ZDHC

ZDHC Wastewater Guidelines

Version 2.2
September 2024

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Abbreviations

Visit the ZDHC Glossary to search for explanations of terminology used across this document and the ZDHC Foundation

CAP	Corrective Action Plan
CETP	Central Effluent Treatment Plant
ETP	Effluent Treatment Plant
MBR	Membrane bio reactor
MMCF	Man-Made Cellulosic Fibres
MRSL	Manufacturing Restricted Substances List
RCA	Root Cause Analysis
SCM	Sustainable Chemical Management
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
ZDHC WW Guidelines	ZDHC Wastewater Guidelines
ZLD	Zero Liquid Discharge

Introduction

Background

The Wastewater ZDHC Guidelines (hereinafter referred to as “WW Guidelines”) sets out limits for wastewater in terms of ‘conventional’ parameters (e.g. temperature, pH), heavy metals and chemicals listed on the ZDHC Manufacturing Restricted Substances List (MRSL).

Chemicals, such as heavy metals, can accumulate in sludge, the limits for which are accompanied by recommended disposal pathways dependent on the type and level of chemical contamination.

It is expected that brands, suppliers, and other stakeholders adopt and implement the wastewater and sludge limits. Suppliers should conduct tests, check results and where appropriate, make adjustments to chemical inputs or effluent treatment processing and dispose of the sludge via the recommended pathway.

The WW Guidelines provide requirements for different effluent treatment models and clarify the type of suppliers that are in scope. It also provides details of sampling, testing and reporting requirements and directs the reader to more detailed supporting documents where appropriate.

The ZDHC Wastewater Council and ZDHC recognise there were some gaps within V2.1 that need to be addressed in the interim period. Therefore it has been decided to publish a ZDHC Wastewater Guidelines V2.2 to ensure clarity on some key points. The updates added within V2.2 do not have any impact on the implementation of the ZDHC Wastewater Guidelines.

Objective

The purpose of the ZDHC Wastewater Guidelines is to set a single, globally unified expectation for sampling, testing, and reporting industrial wastewater and sludge resulting from wet processing across the textile, apparel, leather and footwear industries.

The WW Guidelines provide criteria for wastewater and sludge quality to be monitored by suppliers so that these do not negatively impact the environment. Providing details of sampling, testing and reporting requirements. And enabling the sharing of verified data via a secure ZDHC platform between suppliers and brands.

Scope

In scope

The WW Guidelines apply to discharged industrial[1] wastewater and sludge[2] produced from wastewater treatment operations of textile, apparel, leather and footwear suppliers with wet processing facilities. This includes, but is not limited to:

- Dyeing and finishing of fibres, yarns, threads, fabrics, garments, textile trims and laces
- Fabric mills
- Laundry, washing and finishing facilities
- Printing facilities
- Vertical finished goods manufacturing facilities where any wet processes occur
- Synthetic materials (synthetic fibres or textile-polymer composite microfibres) coated with PU, PVC or similar polymers that hold the appearance of leather but are not made from animal skin or hide.
- With reference to leather:
    - Raw materials include: Hides from animal origin
    - Facility type tanning process includes:
        - Beamhouse and tanning: including soaking, liming, removal of extraneous tissues, unhairing and fleshing, deliming, bating, pickling, pre-tanning, etc.
        - Wet-end, crusting and/or finishing: such as washing, degreasing, re-tanning, dyeing, fat liquoring, oiling, coating etc.

1 *Where a supplier combines their industrial wastewater with their domestic wastewater, the resulting combined wastewater is classified as industrial wastewater, to which these WW Guidelines would apply.*

2 *For a comprehensive list of different types of sludge and which of those that are in scope for the applicability of the WW Guidelines refer to the ZDHC Sludge Reference Document.*

Out of scope

These WW Guidelines do not currently apply to wastewater discharge from suppliers including, but not limited to:

- Accessories or trim manufacturers e.g. zips, buttons (plastic metal, glass, shells etc) and galvanising processes
- Cotton farming
- Cattle ranching
- Polymer production
- Raw wool scouring
- Production of chemicals or mixing of chemical formulations for commercial sale

In addition, the WW Guidelines do not currently apply to:

- Discharge of domestic wastewater only. Such as:
    - From a sewing/garmenting (e.g. staking) facility that employs workers but has no in-house wet processing unit.
    - Domestic wastewater that is not blended with industrial wastewater.
- Wastewater management and treatment systems beyond the property boundaries of the supplier. This includes any third-party, off-site, centralised or common effluent treatment plants (CETP) that are not under the direct control and/or ownership of the supplier.
    - CETPs can choose to monitor their performance against these guidelines.
    - Any supplier who discharges to CETP is deemed an indirect supplier and should test against these guidelines.
- With reference to leather:
    - Slaughterhouses
    - Leather facilities with only mechanical processes/phases e.g. only embossing, polishing, staking or dry milling.

Separate wastewater guidelines are available for Man-Made Cellulosic Fibres (MMCF) suppliers.

Connectivity

This document is part of a set of guidelines and solutions provided by ZDHC. All stakeholders suppliers, brands and laboratories are expected to follow the most current documents and tools listed below:

- ZDHC Sludge Reference Document
- ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan
- ZDHC Gateway
- ZDHC Root Cause Analysis and Corrective Action Plan Template
- Detox.live
- Knowledge Base
- Approved Laboratories

Revision history

- In the spirit of continuous improvement, the WW Guidelines will be reviewed and revised as needed. The WW Guidelines were edited to incorporate learnings and opportunities previously identified during their practical application and implementation at facilities. This version covers the major changes listed below.
- Changes are indicated in red throughout the document.

Version №	Changes	Date
Version 2.2	▪ Layout: Updated and four sections created: (A) wastewater, (B) sludge, (C) microfibres/fibre fragmentation and (D) candidate list. ▪ Out of scope - Definition of non-textile trims updated to include metal parts. ▪ Dyes – Navy blue colourant: Updated to 'Not Applicable' for testing. ▪ OPP: Updated to 'Sample and Report' for leather from previously 'Not Applicable.' ▪ DMFa: Updated to 'Sample and Report' for leather from previously 'Not Applicable.' footnote on mock leather removed. ▪ Flame Retardants: Limit value applied for leather for all substances and aligned with textile limits. ▪ Flame Retardants: Limit value of boron-based flame retardants, determined as total boron by ICP, increased to 500 ppb of total boron for textiles and leather. ▪ Other/Miscellaneous Chemicals: Limit value applied for leather. ▪ Footnote added PCA under restricted amines group. ▪ UV Absorbers: Limit value applied for leather for all substances. ▪ VOC: Limit value applied for leather for toluene and xylene (footnote on Sample and Report for mock leather deleted). ▪ Metals: Exception for antimony for polyester wet processing facilities deleted and limit applied for all textiles including polyester. ▪ Conventional parameters for WW: ▫ Footnote added for temperature difference and persistent foam. ▫ Dissolved oxygen (DO) and total chlorine: limit value applied for textile and leather. ▫ Limit values for AOX and sulphite added to leather. ▪ Sludge testing requirements: tables updated as follows: ▫ Table 4A - ZDHC MRSL Substances (PAH testing applied for leather). ▫ Table 4B - Testing of Metals and Leachate (not applicable for Disposal Pathway C). ▫ Conventional Parameters and Cyanide (not applicable for Disposal Pathway C). ▪ Sludge Pathway G- Max. total metals limits amended. ▪ RCA/CAP for input chemical inventory introduced for detection of ZDHC MRSL substances in sludge. ▪ Sample and Report for ZDHC MRSL substances in sludge removed and changed to 'pass/fail' against reporting limits in Table 4A. ▪ % solids parameter: explanation added as a footnote. ▪ Paint filter parameter: explanation added as a footnote. ▪ pH and cyanide testing in sludge changed to 'Not Applicable' for Disposal Pathway C. ▪ Faecal coliform parameter changed from 'Sample and Report' to 'Not Applicable' for Pathways D and E in sludge testing. ▪ Paint filter test for Disposal Pathway G changed from 'Sample and Report' to 'pass' in sludge testing. ▪ Added sludge documentation templates for each disposal pathway as a mandatory requirement to be maintained by suppliers and to be collected by sampler and submitted to the laboratory.	Sept 2024

