

Using the Combined Wastestream Formula

This worksheet will guide the reader through how to calculate an alternative categorical pretreatment limit when an industrial user's regulated process effluent is comingled with unregulated and/or dilute wastestreams prior to treatment. This worksheet assumes that the user is familiar with the pretreatment program and other industrial user permit guidance from EPA.

Definitions:

Combined Wastestream formula (CWF) is a formula applied where regulated, unregulated and/or dilution wastestreams are combined/mixed prior to pretreatment.

Alternative categorical limit is a regulatory phrase found in 40 CFR 403.6(e), used to identify the calculated limit that may be derived and applied where a process effluent is mixed prior to treatment with wastewaters other than those generated by the regulated process wastewater.

Regulated wastestream refers to a process wastestream that is regulated by a categorical Pretreatment standard for a specific pollutant.

Unregulated wastestream refers to a wastestream that is neither a regulated wastestream nor a dilute wastestream.

Dilute wastestream means:

- Boiler blowdown, non-contact cooling water, stormwater, and demineralizer backwash,
- Any wastestream listed in Appendix D to 40 CFR 403 (considered dilute for all pollutants)¹
- Sanitary wastewater (unless stated otherwise in the categorical Pretreatment standard)

Combined Wastestream Formula [40 CFR 403.6(e)(1)(i)]

$$C_T = \left(\frac{\sum_{i=1}^N C_i F_i}{\sum_{i=1}^N F_i} \right) \left(\frac{F_T - F_D}{F_T} \right)$$

C_T = Alternative concentration limit [mg/L]

C_i = Categorical pretreatment standard concentration in regulated wastestream "i" [mg/L]

F_D = Average daily flow (at least a 30-day average) of dilute wastestreams [MGD]

F_i = Average daily flow (at least a 30-day average) of regulated stream "i" [MGD]

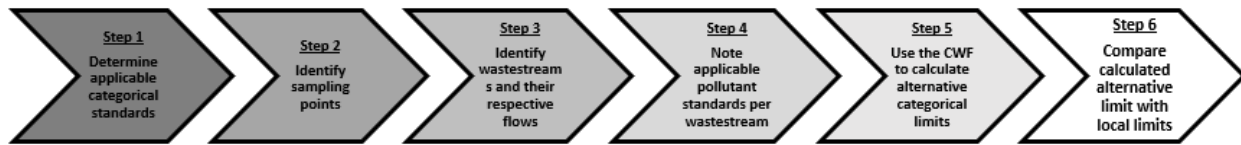
F_T = Average daily flow (at least a 30-day average) of combined flows being treated – TOTAL [MGD]

N = total number of wastestreams regulated for Pollutant Y

¹ 40 CFR 403.6(e)(1)(i) - From: (a) Boiler blowdown streams, non-contact cooling streams, stormwater streams, and demineralizer backwash streams; provided, however, that where such streams contain a significant amount of a pollutant, and the combination of such streams, prior to treatment, with an Industrial User's regulated process wastestream(s) will result in a substantial reduction of that pollutant, the Control Authority, upon application of the Industrial User, may exercise its discretion to determine whether such stream(s) should be classified as diluted or unregulated. In its application to the Control Authority, the Industrial User must provide engineering, production, sampling and analysis and such other information so that the Control Authority can make its determination; or (b) sanitary wastestreams where such streams are not regulated by a Categorical Pretreatment Standard; or (c) from any process wastestreams which were or could have been entirely exempted from categorical Pretreatment Standards pursuant to paragraph 8 of the NRDC v. Costle Consent Decree (12 ERC 1833) for one or more of the following reasons (see appendix D of this part):

- (1) The pollutants of concern are not detectable in the effluent from the Industrial User (paragraph (8)(a)(iii));
- (2) The pollutants of concern are present only in trace amounts and are neither causing nor likely to cause toxic effects (paragraph (8)(a)(iii));
- (3) The pollutants of concern are present in amounts too small to be effectively reduced by technologies known to the Administrator (paragraph (8)(a)(iii)); or
- (4) The wastestream contains only pollutants which are compatible with the POTW (paragraph (8)(b)(i)).

Figure 1: Steps to calculate and appropriately apply alternative limit



STEP 1: Determine applicable categorical standards (and subparts). EPA has promulgated Effluent Limit Guidelines (ELGs) for approximately 60 industrial point source categories and around half of those have categorical pretreatment standards for existing and/or new sources². Effluent Guidelines are national standards for industrial wastewater discharges to surface waters and publicly owned treatment works (municipal sewage treatment plants). The Control Authority should utilize EPA’s Industrial User Permitting Guidance Manual³ to assist in evaluating and identifying applicable categorical standards for each regulated wastestream. The Control Authority should also identify other applicable Pretreatment Standards, including local limits. This step is complete when the Control Authority has determined the applicable point source category and all applicable Pretreatment standards to be met.

