

# Lead and Copper Rule: Instructions for Completing the Evaluation Form for Corrosion Control Treatment (Form 141-C) for Small / Medium Systems

Each section of the 141-C form is numbered/lettered to correspond to these instructions. Use these instructions as a reference tool to complete the form, in addition to the EPA's 2016 Optimal Corrosion Control Treatment Evaluation Technical Recommendations, found online at <https://www.epa.gov/sites/production/files/2016-03/documents/occtmarch2016.pdf>. Systems must recommend one or more of the following treatment options: alkalinity and pH adjustment, calcium hardness adjustment, and/or the addition of a phosphate or silica based corrosion inhibitor. Please contact your Regional Office or Lead and Copper Rule Manager if you have questions and/or need additional guidance. You have up to 6 months from the end of the monitoring period in which the 90<sup>th</sup> percentile exceedance occurred to submit the completed 141-C form to your Rule Manager via fax, email, or standard mail. It must be received by the Rule Manager by the due date (not in transit or postmarked) to avoid a violation.

## A. Public Water System (PWS) General Information:

- 1. Water System Name:** The name of your public water system (PWS), as listed in our database.
- 2. Water System No.:** The 7-digit number assigned to your PWS by the Public Water Supply Section of NCDENR. You should reference this number on all correspondence. Include this number on each page of Form 141-C, at the top (space provided).
- 3. Contact Person:** Provide contact information for the person that will be directly responsible for maintaining the lead and copper corrosion control program.
- 4. Population Served:** The actual population served by your system (not the number of meters present). This number should be close or equal to the population listed on your siting plan and in our database. Population counts should include customers in residence schools such as colleges and universities, nursing homes, military bases and multi-family residences/apartments.
- 5. Person Responsible for Preparing the Form:** Provide information for the person who prepared the recommendation. If a lab or consulting company representative prepared the form for the system, their information should be listed here for any inquiries by the Rule Manager.

## B. Public Water System (PWS) Technical Information:

### 1. Lead/Copper Monitoring Results from Monitoring Period with Exceedance:

In this section, list the dates (including year) of the monitoring period in which the 90<sup>th</sup> percentile exceedance occurred, and list the tap water monitoring results that relate to the exceedance. (**Note:** If the exceedance occurred during reduced monitoring frequency, the monitoring period dates should be listed as "From June 1<sup>st</sup> to Sept. 30<sup>th</sup>," with the respective year indicated. For exceedances occurring during standard 6-month monitoring frequency, the dates will be either "From Jan. 1<sup>st</sup> to June 30<sup>th</sup>," or "From July 1<sup>st</sup> to Dec. 31<sup>st</sup>," of the respective year.)

For the tap water results, please list the minimum and maximum values for both lead and copper from the monitoring period with the exceedance. Additionally, list the 90<sup>th</sup> percentile calculated through the creation of your 90<sup>th</sup> percentile worksheet. **Note:** To calculate the 90<sup>th</sup> percentile for each parameter, list your sample results from low to high in two separate lists on the 90<sup>th</sup> percentile worksheet found at <http://www.ncwater.org/pws/LCR.html>, one list for lead samples and one for copper samples. For only 5 samples, add the results of the 4<sup>th</sup> and 5<sup>th</sup> samples in the list and then divide that sum by 2 to obtain your 90<sup>th</sup> percentile level. For 6 or more samples, for each parameter, multiply the total number of samples by 0.9. For example, if you have 10 lead samples,  $10 \times 0.9 = 9$ , therefore, the 9<sup>th</sup> highest sample result is the lead 90<sup>th</sup> percentile level. If you multiply by 0.9 and arrive at a sample number with a decimal value, you will need to interpolate between the two surrounding results to obtain your 90<sup>th</sup> percentile result (see following example).

**Example Calculation of the 90<sup>th</sup> Percentile Using Interpolation:** To determine the 90<sup>th</sup> percentile result for a set of 23 compliance samples, multiply the total number of samples by 0.9 as follows:

$$23 \text{ samples} * 0.9 = 20.7.$$

Because the calculation above yields a decimal value, you will need to interpolate between the 20<sup>th</sup> and the 21<sup>st</sup> sample results in order to obtain the 90<sup>th</sup> percentile result for the “20.7<sup>th</sup>” sample.

