



Submittal Requirements: Preliminary Irrigation Plan (PIP) Final Irrigation Plan (FIP)

Irrigation plans are required for any development within the City of Fort Collins to comply with both Land Use Code and Water Conservation Standards (section [3.2.1 of the Land Use Code](#) (LUC)). For more information, contact 970-221-6704 or IrrigationDR@fcgov.com.

Irrigation plans are required for any development that is creating a new landscape plan or if the Hydrozones are being updated on an existing landscape plan.

The Preliminary Irrigation Plan (PIP) establishes the general irrigation design and annual water allotted for landscapes. The Final Irrigation Plan (FIP) builds upon the PIP and includes specific irrigation componentry information. For projects also submitting a landscape plan the PIP is required with initial submittals for Final development Plans (FDP) and the FIP is required with initial submittals for Building Permit. For Basic Development Review (BDR), Major and Minor Amendments a PIP *may* be required if there are changes to the hydrozones table.

Preliminary Irrigation Plan (PIP)

The PIP shall be submitted digitally, in the form of a PDF. Review the requirements of the PIP and submit these plans to IrrigationDR@fcgov.com. For more information, contact 970-221-6704.

- a) A digital copy of the PIP as a .pdf.
- b) Provide a **Hydrozone Plan View Diagram**. The Hydrozone Plan View Diagram should depict watering areas broken down by Hydrozones and should align with the corresponding with the Landscape Plan and Utility Plan. The plan layout should fill the pages. Match lines may be used for larger sites. The Plan should include:
 1. 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.
 2. The drawing scale may match the landscape plan and layout of the landscape plan sheets (typically 1:20). If a smaller scale is used, the drawing scale must be large enough to clearly convey the design information.
 3. North arrow and legend.
 4. Property lines, existing and future easements and rights-of-way.
 5. The location/point of irrigation tap connections (POC) with the water system. This must match the information on the Utility plans.
 6. Proposed peak gallons per minute (GPM) and tap size for each tap. Tap size, location, and identification must match information found on Utility plans.
 7. Show the layout of irrigation main lines proposed.
 8. An accurate and clear visual identification of all planting area hydrozones using the following categories using. Use easily distinguish symbols, labeling, hatch patterns, and relationships of plan elements when reviewing the overall plan view provided on each page.

Hydrozone	Water Use (gallons/s.f./season)
High	18
Moderate	14
Low	8
Very Low	3

- c) Include a **Water Use Table** for each irrigation tap, corresponding to the **Hydrozone Plan View Diagram** (described above). The Water Use Table shall show the total annual water use, which shall not exceed an average of fifteen (15) gallons per square foot for the landscape and should align with the Water Budget Table also found on the landscape plans and tap size information found on the Utility Plans. (See instructions and example below).
1. Organize the table by irrigation zones for each tap. If more than one tap is proposed, provide separate table of information for each tap and combined total information.
 2. Divide the plan into irrigation water requirement zones (IWR), grouping plants with the same water needs together. Check the City of Fort Collins Vegetation List (fcgov.com/vegetation) to determine the appropriate water needs for plants in your design.
 3. Calculate the area (in square feet) of each IWR. 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.
 4. Calculate a total water use (in gallons) for each type of hydrozone by multiplying the area of the IWR by the gallons per square foot. Add the water use for all the zones together to determine total annual water use for the site.
 5. Divide the total annual water use by the total square footage to determine average gallons per square foot. The site shall not exceed an average of fifteen (15) gallons per square foot*.

Annual Water Use Tables Per Tap
(an example)

Tap A				
Zone I.D. for Tap A	(CALCULATED) Irrigated Area (s.f.)	(STANDARD DOES NOT CHANGE) Hydrozone	(STANDARD DOES NOT CHANGE) Water Use (gal./s.f.)	(CALCULATED) Total Water Use (gal.)
A1	6,380	Moderate	14	89,320
A2	8,100	Moderate	14	113,400
A3	5,330	High	18	95,940
A4	1,500	High	18	27,000
A5	820	Low	8	6,560
A6	490	Low	8	3,920
SUB TOTAL	22,620			336,140
Average Gal/Sq Ft	14.86* <i>This value not to exceed 15 gal/sq ft.</i>			

Tap B				
Zone I.D. for Tap B	(CALCULATED) Irrigated Area (s.f.)	(STANDARD DOES NOT CHANGE) Hydrozone	(STANDARD DOES NOT CHANGE) Water Use (gal./s.f.)	(CALCULATED) Total Water Use (gal.)
B1	7,200	Moderate	14	100,800
B2	5,000	Moderate	14	70,000
B3	2,000	High	18	36,000
B4	2,000	High	18	36,000
B5	500	Low	8	4,000
B6	505	Low	8	4,040
SUB TOTAL	17,205			250,840
Average Gal/Sq Ft	14.58* <i>This value not to exceed 15 gal/sq ft.</i>			

Aggregate Information (Tap A + Tap B)					
Tap ID	Total Irrigated Area	Average Water Use (gal/sq ft)	Total Water Use (gal)	Proposed Tap Size	Max GPM
A	22,620	14.86	336,140	¾ inch	17
B	17,205	14.58	250,840	¾ inch	17
TOTAL	39,825	14.72	586,980		

Final Irrigation Plan (FIP)

The FIP shall be submitted digitally, in the form of a PDF, and submitted to IrrigationDR@fcgov.com. It should build upon the PIP and show the following information. For more information, contact 970-221-6704 or IrrigationDR@fcgov.com.

