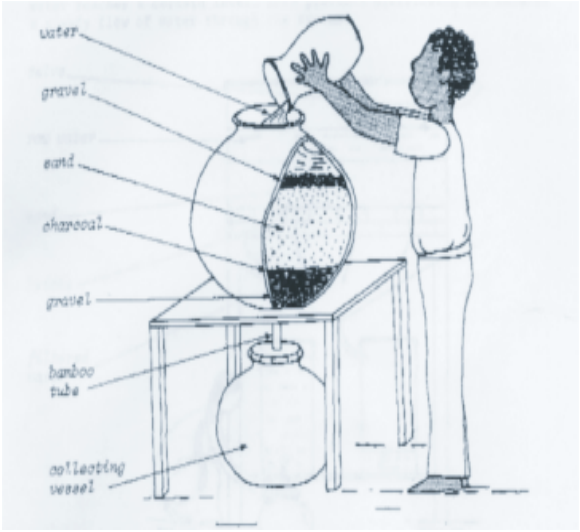
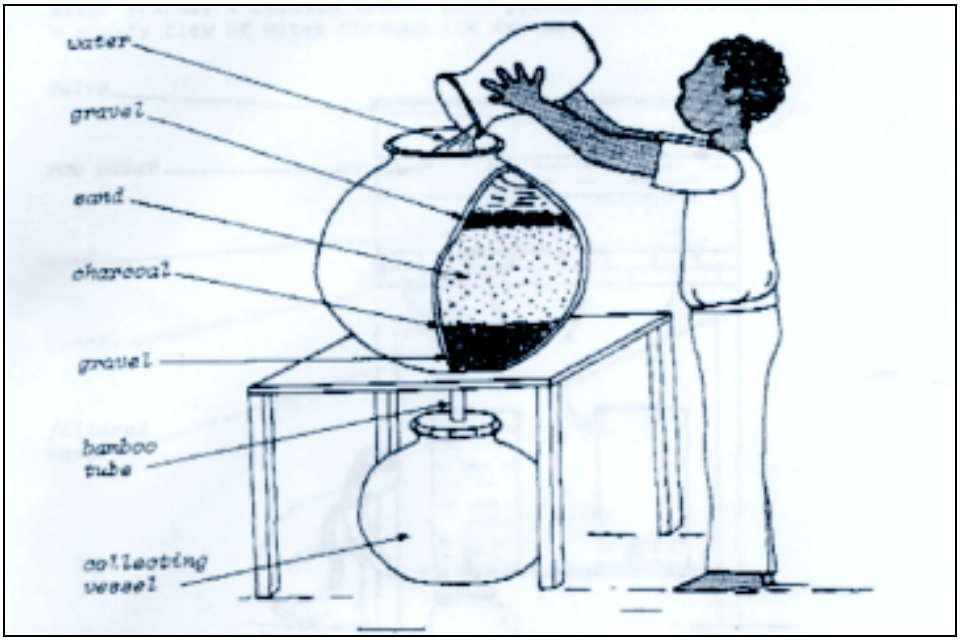
6. SAND FILTRATION



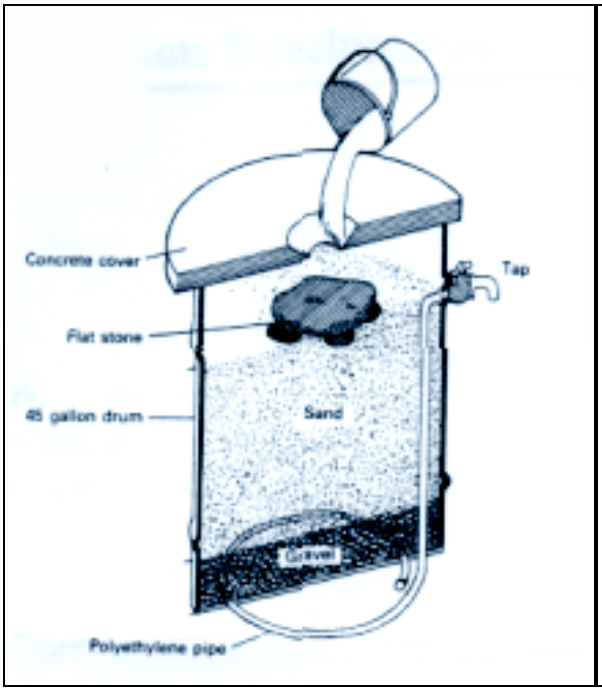
The simplicity of the sand filtration process and its apparent effectiveness have caused wide-spread attention. Public water utilities in the U.S. and Europe use the process and at least one commercial manufacturer is marketing portable sand filtration units.