Version №	Changes	Date
Version 2.1	▪ Updated E.coli Table 3 and missing anions in Table 4B, added 4D for cyanide and corrected lab method in Table 4A and 4B.	October 2022
	▪ Updated tables with correct methods.	April 2022
Version 2.0	▪ Simplified the testing requirements for Direct, Indirect and Zero Liquid Discharge suppliers. ▪ Incorporation of the ZDHC MRSL V2.0 with wastewater limits and testing methods. ▪ Review of the conventional parameters and addition of: E.coli, TDS, sulphate. ▪ Introduction on sludge ZDHC Disposal Pathways and new way of testing for sludge parameters.	March 2022
Version 1.1	The conventional parameters in Appendix A Table 1 were reformatted into two sub-tables: Table 1A covers sum parameters and anions, and Table 1B covers metals. ▪ The reporting limits, standard methods for sludge analysis and lab description methods have been specified in Appendix A Table 3. ▪ Integrated the requirements from the ZDHC Interim Guidelines for suppliers with an on-site Zero Liquid Discharge (ZLD) treatment system - released in February 2019. In addition, the scope of metals testing for raw wastewater is expanded. ▪ Removed sampling and testing of incoming water from the guidelines requirements. Instead, this could be part of the Root Cause Analysis when there is non-conformance to test results of the ZDHC MRSL parameters. ▪ Expanded the standard methods for analysis for conventional parameters to allow suppliers to use legal compliance testing data/results for ZDHC reporting requirements, following certain conditions and exceptions. ▪ Added testing guidelines for persistent foam.	July 2019
Version 1.0	In 2015, ZDHC commissioned a study to better understand the regulatory landscape of wastewater discharge regulations and guidelines across the textile industry. This study concluded: ▪ Wastewater discharge quality regulations vary greatly from country to country and region to region. ▪ Current wastewater regulations do not necessarily focus on the management of hazardous chemicals. ▪ Wastewater guidelines published by different brands, as well as amongst multi-brand consortia, vary greatly, resulting in duplication of testing for suppliers. ▪ There is a need for uniform, global guidance pertaining to wastewater discharge quality, as well as testing and reporting, to enable a more sustainable industry. ▪ Following this study, was the Initial publication of the ZDHC Wastewater Guidelines.	November 2016

PART A

Wastewater

Wastewater discharge types and sample locations

There are five ZDHC Supplier Types under wastewater, these are listed below and illustrated in figures 1a-e:

- Direct discharge
- Indirect discharge with pretreatment[3] (with sludge)
- Indirect discharge with pretreatment (without sludge)
- Indirect discharge without pretreatment
- Zero Liquid Discharge (ZLD)[4]

Additionally, there are three possible sampling locations. These are listed below and illustrated in Figures 1a-1e.

- **Untreated Wastewater** ('Raw wastewater') - Wastewater that is collected prior to any treatment.
- **Discharged wastewater** — Treated wastewater that is discharged to the environment, or partially treated or untreated wastewater that is discharged to a Central Effluent Treatment Plant (CETP) for further treatment. (This is not applicable to indirect discharge without pretreatment as well as to Zero Liquid Discharge facilities)
- **Sludge** — The residual solid, semisolid, or slurry material generated as a by-product of wastewater treatment processes, including primary, secondary and tertiary (ZLD) treatments.

3 *Any process or operation carried out to treat the wastewater prior to discharge to the CETP*

4 *For suppliers to be classified as a Zero Liquid Discharge (ZLD) treatment system they must meet ZDHC's definition of ZLD.*

Direct discharge

Direct discharge is a process in which the wastewater treated and generated by a supplier through its own and operated effluent treatment plant is discharged directly to the land, municipal sewers, or water bodies such as streams, lakes and oceans.

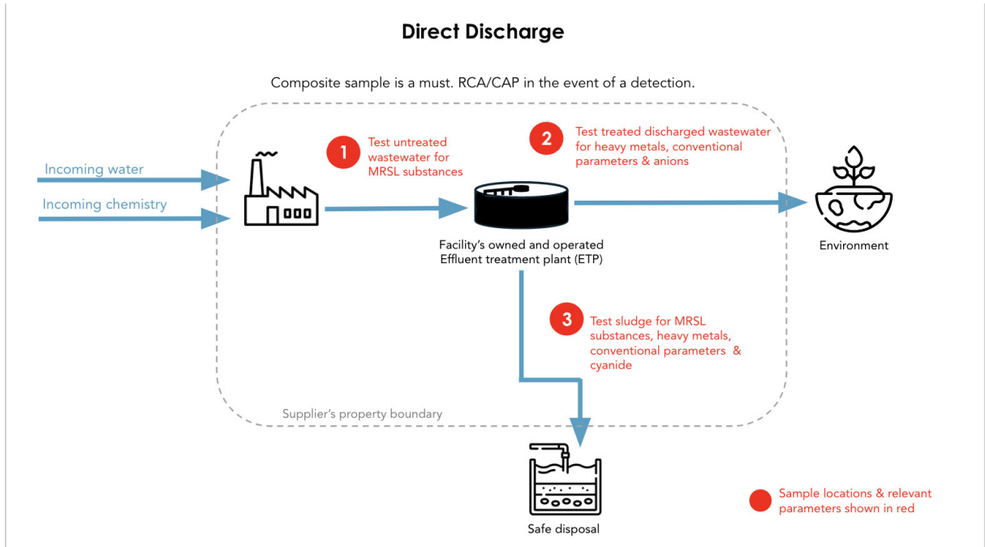

Figure 1a: Schematic illustration of the sample locations for a direct discharge supplier. Sampling locations: untreated wastewater, discharged wastewater, sludge

Indirect discharge

The discharge of wastewater through an industrial wastewater sewer system to a central effluent treatment plant (CETP) that is not owned or operated by the supplier discharging the wastewater. CETP is also referred to as off-site wastewater treatment. There are two main models of Indirect discharge:

- Indirect discharge with pretreatment
- Indirect discharge without pretreatment

Indirect discharge with pretreatment is further categorised into two subparts:

- Indirect with pretreatment (with sludge) as referred to in Figure 1b.
- Indirect with pretreatment (without sludge) as referred to in Figure 1c.

