



Water Environment Association of Ontario

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**“WEAO WILL BE THE PREEMINENT ORGANIZATION OF
TECHNICAL AND PROFESSIONAL INDIVIDUALS
DEDICATED TO THE PRESERVATION AND
ENHANCEMENT OF ONTARIO’S WATER
ENVIRONMENT”**

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June 16, 2008

Ministry of the Environment,
Environmental Sciences and Standards Division,
Standards Development Branch,
40 St. Clair Ave. W., 7th floor
Toronto, Ontario M4V 1M2

Attention: Manager, Water Standards

Re: EBR # 010-0547 Design Guidelines for Sewage Works 2007

Dear Ms Schroeder;

The Water Environment Association of Ontario (WEAO) represents the wastewater sector in Ontario. Our membership is composed of municipalities, academia, engineering consultants, industry, and provincial and federal departments with a focus on wastewater management (municipal wastewater, storm water management, water reuse, and biosolids).

It has been WEAO's pleasure to have been involved in the revision of this document. As noted in the listing of Steering Committee members, there has been considerable representation from our membership. However, as with every revised document, items slip between the cracks. Hence we have formulated a series of comments and questions for points of clarity with respect to the proposed guidelines (*Design Guidelines for Sewage Works 2007*). We have attached comments from members who have already responded to you directly through their own organizations. Their appearance here is to reinforce the need to address the comments, technical or typographical in nature.

Although WEAO has no strong disagreement with the document content and intent we do want to reinforce that, as discussed in the document Preamble, these are **guidelines** only and as such there is the need to ensure they are not applied prescriptively and regarded as “standards”. The application of the Guidelines in a prescriptive manner will stultify the use of new technologies and ideas for continuous improvement in the design of sewage works. **The approvals process must also ensure it regards the contents of the document as what they are intended, and stated, to be, guidelines to be used in conjunction with professional judgement and experience.** Issues such as cost and sustainability, use of actual

**38th ANNUAL TECHNICAL SYMPOSIUM & EXHIBITION
APRIL 5-7, 2009
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data and past performance, and consideration of technologies and equipment other than those indicated in the guidelines, should be taken into consideration when MOE staff review applications.

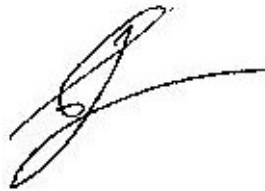
In addition to this caveat, there is one question which we pose to the Ministry:

- 1) If a municipality submits a design that conforms to the MOE **Guidelines**, is the municipality then exempt from performance liability for the plant if the plant has been operated properly?

We thank you for the opportunity to provide WEAO input. We trust the comments will be found to add value to the consultative process. We look forward to additional details being provided, and the opportunity to provide further comment.

For the Water Environment Association of Ontario,

Sincerely,



Catherine Jefferson, MSc.
Executive Director
Water Environment Association of Ontario

Attachment

Cc: P. Takaoka, Chair, Government Affairs Committee

Attachment

General Comments

- comprehensive document including review of and guidelines for all treatment technologies applicable in Ontario
- includes new technologies
- provides vast amounts of engineering data
- provides sufficient information and alerts designers about potential issues
- provides adequate reference to codes, regulations, and other resources
- US/imperial units should not appear in a government document

Detailed Comments

The comments provided below, while numerous, are in most cases minor in nature.

