Validation Testing of ISO30500:2018 on Innovative Non-Sewered Sanitation Systems

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20th February 2019

TÜV SÜD

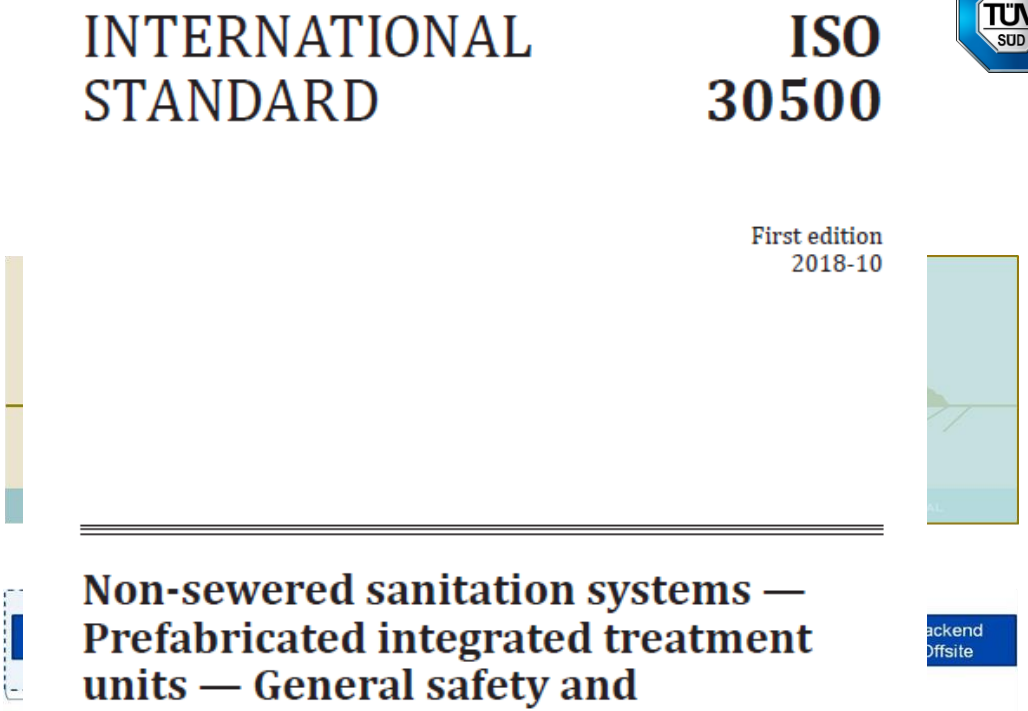
Mehr Wert.
Mehr Vertrauen.

Add value.
Inspire trust.

AfricaSan5 FSM5

ISO30500:2018

- **First** technical standard for NSSS
- Ensures **human health** and **environmental** safety
- Developed by ISO Project Committee (PC) 305
- Published in October 2018
- One of the **fastest** published completed in 2 years


INTERNATIONAL STANDARD

ISO 30500

First edition
2018-10

Non-sewered sanitation systems — Prefabricated integrated treatment units — General safety and performance requirements for design and testing

Systèmes d'assainissement autonomes — Unités de traitement intégrées préfabriquées — Exigences générales de performance et de sécurité pour la conception et les essais

Why validate ISO30500?

- **Feedback mechanism** to standard development
- **Practicality** of test methods
- Manufacturer **insight**

Validation

Scale	Multi unit NSSS	Single user NSSS	Multi unit NSSS
When	July 2018	August 2018	November 2018
Location	Durban, South Africa	Singapore	Coimbatore, India
Scope of testing			
• Environmental	Yes	-	Yes
• Human Health	Yes	Yes	No
• Air emissions	No	Yes	Yes
• Noise	No	Yes	Yes
• Odour	No	No	Yes

Human Health Parameters – minimum spike amount

Table A.4 — Spiking input with human enteric pathogen surrogates

Parameter (Pathogen class)	Human enteric Bacterial pathogens	Human enteric viruses	Human enteric Helminths	Human enteric Protozoa
Surrogate	using *E. coli* as a surrogate, measured in CFU or MPN	using MS2 Coliphage as surrogate, measured in PFU	using *Ascaris suum* viable oval as surrogate	using viable *Clostridium perfringens* spores as surrogate, measured in CFU
Min. faeces spike [number/g, (dry solids)]	10^8	10^8	10^4	10^6
Min. urine spike (number/l)	10^8	10^8	10^4	10^6

Human Health Parameters – Spiking Log Reduction Values (LRVs)

Table 5 — Liquid effluent validation thresholds and log-reduction values (LRVs) for human health protection

Parameter (Pathogen class)	Human enteric bacterial pathogens	Human enteric viruses	Human enteric Helminths	Human enteric Protozoa
Surrogate	using *E. coli*[b] as surrogate, measured in CFU or MPN	using MS2 Coliphage as surrogate, measured in PFU	using *Ascaris suum* viable ova as surrogate	using viable *Clostridium perfringens spores* as surrogate, measured in CFU
Max. concentration in liquids (number/l)	100	10	< 1	< 1
Overall LRV for liquid[a]	≥ 6	≥ 7	≥ 4	≥ 6

[a] Log-reduction values (LRVs) were derived from a quantitative microbial risk assessment (QMRA) as described by WHO 2016. For further information, see Reference [61] and Reference [72].

