	1-100 lb drum		pound		
Polymer - Floc Aid Plate Settlers CM1.13-1	NSF 60&61	4-275 gallon totes	1 –275 gallon tote		gallon		
Polymer - Floc Aid DAF System CM1.13-2	NSF 60&61	4-275 gallon totes	1-275 gallon tote		gallon		

**SUBTOTAL** \$ \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_

See Section CM1.4 for LOX Specifications.

**LOX PRICE PROPOSAL**

Lox suppliers shall submit a price and a total lump sum for LOX, LOX System parts materials markup and the annual maintenance service rate. **One Contract will be awarded for LOX, LOX System parts and LOX Services to the responsive, responsible bidder offering the lowest total lumps sum. All prices shall remain firm.**

The proposed contract price shall be calculated as the total sum to supply LOX (to two tanks 13,000 gal and 6,000 gal), LOX System parts and LOX Services.

**CM1.4 LOX**

(Liquid Oxygen)  $\frac{250,000 \text{ gallons}}{\text{Annual Usage}} \times \$ \frac{\quad}{\text{Unit Price}} = \$ \frac{\quad}{\text{Total}}$

**CM1.4B LOX SYSTEM PARTS MATERIALS MARKUP (%)**

Supplier's actual cost plus  $\frac{\quad}{\quad} \% \times \$5,000 = \$ \frac{\quad}{\text{Total}}$

*Example for a materials markup of 15%, multiply \$5,000 x 1.15 to equal \$5,750*

*\$10,000 is an estimated annual dollar value of LOX System parts. The City may increase or decrease this amount during the length of the contract.*

**CM1.4C LOX ANNUAL MAINTENANCE SERVICE RATE**

To provide LOX annual maintenance services to the Cambridge Water Treatment as described in section E.

Hourly rate of service  $\frac{\quad}{\quad} \times 80 \text{hours} = \$ \frac{\quad}{\text{Total}}$

*The numbers of hours used in the formula is based on the estimated annual amount of hours required for service. The City increase or decrease the number of hours required for services as needed. Prices shall remain firm during the length of the contract.*

**LOX, LOX SYSTEM PARTS, AND LOX SERVICES  
SUBTOTAL**

**\$ \_\_\_\_\_  
SUBTOTAL**

**PROPOSED CONTRACT PRICE  
TOTAL LUMP SUM FOR CHEMICALS  
AND LOX, LOX PARTS, & LOX SERVICES**

**\$ \_\_\_\_\_  
TOTAL LUMP SUM**

**Total lump sum in words:** \_\_\_\_\_

**Bidder's Signature:** \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_

## Vendor Chemical Bid Data Sheet must be submitted for each chemical.

Chemical Name: \_\_\_\_\_

Bidder: \_\_\_\_\_

Manufacture: Yes\_\_\_\_\_ No\_\_\_\_\_

If No:

Manufacturer's Representative: Yes\_\_\_\_\_ No\_\_\_\_\_

Specify location or locations the chemical supplied will be manufactured:

Address: \_\_\_\_\_

Contact person at point of manufacture:

Telephone number: \_\_\_\_\_

Specify the distribution point from which CWD will receive the chemical:

Address: \_\_\_\_\_

Detailed directions (attach if needed):

Contact Person at facility:

Name: \_\_\_\_\_

Telephone number: \_\_\_\_\_

Quantity of chemical routinely in storage: \_\_\_\_\_ (gal)

**Customer References: three (3) potable water treatment plants that have been supplied the chemical in truckload quantities on an annual bid basis within the last three years. References must be from the New England/New Area. Minimum information required: (attach additional)**

1. Water Company or Water Department

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Contact person: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Phone number: \_\_\_\_\_

Delivery Address: \_\_\_\_\_

\_\_\_\_\_

Quantity received annually: \_\_\_\_\_ (gal/lb)

NAME OF BIDDER: \_\_\_\_\_

2. Water Company or Water Department

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Contact person: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Phone number: \_\_\_\_\_

Delivery Address: \_\_\_\_\_

\_\_\_\_\_

Quantity received annually: \_\_\_\_\_ (gal/lb)

3. Water Company or Water Department

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Contact person: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Phone number: \_\_\_\_\_

Delivery Address: \_\_\_\_\_

\_\_\_\_\_

Quantity received annually: \_\_\_\_\_ (gal/lb)

Site visit required: Yes \_\_\_\_\_ No \_\_\_\_\_

**Required attachments:**

ANSI/NSF letter of chemical acceptance

Affidavit of compliance

Certificate of analysis

MSDS Sheet for bid chemical

A technical specification sheet for each product bid.

Specific Gravity verse Concentration chart (for a range of temperatures)

Transportation plans

Training syllabus

Emergency phone contact list for each company involved with generation, supply, and transport of chemical to the CWD.

Samples of each piece of delivery documentation.

NAME OF BIDDER: \_\_\_\_\_

**Americans With Disabilities Act (42 U.S.C. 12131)  
Section 504 of the Rehabilitation Act of 1973  
Tax Compliance/Anti-Collusion Statement**

The Americans with Disabilities Act (the "Act") applies to all employers of fifteen or more employees. All vendors that are subject to the Act must comply with its provisions. In further compliance with the Act, all Contractors who enter into contracts with the City are prohibited from discrimination against the City's employees, regardless of the size of the Contractor.

The Act protects against discrimination on the basis of "disability", which is defined as a physical or mental impairment that substantially limits at least one "major life activity"; discrimination against a person having a history or record of such impairment; and discrimination against an individual regarded - even if inaccurately - as having such an impairment. The Act also expressly prohibits discrimination that is based on an individual's relationship or association with a disabled person.

The bidder shall not discriminate against any qualified employee or job applicant with a disability and will make the activities, programs and services covered by any contract awarded through this procurement readily accessible to and usable by individuals with disabilities. To be qualified for a job, or to avail oneself of the bidder's services, the individual with the disability must meet the essential eligibility requirements for receipt of the bidder's services or participation in the bidder's programs or activities with or without: 1) reasonable modifications to the bidder's rules, policies and practices; 2) removal of architectural, communication, or transportation barriers; or, 3) provisions of auxiliary aids and services.

By submitting its bid, the bidder certifies to the City of Cambridge that it understands and will comply with all applicable provisions of the Act, including compliance with applicable provisions of Section 504 of the Rehabilitation Act of 1973, if the bidder is receiving federal funds.

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals

As required by M.G.L. c. 62C, §49A, the undersigned certifies under the penalties of perjury that the bidder has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

\_\_\_\_\_  
(Print Name of person signing bid)

\_\_\_\_\_  
(Signature & Title)

\_\_\_\_\_  
Name of Company

\_\_\_\_\_  
Address

\_\_\_\_\_  
City State Zip Code

**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1:  
WATER TREATMENT CHEMICAL PURCHASE SPECIFICATIONS**

**1. Objective**

As part of the Cambridge Water Department (CWD) Chemical Management (CM) Program these purchase specifications for water treatment chemicals are meant to protect the public health and promote safe handling, use, and offloading of chemicals at CWD facilities.

**2. Background**

1. Companies awarded chemical contracts must follow CWD Operations procedures for acceptance of the chemical. Failure to comply with our procedures will result in a rejection of the chemical delivery or possibly cancellation of the contract.
2. CM1 includes general procedures applicable to all water treatment chemicals. CM1-1 to CM1-13 includes specific requirements depending on the type of chemical.

**3. Responsibilities**

It is the responsibility of Manager of Water Operations to assure that this SOP is updated periodically or when necessary.

**4. Chemical Bid Form**

1. The quantities outlined on the Bid Sheet are strictly estimated and not guaranteed quantities.
2. Orders will be placed as needed during the term of the contract.
3. Chemical suppliers in preparing this proposal shall not be required to furnish a price for each of the items being sold. Suppliers will be selected by individual chemical. The Cambridge Water Department shall have the unqualified right to purchase their chemical needs from the supplier or suppliers who can best serve their needs.

**5. Provisions of Specifications**

**A. Certification**

Products shall comply with the most recent AWWA Standard.

Products shall be NSF Standard 60 certified for drinking water chemicals. The chemical shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute. A copy of the ANSI/NSF letter of acceptance for the chemical proposed to be supplied shall accompany the bid.

Failure to comply with these requirements or the loss of ANSI/NSF 60 certification shall be considered grounds for cancellation of the contract for the remainder of the contract period.

1. If ANSI/NSF 60 certification is lost; the company shall notify the CWD immediately.
2. The CWD will periodically contact the NSF listing to ensure that companies are ANSI/NSF 60 certified.

**NAME OF BIDDER:** \_\_\_\_\_

**B. CWD Site Visit / Vendor Site Visits**

1. If the vendor has not previously been contracted to supply chemical, a site visit by the vendor to Cambridge Water Treatment Plant (WTP) is required before the initiation of the contract.
2. Vendors intending to submit bids for the supply of Sodium Hypochlorite are encouraged to arrange to inspect the CWD Storage and Day tank. Inspection shall be arranged and coordinated through the Production Manager. Inspections shall be conducted at the bidders sole cost.
3. CWD reserves the right to inspect or visit any proposed vendor's chemical manufacturer's site along with any sites where the chemical will be transloaded, stored for distribution, or repackaged. CWD reserves the right to make such visits anytime during the bid evaluation process and at anytime during the life any chemical supply contract awarded.
4. The site visit will include a discussion of the transportation plan (discussed below) of the vendor. The vendor will attest to the fact that this transportation plan will not deviate and that any proposed changes would be provided to the CWD beforehand.
5. A site visit will also include a walk-through of the manufacturing process, what quality assurance and purity tests are performed on the product, possible contaminants along with mitigating measures, and how often quality assurance and purity tests are performed.
6. Should any concerns be raised by CWD personnel during the site visit, the vendor shall address those concerns. If possible changes are discussed and agreed upon they will be put in writing by the vendor and sent to the appropriate CWD personnel. The conditions will stand for the entire length of the contract unless otherwise noted.

**C. Affidavit of Compliance**

Along with the bid, the prospective vendor shall submit an affidavit of compliance that confirms that the chemical meets CWD specifications. Each company involved in supplying and transporting the chemical to the Cambridge WTP must sign the affidavit of compliance.

**D. Substitutions or Changes of Manufacturer**

1. The vendor may not substitute another manufacturer's product or deliver any other chemical than what is agreed to at the time of award without prior written approval from CWD management. Failure to obtain such approval can result in forfeiture of the contract and the vendor removing any delivery made at the vendor's expense.
2. If the CWD agrees to a substitution in material, the vendor is still responsible for ensuring that the appropriate paperwork is produced and given to the CWD via the delivery driver. If the normal paperwork requirements are not fulfilled CWD reserves to right to reject the delivery.

**E. Certified Analysis Testing for Impurities & Delivery Paperwork**

1. Along with the bid, a certified analysis for impurities must be provided. The details of this chemical analysis are outlined in CM1-1 to CM1-13, depending on the particular chemical. An independent laboratory shall perform testing.

2. A certified analysis for impurities of the chemical must also be conducted with results supplied to the CWD every quarter. An independent laboratory shall perform testing.
3. For our audit program, at any point during the contract, the CWD may have a sample taken from the tank truck and analyzed for purity and trace contaminants. An independent laboratory will perform testing.
4. For each delivery, the vendor will supply a certificate of analysis. The required details of this analysis are outlined in CM1-1 to CM1-11, depending on the type of chemical. The certificate of analysis shall state from where the test sample was taken (i.e. tank truck, rail car, storage tank, etc.).
5. Where chemicals are transloaded from a storage tank, rail car, or other container other than what is delivered to the CWD, the driver or transloader must initial that he/she has witnessed the transloading into the vehicle used for transport to the CWD facility. As evidence of this, the paperwork shall state the container identification such as the DOT UN# along with chemical name and an identification number of the tank truck used for transporting the chemical to the CWD facility. This assures CWD staff that the wrong chemical was not transloaded.

#### **F. Transportation Plan**

1. In order to fully comprehend the “chain-of-custody” before a chemical reaches its CWD destination, the CWD must be provided with a transportation plan along with the bid. Within this plan, a detailed explanation must be provided explaining all companies involved in the manufacturer, distribution, and transportation of the chemical to the CWD facility.
2. Any changes made to the transportation plan, during the contract, must be made known to the CWD two weeks prior to the proposed change. The proposed change must be sent certified mail to the following address: Jim Rita, Production Manager, 250 Fresh Pond Parkway, Cambridge MA 02138, Where two weeks notice is not available, a fax shall be sent to Production Manager of Cambridge water treatment plant at the following number, (617) 349-4796(FAX). The fax shall be confirmed by a telephone call to the Production Manager. (617) –349-4789.
3. Included in this transportation plan shall be an emergency contact list for each company involved in the chemical manufacture, distribution, and transportation of the chemical.
4. Included in this transportation plan shall also be a description of other chemicals manufactured, repackaged, transloaded and transported at each location affiliated with supplying the chemical to the CWD. Also include a description of how these chemicals are packaged.
5. Included in the transportation plan shall be a detailed description of the personal protective equipment required of the driver during the delivery process at the CWTP. List each piece of required personal protective equipment. Chemical offloading may not occur if the driver does not have the proper personal protective equipment.
6. All required bid submissions will be reviewed by CWD staff. Include in the transportation plan a contact person and phone number who is available to answer questions posed by CWD staff during the bid selection process.
7. The vendor (as well as its contractors affiliated with supplying the chemical to the CWD facility) must provide information on their accidental release history as part of the transportation plan.

**NAME OF BIDDER:** \_\_\_\_\_

8. Include in the transportation plan conditions of vendor contract agreements as outlined below.

### **G. Vendor Contract Agreements**

The transportation plan will disclose any conditions and requirements the vendor has with its contractors to manufacture, supply, and/or transport the chemical to the CWD. Disclosure includes conditions of the contract, including provisions for pre-job safety meeting orientations for contractors, training, necessary personal protective equipment, and emergency response procedures that the vendor requires of its contractors.

### **Customer References:**

Provide three (3) possible water treatment plants that have been supplied the chemical in truckload quantities on an annual bid basis within the last three years.

### **I. Possible Submission of Additional Data**

Bidders may be required to submit some or all of the following during the bid evaluation process or during the life of any chemical supply contract that is awarded based on this bid:

1. An audited financial statement
2. Capacity of facilities
3. List of current customer base for the last five years
4. Security measures at all applicable facilities
5. Age and/or maintenance performed on rail cars and tank trucks used for CWD chemicals
6. Emergency notification procedures

### **J. Containers & Appurtenances in contact with CWD supplied Chemical**

1. All containers and appurtenances shall be dedicated solely to that chemical.
2. If the chemical containers or packaging are damaged, they will not be accepted. This minimizes any chance for possible contamination. The damaged products will be returned and proper replacement will be provided accordingly at the vendors expense.
3. Any containers or tank trucks found leaking chemicals shall not be allowed to enter or depart from the CWD facility until the contractor or the designated representative makes appropriate repairs. Any cargo found to be leaking chemicals will be considered an emergency situation requiring immediate attention by the vendor and its contractors.

### **K. Delivery**

1. All orders shall be scheduled in advance so trained CWD personnel can be present to accept and monitor the delivery process.
2. Planned deliveries will only occur during the specified times.

**NAME OF BIDDER:** \_\_\_\_\_

3. An assigned CWD employee will meet the driver at the delivery area and perform a visual inspection of the vehicle. The employee will verify that the UN# is correct on the outside of the vehicle. If no visible problems occur the employee will escort the driver to the appropriate location to commence CWD testing (if appropriate) and unloading.
4. The driver will place blocks behind his wheels to ensure that the truck will not move during unloading.
5. The driver can only hook up the delivery when an assigned CWD employee tells the driver where to make the necessary connections.
6. Any delivery not agreeing with either the temperature or concentration criteria established shall be returned at the contractor's expense.
7. While the truck is unloading, the driver must stay with the truck at all times in case problems occur with the unloading.
8. Hoses shall be clean and free of residue from previous deliveries. Hoses, couplings or adaptors found unclean shall be cleaned at the vendor's expense before unloading.
9. Where tank trucks are used, the truck tank pressure shall be regulated by the driver while unloading and shall not exceed the tank truck manufacturer's specifications.
10. Tank trucks shall be equipped with tank-mounted valves to enable rapid shut-off if an emergency arises.
11. The vendor shall notify the CWD's authorized representative immediately of any delay en route.

**L. Safety and Personal Protective Equipment**

1. The vendor shall ensure that all parties involved in supplying the chemical to the CWD facility observe the applicable safety practices. This includes wearing the appropriate personal protective equipment during transloading and offloading operations. Such operations shall not begin unless the personal protective equipment is worn.
2. The driver shall always wear the appropriate protective face and body apparel when unloading the chemical. The driver shall also be fully educated (classroom & hands-on training) in Hazardous Communication regulations to ensure that they know what to do should an emergency occur on-site or while traveling to the facility.
3. In no case will a driver transport the chemical without being trained on the use of the specific truck used to transport the chemical to the CWD facility.

**M. Safety Requirements of Vendors**

1. Vendors that deliver hazardous chemicals must assure that their employees are trained on performing the job safely, of the hazards related to the job, and applicable provisions in CWD emergency response plans. Upon request by the CWD, vendors must present information regarding the vendors' safety performance as highlighted below:
2. Assure that their employees are trained in safe work practices;

3. Assure that their employees are instructed in the known potential fire, explosion, or toxic release hazards related to the job;
4. Document the required training and the means to verify that their employees have understood the training;
5. Assure that their employees follow the CWD's safety rules and work practices.
6. The training records shall contain the identity of the employees, the dates of training, and the means used to verify that the training was understood.

#### **N. Training and Technical Services**

1. As requested, the contractor shall provide at no additional cost to the CWD, a one-half day formal on-site classroom training session to CWD employees for each supplied chemical. The training classes shall be given within three months of the beginning of the contract period.
2. The training session shall include but not to be limited to the characteristics of the supplied chemical, safe operating and maintenance practices, emergency response, routine operational observations or maintenance tasks, and technical guidance to assure that the workforce is adequately acquainted with all aspects of handling and using the supplied chemical.
3. The instructor shall have sufficient experience and qualifications that will enable him/her to present a training session that is meaningful and complete.
4. The vendor shall coordinate the scheduling of training with CWD Production Manager.

#### **O. Material Safety Data Sheets**

The vendor must submit a manufacturer's Materials Safety Data Sheet (MSDS) prior to CWD's first delivery. A new MSDS must be submitted to the CWD if any revision or change occurs during the contract.

#### **P. Weight Certificate**

Where applicable, all deliveries shall be accompanied by weight certificates or certificates issued by a certified weigher.

Weight slips shall be the basis of vendor invoices for this (these) contracts. Invoices shall be corrected to reflect the specific gravity of each load. CWD specific gravity measures will be considered final. CWD stockpiles all delivery samples for a period of time to allow for vendor verification in the event of a question or dispute.

CWD measures each chemical delivery with various tank height gauges. If CWD finds a discrepancy between weight slips and CWD volume measurements, CWD will notify the vendor. The vendor shall work with CWD staff to resolve disputes. In the event of the failure to resolve delivery volume issues, CWD measurement will be considered final for billing purposes.

#### **Q. Departure**

The driver must make sure that all of the cargo has been unloaded, the appropriate paperwork has been signed, and that all previously open outlets and valves are closed to ensure that nothing can leak out of the vehicle.

**NAME OF BIDDER:** \_\_\_\_\_

**6. Restrictions/Limitations**

N/A

**7. References**

N/A

**SOP CM2:  
GENERAL CHEMICAL DELIVERY REQUIREMENTS**

**1. Objective**

This standing operating procedure covers delivery acceptance of treatment chemicals. Its purpose is to ensure public safety when accepting deliveries of chemicals that are to be added into the Cambridge distribution system. All water treatment chemical deliveries will be properly inspected and tested, where specified, to ensure public safety. SOP CM2 covers general acceptance. SOP CM2-1 to SOP CM2-13 covers the specific acceptance requirements for each chemical.

**2. Background**

**A. Chemical List and Use**

Waterworks accept delivery of following water treatment chemicals.

