



Guidelines for Greywater Reuse

**This translation is provided
for guidance. The governing
text is the Arabic text.**

Second edition 1429AH

Introduction

The Ministry has adopted many programs and plans to raise awareness of the importance of conserving water and to preserve it, as well as the recycling of graywater, washer water, and bath water, where the sewage treatment sector has witnessed great development according to the Ministerial order No. (228) dated 29/8/1426 AH, of recycling the washer water and showers water to use it in the expulsion boxes in government agencies, institutions and public bodies, residential, commercial, educational and industrial centers and complexes, and to be commitment to implement two networks for recycling water when developing specifications and plans for building new facilities. The Ministry aims, from this short version, to raise awareness of the importance of benefiting from graywater recycling, by introducing how to treat and recycle graywater for using it in flush tanks and agriculture and the best method for this treatment, as it constitutes the largest proportion of the water used, as treating that water will contribute to reducing part of the required requirements of fresh water, which is estimated at (30% to 50%) of the individual's needs, and the consequent saving of water bills. Also, reduce the quantities of sewage water pumped to the treatment station. The treatment of that water would also contribute to the rationalization message and maintain a clean environment.

May Allah bless these efforts and may everyone benefit from this guide.

Minister of Water and Electricity

Abdullah bin Abdulrahman Al-Hussain

Sewage water:

It is the product of human use of water after it has been contaminated with organic matter, fats, soap, detergents, hair, bacteria and other materials.

Sewage water is divided into three sections:

1- GREY WATER:

It is the product of the used water, except for toilet water. It is precisely the washer water, Bathing water, laundry water, kitchen water, dishwashers, etc. However, in this manual we recommend that you do not connect the kitchen drain water and the water of the dishwashers to the graywater tank because it contains fat, oil and food residues as they increase the processing requirements and costs. In accordance with German specifications.

2- BLACK WATER:

Resulting water from the use of latrines, which contain large amounts of organic pollutants from human wastes.

3- SEWAGE WATER:

a mixture of gray and black water.

- The graywater from the washes of the mosques, it is cleaner than the graywater mentioned above, and therefore can be reused in flush tanks and agriculture. after addressing it through affordable means, they constitute a significant resource that can replace a portion of fresh water and reduce overall water demand.

Why Grey Water?

- 1- The water represents about 55-74% of the water used in buildings.
- 2- It contains a low level of pollution from organic matter and nitrogen (nitrates, nitrites) as well as germs and microbes. Therefore, it is easy to deal with it during the purification stages.
- 3- Low treatment costs compared to sewage water.
- 4- Human acceptance of reusing that water.
- 5- Recycling and reuse are not harmful to the environment and health, if the specified conditions and specifications are applied.

The following table shows some of the properties of these water in terms of concentrations estimated at grams per person per day:

No.	Properties	Grey Water	Graywater + black water
1	BOD5	34-20	71-50
2	COD	48-25	72-45
3	SS	18-Ram	70-50
4	Tot.N	0.9 - 1.6	13.2-7
5	Tot.P	2.5 - 3.1	4.6-3
6	Tot.P*	0.3 - 0.5	1.9-1

Treatment Methods:

Graywater treatment requires the construction of two sewage drainage networks, the first network is for graywater drainage, where it is assembled into a ground tank for processing and treated and then recycled in the flush tanks and agriculture. And the second network is for the drainage of black water.

The treatment of graywater also requires a creation of a reservoir for the collected treated grey water, and a feeding net for the flush tanks and agriculture.

There are several methods of treatment, and the designer can choose the most appropriate according to the nature of the site. Provided that treated water meets the specified conditions, standards and requirements, in order to protect public health and the environment.