Indirect discharge with pretreatment (with sludge)

Where wastewater is collected, mixed and then subjected to a primary treatment process which can generate sludge, prior to discharge to a CETP.

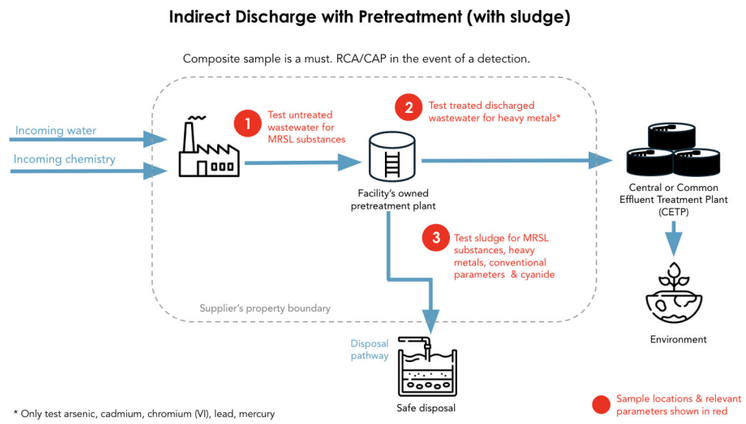

Figure 1b: Schematic illustration of the sample locations for an indirect discharge, with pretreatment (with sludge) supplier. Sampling locations: untreated wastewater, discharged wastewater, sludge

Indirect with pretreatment (without sludge)

Where wastewater is collected, mixed and then treated using simple physical processes that do not generate sludge, prior to discharge to CETP.

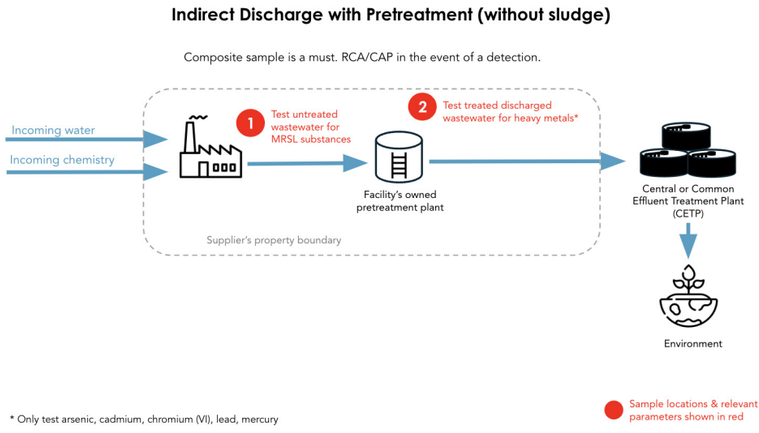

Figure 1c: Schematic illustration of the sample locations for an indirect discharge, with pretreatment (without sludge) supplier. Sampling locations: untreated wastewater, discharged wastewater

Indirect discharge without pretreatment

Where wastewater is discharged directly from the facility to the CETP without any kind of treatment within the facility.

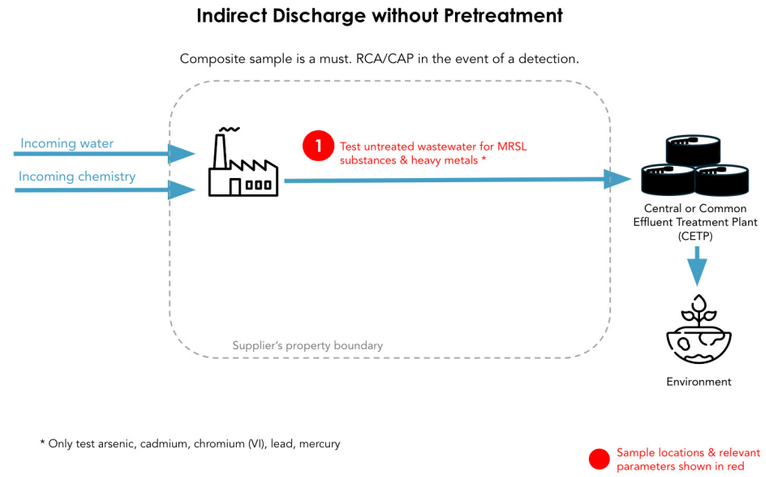

Figure 1d: Schematic illustration of the sample locations for an indirect discharge, without pretreatment supplier. Sampling locations: untreated wastewater (discharged wastewater)

Zero Liquid Discharge (ZLD)

Under ZLD, no industrial wastewater is discharged from a supplier's site in liquid form to the environment. An on-site ZLD treatment system treats and recovers almost all wastewater such that the only water lost is through evaporation or as moisture in the sludge from treatment plant operations. A supplier is not considered to have a ZLD treatment system if there is any industrial liquid discharge to the environment (including the use of recycled wastewater for gardening purposes).

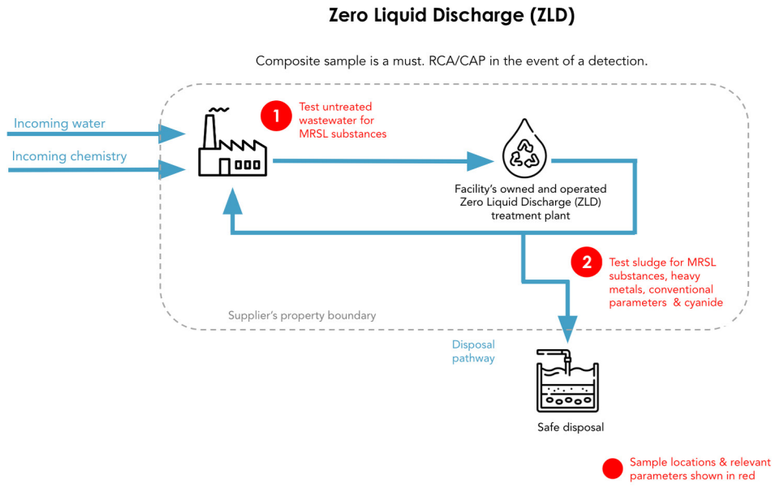

Figure 1e: Schematic illustration of the wastewater discharge types and sample locations. sampling locations: untreated wastewater, sludge

Threshold limits for wastewater flow rates

Suppliers are required to conduct wastewater sampling and testing based on a **threshold wastewater flow rate of 15 m^3/day.** This is because suppliers that discharge less than 15m^3 of wastewater per day (for example, screen printing facilities that wash moulds, screens and tools) do not impact the environment in the same way as those who discharge more than or equal to 15m^3 of wastewater per day (such as a typical dyehouse or tannery). The threshold wastewater average discharge applies to suppliers irrespective of the supplier's production type or production processes[5].

