

PART 1 - GENERAL

<u>1.1 RELATED REQUIREMENTS</u>	.1	Section 03 30 00 - Cast-in-Place Concrete.
	.2	Section 31 23 33.01 - Excavating, Trenching and Backfilling.
	.3	Section 31 32 19.01 - Geotextiles.
<u>1.2 REFERENCES</u>	.1	American National Standards Institute/American Water Works Association (ANSI/AWWA)
	.1	ANSI/AWWA B300-10, Standard for Hypochlorites.
	.2	ANSI/AWWA B301-10, Standard for Liquid Chlorine.
	.3	ANSI/AWWA C223, Fabricated Steel and Stainless Steel Tapping Sleeves.
	.4	ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Service.
	.5	ANSI/AWWA C600-10, Standard for Installation of Ductile-Iron Water Mains, and Their Appurtenances.
	.6	ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.
	.2	ASTM International
	.1	ASTM D 698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³)).
	.3	Canada Green Building Council (CaGBC)
	.1	LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.

1.2 REFERENCES
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- .4 CSA International
 - .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
 - .1 CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- .5 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S520-07, Standard for Fire Hydrants.
- .7 Newfoundland and Labrador Department of Municipal Affairs.
 - .1 Municipal Water, Sewer and Roads Master Construction Specifications, latest revision.

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Pipe certification to be on pipe.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
 - .2 Submit complete drawings and construction schedule for water mains 600 mm diameter and larger. Include method for installation of water main.
- .4 Samples:
 - .1 Inform Departmental Representative of proposed source of bedding materials and

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS
(Cont'd)

- .4 Samples: (Cont'd)
 - .1 (Cont'd)
provide access for sampling at least 4 weeks prior to commencing work.
 - .2 Submit for testing 4 weeks minimum prior to beginning work, samples of materials proposed for use as follows:
 - .1 Pipe bedding and surround material.
 - .3 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .5 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.
 - .4 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.4 CLOSEOUT
SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, hydrant details.
 - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, and hydrants.
- .3 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes, and hydrants for incorporation into manual.

1.5 DELIVERY,
STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.
- .5 Packaging Waste Management: remove for reuse or return of pallets, crates, padding, banding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)	.5 Packaging Waste Management: (Cont'd) Disposal and Section 01 35 21 - LEED Requirements.
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1.6 SCHEDULING OF WORK	.1 Schedule Work to minimize interruptions to existing services.
	.2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
	.3 Notify Departmental Representative and Town a minimum of 24 hours in advance of interruption in service.
	.4 Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.
	.5 Notify fire department of planned or accidental interruption of water supply to hydrants.
	.6 Provide and post "Out of Service" sign on hydrant not in use.
	.7 Advise local police department of anticipated interference with movement of traffic.

PART 2 - PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS	.1 Polyvinyl chloride pressure pipe: to CAN/CSA B137.3, ANSI/AWWA C900, pressure class 150, DR 18, 1 MPa gasket bell end.
	.1 PVC fittings: to CAN/CSA B137.

2.2 VALVES AND
VALVE BOXES

- .1 Valves to open in same direction as local standard.
- .2 Gate valves: to ANSI/AWWA C500, standard iron body, bronze mounted wedge valves with non-rising stems, suitable for 1 Pa with mechanical joints.
- .3 Cast iron valve boxes: three piece sliding type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.
 - .1 Base to be large round type with minimum diameter of 300 mm.
 - .2 Top of box to be marked "WATER"/"EAU".

2.3 HYDRANTS

- .1 Post type hydrants: compression type hydrant, to CAN/ULC-S520, designed for working pressure of 1750 kPa with two 65 mm threaded hose outlets, one 100 mm steamer port, 150 mm riser barrel, 125 mm bottom valve and 150 mm connection for main.
 - .1 Hydrants to open counter clockwise, threads to local standard.
- .2 Hydrant paint: exterior enamel to MPI #96.

2.4 PIPE BEDDING
AND SURROUND
MATERIAL

- .1 Type 1 bedding in accordance with Section 02223 of the Newfoundland and Labrador Municipal Water, Sewer and Roads Master Construction Specifications.

