Graywater Commercial Plan Review Design Guidance

Graywater – Commercial Installation

A project permit application is complete when it meets the submission requirements of the Authority Having Jurisdiction (AHJ). It is the duty of the AHJ to inform the applicant, within 28 calendar days:

a. That the application is complete; or

b. The application is incomplete and what is needed to make the application complete.

Please resource the complete RCW 36.70B.070 regulations at;
https://apps.leg.wa.gov/rcw/default.aspx?cite=36.70B.070

☐ Submit one complete set of plans and required designer qualifications.

- Plans shall be stamped by a WA State Professional Engineer (PE) who demonstrates competency designing, installing, operating and maintaining graywater systems

Note: Commercial graywater systems shall be designed in accordance with Washington State Department of Health – WAC 246-274, Chapter 15 of the UPC/SPC and engineered design

☐ Narrative of Scope to include but not limited to;

- Graywater reuse (treated)
- Cross connection control test – potable and non-potable
- Non-potable plumbing fixtures
- Irrigation (if applicable)
- Plant water guide (if applicable)

☐ Application

☐ Alternate Material, Method or Modification Request Form – AMMRF (if applicable)

To expedite the plan review process in a timely manner, it is important that a complete set of plans be submitted. Below is design guidance to assist the applicant with minimum requests of information.

Plan documents for graywater systems new, altered or repaired must include the minimum criterion to be considered complete but may not be limited to the following;

1. **Cover sheet shall include but not limited to;**
   - Symbols
   - Abbreviations

- General notes
- Code cycles used
- Sheet index
- Site address
- Assessor's parcel number (APN)
- Plumbing systems used in this project
- Graywater pipe labeling
- Full outline detailing cross-connection inspection and test
    - Cross-connection inspection and test is required initially, annually or every 4 years
    - AHJ can set annual cross-connection inspection and test cycle
- Designer credentials
- Plan name

Note: general notes shall include entire cross-connection inspection and test procedure

Sub-Note: electronic plans must be provided with tabs which identify plan sheet so that review comments will correspond to plan sheet

2. **Floor plans shall include but not limited to;**
    - Room names
    - Mechanical room
    - Laundry room
    - Lobby
    - Dwelling units
    - Parking garage
    - Decks
    - Amenity areas
    - Court yards
    - Water features
    - Graywater System
        - Fixtures
        - Sumps
        - Appliances
        - Appurtenances
        - Detention vaults
        - Storage tanks
        - Filtration
        - Treatment
    - Plumbing Systems
        - Water
        - Waste
        - Storm
        - Pressure waste
    - Condensate

Note: all plan sheets shall have a designated area 3' x 3" square labeled "PHSKC Stamp"

Special Instructions: Plumbing systems shall be designed in the following manner without exception;

1. Provide one complete set of plans with all plumbing systems relevant to this project.
2. All other plumbing systems including gas shall be grayed-out except the gray water system, which shall be bolded black to show the differentiation to other plumbing systems and gas.
3. Where potable water, rainwater for non-potable use and/or greywater systems are present within one structure each plumbing system must follow numbers 1 and 2 resulting multiple designs under one plumbing permit in one plan set

Note: No more than three plumbing systems (one bolded black, other two gray) or two plumbing systems and/or one gas system (one bolded black, other two gray) may be present on any given plan sheet preventing observing floor plan data, applicable information and connections to other plumbing systems.

Sub-Note: Special Instructions do not apply when prior approved is given to submit electronically

3. System Design shall include but not limited to;

- **A.** Graywater storage (Tier 2 & 3 only)
- **B.** Non-potable water storage
- **C.** Pipe material used
- **D.** System controls
- **E.** Booster pumps
- **F.** Treatment - Chemical injection
- **G.** Filtration
- **H.** Recirculation system
- **I.** Seismic considerations of equipment
- **J.** Non-potable water reuse system
- **K.** Sub-surface irrigation (if applicable)
  Document "G20C" – Required-Subsurface Irrigation (WAC 246-274-415) Tier 2 & 3
  Download "Washington State University - *State of Washington Irrigation Guide"* Click Here.
  Plant water guide (gallon-per-day-per-plant)
- **L.** Graywater overflow (three-way diverter valve)

4. Construction Details shall include but not limited to;

- **A.** Mechanical room
- **B.** Chemical Treatment
- **C.** Graywater overflow (three-way diverter valve)

5. Schedules shall include but not limited to;

A. Equipment
B. Plumbing Fixtures
C. Irrigation (if applicable)
D. Pipe Material
E. Storage – graywater/non-potable water
F. Filtration equipment
G. Treatment equipment (chemical, etc.)
H. Backflow
I. Circulation pumps
J. Booster pumps
K. Pressure tanks
L. Signage
M. Labeling of pipe system
N. Shutoff valves & Tag I.D. No. (listed in shutdown/startup procedure)

6. Riser Diagram shall include but not limited to;

A. Riser diagram shall include graywater collection source(s) to point of use
B. Riser diagram shall show all components and equipment of system
C. Non-potable water supply system and potable water supply system shall include air/vacuum relief valves
Note: pipe system deactivation and drainage is part of cross-connection inspection and test
D. Size of pipe system and loading
E. Label all components
F. Filtration and treatment
G. Three way diverter valve (surge capacity)
H. Irrigation (if applicable)

7. Operation and maintenance manual shall include but not limited to;

A. Inspection and maintenance schedule
B. Backup water supply
C. Shutdown procedure
D. Startup procedure
E. **Annual cross connection inspection and test** – potable/non-potable
Note: The owner of graywater reuse system shall obtain a plumbing permit and pay all costs associated to PHSKC Plumbing and Gas Program at the current plumbing inspector(s) rate to inspect and affirm no cross-connection exists during an annual or approved cycled cross-connection inspection and test
F. Maintenance Log and Responsibility
G. Minimum Water Quality Requirements and Testing
- WAC 173-219-320 Class A and B Reclaimed Water
  - Item #2 – (a), (b), (c), (d)
    Note: Minimum water quality shall be 4-log virus removal or inactivation
    Sub-Note: Item #2 (d) requires Alternate Material, Method or Modification Request Form (AMMRF)
  - WAC 173-219-330 Performance Standards / Table 1 & 2

H. Emergency Contacts

Applicable when Graywater Tier 2 or 3 is used for subsurface irrigation.