- 1) **The Final Irrigation plan** (1 copy) shall be submitted digitally, in the form of a PDF to Fort Collins Utilities showing the following information:
 - a. A digital copy of the irrigation plan as a .pdf.
 - b. 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.
 - c. The drawing scale may match the landscape plan and layout of the landscape plan sheets (typically 1:20). If a smaller scale is used, the drawing scale must be large enough to clearly convey the design information.
 - d. North arrow and legend.
 - e. Property lines, existing and future easements and rights-of-way.
 - f. Locations to be irrigated with potable and non-potable water and the total square footage of each.
 - g. 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. This should build upon the Water Use Tables included in the PIP.
 - h. A Smart Controller data input chart (see Table 2). The columns labeled precipitation rate, slope and microclimate may be left blank to be completed on the “as-built” drawings.
 - i. For new builds, 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.
 - j. The following General Notes:
 1. Any field adjustment or redesign of this irrigation system must conform to the City of Fort Collins Irrigation Standards in the Land Use Code 3.2.1(J)(3).
 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. Although irrigation components may be shown outside planting areas for clarity, install irrigation pipe and wiring in landscaped areas whenever possible.
 8. 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.
 9. Use only standard tees and elbow fittings. Use of cross type fittings is not allowed.
 10. Provide to the owner prior to the completion of the project: two (2) operating keys for each type of manually operated valves and two (2) of each servicing wrench or tool needed for complete access, adjustment and repair of sprinklers
 11. 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.
 12. Install all electrical power to the irrigation control system in accordance with the national electric code and all applicable local electric utility codes.
 13. 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.
 14. 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 water-proof wire connector. Wire terminations must be located in a valve box. In addition, coil three (3) feet of wire in valve box.

15. 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.

k. 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.

l. Equipment Selection

1. 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.
2. Irrigation controller(s) shall be "smart" controllers, using climate-based or soil moisture-based technology, selected from the WaterSense labeled irrigation controllers list. Controllers must be installed and programmed according to manufacturer's specifications. A data input chart for the Smart Controller, including the precipitation rate from the audit, shall be posted at each irrigation controller. Within 6 weeks of the installation of new landscaping, the irrigation system "smart" Controllers shall be reset to the normal seasonal watering schedule.

- m. An ET sensor or weather monitor shall be installed on each irrigation controller and installed according to the manufacturer's specifications in a location to receive accurate weather conditions.

n. Sprinklers and nozzles shall meet the following requirements:

1. The type of sprinkler and associated nozzles shall be selected to correlate with the size and geometry of the zone being irrigated.
2. 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.
3. 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.
4. Sprinklers, bubblers or emitters on a zone shall be of the same manufacturer.
5. Sprayheads in turf areas shall have a minimum three and one-half (3½) inch pop-up riser height.
6. Sprayheads on a zone shall have matched precipitation nozzles. Variable Arc Nozzles (VANS) are not acceptable for 90, 180 and 360 degree applications. High-Efficiency Variable Arch Nozzles (HE-VANS) are allowed in odd shaped areas where 90, 180 and 360 degrees nozzles are not applicable.
7. Nozzles for rotors shall be selected to achieve an approximate uniform precipitation rate throughout the zone.
8. All sprayheads and rotors shall be equipped with check valves and pressure regulating stems.
9. 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.
10. Remote control valves shall have flow control.
11. 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.
12. 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.

o. 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.

p. 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.

2) Installation Site Inspection

- a. Contact Fort Collins Utilities when irrigation construction begins. Fort Collins Utilities will perform periodic site inspections to ensure installation follows the approved plan.

3) Performance Audit

- a. Contact an auditor from the City's *Approved Auditor List*. Systems with subsurface irrigation are exempt from the audit. The auditor should be independent of the irrigation system designer and installation professional. If this is not the case, indicate what the auditor's role was during design and installation.
- b. 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: a) operating pressure for one sprinkler on each zone, b) 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).
- c. Results below minimum acceptable distribution uniformity will require adjustments and/or repairs made to the irrigation system. These corrections will be noted on the irrigation as-builts and the test area re-audited until acceptable results are produced.

4) Final Submittals and Approval

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

5) Six-Week Inspection

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

Table 1: **Annual Water Use Chart**

Instructions: The Annual Water Use chart should build upon the chart submitted in the PIP and should match the Water Budget chart found on the final landscape plans (see LUC [section 3.2.1](#)). If there are multiple irrigation taps each tap must include its own table.

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 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.
3. Divide the total water use by the irrigated are to determine overall gallons per square foot (not to exceed 15 gal./s.f.)

Tap A				
Zone I.D. for Tap A	(CALCULATED) Irrigated Area (s.f.)	(STANDARD DOES NOT CHANGE) Hydrozone	(STANDARD DOES NOT CHANGE) Water Use (gal./s.f.)	(CALCULATED) Total Water Use (gal.)
A1	6,380	Moderate	14	89,320
A2	8,100	Moderate	14	113,400
A3	5,330	High	18	95,940

A4	1,500	High	18	27,000
A5	820	Low	8	6,560
A6	490	Low	8	3,920
SUB TOTAL	22,620		Avg.: 13.0	336,140
Average Gal/Sq Ft	14.86* <i>This value not to exceed 15 gal/sq ft.</i>			

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

For new builds, 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