Chemical	Use
Alum (80% Al <sub>2</sub> O <sub>3</sub> )	Coagulant
Aqueous Ammonia 29% +/- 24%	Disinfectant
Corrosion Inhibitor	Post Treatment
Fluoride (Hydro- fluorsilicic Acid) 25%	Post Treatment
LOX (liquid oxygen)	Ozone Feed Gas
Potassium Hydroxide 45% total Alkalinity as KOH	pH Adjustment
Potassium Permanganate	Pre-oxidant
Polymer Cationic (liquid)	Coagulant aid
Polymer Non-Ionic (dry)	Coagulant aid / Filter aid
Sodium Bisulfate	De-ozonation
Sodium Hypo-Chlorite 15%	Disinfectant

**B. Health & Safety**

1. Each water treatment chemical has specific health and safety concerns. All CWD employees handling these chemicals must be cautious of the associated hazards.
2. Vendor contractors must also wear the appropriate personal protective equipment during offloading and sampling. These requirements are outlined in the individual SOPs under "Required Equipment/Materials."

**NAME OF BIDDER:** \_\_\_\_\_

### **C. Purchase specifications for Water Treatment Chemicals**

1. SOP CM1 covers the vendor requirements for CWD water treatment chemicals. This includes requirements for product composition and quality, delivery, transloading, unloading, certifications, paper documentation, and safety requirements of vendor contractors.
2. CM2 includes general delivery procedures applicable to all water treatment chemicals. CM2-1 to CM2-13 includes specific requirements for each chemical.

### **3. Responsibilities**

#### **Delivery Acceptance Staff**

1. Only CWD Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure are allowed to accept chemical deliveries.
2. Should any discrepancies occur during the delivery process, it is the responsibility of delivery acceptance staff to contact the appropriate Operations manager. In such situations, further testing may be needed or documents verified.
3. Cambridge Water Treatment Plant Management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on each delivery acceptance SOP.

### **4. Required Equipment/Materials**

Required equipment for delivery acceptance is personal protective equipment, sampling devices, and laboratory equipment. The equipment is dependent upon the individual chemical SOPs.

### **5. Procedures**

#### **A. Pre-arrival/Arrival**

1. Chemical suppliers must schedule deliveries in advance. Unplanned deliveries will not be accepted.
2. For each delivery the responsible supervisor will assign a trained water treatment chemical delivery inspector to the chemical delivery inspection.
3. The driver must check in with the receiving facility when he/she arrives at the WTP before any unloading occurs. The driver will submit all pertinent delivery documentation at this time to the delivery inspector.

#### **B. Inspection**

1. Upon arrival of the delivery, make sure placards located on the tank truck and/or the product containers has the appropriate placard. If not, contact the supervisor immediately; delivery will be rejected if it is the wrong chemical.
2. All water treatment chemical deliveries are to be fully documented to confirm and verify that the truck contains the proper chemical, with signed copies of the forms (see Table B).
3. Fill out a CWD Chemical Delivery Inspection Form to document that you have reviewed the paperwork.

**TABLE B: Necessary Delivery Documentation according to Chemical**

	Alum (80% Al <sub>2</sub> O <sub>3</sub> )	Aqueous Ammonia (19% +/- 24%)	Corrosion Inhibitor	Fluoride (Hydrofluorsilicic Acid) 25%	LOX (liquid oxygen)	Potassium Hydroxide (45% total Alkalinity as KOH)	Potassium Permanganate	Polymer (Cationic liquid)	Polymer (Anionic liquid)	Polymer (Non-Ionic dry)	Sodium Sulfate	Sodium Hypochlorite (15%)
Bill of Lading (Delivery slip)	X	X	X	X	X	X	X	X	X	X	X	X
Transloading Inspection Form												
Certificate of Analysis	X	X	X	X	X	X	X	X	X	X	X	X
Chemical Manufacturer/Supplier Release Order												
Terminal Order												
CWD Chemical Delivery Inspection Form	X	X	X	X	X	X	X	X	X	X	X	X
CWD Chemical Delivery Measurement Report Form	X	X		X		X					X	X

- The delivery inspector must immediately submit the Chemical Delivery Inspection Report with attached vendor shipping documentation to the appropriate supervisor for review.
- The Production Manager shall establish and maintain detailed chemical delivery files, which include the original chemical delivery inspection report and attached documentation.

**C. Sampling**

The Driver shall provide the inspector with two (2) samples that are representative of the loaded chemical. These samples will be used for acceptance testing. Samples shall be a minimum of 250 ml's.

In the event of a discrepancy in the test results or a part of CWD random audits of chemical deliveries, a CWD Supervisor may request that a sample taken from the delivery truck. All such samples shall be taken by the driver.

Samples take from delivery trucks at CWD's site shall be taken from the top of the tank/truck. Samples shall not be taken from discharge valves or hose connections on the bottom of the tank.

**D. Delivery Acceptance Testing**

1. Upon delivery certain chemicals will be tested for assurance. Testing will be performed and results approved before the delivery driver begins offloading chemical in CWTP storage. This testing will be performed by a trained CWD employee unless otherwise indicated.
2. The test methods outlined in the individual SOPs are to determine key characteristics for acceptance purposes only. They are not intended to assure the identity or the purity of the product.

<b>TABLE C: Delivery Acceptance Testing</b>		
<b>Chemical</b>	<b>Testing</b>	<b>Type of Testing</b>
Alum (80% Al <sub>2</sub> O <sub>3</sub> )	Yes	Specific Gravity
Aqueous Ammonia 29% +/- 24%	Yes	Specific Gravity
Corrosion Inhibitor		
Fluoride (Hydro- fluorsilicic Acid) 25%	Yes	Specific Gravity
LOX (Liquid oxygen)	No	
Potassium Hydroxide 45% total Alkalinity as KOH	Yes	Specific Gravity
Potassium Permanganate		TBD
Polymer Cationic (liquid)		TBD
Polymer Non-Ionic (dry)		TBD
Sodium Bisulfate	Yes	Specific Gravity
Sodium Hypo-Chlorite 15%	Yes	Temperature (driver); Appearance; Specific gravity

3. Procedures for the chemical testing are outlined in the individual SOP's.
4. Results of the chemical testing must be documented on the Chemical Delivery Measurement Report.

**E. Inconsistencies in Documentation, Placarding, Testing**

1. The responsible inspector must determine whether the chemical delivery is acceptable.
2. If the inspector finds any serious documentation discrepancies or chemical test discrepancies, the inspector must hold the delivery and obtain direction from his/her supervisor.
3. Resampling and/or retesting may be conducted as necessary and as directed by the Supervisor to verify the chemical characteristics. If the chemical is found to be unsatisfactory or has any serious documentation discrepancies, the Supervisor will direct the load to be rejected.

**F. Chemical Delivery Inspection Program Review**

The Cambridge water treatment plant management staff must continuously review the Water Treatment Chemical Inspection Program to ensure full compliance with this SOP, identify necessary improvements to the SOP to protect public health, issue SOP revisions as needed, and supervise training of chemical delivery inspectors regarding the SOPs and all future revisions.

**G. CWD Chemical Delivery SOP**

The following “Standard Operating Procedure, Chemical Delivery, SOP Code: 21, Revision date: 3/16/05” is provided as reference to clarify the roles and responsibilities of CWD staff and vendor personnel during chemical deliveries to the CWD facility.

CWD will modify this procedure from time to time. Revision will be numbered and dated for reference purposes.

<b>STANDARD OPERATING PROCEDURE</b> <b>SOP NAME: CHEMICAL DELIVERY</b> <b>SOP CODE: 21</b>	<b>REVISION: # 3</b> <b>REVISION DATE: 11/17/06</b>
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**1.0 OBJECTIVE**

This SOP describes the standard operating procedures for transferring chemicals from a chemical delivery truck to a storage tank.

**2.0 BACKGROUND**

Specific chemical acceptance guidelines are located in the Cambridge Water Department Chemical Management Program book. This book is located in the COC.

**2.1 DEFINITIONS**

ANSI	American National Safety Institute
NSF	National Sanitation Foundation
AWWA	American Water Works Association
SCADA	Supervisor Control And Data Acquisition
MSDS	Material Safety Data Sheet
COC	Control Operations Center
PPE	Personal Protective Equipment

**2.2 SAFETY PROCEDURES**

Review and become familiar with the information contained in the Chemical MSDS book. Wear PPE. Avoid exposure to any Mechanical, Electrical and Chemical Hazards. Follow all Lock Out Tag Out, Confined Space and Safety Procedures.

**2.3 POTENTIAL HAZARDS**

Splash or contact with eyes and fumes.

Avoid exposure to any Mechanical, Electrical and Chemical Hazards. Follow all Lock Out Tag Out, Confined Space and Safety Procedures.

**2.4 ASSOCIATED PROCEDURES**

2.4.1 Specific Gravity Test

2.4.2 Refer to specific chemical acceptance guidelines that are located in the CWD Chemical Management Program book. This book is located in the COC

2.4.3 Incoming Chemical Q.C. disposal

### **3.0 RESPONSIBILITIES**

- 3.1.1 Operator required to get a Certificate of Analysis and two Samples from the Driver.
- 3.1.2 Check and sign Truck drivers Paperwork as required.
- 3.1.3 Test Chemical prior to delivery, incase of discrepancies don't proceed with the delivery and notify the Production Manager or designee.
- 3.1.4 Identify and unlock the proper fill line for the driver.
- 3.1.5 Instruct driver how to use page party system and Compressed Air System.
- 3.1.6 Announce over the page party system that there is a chemical delivery.
- 3.1.7 Connect chains in front of doorways leading to chemical area.
- 3.1.8 After product is flowing, monitor fill from the Control Operations Center (COC).
- 3.1.9 At end of delivery, collect paper work, verify that the driver has cleaned up and removed any spilled material, secure the fill stations and return the area to general access.
- 3.1.10 Log the received volumes into Outlook and verify amounts in "SysPro".
- 3.1.11 Record any discrepancies on the driver provided paperwork and report to the production Manager or designee.

### **4.0 REQUIRED EQUIPMENT (PPE)**

**Lab Analysis-** Gloves and Safety Shield

**Pre Delivery-** Safety Glasses and gloves (Truck not pressurized)

**During Chemical Transfer-** Full PPE

### **5.0 PROCEDURES**

#### **5.1 Unloading**

- 5.1.1 Tank trucks used for the delivery of the Chemicals shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of Chemicals into the storage tanks and to enable rapid shut-off if an emergency arises.
- 5.1.2 At delivery, the driver will be required to provide two sample s from the truckload delivered. One of these samples will be tested by CWD personnel. Samples provided shall be samples collected at the truck loading facility and transported with the load by the driver.
- 5.1.3 Sampling of the loads, directly from the tank truck, may be done to resolve acceptance discrepancies, but only with the authorization of the Manager of Water Operations or his/her designee. The truck driver will conduct any such sampling. No sampling is permitted from the bottom of the tank without a dedicated small (1/2 inch) sampling tap.

#### **5.2 Certified Analysis for Impurities**

**Requirements are detailed in each chemical specification.**

#### **5.3 Certificate of Analysis Testing**

Requirements are detailed in each chemical specification.

#### **5.4 Unloading**

- 5.4.1 After Sample has been tested and meets requirements and Certificate of analysis has been received. Instruct driver he can start filling.
- 5.4.2 The operator will instruct the driver to alert him of any trouble and notify him when the delivery is complete via the Page Party System.
- 5.4.3 Operator will monitor the delivery from the Control Room via SCADA and security monitor

**6.0 CHEMICAL ACCEPTANCE CRITERIA**

Posted at Lab Hood, see Specific gravity test procedure

**6.1 Chemical Spills in chemical unload area.**

- 6.1.1 At the conclusion of each delivery, the driver shall remove all materials (chemicals) that are leaked or wasted as part of the delivery process. All materials deposited on the loading area floor shall be cleaned up and removed. This included all leakage from truck valves, vendor hoses and from the making and breaking of hose hook-up to CWD piping. All spill/drip buckets shall be emptied: all chemicals and spillage shall be removed from the CWD facility by the driver following vendor materials handing protocols.
- 6.1.2 In the event of a hazardous material spill event occurring during a chemical delivery to the CWD facility, CWD will follow standard operating procedures and call first responders, the Cambridge Fire Department. This will be followed by calls to the vendor involved, to Massachusetts Department of Environmental Protection (DEP) and a spill clean-up contractor.
- 6.1.3 Vendors are responsible for first response costs, clean-up costs, and disposal costs associated with failures of their equipment, personnel, or their operating procedures.

**7.0 Restrictions/Limitations**

Where sampling and testing are done for delivery acceptance, it is extremely important that care is taken with the sample. Improper handling can adversely effect the safety of CWD employees and the accuracy of the testing results.

**8.0 References**

**AWWA Standard**

Each water treatment chemical has an applicable ANSI/AWWA Standard to be used for reference. The only exceptions are LOX, Aqueous Ammonia and Sodium Bisulfate, which currently has no AWWA standard.

Chemical	AWWA Reference
Alum (80% Al <sub>2</sub> O <sub>3</sub> )	B403a-90
Fluoride (Hydrofluorsilicic Acid) 25%	B-703-00
Potassium Hydroxide 45% total Alkalinity as KOH	B511-00
Potassium Permanganate	B603-98
Polymer (liquid)	B451-98 B452-98 B453-01
Polymer (dry)	B451-98 B452-98 B453-01
Sodium Hypochlorite 15%	B-403-70

**SOP CM1.1:  
Cambridge Water Department  
Water Treatment Chemical Purchase Specifications Aluminum Sulfate**

**A. Composition**

1. Liquid aluminum sulfate clarity. Liquid alum shall be of such clarity as to permit the reading of flow-measuring devices without difficulty.
2. Liquid alum shall contain water-soluble aluminum of not less than 4.23 percent as Al or 8.0 percent as A12O3, except by agreement between the supplier and purchaser.
3. Basic and acidic alum. The range of basicity or acidity of alum is subject to agreement between the supplier and purchaser.
4. In liquid alum, the water-insoluble matter shall not exceed 0.7 percent.
5. Delivery made to CWD via dedicated tank truck that is only used to transport Aluminum Sulfate, and transferred to bulk storage tanks as directed by CWD delivery inspector.
6. Specific impurity limits. The total water-soluble iron (expressed as Fe2O3) content of aluminum sulfate shall be no more than 25 ppm.

The Cambridge Water Department has been evaluating alternative coagulants and various alum supplies. The potential impact on the discharge of Cambridge water treatment plant residuals to the local waste water system have been studied. The Cambridge Water Department is considering establishing stricter standard for metals than currently occur in AWWA Standard B-403a-90.

Impurities of concern include: antimony, arsenic, boron, cadmium, copper, cyanide, lead, molybdenum, mercury, nickel, selenium, silver, zinc, chromium. Data on these impurities shall be provided as part of the Vendor Data Sheet and shall meet the requirements of section C.

Potential vendors are encourage to submit bids for multiple alum types or grades. Each submission shall include detailed vendor data sheets and product information. Impurity data shall conform to the methods outline in section C of this specification. Compliance with AWWA Standard B-403a-90 and Cambridge Water Department iron limit will be considered as minimum requirements.

**B. Unloading**

1. Tank trucks used for the delivery of the Alum shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of Alum into the storage tanks and to enable rapid shut-off if an emergency arises.
2. At delivery, the driver will be required to provide a sample from the truckload delivered to be tested by CWD personnel.

**C. Certified Analysis for Impurities**

1. Aluminum sulfate that meets the requirements of this standard shall contain no soluble material or organic substances in quantities capable of producing deleterious or injurious effects on the health of those consuming a water that has been treated properly with the aluminum sulfate.

2. Product certifications. Aluminum sulfate is a direct additive used in the treatment of potable water. This material should be certified as suitable for contact with or treatment of drinking water by an accredited certification organization in accordance with ANSI/NSF Standard 60, Drinking Water Treatment Chemicals Health Effects. Evaluation shall be accomplished in accordance with requirements that are no less restrictive than those listed in ANSI/NSF Standard 60. Certification shall be accomplished by a certification organization accredited by the American National Standards Institute.

**D. Certificate of Analysis Testing**

1. When sampling for certificate of analysis purposes, the vendor must follow ANSI/AWWA B-403a-90.

**E. General**

1. Aluminum Sulfate shall conform to the ANSI/AWWA B-403a-90. Standard for Aluminum Sulfate.
2. The Cambridge Water Department reserves the right to make multiple awards for the supply of Liquid Aluminum Sulfate. The basis of the awards will be 1) compliance with "Specifications for Water Department Chemicals," 2) bid price, and 3) impurity levels.

**SOP CM2.1:**

**Cambridge Water Department  
Delivery Acceptance of Aluminum Sulfate**

**1. Objective**

This procedure is intended to guide water treatment personnel when they receive deliveries of Aluminum Sulfate to be added to the Cambridge water distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

**2. Background**

**A. Health & Safety**



1. UN3082  
Truck Placard NFPA Tank Label

International Hazard Symbols

*Danger! Corrosive!* Aluminum Sulfate is a buffered acidic solution that causes irritation when it comes into contact with eye's skin or mucus membranes. Protective clothing should be used when handling liquid alum. Avoid inhalation or contact with eyes and skin. Minimum personal protective equipment includes chemical resistant gloves, safety glasses or goggles, and normal work clothes. Chemical resistant clothing, gloves, boots, face shield and respiratory protection are necessary for tasks involving significant exposure potential. Refer to the individual SOPs contained in the local safety plan for specific details.

2. Refer to the WTP SOP 5 for an Emergency Contact List, Procedures and Safety Equipment. Material Safety Data Sheets (located in the control room and at the chemical receiving area) contain information on hard hats and safety glasses, personal protective gear, and handling. The CWD Health & Safety Manual also provides emergency response information.

**B. Vendor Certification/Purchase Specifications**

1. Aluminum Sulfate shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
2. See SOP CM1 for general purchasing specifications and CM1-1 for specific specifications on Aluminum Sulfate.

**C. Recognized synonyms**

1. N/A

**3. Responsibilities**

**A. Delivery Acceptance staff**

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure are allowed to accept Aluminum Sulfate deliveries.
2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

**4. Required Equipment/Materials**

**A. Personal Protective Equipment**

1. Refer to the Aluminum Sulfate SOP contained in the Local Safety Plan for specific details.

**NAME OF BIDDER:** \_\_\_\_\_

2. Those unfamiliar with the hazards of any chemicals used in the test procedures that follow should consult current manufacturers' material safety and health data sheets (MSDS) or other appropriate material safety and health references.

**B. Sample Collection**

1. Equal portions shall be taken at five equally spaced time intervals during the unloading of the tank truck or railroad car. The total sample shall equal 2 qt (2 L).
2. The gross sample (2 qt [2 LI]) should be thoroughly mixed, and three 1-pt (0.5-L) samples retained. They shall be sealed in airtight glass containers.
3. Each sample container shall be labeled to identify it and shall be signed by the sampler. A chain-of-custody form shall accompany all samples and shall be properly completed by the individuals collecting samples.

**E. Documentation (see attachments)**

1. Chemical Delivery Inspection Form for Aluminum Sulfate
2. Chemical Delivery Measurement Form for Aluminum Sulfate
3. Specific Gravity (60F) vs. % Aluminum Sulfate Chart

**5. Procedures**

**A. Scheduling**

1. The Supervisor will schedule deliveries of aluminum Sulfate. At this time the Supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available volume in the tank to assure that there is enough room to unload the entire truckload.

**B. Delivery Documentation & Truck Placards**

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN #1778.
2. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Report.

**C. Sampling**

1. Sampling point. Samples shall be taken at the point of destination.
2. Each sample container shall be labeled to identify it and shall be signed by the sampler. A chain-of-custody form shall accompany all samples and shall be properly completed by the individuals collecting samples.
3. Equal portions shall be taken at five equally spaced time intervals during the unloading of the tank truck or railroad car. The total sample shall equal 2 qt (2 L).
4. The gross sample (2 qt [2 LI]) should be thoroughly mixed, and three 1-pt (0.5-L) samples retained. They shall be sealed in airtight glass containers.
5. Each sample container shall be labeled to identify it and shall be signed by the sampler. A chain-of-custody form shall accompany all samples and shall be properly completed by the individuals collecting samples.
6. Laboratory examination. Laboratory examination by the purchaser of one of the three samples shall be completed within five working days after receipt of the shipment.

