



Landscape and Irrigation Standards for Water Conservation

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City of Fort Collins Land Use Code Revisions

Division 3.2, Section 3.2.1 (E)(3) *Water Conservation:*

(3) *Water Conservation.* All landscaping plans shall be designed to incorporate water conservation materials and techniques through application of Xeriscape landscaping principles. Xeriscape landscaping principles do not include or allow artificial turf or plants, mulched (including gravel) beds or areas without landscape plant material, paving of areas not required for walkways, plazas or parking lots, bare ground, weed covered or infested surfaces or any landscaping that does not comply with the standards of this section.

- a. Xeriscape landscaping principles include the following:
 - 1. Design. The design identifies zones of different water requirements and groups plants together with similar water needs ;
 - 2. Appropriate Use of Turf. Limit high-irrigation turf and plantings to appropriate high-use areas with high visibility and functional needs;
 - 3. Low Water-using Plants. Choose low-water demanding plants and turf where practicable;
 - 4. Irrigation. Design, operate and maintain an efficient irrigation system;
 - 5. Soil Preparation. Incorporate soil amendments before planting;
 - 6. Mulch. Add mulch to planting beds to a minimum depth of 3 inches;
 - 7. Maintenance. Provide regular and attentive maintenance.
- b. Landscape Plans submitted shall include:
 - 1. Accurate and clear identification of all applicable hydrozones using the following categories:
 - High Hydrozone: 18 gallons/s.f./season
 - Moderate Hydrozone: 10 gallons/s.f./season
 - Low Hydrozone: 3 gallons/s.f./season
 - Very Low Hydrozone: 0 gallons/s.f./season
 - 2. A Water Budget Chart that shows the total annual water use, which shall not exceed fifteen (15) gallons per square foot over the site; including all hydrozones used on the Landscape Plan.

Division 5.1, Section 5.1.2 *Definitions:*

Hydrozone shall mean areas within the landscape defined by a grouping of plants requiring a similar amount of water to sustain health. For the purposes of this document, hydrozones are broken into the following four categories:

- (1) Very low hydrozones include plantings that need water when first planted, but none once established. Typical plants in this hydrozone include yarrow, rabbitbrush and many native plants.

(2) Low hydrozones include plantings that generally do not require more than 3 gallons per square foot of supplemental water per year. During plant establishment or drought, additional supplemental water may be beneficial. Typical plants in this hydrozone include buffalograss, penstemon and daylily.

(3) Moderate hydrozones include plantings that generally require 10 gallons per square foot of water supplemental water per year. Typical plants in this hydrozone include turf-type tall fescue, potentilla and purple coneflower.

(4) High hydrozones include plantings that generally require 18 gallons of water per square foot of supplemental water per year. Typical plants in this hydrozone include Kentucky bluegrass, cottonwood, arborvitae and columbine.

Division 3.2, Section 3.2.1 (I)(2) *Landscape Materials, Maintenance and Replacement:*

(2) *Plant Materials.* Plant materials shall be selected from a list of native plants and other plants determined to be appropriate for and well adapted to local environmental conditions to be established and updated from time to time by the Director and entitled the City of Fort Collins Plant List. Additional plants may be added to the Plant List upon a determination by the Director that such plants are appropriate for inclusion consistent with the above standard.

Division 3.2, Section 3.2.1 (J) *Irrigation:*

(1) Provision shall be made for permanent, automatic irrigation of all plant material, with the following exceptions:

- a. Very low water use plantings that do not require any supplemental irrigation beyond establishment.
- b. Trees and other plants used to landscape a residential local street parkway abutting lots for single-family detached dwellings.

(2) For any development provided water by the City, an irrigation plan shall be submitted to and approved by the Utilities General Manager prior to the issuance of the building permit, or if no building permit is required, then prior to commencement of construction. As determined by the City, minor redevelopment or change-in-use projects may not be required to submit an irrigation plan; in such cases, a written statement shall be submitted describing the type of irrigation system proposed. The irrigation plan shall incorporate the City of Fort Collins Irrigation System Standards for Water Conservation set forth below. In addition, the irrigation system must be inspected for compliance with the approved irrigation plan before the issuance of a Certificate of Occupancy.