[b] *E. coli* strain KO11 (ATCC 55124) is used because it is chloramphenicol resistant. Therefore, this antibiotic may be added to the plating medium to suppress the growth of other, interfering bacteria.

Human Health Parameters testing – Objective of validation

- Determine if the **minimum spike amount** can be cultivated and is achievable

- Determine NSSS pathogen **removal efficiency** (max. concentration and LRV)

Spiking – Sampling Methodology

Baseline(S1)

Spike (S2)

Output (S3)

Results – Bacteria

- Minimum spike amount achieved?
- Output threshold and LRVs achieved?

Required Spike Conc. (log/100ml)	Output Threshold (log/100ml)	Log Reduction
7	1	6

		E.coli Log/100ml			
		S1	S2	S3	Log Red
Target			>7	<1	>6
Wed, 20/6/2018	8:00				
	10:00				
Thu, 21/6/2018	8:00	5.07	7.37	0	7.37
	10:00	5.1	7.72	0.22	7.5
	12:00	5.3	7.68	0.22	7.46
	14:00	5.41	7.74	0	7.74
Fri, 22/6/2018	8:00				
	10:00				
Mon, 25/6/2018	8:00	5.03	7.51	0	7.51
	10:00				
	12:00	5.26	7.34	0	7.34
	14:00				
Tue, 26/6/2018	8:00	5.13	7.47	0	7.47
	10:00				
	12:00	5.33	7.38	0	7.38
	14:00				
Wed, 27/6/2018	8:00	5.2	7.54	0.3	7.24
	10:00				
	12:00	5.43	7.73	0.37	7.36
	14:00				

Results - Viruses

- Minimum spike amount achieved?
- Output threshold and LRVs achieved?

Required Spike Conc. (log/100ml)	Output Threshold (log/100ml)	Log Reduction
7	0	7

		Phage Log/100ml			
		S1	S2	S3	Log Red
Target			>7	<0	>7
Wed, 20/6/2018	8:00	3.4	6.82	0	6.82
	10:00	3.3	7.17	0	7.17
Thu, 21/6/2018	8:00				
	10:00				
	12:00				
	14:00				
Fri, 22/6/2018	8:00	3.34	6.82	0	6.82
	10:00	3.26	7.21	0	7.21
Mon, 25/6/2018	8:00				
	10:00	3.14	7.19	0	7.19
	12:00				
	14:00	3.32	6.96	0	6.96
Tue, 26/6/2018	8:00				
	10:00	3.19	7.15	0.12	7.03
	12:00				
	14:00	3.4	7.14	0	7.14
Wed, 27/6/2018	8:00				
	10:00	3.29	7.19	0.22	6.97
	12:00				
	14:00	3.56	7.27	0	7.27

Results - Protozoa

- Minimum spike amount achieved?
- Output threshold and LRVS achieved?

Required Spike Conc. (log/100ml)	Output Threshold (log/100ml)	Log Reduction
5	<0.1	6

		Clostridium Log/100ml			
Date		S1	S2	S3	Log Red
Target			>5	≤0.1	>6
Wed, 20/6/2018	8:00	4.43	6.29	0.82	5.47
	10:00	4.82	6.41	0.73	5.68
Thu, 21/6/2018	8:00				
	10:00				
	12:00				
	14:00				
Fri, 22/6/2018	8:00	4.07	6.54	0.22	6.32
	10:00	4.61	6.54	0.7	5.84
Mon, 25/6/2018	8:00				
	10:00	4.02	6.64	0	6.64
	12:00				
	14:00	4.07	6.57	0	6.57
Tue, 26/6/2018	8:00				
	10:00	4.08	6.54	0	6.54
	12:00				
	14:00	4.37	6.56	0	6.56
Wed, 27/6/2018	8:00				
	10:00	4.2	6.63	0	6.63
	12:00				
	14:00	4.48	6.55	0	6.55

Conclusion

- Minimum spike amount and LRVs are **achievable, and repeatable** at such scale
- Challenges with **procurement of Ascaris** for helminth testing
- Next steps: more extensive testing and collaboration with partners to conduct full ISO30500 testing and certification

Thank you!

Acknowledgements:
University of KwaZulu-Natal (UKZN)-Pollution Research Group (PRG)
Yixing Eco-Sanitary Manufacture CO. Ltd. (Eco-san)

Coimbatore, India

Durban, South Africa