#### **D. Appearance of Raw Product**

1. Liquid aluminum sulfate clarity. Liquid alum shall be of such clarity as to permit the reading of flow-measuring devices without difficulty.

#### **F. Test Procedures - General**

Laboratory examination. Laboratory examination by the purchaser of one of the three samples shall be completed within five working days after receipt of the shipment.

Test procedures will follow one of the following ANSI/AWWA B403-98 methods:

##### 5.3 Specific Gravity

The specific gravity of aluminum sulfate solution may be determined with reasonable accuracy by use of a hydrometer that meets or exceeds the ASTM standards for 117-H, or by use of a specific-gravity balance or a pycnometer. The aluminum sulfate manufacturer should furnish information showing percentage of aluminum as Al or A1203 for aluminum sulfate solutions of different specific-gravity readings.

#### **G. Documentation of Test Results**

1. Document results of these analyses on the Chemical Delivery Measurement Form.
2. If any discrepancies occur during the delivery process, the Supervisor should be contacted. Do not assume analyzer error. The Supervisor will reject the delivery if the product does not appear to be Aluminum Sulfate.

#### **H. Delivery**

1. Once tests are completed and verified, tell the driver to hook up for delivery at the Aluminum Sulfate fill station.
2. Place drop buckets under truck valves.
3. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries.
4. Inspect all valves before they are opened.
5. Note the start time of the delivery and the storage tank elevation in the Operator Log and the Delivery Log.
6. Direct driver to open line valve at Aluminum Sulfate fill station.
7. Observe the first few minutes of delivery to ensure the integrity of the connections.
8. An assigned employee should monitor the Alum SCADA screen periodically throughout the delivery process. Do not fill above 10 feet.
9. Instruct driver to shut down the delivery at the first sign of leakage. Notify staff over intercom if a leak should occur. Be sure to disclose evacuation routes away from the leak.

#### **I. Conclusion of Delivery**

1. Direct driver to close the line valve at the alum fill station once the delivery is completed and the line has been blown empty.
2. Record the final storage tank elevation and time in the Operator Log and Delivery Log .
3. Lock the Alum fill station upon conclusion of delivery.
4. Sign paperwork. Place the Chemical Delivery Measurement Form and Chemical Delivery Inspection Form in the Supervisor's box. Original delivery paperwork from the delivery driver shall be sent to the plant manager. Copies of the delivery paperwork shall be kept by the Supervisor.

5. The driver must make sure that all of the cargo has been unloaded, the appropriate paperwork has been signed, and that all previously open outlets and valves are closed to ensure that nothing can leak out of the vehicle.

Driver must remove all materials (chemicals) that are leaked or wasted as part of the delivery process (e.g. cleaning/draining of hoses before departure).

#### **J. Chain of Custody**

1. The remainder of Alum sampled from the tank truck that was not used for testing will be placed in storage for quality assurance purposes.
2. The laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure the Alum product is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the Alum sample, both the driver and the delivery acceptance staff shall sign the Chain of Custody form.
4. After the conclusion of delivery, place the remainder of Alum product into storage cabinet for a minimum of 30 days.
5. Dispose of the Alum sample properly and note date sample disposed of on the Chain of Custody Form before reusing storage container.

#### **6. Restrictions/Limitations**

1. Laboratory technique is extremely important. Improper technique can lead to an inaccurate result.
2. Laboratory equipment must be properly calibrated.

#### **A. Basis for Rejection**

1. Notice of nonconformance. If the aluminum sulfate delivered does not meet the requirements of this standard, a notice of nonconformance must be provided by the purchaser to the supplier within 10 days after receipt of the shipment at the point of destination. The results of the purchaser's tests shall prevail unless the supplier notifies the purchaser within five working days after receipt of the notice of complaint that a retest is desired. On receipt of the request for a retest, the purchaser shall forward to the supplier one of the sealed samples taken according to Sec. C. If the results obtained by the supplier on retesting do not agree with the results obtained by the purchaser, the other sealed sample shall be forwarded, unopened, for analysis to a referee laboratory agreed on by both parties. The results of the referee analysis shall be accepted as final.

#### **7. References**

1. AWWA Standard for Aluminum Sulfate ANSI/AWWA B403-98.

**CHEMICAL DELIVERY INSPECTION FORM  
ALUMINUM SULFATE**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ AM/PM RECEIVED BY: \_\_\_\_\_  
 CHEMICAL: \_\_\_\_\_ LOCATION: \_\_\_\_\_

**1. IS THE TANK TRUCK PROPERLY MARKED WITH UN# 3082? (Yes/No) \_\_\_\_\_**

IF NO, SUPERVISOR MUST BE CONTACTED.

**2. DELIVERY DOCUMENTATION:**

		BILL OF LADING	INSPECTION / LOADING FORM	SHIPPER RELEASE ORDER	CERTIFICATE OF ANALYSIS	TERMINAL ORDER	NOTES (should any discrepancies occur, notify Supervisor immediately)
1	SUPPLIER / SHIPPER						
2	CARRIER/ TRUCKER				-XX-		
3	CHEMICAL						Should be: Aluminum Sulfate
4	CHEMICAL ID#				-XX-		Should be UN# _____
5	QUANTITY	-XX-	-XX-		-XX-		Verify that tanks can take the full delivery load to avoid overfill situations
6	RAILCAR #					-XX-	Verify that all #s are the same
7	DRIVER NAME				-XX-		Verify driver has signed appropriate paperwork
8	LOADER NAME	-XX-		-XX-	-XX-	-XX-	Verify loader has signed paperwork
9	MANUF'S LAB SIGNATURE	-XX-	-XX-	-XX-	YES/NO (Circle one)	-XX-	Verify lab signature by manufacturer
10	TANK CAR #				-XX-		Verify the tank car # on the paperwork is on the tank car you received

NAME OF BIDDER: \_\_\_\_\_

**3. ALUMINUM SULFATE MEASUREMENT REPORT**

A. SAMPLE FURNISHED BY DRIVER IN PRESENCE OF CWD EMPLOYEE? (Yes/No)\_\_\_\_\_

B. SAMPLE RESULTS ACCEPTABLE? (Yes/No)\_\_\_\_\_

**4. SHIPMENT ACCEPTANCE**

A. SHIPMENT ACCEPTABLE? (Yes/No)\_\_\_\_\_

B. IF SUPERVISOR WAS CONTACTED AT ANY POINT, INDICATE REASON (S)

\_\_\_\_\_  
IF REJECTED, INDICATE SUPERVISOR'S NAME\_\_\_\_\_

D. IF REJECTED, INDICATE REASON(S)\_\_\_\_\_

**CHEMICAL DELIVERY MEASUREMENT FORM  
ALUMINIUM SULFATE**

Each chemical delivery must be accompanied with test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of a CWD employee. Results for the sample collected at the delivery site must be recorded on this form.

---

**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date: (e.g.: 3082 10/30/00)\_\_\_\_\_

---

**SPECIFIC GRAVITY**                      Specific Gravity @ \_\_\_\_\_° F \_\_\_\_\_  
Temp. Compensation \_\_\_\_\_  
Vendor test on Certificate  
of Analysis @ 60° F \_\_\_\_\_ Tank Truck Sample @ 60° F \_\_\_\_\_

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**IS APPEARANCE APPROPRIATE? (YES IF COLORLESS/CLEAR TO MILKY WHITE, OTHERWISE NO)**

IF NO, SHIPMENT CANNOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.

---

Tank Truck Sample \_\_\_\_\_

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**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS?** \_\_\_\_\_

SIGNATURE OF DELIVERY INSPECTOR \_\_\_\_\_ DATE \_\_\_\_\_

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**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1.2:**

**Cambridge Water Department  
Water Treatment Chemical Purchase Specifications Aqua Ammonia**

**A. Composition**

- Ammonia Solutions (**26° Baume**)
  - COMPOSITION: **29.4%** by weight of ammonia gas dissolved in water.
  - CAS REGISTRY NO.1336-21-6
  - FORMULA: NH<sub>2</sub>OH+H<sub>2</sub>O
  - MOL. WT.: 35.05(NH<sub>4</sub>OH)
1. Delivery made to CWD via dedicated tank truck that is only used to transport aqua ammonia, and transferred to bulk storage tanks as directed by CWD delivery inspector.

**B. Unloading**

1. Tank trucks used for the delivery of the aqua ammonia shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of ammonia into the storage tank and to enable rapid shut-off if an emergency arises.
2. Aqua Ammonia **deliveries are to be from a single tank compartment**, the un-loading of multiple compartment will not be allowed during Aqua Ammonia deliveries
3. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries
4. At delivery, the driver will be required to provide a sample from the truckload delivered to be tested by CWD personnel.

**C. Certified Analysis for Impurities**

1. The certificate of analysis must state the percent NH<sub>3</sub>.

**SOP CM2.2:**

**Cambridge Water Department  
Delivery Acceptance of Aqua Ammonia**

**1. Objective**

This procedure is intended to guide water treatment personnel when they receive deliveries of Aqua ammonia to be added to the Cambridge water distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

**2. Background**

**A. Health & Safety**



1. UN 2672  
Truck Placard NFPA Tank Label

International Hazard Symbols

- Colourless liquid.
- Intense, pungent odour of ammonia gas.
- Vapour irritates the eyes and causes tears.

**HAZARD DESCRIPTION:** Irritant and corrosive to skin, eye, respiratory tract and mucous membranes. May cause severe burns, eye and lung injuries. Skin and respiratory related diseases aggravated by exposure. Not recognized by OSHA as a carcinogen. Not listed in the National Toxicology Program annual report. Not listed as a carcinogen by the International Agency for Research on Cancer.

**EXPOSURE LIMITS:** Vapor

OSHA	50 ppm	35 mg/m3 PEL	8 hour TWA
NIOSH	35 ppm	27 mg/m3 STEL	15 minutes
NIOSH	25 ppm	18 mg/m3 PEL	10 hour TWA
ACGIH	25 ppm	18 mg/m3 TLV	8 hour TWA
ACGIH	35 ppm	27 mg/m3 STEL	15 minutes

## EMERGENCY TREATMENT

**EFFECTS OF OVEREXPOSURE:** Eye & Skin: Overexposure can severely irritate and burn the skin or eye causing permanent damage. Inhalation: Severe irritation to nose, throat and lungs causing headaches, coughing, severe lung congestion, breathing difficulty, convulsion or shock.

**EMERGENCY AID:** Skin: flush with copious amounts of water while removing contaminated clothing and shoes. Wash clothing before re-use. Do not rub, or apply ointment on affected area. Ingestion: if conscious, give large amount of water to drink and follow with vinegar or fruit juice. Refer immediately to physician. Eye: flush with copious amounts of water for 15 min. Eyelids should be held apart and away from eyeball for thorough rinsing. **SPEED AND THOROUGHNESS IN RINSING THE EYE IS MOST IMPORTANT IN PREVENTING LATENT PERMANENT INJURIES.** Inhalation: remove to fresh air. Administer oxygen or artificial respiration if necessary. **SEEK IMMEDIATE MEDICAL HELP.**

**NOTE TO PHYSICIAN:** Respiratory injury may appear as delayed phenomenon, pulmonary edema may follow chemical bronchitis. Supportive treatment with necessary ventilation actions, including oxygen, may warrant consideration.

## SPECIAL PROTECTION AND PROCEDURES

**RESPIRATORY PROTECTION:** MSHA/NIOSH approved respiratory protection with full face piece for gas and vapor contaminants effective for anhydrous ammonia and able to be used for entry and escape in emergencies. Refer to 29 CFR 1910.134 and ANSI: Z88.2 for requirements and selection.

**VENTILATION:** Local exhaust sufficient to keep ammonia gas below Permissible Exposure Limits. Refer to 29 CFR 1910.134 and ANSI: Z9.2 for requirements and selection.

**PROTECTIVE EQUIPMENT:** Splash-proof, chemical safety goggles, rubber gloves and boots to prevent contact. Respiratory protection. Cotton work clothes recommended. Refer to 29 CFR 1910.132 to 1910.136 for requirements.

## SPECIAL PRECAUTIONS

**STORAGE AND HANDLING:** Store in cool, well-ventilated area with containers tightly closed. OSHA 29 CFR 1910.111 prescribes handling and storage requirements for anhydrous ammonia as a hazardous material.

**WORK-PLACE PROTECTIVE EQUIPMENT:** as discussed above should be near, but outside of ammonia area. Eyewash and safety shower in immediate vicinity. See 29 CFR 1910.141 for workplace requirements.

**DISPOSAL:** Aqua Ammonia is listed as a hazardous substance under FWPCA. See WASTE DISPOSAL. Classified as RCRA Hazardous waste due to corrosivity with designation D002 if disposed of in original form.

**PERSONAL:** Avoid unnecessary exposure. Use protective equipment as needed. Do not wear contact lenses.

## B. Vendor Certification/Purchase Specifications

1. Aqua ammonia shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
2. See SOP CM1 for general purchasing specifications and CM1-2 for specific specifications on Hydrofluorosilicic Acid.

**C. Recognized synonyms**

1. N/A

**3. Responsibilities**

**A. Delivery Acceptance staff**

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure, are allowed to accept Aqua ammonia deliveries.
2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

**4. Required Equipment/Materials**

**A. Personal Protective Equipment**

1. Refer to the Aqua ammonia SOP contained in the Local Safety Plan for specific details.

**E. Documentation (see attachments)**

1. Chemical Delivery Inspection Form for Aqua ammonia
2. Chemical Delivery Measurement Form for Aqua ammonia
3. Specific Gravity (60F) vs. % Aqua ammonia Chart

**5. Procedures**

**A. Scheduling**

1. The Supervisor will schedule deliveries of aqua ammonia. At this time the Supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available volume in the tank to assure that there is enough room to unload the entire truckload.

**B. Delivery Documentation & Truck Placards**

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN #2672.

**HAZARD CLASS:** 8 (Corrosive)

**PROPER SHIPPING DESCRIPTION:** Ammonia Solutions (Ammonium Hydroxide), 8, UN2672, PG III, RQ

**PLACARD:** Corrosive

**IDENTIFICATION NO:** UN 2672

**NAME OF BIDDER:** \_\_\_\_\_

### **OTHER REGULATORY REQUIREMENTS**

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Section 103, any environmental release of this chemical equal to or over the reportable quantity of 100 lbs. must be reported promptly to the National Response Center, Washington, D.C. (1-800-424-8802). Any consumer product containing 5% or more ammonia requires a POISON label under FHSA (16 CFR 1500. 129(1)).

The material is subject to the reporting requirements of Section 313, Section 304, Section 312, Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372. As of June 30, 1995, this material is reportable with the following qualifications: 10% of total aqueous ammonia is reportable as Ammonia (7664-41-4) under this listing.

EPA Hazard Categories - Immediate: Yes; Delayed: No; Fire: No; Sudden Release: Yes; Reactive: No

Regulated Air Act - 40 CFR 112(r) at concentrations greater than 20% or amounts greater than 20,000 lbs.

1. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Report.

#### **C. Appearance of raw product**

- Colourless liquid.
- Intense, pungent odour of ammonia gas.

#### **D. Sampling**

1. The driver shall bring 2 sealed pint containers full of sample product taken from the load being delivered.
1. One of the two samples will be tested for specific gravity within 5 days of the delivery date.
2. Working under a fume hood pour raw product into a hydrometer tube (to within 2-inches below the top).
3. Place the hydrometer gently into the sample. Make sure it floats in the sample. Check to insure there are no adhering bubbles.
4. Take a reading at the meniscus and record to the nearest 0.001.
5. Measure the temperature to the nearest Fahrenheit degree using the Fahrenheit Thermometer.
6. Make temperature adjustments according to one of the equations at the bottom of the Specific Gravity (60F) vs. % Aqua ammonia Chart to determine the concentration of ammonia in the sample based on the specific gravity reading and temperature. The expected specific gravity should be 0.9089

#### **E. Documentation of Test Results**

1. Document results of these analyses on the Chemical Delivery Measurement Form.
2. If any discrepancies occur during the delivery process, the Supervisor should be contacted. The Supervisor will reject the delivery if the product does not appear to be ammonia.

#### **F. Delivery**

1. Once samples have been examined for appearance and the certificate of analysis and shipping papers have been verified, tell the driver to hook up for delivery at the ammonia fill station.

2. Place drop buckets under truck valves.
3. Inspect all valves before they are opened.
4. Note the start time of the delivery and the storage tank elevation in the Operator Log and the Delivery Log.
5. Direct driver to open line valve at ammonia fill station.
6. Observe the first few minutes of delivery to ensure the integrity of the connections.
7. An assigned employee should monitor the ammonia SCADA screen periodically throughout the delivery process. Do not fill above 6 feet.
8. Instruct driver to shut down the delivery at the first sign of leakage. Notify staff over intercom if a leak should occur. Be sure to disclose evacuation routes away from the leak.

#### **G. Conclusion of Delivery**

1. Direct driver to close the line valve at the ammonia fill station once the delivery is completed and the line has been blown empty.
2. The driver must make sure that all of the cargo has been unloaded, the appropriate paperwork has been signed, and that all previously open outlets and valves are closed to ensure that nothing can leak out of the vehicle.

Driver must remove all materials (chemicals) that are leaked or wasted as part of the delivery process (e.g. cleaning/draining of hoses before departure).

3. Record the final storage tank elevation and time in the Operator Log and Delivery Log .
4. Lock the ammonia fill station upon conclusion of delivery.
5. Sign paperwork. Place the Chemical Delivery Measurement Form and Chemical Delivery Inspection Form in the Supervisor's box. Original delivery paperwork from the delivery driver shall be sent to the plant manager. Copies of the delivery paperwork shall be kept by the Supervisor.

#### **H. Chain of Custody**

1. The ammonia sample container sampled from the tank truck that was not used for testing will be placed in storage for quality assurance purposes.
2. The laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure the ammonia product is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the ammonia sample, both the driver and the delivery acceptance staff shall sign the Chain of Custody form.
4. Dispose of the ammonia sample properly and note date sample disposed of on the Chain of Custody Form before reusing storage container.

**CHEMICAL DELIVERY INSPECTION FORM  
AQUA AMMONIA**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ AM/PM RECEIVED BY: \_\_\_\_\_  
 CHEMICAL: \_\_\_\_\_ LOCATION: \_\_\_\_\_

**1. IS THE TANK TRUCK PROPERLY MARKED WITH UN# 2672? (Yes/No) \_\_\_\_\_**

IF NO, SUPERVISOR MUST BE CONTACTED.

**2. DELIVERY DOCUMENTATION:**

		BILL OF LADING	INSPECTION/ LOADING FORM	SHIPPER RELEASE ORDER	CERTIFICATE OF ANALYSIS	TERMINAL ORDER	NOTES (should any discrepancies occur, notify Supervisor immediately)
1	SUPPLIER/ SHIPPER						
2	CARRIER/ TRUCKER				-XX-		
3	CHEMICAL						Should be, Aqua ammonia,
4	CHEMICAL ID#				-XX-		Should be UN# 2672
5	QUANTITY	-XX-	-XX-		-XX-		Verify that tanks can take the full delivery load to avoid overfill situations
6	RAILCAR #					-XX-	Verify that all #s are the same
7	DRIVER NAME				-XX-		Verify driver has signed appropriate paperwork
8	LOADER NAME	-XX-		-XX-	-XX-	-XX-	Verify loader has signed paperwork
9	MANUF'S LAB SIGNATURE	-XX-	-XX-	-XX-	YES/NO (Circle one)	-XX-	Verify lab signature by manufacturer
10	TANK CAR #				-XX-		Verify the tank car # on the paperwork is on the tank car you received

**3. AMMONIA MEASUREMENT REPORT**

A. TWO PINT SAMPLES FURNISHED BY DRIVER? (Yes/No) \_\_\_\_\_

B. SAMPLE RESULTS ACCEPTABLE? (BASED ON APPEARANCE) (Yes/No) \_\_\_\_\_

**4. SHIPMENT ACCEPTANCE**

A. SHIPMENT ACCEPTABLE? (Yes/No) \_\_\_\_\_

B. IF SUPERVISOR WAS CONTACTED AT ANY POINT, INDICATE REASON(S)

IF REJECTED, INDICATE SUPERVISOR'S NAME \_\_\_\_\_

D. IF REJECTED, INDICATE REASON(S) \_\_\_\_\_

NAME OF BIDDER: \_\_\_\_\_

**CHEMICAL DELIVERY MEASUREMENT FORM  
AQUA AMMONIA**

Each chemical delivery must be accompanied with test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of a CWD employee. Results for the sample collected at the delivery site must be recorded on this form.