The flow rate is calculated as follows:

$$\text{Flow rate } (m^3/\text{ day}) = \frac{\text{annual wastewater discharged in } m^3}{\text{total number of working days per year}}$$

5 *From any wet processing and/or from any operation such as rinsing screens, tools or equipment wash. This includes but is not limited to sizing, desizing, pretreatment, dyeing, printing (including digital printing), finishing, laundry, non-woven manufacturing using hydro entanglement, etc.*

Table A: Testing Requirements for Suppliers that Generate on Average, Equal To, or More Than 15m^3 of Industrial Wastewater per Day

Test Parameters and Sample Locations/ Discharge Types	ZDHC MRSL[a] Sample untreated wastewater and test Tables 1A-1T parameters	ZDHC Heavy Metals Sample discharged wastewater and test Table 2 parameters	ZDHC Conventional and Anions Sample discharged wastewater and test Table 3 parameters	ZDHC Sludge Sample sludge and test from Table (4A, 4B,4C) parameters from Part B
Direct	✓	✓	✓	Sample and test against the major ZDHC sludge disposal pathway in accordance with the ZDHC Wastewater Guidelines.
Indirect with Pretreatment (with Sludge)	✓	✓ Test only arsenic, cadmium, chromium (VI), lead, mercury	✗	Sample and test against the major ZDHC sludge disposal pathway in accordance with the ZDHC Wastewater Guidelines.
Indirect with Pretreatment (without Sludge)	✓	✓ Test only arsenic, cadmium, chromium (VI), lead, mercury	✗	✗
Indirect without Pretreatment	✓	✓ Test only arsenic, cadmium, chromium (VI), lead, mercury[b]	✗	✗
Zero Liquid Discharge (ZLD)	✓	✗	✗	Sample and test against the major ZDHC sludge disposal pathway in accordance with the ZDHC Wastewater Guidelines.

a = Excluding ZDHC heavy metals

b= For the facilities with indirect without pretreatment discharge type ZDHC MRSL substances as well as ZDHC heavy metals (arsenic, cadmium, chromium (VI), lead, mercury) as explained in the above table should be sampled and tested only at untreated wastewater as there is no pretreatment involved.

Table B: Testing Requirements for Suppliers that Generate on Average, Less Than 15m^3 of Industrial Wastewater per Day

Test Parameters and Sample Locations/ Discharge Types	**ZDHC MRSL**[a] Sample untreated wastewater and test Tables 1A-1T parameters	**ZDHC Heavy Metals** Sample discharged wastewater and test Table 2 parameters	**ZDHC Conventional and Anions** Sample discharged wastewater and test Table 3 parameters	**ZDHC Sludge** Sample sludge and test from Table (4A, 4B,4C) parameters from Part B
Direct	✗	✓	✓	✗
Indirect with Pretreatment (with Sludge)	✗	✗	✗	✗
Indirect with Pretreatment (without Sludge)	✗	✗	✗	✗
Indirect without Pretreatment	✗	✗	✗	✗
Zero Liquid Discharge (ZLD)	✗	✗	✗	✗

a =Excluding ZDHC Heavy Metals

Requirements

At a minimum, it is expected that facilities meet and comply with the requirements that are set by local legislation.[6] Additionally, suppliers should sample and test for ZDHC WW Guidelines V2.2 according to the matrix given in Tables A and B, based on the threshold wastewater flow rate of the supplier.

Suppliers should meet the below requirements:

- Perform wastewater testing twice a year i.e. during the October and April cycles.
- Generate a ClearStream Report for every wastewater testing cycle.
- Meet all reporting limits for ZDHC MRSL parameters (Table 1A-1T).
- Meet, at a minimum wastewater Foundational Limits for all Heavy Metals (Table 2).
- Meet, at a minimum wastewater Foundational Limits for all Conventional Parameters and Anions (Table 3) for direct discharge facilities.
- In case of non-conformities in the ClearStream Report, suppliers should perform a RCA and upload a CAP in their ZDHC Gateway supplier account.

ZDHC MRSL wastewater parameters and reporting limits, Table 1A-1T

The ZDHC MRSL parameters exclude heavy metals which are listed separately in Table 2, as these are often included in legally mandated standards.

The purpose of testing ZDHC MRSL parameters is to check for intentional use of ZDHC MRSL substances and/or high levels of respective contamination in the chemical inputs. Therefore, the WW Guidelines require testing of ZDHC MRSL substances in untreated wastewater only. This also allows us to compare ZDHC MRSL data for all supplier types: direct, indirect, and Zero Liquid Discharge (ZLD).

6 *It is not the intent of the ZDHC Foundation to act as an agency reporting wastewater and sludge discharge data to governments or authorities having jurisdiction. It is expected that suppliers are accountable for reporting on their wastewater and sludge discharges, in accordance with applicable laws.*

Reporting limits mentioned in the following tables apply to all chemical substances of the respective ZDHC MRSL group. The methods for analysis/testing in the WW Guidelines are recommended for use by ZDHC Approved Laboratories. However, laboratories can use equivalent analytical methods provided they are pre-approved by ZDHC. (An equivalent method is defined by ZDHC as a similar analytical method which has a similar detection limit with acceptable uncertainty of measurements and reproducibility and reliability as given by the suggested method. The laboratory has to share with ZDHC relevant information to assess the equivalence. The aim is that data from one laboratory can be compared directly and equivalently to any other laboratory in the ZDHC Programme.)