1. page 2-8, item 2.4.2.1, last bullet – reference to 70 manholes must be a typographic error
2. page and item as above, Engineering Drawings – a bullet should be added requesting that geotechnical information and groundwater table elevations along the sewer route be included on the drawings
3. page 2-9, item 2.4.3.2. – a bullet requesting that each site plan be developed according to local municipal bylaws and be approved by the local municipality should be added
4. page 2-10, item as above – a bullet should be added requesting that each drawing should bear a seal of a professional engineer licensed in Ontario.
5. page 3-5, item 3.8, third sentence – the words “peak hourly” should be changed to “instantaneous”
6. page 3-11, item 3.11, the word “diesel” should be replaced with “standby or stationary”; noise can be emitted not only from diesel generators but from gasoline, digester and natural gas generators.
7. page 3-12, item 3.12, and second bullet – add a sentence “Continuous flow through sampling line should be a design consideration where feasible.”
8. page 3-15, item 3.14.1, and fourth bullet – change the word “Conditions” to “Conditioning”.
9. page 4-6, item 4.4.4 – corrosive nature of iron salts on metals and concrete should be mentioned.
10. page 5-7, item 5.4.5 – a comment regarding bylaws (by some municipalities) requiring parking lots CB connection to sanitary sewers should be provided.
11. page 5-14, item 5.7.1 – Manning formula should be better typed/arranged; definition of hydraulic radius should be provided, there should be an indication that slope is unit less (m/m)
12. page 5-15, item 5.7.5 – Kutter formula should be provided
13. page 7-5, item 7.2.2, fourth paragraph – it is unclear in which well (dry, wet or both) the listed required ventilation rate is needed.
14. page 7-9, item 7.2.7, and fourth paragraph – the factor of 0.15 works only for metric units; it should be recalculated for imperial units or conversion to imperial should be deleted to avoid misuse of this factor.
15. page 7-10, fifth paragraph – there are almost no pumping stations with manually cleaned bar screens; it is an undesirable piece of equipment that if designed, is usually removed in first few months of operation. Maintenance crews would rather deal with subsequent pump maintenance issues if they occur.
16. page 7-10, sixth paragraph – replace word “potable” with “portable”
17. page 7-10, sixth paragraph – the sentence “Adequate provision” is missing the word “air” after the word “for”.
18. page 7-11, item 7.2.9 Dry Wells, first bullet – dehumidification is almost never provided at sewage pumping station; ventilation is normally sufficient.
19. page 7-14, item 7.3.2 – with the exception of sewer manholes covers, the industry practice is to provide 900x900 mm or larger hatches anywhere it is practical to ensure convenient personnel entry when wearing SCBA.
20. page 7-19, item 7.9 – add a requirement for an external bypass and portable pump connection for small pumping stations (was included in old guidelines and is a desired operational convenience).
21. page 7-19, item 7.9.1 – force main velocity of 0.6 m/s is lower than in old guidelines (0.8 m/s) and will lead to more solids deposition; maximum velocity should be listed.
22. page 7-20, first paragraph – slow closing check valves should be listed as one of the force main's surge protection measures.