The following considerations are taken into account when choosing the standard treatment option:

- 1- The station's suitability for water quality to be reused.
- 2- Classify the optimal capacity of the station to suit the actual need for use.
- 3- Having a station efficiency to achieve the highest returns of treated water (Recovery).
- 4- A station efficiency to achieve high quality of produced water to meet the specifications of the World Health Organization and the Presidency of Meteorology and Environment
- 5- The suitability of the station to the location and number of users.
- 6- Low cost, easy to operate and maintain.

The attached diagram illustrates one of the methods of the grey water treatments. Also, any other method can be used that achieves the required quality of the produced water indicated in the standard specifications.

Specifications and standards of the produced water from grey water treatment stations:

First: Naturalistic Properties:

No	Properties	Maximum permissible limits (mg / l)
1	Floating material	none
2	Total Suspended solids TSS	10
3	PH	8.4-6

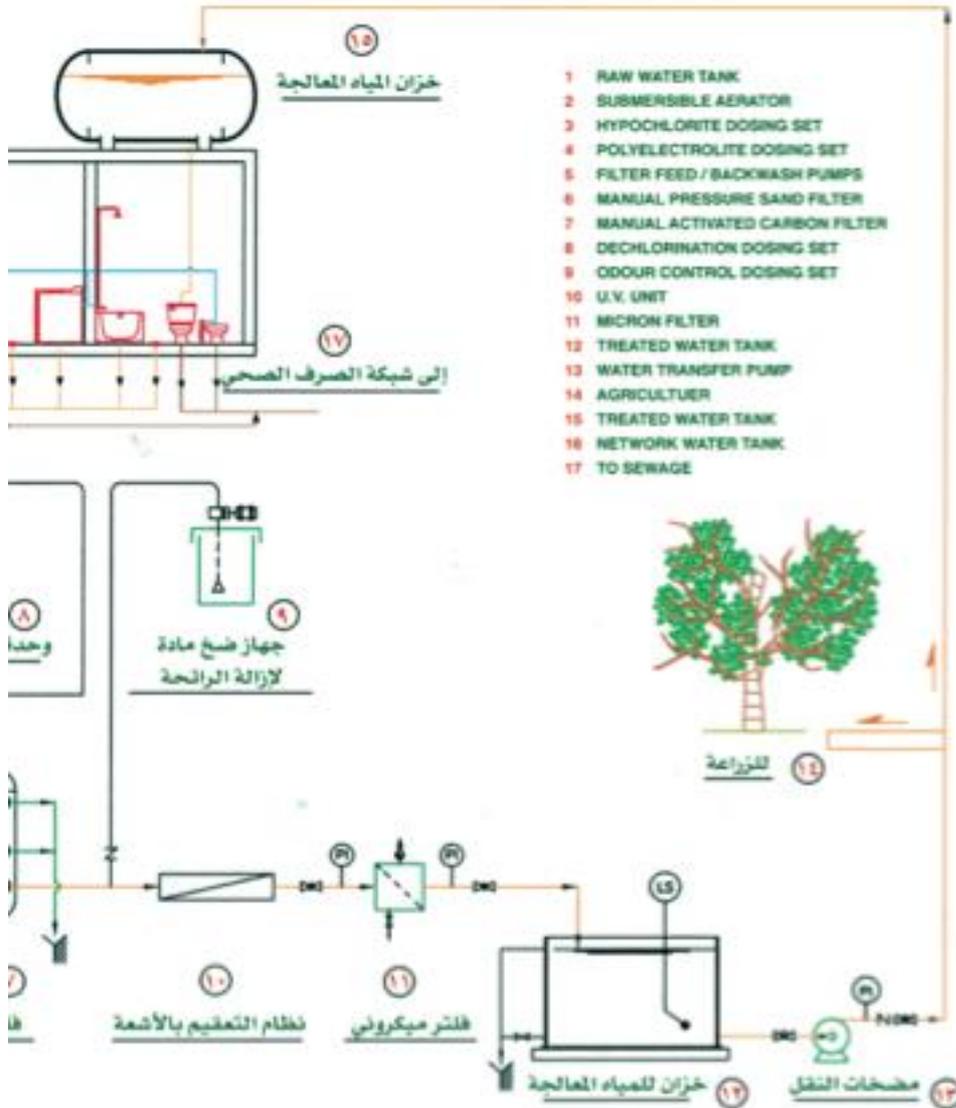
Second: Organic Chemical Properties:

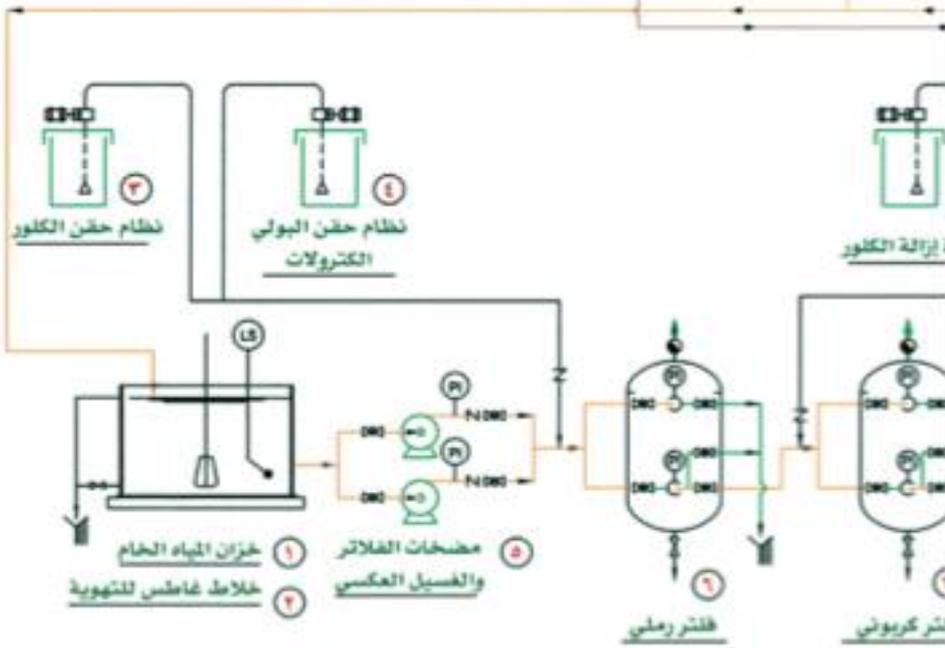
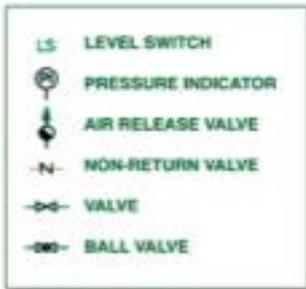
No.	Properties	Maximum permissible limits (mg / l)
1	biochemical requirement for oxygen (BOD5)	10
2	Chemical oxygen requirement (COD)	50
3	Total organic carbonates (TOC)	40
4	Oils and greases	none

Third: chemical compounds:

NO.	Properties	Maximum permissible limits (mg / l)
1	(NO3-N)	10
2	(NH3-N)	5
3	Free residual chlorine	0.2 - 0.5