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**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date:  
(e.g.: 267210/30/00)\_\_\_\_\_

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**SPECIFIC GRAVITY**                      Specific Gravity @ \_\_\_\_\_<sup>0</sup> F \_\_\_\_\_  
Temp. Compensation \_\_\_\_\_  
Vendor test on Certificate of Analysis @ 60<sup>0</sup> F \_\_\_\_\_                      Tank Truck Sample @ 60<sup>0</sup> F \_\_\_\_\_

---

**IS APPEARANCE APPROPRIATE? (YES IF IT IS COLORLESS, OTHERWISE NO)**  
IF NO, SHIPMENT CAN NOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.

Tank Truck Sample \_\_\_\_\_

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**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS?** \_\_\_\_\_                      **DATE** \_\_\_\_\_  
**SIGNATURE OF DELIVERY INSPECTOR** \_\_\_\_\_

**SOP CM1.3  
Polyaluminum Chloride (PAC) Specifications**

Product shall be ANS/NSF Standard 60 certified for potable water

Liquid PAC shall conform to AWWA Standard B408-93.

The Water Department will only consider proposals whose products have been jar tested at the CWD facility during cold-water conditions and meet CWD requirements for final DAF turbidity, UV 254 removal, floated water pH, and TOC removal. To make arrangements for testing please contact:

**Timothy MacDonald**  
**Manager of Water Operations**  
**Phone number: 617-349-4773**

CWD will be the sole determiner of suitable and un-suitable test results and suitable and un-suitable products.

The PAC shall be Holland PC H-180 or approved equivalent.

The PAC shall have the following specifications (alternatives will be considered based on in plant jar testing as noted above):

Al <sub>2</sub> O <sub>3</sub>	10.5±0.3
Basicity	65 – 75%
Specific Gravity	1.22 – 1.27

Supplier will provide a product analysis including an analysis of heavy metals in the neat product with the bid.

**SOP CM2.3  
Polyaluminum Chloride (PAC) Delivery Requirements.**

The City's estimated six month usage is 12,000 gallons. The City expects to order deliveries ranging from a minimum of 1,000 gallons and a high of 5,000 gallons or a full truck load. The usage noted on this bid document is based on an estimate volume: the City may increase or decrease the actual usage as required.

**SOP CM1.4**

**Water Treatment Chemical Purchase Specifications Liquid Oxygen and LOX Services**

A. General

**Lox and Lox System Service/Support**

The vendor that is awarded the contract to supply LOX to the Cambridge water treatment facility is also required to provide periodic service and parts for the Cambridge LOX storage facilities. One award will be made for LOX, LOX SERVICES and LOX SYSTEM PARTS.

The successful vendor shall be in the business of both supplying LOX and routinely providing maintenance service to its own and customer LOX storage facilities.

B. Government or Industry Standard

Since there is currently no AWWA standard for Liquid Oxygen, vendors shall follow the current ANSI and OSHA standards for storage and handling.

C. Certificate of Analysis

Contents of certificate of analysis shall disclose nitrogen, water and total hydrocarbons as Methane. These results shall be provided with every shipment.

D. Composition

	Bulk Liquid	Standard Grade (Industrial Grade)	
1.	Oxygen, min %vol.	99.5	
2.	Nitrogen, max ppm/vol.	100	
3.	Water, max ppm/vol.	2	
4.	Dew point, max. °F	-97	
5.	Total Hydrocarbons as <25		methane, max ppm/vol.
6.	Liquid Oxygen shall be delivered to the Cambridge Water Treatment Plant by tank truck as required.		

E. Specification LOX System Services

LOX System Services shall include, but not limited to, repair and maintenance of valves, calibration of regulators and gauges, replacement of gaskets, repair and replacement of sensors, and pipe repair and installation. The work covered under this bid item shall include work on the LOX tank(s) system (e.g. the tanks, accumulator system, and the three-way valve), the vaporizers and control valves, and the down stream control valves, pressure reduces, filters, and sensors.

**SOP CM1.5:**

**Water Treatment Chemical Purchase Specifications Hydrofluosilicic Acid**

**A. Composition**

1. HFS as 100% concentration H<sub>2</sub>SiF<sub>6</sub>.
2. HFS shall be free of visible suspended matter.
3. It shall be water white to straw yellow.
4. It shall be delivered at approximately 23% HFS by weight.
5. Delivery made to CWD via dedicated tank truck that is only used to transport Hydrofluosilicic Acid, and transferred to bulk storage tanks as directed by CWD delivery inspector.

**B. Unloading**

1. Tank trucks used for the delivery of the acid shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of acid into the storage tanks and to enable rapid shut-off if an emergency arises.
2. Bulk shipments shall be made in rubber-lined tank trucks.
3. At delivery, the driver will be required to provide a sample from the truckload delivered to be tested by CWD personnel.

**C. Certified Analysis for Impurities**

1. HFS shall contain no mineral or organic substances in quantities that could be harmful to the public health.
2. HFS shall contain a maximum of 1 percent hydrofluoric acid.
3. HFS shall contain not more than 0.020 percent by weight of heavy metals, expressed as lead (Pb).

**D. Certificate of Analysis Testing**

1. When sampling for certificate of analysis purposes, the vendor must follow ANSI/AWWA B703-00, Section 5.
2. The certificate of analysis shall state the specific gravity and percent (%) acid.

**E. General**

1. Hydrofluosilicic Acid shall conform to the ANSI/AWWA B703-00 Standard for Fluorsilicic Acid.

**SOP CM2.5:  
Delivery Acceptance of Hydrofluosilicic Acid**

Revision Number: 2  
Revision Date: 9/15/03

**1. Objective**

This procedure is intended to guide water treatment personnel when they receive deliveries of Hydrofluosilicic Acid (H<sub>2</sub>SiF<sub>6</sub>) to be added to the Cambridge water distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

**2. Background**

**A. Health & Safety**



1. UN1778  
Truck Placard NFPA Tank Label

International Hazard Symbols

*Danger! Corrosive!* Hydrofluosilicic Acid is a fuming, corrosive liquid. Vapors are slightly **flammable**. Keep away from heat, sparks and open flame. Avoid inhalation or contact with eyes and skin. Minimum personal protective equipment includes chemical resistant gloves, safety glasses or goggles, and normal work clothes. Chemical resistant clothing, gloves, boots, face shield and respiratory protection are necessary for tasks involving significant exposure potential. Refer to the individual SOPs contained in the local safety plan for specific details.

2. Refer to the WTP SOP 5 for an Emergency Contact List, Procedures and Safety Equipment. Material Safety Data Sheets (located in the control room and at the chemical receiving area) contain information on hard hats and safety glasses, personal protective gear, and handling. The CWD Health & Safety Manual also provides emergency response information.

**B. Vendor Certification/Purchase Specifications**

1. Hydrofluosilicic Acid shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
2. See SOP CM1 for general purchasing specifications and CM1-5 for specific specifications on Hydrofluosilicic Acid.

**C. Recognized synonyms**

1. Hydrofluosilicic Acid can be also referred to as: Fluorsilicic Acid, Fluoride, HFS, “Silly acid”, or H<sub>2</sub>SiF<sub>6</sub>, Hexafluosilicic Acid.

**3. Responsibilities**

**A. Delivery Acceptance staff**

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure are allowed to accept Hydrofluosilicic acid deliveries.
2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

**4. Required Equipment/Materials**

**A. Personal Protective Equipment**

1. Refer to the Hydrofluosilicic Acid SOP contained in the Local Safety Plan for specific details.

**B. Sample Collection Devices**

1. Sample Rod
2. Acid resistant container

**C. Laboratory Devices**

- |                                 |                             |
|---------------------------------|-----------------------------|
| 1. Hydrometer tube              | 7. 25-ml graduated pipettes |
| 2. 1.200-1.400 range hydrometer | 8. Fluoride analyzer        |
| 3. 1000-ml volumetric flask     | 9. 100-ml beakers           |
| 4. 200-ml volumetric flask      | 10. 50-ml beakers           |
| 5. 1-ml pipette (Pipette A)     | 11. Magnetic Stirring Bar   |
| 6. 1-ml pipette (Pipette B)     | 12. Fahrenheit Thermometer  |

**D. Reagents**

1. 1.00 mg/l Fluoride Standard (prepared 50/50 with TISAB)
2. 2.00 mg/l Fluoride Standard (prepared 50/50 with TISAB)
3. 1.20 mg/l Fluoride Reference Standard (prepared 50/50 with TISAB)
4. TISAB

**E. Documentation (see attachments)**

4. Chemical Delivery Inspection Form for Hydrofluosilicic Acid
5. Chemical Delivery Measurement Form for Hydrofluosilicic Acid
6. Specific Gravity (60F) vs. % Hydrofluosilicic Acid Chart

**5. Procedures**

**A. Scheduling**

1. The Supervisor will schedule deliveries of hydrofluosilicic acid. At this time the Supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available volume in the tank to assure that there is enough room to unload the entire truckload.

**B. Delivery Documentation & Truck Placards**

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN #1778.
2. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Report.

**C. Sampling**

1. Have the driver obtain a sample from the hatch at the top of the truck using a sample rod device.
2. Observe actual sample collection while standing at a safe distance.
3. Have the driver draw at least one liter of product into a clean acid resistant container.

**D. Appearance of raw product**

1. Note the color of the  $H_2SiF_6$ ; it should be a white/clear to straw yellow.
2. Measure the specific gravity of the raw product
3. Pour raw product into a hydrometer tube (to within 2" below the top).
4. Place the 1.200 - 1.400 range hydrometer gently into the sample. Make sure it floats in the sample. Check to insure there are no adhering bubbles.
5. Take a reading at the meniscus and record to the nearest 0.001.
6. Measure the temperature to the nearest Fahrenheit degree using the Fahrenheit Thermometer.
7. 5. Make temperature adjustments according to one of the equations at the bottom of the Specific Gravity (60F) vs. % Hydrofluosilicic Acid Chart to determine the concentration of fluoride in the diluted sample (1:200,000) based on the specific gravity reading and temperature. The expected specific gravity should be 1.21 to 1.25. Adjust C of A results to 60 degrees F if needed.

**E. Diluting Delivery Fluoride Sample to 1:200,000**

1. Using "Pipette A" pipette 1 ml of the Hydrofluosilicic acid into a 1000-ml volumetric flask containing approx. 800 ml distilled water. Bring the solution up to the 1000-ml mark with distilled water. Mix thoroughly by inverting the flask several times.
2. Using "Pipette B" pipette 1 ml of the solution in the 1000-ml flask into a 200-ml volumetric flask containing approximately 150 ml distilled water. Bring the solution up to the 200- ml mark with distilled water. Mix thoroughly by inverting the flask several times.
3. The final dilution is now at a concentration of approximately 1 mg/l fluoride.

**F. Preparation for Delivery Acceptance Testing**

1. Place 50 ml beaker with the following labels on lab bench: delivery sample, TISAB.
2. Place 100 ml beaker with the following labels on bench: 1 mg/l, 2 mg/l, known reference sample, delivery sample.
3. Pour approximately 30 ml of TISAB into the 50 ml TISAB beaker.
4. Pipette 25 ml from 50 ml TISAB beaker into the delivery sample 100 ml beaker.
5. Pour approximately 30 ml of the delivery sample into the 50 ml delivery sample beaker.
6. Pipette 25 ml from the 50 ml delivery sample beaker into the 100 ml delivery sample beaker.
7. Pour approximately 50 ml of 1 mg/l standard, 2 mg/l standard, and known reference standard into the corresponding 100 ml beakers.

**G. Calibration of Corning 350 Meter**

1. Press "on/off" on Corning 350 Meter.
2. Press "cal". If more than one channel in use, select proper channel (blackened highlight) using arrow keys and press "enter". The first calibration standard (cal 1= 1.00) should be highlighted.
3. Place small magnetic stirring bar in 100 ml 1 mg/l beaker and place on foam pad on stirrer. Gently pat and submerge tips of fluoride measuring and reference electrodes into beaker. DO NOT rub electrodes dry! Pat dry only.
4. Turn mixer on low ensuring stirring bar does not strike electrodes.

5. Wait 3 minutes (all samples) and then set 1 mg/l standard by pressing “read”. If the display decimal stops blinking before three minutes, then Auto Endpoint is engaged. Remove Auto Endpoint by pressing “auto read”.
6. The second calibration standard should now be highlighted (cal2= 2.00).
7. Repeat steps (3-5) for 2 mg/l standard. The electrode slope will appear briefly at the bottom of the display when “read” is pressed. Record slope on Chemical Delivery Measurement Form. The meter will automatically return to measurement mode. A slope of –50 to –59 is recommended.

#### **H. Measurement**

1. Place known 1.20 mg/l reference sample on meter next. The reading should agree within 0.04 mg/l of theoretical. If not, remake standards and recalibrate. Record on Chemical Delivery Measurement Form.
2. Measure sample of final dilution from F3. and record results on Chemical Delivery Measurement Form.
3. Compare the measured result of the delivery sample to the calculated value from the Specific Gravity (60F) vs. Hydrofluosilicic Acid Chart.
4. The difference between the measured and calculated values should be no more than 10%.
4. Press “on/off” to shut off meter.
5. Keep probes in 1 mg/l fluoride solution between tests.

#### **I. Documentation of Test Results**

1. Document results of these analyses on the Chemical Delivery Measurement Form.
2. If any discrepancies occur during the delivery process, the Supervisor should be contacted. Do not assume fluoride analyzer error. The Supervisor will reject the delivery if the product does not appear to be fluoride.

#### **J. Delivery**

1. Once tests are completed and verified, tell the driver to hook up for delivery at the fluoride fill station.
2. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries
3. Place drop buckets under truck valves.
4. Inspect all valves before they are opened.
5. Note the start time of the delivery and the storage tank elevation in the Operator Log and the Delivery Log.
6. Direct driver to open line valve at fluoride fill station.
7. Observe the first few minutes of delivery to ensure the integrity of the connections.
8. An assigned employee should monitor the Fluoride SCADA screen periodically throughout the delivery process. Do not fill above 9 feet.
9. Instruct driver to shut down the delivery at the first sign of leakage. Notify staff over intercom if a leak should occur. Be sure to disclose evacuation routes away from the leak.

#### **K. Conclusion of Delivery**

1. Direct driver to close the line valve at the fluoride fill station once the delivery is completed and the line has been blown empty.
2. Record the final storage tank elevation and time in the Operator Log and Delivery Log .
3. Lock the Fluoride fill station upon conclusion of delivery.
4. Sign paperwork. Place the Chemical Delivery Measurement Form and Chemical Delivery Inspection Form in the Supervisor’s box. Original delivery paperwork from the delivery driver shall be sent to the plant manager. Copies of the delivery paperwork shall be kept by the Supervisor.

#### **L. Chain of Custody**

1. The remainder of fluoride sampled from the tank truck that was not used for testing will be placed in storage for quality assurance purposes.
2. The laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure the fluoride product is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the fluoride sample, both the driver and the delivery acceptance staff shall sign the Chain of Custody form.

4. After the conclusion of delivery, place the remainder of fluoride product into a 1-liter container. Log the container number on the Chain of Custody form and place into storage cabinet for a minimum of 30 days.
5. Dispose of the fluoride sample properly and note date sample disposed of on the Chain of Custody Form before reusing storage container.

#### **6. Restrictions/Limitations**

1. Laboratory technique is extremely important. Improper technique can lead to an inaccurate result. Pipetting skills are needed for this procedure.
2. Laboratory equipment must be properly calibrated.

#### **7. References**

AWWA Standard for Fluosilicic Acid ANSI/AWWA B703-00.

**CHEMICAL DELIVERY INSPECTION FORM  
HYDROFLUOSILICIC ACID**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ AM/PM RECEIVED BY: \_\_\_\_\_  
 CHEMICAL: \_\_\_\_\_ LOCATION: \_\_\_\_\_

**1. IS THE TANK TRUCK PROPERLY MARKED WITH UN# 1778? (Yes/No)** \_\_\_\_\_

IF NO, SUPERVISOR MUST BE CONTACTED.

**2. DELIVERY DOCUMENTATION:**

		BILL OF LADING	INSPECTION/ LOADING FORM	SHIPPER RELEASE ORDER	CERTIFICATE OF ANALYSIS	TERMINAL ORDER	NOTES (should any discrepancies occur, notify Supervisor immediately)
1	SUPPLIER/ SHIPPER						
2	CARRIER/ TRUCKER				-XX-		
3	CHEMICAL						Should be HFS, Hydrofluosilicic Acid, or recognized synonym
4	CHEMICAL ID#				-XX-		Should be UN# 1778
5	QUANTITY	-XX-	-XX-		-XX-		Verify that tanks can take the full delivery load to avoid overfill situations
6	RAILCAR #					-XX-	Verify that all #s are the same
7	DRIVER NAME				-XX-		Verify driver has signed appropriate paperwork
8	LOADER NAME	-XX-		-XX-	-XX-	-XX-	Verify loader has signed paperwork
9	MANUF'S LAB SIGNATURE	-XX-	-XX-	-XX-	YES/NO (Circle one)	-XX-	Verify lab signature by manufacturer
10	TANK CAR #				-XX-		Verify the tank car # on the paperwork is on the tank car you received

**3. FLUORIDE MEASUREMENT REPORT**

A. SAMPLE FURNISHED BY DRIVER IN PRESENCE OF CWD EMPLOYEE? (Yes/No) \_\_\_\_\_

B. SAMPLE RESULTS ACCEPTABLE? (Yes/No) \_\_\_\_\_

**4. SHIPMENT ACCEPTANCE**

A. SHIPMENT ACCEPTABLE? (Yes/No) \_\_\_\_\_

B. IF SUPERVISOR WAS CONTACTED AT ANY POINT, INDICATE REASON(S) \_\_\_\_\_

IF REJECTED, INDICATE SUPERVISOR'S NAME \_\_\_\_\_

D. IF REJECTED, INDICATE REASON(S) \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_

**CHEMICAL DELIVERY MEASUREMENT FORM  
HYDROFLUOSILICIC ACID**

Each chemical delivery must be accompanied with test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of a CWD employee. Results for the sample collected at the delivery site must be recorded on this form.

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**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date: (e.g.: 1778 10/30/98)\_\_\_\_\_

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**SPECIFIC GRAVITY**

Specific Gravity @ \_\_\_\_\_° F \_\_\_\_\_  
Temp. Compensation \_\_\_\_\_

Vendor test on Certificate  
of Analysis @ 60° F \_\_\_\_\_

Tank Truck Sample @ 60° F \_\_\_\_\_

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**CALCULATED FLUORIDE CONCENTRATION AFTER 1:200,000 DILUTION**

(based on specific gravity, use attached chart)

Tank Truck Sample \_\_\_\_\_ mg/l

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**MEASURED FLUORIDE CONCENTRATION AFTER 1:200,000 DILUTION**

Slope: \_\_\_\_\_

Tank Truck Sample \_\_\_\_\_ mg/l 1.20 known: \_\_\_\_\_

**IS MEASURED FLUORIDE CONCENTRATION WITHIN 10% OF SPECIFICATION? (Yes\No) \_\_\_\_\_**

IF NO, SHIPMENT **CAN NOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.**

Tank Truck Sample \_\_\_\_\_

**IS APPEARANCE APPROPRIATE? (YES IF IT IS WHITE/CLEAR TO STRAW YELLOW, OTHERWISE NO)**

IF NO, SHIPMENT CAN NOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.

