Iowa Emergency Provision of Water: Transport and Safety

Applicable Code: Code of Iowa subsection 455B.177(2), and section 455B.262, and Iowa Administrative Code subrule 567—43.1(1).

Purpose: This document specifies requirements for emergency bulk water transport (water hauling) for potable use (water safe to drink) by public water supply systems (PWS) during emergencies. Water hauling helps to provide an uninterrupted water supply during emergency situations, which is essential for the protection of public health and safety.

Emergency situations include natural occurrences such as high winds, flooding, ice storms, or extended periods of drought; and, manmade causes such as inadvertent or deliberate contamination of water supplies or tampering with facilities. In all of these situations, loss of service can occur and lead to contamination.

A community will require a minimum quantity of potable water to sustain life and provide for sanitation in any emergency situation. Such requirements differ widely from those under normal circumstances. The situation may necessitate hauling potable water from another location to the affected system.

Scope: This document only applies to emergency bulk water hauling for potable use at PWSs. This document does not cover non-potable water hauling for the following uses: well drilling, construction activities, swimming pool filling, agricultural applications, civil emergencies, firefighting.

Calculate Quantity of Water Needed:
The U.S. Department of Defense has published a technical guide on minimal individual water requirements. Potable water for human consumption (drinking and cooking) and sanitation of hospital equipment are the only considered uses.

- Individuals: 0.5-5.0 gallons per capita per day (GPCD)
- Hospitals and care centers: 5 -15 gallons per capita per day
- Mass shelters: 3 gallons per capita per day

Recommendation for Certified Water Operator:
If a PWS does not have enough certified water operators to assist with the emergency, or if a typically non-PWS has been isolated from the water supplier, consider requesting technical assistance from neighboring PWSs, Iowa Rural Water Association, or Iowa DNR. A certified water operator understands the requirements needed in such a situation, including disinfectant residual measurement, chemical dosage, potable and non-potable plumbing separation (cross-connection control), sample collection, etc., and can work independently or with minimal direction on the task needed at the time. They may have access to a disinfectant residual test kit and other equipment. A certified operator may also be utilized during the emergency to direct the activities of other volunteer operators or when assisting facilities completely unfamiliar with the requirements of a PWS.

Approved Source of Water Required:
Water from Iowa PWS in compliance with Iowa DNR rules

Hauled water must come from a PWS currently regulated by the Iowa DNR and must be compliant with the Iowa DNR rules. Prior approval by Iowa DNR is required for use of water from any PWS with a chronic health-based standard violation.

All other water sources require prior approval from Iowa DNR

If the source of hauled water is not an Iowa DNR-regulated PWS, including water from PWSs in surrounding states, the receiving PWS must contact the Iowa DNR for approval before receiving the water.

Chlorine residual required

- The hauled water should be disinfected with chlorine to ensure bacterial safety in the tanker and in the distribution system. If the providing PWS disinfects with chlorine, testing must be conducted to ensure the minimum disinfectant

residual is met. If the PWS providing the water does not disinfect, then chlorine disinfectant must be added to the hauled water before use or storage. The minimum disinfectant residual must be maintained in the hauling tanker as well as in any storage tanks and in the receiving distribution system.
    - Minimum residual of 2.0 mg/L total chlorine or chloramines
    - Minimum residual of 0.5 mg/L free chlorine
- If no disinfectant can be used, the hauled water must be boiled before any human consumption use, which includes drinking, bathing, handwashing, oral hygiene purposes, food preparation, dishwashing, ice making, or food processing.

Equipment Preparation

Liquid Bulk Trailer & Tank Construction

All liquid bulk trailers and tanks used for transportation of potable water shall be constructed of durable food-grade material, and must be cleaned and sanitized before the first use with potable water. Examples include stainless steel or other material approved for drinking water contact or liquid food contact (e.g., milk) by the NSF International (NSF), the US Food and Drug Administration (FDA), the US Department of Agriculture (USDA), or the American Water Works Association (AWWA). All interior coatings, hoses, gaskets, lubricants, connections, pumps, heaters, or other water contact equipment must also be food-grade or approved for drinking water use by NSF, FDA, USDA, or AWWA. Documentation is required.

