

View Residential Water Fixture Unit Calculations Worksheet

Date:
 Permit Number:
 Development Name:
 Model Name:
 Address:



RESIDENTIAL WATER FIXTURE UNIT CALCULATIONS				
FIXTURE:	Quantity	Water FU <small>(Based on Table AP 103.3(2) of the 2018 IRC)</small>	TOTAL WATER F.U.	
Bathtub (with/without overhead shower head)	x	1.4	0	
Clothes washer	x	1.4	0	
Dishwasher (DW)	x	1.4	0	
3 Piece Bath Group (1 sink, toilet, tub)	x	2.6	0	
4 Piece Bath Group (1 sink, toilet, tub, shower stall)	x	3.8	0	
5 Piece Bath Group (2 sinks, toilet, tub, shower stall)	x	4.5	0	
Half Bath Group (toilet and sink only)	x	1.4	0	
Hose Bibb (sillcock)	x	2.5	0	
Kitchen group (DW & Sink with/without garbage grinder)	x	2.5	0	
Kitchen Sink	x	1.4	0	
Laundry group (clothes washer standpipe & laundry tub)	x	2.5	0	
Laundry tub	x	1.4	0	
Lavatory (sink)	x	0.7	0	
Shower stall	x	1.4	0	
Water closet/toilet (tank type)	x	1.0	0	
Basement Rough-In <small>(specify number and fixture type below, i.e. "3 piece bath group (1 sink, toilet, tub)" and the Water FU associated with the fixture type)</small>				
	x		0	
	x		0	
	x		0	
	x		0	
	x		0	
	x		0	
Graywater Credit (1.0 FU per water closet/toilet using graywater system)	x	-1.0	0	
(DO NOT WRITE BELOW THIS LINE) TOTALS :			0.0	Water FU
Peak Demand Estimate (Based on Table AP 103.3(3) of the 2018 IRC) =				GPM
If within Approved WEP Development: -2 gpm WEP credit				GPM
Highest Irrigation Zone (assumed 7 GPM unless irrigation calculations are submitted and residential water fixture unit calculations are signed and sealed by an engineer licensed in the State Colorado). GPM flow =				GPM
TOTAL GPM =				GPM
Water Meter size, to be filled in by the Town of Castle Rock Utility Department =				
SFE EQUIVALENT =				
Maximum calculated irrigable area (as shown on attached landscape plan) =				Sq.Ft.
Actual irrigated area (as shown on attached landscape plan) =				Sq.Ft.
Total turf area (as shown on attached landscape plan) =				Sq.Ft.
Total planting area (as shown on attached landscape plan) =				Sq.Ft.
<p><small>*For an individual address to qualify for a 5/8" (0.67 SFE) meter (that is not located within a development with an approved Water Efficiency Plan), the maximum calculated or actual irrigable area must be less than or equal to 1,400 sq.ft.</small></p>				



MEMORANDUM

To: Mark Marlowe, P.E., Director, Castle Rock Water

Thru: Jeanne Stevens, P.E., Engineering Manager

From: Tina Close, P.E., Plan Review Supervisor

Date: March 18, 2019

Title: Graywater System Credit for Residential Water Fixture Unit Calculations

Summary: Graywater systems proposed for new residential homes in Castle Rock Water's service area will receive a 1.0 fixture unit (FU) credit for each water closet using graywater.

Discussion: On January 8, 2019, Town Council adopted Ordinance No. 2018-047 *An Ordinance Amending Title 4 of the Castle Rock Municipal Code Adding a New Chapter 4.05 Entitled Graywater Systems*. The purpose of this ordinance is to allow graywater systems in Castle Rock Water's service area, to potentially reduce indoor water consumption to meet conservation goals.

Graywater systems are only allowed in new homes where plumbing systems have been designed for the graywater system. The Town of Castle Rock Residential Water Fixture Unit Calculation form has been revised to include a "Graywater Credit", 1.0 FU per water closet/toilet using a graywater system.