Tank Truck Sample \_\_\_\_\_

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**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS? \_\_\_\_\_**

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SIGNATURE OF DELIVERY INSPECTOR \_\_\_\_\_

DATE \_\_\_\_\_

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**NAME OF BIDDER:** \_\_\_\_\_

**WATERWORKS OPERATIONS**  
**Specific Gravity (60F) vs. % Hydrofluosilicic Acid**

S.G.	% H <sub>2</sub> SiF <sub>6</sub>	ppm after 1:200,000 dilution	S.G.	% H <sub>2</sub> SiF <sub>6</sub>	ppm after 1:200,000 dilution	S.G.	% H <sub>2</sub> SiF <sub>6</sub>	ppm after 1:200,000 dilution
1.182	20.359	0.951	1.217	24.278	1.168	1.252	28.197	1.395
1.183	20.471	0.957	1.218	.390	1.174	1.253	28.309	1.402
1.184	20.583	0.963	1.219	24.502	1.180	1.254	28.421	1.409
1.185	20.695	0.969	1.220	24.614	1.187	1.255	28.533	1.415
1.186	20.807	0.975	1.221	24.726	1.193	1.256	28.645	1.422
1.187	20.919	0.981	1.222	24.838	1.200	1.257	28.757	1.429
1.188	21.031	0.987	1.223	24.950	1.206	1.258	28.981	1.441
1.189	21.143	0.993	1.224	25.062	1.212	1.259	29.093	1.448
1.190	21.255	1.000	1.225	25.174	1.219	1.260	29.205	1.454
1.191	21.367	1.006	1.226	25.286	1.225	1.261	29.317	1.461
1.192	21.479	1.012	1.227	25.398	1.232	1.262	29.429	1.468
1.193	21.591	1.018	1.228	25.510	1.238	1.263	29.541	1.475
1.194	21.703	1.024	1.229	25.622	1.244	1.264	29.653	1.481
1.195	21.815	1.030	1.230	25.734	1.251	1.265	29.765	1.488
1.196	21.927	1.036	1.231	25.846	1.257	1.266	29.877	1.495
1.197	22.039	1.043	1.232	25.958	1.264	1.267	29.989	1.502
1.198	22.151	1.049	1.233	26.070	1.270	1.268	30.101	1.508
1.199	22.263	1.055	1.234	26.182	1.277	1.269	30.213	1.515
1.200	22.376	1.061	1.235	26.294	1.283	1.270	30.325	1.522
1.201	22.487	1.067	1.236	26.406	1.290			
1.202	22.599	1.073	1.237	26.518	1.296			
1.203	22.711	1.080	1.238	26.630	1.303			
1.204	22.823	1.086	1.239	26.742	1.309			
1.205	22.935	1.092	1.240	26.854	1.316			
1.206	23.047	1.098	1.241	26.966	1.323			
1.207	23.159	1.105	1.242	27.078	1.329			
1.208	23.271	1.111	1.243	27.190	1.336			
1.209	23.383	1.117	1.244	27.301	1.342			
1.210	23.495	1.123	1.245	27.413	1.349			
1.211	23.607	1.130	1.246	27.525	1.355			
1.212	23.718	1.136	1.247	27.637	1.362			
1.213	23.830	1.142	1.248	27.749	1.369			
1.214	23.942	1.149	1.249	27.861	1.375			
1.215	24.054	1.155	1.250	27.973	1.382			
1.216	24.166	1.161	1.251	28.085	1.389			

**TEMPERATURE EQUATION: For > 60 deg F:**  $SG@60^{\circ}F = SG@T^{\circ}F - (0.00045 \times (T-60))$

**For < 60 deg F:**  $SG@60^{\circ}F = SG@T^{\circ}F + (0.00045 \times (60-T))$

*Note: SG = Specific Gravity, T = Temperature of truck sample at time of Specific Gravity Testing.*

**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1.6:  
Water Treatment Chemical Purchase Specifications Potassium Hydroxide**

*Revision Number: 2  
Revision Date: 9/15/03*

**A. Composition**

1. Liquid potassium hydroxide supplied under this standard shall contain a minimum of either 45 percent or 50 percent total alkalinity as potassium hydroxide.

**B. Unloading**

1. Tank trucks used for the delivery of the Potassium Hydroxide shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of KOH into the storage tanks and to enable rapid shut-off if an emergency arises.
2. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries
3. At delivery, the driver will be required to provide a sample from the truckload delivered to be tested by CWD personnel.

**C. Certified Analysis for Impurities**

1. The potassium hydroxide supplied according to this standard shall contain no soluble material or organic substances in quantities capable of producing deleterious or injurious effects on the health of those consuming water that has been treated properly with the potassium hydroxide.

**D. Certificate of Analysis Testing**

1. When sampling for certificate of analysis purposes, the vendor must follow ANSI/AWWA B511-00.
2. The certificate of analysis shall state the specific gravity and percent (%) Potassium Hydroxide.

**E. General**

1. Potassium Hydroxide shall conform to the ANSI/AWWA B511-00 Standard.

**SOP CM2.6:**

**Delivery Acceptance of Potassium Hydroxide**

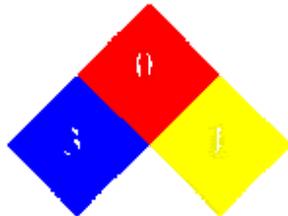
Revision Number: 2  
Revision Date: 9/15/03

**1. Objective**

This procedure is intended to guide water treatment personnel when they receive deliveries of Potassium hydroxide to be added to the Cambridge water distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

**2. Background**

**A. Health & Safety**



1. UN 1814

Truck Placard NFPA Tank Label

International Hazard Symbols

*Danger! Corrosive!* Potassium hydroxide is an acidic solution that causes irritation when it comes into contact with eye's skin or mucus membranes. Protective clothing should be used when handling potassium hydroxide. Avoid inhalation or contact with eyes and skin. Minimum personal protective equipment includes chemical resistant gloves, safety glasses or goggles, and normal work clothes. Chemical resistant clothing, gloves, boots, face shield and respiratory protection are necessary for tasks involving significant exposure potential. Refer to the individual SOPs contained in the local safety plan for specific details.

Effects:

- **Inhalation:** May cause ulceration, and burns to mouth, throat, and stomach, severe irritation of respiratory system.
- **Skin:** May cause severe burns.
- **Eye:** May cause severe burns and permanent eye damage.
- **Ingestion:** May cause severe burns to mouth, throat, and stomach. May be fatal.

First Aid:

- **Inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.
- **Eyes:** Immediately flush with plenty of water for at least 15 minutes.
- **Skin:** Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.
- **Ingestion:** Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs beaten with water.

1. Refer to the WTP SOP 5 for an Emergency Contact List, Procedures and Safety Equipment. Material Safety Data Sheets (located in the control room and at the chemical receiving area) contain information on hard hats and safety glasses, personal protective gear, and handling. The CWD Health & Safety Manual also provides emergency response information.

**B. Vendor Certification/Purchase Specifications**

1. Potassium hydroxide shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
2. See SOP CM1 for general purchasing specifications and CM1-6 for specific specifications on Potassium hydroxide.

**C. Recognized synonyms**

1. KOH
2. Caustic Potash Solution
3. Lye
4. Potassium Hydrate Solution

**3. Responsibilities**

**A. Delivery Acceptance staff**

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure are allowed to accept Potassium hydroxide deliveries.
2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

**4. Required Equipment/Materials**

**A. Personal Protective Equipment**

1. Refer to the Potassium hydroxide SOP contained in the Local Safety Plan for specific details.
2. Those unfamiliar with the hazards of any chemicals used in the test procedures that follow should consult current manufacturers' material safety and health data sheets (MSDS) or other appropriate material safety and health references.

**B. Sample Collection**

1. Sampling of liquid potassium hydroxide should be conducted quickly, preferably when the atmosphere is not unusually damp. The sample should be sealed as quickly as possible to avoid adsorption of moisture and carbon dioxide from the surrounding air.
2. Sample taken from a tank car or truck may be obtained by means of a thief sampler.

**E. Documentation**

1. Chemical Delivery Inspection Form for Potassium hydroxide
2. Chemical Delivery Measurement Form for Potassium hydroxide
3. Specific Gravity (60F) vs. % Potassium hydroxide Chart

**5. Procedures**

**A. Scheduling**

1. The Supervisor will schedule deliveries of potassium hydroxide. At this time the Supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available volume in the tank to assure that there is enough room to unload the entire truckload.

## **B. Delivery Documentation & Truck Placards**

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN # 1814.
2. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Report.

## **C. Sampling**

1. Samples shall be taken at the point of destination
2. The gross liquid sample (approximately 1 gallon) shall be thoroughly mixed. Approximately 1 pt of the mixed solution shall be sealed in each of three airtight, moisture proof glass or plastic containers. Each sample container shall be labeled to identify it, and the shall be dated and signed by the sampler.
3. Time of analysis. Laboratory examination of the sample shall be completed within five working days after receipt of the shipment.
4. Two samples of the liquid or dry material, as applicable, shall be retained for at least 30 days after the date of receipt for use by the supplier or the referee laboratory, if needed..
5. Laboratory examination. Laboratory examination by the purchaser of one of the three samples shall be completed within five working days after receipt of the shipment.

## **D. Appearance of raw product**

- A. Liquid potassium hydroxide is a milky off-white color.

## **F. Test Procedures - General**

**Test procedures will follow one of the following ANSI/AWWA B511-00 methods:**

### 5.2.1 Total alkalinity test.

#### 5.2.1.1 Reagents.

1. 1.0N hydrochloric acid.\*
2. Barium chloride, 10 percent solution.
3. Phenolphthalein indicator.
4. Modified methyl orange indicator. Dissolve 0.1 g of methyl orange and 0.14 g of xylene cyanol FF dye in 100 mL of water and filter if necessary.

#### 5.2.1.2 Procedure.

***CAUTION: When dry potassium hydroxide is added to water, a violent evolution of heat results. Care should be taken to slowly add the sample of potassium hydroxide to the water to reduce the intensity of the reaction.***

1. Transfer approximately 18 g of dry or liquid potassium hydroxide from the sample bottle to a tared weighing bottle. Weigh the sample accurately
2. Transfer the weighed sample to a 1,000-mL volumetric flask that has been partially filled with approximately 300 mL of freshly boiled and cooled distilled water. Rinse the weighing bottle into the flask with freshly boiled and cooled distilled water. After the potassium hydroxide is dissolved, cool the flask's contents by surrounding the flask with constantly running water until room temperature is reached. Then fill the flask to the 1,000-mL mark with freshly boiled and cooled distilled water and mix thoroughly
3. Place a 100-mL aliquot from the 1,000-mL volumetric flask into an Erlenmeyer flask. Add 5 mL of barium chloride solution, stopper the flask, and let it stand for 5 min. Add 3 drops of phenolphthalein indicator and titrate to the disappearance of the pink color with 1.0N HCl. Record the millilitres used as Reading A. Add 2 drops of the modified methyl orange indicator and titrate with 1.0N HCl to a steel grey end point. Record the millilitres used as Reading B.

**NAME OF BIDDER:** \_\_\_\_\_

### 5.2.1.3 Calculations.

$\frac{(A+B) \times N \times 0.0561 \times 100}{\text{grams of sample in aliquot}}$  = percent total alkalinity as KOH (Eq 1)

$\frac{A \times N \times 0.0561 \times 100}{\text{grams of sample in aliquot}}$  = percent total hydroxide as KOH (Eq 2)

$\frac{B \times N \times 0.0691 \times 100}{\text{grams of sample in aliquot}}$  = percent carbonate as K<sub>2</sub>CO<sub>3</sub> (Eq 3)

$\frac{(A + B) \times N \times 0.0471 \times 100}{\text{grams of sample-in aliquot}}$  = percent total alkalinity as K<sub>2</sub>O (Eq 4)

\*Nominal; exact normality to be determined by titrating against standard solution of 1.0N reagent-grade Na<sub>2</sub>CO<sub>3</sub>.

5.2.2 Potassium carbonate (alternate method). The gas volumetric method for determination of low levels of potassium carbonate may be used. For testing procedures, refer to the most recent revision of ASTM E291.

5.2.3 Referee analysis. In the event that a referee analysis is needed, the most recent revision of ASTM E291 shall be followed for the methods of analysis.

### Documentation of Test Results

1. Document results of these analyses on the Chemical Delivery Measurement Form.
2. If any discrepancies occur during the delivery process, the Supervisor should be contacted. Do not assume analyzer error. The Supervisor will reject the delivery if the product does not appear to be Potassium hydroxide.

### K. Delivery

1. Once tests are completed and verified, tell the driver to hook up for delivery at the Potassium hydroxide fill station.
2. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries
3. Place drop buckets under truck valves.
4. Inspect all valves before they are opened.
5. Note the start time of the delivery and the storage tank elevation in the Operator Log and the Delivery Log.
6. Direct driver to open line valve at Potassium hydroxide fill station.
7. Observe the first few minutes of delivery to ensure the integrity of the connections.
8. An assigned employee should monitor the Alum SCADA screen periodically throughout the delivery process. Do not fill above 10 feet.
9. Instruct driver to shut down the delivery at the first sign of leakage. Notify staff over intercom if a leak should occur. Be sure to disclose evacuation routes away from the leak.

### M. Conclusion of Delivery

1. Direct driver to close the line valve at the alum fill station once the delivery is completed and the line has been blown empty.
2. Record the final storage tank elevation and time in the Operator Log and Delivery Log .
3. Lock the Alum fill station upon conclusion of delivery.
4. Sign paperwork. Place the Chemical Delivery Measurement Form and Chemical Delivery Inspection Form in the Supervisor's box. Original delivery paperwork from the delivery driver shall be sent to the plant manager. Copies of the delivery paperwork shall be kept by the Supervisor.

#### **N. Chain of Custody**

1. The remainder of KOH sampled from the tank truck that was not used for testing will be placed in storage for quality assurance purposes.
2. The laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure the KOH product is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the KOH sample, both the driver and the delivery acceptance staff shall sign the Chain of Custody form.
4. After the conclusion of delivery, place the remainder of KOH product into storage cabinet for a minimum of 30 days.
5. Dispose of the KOH sample properly and note date sample disposed of on the Chain of Custody Form before reusing storage container.

#### **6. Restrictions/Limitations**

1. Laboratory technique is extremely important. Improper technique can lead to an inaccurate result.
2. Laboratory equipment must be properly calibrated.

#### **Basis for Rejection**

##### Rejection

Notice of nonconformance. If the potassium hydroxide delivered does not meet the requirements of this standard, a notice of nonconformance shall be provided by the purchaser to the supplier within 10 working days after receipt of the shipment at the point of destination. The results of the purchaser's tests shall prevail unless the supplier notifies the purchaser within five working days after receipt of the complaint that a retest is desired. On receipt of the request for a retest, the purchaser shall forward to the supplier one of the sealed samples taken according to Sec. 5.1. In the event that the results obtained by the supplier on retesting do not agree with the test results obtained by the purchaser, the other sealed sample shall be forwarded, unopened, for analysis to a referee laboratory agreed on by both parties. The results of the referee analysis shall be accepted as final.

Removal of unsatisfactory material. If the material does not meet the requirements of this standard, the supplier shall remove the material from the premises of the purchaser or make a price adjustment agreed on by the supplier and the purchaser.

#### **7. References**

AWWA Standard for Potassium hydroxide ANSI/AWWA B511-00.

**CHEMICAL DELIVERY INSPECTION FORM**  
**Potassium Hydroxide**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ AM/PM RECEIVED BY: \_\_\_\_\_  
CHEMICAL: \_\_\_\_\_ LOCATION: \_\_\_\_\_

**1. IS THE TANK TRUCK PROPERLY MARKED WITH UN# 1814? (Yes/No) \_\_\_\_\_**

IF NO, SUPERVISOR MUST BE CONTACTED.

**2. DELIVERY DOCUMENTATION:**

		BILL OF LADING	INSPECTION/ LOADING FORM	SHIPPER RELEASE ORDER	CERTIFICATE OF ANALYSIS	TERMINAL ORDER	NOTES (should any discrepancies occur, notify Supervisor immediately)
1	SUPPLIER/ SHIPPER						
2	CARRIER/ TRUCKER				-XX-		
3	CHEMICAL						Should be: Potassium hydroxide
4	CHEMICAL ID#				-XX-		Should be UN# ____
5	QUANTITY	-XX-	-XX-		-XX-		Verify that tanks can take the full delivery load to avoid overfill situations
6	RAILCAR #					-XX-	Verify that all #s are the same
7	DRIVER NAME				-XX-		Verify driver has signed appropriate paperwork
8	LOADER NAME	-XX-		-XX-	-XX-	-XX-	Verify loader has signed paperwork
9	MANUF'S LAB SIGNATURE	-XX-	-XX-	-XX-	YES/NO (Circle one)	-XX-	Verify lab signature by manufacturer
10	TANK CAR #				-XX-		Verify the tank car # on the paperwork is on the tank car you received

**3. POTASSIUM HYDROXIDE MEASUREMENT REPORT**

A. SAMPLE FURNISHED BY DRIVER IN PRESENCE OF CWD EMPLOYEE? (Yes/No) \_\_\_\_\_

B. SAMPLE RESULTS ACCEPTABLE? (Yes/No) \_\_\_\_\_

**4. SHIPMENT ACCEPTANCE**

A. SHIPMENT ACCEPTABLE? (Yes/No) \_\_\_\_\_

B. IF SUPERVISOR WAS CONTACTED AT ANY POINT, INDICATE REASON (S)

IF REJECTED, INDICATE SUPERVISOR'S NAME \_\_\_\_\_

D. IF REJECTED, INDICATE REASON(S) \_\_\_\_\_

NAME OF BIDDER: \_\_\_\_\_

**CHEMICAL DELIVERY MEASUREMENT FORM**  
**Potassium Hydroxide**

Each chemical delivery must be accompanied with test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of a CWD employee. Results for the sample collected at the delivery site must be recorded on this form.

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**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date: (e.g.: 1814 10/30/00)\_\_\_\_\_

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**SPECIFIC GRAVITY**

Specific Gravity @ \_\_\_\_\_<sup>0</sup> F \_\_\_\_\_  
Temp. Compensation \_\_\_\_\_

Vendor test on Certificate  
of Analysis @ 60<sup>0</sup> F \_\_\_\_\_

Tank Truck Sample @ 60<sup>0</sup> F \_\_\_\_\_

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**IS APPEARANCE APPROPRIATE? (YES IF IT IS WHITE/CLEAR TO MILKY WHITE, OTHERWISE NO)**

IF NO, SHIPMENT CANNOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.

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Tank Truck Sample \_\_\_\_\_

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**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS?** \_\_\_\_\_

SIGNATURE OF DELIVERY INSPECTOR \_\_\_\_\_

DATE \_\_\_\_\_

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**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1.7:**

**Water Treatment Chemical Purchase Specifications Potassium Permanganate**

**A. Composition**

1. DARK PURPLE TO BRONZE CRYSTALS
2. The KMnO4 contents shall not be less than 98 percent by weight .
3. Potassium permanganate has a bulk density of 90 to 100 lb/ft3. It's solubility in distilled water is shown in the following table.

<u>Temperature C</u>	<u>Solubility g/L</u>
0	27.8
20	65.0
60	230.0

4. Particle size: No more than 7 percent of the material shall pass through a US standard sieve series No. 200 sieve, and no more than 20 percent by weight shall be retained on a US standard sieve series No. 40 sieve.

**B. Special Issues**

1. Storage and Handling Precautions. Potassium permanganate is a strong oxidizing agent and should be treated as such. It reacts with many materials, and care should be exercised in its use. It should be stored in closed containers in cool, dry areas on concrete floors and should be protected from physical damage. If stored outdoors, containers should be protected from weather by a suitable cover. It should be segregated from organics, concentrated acids, peroxides, ammonium compounds, metallic powders, elemental sulfur, phosphorus, carbon, metal hydrides, hydrazine, hydroxylamines, formaldehyde, and combustible products.
2. Spills of dry permanganate should be swept up and transferred to clean metal drums and disposed of according to federal, provincial, state, and local regulations. Spilled permanganate should not be returned to the original drums that contain uncontaminated product. After the permanganate has been cleaned up, the residual permanganate on the floor should be flushed with water into a sanitary sewer, complying with federal, provincial, state, and local regulations.