Not allowed: Any tank, water buffalo, or bulk trailer that was previously used to transport petroleum products, toxic materials, firefighting chemicals, hazardous substances, manure, wastewater sludge, or non-potable surface water shall not be used to transport or store potable drinking water. These tanks cannot be cleaned sufficiently to ensure use for potable water.

Tank Wash or Cleaning Facilities

Hauling tankers must meet food-grade transport tanker washing and cleaning standards. Tank truck operators should call the facility to determine if limitations apply before sending equipment. IDALS Dairy Tank Wash list of facilities: https://iowaagriculture.gov/sites/default/files/dairy/IOWA%20DAIRY%20INDUSTRY%20LIST-2019.pdf. Tank Cleaning Facilities: https://www.bulktransporter.com/tank-cleaning-directory/iowa

Sanitize

All tanks and bladders used for potable water hauling or holding must be cleaned and sanitized in accordance with AWWA C652 prior to first use. Tanks and bulk liquid trailers are considered confined spaces with special entry regulations. Residual compounds or cleaning compounds can cause a hazardous atmosphere to workers who enter for cleaning purposes. Tank interiors may also be extremely slippery. Therefore, cleaning and disinfection procedures should be completed without entry, if possible. Disinfect the tank interior using one of these methods:

- Spray down the tank with a solution of 200 mg/L chlorine. Application of the solution is made by spray, sponge, or brush and shall remain in contact with the tank walls for at least 30 minutes. A 200 mg/L chlorine solution is made by adding to 50 gallons of potable water either:
    - 800 mL or 3.4 cups of household bleach (5% strength sodium hypochlorite), or
    - 320 mL or 1.3 cups of liquid pool chlorine (12.5% strength sodium hypochlorite).
- Determine tank volume. Fill the tank with 50 mg/L chlorine solution and allow to disinfect for 6 hours. A 50 mg/L chlorine solution is made by adding to each 100 gallons of potable water either:
    - 400 mL or 1.6 cups of household bleach (5% strength sodium hypochlorite), or
    - 160 mL or 0.4 cup of liquid pool chlorine (12.5% strength sodium hypochlorite).

NOTE: Efforts should be made to minimize the impact of the chlorine solution when discharging it after disinfection; do not discharge to a receiving stream or water body.

Repeat Hauling

No additional cleaning is required between loads if the tanker is only used for hauling potable water. If other products are hauled, the tanker must be cleaned to food-grade levels and sanitized as previously described.

Filling Tanker

Water tanks or bulk trailers may only fill at a designated location approved by the public water system. Fill devices must include a method of backflow protection to protect the source water, such as an air gap, approved double check valve assembly, or a Reduced Pressure Zone (RPZ) device. Likewise, when dispensing water the tanker/tank must have backflow protection. To ensure adequate mixing, add the chlorine solution to the tank and then immediately add the water. If it is a baffled (compartmentalized) tank, add the appropriate volume of chlorine solution to each baffled area immediately followed by water.

Testing Steps to Provide Water

Testing Chlorine Residuals

Using an appropriate drinking water chlorine test kit, measure the chlorine residual at the following locations and frequencies. Maintain a record of each measurement, including exact location of the sample. The chlorine disinfectant residual must be at or above 2.0 mg/L total chlorine or chloramines, or 0.5 mg/L free chlorine at all times. Additional chlorine may be added as needed.

- Water hauling transport tanker: Tested daily or every time tanker is filled, whichever is more frequent. Record required.
- Storage tank or bladder: Tested daily or every time it is filled, whichever is more frequent. Record required.
- Distribution system: Tested daily. Record required.
- As needed to address conditions on the ground. Measure chlorine residuals as needed to ensure supplied water is safe during the emergency

Testing Coliform Bacteria

Using a DNR-certified laboratory for coliform bacteria drinking water analysis, collect a bacteria sample from each location and at the required frequency listed below. Submit the sample to the DNR-certified laboratory as soon as possible and no later than 30 hours from time of collection. The analysis takes at least 18 hours due to incubation time.