Sand filtration is a flexible process, which can be undertaken in small containers or in industrial facilities. Units which might be practical for family use appear to require care in design and operation to assure predictability of results. The biological "skin" which forms at the top of the sand filter layer is critical to the effectiveness of the filtering process but also becomes an impediment to water flow after a period of time. Removal of this skin layer is said to reduce the effectiveness of the filtering process until the biological processes regenerate.

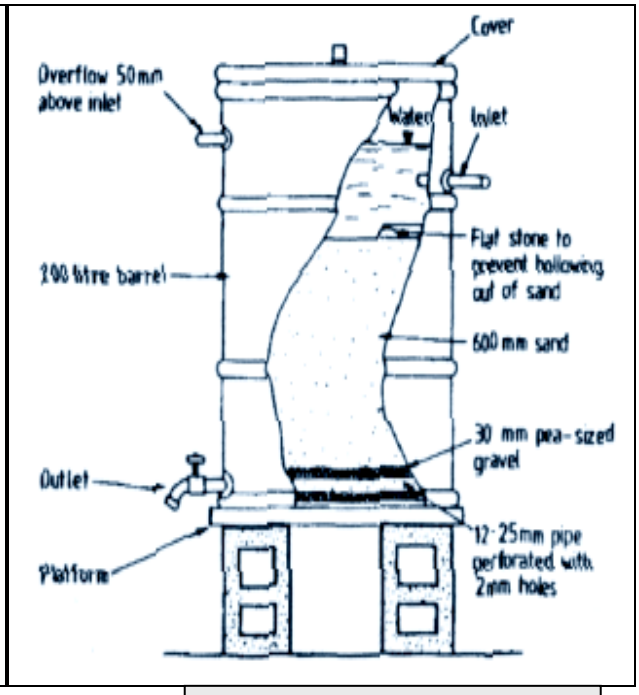
Additionally, researchers and developers report it is best to maintain a constant and steady flow of water through the filter, both to maintain the integrity of the biological filter layer and to assure the best possible water quality. This would seem a difficult task for small units, such as the one pictured above. For large tanks or multi-stage units, flow regulation could be more easily regulated through internal valves or design features.



Household sand filter



Cut away of drum sand filter with upward flow



Drum sand filter with upward spigot

PRODUCT ITEM/NAME	PRODUCER or SPONSOR ORGANIZATION
SINGLE STAGE SAND FILTRATION	International Water and Sanitation Centre P.O. Box 93190 The Hague, The Netherlands **PHONE**: 31-(0)70-33 141 33 **FAX**: (0)70-38 140 34 Environmental Health Project 1611 N. Kent St, Suite 300 Arlington, VA 22209-2111 **PHONE**: 703-247-8730 **FAX**: 703-243-9004 **EMAIL**: ehp@access.digex.com

FEATURES	OPERATION
- Simple construction and materials. A variety of containers can be adapted.	- Said to work best when constant water levels are maintained in tank and small withdrawals made on routine basis..

DIMENSIONS

MODEL NUMBER	LENGTH	WIDTH	HEIGHT	ESTIMATED WEIGHT	RATED CAPACITY	OPERATING LIFE	COST

INSTALLATION REQUIREMENTS	OPERATION AND MAINTENANCE REQUIREMENTS
	- Top layer of sand must be removed when water flow slows.