**C. Certified Analysis for Impurities**

1. The potassium permanganate supplied according to this standard shall contain no substances in quantities capable of producing deleterious or injurious effects to the health of those consuming water that has been treated properly with potassium permanganate.
2. Product certifications. Potassium permanganate is a direct additive used in the treatment of potable water. This material should be certified as suitable for contact with or treatment of drinking water by an accredited certification organization in accordance with ANSI ' Standard 60, Drinking Water Treatment Chemicals-Health Effects. Evaluation shall be accomplished in accordance with requirements that are no less restrictive than those listed in ANSI/NSF Standard 60. Certification shall be accomplished by a certification organization accredited by the American National Standards Institute.

**D. Certificate of Analysis Testing**

1. When sampling for certificate of analysis purposes, the vendor must follow ANSI/AWWA B603-98 Section 5.

**E. General**

Potassium permanganate shall conform to the ANSI/AWWA B603-98 Standard for Potassium permanganate.

**NAME OF BIDDER:** \_\_\_\_\_

## SOP CM2.7:

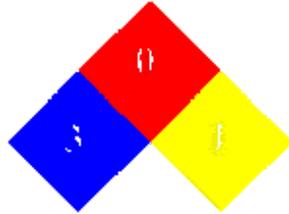
### Delivery Acceptance of Potassium Permanganate

#### 1. Objective

This procedure is intended to guide water treatment personnel when they receive deliveries of Potassium permanganate to be added to the Cambridge water distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

#### 2. Background

##### A. Health & Safety



1. UN#1490  
Truck Placard

NFPA Tank Label

International Hazard Symbols

*Danger! Corrosive!* When handling potassium permanganate, good safety procedures must be observed. These include the use of safety goggles, safety glasses with side shields, or face shield; impervious rubber or PVC gloves and apron; and a NIOSH\*-MSHA" approved respirator meeting general industry standards as described in ANSI. Z88.2, Practices for Respiratory Protection, latest revision.

Potassium permanganate is corrosive to the eyes and can cause severe burns. If exposed to permanganate, immediately flush the affected eye with water for 15 min while holding the eyelid open. Consult a physician immediately.

For additional safety aspects, refer to material safety data sheets (MSDS)

1. Chemical resistant clothing, gloves, boots, face shield and respiratory protection are necessary for tasks involving significant exposure potential. Refer to the individual SOPs contained in the local safety plan for specific details.
2. Refer to the WTP SOP 5 for an Emergency Contact List, Procedures and Safety Equipment. Material Safety Data Sheets (located in the control room and at the chemical receiving area) contain information on hard hats and safety glasses, personal protective gear, and handling. The CWD Health & Safety Manual also provides emergency response information. B. Vendor Certification/Purchase Specifications
3. Potassium permanganate shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
4. See SOP CM1 for general purchasing specifications and CM1-7 for specific specifications on Potassium permanganate.

##### C. Recognized synonyms

N/A

#### 3. Responsibilities

##### A. Delivery Acceptance staff

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained in this procedure are allowed to accept Potassium permanganate deliveries.

NAME OF BIDDER: \_\_\_\_\_

2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

#### **4. Required Equipment/Materials**

##### **A. Personal Protective Equipment**

1. Refer to the Potassium permanganate SOP contained in the Local Safety Plan for specific details.
2. Those unfamiliar with the hazards of any chemicals used in the test procedures that follow should consult current manufacturers' material safety and health data sheets (MSDS) or other appropriate material safety and health references.

##### **B. Sample Collection**

1. Sampling point. Samples shall be taken at the point of destination. Individual samples shall be combined into a gross or composite 3-lb (1.35-kg) minimum sample, mixed, and properly divided to produce three final samples. A 1-lb (0.45-kg) final sample shall be reserved for tests, and two 1-lb (0.45-kg) samples shall be sealed and retained for possible retesting.
2. Packaged material. A composite sample of the shipment shall be collected from factory-sealed containers only, according to the following table. For lots of less than 10 containers, each container shall be sampled. Using a sampling thief, sufficient sample quantity shall be taken from each container to yield a minimum 3lb (1.35-kg) composite sample. The composite sample shall be divided into three 1-lb (0.45-kg) individual samples. The 1-lb (0.45-kg) composite samples shall be placed in separate, clean, dry, glass or polypropylene containers, which are to be sealed and marked appropriately. See Sec. 1 regarding samples for testing and retesting. A chain-of-custody form shall accompany all samples and shall be properly completed by the individuals collecting samples.

##### **E. Documentation (see attachments)**

1. Chemical Delivery Inspection Form for Potassium permanganate
2. Chemical Delivery Measurement Form for Potassium permanganate

#### **5. Procedures**

##### **A. Scheduling**

1. The Supervisor will schedule deliveries of potassium permanganate. At this time the Supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available storage room to assure that there is enough room to unload the entire number of drums ordered.

##### **B. Delivery Documentation & Truck Placards**

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN # 1490.
2. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Report.

##### **D. Appearance of raw product**

1. DARK PURPLE TO BRONZE CRYSTALS, ODORLESS

## F. Test Procedures - General

Test procedures will follow one of the following ANSI/AWWA B603-98 methods:

When performing tests, observe all safety precautions. Use good laboratory practices. Before handling chemicals, refer to the respective material safety data sheets (MSDS).

### KMnO<sub>4</sub>-Assay

Standard solution preparation. Prepare and standardize a 1.000 g/L KMnO<sub>4</sub> standard solution as follows:

1. Accurately weigh 1.005 g of reagent-grade potassium permanganate, transfer to a 1-L volumetric flask, and dilute to volume with boiled and cooled distilled water. Allow to stand with occasional mixing for 15 min.
2. Accurately weigh 2.120 g of primary standard-grade sodium oxalate and transfer to a 1-L volumetric flask. Add 20 mL of 20 percent by weight H<sub>2</sub>SO<sub>4</sub> to the 1-L volumetric flask containing the oxalate, and dilute to volume with boiled and cooled distilled water. Mix until dissolved and allow to stand for 5 min.
3. Transfer 40 mL of the sodium oxalate solution by pipette into a small Erlenmeyer flask, heat to 70' to 80'C (158' to 176'F), and titrate with the KMnO<sub>4</sub> solution prepared in step 1 to a faint pink end point that persists for 20 to 30 seconds.
4. The standardization factor F is calculated as follows:

$$F = 40/x \text{ (Eq 1)}$$

Where: x = mL of KMnO<sub>4</sub> used in titration

Procedure. Accurately weigh 1.000 g of sample potassium permanganate (grind sample if coarseness hampers exact measurement) and 2.120 g of primary standard-grade sodium oxalate on a watch glass and transfer quantitatively to a 500-mL Erlenmeyer flask. Add 150 mL of distilled water and 20 mL of 20 percent H<sub>2</sub>SO<sub>4</sub>. Heat while stirring to 70' to 80'C (158' to 176'F) and then titrate with the standard KMnO<sub>4</sub> solution prepared in Sec. 5.3.1 to a faint pink end point that persists for 20 to 30 seconds. The percentage of KMnO<sub>4</sub> in the sample is then calculated as follows:  
percentage KMnO<sub>4</sub> = 100.00 - (0.1 FT) (Eq 2)

Where:

F = standardization factor obtained above

T = mL standard KMnO<sub>4</sub> solution used in titration

### Particle Size

1. Using US Standard Sieves with 8-in. (200-mm) diameter screens, stack a No. 40 (International Standard No. 425) sieve above a No. 200 (International Standard No. 75) sieve with a pan on the bottom and a lid on top.
2. Weigh out a 100 g ± 0.1 g sample of the potassium permanganate to be tested.
3. Place the sample on the upper, or coarser, screen and mount in a mechanical shaker. Shake for 3 min.
4. Disassemble the screens and weigh the product retained on the No. 40 sieve and also the product that passed through the No. 200 sieve and was collected in the pan.
5. The percentage retained on the No. 40 sieve and the percentage that passed through the No. 200 sieve collected in the pan are equal to the respective weights obtained in number 3 above.

### Water Tolerance

The capacity of free-flowing grade potassium permanganate to adsorb moisture and remain flowable shall be determined by the following procedure:

**NAME OF BIDDER:** \_\_\_\_\_

1. Weigh out 100 g  $\pm$  1 g of the sample to be tested.
2. Add the weighed material to a suitable container (about 500 mL in volume) that has a tight-fitting lid.
3. Using distilled water and a burette or pipette calibrated in 0.1-mL increments, add 0.7 mL to the preweighed sample in the container, distributed evenly over the surface of the sample.
4. Cover and shake vigorously by hand for 20 to 30 seconds so that the water and sample are mixed thoroughly.
5. Remove the lid and pour the potassium permanganate sample into a funnel\* mounted on a ring stand.
6. If the material mixed with the water flows freely through the funnel, then the sample meets the water-tolerance test. If the material mixed with water does not flow freely through the funnel, then the sample does not meet the standard.

\*A glass powder funnel (Corning No. 6220 or equivalent) with top inside diameter of 75 mm, stem length of 30 mm, and an inside stem diameter of 12 mm t 1 mm.

### **Documentation of Test Results**

1. Document results of these analyses on the Chemical Delivery Measurement Form.
2. If any discrepancies occur during the delivery process, the Supervisor should be contacted. Do not assume analyzer error. The Supervisor will reject the delivery if the product does not appear to be Potassium permanganate.

### **K. Delivery**

Marking Required. Each shipment shall be identified as to product, grade, net weight, name and address of manufacturer, and brand name. Packages or containers shall show a lot number and identification of manufacturer. All markings on packaged, containerized, or bulk shipments shall conform to applicable laws and regulations, including requirements established by the US Occupational Safety and Health Administration (OSHA) and US Department of Transportation (DOT).

Optional. Each package, drum, or other container of material may also bear the statement "This material meets the requirements of AWWA B603-98, Standard for Potassium Permanganate," provided that the requirements of this standard are met and the material is not of a different quality as called for by separate agreement between the supplier and purchaser.

#### **Packaging and Shipping**

Packaging and shipping of potassium permanganate shall conform to all applicable federal, provincial, state, and local regulations.

Containers. Potassium permanganate shall be shipped in DOT-authorized bulk trailers, single-trip steel drums, and plastic pails. Material shall be provided in 55 lb (25 kg) net weight containers. Purchaser's specifications must meet the DOT regulations.

Net weight. The net weight of the package or container shall not deviate from the recorded weight by more than  $\pm$  2.0 percent. If a dispute arises concerning the weight of packaged or containerized material, acceptance or rejection shall be based on the weight of not less than 10 percent of the packages received, selected at random from the shipment.

### **L. Conclusion of Delivery**

1. Record the final drum count and time in the Operator Log and Delivery Log
2. Sign paperwork. Place the Chemical Delivery Measurement Form and Chemical Delivery Inspection Form in the Supervisor's box. Original delivery paperwork from the delivery driver shall be sent to the plant manager. Copies of the delivery paperwork shall be kept by the Supervisor.

### **M. Chain of Custody**

1. The remainder of sample not used for testing will be placed in storage for quality assurance purposes.
2. The laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure that the product is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the product sample, both the driver and the delivery acceptance staff shall sign the Chain of Custody form.
4. After the conclusion of delivery, place the remainder of the product into storage cabinet for a minimum of 30 days.
5. Dispose of the product sample properly and note date sample disposed of on the Chain of Custody Form before reusing storage container.

### **6. Restrictions/Limitations**

1. Laboratory technique is extremely important. Improper technique can lead to an inaccurate result.
2. Laboratory equipment must be properly calibrated.

### **Basis for Rejection**

Notice of nonconformance. If the potassium permanganate delivered does not meet the requirements of this standard, a notice of nonconformance shall be provided by the purchaser to the supplier within 10 days after receipt of the shipment at the point of destination. The results of the purchaser's test shall prevail unless the supplier notifies the purchaser within 10 working days after receipt of the notice of complaint that a retest is desired. On receipt of the request for a retest, the purchaser shall forward to the supplier one of the sealed samples taken according to Sec. 5. 1. If the results obtained by the supplier on retesting do not agree with the test results obtained by the purchaser, the other sealed sample shall be forwarded, unopened, for analysis to a referee laboratory agreed on by both parties. The results of the referee analysis shall be accepted as final. The cost of the referee analysis shall be paid for as specified by the purchaser.

### **7. References**

AWWA Standard for Potassium permanganate ANSI/AWWA B603-98.

**CHEMICAL DELIVERY INSPECTION FORM**  
**Potassium Permanganate**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ AM/PM RECEIVED BY: \_\_\_\_\_  
CHEMICAL: \_\_\_\_\_ LOCATION: \_\_\_\_\_

**1. IS THE TANK TRUCK PROPERLY MARKED WITH UN# 1490? (Yes/No) \_\_\_\_\_**

IF NO, SUPERVISOR MUST BE CONTACTED.

**2. DELIVERY DOCUMENTATION:**

		BILL OF LADING	INSPECTION/ LOADING FORM	SHIPPER RELEASE ORDER	CERTIFICATE OF ANALYSIS	TERMINAL ORDER	NOTES (should any discrepancies occur, notify Supervisor immediately)
1	SUPPLIER/ SHIPPER						
2	CARRIER/ TRUCKER				-XX-		
3	CHEMICAL						Should be: Potassium permanganate
4	CHEMICAL ID#				-XX-		Should be UN# ____
5	QUANTITY	-XX-	-XX-		-XX-		Verify that tanks can take the full delivery load to avoid overfill situations
6	RAILCAR #					-XX-	Verify that all #s are the same
7	DRIVER NAME				-XX-		Verify driver has signed appropriate paperwork
8	LOADER NAME	-XX-		-XX-	-XX-	-XX-	Verify loader has signed paperwork
9	MANUF'S LAB SIGNATURE	-XX-	-XX-	-XX-	YES/NO (Circle one)	-XX-	Verify lab signature by manufacturer
10	TANK CAR #				-XX-		Verify the tank car # on the paperwork is on the tank car you received

**3. POTASSIUM PERMANGANTE MEASUREMENT REPORT**

A. SAMPLE FURNISHED BY DRIVER IN PRESENCE OF CWD EMPLOYEE? (Yes/No) \_\_\_\_\_

B. SAMPLE RESULTS ACCEPTABLE? (Yes/No) \_\_\_\_\_

**4. SHIPMENT ACCEPTANCE**

A. SHIPMENT ACCEPTABLE? (Yes/No) \_\_\_\_\_

B. IF SUPERVISOR WAS CONTACTED AT ANY POINT, INDICATE REASON (S)

IF REJECTED, INDICATE SUPERVISOR'S NAME \_\_\_\_\_

D. IF REJECTED, INDICATE REASON(S) \_\_\_\_\_

NAME OF BIDDER: \_\_\_\_\_

**CHEMICAL DELIVERY MEASUREMENT FORM**  
**Potassium Permanganate**

Each chemical delivery must be accompanied with test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of a CWD employee. Results for the sample collected at the delivery site must be recorded on this form.

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**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date: (e.g.: 1490 10/30/00)\_\_\_\_\_

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**IS APPEARANCE APPROPRIATE?** (YES IF IT IS DARK PURPLE TO BRONZE CRYSTALS, ODORLESS, OTHERWISE NO) **IF NO, SHIPMENT CANNOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.**

Tank Truck Sample\_\_\_\_\_

---

**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS?** \_\_\_\_\_ **DATE** \_\_\_\_\_  
**SIGNATURE OF DELIVERY INSPECTOR** \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1.10:  
Cambridge Water Department  
Specifications Sodium Bisulfite**

**A. Composition**

1. Sodium bisulfite shall contain not less than 35% and not more than 40% sodium bisulfite by weight.
2. Product shall be NSF 60 Certified.
3. Delivery made to the Cambridge Treatment Facilities via tank truck, and transferred to bulk storage tanks as directed by CWD Operations staff.

**B. Unloading**

1. Tank trucks used for the delivery of the sodium bisulfite shall be fully equipped to unload by pressurizing the tanks with air, and shall also be equipped with valves to control the flow of sodium bisulfite into the storage tanks and to enable rapid shut-off if an emergency arises. It is the responsibility of the vendor to properly dispose of any sodium bisulfate spilled during transfer.
2. CWD provides house air for the delivery, delivery truck engine(s) are to be off during deliveries.
3. Drum deliveries, driver shall off load all drums and carboys to ground level and transport to the chemical room as directed by CWD staff.
4. At delivery, the driver may be requested to provide samples to Cambridge Water Department.

**C. Certificate of Analysis Testing**

1. The certificate of analysis shall state the specific gravity and percent (%) sodium bisulfite.

**D. General**

1. Where applicable, Cambridge Water Department shall retain two composite samples (obtained as per item B.2.) from each shipment for a minimum of 30 days. The vendor agrees the contents of the samples fairly represent the quality of the product delivered in that shipment. Upon awarding of Bid, the vendor will supply Cambridge Water Department with the name of a local independent laboratory mutually acceptable to both CWD and vendor capable of performing the required analyses. When analysis shows the vendor's product to be in violation of one or more of these specifications, CDW may require of the vendor one or more of the following: 1) remove or pay for removal of the product in question, 2) reimburse CWD for the cost of cleaning up the chemical feed system and the affected portion of the water distribution system, 3) pay for chemical analyses, 4) have bid contract terminated.
2. If the bidder's product is unsatisfactory, but was inadvertently placed into the facilities system prior to rejection and subsequently causes physical damage or extra clean-up cost, CWD will either 1) be reimbursed for any associated cost, or 2) a new supplier will be engaged. Any equipment damage, down time, labor charges, fines, or any other costs resulting from defective material will be assumed by the supplier.

**E. Storage Information**

**The plant contains one 550-gallon Vertical Cylindrical, fiberglass storage tanks for sodium bisulfite.**

<b>Cambridge Water Department</b> <b>SOP CM1-11: Water Treatment Chemical Purchase Specifications</b> <b>Sodium Hypochlorite</b>
--

**A. Composition**

1. Sodium hypochlorite shall be delivered within the range of 12 to 15 percent.
2. Sodium hypochlorite shall be clear to yellow in color with no visual evidence of particulates in the product.
3. Sodium hypochlorite shall be delivered between 0.1 and 0.5 weight percent
4. excess sodium hydroxide. Excess sodium hydroxide not within this range may be grounds for rejecting the delivery.
5. Sodium hypochlorite shall have a pH between 11 and 13. A pH not within this range may be grounds for rejecting the delivery.
6. **Upon observance of particulates in the product or the development of a sludge like material in the storage tanks or associated process piping the vendor shall, upon the Production Manager's direction, clean the affected equipment and dispose of the material in accordance with applicable laws and regulations. The cleaning of affected equipment shall be coordinated with the Production Manager in order to ensure continual primary disinfection.**
7. Sodium hypochlorite shall conform to the maximum concentrations listed in Table-B(9).
8. The Certified Analysis for Impurities shall disclose results of the parameters listed in Table B(9).
9. Following the start of the CWD contract, a Certified Analysis for Impurities may be required every 6 months thereafter.

**B. General**

1. Sodium Hypochlorite shall conform with the ANSI/AWWA B300a-99 Standard for Hypochlorites.
2. The delivery time of the shipment should not exceed 72 hours from the time of manufacture.
3. Upon award of the contract, new vendors shall pay for an initial cleaning of all sodium hypochlorite storage tanks and associated process piping. The CWD will not be responsible for any cleaning costs incurred during the contract period.
4. Storage tank cleaning shall be coordinated with the Production Manager.

**C. Certified Lab Report**

(Table B9)

The Sodium hypochlorite shall conform to the following maximum concentrations. The certified lab report shall contain information on this. Concentrations in parts per million.

Arsenic	1.5
Barium	2
Cadmium	2
Chromium (total)	2
Cobalt	0.5
Copper	0.2
Iron	1.0
Lead	2
Mercury	0.02
Nickel	0.1
Selenium	2
Silver	2
Total trihalomethanes	150
Chlorate (at time of delivery)	1000
Chlorite (at time of delivery)	1500

NAME OF BIDDER: \_\_\_\_\_

**D. Delivery Documentation**

**Certificate of Analysis**

1. Date and Time of Manufacture
2. Percent chlorine by weight
3. Excess sodium hydroxide
4. Specific gravity
5. pH.

**E. Temperature**

The vendor shall guarantee that the temperature of the sodium hypochlorite delivered has never reached a temperature of more than 105°C. Failure to meet this requirement shall be considered adequate justification for rejection of deliveries.