- Tanker: One sample required after cleaning and before first use as a potable water tanker. Record required. If water must be used before the analytical result is received, system must implement a boil or bottled water advisory until an “absent” total coliform bacteria result is achieved.
- Storage tank or bladder: One sample required after cleaning and before first use as a potable water tanker. Record required.
- Distribution system: For systems bringing in no more than one load of water each week: one sample required with each new load of water or once per month, whichever is more frequent. For systems bringing in multiple loads each week, at least weekly samples (similar number and location to required bacteria sampling plan or as otherwise allowed by DNR FO on a case-by-case basis), provided that at all times, the chlorine residuals are maintained and positive pressure is maintained. These distribution system samples may be used for coliform bacteria compliance purposes. Record required.
    - NOTE: If positive pressure is not maintained at all times in the distribution system, microbial or chemical contamination can occur in the system from back pressure or backsiphonage. Refer to the Iowa Main Break and Depressurization Guidance for additional guidance.

Acceptable result: A result of “no bacteria detected” or “absent” is required for the sample to be considered acceptable for distribution or use.

Unacceptable result that requires immediate action: DNR must be notified immediately upon the system learning of any laboratory analytical result which confirms the presence of total coliform bacteria or *E. coli*. Additional actions regarding disinfection and possible boil advisory will be required.

Flushing system prior to using hauled water

If the water currently located within your system has been contaminated, it must be completely flushed out and replaced with hauled water. Confirm this by testing chlorine residuals at all locations within your system. The residual should be close to the hauled water chlorine residual.

Recordkeeping

Records must be available for inspection and retained for 5 years after the incident is resolved.

- *Water Hauling:* Recordkeeping is required to provide the receiving PWS with pertinent information regarding the safety of the hauled water, and ensuring it was of potable quality. Records should include the following items listed on the Bulk Drinking Water Hauling Record, plus any notes regarding the receiving tank, site conditions, and any other significant items.
- *Chlorine Testing:* Records must be maintained for all chlorine testing conducted at tanker and storage vessels, and in the distribution system.
- *Bacteria Testing:* Records must be maintained for all coliform bacteria testing conducted at tanker and storage vessels, and in the distribution system.

Contact Requirements and Additional Resources

- The PWS must contact the DNR Field Office staff when water hauling is necessary. The Field Office staff may visually inspect and approve use of the hauled water. Additional actions may be necessary to ensure public health.
- If bulk water hauling is required due to an emergency, the *Bulk Drinking Water Hauling Record* must be completed and sent to the DNR within 24 hours of the water hauling when a facility or point of distribution hauls in bulk water (IAC 567—43.1(1)). The report may be completed via phone if conditions warrant. Contact the Field Office in which the receiving PWS resides.
- The Iowa Main Break and Depressurization Guidance documents are available (lower right column): https://www.iowadnr.gov/Environmental-Protection/Water-Quality/Drinking-Water-Compliance/Public-Notice
- DNR Water Supply Engineering staff are available for questions on recovery, emergency well-drilling, connection to alternate source, etc.

DNR FO1 (Manchester): 563-927-2640
DNR FO2 (Mason City): 641-424-4073
DNR FO3 (Spencer): 712-262-4177
DNR FO4 (Atlantic): 712-243-1934
DNR FO5 (Des Moines): 515-725-0268
DNR FO6 (Washington): 319-653-2135

DNR WS Engineering: 515-725-0278, 515-805-4523, 515-776-8922
DNR Emergency Response (after hours): 515-725-8694

- The Iowa Department of Inspections, Appeals, and Licensing regulates food and beverage service. Contact them at 515-281-6538. There are several documents available online:
  - Guidance for Food Establishments during and after a Water Advisory https://dial.iowa.gov/licenses/food-hotels/food-resources/water-advisory-guidance
  - After the Flood: Cleaning & Re-opening Requirements for Food Establishments https://dial.iowa.gov/licenses/food-hotels/food-resources/reopening-after-flood
  - Food Emergency Pocket Guide (available upon request from DIAL) https://dia.iowa.gov/sites/default/files/documents/2018/07/afdo_foodemergencypocketguide.pdf
  - Food Safety for Food Establishments During a Power Outage https://dial.iowa.gov/licenses/food-hotels/food-resources/power-outage-guidance

Bulk Drinking Water Hauling Record

If bulk water hauling is required due to an emergency, this form must be completed and sent to the DNR within 24 hours of hauling when a facility or point of distribution hauls in bulk water (IAC 567—43.1(1)). The report may be completed via phone if conditions warrant by calling the appropriate DNR Field Office during normal business hours, or the Emergency Response Number at 515-725-8694 after hours.