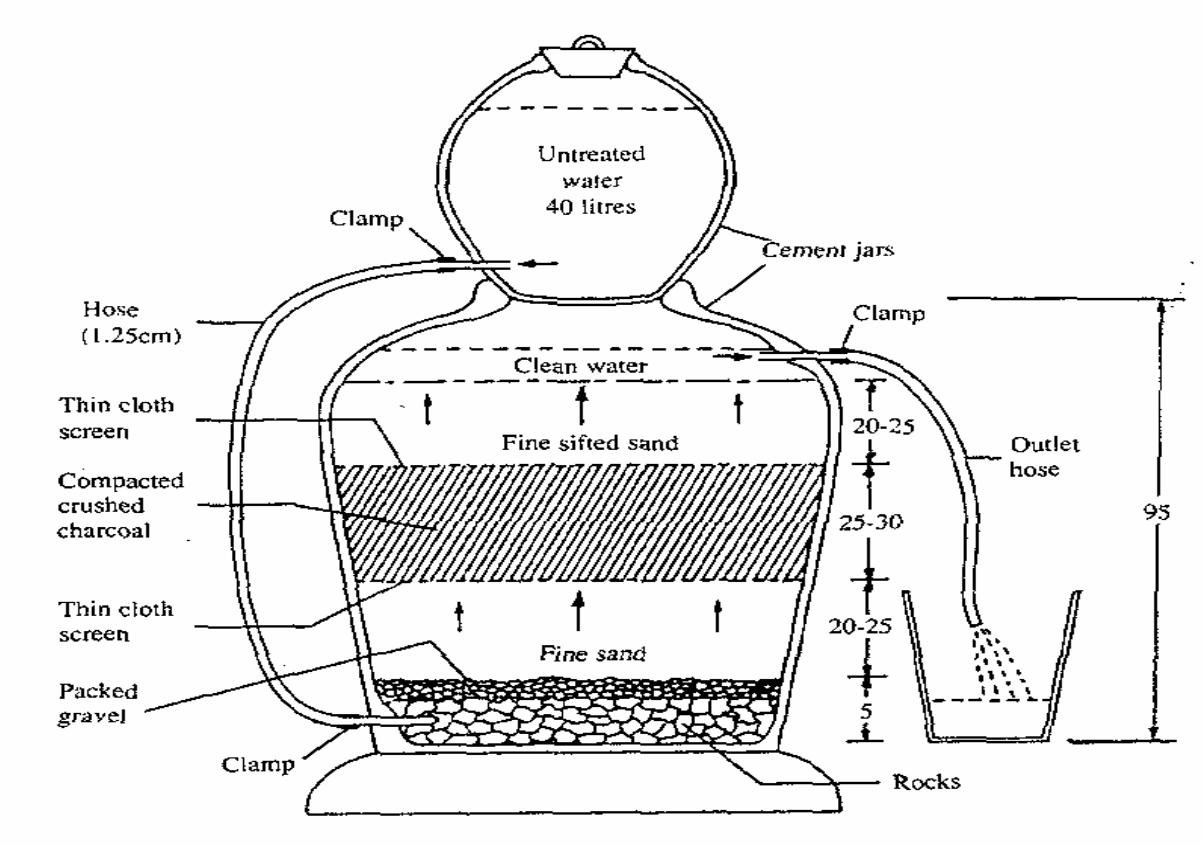


Diagram of UNICEF upward-flow filter

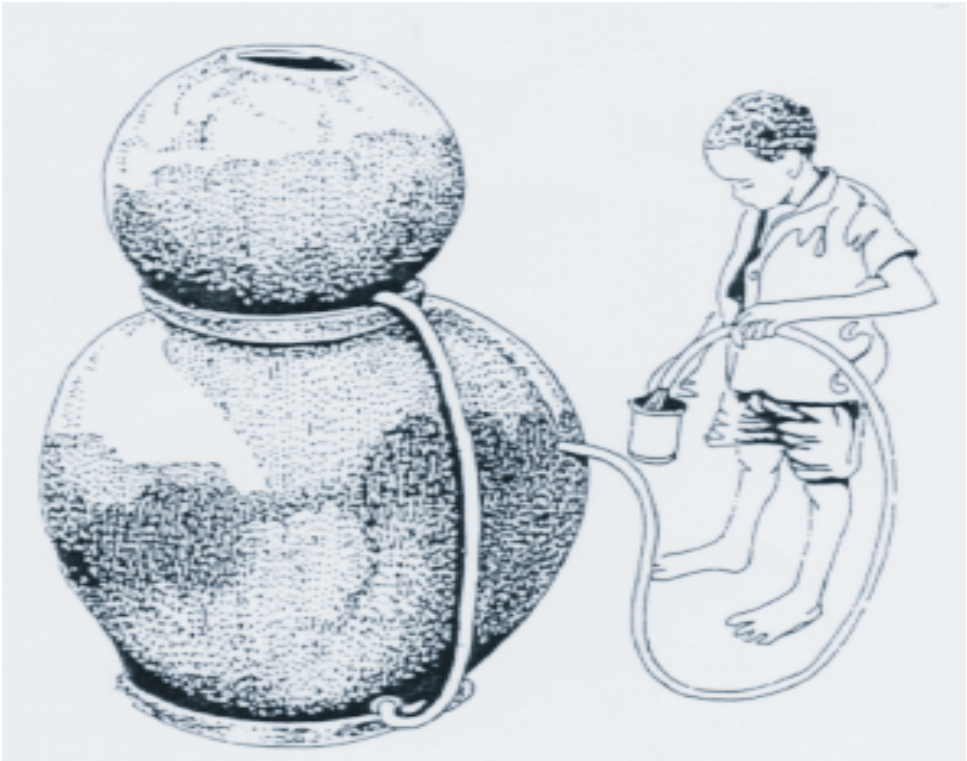


Illustration of UNICEF upward flow filter

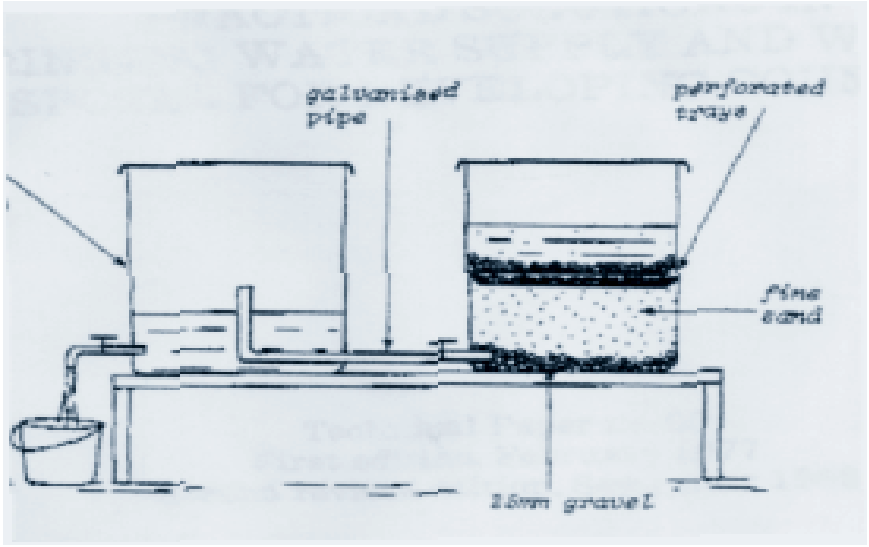
PRODUCT ITEM/NAME	PRODUCER or SPONSOR ORGANIZATION
UPWARD FLOW SLOW SAND FILTER	UNICEF Technology Support Section Eastern Africa Regional Office P.O. Box 44145 Nairobi, Kenya

FEATURES	OPERATION
- Simple, locally available materials - UNICEF design said to provide water for up to 10 people - Said to operate up to a year before cleaning required, depending on quality of source water	- Maximum capacity of UNICEF design about 40 liters per day