On the Residential Water Fixture Unit form the applicant will indicate the number of 3 piece Bath Groups, 4 piece Bath Groups, 5 piece Bath Groups, and water closet/toilet's proposed for the new home, including any basement rough-ins. The last row provided for fixtures on the form indicate the "Graywater Credit", where the applicant will provide the number of water closet/toilet's that will use the graywater system; that total will be multiplied by negative one, therefore providing a 1.0 FU credit for each graywater system water closet/toilet.

Peak demand in gallons per minute will remain the same, and continue to be interpolated from Table P2903.6 (1) 2012 IRC, using the total overall household Water FU, after any graywater credits are applied.

Cc: Engineering Office Assistant (once finalized)



STANDARD OPERATING PROCEDURE (SOP)		
Division: Engineering	SOP # 2018-01RWFU	SOP Owner: Kevin Elliott
Strategic Goal Tactic # N/A	Revision # N/A Date: 02/13/2018	Implementation Date: 02/13/2018

APPROVALS

Created By: Kevin Elliott	Supervisor: Jeanne Stevens
Division Manager: Jeanne Stevens	Director of Castle Rock Water: Mark Marlowe <i>[Signature]</i>
Title: Residential Water Fixture Unit Calculation SOP	

1. Purpose

- ▶ To provide guidance in the preparation of Residential Water Fixture Unit Calculations utilizing the revised Residential Fixture Unit Calculation Sheet and to highlight changes associated with the Residential Fixture Unit Calculation Sheet

2. Scope

- ▶ This SOP is intended to be used by Engineers, Developers, Homebuilders, Castle Rock Water Staff and others that may perform Residential Water Fixture Unit Calculations to determine the required meter size for individual units within residential development(s).

3. Prerequisites/Applicable Documents

- ▶ A Residential Fixture Unit Calculation Sheet will still be required for each specific address showing the possible options that would increase water demand. These options primarily include basement rough-ins associated with the given model and address. This would establish the potential demand that each specific home would place on the water system. Custom home plans would show the house as it is to be constructed and include all options/finishes that would increase water demand.
- ▶ If a value for highest irrigation zone other than 7.0 gpm is to be used for the purposes of calculating peak demand, complete front and back yard landscape and irrigation plans, to scale, must be submitted along with the associated irrigation worksheet(s). Additionally, the Residential Water Fixture Unit Calculation Sheet must be signed and sealed by an engineer licensed in the State of Colorado.

4. Responsibilities

- ▶ Currently Castle Rock Water Plan Review staff calculate the instantaneous peak flow based on the information provided on the Residential Water Fixture Unit Calculation worksheet. This SOP does not change this procedure, however there are additional criteria (Shown on the Residential Water Fixture Unit Calculation worksheet as well as Section 5 – Procedures, and Section 6 - Requirements of this document) that must be met for a specific home to qualify for a 0.67 SFE (5/8") meter.

5. Procedure

- ▶ The individual responsible for the preparation of the Residential Water Fixture Unit Calculation Sheet (Engineer, Homebuilder, Developer, etc.) will download the fillable form from CRgov.com. This fillable form must be completed and submitted to the Town of Castle Rock for review and approval. [Click here](#) for the fillable calculation worksheet.
- ▶ On the Residential Water Fixture Unit Calculation Sheet, enter the quantity for each fixture, including basement rough-ins associated with the given model and address.
- ▶ For the initial Residential Water Fixture Unit Calculation Sheet calculated for each model within each development, provide a copy of the Standard Plan submitted to the Town of Castle Rock Building Department so that Castle Rock Water Plan Review staff can verify the quantity of the fixtures (including basement rough-

ins) shown on the Residential Water Fixture Unit Calculation Sheet. This calculation will be used when reviewing the instantaneous peak indoor demand for subsequent identical models in the development with adjustments being made for each address based on the irrigation demand for the particular address. Although a "master" Residential Water Fixture Unit Calculation Sheet for each model was prepared, the Residential Water Fixture Unit Calculation Sheet must identify the specific address for permitting and fee assessment purposes.