2.5 BACKFILL
MATERIAL

- .1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

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| <u>2.6 MARKER TAPE</u> | .1 | Detectable underground warning tape with aluminum backing. Yellow in colour and marked "CAUTION BURIED WATER LINE BELOW". |
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| <u>2.7 PIPE DISINFECTION</u> | .1 | Sodium hypochlorite or Calcium hypochlorite to ANSI/AWWA B300 to disinfect water mains. |
| | .2 | Liquid chlorine: to AWWA B301. |
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| <u>2.8 REDUCING AGENT</u> | .1 | Hydrogen peroxide, 35% by mass commercial grade. |
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| <u>2.9 TAPPING SLEEVE</u> | .1 | Tapping sleeves for cast iron, ductile iron, asbestos cement, PVC to AWWA C900, for taps other than size-on size:
.1 Split assembly to incorporate an annular gasket cemented or mechanically held in place on the branch end or split assembly incorporating ring seal and wrap-around sleeve length gasket liner.
.2 Meets the requirements of AWWA C900. |
| | .2 | Tapping sleeves for size on size taps on cast iron, ductile iron, PVC to AWWA C900:
.1 Split assembly incorporating ring seal and wrap-around sleeve length gasket/liner.
.2 Meets the requirements of AWWA C223. |
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| <u>2.10 THRUST BLOCKS</u> | .1 | Thrust blocks and anchors: 25 MPa concrete and 15M, Grade 400 reinforcing steel where indicated. |
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PART 3 - EXECUTION

- 3.1 EXAMINATION .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- 3.2 PREPARATION .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
- .1 Inspect materials for defects to approval of Departmental Representative.
- .2 Remove defective materials from site as directed by Departmental Representative.
- 3.3 TRENCHING .1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe of 1.8 m minimum from finished grade or as indicated.
- .3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.4 CONCRETE
BEDDING AND
ENCASEMENT

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
 - .1 Place concrete to details as indicated.
- .2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within 24 hours after placing.

3.5 GRANULAR
BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% maximum density to ASTM D 698.
- .6 Fill unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.6 PIPE
INSTALLATION

- .1 Lay pipes to manufacturer's standard instructions and specifications.
 - .1 Do not use blocks except as specified.
- .2 Join pipes in accordance with manufacturer's recommendations.
- .3 Bevel or taper ends of PVC pipe to match fittings.
- .4 Handle pipe by methods approved by Departmental Representative and recommended by pipe manufacturer. Do not use chains or cables

3.6 PIPE
INSTALLATION
(Cont'd)

- .4 (Cont'd)
passed through pipe bore so that weight of pipe bears on pipe ends.
- .5 Lay pipes on prepared bed, true to line and grade.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
 - .2 Take up and replace defective pipe.
 - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .6 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
- .7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
 - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Position and join pipes with equipment and methods approved by Departmental Representative.
- .10 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .11 Align pipes before jointing.
- .12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

3.6 PIPE
INSTALLATION
(Cont'd)

- .13 Avoid displacing gasket or contaminating with dirt or other foreign material.
 - .1 Remove disturbed or contaminated gaskets.
 - .2 Clean, lubricate and replace before jointing is attempted again.
- .14 Complete each joint before laying next length of pipe.
- .15 Minimize deflection after joint has been made.
- .16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .18 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .19 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .20 Do not lay pipe on frozen bedding.
- .21 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .22 Backfill remainder of trench.

3.7 VALVE
INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.

3.8 HYDRANTS

- .1 Install hydrants at locations as indicated.
- .2 Install hydrants in accordance with AWWA M17.
- .3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.
- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
- .5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.
- .6 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with clear stone to level 150 mm above drain holes. Wrap pit with geotextile fabric.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.9 THRUST BLOCKS
AND RESTRAINED
JOINTS

- .1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Departmental Representative.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 24 hours after placing.