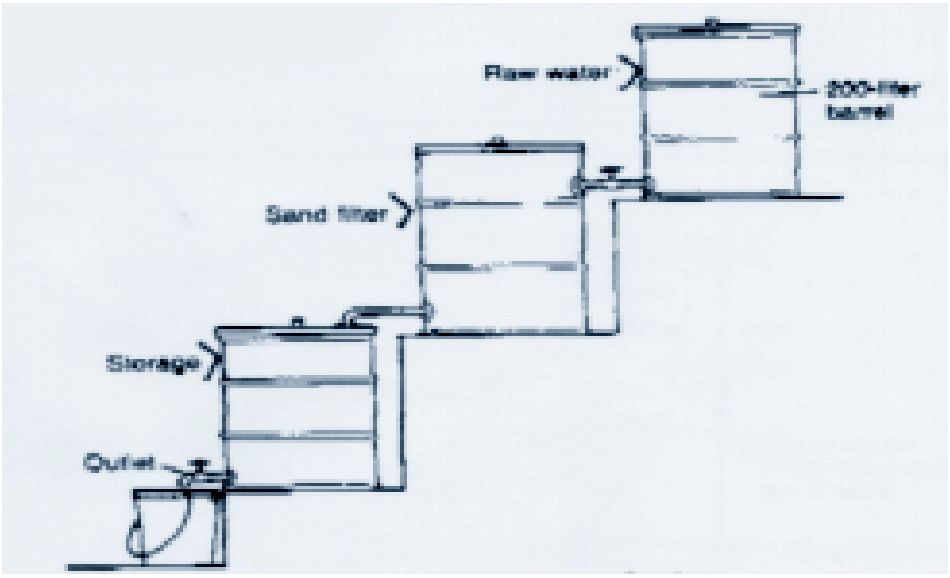
DIMENSIONS

MODEL NUMBER	LENGTH	WIDTH	HEIGHT	ESTIMATED WEIGHT	RATED CAPACITY	OPERATING LIFE	COST

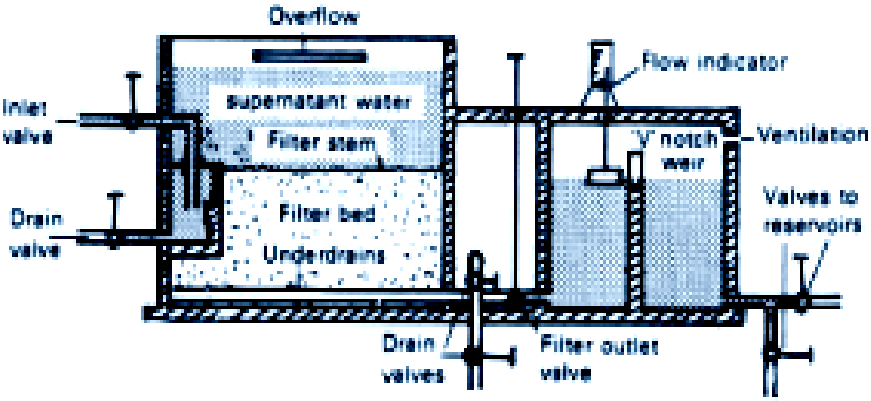
INSTALLATION REQUIREMENTS	OPERATION AND MAINTENANCE REQUIREMENTS
- Spouts for inlet and outlet tubes must be created while jar is being molded	



Two barrel household sand filter unit



Gravity flow and sand filter storage system



IRC slow sand filter

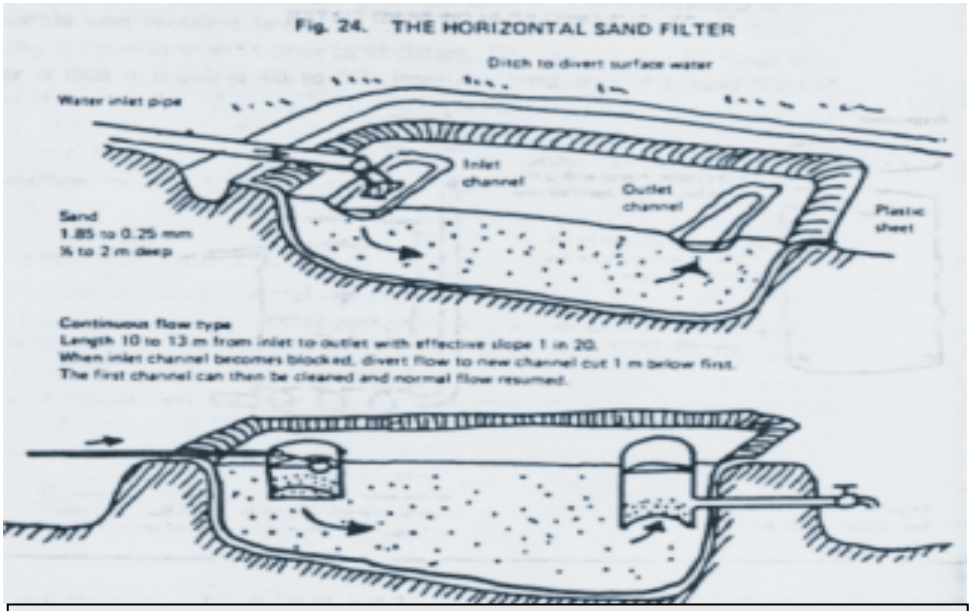
PRODUCT ITEM/NAME	PRODUCER or SPONSOR ORGANIZATION
MULTI-STAGE SAND FILTRATION	Environmental Health Project 1611 N. Kent St, Suite 300 Arlington, VA 22209-2111 **PHONE**: 703-247-8730 **FAX**: 703-243-9004 **EMAIL**: ehp@access.digex.com International Water and Sanitation Centre P.O. Box 93190 The Hague, The Netherlands **PHONE**: 31-(0)70-33 141 33 **FAX**: (0)70-38 140 34

