



Fort Collins Utilities Performance Audit Guidelines

Note: Audit is performed on turf zones with rotors, spray heads or multi-jet rotary nozzles, not subsurface systems, microspray, bubbler or drip zones.

1. System Evaluation

- Do a visual inspection of each zone to identify any defects or deficiencies in the system. List any problems on the Zone Evaluation Form.

2. Pressure Test

- Pressure tests should be conducted using the appropriate pressure testing device on one sprinkler per zone.
- All pop-up spray sprinkler bodies equipped with spray nozzles shall operate at no less than twenty (20) psi and no more than thirty (30) psi.
- All rotary sprinklers and multi-stream rotary nozzles on pop-up spray bodies shall operate at the manufacturer's specific optimum performance pressure.

3. Audit Procedures

- Maximum wind velocity of 5 mph. Over 5 mph, wind is felt on the face.
- All catch devices must be uniform in size and shape. Larger collectors give better repeatable results.
- A minimum of 24 catch cans should be used.
- The catch cans along the edge of the zones should be placed 12 to 24 inches in from the edge.
- Minimum catchment device spacing:
 - For spray heads: near a head (within 2 to 3 feet) and half-way between the heads.
 - For rotors spaced less than 40 feet on center: near a head (within 2 to 3 feet) and every one-third of the distance between the heads.
 - Rotors spaced greater than 40 feet on center: near a head (within 2 to 3 feet) and every one-fourth of the distance between the heads.
- Unusual or irregularly shaped areas:
 - For rotors: uniform grid of catch devices, 10 to 20 feet on center spacing (i.e., baseball infield, golf green).
 - For spray heads: uniform grid of catch devices, 5 to 8 feet on center spacing (i.e., curvilinear areas without defined rows of sprinklers).
- Test run times must be consistent and appropriate for the sprinkler type and arc. Recommended 10 minutes for rotors and multi-jet spray nozzles and 5 minutes for spray heads.
- When the test area contains multiple stations, the test run times for each station or zone must be adjusted to achieve a matched precipitation rate across the test area.
- Using information from one station or zone and applying to another may be used when there are a large number of sprinkler zones that are identical, i.e. the same sprinkler head, nozzle, spacing and operating pressure. The auditor may elect to

perform catch device tests on one-third to one-half of the sprinkler zones to get an average value that could be applied to all sprinkler zones that are identical.

4. Performance Calculations

Precipitation Rate using milliliter readings:

$$PR_{net} = [(V_{avg}) \times 3.66] \div (T_R \times A_{CD}) = \text{_____ in/hr}$$

Precipitation Rate using inch (decimal) readings:

$$PR_{net} = (V_{avg} \times 60 \text{ min}) \div (T_R \times A_{CD}) = \text{_____ in/hr}$$

Where:

PR_{net} = precipitation rate (inches per hour)

V_{avg} = Avg. catchment volume (milliliters or inches)

T_R = Test run time (minutes).

A_{CD} = Area of catch can throat area (square inches)

Distribution Uniformity using low-quarter (DU_{LQ})

$$DU_{LQ} = \frac{\text{Average Catch of Lower Quarter}}{\text{Average Catch Overall}} = \text{_____ \%}$$

5. Audit Results

- The City's Land Use Code says, "Minimum acceptable distribution uniformities shall be 60% for sprayhead zones and 70% for rotor zones. Sprayheads shall include zones with multi-stream rotary nozzles." If the audit shows the system doesn't meet these standards, the contractor must correct the problems and have a new audit performed.

6. Audit Forms

The auditor must provide the following forms to the contractor/owner:

- Performance Audit Form
- Zone Evaluation Form
- Catch Can Form

6. Follow-up Inspections

- The City will perform periodic inspections for quality assurance. Submittal of inaccurate audit data may result in auditor's removal from the City's Approved Auditor List.