23. page 7-20, item 7.9.7 – the guidelines should **ban** construction of sewage force mains from material normally used for water mains (PVC); any labelling of buried service is not practical and eventually someone will hook up water service to the sewage force main.
24. page 8-20, item 8.5.9 - add another bullet item to cover head loss allowance due to biological growth and accumulation of solids in channels, valves, screens, and outfalls.
25. page 8-20, item 8.5.10 – add sentence with requirement to avoid mixing raw or digested sludges with primary scum and grease due to pipelines lining with grease and subsequent reduction of active diameter.
26. page 8-21, item 8.5.13 – the paragraph implies that grit can be re-suspended from the bottom of the channel with liquid velocity of 0.9 m/s that would happen once a day. This normally does not happen; any channel that carries sewage containing grit that would ever see lower than 0.9 m/s velocity should be aerated or otherwise agitated.
27. page 8-23, third paragraph – a sentence should be added to note that manually cleaned bar screens if plugged should overflow to downstream processes, even during peak flow
28. page 8-28, first paragraph – it would simplify the matter if required times of full load operation rather than fuel tank volumes were listed.
29. page 8-28, item 8.7.2 – a CSA Standard related to backflow preventer installation should be mentioned here.
30. page 8-29, third paragraph – replace words “filter belt presses” with “screening, thickening, and dewatering process units”.
31. page 8-31, fifth bullet item – replace word “sludge” with “digester”.
32. page 8-32, Table 8-4 – minimum diameter requirement of 150 mm for sludge is inconsistent with previously required 100 mm; requirements for different sludges (WAS, TWAS, RS) may differ and should be listed.
33. page 8-37, item 8.9.2.8, second paragraph – “moderate temperature” water is commonly referred to as “tepid water”; a temperature of **10 deg C is too low for extended eye wash**. A requirement for an automatic, temper-proof, temperature regulating valve with 30 to 32 deg C reliable output should be included.
34. page 10-4, item 10.1.1.1 – a sentence that manually cleaned screens can be used only if mechanically cleaned are not feasible should be added.
35. page 10-7, item 10.3.1, third paragraph – the sentence “Grit removal is normally” has the word “aerated” misplaced; I am not familiar with **aerated** grit vortex tanks.
36. page 10-10, item 10.3.3.3, second bullet – air flow in imperial units should be in SCFM, not US gal;
37. page 10-11, item 10.3.3.4 – add sentence that design and selection consideration should be given to performance of vortex grit removal during low flow;
38. page 12-11, item 12.2.4.8, last line – change the word “vacuum” to “dewatering centrate or...”
39. page 12-13, first line – add words “air driven” before the word “pumps”;
40. page 12-14, last bullet item – add words “or disks” before the word “diffusers”
41. page 12-17, item 12.3.1, third paragraph – add word “even” before the word “when”.
42. page 12-25, second paragraph from the bottom – correct typographical error in the word “hydraulic”
43. page 12-34, item 12.4.6.1, third paragraph – condensation inside the RBC enclosures is not a concern but freezing and ice build-up may be an issue; in Southern Ontario insulation or heating of the RBC covers is not necessary.
44. page 12-34, item as above, sixth paragraph – a bullet item about reverse rotation and air scouring and chemical cleaning of RBCs should be added.
45. page 14-6, item 14.2.5.3 – a requirement to provide an overflow with a water seal or other device, to prevent tanks venting to the indoors via overflows should be included.
46. page 14-14, item 14.4.2.4, third paragraph – conversion of 2.5 cm to 6.4 inches is incorrect.
47. page 16-5, item 16.1.1 – a paragraph requiring consideration to implement TWAS pre-treatment prior to digestion (cells lyses or others) to improve digestion should be added.
48. page 16-6, Table 16-1 – listed solids concentration for primary and digested sludges appear to be higher than normally experienced; 13% solids is probably semi-solid state and not pumpable; CAS primary sludge expected solids concentrations **with and without WAS co-thickening** should be listed.
49. page 16-11, item 16.2.5.1, second sentence of second paragraph – preheating raw sludge presents challenges often offsetting its benefits; as a minimum grinders or chopper pumps needs to be used in addition to non-clog heat exchangers;
50. page 16-12, third paragraph – list the range of acceptable hot water temperature for proper sludge heating.
51. page 16-12, fourth paragraph – indicate that 82 degrees Celsius is a **minimum** desired temperature for boiler operation

52. page 16-13, items 16.2.5.3 and 16.2.5.4 – gas piping and appurtenance requirements should not be descriptive, but rather should refer the designer to the latest edition of the B105 Gas Code; the code is subject to changes and revisions and some requirement provided in the guidelines may no longer be adequate;
53. page 16-21, last line of the second paragraph – change mg/l to mg/L
54. page 16-34, item 16.4.6, second paragraph – when giving a concentration of 30% for autogenously burning cake, volatile solids % factor should be flagged as well.
55. page 16-35, item 16.4.6, last line – this sentence should be elaborated (How?, Where? When?, By Whom?) or deleted.
56. page 16-36, item 16.4.6.1 – add paragraph about design consideration for heat recovery.
57. page 16-37, item 16.6.1 – a graph from the old guidelines with water head loss multiplier v/s percent solids should be included, it was widely and successfully used by designers for sludge pumping systems design.
58. page 17-10, Table 17-1 – expected performance of a centrifuge on WAS with and without polymer should be listed.
59. page 17-12, sixth bullet item – request design consideration for enclosing GBT and providing exhaust, odour control, inspection doors, and cleaning convenience.
60. page 17-14, Table 17-2 – solid bowl centrifuges can routinely dewater raw and digested sludges to 30%; WAS 12 to 15% is achievable with polymer only, but may not be desired due to difficulties in subsequent mixing with other sludges prior to dewatering or digestion.
61. page 17-17, fourth paragraph – add bullet item with design requirements related to redirecting and re-suspending slop and wet cake to a centrate line during centrifuge start-up (a gate or reverse running screw conveyor is normally used); applies to raw and digested sludge dewatering.
62. page 17-18, item 17.4.3 – add paragraph about BFP enclosures, air exhaust and splashing, odour, and vapour control.
63. page 19-8, second bullet – cast iron or SST pumps would be sufficient for septage; copper and septage waste do not appear to be compatible.
64. page 20-3, Table 20-1 – the word “Deformers” is most likely intended to read “Defoamers”
65. page 20-5, second paragraph – change the word “buildings” to “rooms”.
66. page 20-5, item 20.2.1, first paragraph – conversion of 60 deg C to 86 deg F is incorrect.
67. page 20-5, third paragraph – add requirement that vents of tanks containing moisture sensitive chemical should be equipped with desiccant cartridges.
68. page 20-6, first paragraph – add sentence with requirement that overflows from tanks holding corrosive chemicals should be provided with seals to prevent vapours migrating to the room and to maintain reliable overflow service.
69. page II-1, Appendix II, 19-th and 20-th line – delete letters “US”.
70. page III-1, Appendix III, 13-th line – add “Dissolved Air Flootation”

