

COOLING TECHNOLOGY INSTITUTE

CTI Code Tower

Standard Specifications

Corrosion Coupon Preparation and Testing



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STD-149 (22)

This document was developed using the consensus procedure outlined in the CTI Operating Procedure 304 and has been approved for publication by the CTI Board of Directors

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This guideline document summarizes the best current state of knowledge regarding the specific subject. This document represents a consensus of those individual members who have reviewed this document, its scope and provisions. It is intended to aid all users or potential users of cooling towers.

Approved by the CTI Executive Board.



This document has been reviewed and approved as part of CTI's Five Year Review Cycle. This document is again subject to review in 2027.

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CTI-Guideline
STD-149 (22)

Corrosion Coupon Testing and Test Devices

General

The Water Treating Committee of the Cooling Technology Institute has initiated a program to develop standardized test procedures and evaluation techniques. These are designed to provide a uniform method to compare relative water treatment program performance in a cooling water system. Corrosion coupons, when prepared and evaluated similarly, can provide a standardized method to compare relative corrosion performance of various water treatment conditions within a cooling water system. This standard will provide uniformity in the evaluation process. Coupons are typically obtained from reputable suppliers who prepare the coupons using various procedures outlined below. Coupon corrosion rates and characteristics are not necessarily an indication of the actual system corrosion, but rather are a relative performance indicator.

Corrosion Coupons

Corrosion coupons installed in a cooling water system are used as a primary source of performance evaluation in many cases. However, variations including the coupon holding device, size of coupon, preparation of coupon, orientation of coupon, evaluation of coupon, metallurgy, and presentation of results, among other factors, can render comparisons between coupon results difficult. To the degree that standardization can be achieved, it is beneficial.

This document addresses the use of coupons, type of coupon racks, preparation of coupons prior to installation, installation of coupons, removal of coupons, cleaning of coupons, and evaluation of the coupons.

Side Stream Coupon Racks

The recommended device is shown in Figure 1.

1. The coupon rack water supply line shall be installed on the side of a cooling water pipe, not at the bottom or top of a horizontal run. It may be installed on any side of a vertical run of pipe.

2. Water flow shall be controlled at the outlet of the coupon rack under all circumstances to assure the rack is completely full of water.
3. The corrosion rack will be oriented in a position to guarantee that it will remain flooded at all times. Full water flow through the system should be observed at all times.
4. The linear water flow rate (feet per second/meters per second) past the coupon is a critical parameter in determining the corrosion rate to be experienced by the coupon. A flow rate should be chosen that is typical of the system component that is being modeled. In addition, a properly selected flow control valve and flow measurement device should be installed on the discharge end of the rack, upstream of the exit block valve. Dole valves are one means of addressing both concerns, but the orifices frequently foul or become damaged, and they may be unreliable unless a flow measurement device is incorporated to verify the flow control. For this reason a proper flow control valve immediately preceded by a flow measurement device may be a more reliable choice. Water flow to the test rack is typically held between 1.5 to 5 feet per second (0.46 to 1.5 meters per second), or a velocity appropriate for the application.
5. Shut off valves should be installed at both ends of the rack to insure that it can be isolated in order to change coupons or effect repairs. Drainage also needs to be provided. A block and bleed system using ball valves is typically used.
6. The piping of the coupon rack shall be 1-inch diameter, Schedule 40 PVC or CPVC pipe. If PVC or CPVC is used, it should be protected from any possibility of accidental impact and breakage. Schedule 80 pipe may be utilized for strength in place of Schedule 40.

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When using PVC, which may be subject to formation of biofilm, annual cleaning of the rack and supply lines with a cleaning solution such as bleach may be performed. This may be necessary more often if conditions dictate. Adequate flushing of cleaning chemicals from the line prior to installing coupons is an important part of this effort. For specialized applications, other materials such as stainless steel or black iron may be utilized; considerations can include operating pressures and temperatures, among other factors.

7. The preferred location of the rack is in the combined return water to the cooling tower. The water at this point is normally higher temperature, which renders it more corrosive than the supply water. Other locations, as dictated by circumstances such as a specific heat exchanger outlet line, may also be used.
8. The exterior of the coupon holder shall be visibly marked so that coupon orientation is known after screwing the coupon and holder into the coupon rack.

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