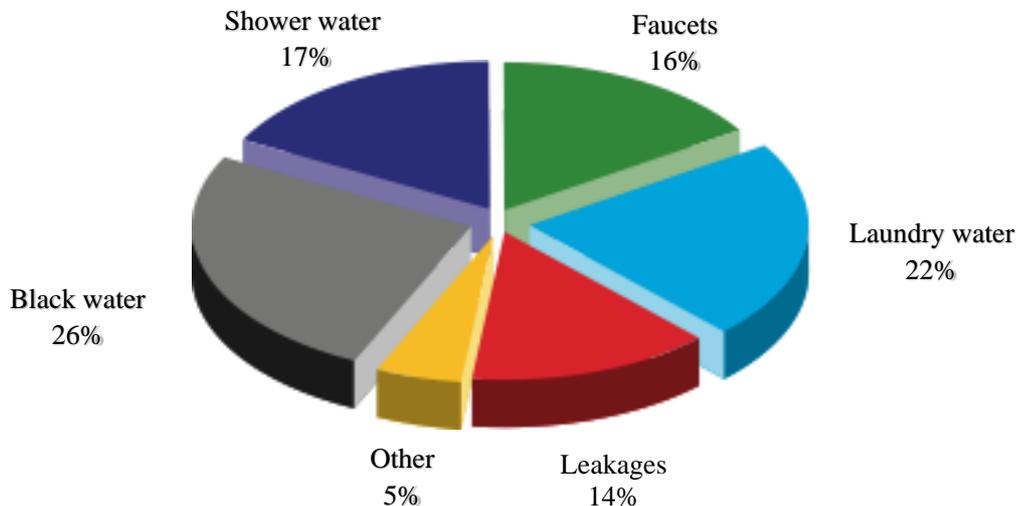
Indicative scheme for one of the treatment systems





The expected savings from graywater recycling and its use in expulsion boxes:

Assuming that the daily water consumption of an individual is (250) liters, and that amount is consumed by the distribution ratios shown in the following figure:



From the distribution ratios shown above, it is clear that how much gray water can be treated, which is produced from Faucets, showers and laundry, except for toilets and kitchens, is about (55%) of the daily consumption of an individual, and that water can be recycled and used and benefit by approximately (92% - 98%) of this percentage. The rest of the percentage (2% - 8%) is the solids and plankton deposited on the filters. This means that by using the technology of treating gray water and reusing it completely in the water of expulsion boxes in toilets and other uses such as agriculture, we have achieved a saving of about (50%) of the total daily consumption per person.

The estimated cost:

Properties	Station capacity of 50 m3 / day	Station capacity of 250 m3 / day	Station capacity of 500 m3 / day
Station consumption cost per cubic meter	0.36 Riyal	0.22 Riyal	0.2 Riyal
Operation and maintenance cost per cubic meter	1.59 Riyal	0.78 Riyal	0.59 Riyal
Total treating cost per cubic meter	1.95 Riyal	1.00 Riyal	0.79 Riyal

Assuming that the station's life span is (20 years).

1- Station depreciation cost per cubic meter = total costs (a + b + c + d) ÷ production volume x life span x 365

- 1- (A) Purification devices and equipment.
- (B) Site preparation.
- (C) Supplying a private network for recycling.
- (D) Reservoirs.

2- Operation and maintenance cost per cubic meter = Operation and maintenance cost (A + B + C + D) ÷ Production volume x 365

- 2- (A) Energy.
- (B) Chemical materials.
- (C) Spare parts.
- (D) workers' wages.

Annual expected savings:

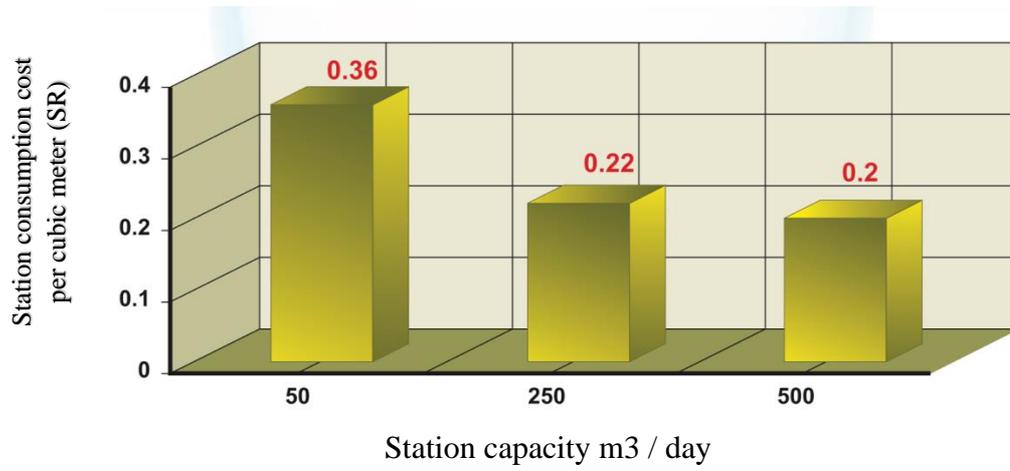
NO.	Station capacit (m3 / day)	Annual Savings Amount (SAR)	Capital Payback Period (monthly)
1	50	73.912	21
2	250	476.325	10
3	500	987.325	9