Please print legibly

Bulk Water Hauler Name:

Tanker ID Number (VIN): _____ Tanker License Plate: _____

Hauler Address: _____

Hauler Phone Number: _____

Water Supply Source Name:

City: _____ PWSID: _____

Address of Fill Site: _____

Chlorine Residual Level at Fill: _____ mg/L ☐ Free or ☐ Total

Driver or Bulk Water Representative Signature: _____

Print Name: _____ Date and Time: _____

Site or Facility Receiving Bulk Water Name:

Date of Delivery: _____ Quantity of water delivered, gal: _____

Chlorine Residual Level at Delivery: _____ mg/L ☐ Free or ☐ Total

Address of Fill Site: _____

Purpose: ☐ Public Distribution ☐ Emergency Supply for Building ☐ Emergency Supply for PWS WTP

☐ Other (please specify): _____

Address or Location: _____

Receiving Site or Facility Representative Signature: _____

Print Name: _____ Date and Time: _____

Chlorine Dosage Charts

Chlorine for disinfection should be liquid sodium hypochlorite or granular calcium hypochlorite.
WARNING: Do not use scented bleach, stabilized chlorine pool tablets, or bleach with cleaning additives.

To introduce 1 ppm free chlorine

Type of Chlorine	Volume of Water (in gallons)									
	50		100		500		1000		5000	
Household bleach[1] (5%)	0.75 tsp	4 mL	1.5 tsp	8 mL	7.5 tsp	40 mL	2.7 oz	80 mL	13 oz	400 mL
Liquid pool chlorine[2] (12.5%)	0.3 tsp	1.6 mL	0.7 tsp	3.2 mL	3 tsp	16 mL	1.1 oz	32 mL	5.3 oz.	160 mL
Calcium Hypochlorite Granules[3]	--		--		--		0.2 oz	5.7 g	1 oz	28 g

To introduce 10 ppm free chlorine

Type of Chlorine	Volume of Water (in gallons)									
	50		100		500		1000		5000	
Household bleach[1] (5%)	8 tsp	40 mL	2.7 oz	80 mL	13.3 oz	400 mL	1.5 pints	800 mL	1 gal	4 L
Liquid pool chlorine[2] (12.5%)	3.25 tsp	16 mL	1.1 oz	32 mL	5.3 oz	160 mL	1.3 cups	320 mL	3.2 pints	1.6 L
Calcium Hypochlorite Granules[3]	--		0.2 oz	5.7 g	1 oz	28 g	2 oz	57 g	10 oz	283 g

To introduce 200 ppm free chlorine (for cleaning tank)

Type of Chlorine	Volume of Water (in gallons)									
	50		100		500		1000		5000	
Household bleach[1] (5%)	27 oz or 3.4 cups	800 mL	6.4 cups	1.6 L	2 gal	8 L	4 gal	16 L	20 gal	80 L
Liquid pool chlorine[2] (12.5%)	1.3 cups	320 mL	2.6 cups	640 mL	12.8 c	3.2 L	3.2 qt	6.4 L	8 gal	32 L
Calcium Hypochlorite Granules[3]	2 oz	57 g	4 oz	114 g	1.2 lbs.	560 g	2.5 lbs.	1.14 kg	12.5 lbs.	5.66 kg

Note: Use of manufacturer or product names are for informational purposes and do not show preference.

[1]Unscented liquid bleach. Sodium hypochlorite solution at 5.25% – 8% available chlorine; table assumes 5% because age of the chlorine and storage conditions are unknown and solution strength degrades over time and at elevated temperatures. Available under trade names Clorox, Roman Cleanser, Purex, and others.

[2]Sodium hypochlorite solution at 12.5% available chlorine. Available under trade names Sun Chlorine, Blue Whale, Pool Tech, and others.

[3]Calcium hypochlorite granules or tablets at 70% available chlorine. Available under trade names HTH, Zappit, Sentry, and others.