(3) The City of Fort Collins Irrigation System Standards for Water Conservation are as follows:

a. Irrigation Methods and Layout

- 1. The irrigation system shall be designed according to the hydrozones shown on the landscape plan.

2. Each zone shall irrigate a landscape with similar site, soil conditions and plant material with similar water needs. To the extent reasonably feasible, areas with significantly different solar exposures shall be zoned separately.
 3. Turf and non-turf areas shall be irrigated on separate zones.
 4. On steep grades, an irrigation method with a lower precipitation rate shall be used in order to minimize runoff and, to the extent feasible, these areas shall be zoned separately.
 5. Drip, micro-sprays, sprayheads and rotors shall not be combined on the same zone.
 6. The irrigation method shall be selected to correlate with the plant density. Drip irrigation or bubblers shall be used for sparsely-planted trees and shrubs, and rotors, sprayheads and multi-jet rotary nozzles shall be used for turfgrass.
- b. Equipment Selection
7. In order to reduce leakage of water from the irrigation system, a master shut-off valve shall be installed downstream of the backflow device to shut off water to the system when not operating.
 8. For irrigation systems that are on a combined-use tap, with a water meter installed upstream to measure total water use, the installation of an irrigation-only submeter should be considered. This submeter would enable the owner and landscape maintenance contractor to monitor water use for irrigation, and would not be used for billing purposes. The cost of installation and maintenance of the submeter shall be borne by the owner of the property, and not by the City. All such submeters shall be installed in accordance with the specifications established by the City
 9. Irrigation controller(s) shall be “smart” controllers, using climate-based or soil moisture-based technology, selected from the Irrigation Association’s current Smart Water Application Technologies (SWAT) tested products list or other similarly tested product list. Controllers must be installed and programmed according to manufacturer’s specifications.
 - a. A data input chart for the Smart Controller, including the precipitation rate from the audit, shall be posted at each irrigation controller.
 - b. Within 6 weeks of the installation of new landscaping, the irrigation system “smart” Controllers shall be reset to the normal seasonal watering schedule.
 10. A rain sensor shall be installed on each irrigation controller and installed according to the manufacturer’s specifications.
 11. Sprinklers and nozzles shall meet the following requirements:
 - a. The type of sprinkler and associated nozzles shall be selected to correlate with the size and geometry of the zone being irrigated.

- b. Sprinklers shall be spaced no closer than seventy-five (75) percent of the maximum radius of throw for the given sprinkler and nozzle. Maximum spacing shall be head-to-head coverage.
 - c. Coverage arcs and radius of throw for turf areas shall be selected and adjusted to water only turf areas and minimize overspray onto vegetated areas, hard surfaces, buildings, fences, or other non-landscaped surfaces.
 - d. Sprinklers, bubblers or emitters on a zone shall be of the same manufacturer.
 - e. Sprayheads in turf areas shall have a minimum three and one-half (3½) inch pop-up riser height.
 - f. Sprayheads on a zone shall have matched precipitation nozzles.
 - g. Nozzles for rotors shall be selected to achieve an approximate uniform precipitation rate throughout the zone.
 - h. All sprayheads and rotors shall be equipped with check valves and pressure regulating stems.
12. Pressure-compensating emitters shall be used for drip irrigation. For sloped areas, a check valve shall be installed and the drip line shall be parallel to the slope.
13. Remote control valves shall have flow control.
14. A backflow prevention assembly shall be installed in accordance with local codes. All backflow assemblies shall be equipped with adequately sized winterization ports downstream of the backflow assembly.
15. Properties with single or combined point of connection flows of 200 gpm or greater, shall have a control system capable of providing real-time flow monitoring and the ability to shut down the system in the event of a high flow condition.
- c. Sleeving
- 1. Separate sleeves shall be installed beneath paved areas to route each run of irrigation pipe or wiring bundle. The diameter of sleeving shall be twice that of the pipe or wiring bundle.
 - 2. The sleeving material beneath sidewalks, drives and streets shall be PVC Class 200 pipe with solvent welded joints.
- d. Water Pressure
- 1. The irrigation system designer shall verify the existing available water pressure.
 - 2. The irrigation system shall be designed such that the point-of-connection design pressure, minus the possible system pressure losses, is greater than or equal to the design sprinkler operating pressure.