- ▶ For Custom Homes, provide a copy of the Architectural Plan submitted to the Town of Castle Rock Building Department so that Castle Rock Water Plan Review staff can verify the quantity of the fixtures shown on the Residential Water Fixture Unit Calculation Sheet. Additionally complete front and back yard landscape and irrigation plans, to scale, must be submitted along with the associated irrigation worksheet(s), showing each irrigation zone flowrate in gpm. Residential irrigation designs shall be consistent with industry standards, and will include a minimum of three heads/nozzles per zone. The highest irrigation zone flowrate will then be added to the instantaneous peak demand to determine the total peak demand in gpm. If this information is not submitted, the highest irrigation zone flowrate that will be utilized on the Residential Water Fixture Unit Calculation worksheet will be 7.0 gpm. The Residential Water Fixture Unit Calculation Sheet must be signed and sealed by an engineer licensed in the State of Colorado.
- ▶ The Residential Water Fixture Unit Calculation Sheet automatically calculates the total number of Fixture Units based on the quantities entered for each fixture shown on the Residential Water Fixture Unit Calculation Sheet.
- ▶ The instantaneous peak demand will be determined by Castle Rock Water using the total number of fixture units and interpolating the flow in gpm based on the values contained in Table P2903.6(1) of the 2012 IRC (or the appropriate table included in subsequently adopted Building Codes).
- ▶ Seven gallons per minute (7 gpm) will be used as the highest irrigation zone flowrate unless the following are provided:
 - Complete, to scale front and back yard landscape and irrigation plans, along with the associated irrigation worksheet(s) showing each irrigation zone flowrate. Residential irrigation designs shall be consistent with industry standards, and will include a minimum of three heads/nozzles per zone. Sprinkler systems will be appropriately hydro-zoned to account for variations in plant type, slope, and exposure. Rotors, fixed spray, and drip shall be zoned separately.
 - The highest irrigation zone flowrate will then added to the instantaneous peak demand to determine the total peak demand in gpm.
 - The Residential Water Fixture Unit Calculation Sheet must be signed and sealed by an engineer licensed in the State of Colorado.
- ▶ Meter size and associated System Development Fees will then be calculated by Castle Rock Water Plan Review staff based on the total flowrate in gpm.

6. Requirements

- ▶ For homes at a specific address to qualify for a 0.67 SFE (5/8") meter, the following conditions must be met:
 1. Total lot shall have a maximum calculated or actual irrigable area of 1,400 square feet or less which includes turf and other landscaping. See attached "How to Calculate Irrigable Area" and the generic plot plan which reflects the areas identified in the "How to Calculate Irrigable Area" document. The maximum calculated or actual irrigable area shall be submitted for water budget rate determination.
 2. The back yard will be included in the maximum calculated or actual irrigable area outlined in item 1 above.
 3. Basement rough-ins (3-piece bath at a minimum) shall be included in the Residential Water Fixture Unit calculations.
 4. To qualify for a 0.67 SFE (5/8") meter, **THE FOLLOWING TWO CONDITIONS MUST ALL BE MET:**
 - The maximum calculated or actual irrigable area must be 1,400 square feet or less
 - The Residential Water Fixture Unit Calculations must reflect a maximum peak flow of 20.00 gpm or less
 5. The maximum calculated or actual irrigable area as appropriate, will be used as the landscape (Tier 2) water budget for each specific address going forward and no increase in that irrigable area will be allowed under the water budget rate structure.
 6. Builders must post a hard plastic or metal placard in the home next to the meter stating the home is limited in irrigable area based on TOCR guidelines and that no concessions and/or re-calculations will be considered based on historic water usage.

