

Comprehensive Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2): Quick Reference Guide

Overview of the Rules

Titles*	<ul style="list-style-type: none"> ▶ Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) 63 FR 69390, December 16, 1998, Vol. 63, No. 241 ▶ Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) 71 FR 388, January 4, 2006, Vol. 71, No. 2
Purpose	Improve public health protection by reducing exposure to disinfection byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans.
General Description	<p>The DBPRs require public water systems (PWSs) to:</p> <ul style="list-style-type: none"> ▶ Comply with established maximum contaminant levels (MCLs) and operational evaluation levels (OELs) for DBPs, and maximum residual disinfection levels (MRDLs) for disinfectant residuals. ▶ Conduct an initial evaluation of their distribution system. <p>In addition, PWSs using conventional filtration are required to remove specific percentages of organic material that may react to form DBPs through the implementation of a treatment technique.</p>
Utilities Covered	The DBPRs apply to all sizes of community water systems (CWSs) and nontransient noncommunity water systems (NTNCWSs) that add a disinfectant other than ultraviolet (UV) light or deliver disinfected water, and transient noncommunity water systems (TNCWSs) that add chlorine dioxide.
*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.	

Overview of Requirements

This table shows how the requirements for the Stage 2 DBPR build on the existing requirements established in the Stage 1 DBPR. For more information on changes in monitoring requirements, see Table 1.

		Stage 1 DBPR	Stage 2 DBPR	For More Info:	
Coverage	All CWSs and NTNCWSs that add disinfectant other than UV light and TNCWSs that treat with chlorine dioxide.	✓	✓		
	Consecutive systems that deliver water treated with a disinfectant other than UV light.		✓		
TTHM & HAA5 MCL Compliance	MCL compliance is calculated using the running annual average (RAA) of all samples from all monitoring locations across the system.	✓		See Table 3 and Table 4.	
	MCL compliance is calculated using the locational RAA (LRAA) for each monitoring location in the distribution system.		✓		
Regulated Contaminants & Disinfectants	<i>Contaminants</i>				
	Total Trihalomethanes (TTHM)	✓	✓	See Table 2.	
	5 Haloacetic Acids (HAA5)	✓	✓		
	Bromate	✓	Regulated under Stage 1 DBPR ¹		
	Chlorite	✓	Regulated under Stage 1 DBPR		
	<i>Disinfectants</i>				
	Chlorine/chloramines	✓	Regulated under Stage 1 DBPR		
Chlorine dioxide	✓	Regulated under Stage 1 DBPR			
Operational Evaluation	If an operational evaluation level (OEL) is exceeded, systems must evaluate practices and identify DBP mitigation actions.		✓	See Table 5.	

1. A new analytical method for bromate was approved with the Stage 2 DBPR.

Table 1. Changes in Monitoring Requirements

		Stage 1 DBPR		Stage 2 DBPR	
TTHM/ HAA5 Routine Monitoring	Number of Samples	Based on source water type, population, and number of treatment plants or wells.		Based on source water type and population.	
	Sample Locations	At location of maximum residence time. ¹		Based on Initial Distribution System Evaluation (IDSE) requirements. ²	
	Compliance Calculation	RAA must not exceed the MCL for TTHM or HAA5.		LRAA must not exceed the MCL for TTHM or HAA5.	
Reduced Monitoring	Eligibility	TTHM/HAA5	All systems need TTHM RAA \leq 0.040 mg/L and HAA5 \leq 0.030 mg/L. Subpart H systems also need source water TOC RAA at location prior to treatment \leq 4.0 mg/L. ^{3,4} The Stage 2 DBPR left eligibility unchanged but specifies that Subpart H systems must take source water TOC samples every 30 days. Subpart H systems on reduced monitoring must take source water TOC samples every 90 days to qualify for reduced monitoring.		
		Bromate ⁵	Source water bromide RAA $<$ 0.05 mg/L. With the Stage 2 DBPR specified entry point to distribution system bromate RAA \leq 0.0025 mg/L.		
¹ Subpart H systems serving \geq 10,000 must have at least 25 percent of samples at the location of maximum residence time; the remaining samples must be representative of average residence time.					
² All systems are required to satisfy their IDSE requirement by July 10, 2010.					
³ Subpart H systems are water systems that use surface water or ground water under the direct influence of surface water (GWUDI).					
⁴ Ground water systems serving $<$ 10,000 must meet these RAA for 2 years; can also qualify for reduced monitoring if the TTHM RAA is \leq 0.020 mg/L and a HAA5 RAA \leq 0.015 mg/L for 1 year.					
⁵ A new analytical method for bromate was established with the Stage 2 DBPR.					