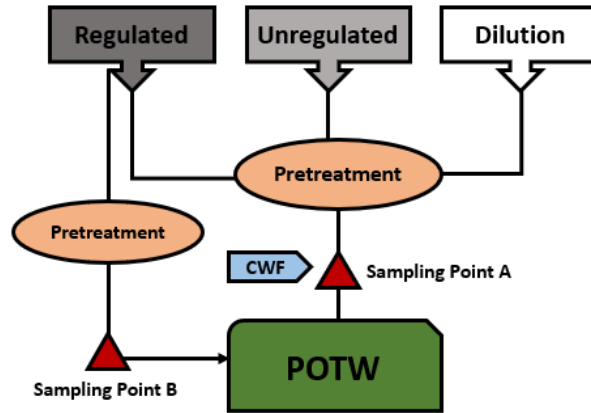
Step 2: Identify sampling point(s). Identify the sampling location where the user will be permitted for sampling. Determining an appropriate sampling point will enable the permit writer to follow the below procedures to correctly apply effluent limits in the industrial user permit. The permit should clearly designate the sampling point(s) where limits apply, the period in which the limits apply (e.g., from a specific date to a specific date if different from the effective period of the permit), and the units (e.g., mg/L or lbs/day). In addition, the effluent limits should be expressed in terms of the duration for which the limits themselves are intended to apply (e.g., instantaneous maximum, maximum daily, or monthly average) and such terms should be well defined.

Based on the chosen sampling point, determine whether categorical limits or local limits apply, or whether alternative categorical limits would need to be calculated. Alternative categorical limits would need to be calculated if regulated wastestreams mix with unregulated and/or dilute wastestreams prior to the designated sampling point. See diagram below and EPA’s Industrial User Permitting Guidance Manual for assistance in determining which limits would apply at the designated sampling point.

In the following diagram, based on where Sampling Point A has been designated, the combined wastestream formula would need to be applied as regulated process wastewater is mixing with unregulated and/or dilute wastestreams prior to sampling. Whereas, in the case of Sampling Point B, the regulated wastestream is not mixed and categorical standards would apply at that point.

² See: <https://www.epa.gov/eg>, for more information on ELGs.

³ U.S. EPA Office of Water Industrial User Permitting Guidance Manual, September 2012. 833-R-12-001A



Step 3: Identify wastestreams and their respective flows. This includes regulated, unregulated and dilution wastestreams discharging to the designated sampling point. Determine flows for each Wastestream (utilize EPA Industrial User Inspection and Sampling Manual). Identify all regulated wastestreams subject to categorical pretreatment standard that apply to the facility (those determined to be applicable in Step 1). Additionally, non-regulated wastestreams and dilute wastestreams should be identified. The classification of each wastestream should be documented. The Control Authority will need to obtain flow values for all wastestreams to calculate alternative categorical limits for each pollutant using the combined wastestream formula.

Helpful Tips 1:

The following should be considered when determining flow rates for each wastestream:

- Establish the length of time to be evaluated with respect to long-term daily average flow, for example, the normal daily average during a representative year.
- Avoid estimating the average flow rate based on data for a few high days, weeks, or months.
- Use the actual rate rather than the design rate; emphasize historical data rather than future projections.
- Use the same average rate to calculate both daily maximum and maximum monthly average alternative limits.

Step 4: Note applicable pollutant standards per wastestream. Once the applicable category (or categories) have been determined and wastestreams identified, the Control Authority should denote the regulated pollutants, units, and limit types for each pollutant (e.g. daily maximum, monthly average). The Control Authority must then denote for each wastestream the applicable pollutants and applicable categorical standards (note: if multiple subparts apply make note of the categorical limits for each pollutant for each subpart).

Step 5: Use the combined wastestream formula to calculate alternative categorical limits for each pollutant.

For ease of use, an exercise template is attached to this worksheet for your use. Note: Calculations must be done for each pollutant and frequency (e.g. daily maximum, monthly).

Helpful Tips 2:

The following applies to alternative limits calculated using the CWF:

- The alternative limits are enforceable as categorical pretreatment standards.
- Converting concentration-based standards to mass-based, or vice versa, may be required.
- The alternative limits must be calculated for daily maximum and long-term averages.
- The calculated alternative limits must be greater than the analytical detection limit.