7. Castle Rock Water will identify these homes within the billing system and include notifications in Welcome Packets sent to the residents. (There may also be the possibility of requiring this information to be recorded so that it appears in Title documents for future homebuyers.)
 - ▶ For homes at a specific address that qualify for a 0.67 SFE (5/8") meter, Castle Rock Water Staff will track these calculations/addresses internally and conduct random inspections to determine compliance with the program. Homes found not to be in compliance will be required to be brought into compliance or be subject to additional System Development Fees and recurring monthly charges being assessed to reflect the actual instantaneous peak demand as constructed.

6. References

- ▶ Current Development Services Fee Schedule
- ▶ 2012 International Residential Code (IRC) (or the currently adopted Building Code).

7. Appendix

- ▶ The Residential Water Fixture Unit Calculations Worksheet fillable form can be found by [clicking here](#).

How to Calculate Irrigable Area

Definition:

1. Calculated or Actual Irrigable Area: area within the boundaries of the lot that has the *potential* to be irrigated or is irrigated. Features that will not be considered as potential irrigable area include impervious areas such as the building footprint, driveways, walkways, decks, etc. Trees and plant material that are irrigated are included in irrigable area using their canopy area at full growth.

How to calculate the potential irrigable area if back yard (and/or possibly front yard) is not landscaped by the Builder:

1. Find Lot Size in square feet.
2. Calculate the square footage of the footprint of the house, driveway, patio, at grade deck, and sidewalk area within the lot. (Shown as crosshatched red squares on the Example Irrigable Area Plot Plan)
3. Calculate the square footage of the 5' wide area along the perimeter of the foundation that is pervious but cannot have irrigation (Shown as blue triangular hatching on the Example Irrigable Area Plot Plan). Be sure to exclude this area of overlap at the driveway.
4. Calculate the square footage of the (maximum 5' wide) area along drainage swales (Shown as red crosshatching on the Example Irrigable Area Plot Plan). Pay close attention to lot lines that are 10' or less from the side of the house as you could end up with coinciding/overlapping areas.
5. Subtract above Items 2, 3, and 4 from Item 1 and add back in any coinciding/overlapping areas (identified in Item 4) to obtain the maximum irrigable area.
6. The maximum irrigable area (calculated in accordance with Item 5 above) is multiplied by 75% (this assumes the homeowner will plant 75% of the remaining area with plant material that needs to be irrigated) to obtain the calculated irrigable area which will be used as the landscape (Tier 2) water budget for each specific address going forward. No increase in that irrigable area will be allowed under the water budget rate structure.

How to calculate actual irrigable area if front and back yard is landscaped:

1. Actual turf area that is irrigated in square feet.
2. Actual irrigated tree and plant material area. This is calculated utilizing full growth canopy area in square feet for trees and other plant material and adding them all together.
3. Total actual irrigable area is calculated by adding Item 1 and Item 2 above.

Sample calculation to determine calculated irrigable area:

Lot Area: $60' \times 110' = 6,600$ Square Feet

Impervious Area:

Deck: $10' \times 25' = 250$ Square Feet

Living Area: $(45' \times 30') + (25' \times 10') = 1,600$ Square Feet

Garage: $20' \times 20' = 400$ Square Feet

Porch: $5' \times 10' = 50$ Square Feet

Front Walk: $(3' \times 9') + (4' \times 3') = 39$ Square Feet

Driveway: $16' \times 25' = 400$ Square Feet

Total Impervious Area = $250 + 1,600 + 400 + 50 + 39 + 400 = 2,739$ Square Feet

How to Calculate Irrigable Area

Sample Calculation (Continued)

Perimeter Foundation Area:

$$(50' \times 5') + (55' \times 5') + (15' \times 5') + (15' \times 5') + (11' \times 5') + (5' \times 5') = 755 \text{ Square Feet}$$

Drainage Swale Area:

$$(110' \times 5') + (110' \times 5') + (50' \times 5') = 1,350 \text{ Square Feet}$$