Notes:

oz = U.S. fluid ounce
tsp = teaspoon
tbsp = tablespoon
c = cup
qt = quart
gal = gallon
g = gram
kg = kilogram
mL = milliliter
L = liter
1 tsp = 5 mL
3 tsp = 1 tablespoon = 15 mL

50 mg/L concentration = 1 gallon or 4L of household bleach (5%) in 1000 gal potable water

Fluid Measure Equivalents (liquid, volume)

American Standard (cup)	American Standard (fluid ounces)	Metric (mL)
2 Tbsp	1	30
1/4 cup	2	60
1/2 cup	4	125
1 cup	8	250
1.5 cups	12	375
2 cups or 1 pint	16	500
4 cups or 1 quart	32	1000 or 1 liter
4 quarts or 1 gallon	128	4 liters

Dry Measure Equivalents (solid, volume or weight)*

Tablespoon	Cup	Ounce	Grams
3 teaspoons	1 tablespoon	0.5	14.3
2	1/8	1	28.3
4	1/4	2	56.7
5 1/3	1/3	2.6	75.6
8	1/2	4	113.4
12	3/4	6	0.375 pound
32	2	16	1 pound

*measurement shown in column header unless otherwise noted

Water Hauling Checklist

Tanker and Water Source

- ☐ Tanker or water bladder must be approved for hauling food grade materials. Documentation required.
- ☐ Sanitize the tanker or water bladder prior to the first use as a potable water vessel in compliance with AWWA C652. If continually used for repeated potable water hauling, additional sanitizing is not required; maintain chlorine residuals.
- ☐ Obtain the water from a regulated Iowa PWS that meets all applicable drinking water standards prior to hauling; *Bulk Drinking Water Hauling Record* required. For any other water supply, DNR approval is required before use.
- ☐ Both filling and dispensing devices must include backflow protection to protect the source water: air gap, double check-valve assembly, RPZ device.

Chlorine Residual Testing

- ☐ Maintain chlorine residuals of the hauled water at or above 0.5 mg/L free chlorine or 2.0 mg/L total chlorine or chloramines in the tanker and in the distribution system. Records required of each measurement, including exact location tested.
- ☐ Test the tanker itself for chlorine residual at least daily, or every time it is filled, whichever is most frequent. Record required of each measurement.
- ☐ Test the distribution system for chlorine residuals at least daily. Record of each measurement required, including exact location tested.

Total Coliform Bacteria Testing

- ☐ Collect a coliform bacteria sample from each location and at the required frequency. The analysis must be conducted by a certified laboratory; holding time is 30 hours from collection to start of analysis. Incubation time is at least 18 hours. Test sites include:
  - Tanker: One sample required after cleaning and before first potable water use.
  - Storage tank or bladder: One sample required after cleaning and before first use.
  - Distribution system: One sample required initially before first use, and then with each new load of water or once per month, whichever is more frequent.
- ☐ A result of “no bacteria detected,” “absent,” or “0” is an acceptable result for use and distribution of the water. Notify the DNR immediately of any laboratory analytical result that is positive for total coliform bacteria or *E-coli*. Additional actions regarding disinfection and possible boil advisory will be required.
- ☐ Prior to first use, the water within the system must be completely flushed out and replaced with hauled water. Confirm this by testing chlorine residuals at all locations within the system until the residual values match the hauled water value.
- ☐ The Iowa Department of Inspections, Appeals, and Licensing may have additional requirements for food establishments. Call 515-281-6538.
- ☐ The Iowa DNR may have additional requirements for the specific situation. Phone:

FO1 (Manchester): 563-927-2640
FO2 (Mason City): 641-424-4073
FO3 (Spencer): 712-262-4177
DNR FO4 (Atlantic): 712-243-1934
DNR FO5 (Des Moines): 515-725-0268
DNR FO6 (Washington): 319-653-2135

DNR Water Supply Engineering: 515-725-0278, 515-805-4523, 515-776-8922
DNR Emergency Response (after hours): 515-725-8694

- ☐ Records must be available for inspection and retained for 5 years.

Chlorine Residual Log

System Name: ______________________________ Page #: ____________

Date	Time	Location	Chlorine Residual, mg/L	Free or Total	Analyst
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