Table 2. Regulated Contaminants and Disinfectants

Regulated Contaminants	Stage 1 DBPR		Stage 2 DBPR	
	MCL (mg/L)	MCLG (mg/L)	MCL (mg/L)	MCLG (mg/L)
TTHM	0.080		Unchanged ²	
Chloroform		-		0.07
Bromodichloromethane		Zero		Unchanged ²
Dibromochloromethane		0.06		Unchanged ²
Bromoform		Zero		Unchanged ²
HAA5	0.060		Unchanged ²	
Monochloroacetic acid		-		0.07
Dichloroacetic acid		Zero		Unchanged ²
Trichloroacetic acid		0.3		0.2
Bromoacetic acid		-		-
Dibromoacetic acid		-		-
Bromate (plants that use ozone) ¹	0.010	Zero	Unchanged ²	Unchanged ²
Chlorite (plants that use chlorine dioxide)	1.0	0.8	Unchanged ²	Unchanged ²
Regulated Disinfectants	MRDL ³ (mg/L)	MRDLG ³ (mg/L)	MRDL (mg/L)	MRDLG (mg/L)
Chlorine	4.0 as Cl ₂	4	Unchanged ²	Unchanged ²
Chloramines	4.0 as Cl ₂	4	Unchanged ²	Unchanged ²
Chlorine dioxide	0.8	0.8	Unchanged ²	Unchanged ²
¹ A new analytical method for bromate was established with the Stage 2 DBPR.				
² Stage 2 DBPR did not revise the MCL or MRDL for this contaminant/disinfectant.				
³ Stage 1 DBPR included MRDLs and MRDLGs for disinfectants, which are similar to MCLs and MCLGs.				

Table 3. Compliance Determination		
	Stage 1 DBPR	Stage 2 DBPR
TTHM/HAA5	RAA	LRAA
Bromate ¹	RAA	Unchanged ²
Chlorite	Daily/follow-up monitoring	Unchanged ²
Chlorine dioxide	Daily/follow-up monitoring	Unchanged ²
Chlorine/chloramines	RAA	Unchanged ²
DBP precursors (TOC sample set)*	Monthly for TOC and alkalinity	Every 30 days for TOC and alkalinity
¹ A new analytical method for bromate was established with the Stage 2 DBPR.		
² Stage 2 DBPR did not change the compliance requirements for this contaminant/disinfectant.		
*TOC sample set is comprised of source water alkalinity, source water TOC, and treated TOC.		

Table 4. Compliance with MCLs and MRDLs (Routine Monitoring)						
Contaminant/Disinfectant	Coverage		Stage 1 DBPR		Stage 2 DBPR	
	Source Water	Population	Monitoring Frequency	Total Distribution System Monitoring Locations	Monitoring Frequency ¹	Total Distribution System Monitoring Locations
TTHM/HAA5	Subpart H	< 500	Per year ²	1 per treatment plant	Per year ²	2
		500 - 3,300	Per quarter	1 per treatment plant	Per quarter	2
		3,301 - 9,999		4		
		10,000 - 49,000		8		
		50,000 - 249,999		12		
		250,000 - 999,999		16		
		1,000,000 - 4,999,999		20		
	≥ 5,000,000					
	Ground water	< 500	Per year ²	1 per treatment plant	Per year ²	2
		500 - 9,999	Per quarter		Per quarter	4
10,000 - 99,999		6				
100,000 - 499,999		8				
≥ 500,000						
Bromate ³	Systems that use ozone as a disinfectant		Monthly	1 at entry point to distribution system	Unchanged ⁴	
Chlorite	Systems that use chlorine dioxide as a disinfectant		Daily (at entrance to distribution system); monthly (in distribution system)	1 at entry point to distribution system; 3 in distribution system	Unchanged ⁴	
Chlorine dioxide	Systems that use chlorine dioxide as a disinfectant		Daily	1 at entry point to distribution system	Unchanged ⁴	
Chlorine/Chloramines	All systems		Same location and frequency as Total Coliform Rule (TCR) sampling		Unchanged ⁴	
DBP precursors (TOC sample set)*	Systems that use conventional filtration		Monthly	1 per source water source	Unchanged ⁴	
¹ All systems must monitor during the month of highest DBP concentrations. Systems on quarterly monitoring, except Subpart H systems serving 500 - 3,300, must take dual sample sets every 90 days at each monitoring location. Systems on annual monitoring and Subpart H systems serving 500 - 3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. If monitoring annually, only one location with a dual sample set per monitoring period is needed if the highest TTHM and HAA5 concentrations occur at the same location and in the same month.						
² Ground water systems serving < 10,000 and Subpart H systems serving < 500 must increase monitoring to quarterly if an MCL is exceeded.						
³ A new analytical method for bromate was established with the Stage 2 DBPR.						
⁴ Stage 2 DBPR did not revise the monitoring frequency or location requirements for this contaminant/disinfectant.						