3.10 HYDROSTATIC
AND LEAKAGE TESTING

- .1 Do tests in accordance with ANSI/AWWA C600.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
 - .1 Perform tests in presence of Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Departmental Representative.
- .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.
- .7 Leave hydrants, valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .10 Open valves as directed by Departmental Representative and provide key(s) to Departmental Representative so that status of each valve in tested section can be verified.
- .11 Expel air from main by slowly filling main with potable water.
 - .1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

3.10 HYDROSTATIC
AND LEAKAGE TESTING
(Cont'd)

- .11 (Cont'd)
 - .2 Remove stops after satisfactory completion of test and seal holes with plugs approved by Departmental Representative.
- .12 Thoroughly examine exposed parts and correct for leakage as necessary.
- .13 Apply hydrostatic test pressure of 1035 kPa minimum based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .14 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .16 Repeat hydrostatic test until defects have been corrected.
- .17 Apply leakage test pressure of 1035 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.
- .18 No leakage is permitted during the leakage test.
- .19 Locate and repair defects if leakage is detected.
- .20 Repeat test until no leakage is detected.

3.11 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material within 3 m of pipe.

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- 3.11 PIPE SURROUND (Cont'd) .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D 698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D 698.
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- 3.12 BACKFILL .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 98% maximum density to ASTM D 698.
.1 In landscaped areas, compact to at least 85% maximum density to ASTM D 698.
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- 3.13 HYDRANT FLOW TESTS .1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports.
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- 3.14 PAINTING OF HYDRANTS .1 After installation, paint hydrants red.
- .2 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.
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- 3.15 FLUSHING AND DISINFECTING .1 Flushing and disinfecting operations: witnessed by Departmental Representative.
.1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.
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3.15 FLUSHING AND
DISINFECTING
(Cont'd)

- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

- .3 Flushing flows as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150

- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Departmental Representative approval, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.
- .7 Chlorine application to be injected through a service line connect to a corporation stop at top of main close to the point where the water main is being filled at a rate proportional to filling rate.
- .8 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .9 Take water samples at all hydrants and termination points, in suitable sequence, to test chlorine residual. Number and location of sample points shall be subject to the approval of the Departmental Representative.
- .10 Continue chlorine application until residuals of at least 50 mg/L are detected at each sample point.
- .11 Leave system charged with disinfectant chlorine for 24 hours. If chlorine residual has fallen below 25 mg/L at any sample point

3.15 FLUSHING AND
DISINFECTING
(Cont'd)

- .11 (Cont'd)
at the end of the 24 hour period, the system shall be re-chlorinated.
- .12 Flush line to remove chlorine solution. Continue flushing until the chlorine residual measured is equal to the chlorine residual in the existing distribution system. Under no circumstances shall chlorine disinfectant solution remain in pipe for more than 48 hours.
- .13 Add 1.0% hydrogen peroxide reducing agent to the disinfectant solution at point of discharge or within a retention facility such that the solution is disposed to the environment with a total chlorine residual no greater than 0.0 mg/L in accordance with local regulations. Check chlorine residuals before disposal to the environment at regular intervals.
- .14 Perform bacteriological tests on water main, after disinfectant chlorine solution has been flushed out.
 - .1 Take samples daily for minimum of 2 days. Number and location of sample points shall be subject of the approval of the Departmental Representative.
 - .2 Samples shall be taken in sterile bottles. Analysis shall be done by an independent lab subject to the approval of the Departmental Representative.
 - .3 Should contamination remain or recur during this period, repeat disinfecting procedure.
- .15 After testing and submission of the written results for the passing of the bacteriological tests, remove corporation stops and install plugs. Visually check for leakage after plugs are installed with water main under normal operating pressure.

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- 3.16 TESTING .1 Inspection and testing of pipe bedding surround and backfill material will be carried out by independent inspection and testing agency designated by Departmental Representative. Costs of these tests will be paid by Contractor in accordance with Section 01 29 83 - Payment Procedures for Testing Laboratory Services and Section 01 45 00 - Quality Control.
- 3.17 SURFACE RESTORATION .1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.
- 3.18 CLEANING .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.