3. 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.
4. All rotary sprinklers and multi-stream rotary nozzles on pop-up spray bodies shall operate at the manufacturer's specific optimum performance pressure.
5. If the operating pressure exceeds the manufacturer's specified maximum operating pressure for any sprinkler body, pressure shall be regulated at the zone valve or sprinkler heads.
6. Booster pumps shall be installed on systems where supply pressure does not meet the manufacturer's minimum recommended operating pressure for efficient water distribution.

(e) Sprinkler Performance Audit

1. A sprinkler performance audit shall be performed by a landscape irrigation auditor certified by the Irrigation Association (a non-profit industry organization dedicated to promoting efficient irrigation). The sprinkler audit must be performed by an auditor independent of the installation contractor.
2. The audit shall include measurement of distribution uniformity. Minimum acceptable distribution uniformities shall be sixty (60) percent for sprayhead zones and seventy (70) percent for rotor zones.
3. The audit shall measure the operating pressure for one sprinkler on each zone to determine whether the zone meets the above pressure requirements.
4. A copy of the sprinkler performance audit shall be submitted to and approved by the City before issuance of a certificate of occupancy.



Submittal Checklist: *Landscape Plan*

Refer to the City's Submittal Checklists for Project Development Plans (PDP) and Final Plan Review for additional submittal requirements. These notes supplement those documents.

Landscape Plans must include:

- Accurate and clear identification of all applicable hydrozones using the following categories:
 - High Hydrozone: 18 gallons/s.f./season
 - Moderate Hydrozone: 10 gallons/s.f./season
 - Low Hydrozone: 3 gallons/s.f./season
 - Very Low Hydrozone: 0 gallons/s.f./season
- A Water Budget Chart that shows the total annual water use, which shall not exceed fifteen (15) gallons per square foot over the site, including all hydrozones used on the landscape plan. (Table 1)
- Plant material shall be selected from the *City of Fort Collins Plant List*.
- A General Note: "An irrigation plan is required to be submitted to and approved by Fort Collins Utilities prior to the issuance of the building permit, in accordance with the Land Use Code Section 3.2.1.J requirements."

Table 1: **Water Budget Chart**

A Water Budget is the target amount of water that should be applied during a typical watering season.

Instructions:

1. Divide the plan into hydrozones, grouping plants with similar water needs together. Check the *City of Fort Collins Plant List* to determine the appropriate hydrozones for plants in your design.
2. Calculate the area (in square feet) for each hydrozone. Add the square feet together for all the areas in the same hydrozone. For example, if there are three Moderate hydrozone areas, add the areas together for a total.
3. Calculate a total water use (in gallons) for each type of hydrozone by multiplying the area by the gallons per square foot. Add the water use for all the hydrozones together to determine a total annual water use for the site.
4. Divide the total annual water use by the total square footage to determine that the overall site will use no more than 15 gallons per square foot per watering season.

Water Budget Chart
(an example)

Hydrozone	Area (s.f.)	Water Need (gallons/s.f.)	Annual Water Use (gallons)
High	6,830	18	122,940
Moderate	14,480	10	144,800
Low	1,310	3	3,930
Very Low	0	0	0
TOTAL	22,620	Avg.: 12.0	271,670

Note: The average Water Need must be a maximum of 15 gal./s.f./season.



Submittal Checklist: *Irrigation Plan*

An irrigation plan is required for any development provided water by the City. Submit irrigation plans to Fort Collins Utilities (FCU) at 700 Wood St., Contact Eric Olson at 970- 221-6704 or eolson@fcgov.com for more information.

Compliance with the Irrigation Standards for Water Conservation includes five steps.

Step 1: Irrigation Plan Submittal & Review

Submit Irrigation Plan to FCU prior to the issuance of the building permit, or if no building permit is required, then prior to commencement of construction. FCU will stamp and sign a plan approved for construction. The plan must meet the requirements of Land Use Code 3.2.1(J)(3) and the *Irrigation Plan Submittal Checklist* and the following information.