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Table 1A: Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): Including All Isomers				
Nonylphenol ethoxylates (NPEO)	Multiple Including 9016-45-9 26027-38-3 37205-87-1 68412-54-4 127087-87-0	5	5	NP/OP: ISO 18857-2 (modified dichloromethane extraction) or ASTMD7065 (GC-MS or LC-MS(-MS) OPEO/NPEO (n>2): ASTM D7742 ISO 18857-2
Nonylphenol (NP), mixed isomers	Multiple Including 104-40-5 11066-49-2 25154-52-3 84852-15-3	5	5	NP/OP: ISO 18857-2 (modified dichloromethane extraction) or ASTMD7065 (GC-MS or LC-MS(-MS) OPEO/NPEO (n>2): ASTM D7742 ISO 18857-2
Octylphenol ethoxylates (OPEO)	Multiple Including 9002-93-1 9036-19-5 68987-90-6	5	5	NP/OP: ISO 18857-2 (modified dichloromethane extraction) or ASTMD7065 (GC-MS or LC-MS(-MS) OPEO/NPEO (n>2): ASTM D7742 ISO 18857-2
Octylphenol (OP), mixed isomers	Multiple Including 140-66-9 1806-26-4 27193-28-8	5	5	NP/OP: ISO 18857-2 (modified dichloromethane extraction) or ASTMD7065 (GC-MS or LC-MS(-MS) OPEO/NPEO (n>2): ASTM D7742 ISO 18857-2
Table 1B: Antimicrobials and Biocides				
o-Phenylphenol (+salts)	90-43-7	100	Sample and Report	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 an alternative method of solvent extraction and derivatisation are included
Triclosan	3380-34-5	100	100	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 an alternative method of solvent extraction and derivatisation are included
Permethrin	Multiple including 52645-53-1	500	500	USEPA 8270E Solvent extraction, followed by GC-MS ISO 14154:2005 An alternate method, without derivatisation and determination by LCMS/LCMSMS, is also possible
Table 1C: Chlorinated Paraffins				
Medium-chain Chlorinated Paraffins (MCCPs) (C14-C17)	85535-85-9	500	500	Preparation: EPA 3510 Analysis: ISO18219-2:2021 Method for MCCP wit GC-MS(NCI) or LC-MS/MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Short-Chain Chlorinated Paraffin (SCCPs) (C10′– C13)	85535-84-8	25	25	Preparation: EPA 3510 Analysis: ISO18219-2:2021, ISO 12010:2019 Method for SCCP wit GC-MS(NCI) or LC-MS/MS
Table 1D: Chlorobenzenes and Chlorotoluenes				
1,2-dichlorobenzene	95-50-1	0.2	0.2	USEPA 8260D, 8270E, Purge and Trap, Head Space Dichloromethane extraction followed by GC-MS
Other isomers of mono-, di-, tri-, tetra-, penta- and hexa- Chlorobenzene and mono-, di-, tri-, tetra- and penta- chlorotoluene	Multiple including 108-90-7 541-73-1 106-46-7 87-61-6 120-82-1 108-70-3 634-66-2 634-90-2 95-94-3 608-93-5 118-74-1 95-49-8 108-41-8 106-43-4 32768-54-0 95-73-8 19398-61-9 118-69-4 95-75-0 25186-47-4 7359-72-0 2077-46-5 6639-30-1 23749-65-7 21472-86-6 1006-32-2 875-40-1 1006-31-1 877-11-2	0.2	0.2	USEPA 8260D, 8270E, Purge and Trap, Head Space Dichloromethane extraction followed by GC-MS
Table 1E: Chlorophenols				
2-chlorophenol	95-57-8	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3-dichlorophenol	576-24-9	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3,4-trichlorophenol	15950-66-0	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
2,3,5-trichlorophenol	933-78-8	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3,6-trichlorophenol	933-75-5	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,4-dichlorophenol	120-83-2	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,4,5-trichlorophenol	95-95-4	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,4,6-trichlorophenol	88-06-2	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,5-dichlorophenol	583-78-8	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,6-dichlorophenol	87-65-0	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
3-chlorophenol	108-43-0	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
3,4-dichlorophenol	95-77-2	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
3,4,5-trichlorophenol	609-19-8	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
3,5-dichlorophenol	591-35-5	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
4-chlorophenol	106-48-9	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
Pentachlorophenol (PCP)	87-86-5	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3,5,6 Tetrachlorophenol	935-95-5	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3,4,6-tetrachlorophenol	58-90-2	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included
2,3,4,5-tetrachlorophenol	4901-51-3	0.5	0.5	USEPA 8270E Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS BS EN 12673-1999 the procedure of solvent extraction and derivatisation are included

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Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Table 1F: N,N-di-methylformamide (DMFa)				
Dimethyl formamide; N,N-dimethylformamide (DMFa)	68-12-2	1000	Sample and Report	EPA 8015, EPA 8270E
Table 1G: Dyes – Carcinogenic or Equivalent Concern				
Basic violet 3 with >0.1% of Michler´s Ketone	548-62-9	500	500	Liquid extraction, LC/MS
C.I. Acid Red 26	3761-53-3	500	500	Liquid extraction, LC/MS
C.I. Acid Violet 49	1694-09-03	500	500	Liquid extraction, LC/MS
C.I. Basic Blue 26 (with Michler's Ketone > 0.1%)	2580-56-5	500	500	Liquid extraction, LC/MS
C.I. Basic Green 4 (Malachite Green Chloride)	569-64-2	500	500	Liquid extraction, LC/MS
C.I. Basic Green 4 (Malachite Green Oxalate)	2437-29-8	500	500	Liquid extraction, LC/MS
C.I. Basic Green 4 (Malachite Green)	10309-95-2	500	500	Liquid extraction, LC/MS
C.I. Basic Red 9	569-61-9	500	500	Liquid extraction, LC/MS
C.I. Basic Violet 14	632-99-5	500	500	Liquid extraction, LC/MS
C.I. Direct Black 38	1937-37-7	500	500	Liquid extraction, LC/MS
C.I. Direct Blue 6	2602-46-2	500	500	Liquid extraction, LC/MS
C.I. Direct Red 28	573-58-0	500	500	Liquid extraction, LC/MS
C.I. Disperse Blue 1	2475-45-8	500	500	Liquid extraction, LC/MS
C.I. Disperse Blue 3	2475-46-9	500	500	Liquid extraction, LC/MS
C.I. Disperse Orange 11	82-28-0	500	500	Liquid extraction, LC/MS
Table 1H: Dyes – Disperse (Allergenic)				
Disperse Blue 102	12222-97-8	50	NA	Liquid extraction, LC/MS
Disperse Blue 106	12223-01-7	50	NA	Liquid extraction, LC/MS
Disperse Blue 124	61951-51-7	50	NA	Liquid extraction, LC/MS
Disperse Blue 26	3860-63-7	50	NA	Liquid extraction, LC/MS

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Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Disperse Blue 35	12222-75-2	50	NA	Liquid extraction, LC/MS
Disperse Blue 35	56524-77-7	50	NA	Liquid extraction, LC/MS
Disperse Blue 7	3179-90-6	50	NA	Liquid extraction, LC/MS
Disperse Brown 1	23355-64-8	50	NA	Liquid extraction, LC/MS
Disperse Orange 1	2581-69-3	50	NA	Liquid extraction, LC/MS
Disperse Orange 3	730-40-5	50	NA	Liquid extraction, LC/MS
Disperse Orange 37/59/76	13301-61-6	50	NA	Liquid extraction, LC/MS
Disperse Red 1	2872-52-8	50	NA	Liquid extraction, LC/MS
Disperse Red 11	2872-48-2	50	NA	Liquid extraction, LC/MS
Disperse Red 17	3179-89-3	50	NA	Liquid extraction, LC/MS
Disperse Yellow 1	119-15-3	50	NA	Liquid extraction, LC/MS
Disperse Yellow 3	2832-40-8	50	NA	Liquid extraction, LC/MS
Disperse Yellow 39	12236-29-2	50	NA	Liquid extraction, LC/MS
Disperse Yellow 49	54824-37-2	50	NA	Liquid extraction, LC/MS
Disperse Yellow 9	6373-73-5	50	NA	Liquid extraction, LC/MS
Table 1I: Dyes – Navy Blue Colourant				
Component 1: C39H23Cl-CrN7O12S 2Na Component 2: C46H-30CrN10O20S2 3Na	118685-33-9 CAS No. Not Allocated	NA	NA	This group is Not Applicable for testing in wastewater
Table 1J: Flame Retardants				
Boric acid	10043-35-3, 11113-50-1	500	500	determined as total boron via ICP
Diboron trioxide	1303-86-2	500	500	determined as total boron via ICP
Disodium octaborate	12008-41-2	500	500	determined as total boron via ICP