A partial table of example sample numbers and lead results is shown below:

Sample No. (S)	Result for Lead (R)
20	0.012 mg/L
21	0.018 mg/L

To interpolate the 90<sup>th</sup> percentile result:

- Arrange the sample numbers and results as shown below:

$$\begin{array}{ll}
 S_1 = 20^{\text{th}} \text{ sample} & R_1 = 0.012 \text{ mg/L of lead} \\
 S_2 = 20.7 & R_2 = 90^{\text{th}} \text{ percentile (to be calculated)} \\
 S_3 = 21^{\text{st}} \text{ sample} & R_3 = 0.018 \text{ mg/L of lead}
 \end{array}$$

- Substitute the appropriate values into the following formula:

$$R_2 = R_1 + (R_3 - R_1) * \frac{(S_2 - S_1)}{(S_3 - S_1)}$$

- Complete the calculation:

$$R_2 = 0.012 \text{ mg/L} + (0.018 \text{ mg/L} - 0.012 \text{ mg/L}) * \frac{(20.7 - 20)}{(21 - 20)}$$

$$R_2 = 0.012 \text{ mg/L} + (0.006 \text{ mg/L}) * (0.7)$$

$$R_2 = 0.0162 \text{ mg/L}$$

The R<sub>2</sub> value is the 90<sup>th</sup> percentile for 23 samples collected and exceeds the lead action level of 0.015 mg/L. Therefore, this system has an exceedance for lead.

You should use this formula to calculate your 90<sup>th</sup> percentile whenever necessary to ensure that you are aware if there is an exceedance at your water system. You may also use the online interpolation calculator located at [http://www.ajdesigner.com/phpinterpolation/linear\\_interpolation\\_equation.php](http://www.ajdesigner.com/phpinterpolation/linear_interpolation_equation.php). If you choose to use the online calculator, please be aware that the sample numbers correspond with the “x” values, and the results correspond with the “y” values.

## 2. Source Water Lead and Copper:

Collect your source water samples, as soon as possible following the exceedance, and have them analyzed for both lead and copper by a NC certified laboratory.

**2a) Untreated Supply:** Collect a sample directly at each source of your water, prior to any treatment. Record the results in the table for each source.

**2b) Treated Supply:** Collect a sample at each entry point to your water system, following all treatment processes. Record the results in the table for each source.

### 3. Water Quality Parameter (WQP) Monitoring Results:

Collect your entry point and distribution system water quality parameter (WQP) samples as soon as you are aware of the exceedance, before making any adjustments to treatment. These WQP samples should be collected within the same monitoring period as the exceedance, or shortly thereafter. [Note: See 40 CFR 141.89 and 40 CFR 141.23(k)(1) for analytical requirements for lead, copper, pH, temperature, alkalinity, calcium, conductivity, orthophosphate and silica.]

Identify all entry points, which are any sampling taps located directly after all treatment but prior to entering the distribution system. If you have multiple entry points, you will need to obtain data for each of them.

**3a) Entry Point WQP Monitoring Results:** These samples should be collected at each entry point to the distribution system, after all treatment processes. Collect two samples per entry point on different days, and record the measurements/analytical results for both samples in the table. Copy the sheet for any additional entry points beyond the provided spaces. (**Note:** You only need to record orthophosphate and silica data if the system was feeding those chemicals at the time of the exceedance.)

**3b) WQP Distribution System Monitoring Results:** Collect at least one sample for WQPs in the distribution system. The sample location should be indicative of water quality throughout your system and does not need to coincide with your regular lead/copper sampling locations. If you collect more than one sample in the distribution system, provide minimum and maximum results for each parameter.

**3c) Untreated and Treated Water Quality:** Systems using only groundwater with chlorination at the time of the 90<sup>th</sup> percentile exceedance do not need to fill out this section. All other systems should list all available data for the WQPs listed, both at the source and after all treatment (at the entry point). If you do not have data for some of the items, please leave those spaces blank, however, you should strive to obtain as much data as possible. Systems using phosphate-based chemicals to treat for iron/manganese must include their orthophosphate and iron and manganese data here. Copy this sheet, as necessary, for additional sources.