FEATURES	OPERATION
- Additional containers permit more continuous operation and storage - IRC design offers long operating life and potentially more predictable water quality - Filter skin of biological material forms at top of sand layer and is said to provide the most important element of the filter.	- raised feed pipe in two barrel illustration helps to assure that sand in the filter container stays wet

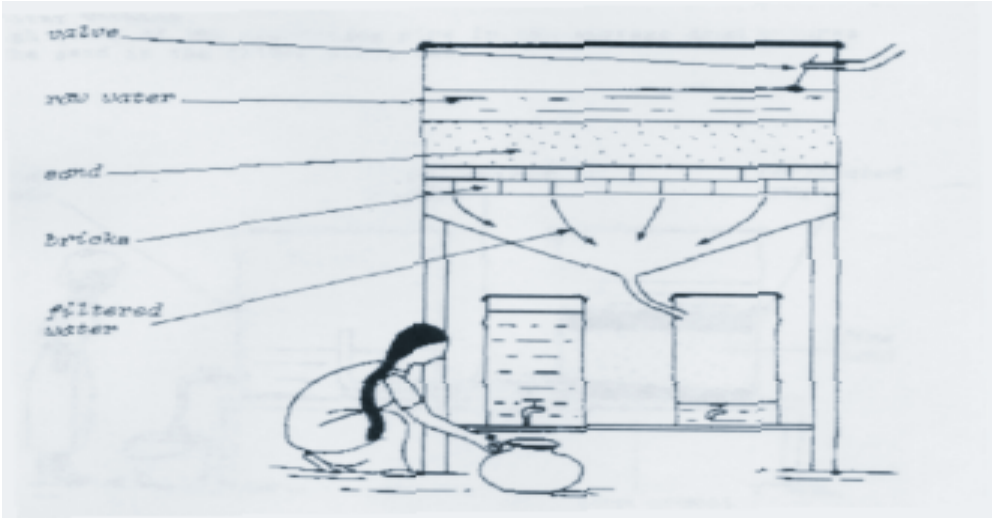
DIMENSIONS

MODEL NUMBER	LENGTH	WIDTH	HEIGHT	ESTIMATED WEIGHT	RATED CAPACITY	OPERATING LIFE	COST

INSTALLATION REQUIREMENTS	OPERATION AND MAINTENANCE REQUIREMENTS
	- Periodic removal of filter skin at top layer of sand required when water flow slows. Water quality said to be reduced after sand removal until biological materials in filter skin regenerate.



Horizontal sand filter



Wooden tank household sand filter

Portapak “250” enhanced slow sand filtration unit

PRODUCT ITEM/NAME	PRODUCER or SPONSOR ORGANIZATION
LARGE TANK SAND FILTRATION UNITS	International Water and Sanitation Centre P.O. Box 93190 The Hague, The Netherlands **PHONE**: 31-(0)70-33 141 33 **FAX**: 31-(0)70-38 140 34 Potapak 3 Canal Walk Toomer's Wharf Newbury, Berkshire RG13 1DY UNITED KINGDOM **PHONE**: 0635 30552 **FAX**: 0635 30844

FEATURES	OPERATION
- Horizontal sand filter can be in large container or in natural sand bed. - Wood tank unit uses piped water source with internal float valve to prevent overflow; IRC design said to serve family of 10 people - Potapak unit said to remove 99% or more of pathogens; used with gravel pre-filter to treat high turbidity	- Each system relies on natural water drainage

DIMENSIONS

MODEL NUMBER	LENGTH	WIDTH	HEIGHT	ESTIMATED WEIGHT	RATED CAPACITY	OPERATING LIFE	COST
Potapak 250		1250 mm diameter	1200 mm		520 liter/hour		US $4000 (Gravel pre-filter US $1750)

INSTALLATION REQUIREMENTS	OPERATION AND MAINTENANCE REQUIREMENTS