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Disodium tetraborate, anhydrous	1303-96-4, 1330-43-4	500	500	determined as total boron via ICP
Tetraboron disodium heptaoxide, hydrate	12267-73-1	500	500	determined as total boron via ICP
Hexabromocyclodecane (HBCDD)	3194-55-6	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
2,2-bis(bromomethyl)-1,3-propanediol (BBMP)	3296-90-0	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Polybromobiphenyls (PBB)	59536-65-1	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Monobromobiphenyls (MonoBB)	Multiple	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Monobromodiphenylethers (MonoBDEs)	Multiple	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Dibromobiphenyls (DiBB)	Multiple	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Dibromopropylether	21850-44-2	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tribromodiphenylethers (TriBDEs)	Multiple	25	25	USEPA 8270E,ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tetrabromodiphenyl ether (TetraBDE)	40088-47-9	25	25	USEPA 8270E,ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Pentabromodiphenyl ether (PentaBDE)	32534-81-9	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Hexabromodiphenyl ether (HexaBDE)	36483-60-0	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Heptabromodiphenyl ether (HeptaBDE)	68928-80-3	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Octabromobiphenyls (OctaBB)	Multiple	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Octabromodiphenyl ether (OctaBDE)	32536-52-0	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Nonabromobiphenyls (NonaBB)	Multiple	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Nonabromodiphenyl ether (NonaBDE)	63936-56-1	25	25	USEPA 8270E,ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Decabromobiphenyl (DecaBB)	13654-09-6	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Decabromodiphenyl ether (DecaBDE)	1163-19-5	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tetrabromobisphenol A (TBBPA)	79-94-7	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Bis(2,3-dibromopropyl) phosphate (BDBPP)	5412-25-9	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tris-(2-chloro-1-methylethyl)phosphate (TCPP)	13674-84-5	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tris(1-aziridinyl) phosphine oxide) (TEPA)	545-55-1	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Tris(2,3,-dibromopropyl)-phosphate (TRIS)	126-72-7	25	25	USEPA 8270E, ISO 22032, USEPA 527 and USEPA 8321B Dichloromethane extraction GC-MS or LC-MS(-MS)
Table 1K: Glycols / Glycol Ethers				
2-ethoxyethanol	110-80-5	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
2-ethoxyethyl acetate	111-15-9	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
2-methoxyethanol	109-86-4	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
2-methoxyethylacetate	110-49-6	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
2-methoxypropylacetate	70657-70-4	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
Bis(2-methoxyethyl)-ether	111-96-6	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
Ethylene glycol dimethylether	110-71-4	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
Triethylene glycol dimethyl ether	112-49-2	50	50	USEPA 8270E, Liquid extraction, LC-MS, GC-MS
Table 1L: Halogenated Solvents				
1,2-dichloroethane	0107-06-02	1	1	US EPA 8260D Headspace GC/MS or Purge and trap GC/MS
Methylene chloride	75-09-2	1	1	US EPA 8260D Headspace GC/MS or Purge and trap GC/MS
Tetrachloroethylene	127-18-4	1	1	US EPA 8260D Headspace GC/MS or Purge and trap GC/MS
Trichloroethylene	79-01-6	1	1	US EPA 8260D Headspace GC/MS or Purge and trap GC/MS
Table 1M: Organotin Compounds				
Dipropyltin compounds (DPT)	Multiple including 867-36-7	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Mono- , di- and tri-butyltin derivatives	Multiple including 1118-46-3 1461-22-9	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Mono-, di- and tri-methyltin derivatives	Multiple including 993-16-8 753-73-1 1066-45-1	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Mono-, di- and tri-octyltin derivatives	Multiple including 3091-25-6 3542-36-7 2587-76-0	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Mono-, di- and tri-phenyltin derivatives	Multiple including 1124-19-2 1135-99-5 639-58-7	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Tetrabutyltin Compounds (TeBT)	Multiple including 1461-25-2	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Tetraethyltin Compounds (TeET)	Multiple including 597-64-8	0.01	0.01	ISO 17353

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Tetraoctyltin compounds (TeOT)	Multiple including 3590-84-9	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Tricyclohexyltin (TCyHT)	Multiple including 3091-32-5	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Tripropyltin Compounds (TPT)	Multiple including 2279-76-7	0.01	0.01	ISO 17353 Derivatisation with NaB (C2H5) GC-MS
Table 1N: Other/Miscellaneous Chemicals				
AEEA [2-(2-aminoethylamino)ethanol]	111-41-1	500	500	liquid extraction, LC-MSMS
Bisphenol A	80-05-7	10	10	Liquid extraction, LC-MS
Borate, zinc salt	12767-90-7	100	100	determined as total boron and total zinc via ICP
Footnote for borate, zinc salt: Limit refers to boron and zinc individually, not the salt.				
Quinoline	91-22-5	50	50	Liquid extraction, LC-MS
Silica (particles of respirable size)	14464-46-1	N/A	N/A	This parameter is Not Applicable for testing in WW
Thiourea	62-56-6	50	50	Liquid extraction, LC-MS
Table 1O: Perfluorinated and Polyfluorinated Chemicals (PFCs)				
Perfluorooctane sulfonate (PFOS) and related substances	Multiple including 1763-23-1	0.01	0.01	PFCs: EPA 537:2020 FTOH: BS EN 12673-1999, EPA 8270, PFCs: LC-MSMS FTOH: GC-MS Derivatisation with acetic anhydride followed by GC-MS
Perfluorooctanoic acid (PFOA) and related substances	Multiple including 335-67-1	1	1	PFCs: EPA 537:2020 FTOH: BS EN 12673-1999, EPA 8270, PFCs: LC-MSMS FTOH: GC-MS Derivatisation with acetic anhydride followed by GC-MS
Footnote on PFAS: ZDHC Wastewater Guidelines V2.2 requires facilities to test for the ZDHC MRSL V2.0 substances. With respect to PFAS, the ZDHC MRSL V2.0 only restricts the species listed in table 1O. However, the ZDHC MRSL V3.1 restricts all PFAS and this restriction will thus be included in ZDHC Wastewater Guidelines V3.0.				
Table 1P: Phthalates – Including All Other Esters of Ortho-Phthalic Acid				
1,2-benzenedicarboxylic acid, di-C6-8 branched and liearalkyl esters , C7-rich (DIHP)	71888-89-6/ 84777-06-0	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
1,2-benzenedicarboxylic acid, di-C7-11 branched and liearalkyl esters (DHNUP)	68515-42-4/ 68515-50-4	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Bis(2-methoxyethyl) phthalate (DMEP)	117-82-8	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Butyl benzyl phthalate (BBP)	85-68-7	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-cyclohexyl phthalate (DCHP)	84-61-7	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-iso-decyl phthalate (DIDP)	26761-40-0	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-iso-octyl phthalate (DIOP)	27554-26-3	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-isobutyl phthalate (DIBP)	84-69-5	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-isononyl phthalate (DINP)	28553-12-0	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-n-hexyl phthalate (DnHP)	84-75-3	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-n-octyl phthalate (DNOP)	117-84-0	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-n-pentylphthalates	131-18-0	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di-n-propyl phthalate (DPRP)	131-16-8	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Di(ethylhexyl) phthalate (DEHP)	117-81-7	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Dibutyl phthalate (DBP)	84-74-2	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Diethyl phthalate (DEP)	84-66-2	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Diisopentylphthalates	605-50-5	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Dinonyl phthalate (DNP)	84-76-4	10	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Table 1Q: Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	83-32-9	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Acenaphthylene	208-96-8	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Anthracene	0120-12-7	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[a]anthracene	56-55-3	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[a]pyrene	50-32-8	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[b]fluoranthene	205-99-2	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[e]pyrene	192-97-2	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[ghi]perylene	191-24-2	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[j]fluoranthene	205-82-3	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Benzo[k]fluoranthene	0207-08-09	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Chrysene	0218-01-09	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Dibenz[a,h]anthracene	53-70-3	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Fluoranthene	206-44-0	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Fluorene	86-73-7	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Indeno[1,2,3-cd]pyrene	193-39-5	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS

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Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
Naphthalene	91-20-3	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Phenanthrene	85-01-8	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Pyrene	129-00-0	1	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Table 1R: Restricted Aromatic Amines (Cleavable from Azo-Colourants)				
2-naphthylamine	91-59-8	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
2-Naphthylammoniumacetate	553-00-4	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
2,4-xylidine	95-68-1	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
2,4,5-trimethylaniline	137-17-7	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
2,4,5-trimethylaniline hydrochloride	21436-97-5	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
2,6-xylidine	87-62-7	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
3,'3-dichlorobenzidine	91-94-1	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
3,3-dimethoxylbenzidine	119-90-4	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
3,3-dimethylbenzidine	119-93-7	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-aminoazobenzene	60-09-3	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-aminodiphenyl	92-67-1	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-chloro-o-toluidine	95-69-2	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
4-chloro-o-toluidinium chloride	3165-93-3	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-chloroaniline	106-47-8	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
Footnote for 4-chloroaniline:- P-Chloroaniline (PCA) has historically been used in the manufacture of dyes, pigments and other industrial chemicals. PCA is a carcinogenic amine that can be released from certain restricted dyes by reductive azo cleavage. It can also be present as a very low level contaminant in non-restricted dyes that do not release it via reductive azo cleavage. Deliberate use of PCA or dyes that are known to release PCA is not permitted and there is a limit in the ZDHC MRSL of 150 ppm. However, the use of conformant formulations with PCA below this limit value may occasionally result in PCA detections in untreated effluent, particularly where a facility has dyed a large number of black or dark shades over a relatively short period of time. If PCA is detected in wastewater and it is confirmed that the dye inventory is ZDHC MRSL conformant, it is advisable to liaise with dye suppliers to seek the lowest PCA content or PCA-free option for dyes such as reactive Black 5, which are used in large quantities and can be the source of PCA.				
4-methoxy-m-phenylene diammonium sulphate; 2,4-diaminoanisole sulphate	39156-41-7	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-methoxy-m-phenylenediamine	0615-05-04	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4-methyl-m-phenylenediamine	95-80-7	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4,4-methylene-bis-(2-chloro-aniline)	101-14-4	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4,4-methylenedi-o-toluidine	838-88-0	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4,4-methylenedianiline	101-77-9	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4,4-oxydianiline	101-80-4	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
4,4-thiodianiline	139-65-1	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
5-nitro-o-toluidine	99-55-8	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
6-methoxy-m-toluidine	120-71-8	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
Benzidine	92-87-5	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
o-aminoazotoluene	97-56-3	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS

Table 1A-T: ZDHC MRSL Wastewater Parameters and Reporting Limits (changes to V2.1 highlighted in red)

Substance	CAS Number	Reporting Limit (ug/L) TEXTILE	Reporting Limit (ug/L) LEATHER	Standard Method for Analysis/Testing
o-anisidine	90-04-0	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
o-toluidine	95-53-4	0.1	0.1	Reduction step with sodium dithionite, solvent extraction USEPA 8270E and ISO 14362-1 and ISO 14362-3 (if needed) GC/MS and LC/MS/MS
Table 1S: UV Absorbers				
2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl) phenol (UV-350)	36437-37-3	100	100	US EPA 8270ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS (-MS)
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1	100	100	US EPA 8270ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS (-MS)
2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)	3846-71-7	100	100	US EPA 8270ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS (-MS)
2,4-Di-tert-butyl-6-(5-chlorobenzotriazole-2-yl) phenol (UV-327)	3864-99-1	100	100	US EPA 8270ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS (-MS)
Table 1T: Volatile Organic Compounds (VOC)				
Benzene	71-43-2	1	1	ISO 11423-1 Headspace or Purge and trap GC-MS USEPA 8260D Add ISO 20595 Static headspace for determination of VOC in wastewater
m-cresol	108-39-4	1	1	ISO 11423-1 Headspace or Purge and trap GC-MS EPA 8270 BS EN 12673-1999
o-cresol	95-48-7	1	1	ISO 11423-1 Headspace or Purge and trap GC-MS EPA 8270 BS EN 12673-1999
p-cresol	106-44-5	1	1	ISO 11423-1 Headspace or Purge and trap GC-MS EPA 8270 BS EN 12673-1999
Toluene	108-88-3	1	1	HJ 1067 or EPA 8260D or ISO 11423-1
Xylene	1330-20-7	1	1	ISO 11423-1 Headspace or Purge and trap GC-MS USEPA 8260D

ZDHC heavy metals wastewater parameters and limits, Table 2

Heavy metals can be present in incoming water, in raw materials such as polyester and metal complex dyes, as well as in the piping of water distribution systems.

ZDHC has created a three-level approach to the limits for heavy metals to promote continuous improvement. The limits become more stringent as they move from Foundational, Progressive to Aspirational Levels.

We encourage suppliers to strive for continuous improvement in their impact on the environment and human health. This can be achieved by proactively developing and managing data driven, continuous improvement plans addressing input chemistry, chemical management systems and output control.

These guidelines recommend methods for analysis and testing based on internationally recognised standard water and wastewater testing methodologies, as well as government-recognised testing requirements in the European Union, the United States of America, China, and India. Equivalent methods can be used only if approved by ZDHC.

Table 2: ZDHC Heavy Metals Wastewater Parameters and Limits

Parameter	Unit	Parameter Limit Values - TEXTILE			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/Europe	United States	China	India
Antimony	mg/L	0.1	0.05	0.01	0.1	0.05	0.01	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	HJ 700	IS 3025 (Part 65)
Note: Antimony is used as a catalyst in polyester fibre manufacture and may leach out in wastewater at polyester fabric or yarn or fibre processing facilities. Brands and suppliers are encouraged to work with their polyester fibre suppliers to control antimony in their input materials.											
Chromium (VI)	mg/L	0.05	0.005	0.001	0.15	0.05	0.02	ISO 18412	USEPA 218.6	GB 7467	IS 3025 (Part 52) must meet reporting limit
Barium	mg/L	Sample and Report only			Sample and Report only				EPA 200.8 EPA 6010C EPA 6020a	HJ 700	
Selenium	mg/L	Sample and Report only			Sample and Report only				EPA 200.8 EPA 6010C EPA 6020a	HJ 700	
Tin	mg/L	Sample and Report only			Sample and Report only				EPA 200.8 EPA 6010C EPA 6020a	HJ 700	
Arsenic	mg/L	0.05	0.01	0.005	0.05	0.01	0.005	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	HJ 700	IS 3025 (Part 65)

