WATER AND SANITATION DEPARTMENT

ANNEXURE D:

WATER RECLAMATION FOR INDUSTRIAL USE

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DESCRIPTION **PAGE**

NOMENCLATURE

BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
CoE	City of Ekurhuleni
DWS	Department of Water and Sanitation
TOC	Total organic carbon

1. WATER RECLAMATION FOR INDUSTRIAL USE

With the increase in the usage of non-potable water for public industrial and commercial uses, CoE requires the installation of dual systems for potable water and reclaimed water to reduce the probability of cross contamination of their potable water supply systems as well as to relieve pressure on potable supply sources. This section will provide the Engineer with the general requirements for planning and designing a reclaimed water supply and distribution system to prevent cross contamination to the approval of the CoE Water and Sanitation Department.

1.1. Planning

The types of potential water reuse applications, the applicable regulatory and statutory requirements, potential consumer locations and demands, future developments and expansion of the system as well as identification of existing water reuse infrastructure must be established.

The following must be addressed during the planning stage of any reclaimed water system in the CoE:

- Consult/develop CoE reclaimed water master plan;
- Determine current and future reclaimed water demand projections;
- Demand estimate by reuse use category i.e. municipal uses, industries, irrigation and agricultural uses;
- Type and development of water reclamation system; and,
- Implementation.

1.2. Sources of Supply

Potential sources of supply must be investigated for generating reclaimed water for reuse. The following sources shall form the basis to develop a non-potable water distribution system for the CoE.

- Treated wastewater;
- Untreated or partially treated raw water otherwise available to produce potable water;
- Wastewater from mining operations;
- Stormwater run-off; and,
- Groundwater.

1.3. Treatment for Reclaimed Water

Appropriate treatment processes must be selected and evaluated to achieve the required quality of reclaimed water. The major water quality parameters the Engineer must consider are the following:

- Biodegradable organics i.e. BOD, COD and TOC;
- Suspended solids;
- Nutrients;
- Dissolved solids; and,
- Pathogens.

The degree of treatment required shall be governed by the highest use for reclaimed water in the supply and distribution system. This shall normally be the standards as set out by the Department of Water and Sanitation (DWS) general limits unless otherwise agreed upon with the CoE and the end consumers.

1.4. Demand Management

Reclaimed water supply systems shall be designed with a controlled demand on users such as irrigation and agricultural uses. The system must be designed in such a manner that demand peaking is limited, and operational storage are kept to an absolute minimum.

The demand pattern must be determined for each reclaimed water supply and distribution system based on the type of users and their individual requirements, and methods put in place to reduce peaking in demand where possible.

The following methods shall be considered for reducing peaking:

- Scheduling irrigation periods for different users; and,
- Provide on-site storage for large consumers.

1.5. System Hydraulics

The reclaimed water supply and distribution systems shall be designed in a similar manner to potable water systems with the following exceptions:

- The peak factors shall be determined based on the type of user and demand requirements;
- The required pressure shall be based on the end user requirements (discharged in storage dams or tanks).

1.6. Design Components

1.6.1. Major Structures

All major structures such as pump stations, storage facilities and valve chambers shall be designed in the same manner as for potable water supply systems unless otherwise required by the CoE Water and Sanitation Department. The pipework and appurtenances shall be clearly marked and labelled as reclaimed water system as required in **Section 1.8.3.3**.

1.6.2. Service Connections

Where future service connections cannot be accommodated through installation of simple taps, the Engineer shall provide service connections where expansion of the system is most likely to take place. The connections/taps shall be clearly marked and labelled as reclaimed water system as required in **Section 1.8.3.3**.

1.6.3. Pressure

The required minimum pressure in the system can be as low as 9 m, and the maximum pressure shall be equal to pressure class of the material selected or end user requirements whichever is the greatest.

CoE requires the pressure in reclaimed water systems to be less than that of their potable supply systems to reduce the risk of cross contamination.

1.6.4. Pipe Material

The selection of piping material shall be based on the anticipated pressure and water quality of the reclaimed water. The colour of reclaimed water pipes shall be orange to comply with the CoE bylaws for water reclamation. Tracer tape shall be applied to the pipe during installation prior to backfilling for easy location and identification should repairs be required.

Isolating valves shall be spaced at a maximum distance of 500 m apart on supply pipelines and as required on distribution systems to isolate not more than 600 m of pipeline by closing a maximum of four valves.

Many appurtenances such as air release valves, surge valves, altitude valves, flush valves, and other system components may not be available in the colour orange, but they shall be painted or otherwise appropriately marked for identification.

All above ground installations shall be painted orange and/or clearly labelled to indicate the service for reclaimed water.

The appurtenances shall be appropriate for the anticipated higher total dissolved solids (TDS) levels of the reclaimed water.

1.7. Storage

The storage requirement must be adequately sized to match the reclaimed water supply through the following:

- Sufficient storage of non-potable water for balancing supply and demand;
- Storage facility to be located close to the demand centre to limit long lengths of large diameter distribution pipework associated with peak demands from the storage facility;
- Supplement non-potable water with other sources to meet peak demands;
- Dispose of excess non-potable water; and,
- Combination of the above.