Special consideration should be given to varying long-term averages between categories (i.e., 30-day average versus 4-day average versus monthly average).

Step 6: Compare calculated alternative limit with local limit

Pollutants which the Control Authority has a local limit for must be compared to the calculated alternative concentration limits and the most stringent limit must be applied in the industrial user permit at the designated sampling point.

Combined Wastestream Formula Worksheet

Significant Industrial User _____

Step 1: Applicable Effluent Limit Guideline(s) based on categorical determination

Step 2: Identify Sampling Point

Step 3: Identify Wastestreams and their respective flows:

Regulated Process Flow 1 _____

Unregulated Process Flow 1 _____

Dilution Flow _____

Step 4: Note applicable pollutant standards per wastestream:

Applicable Categorical Standard: _____		
Parameter	Categorical Daily Maximum Limit [mg/L]	Categorical Monthly Average Limit [mg/L]

Step 5: Use the CWF to calculate alternative categorical limits

Combined Wastestream Formula [40 CFR 403.6(e)(1)]

$$C_T = \left(\frac{\sum_{i=1}^N C_i F_i}{\sum_{i=1}^N F_i} \right) \left(\frac{F_T - F_D}{F_T} \right)$$

- C_T = Alternative concentration limit for Pollutant Y for the combined wastestream (milligrams per liter, mg/L)
- F_D = Average daily flow (at least a 30-day average) for dilute wastestreams (million gallons per day, MGD)
- C_i = Categorical pretreatment standard concentration for Pollutant Y in regulated wastestream i (mg/L)
- F_i = Average daily flow (at least a 30-day average) of regulated stream i (MGD)
- F_T = Average daily flow (at least a 30-day average) of combined flows being treated, which includes F_D, F_i, and unregulated wastestreams (MGD)
- N = total number of wastestreams regulated for Pollutant Y

Step 6: Compare calculated alternative limit with local limit and apply the more stringent limit

Calculated Alternative Categorical Limit (C_T) _____

Local Limit _____

Limit to Place in Permit _____

Combined Wastestream Formula Worksheet – Example 1: One regulated wastestream

Significant Industrial User: Plating Are Us Inc.

Step 1: Applicable Effluent Limit Guideline(s): Metal Finishing, 40 CFR Part 433.15

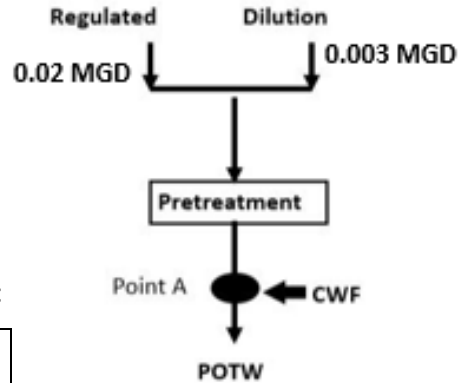
Step 2: Identify Sampling Point: Point A (see diagram)

Step 3: Identify wastestreams and their respective flows:

Regulated Process Flow 1 0.02 MGD

Unregulated Process Flow 1 N/A

Dilution Flow 0.003 MGD



Step 4: Note applicable pollutant standards per wastestream:

Table 1: Categorical Standards from 40 CFR Part 433.15 & 433.17:

PARAMETER	CATEGORICAL DAILY MAXIMUM LIMIT, [mg/L]	CATEGORICAL MONTHLY AVERAGE LIMIT, [mg/L]
CADMIUM (Existing Sources)	0.69	0.26
CADMIUM (New Sources)	0.11	0.07
CHROMIUM	2.77	1.71
COPPER	3.38	2.07
LEAD	0.69	0.43
NICKEL	3.98	2.38
SILVER	0.43	0.24
ZINC	2.61	1.48
CYANIDE, TOTAL	1.2	0.65
TTO	2.13	

Step 5: Use the CWF to calculate alternative categorical limits:

Combined Wastestream Formula Calculation for Zinc Daily Maximum⁴:

$$Daily\ Max\ Zn_{CWF} = \frac{\left(2.61 \frac{mg}{L} * 0.02\ MGD\right)}{0.02\ MGD} * \frac{\left(\left(0.02\ MGD + 0.003\ MGD\right) - 0.003\ MGD\right)}{\left(0.02\ MGD + 0.003\ MGD\right)}$$

$$Daily\ Max\ Zn_{CWF} = 2.27\ mg/L$$

Step 6: Compare calculated alternative limit with local limit and apply the more stringent limit

Table 2: POTW Local Limits

PARAMETER	DAILY MAXIMUM LOCAL LIMIT [mg/L]
Zinc	2.45

Calculated Alternative Categorical Limit for Zinc (daily max) = 2.27 mg/L

Local Limit for Zinc (daily max) = 2.45 mg/L

Permitted Limit for Zinc (daily max) = 2.27 mg/L

⁴ This calculation must be done for every pollutant, and each monitoring frequency (e.g. daily, monthly).