- A digital copy of the irrigation plan as a .pdf.
- A title block with name of project, sheet name, company identification including address, phone number, name of person preparing the plan and date. Name, address and contact phone number for property owner.
- A reference to the specific landscape plan, with its date and the designer's name and contact information.
- A scale to match landscape plan; preferably 1" = 20 feet.
- North arrow and legend.
- Property lines, existing and future easements and rights-of-way.
- Locations to be irrigated with potable and non-potable water and the total square footage of each.
- An Annual Water Use Chart (see Table 1). Include the square footage of zones and irrigation water use. The water use data shall reflect the water requirements of the hydrozones identified on the associated landscape plan.
- A Smart Controller data input chart (see Table 2). The columns labeled 'slope' and 'microclimate' may be left blank to be completed on the "as-built" drawings.
- A Pressure Calculation Worksheet (see Table 3). Show that the point-of-connection design pressure, minus the possible system pressure losses, is greater than or equal to the design sprinkler operating pressure.
- The following General Notes:
 1. Any field adjustment or redesign of this irrigation system must conform to the City of Fort Collins Irrigation Standards.
 2. Contractor installing the system must provide FCU and the owner with "as-built" drawings after installation is complete, including updated charts with existing field conditions.
 3. The system design assumes a minimum dynamic pressure for the irrigation system of __ psi, at a minimum discharge of __ gpm at each __-inch point-of-connection. Verify pressure and flow on site prior to construction.

4. Read thoroughly and become familiar with the specifications and installation details for this and related work prior to construction.
5. Coordinate utility locates (“Call Before You Dig”) of underground utilities prior to construction.
6. Do not proceed with the installation of the irrigation system when it is obvious in the field that obstructions or grade differences exist that might not have been considered in the engineering. If discrepancies in construction details, legend, notes or specifications are discovered, bring all such obstructions or discrepancies to the attention of the owner’s representative.
7. The drawings are diagrammatic. Therefore, the following should be noted:
 - Although irrigation components may be shown outside planting areas for clarity, install irrigation pipe and wiring in landscaped areas whenever possible.
 - Tree and shrub locations as shown on landscape plans take precedence over irrigation equipment locations. Avoid conflicts between the irrigation system, planting materials and architectural features.
 - Use only standard tees and elbow fittings. Use of cross type fittings is not allowed.
8. Provide the following components to the owner prior to the completion of the project:
 - Two (2) operating keys for each type of manually operated valves.
 - Two (2) of each servicing wrench or tool needed for complete access, adjustment and repair of sprinklers.
9. Select nozzles for sprayheads and rotors with arcs which provide complete and adequate coverage with minimum overspray for the site conditions. Carefully adjust the radius of throw and arc of coverage of each rotary sprinkler to provide the best performance.
10. Install all electrical power to the irrigation control system in accordance with the national electric code and all applicable local electric utility codes.
11. If a section of unsized pipe is located between the identically sized sections, the unsized pipe is the same nominal size as the two sized sections. The unsized pipe should not be confused with the default pipe size noted in the legend.
12. Install a minimum of two (2) appropriately sized control wires and one (1) common wire from controller location to each dead-end of mainline for use as spares in case of control wire failure. Cap end of wires with waterproof wire connector. Wire terminations must be located in a valve box. In addition, coil three (3) feet of wire in valve box.
13. Within six (6) weeks of the installation of new landscaping, the irrigation system installer shall reset the Smart Controllers to the normal seasonal watering schedule.

Step 2: Installation Site Inspection

Contact FCU when irrigation construction begins. FCU will perform periodic site inspections to ensure installation follows the approved plan.

Step 3: Performance Audit

- Contact an auditor from the City's *Approved Auditor List*. Systems with subsurface irrigation are exempt from the audit.
- Auditor performs audit according to the City's *Sprinkler Performance Audit Guidelines* and using the Performance Audit and Catch Can Data forms, including the following data:
 - Operating pressure for one sprinkler on each zone. Must meet the stated pressure requirements of City of Fort Collins Land Use Code 3.2.1(J)(3)(d).
 - Distribution uniformity. Minimum acceptable distribution uniformities are: 60% for sprayhead zones and 70% for rotor zones. The auditor may elect to perform tests on one-third to one-half of the zones to get an average value that could be applied to all zones that are identical (have the same sprinkler head, nozzle, spacing and operating pressure).