Sufficient storage must be provided in the event that sub-standard effluent is produced or in the event of a power failure. Where substandard effluent is produced, it must be returned to the head of the works for retreatment.

1.7.1. Seasonal Storage

The storage facility must be designed to allow storage of surplus effluent during periods of low demand for withdrawal during periods of high demand.

The storage facilities can either be a covered or open surface impoundment, however, in the case of open storage facilities, the evaporation losses must be determined to optimise the surface area by balancing the estimated precipitation and evaporation losses.

Where open storage facilities are selected, the Engineer must provide sufficient excess storage to accommodate precipitation and stormwater run-off during critical storm events, should discharge be prohibited from these facilities. Open storage facilities are to be fenced off to prevent animal access and consumption of the reclaimed water.

1.7.2. Operational Storage

The operational storage volume must be adequate to meet the daily or temporary fluctuation in demand during peak periods. This shall typically include balancing treated wastewater flowrates, pumping rate into the distribution system and the variation in system demand.

Other factors to consider when sizing operational storage volume are:

- Reliability of system;
- Uninterrupted supply storage volume; and,

- Alternative water supply connections.

1.7.3. Supplemental Supply

Where sufficient supplemental supply sources such as untreated surface water and stormwater run-off are available, these sources must be utilised first before providing surface storage, or reduce the footprint of surface water storage.

1.8. Safeguards

The implementation of dual water distribution systems for potable and reclaimed water shall be responsibility of the consultant and the CoE to protect public health through the following safeguarding measures as part of any reclaimed water supply and distribution system.

- Prevention of cross contaminations;
- Prevention of improper use of reclaimed water; and,
- Prevention of improper operation of the system.

The potential risk to public health must be evaluated for each individual system to identify suitable safeguards, which can deviate from the above on approval from the CoE Water and Sanitation Department.

1.8.1. Prevention of cross-connections

Where required a cross-connection/backflow connection shall be designed to prevent contamination of the potable water supply.

No connections to the potable supply system shall be allowed.

1.8.2. Prevention of improper use

Proper and consistent identification of the reclaimed water supply system (*including pumps, pipelines, reservoirs and outlets*) must be provided to minimise cross-contamination.

System components shall be painted orange, clearly labelled and tracer tape applied for underground installations to identify the service as reclaimed water supply.

All outlets shall be clearly labelled and the Engineer shall ensure that all fittings are designed such that no cross connections can be made between reclaimed and potable supply systems. All outlets shall be designed as underground installations in locked chambers.

Pipeline identification shall be embossed or stencilled on the crown of the pipe to allow easy identification when repairs are required. The embossing or stencil shall read, "**CAUTION RECLAIMED WATER - DO NOT DRINK**" in not more than 1.5 m intervals. Warning tape with the same wording shall be continuous along the full length of the pipeline, laterals, fittings and valves in intervals not exceeding 3.0 m.

Reclaimed water pipelines shall be treated as a sewer near a potable water pipeline, and a reclaimed water pipeline near a sewer shall be treated as a potable water pipeline. Lateral separation of 1.5 m shall be used from pipe wall to pipe wall between reclaimed water and parallel potable water and sewer pipelines where possible.

A clear vertical separation of at least 300 mm shall be applied between reclaimed water and an intersecting potable water or sewer line. Pipeline joints on reclaimed water lines should be evenly spaced on each side of a crossing potable water or sewer line.

1.8.3. Prevention of improper operation

1.8.4. Valve boxes and chambers

All valve boxes and chambers shall be fitted with an orange or painted in orange lockable access cover. These covers shall not be interchangeable with potable water supply access covers.

1.8.5. Blow offs and drain valves

Blow offs or end of line drain valves shall be orange and appropriately marked as reclaimed water.

1.8.6. Storage Facilities

All storage facilities should be identified by signs and labelled with the words "**CAUTION: RECLAIMED WATER – DO NOT DRINK**" or similar wording.

1.8.7. Landscape irrigation

Landscape irrigation shall be limited to periods where public contact with spray will be minimal. This shall typically be done during nighttime, which will also reduce evaporation losses.

Frequent maintenance and inspection of the irrigation system shall be carried out to correct damaged or malfunctioning sprinklers.

1.8.8. Monitoring stations

Stations to monitor pressure and to draw a water sample to take back to the lab for testing for chlorine residual and other water-quality parameters should be installed at key locations in the reclaimed-water distribution system.

Where required the Engineer shall design chlorination systems at intermediate storage facilities to provide sufficient chlorine residual.

1.8.9. Parks and recreational facilities

All facilities and equipment at parks and recreational facilities shall be protected from overspray of reclaimed water; this shall be done by proper irrigation layout planning and sprinkler design to ensure minimal impact on public health.

1.8.10. Food establishments

Reclaimed water shall only be used for toilet flushing in food establishments on the approval of the relevant statutory and regulatory authorities. Irrigation systems using reclaimed water shall not be permitted in close proximity to food establishments.