Combined Wastestream Formula Worksheet – Example 2- Two Regulated Wastestreams

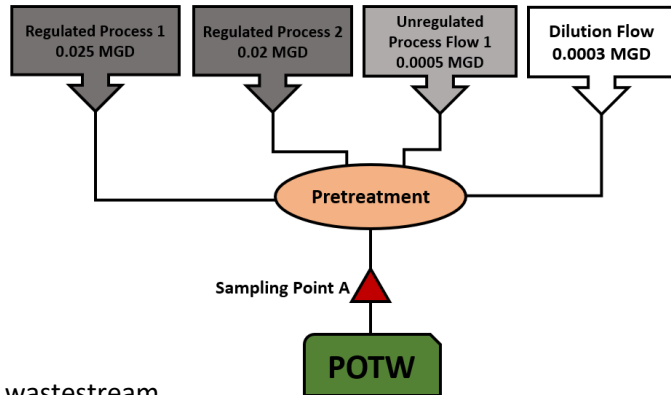
Significant Industrial User: We Do It All, Inc.

Step 1: Applicable Effluent Limit Guideline(s): Regulated Process 1 - Metal Finishing, 40 CFR Part 433.15, Regulated Process 2 - Porcelain Enameling-Steel Basis Material Subcategory, 40 CFR Part 466.14

Step 2: Identify Sampling Point: Point A (see diagram)

Step 3: Identify wastestreams and their respective flows:

Total Regulated Flow Process 1: 0.025 MGD
 Total Regulated Flow Process 2: 0.2 MGD
 Total Unregulated Process Flow 1: 0.0005 MGD
 Total Dilution Flow: 0.0003 MGD



Step 4: Note applicable pollutant standards per wastestream

Table 1: Categorical Standards from 40 CFR Part 433.15 & 466.14:

Regulated Process 1 Table 1: Metal Finishing Existing Source Categorical Standards 40 CFR Part 433.15		
PARAMETER	CATEGORICAL DAILY MAXIMUM LIMIT, mg/L	CATEGORICAL MONTHLY AVERAGE LIMIT, mg/L
CADMIUM	0.69	0.26
CHROMIUM	2.77	1.71
COPPER	3.38	2.07
LEAD	0.69	0.43
NICKEL	3.98	2.38
SILVER	0.43	0.24
ZINC	2.61	1.48
CYANIDE, TOTAL	1.2	0.65
TTO	2.13	

Regulated Process 2 Table 2: Porcelain Enameling-Steel Basis Material Subcategory Existing Source Categorical Standards 40 CFR Part 466.14		
PARAMETER	CATEGORICAL DAILY MAXIMUM LIMIT, mg/L	CATEGORICAL MONTHLY AVERAGE LIMIT, mg/L
CHROMIUM	0.42	0.17
LEAD	0.15	0.13
NICKEL	1.41	1.00
ZINC	1.33	0.56

Step 5: Use the CWF to calculate alternative categorical limits:

Combined Wastestream Formula Calculation for Zinc Daily Maximum⁵:

$$= \frac{\left(2.61 \frac{mg}{L} * 0.025 MGD\right) + \left(1.33 \frac{mg}{L} * 0.02 MGD\right)}{(0.025 MGD + 0.02 MGD)} * \frac{((0.025 + 0.02 + 0.0005 + 0.0003) MGD - 0.003 MGD)}{(0.025 + 0.02 + 0.0005 + 0.0003) MGD}$$

$$Daily Max Zn_{CWF} = 2.03 mg/L$$

Step 6: Compare calculated alternative limit with local limit and apply the more stringent limit

Calculate Alternative Categorical Limit for Zinc (daily max) = 2.03 mg/L

Local Limit for Zinc (daily max) = 2.45 mg/L

Permitted Limit for Zinc (daily max) = 2.03 mg/L (most stringent)

Table 2: POTW Local Limits	
PARAMETER	DAILY MAXIMUM LOCAL LIMIT [mg/L]
Zinc	2.45

⁵ This calculation must be done for every pollutant, and each monitoring frequency (e.g. daily, monthly).