**Note:** Orthophosphate values, if required, must be reported in terms of 'mg/L as PO<sub>4</sub>.'

### 4. Existing Conditions:

Mark "yes" or "no" to indicate if any treatment is used at the system, including basic chlorination. Please list all chemicals and treatment processes used at the system, even if some chemicals or processes are only used seasonally or rarely during a normal operating year, to ensure that your recommendation can be evaluated appropriately.

Examples include: sodium hypochlorite, caustic, soda ash, orthophosphate (list brand and type), rapid mixing, green-sand filtration, etc.

### 5. Planned Changes:

If the system has already funded or submitted plans for changes at the system in the near future (approximately 1-2 years), including adding/removing sources, altering treatment processes, and/or other significant changes that may alter water quality, list those planned changes in this section. Any changes required by the lead and/or copper 90<sup>th</sup> percentile exceedance should not be listed here (e.g. the CCT recommended by this form).

## 6. Present Corrosion Control Treatment:

If you do not have corrosion control of any kind currently installed, mark the first box “None” and skip the remainder of this section.

If you use pH/alkalinity/calcium adjustment or inhibitors, list all information for each treatment used. If you use orthophosphate for control of iron/manganese, please include your chemical type and dose, and note that the treatment is for control of those parameters in the comments.

If you have previously completed a 141-C form or have completed any independent corrosion control studies, please list this information in the areas provided. Attach copies of any prior 141-C forms, if available. Please identify any changes made to the system based on prior corrosion control experiences, as well as, how the changes were documented.

## 7. Distribution System:

Please indicate if there are any lead service lines present at the system, and indicate whether or not they can be located properly. Do not include lead goosenecks or lead-based solder present in the distribution system; include only lead-based piping. Please review your system’s records if you are unsure about the presence and/or location of lead-based plumbing.

If the distribution system is flushed at all during a normal year of operation, please mark the appropriate box. Systems with low or sporadic water use may want to implement a regular full-system flushing program to ensure that water quality does not deteriorate due to long residence times in the distribution system.

## 8. Historical Information:

Please mark the appropriate boxes regarding any water quality complaints that have occurred at the system and whether or not they are documented. Provide information regarding the variety and number of complaints at the system, including taste/odor complaints, discolored water, and the presence of particulates/sediment. This section will provide the Rule Manager with additional information about the water quality at the system.

## 9. Treatment Constraints for Simultaneous Compliance:

Systems that only use groundwater with chlorination may skip this section. All other systems must complete this section of the form.

Determine if adding any of the proposed corrosion control treatments will affect any of your current treatment processes or your regulatory sample results for the listed Regulatory and Functional Constraints. You may also consider if adding treatment will require additional capital improvements such as an expanded building, new plumbing fixtures, and other associated items. Constraint numbers 1-3 are applicable for almost all water systems and treatment additions.

If you choose to identify an option as constraint 4, you must provide significant background information proving without a reasonable doubt that the option is not possible (due to severe consequences to other regulatory items). Choosing constraint 4 due to the expense of a new facility or significant expansion of a current facility is not an option!

References available to assist you with completing this section include the following:

- EPA’s 2016 [Optimal Corrosion Control Treatment Evaluation Technical Recommendations](#)
- EPA’s Simultaneous Compliance Web Tool (you will need to create a username through the website in order to use this free reference tool).
- Water Research Foundation’s report entitled “[Decision Tool to Help Utilities Develop Simultaneous Compliance Strategies](#)” (particularly Tables 1.2 and 1.3, on pages 4 and 5, respectively).
- AWWA’s “Managing Change and Unintended Consequences: Lead and Copper Rule Corrosion Control Treatment.”
- The PWS Section Rule Managers and Regional Office Staff

## 10. Evaluation:

Evaluate any information related to other water system facilities that have similar water quality and that have installed successful corrosion control treatment, as this information may be helpful when completing your final recommendation. Please identify the type of treatment used, as well as, the system information (including the Water System Name and Water System No.). If you have questions about locating similar water systems in your area, please contact your Public Water Supply Section Regional Office or the laboratory that conducts your WQP sampling. In lieu of, or in addition to completing this section, a water system may choose to conduct pipe rig/loop tests, metal coupon tests, or partial-system tests to identify the most effective treatment option (Reference 40 CFR 141.82(c)(2) of the Lead and Copper Rule or your Rule Manager for more information). If a system chooses to conduct one or more of the additional studies, they must provide a final report detailing their study methods and conclusions to their Rule Manager with their completed 141-C form.