*TOC sample set is comprised of source water alkalinity, source water TOC, and treated TOC.



Table 5. Operational Evaluation Levels (OELs)

Applies to:	All systems subject to Stage 2 DBPR monitoring requirements that conduct compliance monitoring and collect samples quarterly.
Purpose of establishing OELs:	To reduce peaks in DBP levels and exposure to high DBP levels.
OEL calculations:	<ul style="list-style-type: none"> ▶ Calculated for both TTHMs and HAA5s at each monitoring location using Stage 2 DBPR compliance monitoring results. ▶ OEL is determined by the sum of the two previous quarter's TTHM or HAA5 result plus twice the current quarter's TTHM or HAA5 result at that location, divided by four. ▶ $OEL = (Q1 + Q2 + 2Q3) / 4$
OELs are exceeded:	During any quarter in which the OEL is greater than the TTHM or HAA5 MCL.
If an OEL is exceeded, a system must:	<ul style="list-style-type: none"> ▶ Conduct an operational evaluation. ▶ Submit a written report of the evaluation to the state no later than 90 days after being notified of the analytical results that caused the exceedance(s). ▶ Keep a copy of the operational evaluation report and make it publically available upon request.
The operational evaluation must include:	<ul style="list-style-type: none"> ▶ An examination of the treatment and distribution systems' operational practices that may contribute to TTHM and HAA5 formation. ▶ Steps to minimize future exceedances.
OEL requirements take effect:	When the system begins compliance monitoring for the Stage 2 DBPR.

Table 6. Standard Monitoring Compliance Dates

If You are a System Serving:	Schedule ¹	Begin LRAA TTHM & HAA5 Monitoring By:
At least 100,000 people or part of a combined distribution system (CDS) serving at least 100,000 people.	1	April 1, 2012
50,000 to 99,999 people or part of a CDS serving 50,000 to 99,999 people.	2	October 1, 2012
10,000 to 49,999 people or part of a CDS serving 10,000 to 49,999 people.	3	October 1, 2013
Less than 10,000 people or part of a CDS serving less than 10,000 people.	4	October 1, 2013 ²

¹Your schedule is determined by the largest system in your CDS.

²Systems not conducting *Cryptosporidium* monitoring under Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) must begin LRAA TTHM/HAA5 monitoring by this date. Systems conducting *Cryptosporidium* monitoring under LT2ESWTR must begin LRAA TTHM/HAA5 monitoring by October 1, 2014.

Table 7. TOC Removal

Subpart H systems that use conventional filtration treatment are required to remove specific percentages of organic materials, measured as total organic carbon (TOC), that may react with disinfectants to form DBPs. Removal must be achieved through a treatment technique (enhanced coagulation or enhanced softening) unless a system meets alternative criteria. Systems practicing softening must meet TOC removal requirements for source water alkalinity greater than 120 mg/L CaCO₃.

Source Water TOC (mg/L)	Source Water Alkalinity, mg/L as CaCO ₃		
	0 - 60	> 60 to 120	> 120
> 2.0 to 4.0	35.0%	25.0%	15.0%
> 4.0 to 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

For additional information on the DBPRs:
 Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at <http://water.epa.gov/drink>; or contact your state drinking water representative.