**F. Delivery**

1. Delivery trucks shall be equipped with a hatch or other suitable means of drawing samples for testing from the tank, not the delivery piping.
2. A Y-strainer or basket strainer shall be applied by the delivery driver. It shall be used during the delivery process to trap sediments from entering the facility piping.
3. Suspended Solids Test:

The CWD reserves the right to perform the “Suspended Solids Quality Test for Bleach using Vacuum Filtration”, developed by Dr. Bernard Bubnis of Novatek, A Division of EBB, Inc.

Analysis would be performed on the sample taken out of the tank truck and shall be considered representative of the lot. CWD reserves the right to perform this test periodically as an acceptance criterion upon tank truck arrival.

Product not within the specifications described below may be grounds for rejecting the delivery.

The suspended solids in the sodium hypochlorite delivered under this contract shall be minimized and the shipments delivered shall achieve a filtration time of less than 3 minutes for 1000ml when applying the “Suspended Solids Quality Test for Bleach using Vacuum Filtration”.

Vendors not complying with this requirement shall institute corrective actions immediately to minimize suspended solids content.

**Cambridge Water Department  
SOP CM2.11: Delivery Acceptance of Sodium Hypochlorite**

**Revision Number:**  
**Revision Date: 12/10/01**  
**Pages: 1-7**

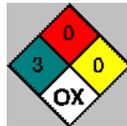
**4.3.1 OBJECTIVE:** This procedure is intended to guide water treatment personnel when they receive deliveries of Sodium Hypochlorite (NaOCl) to be added to the distribution system. It will direct them through important aspects of delivery acceptance including sampling, delivery documentation, testing, and delivery. This SOP is used to determine key characteristics for acceptance purposes only. It is not intended to assure the purity of the product.

**4.3.2 BACKGROUND**

**A. Health & Safety**

1. **UN1791**

Truck Placard



NFPA Tank Label



International Hazard Symbols

*Danger! Toxic! Corrosive!* Sodium Hypochlorite is a yellowish alkaline liquid [pH ~13] Liquid and mists are very corrosive. May react with acids or other materials to release toxic vapors. Avoid contact with eyes and skin. Minimum personal protective equipment includes chemical resistant gloves, safety glasses or goggles, and normal work clothes. Chemical resistant clothing, gloves, boots, face shield and respiratory protection are necessary for tasks involving significant exposure potential. Refer to the individual SOPS contained in the local safety plan for specific details.

2. Refer to the CWTP Operators Handbook Section \_\_ Emergencies, for an Emergency Contact List. See Section \_\_\_ Safety, of the operators Handbook for information on hard hats and safety glasses, Emergency eyewash and showers, Material Safety Data Sheets. The CWD Health & Safety Manual also provides emergency response information.

**B. Vendor Certification/Purchase Specifications:**

1. Sodium Hypochlorite shall be NSF Standard 60 certified for drinking water chemicals. It shall have been tested and certified by a product certification organization accredited for this purpose by the American National Standards Institute.
2. See SOP CM1 for general purchase specifications and CM1-11 for specific specifications on Sodium Hypochlorite.

**C. Recognized Synonyms**

Sodium Hypochlorite can also be referred to as Hypochlorite solution or Sodium Hypochlorite solution.

### 4.3.3 RESPONSIBILITIES

#### A. Delivery Acceptance Staff

1. Only Water Treatment personnel or CWD Laboratory staff that have been trained and have successfully demonstrated their capabilities to the quality assurance staff in this procedure are allowed to accept Sodium Hypochlorite deliveries.
2. Should any discrepancies occur during this procedure, it is the responsibility of personnel to contact the other Operations manager. In such situations, further testing may be needed.
3. CWD management staff and successful chemical supply bidders are responsible for the development and implementation of training. A log will be kept of all persons trained on this SOP.

### 4.3.4 REQUIRED EQUIPMENT/MATERIALS

#### A. Personal Protective Equipment

Refer to the Sodium Hypochlorite SOP contained in the local safety plan for specific details.

#### B. Sample Collection Devices

Sample container

#### C. Laboratory Devices

- |                                 |                             |
|---------------------------------|-----------------------------|
| 1. Hydrometer tube & Hydrometer | 5. Thermometer              |
| 2. 200 volumetric flask         | 6. 10 ml pipet & bulb       |
| 3. 125 ml Erlenmeyer flask      | 7. 50 ml burette            |
| 4. 4.0 ml pipet                 | 8. 25 ml graduated cylinder |

#### D. Reagents

1. Crystalline potassium iodide
2. Glacial acetic acid
3. Sodium thiosulfate or Phenyl-arsine oxide
4. Soluble starch solution
5. Distilled Water

#### E. Delivery Documentation

1. Chemical Delivery Inspection Form for Sodium Hypochlorite
2. Chemical Delivery Measurement Form for Sodium Hypochlorite

### 4.3.5 PROCEDURES

#### A. Scheduling

1. The Supervisor will schedule deliveries of sodium hypochlorite. At this time the supervisor should also determine and schedule who will accept the delivery to avoid any conflicts or unnecessary delays.
2. Before the delivery arrives, calculate the available volume in the tank to assure that there is enough room to unload the entire truckload.

#### B. Delivery Documentation & Truck Placards

1. Upon truck entrance, verify placarding. The cargo truck must be marked with UN #1791.
2. Verify delivery documentation received from the truck driver. Complete the Chemical Delivery Inspection Form.

**C. Sampling**

1. Have the driver obtain a sample from the hatch at the top of the truck.
2. Observe actual sample collection while standing at a safe distance.
3. Have the driver draw at least one pint of product into an airtight, moisture-proof glass or plastic container.

**D. Temperature**

Measure the temperature of the product. Solution temperature should not exceed 105 degrees F. does not load, the load should be rejected.

**E. Appearance of raw product**

Note the appearance of the product; it should be a clear light-yellow liquid with no significant amount of solids in the sample.

**F. Measure the specific gravity of the raw product.**

1. Pour raw product into a hydrometer tube (to 2" below the top).
2. Place the hydrometer into the sample (gently). Make sure it floats in the sample.
3. Take a reading. At 68°F the expected specific gravity should be approximately 1.196 to 1.249, depending on the delivered product strength.

**G. Available Chlorine Test**

1. Accurately measure 4.0 ml of sample and transfer it to a 200ml volumetric flask. Make up the rest of the volume with distilled water.
2. Measure 25 ml of the solution from the 200 ml flask into a 125 ml Erlenmeyer flask.
3. Add 1g of crystalline potassium iodide and make acid with approximately 4 ml of glacial acetic acid.
4. Titrate with 0.1N sodium thiosulfate or phenylarsine oxide (paO) until the yellow color of the iodine is nearly destroyed. Note that paO is a potential carcinogen and should be used with great caution. Add about 1 ml of soluble starch solution and continue to titrate until the blue (blackish-blue) color disappears entirely.
5. Calculation:  
If the volumes and normality given above were used, use the following:  
 $\text{mls of sodium thiosulfate} \times \text{normality} \times 7.09 = \text{volume or trade \%}$

**H. Documentation of Test Results**

1. Document results of testing on the Chemical Delivery Measurement Form.
2. If the appearance is not appropriate or any product contamination is suspected, contact the Supervisor immediately. If the specific gravity or available chlorine test is outside of the specified range or significantly different than the vendor test results, the Supervisor must be contacted immediately. The delivery may be rejected by the Supervisor in such cases.

**I. Delivery**

1. Make sure the truck wheels are chocked.
2. Once tests are completed and verified, tell the driver to hook up for delivery at the appropriate tank.
3. Place drop buckets under truck valves.
4. Inspect all valves before they are opened.

5. Observe the first few minutes of delivery to ensure the integrity of the connections, and unloading pressure not exceed 15 psi.
6. An assigned employee should monitor the appropriate SCADA screen periodically throughout the delivery process.
7. Insure the driver stays with the delivery truck throughout the delivery.
8. Instruct the driver to shut down the delivery at the first sign of leakage. Notify staff over intercom if a leak should occur. Be sure to disclose evacuation routes away from the leak.

**J. Conclusion of Delivery**

1. Lock the entry into the inlet valve for the tank that received the delivery.
2. Sign paperwork. Place the Chemical Delivery Measurement Form and the Chemical Delivery Inspection Form on the Program Manager of Water Treatment's desk. Original delivery paperwork from the delivery driver shall be sent to Guy Foss, Superintendent of Transmission & Treatment. Copies of the delivery paperwork shall be kept by the Supervisor.

**K. Chain of Custody**

1. The remainder of sodium hypochlorite sampled from the tank truck that was not used for testing will be placed in storage for quality assurance purposes. This remainder may disposed of after 30 days.
2. The Southboro laboratory staff may conduct further testing for quality assurance purposes. Samples may also be used for purity testing by an independent laboratory quarterly to ensure the sodium hypochlorite is complying with CWD purchase specifications.
3. After the delivery truck driver has provided delivery acceptance staff with the sodium hypochlorite sample, delivery acceptance staff shall sign the Chain of Custody form.
4. After the conclusion of delivery, place the remainder of sodium hypochlorite product into a 1-liter container. Label the container and place into storage cabinet for a minimum of 30 days.

**4.3.6 RESTRICTIONS/LIMITATIONS**

- A. Laboratory technique is extremely important in the sodium hypochlorite testing procedure. Improper technique can lead to an inaccurate result.
- B. Laboratory equipment must be properly calibrated.

**4.3.7 REFERENCES**

**Cambridge Water Department  
CHEMICAL DELIVERY INSPECTION FORM  
SODIUM HYPOCHLORITE**

AM

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ PM RECEIVED BY: \_\_\_\_\_  
 CHEMICAL: \_\_\_\_\_ CWD PO#: \_\_\_\_\_ LOCATION: \_\_\_\_\_  
(From Bill of Lading)

1. **IS THE TANK TRUCK PROPERLY MARKED WITH UN# 1791?** (Yes/No) \_\_\_\_\_  
 IF NO, SUPERVISOR MUST BE CONTACTED.
2. **IS THE TANK TRUCK FROM ELITE / IONICS?** (Yes/No) \_\_\_\_\_  
 IF NO, SUPERVISOR MUST BE CONTACTED.
3. **IS SAMPLE FURNISHED BY DRIVER IN PRESENCE OF XXXXX EMPLOYEE?** (Yes/No) \_\_\_\_\_  
 IF NO, SUPERVISOR MUST BE CONTACTED.

		BILL OF LADING	CERTIFICATE OF ANALYSIS	NOTES <small>(should any discrepancies occur, notify Supervisor immediately)</small>
1	SUPPLIER/ SHIPPER			
2	CHEMICAL NAME			Sodium Hypochlorite solution (15%); Hypochlorite solution or any other recognized synonym
3	CHEMICAL ID#		-XX-	UN# 1791
4	QUANTITY		-XX-	Verify that CWD tanks can take the full delivery load to avoid overfill situations
5	DRIVER=S INITIALS	-XX-		Verify that the driver has initialed the Certificate of Analysis
6	MANUF=S LAB SIGNATURE	-XX-	YES/NO <small>(Circle one)</small>	Verify lab signature is present on Certificate of Analysis
7	TRAILER #			Verify the trailer # on the paperwork is on the tank truck you received. Trailer #s should be the same.

**4. Delivery Documentation**

**5. Sodium Hypochlorite Measurement Report**

A. Sample Results Acceptable? (Yes/No) \_\_\_\_\_

**6. Shipment Acceptance**

A. Shipment Acceptable? (Yes/No) \_\_\_\_\_

B. If supervisor was contacted at any point, indicate reason(s): \_\_\_\_\_

C. If rejected, indicate supervisors name: \_\_\_\_\_

D. If rejected, indicate reason(s): \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_

**Cambridge Water Department  
CHEMICAL DELIVERY MEASUREMENT FORM  
SODIUM HYPOCHLORITE**

Each chemical delivery must be accompanied with a test results performed by the vendor on the contents of the delivery truck. A sample of the product must also be collected from the truck in the presence of an CWD employee. Results for both samples must be recorded on this form.

---

**TEMPERATURE OF SAMPLE TAKEN BY DRIVER** \_\_\_\_\_ °F    **TRAILER #** \_\_\_\_\_

---

**SAMPLE ID # GIVEN TO SAMPLE:** This is defined as the UN# and delivery date: (e.g.: 1791-0/30/98) \_\_\_\_\_

---

**SPECIFIC GRAVITY**  
Vendor test results \_\_\_\_\_ @ \_\_\_\_\_ °F    °C                      XXXXX Lab Results \_\_\_\_\_ @ \_\_\_\_\_ °F    °C  
C  
(on Certificate of Analysis)

---

**MEASURED AVAILABLE CHLORINE CONCENTRATION**  
Vendor test results \_\_\_\_\_ Trade %                      XXXXX Lab Results \_\_\_\_\_ Trade %  
(on Certificate of Analysis)

---

**IS MEASURED AVAILABLE CHLORINE CONCENTRATION WITHIN 10% OF SPECIFICATION? IF NO, SHIPMENT CAN NOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.**  
Circle one    **(YES\NO)**

---

**IS APPEARANCE APPROPRIATE? (YES, IF IT IS WHITE/CLEAR TO LIGHT YELLOW, OTHERWISE NO) IF NO, SHIPMENT CAN NOT BE ACCEPTED AND SUPERVISOR MUST BE CONTACTED.**  
Circle one    **(YES\NO)**

---

**WHICH XXXXX STORAGE TANK IS RECEIVING THE DELIVERY?** \_\_\_\_\_

---

**SHIPMENT ACCEPTABLE BASED ON LAB RESULTS? (Yes/No)** \_\_\_\_\_

**SIGNATURE OF DELIVERY INSPECTOR** \_\_\_\_\_                      **DATE** \_\_\_\_\_

**SHOW CALCULATIONS HERE:**  
Finish Reading: \_\_\_\_\_ ml  
Start Reading: \_\_\_\_\_ ml  
Total used: \_\_\_\_\_ ml  
x Normality x 7.09= \_\_\_\_\_ %

**NAME OF BIDDER:** \_\_\_\_\_

**SOP CM1.12:**

**Cambridge Water Department  
Water Treatment Chemical Purchase  
Specifications Calcium Hypochlorite**

- The Calcium Hypochlorite shall be supplied in one-hundred pound drums and shall not contain mineral or organic substances in quantities that would be deleterious to those consuming any water treated with it.
- The material shall contain 70 percent available chlorine and shall conform to AWWA Standard B-300-99 for Hypochlorites.

**SOP CM1.13:**

**Cambridge Water Department  
Water Treatment Chemical Purchase  
Specifications Polymer(s)**

Three water treatment polymers are specified in this section for use in various treatment processes.

Chemicals provided under these specifications shall meet AWWA Standards B451-98, B452-98, or B453-01 as appropriate.

Vendors proposing alternative chemicals are responsible for bench scale and full scale testing of their products to demonstrate that they are equal to the specified products.

CWD shall make the sole and final determination that the trial data is “equal”.

CWD shall make the final and sole determination that any product is an “approved equal”.

**CM1.13-1 Polyacrylamide Flocculation Aid for Backwash Solids Removal (Plate Settlers)**

Polyacrylamide must be Ondeo Nalco N8184 or approved equal

Specific Gravity	1.03-1.08
Density	8.6-8.9 lb/gal
Solubility in Water	Emulsifiable
Viscosity	400 cps @ 75 degree F
Freezing Point	<-50 degrees F
Pour Point	-36 degrees F
NSF	Standard 60 & 61
Delivery Container	275 gallon Ecobulk MX returnable container

Vendor is responsible compatibility with existing CWD handling and mixing equipment.

Vendor is responsible for the return cost of the emptied container, these costs are to be included in the bid price of the material provide. The removal of the used contain is to be coordinated with CWD staff.

**CM1.13-2 Polyaluminum Chloride Flocculation Aid for DAF System**

Polyaluminum Chloride must be Ondeo Nalco N8187 or approved equal

Specific Gravity	1.34 @ 77 degrees F
Solubility in Water	Complete
PH (100%)	3.5
Freezing Point	32 degrees F
VOC Content	0.00%
NSF	Standard 60 & 61
Delivery Container	275 gallon Ecobulk MX returnable container

**NAME OF BIDDER:** \_\_\_\_\_

**CM1.13-3 Polyacrylamide Filter Aid**

Polyacrylamide must be Ondea Nalco N8182 or approved equal

Specific Gravity	1.0 – 1.05 @ 75 degrees F
Solubility in Water	Emulsifiable
PH (1%)	8.0
Viscosity	250-750 cps @ 75 degrees F
Freezing Point	-22 degrees F
Boiling Point	212 degrees F
NSF	Standard 60 & 61
Delivery Container	50 pound bags

**Chapter 2.121**

**LIVING WAGE ORDINANCE**

**Sections:**

- 2.121.010 Title and Purpose**
- 2.121.020 Definitions**
- 2.121.030 Living Wage**
- 2.121.040 Waivers and Exceptions**
- 2.121.050 Notification Requirements**
- 2.121.060 Duties of covered Employers**
- 2.121.070 Community Advisory Board**
- 2.121.080 Enforcement**
- 2.121.090 Severability**
- 2.121.100 Effective Date**

**2.121.010 Title and Purpose.**

This Chapter shall be known as the "Cambridge Living Wage Ordinance". The purpose of this ordinance is to assure that employees of the City of Cambridge and employees of City contractors, subcontractors and beneficiaries of tax abatements, loans, grants, subsidies and other assistance provided by the City earn an hourly wage that is needed to support a family of four.

**2.121.020 Definitions.**

For the purposes of this ordinance, the term:

(a) "**Applicable Department**" means the Personnel Department for employees of the City of Cambridge, the Purchasing Department, with the advice and assistance of the appropriate department which receives the services, for Covered Employers who contract or subcontract with the City of Cambridge, the School Department for employees, contractors and subcontractors of the School Department, and the City Manager's Office for any other Person who is a Beneficiary of assistance other than a contract or subcontract.

(b) "**Assistance**" means:

(1) any grant, loan, tax incentive, bond financing, subsidy, or other form of assistance valued at least \$10,000 that an employer receives by or through the authority or approval of the City of Cambridge, including, but not limited to, c. 121A tax abatements, industrial development bonds, Community Development Block Grant (CDBG) loans and grants, Enterprise Zone designations awarded after the effective date of this Chapter, and the lease of city owned land or buildings below market value; and

(2) any service contract, as defined herein, of at least \$10,000 with the City of Cambridge that is made with an employer to provide services pursuant to G.L.c. 30B or other public procurement laws, awarded, renegotiated or renewed after the effective date of this Chapter.

(3) any service subcontract, as defined herein, of at least \$10,000.

(c) "**Beneficiary**" means:

(1) any person who is a recipient of Assistance;

(2) any company or person that is a tenant or sub-tenant, leaseholder or sub-leaseholder of a recipient of Assistance, provided that said company or person employs at least 25 persons and occupies property or uses equipment or property that is improved or developed as a result of Assistance, after the effective date of this Chapter; and

**(d) "Covered Employer"** means the City of Cambridge or a Beneficiary of Assistance.

**(e) "Covered Employee"** means:

(1) a person employed by the City of Cambridge except for persons in those positions listed in Section 2.121.040(j) of this ordinance; and

(2) a person employed by a Covered Employer, or a person employed by an independent contractor doing business with a Covered Employer, who would directly expend any of his or her time on the activities funded by the contract or the activities for which the Beneficiary received the Assistance, except for persons in those positions listed in Section 2.121.040(j) of this ordinance..

**(f) "Living Wage"** has the meaning stated in Section 2.121.030.

**(g) "Person"** means one or more of the following or their agents, employees, servants, representatives, and legal representatives: individuals, corporations, partnerships, joint ventures, associations, labor organizations, educational institutions, mutual companies, joint-stock companies, trusts, unincorporated organizations, trustees, trustees in bankruptcy, receivers, fiduciaries, and all other entities recognized at law by the Commonwealth of Massachusetts.