Area of Overlap:

$$(50' \times 2.5') + (55' \times 2.5') = 262.5 \text{ Square Feet}$$

Maximum Irrigable Area:

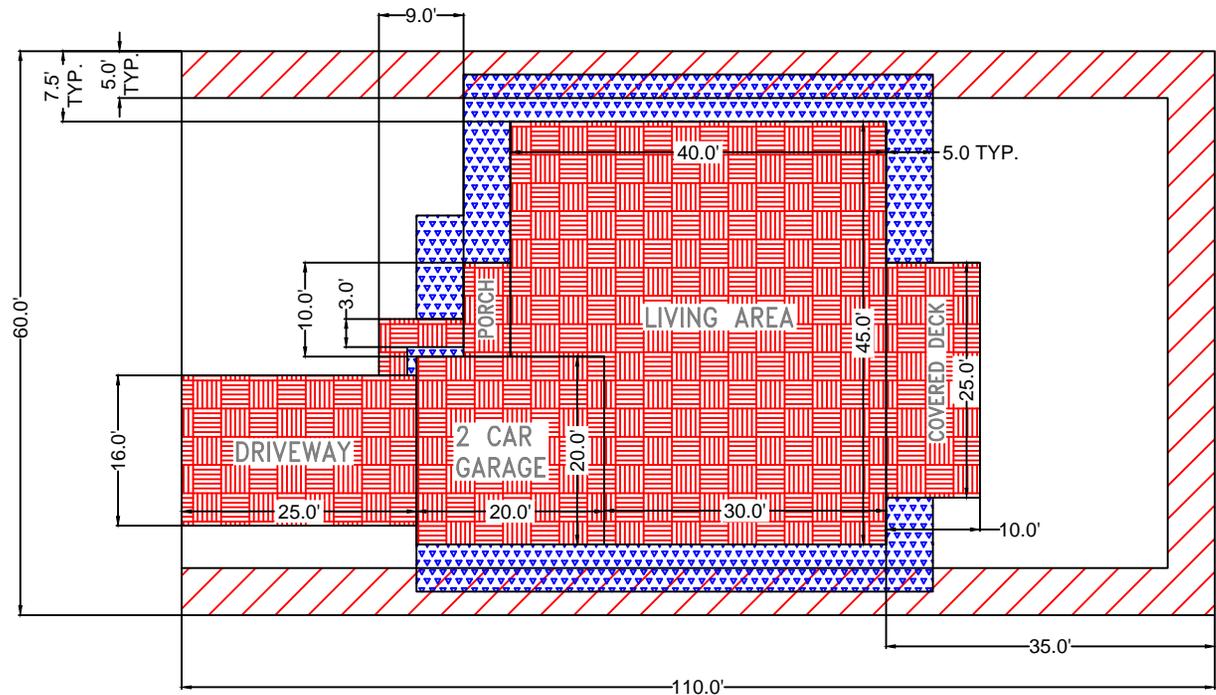
$$6,600 - (2,739 + 755 + 1350 - 262.5) = 2,018.5 \text{ Square Feet}$$

Calculated Irrigable Area:

$$2,018.5 \times 0.75 = 1,513.88 \text{ Square Feet*}$$

*Based on the requirement that the Calculated or Actual Irrigable Area cannot exceed 1,400 Square Feet, this specific address would not qualify for a 0.67 (5/8") meter.

The Residential Water Fixture Unit Calculations Worksheet fillable form can be found by [clicking here](#).



Sheet Revisions

Date	Comments
02-09-18	ISSUED FOR USE



Town of Castle Rock
 100 N. Wilcox St.
 Castle Rock, CO 80104
 Phone: (720) 733-2200
 Fax: (720) 733-2217
Development Services

**EXAMPLE IRRIGABLE
 AREA PLOT PLAN**

Issued By: Town of Castle Rock, Development Services February 9, 2018

DETAIL PLAN NO.

W-36

Sheet 1 of 1