Comments specifically on Section 12.4

12.4 OTHER BIOLOGICAL SYSTEMS

12.4.1 GENERAL

Alternative biological processes include a wide range of suspended growth, fixed film processes. Some of the processes described in this section are not common in Ontario or in Canada. Some of these processes may include proprietary equipment or processes that will require co-ordination with the manufacturer or supplier of the technologies. Care should be taken to obtain pilot and full-scale performance results for such processes to ensure an adequate design.

12.4.2 Sequencing Batch Reactors (SBRs)

The fill and draw mode of the activated sludge process commonly termed the Sequencing Batch Reactor (SBR) may be used in a similar fashion to the activated sludge process. Continuity and reliability of treatment equal to that of the continuous flow through modes of the activated sludge process should be provided. ~~Supplemental treatment units may be required to meet applicable effluent quality criteria.~~ For an effective treatment SBR uses elaborated control strategies that allow an optimal use of time and space to manage both hydraulic and pollutant loads. It is important that the control sequence be well engineered in order to be able to meet effluent criteria. The manufacturer input should be included in the design and sizing of these units.

12.4.2.1 DESIGN CONSIDERATIONS

- ~~More than two tanks should be provided.~~ Like other activated sludge processes depending on the flow range, at least two tanks should be provided. For emergency maintenance, provisions should be considered (i.e. spare parts, remote technical support) in order to minimise downtime. Influent baffling using a baffle wall and adequate physical separation of the influent from the decanter is recommended for any basin which may operate with a continuous feed during the settle and decant phases;
- All SBR tanks should have a minimum freeboard of not less than 600 mm (24 in);

The decantable volume and decanter capacity of the sequencing batch reactor system with the largest basin out of service should be sized such to keep the same aeration fraction of time in the cycle as in 100% average design flow condition. ~~to pass at least 75 percent of the peak daily flow without changing cycle times.~~

A decantable volume providing no acceleration for settling time ~~at least 4 hours retention time~~ with the largest basin out of service based on 100 percent of the peak daily flow is recommended; *[EXPLANATION: When sustained high hydraulic load occur process performances will mainly depend on three key steps; aeration, settling and decant. Static fill step helps to develop the anaerobic biological selector effect and therefore enhance the settling properties of the sludge. However its induced action is not instantaneous and its impact on biomass is not immediate. Therefore it can be temporary skipped when sustained high hydraulic load occurs and expect no sludge settling quality deterioration.*

Aeration: *Under normal operating conditions (i.e. all unit tanks running), aeration capacity (air flow and step duration) should be sufficient to cover maximum pollutants load for a given day, this maximum load is supposed to be intercepted during maximum dry weather flow. Usually this flow is 1.5 to 2 times as big as the average daily flow (also called annual flow). When the largest unit is out of service, one should consider providing enough aeration capacity for at least the total (100%) average load so that in average the effluent quality will be in compliance with discharge criteria. Therefore when the largest unit is out of service, aeration step duration should be sufficient to cover 100% of total average load. This means that the percentage of aeration time per cycle corresponding to average daily flow condition should remain unchanged even when the system loses its largest unit treatment tank.*

Settling: This step has a direct impact on effluent quality in terms of suspended solids especially at high hydraulic flow. There should be no compromise on the time allocated to this step which normally last at least 1 hour assuming 2m/h floc settling average velocity. Fix decanters require more time since their intake is at the level of sludge blanket almost.