Alternate Material, Method or Modification Request Form (AMMRF)
shall be provided and demonstrate conformity to soil conditions in accordance with **WAC 246-274-415**.

To download fillable AMMRF "click here".

WAC 246-274-415 (Document G20C)
Design requirements—Irrigation field components—Tier 2 and Tier 3 greywater irrigation systems.

Greywater irrigation fields for Tier 2 and Tier 3 systems must be designed to meet the following requirements:

(1) Calculation of the total irrigation area is based on:

(a) The operating capacity of the system; and

(b) Irrigation rates that are dependent on the plant factor and evapotranspiration rate.

(2) The total irrigation area shall be determined by using the following equation:

$$\text{Irrigation area (square feet)} = \frac{\text{Greywater volume (gallons per week) divided by}}{\text{Evapotranspiration x Plant Factor x 0.62}}$$

Where:

Evapotranspiration (ET)	=	The monthly average of May through September ET rates in inches divided by four, as determined by the Washington State University, *State of Washington Irrigation Guide*, 1985 (as amended 1990; 1992 for select western Washington crops), or weekly averages based on actual conditions;
Plant Factor	=	0 to 0.3 for low water use plants; 0.4 to 0.6 for average water use plants; and 0.7 to 1.0 for high water use plants;
0.62	=	The conversion factor (from inches of ET to gallons per week)

(a) This formula includes a factor of 1 for irrigation efficiency based on subsurface irrigation evenly distributed.

(b) The Washington State University, *State of Washington Irrigation Guide*, is available from the Washington state department of health's web site.

(c) The person designing the system may demonstrate to the satisfaction of the local health officer that adjustments to the values identified in this subsection are appropriate based on:

(i) Professional judgment; and

(ii) Applicable reference materials considering relevant factors such as water requirements of plants, density of plantings, microclimates of the site, irrigation efficiency of the system, and soil conditions.

(3) Irrigation rates must not exceed maximum allowable soil loading rates in Table II based on the finest textured soil in the lower twenty-four inches of suitable soil. The soil loading rate in Table II may be increased up to a factor of 2 for soil types 1-4 and up to a factor of 1.5 for soil types 5 and 6 when a treatment technology that meets the requirements of WAC 246-274-400 is used.

Table II

Soil Type Description and Maximum Hydraulic Loading Rate

Soil Type	Soil Textural Classification Description	Loading Rate for Greywater gal./sq. ft./day
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils excluding soil types 5 and 6, all soil types with greater than or equal to 90% rock fragments.	Not suitable without augmentation 1.0 with augmentation
2	Coarse sands.	Not suitable without augmentation 1.0 with augmentation
3	Medium sands, loamy coarse sands, loamy medium sands.	0.8
4	Fine sands, loamy fine sands, sandy loams, loams.	0.6
5	Very fine sands, loamy very fine sands; or silt loams, sandy clay loams, clay loams, and silty clay loams with a moderate structure or strong structure (excluding a platy structure).	0.4
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	0.2
7	Sandy clay, clay, silty clay, and strongly cemented firm soils, soil with a moderate or strong platy structure, any soil with a massive structure, any soil with appreciable amounts of expanding clays.	Not suitable

(4) The subsurface irrigation components of the greywater irrigation system must be installed in suitable soil. The suitable soil may consist of original, undisturbed soil or original soil that is augmented.

(5) The subsurface irrigation components of the greywater irrigation system must be installed a minimum of four inches deep and no deeper than twelve inches below the finished grade. The four-inch cover layer must consist of two inches of suitable soil and two inches of mulch.

(6) There must be a minimum of twenty-four inches of suitable soil between the subsurface irrigation components of the greywater irrigation system and any restrictive layer or the highest water table during the growing season.

(7) If the original soil is augmented, the mixture used for augmentation must meet the following criteria to ensure that suitable soil is used:

(a) The mixture must have an organic content that is at least five percent to support plant life and increase soil structure, and no greater than ten percent to prevent excessive decomposition;

(b) The mixture must be a well blended mix of mineral aggregate (soil) and compost where the soil ratio depends on the requirements for the plant species; and

(c) The mineral aggregate must have the following gradation:

Sieve Size	Percent Passing
3/8	100
No. 4	95 - 100
No. 10	75 - 90
No. 40	25 - 40
No. 100	4 - 10
No. 200	2 - 5

(8) If native soil is augmented, the additional soil must be tilled into the native soil a minimum of four inches.

(9) Soil types 1 and 2 must be augmented before use. Soil type 7 is not suitable for subsurface irrigation.

(10) The irrigation field may only be located on slopes of less than thirty percent, or seventeen degrees.

(11) Irrigation scheduling should incorporate the use of adjustment features so that application rates are closely matched with soil and weather conditions.

[Statutory Authority: RCW 90.46.015. WSR 11-02-011, § 246-274-415, filed 12/28/10, effective 7/31/11.]