**(h) "Service Contract"** means a contract let to a contractor by the City of Cambridge for the furnishing of services, to or for the City, except contracts where services are incidental to the delivery of products, equipment or commodities. A contract for the purchase or lease of goods, products, equipment, supplies or other property is not a "service contract" for the purposes of this definition.

**(i) "Service Subcontract"** means a subcontract primarily for the furnishing of services, to or for a recipient of Assistance, except where services are incidental to the delivery of products, equipment or commodities. A contract for the purchase or lease of goods, products, equipment, supplies or other property is not a "service subcontract" for the purposes of this definition.

### **2.121.030 Living Wage.**

**(a) Applicability.** Covered Employers shall pay no less than the Living Wage to their employees.

**(b) Amount of wage.** The Living Wage shall be calculated on an hourly basis and shall be no less than \$10.00, subject to adjustment as provided herein. The Living Wage shall be upwardly adjusted each year no later than March first in proportion to the increase at the immediately preceding December 31 over the year earlier level of the Annual Average Consumer Price Index for All Urban Consumers (CPI -U) Boston-Lawrence-Salem, MA - NH, as published by the Bureau of Labor Statistics, United States Department of Labor applied to \$10.00.

**(c) No reduction in collective bargaining wage rates.** Nothing in this Chapter shall be read to require or authorize any beneficiary to reduce wages set by a collective bargaining agreement.

**(d) Cuts in non-wage benefits prohibited.** No Beneficiary will fund wage increases required by this Chapter, or otherwise respond to the provisions of this Chapter, by reducing the health, insurance, pension, vacation, or other non-wage benefits of any of its employees.

**2.121.040 Waivers and Exceptions.**

**(a) Waivers.** A Covered Employer may request that the City Manager grant a partial or whole waiver to the requirements of this Chapter.

**(b) General Waivers.** Waivers may be granted where application of this Chapter to a particular form of Assistance is found by the City Solicitor to violate a specific state or federal statutory, regulatory or constitutional provision or provisions, and the City Manager approves the waiver on that basis.

**(c) Hardship Waivers for certain not-for-profit employers.** An employer, who has a contract with the City of Cambridge which is not subject to the provisions of G.L. c. 30B, may apply to the City Manager for a specific waiver where payment of the Living Wage by a not-for-profit Covered Employer would cause a substantial hardship to the Covered Employer.

**(d) Chapter 30B contract waivers.** Prior to issuing an invitation for bids for a procurement contract subject to the provisions of G.L. c. 30B, any Applicable Department may apply to the City Manager for a waiver of the application of the Living Wage to the contract where payment of the Living Wage by a Covered Employer would make it inordinately expensive for the City to contract for the services or would result in a significant loss of services, because the contracted work cannot be segregated from the other work of the Covered Employer.

**(e) General Waiver Request Contents.** All General Waiver requests shall include the following:

- (1) The nature of the Assistance to which this Chapter applies;
- (2) The specific or official name of the Assistance and Assistance program, the statutory or regulatory authority for the granting of the Assistance, and a copy of that authority;
- (3) The conflicting statutory, regulatory, or constitutional provision or provisions that makes compliance with this Chapter unlawful, and a copy of each such provision; and (4) A factual explication and legal analysis of how compliance with this Chapter would violate the cited provision or provisions, and the legal consequences that would attach if the violation were to occur.

**(f) Hardship Waiver Request Contents.** All Hardship Waiver requests shall include the following:

- (1) The nature of the Assistance to which this Chapter applies;
- (2) A detailed explanation of why payment of the Living Wage would cause a substantial hardship to the Covered Employer; and
- (3) A statement of proposed wages below the Living Wage.

**(g) Chapter 30B Contract Waiver Request Contents.** A Chapter 30B contract waiver request shall include the following:

- (1) The nature of the Assistance to which this Chapter applies;

(2) A detailed explanation of why the contracted work cannot be segregated from the other work of the bidding Covered Employers thereby making the cost of the contract with the payment of the Living Wage inordinately expensive or would result in a significant loss of services;

**(h) Community Advisory Board review and recommendation regarding waiver requests.** The Community Advisory Board, as described in Section 2.121.070 of this ordinance, shall consider waiver requests along with their supporting documentation and analysis, and may hold a public hearing to consider the views of the public before making a recommendation to the City Manager regarding the waiver request. For a hardship waiver, the Community Advisory Board shall offer an opportunity to be heard to employees of the Covered Employer. After reviewing the recommendation of the Community Advisory Board, the City Manager may approve and grant or deny all or part of a request. The City Manager may in his or her discretion grant a temporary hardship waiver pending the hearing before the Community Advisory Board. For Chapter 30B contract waivers, the Community Advisory Board shall make its recommendation to the City Manager no more than thirty days after it is notified of the request for a Chapter 30B contract waiver.

**(i) Terms of exceptions.** If an employer is subject to this Chapter as a result of its receipt of more than one kind of Assistance covered by this Chapter, and if the City Manager grants a waiver with respect to one form of Assistance, the City Manager need not find that this Chapter is inapplicable to the employer with respect to another form of Assistance received by the employer.

**(j) Exceptions.** The following positions will be excepted from the requirement of the payment of the Living Wage upon certification in an affidavit in a form approved by the Applicable Department and signed by a principal officer of the Covered Employer that the positions are as follows:

(1) youth hired pursuant to a city, state, or federally funded program which employs youth as defined by city, state, or federal guidelines, during the summer, or as part of a school to work program, or in other related seasonal or part-time program;

(2) work-study or cooperative educational programs;

(3) trainees who are given a stipend or wage as part of a job training program that provides the trainees with additional services, which may include, but are not limited to, room and board, case management, or job readiness services.

(4) persons working in a recognized supported employment program that provides workers with additional services, which may include, but are not limited to, room and board, case management, counseling, or job coaching;

(5) positions where housing is provided by the employer;

(6) employees who are exempt from federal or state minimum wage requirements; and

(7) individuals employed by the City of Cambridge where the employment of such individuals is intended primarily to provide a benefit or subsidy to such individuals, although the City is compensating them for work performed.

## **2.121.050 Notification Requirements.**

All Applicable Departments shall provide in writing an explanation of the requirements of this ordinance in all requests for bids for service contracts and to all persons applying for Assistance as defined by this ordinance. All persons who have signed a service contract with the City of Cambridge or a contract for Assistance shall forward a copy of such requirements to any person submitting a bid for a subcontract on the Assistance contract.

**2.121.060 Duties of Covered Employers.**

**(a) Notification Requirements.** Covered employers shall provide each Covered employee with a fact sheet about this ordinance and shall post a notice about the ordinance in a conspicuous location visible to all employees. The fact sheet and poster shall be provided to the Covered Employer by the Applicable Department and shall include:

- (1) notice of the Living Wage amount;
- (2) a summary of the provisions of this ordinance;
- (3) a description of the enforcement provisions of the ordinance;
- (4) the name, address, and phone number of a person designated by the Applicable Department to whom complaints of noncompliance with this ordinance should be directed.

**(b) Contract for Assistance.** At the time of signing a contract for assistance with the City of Cambridge or with a Beneficiary, the contract must include the following:

- (1) the name of the program or project under which the contract or subcontract is being awarded;
- (2) a local contact name, address, and phone number for the Beneficiary;
- (3) a written commitment by the Beneficiary to pay all Covered Employees not less than the Living Wage as subject to adjustment under this ordinance and to comply with the provisions of this ordinance;
- (4) a list of Covered Employees under the contract with the employees' job titles;
- (5) a list of all subcontracts either awarded or that will be awarded to Beneficiaries with funds from the Assistance. Upon signing any subcontracts, the Covered Employer shall forward a copy of the subcontract to the Applicable Department.

**(c) Maintenance of payroll records.** Each Covered Employer shall maintain payrolls for all Covered Employees and basic records relating thereto and shall preserve them for a period of three years. The records shall contain the name and address of each employee, the job title and classification, the number of hours worked each day, the gross wages, deductions made, actual wages paid, and copies of social security wage and withholding reports, and evidence of payment thereof and such other data as may be required by the Applicable Department from time to time.

**(d) Applicable Department duties.** The Applicable Department shall cause investigations to be made as may be necessary to determine whether there has been compliance with this Ordinance. The Applicable Department shall report the findings of all such investigations to the Community Advisory Board.

**(e) Covered Employer to cooperate.** The Covered Employer shall submit payroll records on request to the Applicable Department. The Covered Employer shall permit City representatives to observe work being performed upon the work site, to interview employees and to examine the books and records relating to the payrolls being investigated to determine payment of wages.

**(f) City Assistance Reports.** Each Applicable Department shall file a City Assistance Report with the City Manager and the Community Advisory Board by July 31 of each year. The report shall include, for each Assistance package or contract approved during the preceding fiscal year:

- (1) the name of the Applicable Department (awarding agency), the name of the specific program under which the Assistance was awarded, and the origin of funds for Assistance;
- (2) a description of the purpose or project for which the Assistance was awarded;
- (3) the name, address, and phone number of a local contact person for the Covered Employer;
- (4) the total cost to the City of Assistance provided to each Beneficiary, including both face-value of Assistance, as well as revenue not collected as a result of the Assistance.

**2.121.070 Community Advisory Board.**

**(a) Purpose.** The purpose of the Community Advisory Board shall be to review the effectiveness of this Ordinance at creating and retaining Living Wage jobs, to make recommendations to the City Manager regarding the granting of Waivers to Covered Employers, to review the implementation and enforcement of this ordinance, and to make recommendations from time to time in connection therewith.

**(b) Composition.** The Community Advisory Board shall be composed of nine members and shall include representatives of labor unions, community organizations and the business community. All members will be appointed by the City Manager. Members of the Board shall serve a three-year term. Whenever a vacancy shall occur the City Manager shall appoint a replacement within thirty days of said vacancy.

**(c) Meetings.** The Community Advisory Board shall meet quarterly and in special session as required. All meetings of the Board shall be open to the public and will allow for public testimony on the uses of the City Assistance generally, and on specific instances of Assistance or proposed Assistance as received or sought by individual enterprises.

**(d) Conflict of Interest.** No member of the Community Advisory Board shall participate in any proceeding concerning a Beneficiary, a Covered Employer or a Covered Employee, or applicant for waiver or exemption, if the member or any member of his or her immediate family has a direct or indirect financial interest in the outcome of said proceeding.

**2.121.080 Enforcement.**

**(a) Enforcement powers.** In order to enforce this Chapter, the Applicable Department may, with the approval and assistance of the City Solicitor, issue subpoenas, compel the attendance and testimony of witnesses and production of books, papers, records, and documents relating to payroll records necessary for hearing, investigations, and proceedings. In case of failure to comply with a subpoena, the City may apply to a court of appropriate jurisdiction for an order requiring the attendance and testimony of witnesses and the productions of books, papers, records, and documents. Said court, in the case of a refusal to comply with any such subpoena, after notice to the person subpoenaed, and upon finding that the attendance or testimony of such witnesses or the production of such books, papers, records, and documents, as the case may be, is relevant or necessary for such hearings, investigation, or proceedings, may issue an order requiring the attendance or testimony of such witnesses or the production of such documents and any violation of the court's order may be punishable by the court as contempt thereof.

**(b) Complaint procedures.** An employee who believes that he or she is a Covered Employee or an applicant for a position to be filled by a Covered Employee who believes that his or her employer is not complying with requirements of this Chapter applicable to the employer may file a complaint with the Applicable Department or with the Community Advisory Board. Complaints of alleged violations may also be filed by concerned citizens or by the City Council. Complaints of alleged violations may be made at any time, but in no event more than three years after the last date of alleged violation, and shall be investigated promptly by the Applicable Department. Statements written or oral, made by an employee, shall be treated as confidential and shall not be disclosed to the Covered Employer without the consent of the employee.

**(c) Investigations and hearings.** The Applicable Department shall investigate the complaint, and may, in conjunction with the City Solicitor, and in accordance with the powers herein granted, require the production by the employer of such evidence as required to determine compliance. Prior to ordering any penalty the

applicable Department shall give notice to the employer and conduct a hearing. If at any time during these proceedings, the employer voluntarily makes restitution of the wages not paid to the employee making the complaint and to any similarly situated employees, by paying all back wages owed plus interest at the average prior year Massachusetts passbook savings bank rate, or otherwise remedies the violation alleged if the violation involves matters other than wages, then the Applicable Department shall thereafter dismiss the complaint against the employer.

**(d) Remedies.** In the event that the Applicable Department, after notice and hearing, determines that any Covered Employer has failed to pay the Living Wage rate or has otherwise violated the provisions of this Chapter, the Applicable Department may order any or all of the following penalties and relief:

(1) Fines up to the amount of \$300 for each Covered Employee for each day that the Covered Employer is in violation of this Ordinance, except if the violation was not knowing and willful, then the total fine shall not exceed the amount of back wages plus interest owed;

(2) Suspension of ongoing contract and subcontract payments;

(3) Ineligibility for future City Assistance for up to three years beginning when all penalties and restitution have been paid in full. In addition, all Covered Employers having any principal officers who were principal officers of a barred beneficiary shall be ineligible under this section; and

(4) Any other action deemed appropriate and within the discretion and authority of the city.

Remedies in this section shall also apply to the party or parties aiding and abetting in any violation of this chapter.

**(e) Private right of action.** Any Covered Employee, or any person who was formerly employed by a Beneficiary, may bring an action to enforce the provisions of this Chapter to recover back pay and benefits, attorneys fees and costs, by filing suit against a Beneficiary in any court of competent jurisdiction.

**(f) Remedies herein non-exclusive.** No remedy set forth in this Chapter is intended to be exclusive or a prerequisite for asserting a claim for relief to enforce the right granted under this Chapter in a court of law. This Chapter shall not be construed to limit an employee's right to bring a common law cause of action for wrongful termination.

**(g) Retaliation and discrimination barred.** A Covered Employer shall not discharge, reduce the compensation or otherwise retaliate against any employee for making a complaint to the City, otherwise asserting his or her rights under this Chapter, participating in any of its proceedings or using any civil remedies to enforce his or her rights under the Chapter. The City shall investigate allegations of retaliation or discrimination and shall, if found to be true, after notice and a hearing, order appropriate relief as set out in paragraphs (c) and (d) herein

#### **2.121.090 Severability.**

In the event any provision of this ordinance shall be held invalid or unenforceable by any court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provisions hereof.

#### **2.121.100 Effective Date.**

This law shall be effective sixty (60) after final passage.

The Living Wage Ordinance (2.121) provides, at 1.121.030(b) that the wage shall be upwardly adjusted each year no later than March 1<sup>st</sup> in proportion to the increase in the Annual Average Consumer Price Index for the prior calendar year for All Urban Consumers (CPI-U) in the Boston area, as published by the federal Bureau of Labor Statistics.

For calendar year 1999, the CPI-U increased by 2.5%. Therefore the new living wage, as of March 1, 2000 is \$10.25.

For calendar year 2000, the CPI-U increased by 4.3%. Therefore the new living wage, as of March 1, 2001 is \$ 10.68.

For calendar year 2001, the CPI-U increased by 4.3%. Therefore the new living wage, as of March 1, 2002 is \$11.11.

For calendar year 2002, the CPI-U increased by 2.6% . Therefore the new living wage, as of March 1, 2003 is \$11.37.

The City Council has voted to amend the section of the Living Wage Ordinance (1.121.030 (b) that provides the method for calculating cost of living increases each year. As a result of this change, the living wage as of March 30, 2003 is \$11.44.

For calendar year 2003, the CPI-U increased by 3.76% . Therefore the new living wage, as of March 1, 2004 is \$11.87.

For calendar year 2004, the CPI-U increased by 2.7% . Therefore the new living wage, as of March 1, 2005 is \$12.19.

For calendar year 2005, the CPI-U increased by 3.3%. Therefore the new living wage, as of March 1, 2006 is \$12.59.

**City Of Cambridge  
Articles Of Agreement  
For Materials, Supplies or Equipment**

Commodity:

**File Number:**

**State Contract:**

This agreement is made and entered into this \_\_\_\_\_, by and between the **City Of Cambridge** ("the CITY"), a municipal corporation organized and existing under the laws of the Commonwealth of Massachusetts, and \_\_\_\_\_ existing under the laws of the State of \_\_\_\_\_ ("the Contractor").

**Address:**

**Telephone: Fax, Email**

**Article I. Definition.** "This Contract" as used herein shall mean these Articles of Agreement and "the bid documents," which include, but are not limited to, the instructions to bidders, the Contractor's bid or proposal, the specifications, the general conditions, the requirements, the applicable addenda, and all documents and forms submitted with the Contractor's bid or proposal.

**Article II. Duration.** The Contractor shall commence the performance of this contract for the period beginning on \_\_\_\_\_ and ending on \_\_\_\_\_.

**Article III. Terms.** The Contractor agrees to furnish and deliver materials, supplies or equipment all in accordance with the bid documents of (bid opening date) or (proposal if appropriate).

Contract Value:

**Article IV. Payment.** The City agrees to pay to Contractor the sum set forth in the Contractor's bid or proposal. **Contractor shall invoice the department to which it provided the service not, the Purchasing Department.**

**Article V. Termination.** The following shall constitute events of default under this Contract requiring immediate termination: a) any material misrepresentation made by the Contractor, b) any failure by the Contractor to perform any of its obligations under this Contract including, but not limited to, the following: (i) failure to commence performance of this Contract at the time specified in this Contract due to a reason or circumstance within the Contractor's reasonable control, (ii) failure to perform this Contract with sufficient personnel and equipment or with sufficient material to ensure the completion of this Contract within the specified time due to a reason or circumstance within the Contractor's reasonable control, (iii) failure to perform this Contract in a manner reasonably satisfactory to the City, (iv) failure to promptly re-perform within reasonable time the services that were rejected by the City as erroneous or unsatisfactory, (v) discontinuance of the services for reasons not beyond the Contractor's reasonable control, (vi) failure to comply with a material term of this Contract, including, but not limited to, the provision of insurance and nondiscrimination, and (vii) any other acts specifically and expressly stated in this Contract as constituting a basis for termination of this Contract.

**Article VI. Damages.** From any sums due to the Contractor for materials, supplies or equipment delivered, the City may keep for its own the whole or any part of the amount for expenses, losses and damages as directed by the Purchasing Agent, incurred by the City as a consequence of purchasing materials, supplies or equipment as a result of any failure, omission or mistake of the Contractor in furnishing or delivering materials, supplies or equipment as provided in this Contract.

**NAME OF BIDDER:** \_\_\_\_\_

**Article VII. Conflict.** In the event there is a conflict between these Articles and the bid documents, the bid documents shall supersede these articles.

**Article VIII. Governing laws and ordinances.** This Contract is made subject to all the laws of the Commonwealth and the Ordinances of the City and if any such clause thereof does not conform to such laws or ordinances, such clause shall be void (the remainder of the Contract shall not be affected) and the laws or ordinances shall be operative in lieu thereof.

**Article IX. Performance Security.** Upon execution of this Contract by the Contractor, the Contractor shall furnish to the City security for the faithful performance of this Contract in the amount of 0% of the value of the bid in the form of a performance bond issued by a surety satisfactory to the city or in the form of a certified check.

**Article X. Equal Opportunity.** the Contractor in the performance of all work under this contract will not discriminate on the grounds of race, color, sex, age, religious creed, disability, national origin or ancestry, sexual orientation, marital status, family status, military status, or source of income in the employment practices or in the selection or retention of subcontractors, and in the procurement of materials and rental of equipment. The city may cancel, terminate or suspend the contract in whole or in part for any violation of this article.

**Article XI. Assignability** the Contractor shall not assign, sell, subcontract or transfer any interest in this contract without prior written consent of the city.

In witness whereof the parties have hereto and to four other identical instruments set their hands the day and year first above written.

**Approved as to Form:**

**The Contractor:**

\_\_\_\_\_  
**Donald A Drisdell**  
City Solicitor

\_\_\_\_\_  
**Signature and Title**

\_\_\_\_\_  
**Robert W. Healy**  
City Manager

\_\_\_\_\_  
**Cynthia H. Griffin**  
Purchasing Agent