Step 4: Final Submittals and Approval

- Submit "as-built" irrigation plan, completed Smart Controller input chart and Sprinkler Performance Audit and Catch Can Data forms to FCU.
- FCU approves the installation and submittal documents before issuance of a certificate of occupancy.

Step 5: Six-Week Inspection

- Within six weeks of the installation of new landscaping, reset the Smart Controller(s) to the normal seasonal watering schedule.
- FCU will inspect that the controller has been programmed for a normal schedule, that the input chart has been posted and the rain sensor properly installed.

Table 1: Annual Water Use Chart

Instructions:

1. Irrigated areas for each zone should be a "best estimate" splitting areas between zones as necessary. For drip irrigation, the irrigated area should approximate the area actually wetted by the emitters.
2. The average annual water use in gallons per square foot can be determined by referring to the hydrozones listed on Water Budget Chart on the landscape plan.
3. The annual total water use (gallons) can be determined by multiplying the irrigated area (square feet) by the average gallons per square foot for that zone.
4. Divide the total water use by the irrigated area to determine overall gallons per square foot (not to exceed 15 gal./s.f.)

Annual Water Use Chart

(an example)

Zone I.D.	Irrigated Area (s.f.)	Hydrozone	Water Use (gal./s.f.)	Total Water Use (gal.)
A1	6,380	Moderate	10	63,800
A2	8,100	Moderate	10	81,000
A3	5,330	High	18	95,940
A4	1,500	High	18	27,000
A5	820	Low	3	2,460
A6	490	Low	3	1,470
TOTAL	22,620		Avg.: 12.0	271,670

Table 2: Smart Controller Data Input Chart

This chart is to be used to input data to program the Smart Controller. Terms will vary according to the type of controller installed. Refer to the User's Manual for a definition of the parameters as defined by the specific controller. For drip zones, use the estimated precipitation rate.

Smart Controller Data Input Chart

(an example)

Zone ID	Sprinkler Type	Precip. Rate (in./hr.)	Plant Material Type	Soil Type	Slope	Microclimate (Sun/Shade)
A1	Spray	1.5	Cool turf	Clay	Gentle	Sunny All Day
A2	Spray	1.5	Warm turf	Clay	Mild	Sunny Most of the Day
A3	Rotor	.5	Cool turf	Clay	Steep	Shady Most of the Day
A4	Drip	1.1	Shrubs	Clay	None	Shady All Day
A5	Bubbler	2.3	Perennials	Clay	Moderate	Sunny All Day

Table 3: Pressure Calculation Worksheet

Complete this form for the most pressure-demanding lateral and submit it with the irrigation plan.

Pressure Calculation Worksheet

- A. Pressure available at point-of-connection _____ psi
- B. Pressure loss through the meter - _____ psi
- C. Pressure loss through backflow prevention device - _____ psi
- D. Pressure loss in mainline pipe from backflow prevention device to remote control valve - _____ psi
- E. Pressure loss through remote control valve - _____ psi
- F. Pressure loss in lateral pipe from remote control valve to most remote sprinkler - _____ psi
- G. Elevation change from point-of-connection to most remote sprinkler (0.43 psi per foot of elevation):
 pressure loss - _____ psi
 or
 pressure gain + _____ psi
- H. Miscellaneous losses through other valves, strainers, etc.
 (in some cases this will not be applicable) - _____ psi
- I. Total possible pressure loss (add *B* through *H*) - _____ psi
- J. Remaining pressure (subtract *I* from *A*) _____ psi
- K. Minimum pressure required at sprinkler _____ psi
- L. Difference (Subtract *K* from *J*. If the value is negative, a booster pump may be needed. If the value is more than +15 psi, pressure reduction may be necessary for this zone, and/or other zones.) _____ psi