Decant or Fill-Decant: Under a significantly durable (2 hours) high hydraulic load and when the largest unit is out of service, one expect the individual decanter capacity of any available unit tank be sized big enough to evacuate within short period treated batch volume plus whatever share of the peak wet weather flow it gets during fill decant for instance. Special attention should be paid to the volume of untreated wastewater that is allowed to enter during fill decant. All measures should be taken to prevent any short circuiting between inlet and outlet of unit treatment tank. In case of abnormal peaking factor due to infiltration for instance and when the largest unit is not in operation, accelerated cycle should provide adequate time for aeration taking into account dilution factor.]

- System reliability with any single tank unit out of service and the instantaneous delivery of flow should be evaluated in the design of decanter weirs and approach velocities. The treated effluent from each reactor should be free of scum and have a total suspended solids concentration non greater than 30 mg/l at any time. [For large plants where scum is a concern](#), scum removal should be provided. An adequate zone of separation between the sludge blanket and the decanter(s) should be maintained throughout the decant phase;
- Decanters should draw [from top water level to bottom water level](#) treated effluent ~~from~~ below the water surface and exclude scum;
[In case of fixed decanter, more settling time \(at least 2 hours\) should be provided under all flow condition.](#)
- The water depth of any basin [lacking a baffle wall](#) where simultaneous fill and decant may occur should be limited to not less than 3.7 m (12 ft) at the end of the decant phase. The minimum water depth can be reduced to 3 m (10 ft) for SBRs [with baffle wall or](#) with non-continuous feed;
- Adequate means to accommodate basin dewatering should be provided. All sludge transfer and wasting pumps should be accessible for maintenance without dewatering the tank;
- The capability to transfer sludge between SBR tanks should be provided. If the decant pumps are used for sludge transfer, all solids in the decant piping need to be flushed and recycled back to the SBR;
- The blowers should be provided in multiple units, so arranged and in such capacities as to meet the maximum air demand in the aerated portions of the fill/react and react phases of the cycle with the single largest unit out of service;
- Independent of aeration mixing should be provided for all systems where biological phosphorus removal or [significant](#) denitrification is required. The mixing equipment should be sized to thoroughly mix the entire basin [main zone](#) ~~from a settled condition within 5 minutes without aeration;~~
- Downstream processes need to be sized to handle peak discharge rates that will occur during decant phase [or provide adequate post equalisation;](#)
- All 24-hour effluent quality composite samples for compliance reporting or monitoring plant operations should be flow-paced and include samples collected at the beginning and end of each decant phase; and

- Programmable logic controllers (PLC) should be provided. Multiple PLCs [or spare components for PLC \(processor, input/output module, and power supply\)](#) should be provided as necessary to ensure rapid process recovery or minimize the deterioration of effluent quality from the failure of a single controller. An uninterruptible power supply with electrical surge protection should be provided for each PLC to retain program memory (i.e., process control program, last-known set points and measured process/equipment status) through a power loss. A hard-wired backup for manual override should be provided in addition to automatic process control. Both automatic and manual controls should allow independent operation of each tank. In addition, a fail-safe control should be provided which cannot be adjusted by the operator allowing at least 20 minutes of settling between the react and decant phases.

12.4.2.2 UNIT SIZING

Activated sludge process design considerations in Section Activated Sludge should be reviewed. The aeration tank volumetric loading should not exceed $0.24 \text{ kg BOD}_5 / (3\text{d})$ ($15 \text{ lb BOD}_5 / \text{d} / 1000 \text{ ft}^3$). Design F/M ratios should be within the range of 0.05 to 0.1 d^{-1} . The reactor MLVSS and MLSS concentrations and aeration tank volumetric loading should be calculated at the ~~low-water level~~ [average aeration level under average design flow](#).