## 11. Recommendation/Proposed Treatment:

**You MUST complete this section in its entirety or the 141-C form will be deemed incomplete.**

If you do not provide a completed treatment recommendation in a timely manner (either before the end of the allowed 6-month period or by the deadline specified in a non-concur letter/email), the system may receive a violation for failure to submit the CCT Recommendation on time.

**11a)** In this section, you MUST detail the corrosion control treatment method you propose to operate at the system. Please check the appropriate boxes and fill in the information for chemical or method used, target values in the distribution system, and inhibitor dosages, accordingly. Typically, a target value is in the middle of a specified range (see section 11b) or slightly above a minimum value.

Systems that are currently operating corrosion control treatment are expected to reassess and potentially adjust their treatment, including the option of providing additional treatment processes. You must include a brief explanation regarding the cause of the exceedance and how you will adjust treatment to correct corrosion issues.

### Installation Requirements for Small/Medium Systems:

- For systems on their first lead and/or copper exceedance, the option exists to conduct 2 consecutive 6-month monitoring periods with 90<sup>th</sup> percentile values below both the lead and copper action levels to avoid immediate treatment installation. However, you MUST still:
  - complete a CCT Recommendation using the available options
  - contact your Rule Manager to verify that you qualify as an initially exceeding system before attempting the 2 consecutive 6-month monitoring period sampling option.
- Systems that are on their second (or greater) exceedance are required to install treatment. The system will be required to install the approved CCT within 12 months of the second exceedance (as opposed to the 24 months allowed for an initial exceedance).

**11b)** For your proposed operating guidelines, list each parameter that you will be altering for corrosion control and specify a range of values, minimum value, or maximum value for that parameter (as applicable). You do not need to specify ranges for a particular parameter if you are not altering that parameter.

For example, if you are only adjusting pH, you will only need to specify your pH range. If you are adjusting pH and feeding orthophosphate, you should specify a range for your pH and a minimum orthophosphate value (as PO<sub>4</sub>, not total P) at the entry point (dosage) and in the distribution system (residual). Please specify operational values/ranges that are both achievable at the system and reasonable, in terms of regulation. If you specify a range that is very small (such as 7.2 - 7.3 for pH) or is very large (such as 7.0 - 9.0 for pH), the Rule Manager may not approve your CCT Recommendation and/or may create and approve an altered value/range.

Additional information for setting ranges:

- i) The minimum acceptable pH value is 7.0 standard units (see ii below). Anything below this will not be accepted. The upper limit is typically restricted to a maximum of 9.5 standard units, however, the maximum approved will depend on your system's water chemistry and EPA guidance recommendations.
- ii) If you are feeding orthophosphate as part of your corrosion control program, a pH range of 7.2 - 7.8 is typically suggested. Some systems are unique and may require slightly different parameters (e.g. systems with chloramines will have a higher pH range). Consult your Regional Office and Rule Manager if you have questions.
- iii) The minimum acceptable value for orthophosphate addition is 0.5 mg/L as PO<sub>4</sub> at the entry point AND in the distribution system. Systems with high lead levels or high Dissolved Inorganic Carbonate (DIC) values may be approved for 1.0 mg/L as PO<sub>4</sub> as their minimum.  
**Note:** You may need to feed more than 0.5 mg/L as PO<sub>4</sub> at the entry point in order to achieve the proper residual in your distribution system!
- iv) The values/ranges listed on this form will be those that you are required to maintain for WQP compliance monitoring, following the installation of the CCT at your system. If your required WQP sampling results are outside of these values/ranges for more than 9-days per 6-month period, you may be required to complete an additional 2 consecutive 6-months of WQP monitoring, and you may be returned to standard lead and copper monitoring.

## 12. Additional Comments:

Provide any additional comments that will assist in determining optimal corrosion control treatment for your PWS. If you have no additional comments, you may leave this section blank (it will not affect the approval process). This section can include any corrosion control study information from the previous sections, information from the Regional Office, or any comments that may provide an explanation for any part of your WQP values/ranges or CCT Recommendation. Please attach additional sheets as necessary.