Assuming that the cost of a cubic meter of network water is (6) riyals.

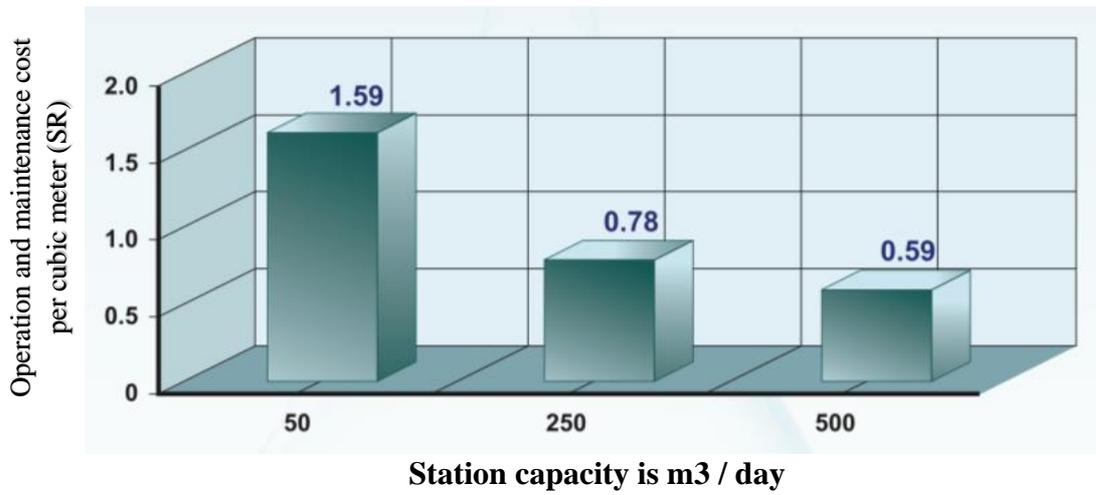
* The amount of annual savings = Station capacity x 365 x [cost per cubic meter of network water (6 riyals) - annual treatment cost (capital + operation and maintenance)]

* Duration of Capital Payback = Value of Capital / Annual Savings

Total Station consumption cost per cubic meter of treated water



Total operating and maintenance cost per cubic meter of treated water



General requirements:

- 1- Obtaining the necessary license to establish graywater treatment stations from the Ministry of Water and Electricity.
- 2- Treated graywater should not be used for purposes other than those intended for that purpose or in conformity with the specifications of that water. In the case of using it for agriculture, that water should not be used in water sprinklers, unless irrigation is during periods when the irrigated area is empty of people.
- 3- The operator of the treatment stations must adhere to operate those stations according to the scientific and technical foundations, and the instructions contained in the operating manuals, and conduct periodic analyzes and checks in laboratories accredited by the Ministry of Water and Electricity.
- 4- Not to store treated graywater for more than (24) hours, to prevent the multiplication of bacteria and the spread of odors.
- 5- The need for all members of society, governmental and non-governmental institutions to participate in raising awareness of the importance of water recycling and reuse, whether it is graywater or treated black water, as one of the unconventional sources to reduce the overall demand for freshwater needs.

**Together to provide 30% to 50% of water needs per day
By reusing the grey water**