Table 2: ZDHC Heavy Metals Wastewater Parameters and Limits

Parameter	Unit	Parameter Limit Values - TEXTILE			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/Europe	United States	China	India
Chromium, total	mg/L	0.2	0.1	0.05	1.5	0.8	0.3	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	HJ 700	IS 3025 (Part 65)
Cobalt	mg/L	0.05	0.02	0.01	0.05	0.02	0.01	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	HJ 700	IS 3025 (Part 65)
Cadmium	mg/L	0.1	0.05	0.01	0.1	0.05	0.01	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 41) AAS Instrumental Method
Copper	mg/L	1	0.5	0.25	1	0.5	0.25	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 42) AAS Instrumental Method
Lead	mg/L	0.1	0.05	0.01	0.1	0.05	0.01	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 47) AAS Instrumental Method
Nickel	mg/L	0.2	0.1	0.05	0.2	0.1	0.05	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 11912 HJ 700	IS 3025 (Part 65) IS 3025 (Part 54) AAS Instrumental Method
Silver	mg/L	0.1	0.05	0.005	0.1	0.05	0.005	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 11907 HJ 700 I	IS 3025 (Part 65)
Zinc	mg/L	5	1	0.5	5	1	0.5	ISO 17294	USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7472 GB7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 49) AAS Instrumental Method
Mercury	mg/L	0.01	0.005	0.001	0.01	0.005	0.001	ISO 17294 ISO 11885	EPA 200.8-SIM EPA 6020A-SIM EPA 245.1 EPA 245.7	HJ 597 HJ694	IS 3025 (Part 48) Cold Vapor AAS only IS 3025 (Part 65) [SIM]

ZDHC conventional parameters and anions for wastewater, Table 3

Conventional parameters have traditionally been used by global legislation to describe and regulate wastewater quality.

ZDHC has created a three-level approach to the limits for conventional parameters to promote continuous improvement. The limits become more stringent as they move from Foundational, Progressive to Aspirational Levels.

We encourage suppliers to strive for continuous improvement in their impact on the environment and human health. This can be achieved by proactively developing and managing data driven, continuous improvement plans addressing input chemistry, chemicals management systems and output control.

These guidelines recommend methods for analysis and testing based on internationally recognised standard water and wastewater testing methodologies, as well as government-recognised testing requirements in the European Union, the United States of America, China and India. Equivalent methods can be used if approved by ZDHC.

Table 3: ZDHC Conventional Parameters and Anions for Wastewater

Parameters	Unit	Parameter Limit Values - TEXTILES			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/ Europe	United States	China	India
pH [a]	pH	6-9			6-9			ISO 10523	USEPA 150.1 SM 4500-H+	HJ1147	IS 3025 (Part 11) Electrometric method only
Temperature Difference[a]	°C	Δ+15	Δ+10	Δ+5	Δ+15	Δ+10	Δ+5	DIN 38 404-4 or equivalent	USEPA 170.1 SM 2550	GB/T 13195	IS 3025 (Part 9)

Take the temperature of the discharged wastewater and the receiving body of water upstream. The temperature of the receiving body is subtracted from the temperature of the discharged wastewater to give the delta temperature difference, which can be a positive or a negative value. The discharge limits only refer to a positive value, which produces an overall increase in the temperature of the receiving body of water.

This parameter is measured on-site by the sampler and is applicable only for direct discharge.

There may be situations where the sampler is not able to measure the temperature of the receiving body. These situations may include:
- The receiving body may be several kilometres away from the point of discharge and the facility is discharging the effluent into the receiving body through a pipeline.
- Accessing the location of the receiving body to measure its temperature can be risky in terms of injury to the sampler or damage to equipment.
- The effluent is discharged directly into the ground.

In all such cases where access to the receiving body is not possible or unsafe, the laboratory should report this parameter as “Not Applicable”.

Table 3: ZDHC Conventional Parameters and Anions for Wastewater

Parameters	Unit	Parameter Limit Values - TEXTILES			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/ Europe	United States	China	India
E.coli	MPN/100-ml	126 MPN/100-ml			126 MPN/100-ml				SM 9221B presumptive, confirm positive with SM9221F or G		
Colour (436nm; 525; 620nm)	m-1	7; 5; 3	5; 3; 2	2; 1; 1	7; 5; 3	5; 3; 2	2; 1; 1	ISO 7887-B			
Persistent Foam[b]	Absent / present	No indication of persistent foam in receiving water	No indication of persistent foam in receiving water	No indication of persistent foam in receiving water	No indication of persistent foam in receiving water	No indication of persistent foam in receiving water	No indication of persistent foam in receiving water	N/A	N/A	N/A	N/A
b: Foam is a naturally occurring phenomenon in aeration basins in which biological wastewater treatment occurs. Samplers should include photographs of the foam they witnessed in the final lab report, along with the time and date of taking such photos. The foam colour should be similar to the liquid in the aeration basin, should dissipate quickly and should be contained within the aeration basin. For direct discharge facilities, samplers should check for persistent foam on the surface of receiving waters at the point of discharge and the presence or absence of foam should be noted. This should be checked at the same location used for sampling the temperature difference. This test is to be done on-site by the sampler. In case the receiving body is not accessible or risky to access for the sampler, a visual estimation of the foam in the aeration basin should be done. If the foam is higher than 45 centimetres in height (by visual estimation) then it could result in permanent foam being discharged onto the surface of receiving waters and should be reported as 'fail' for the foam parameter.										
Wastewater Flow Rate [a]	m^3 per day	15m^3 per day			15m^3 per day						
Ammonium-Nitrogen	mg/L	10	1	0.5	10	1	0.5	ISO 11732 ISO 7150	USEPA 350.1 USEPA 350.3 SM 4500 NH3 - D, E, F, G, or H	HJ 535	IS 3025 (Part 34) phenate or ammonia selective electrode only
AOX	mg/L	3	0.5	0.1	3	0.5	0.1	ISO 9562	US EPA 1650	HJ/T 83-2001	
Biochemical Oxygen Demand 5-days Concentration (BOD5)	mg/L	30	15	8	50	30	20	ISO 5815-1	USEPA 405.1 SM 5210-B	HJ 505	IS 3035 (Part 44) seeded dilution water (BOD5)
Chemical Oxygen Demand (COD)	mg/L	150	80	40	250	150	100	ISO 6060 ISO 15705	USEPA 410.4 SM 5220-D	HJ 828 GB/T 11914 e	IS 3025 (Part 58) e
Dissolved Oxygen (DO) [a]	mg/L	≥ 4			≥ 4			ISO 5814	EPA 360.1 SM 4500-O-G	HJ 506	

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Table 3: ZDHC Conventional Parameters and Anions for Wastewater

Parameters	Unit	Parameter Limit Values - TEXTILES			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/ Europe	United States	China	India
Oil and Grease	mg/L	10	2	0.5	20	10	5	ISO 9377-2	SM 5520-B/C USEPA 1664 revision B	HJ 637 (total oil and grease)	IS 3025 (Part 39) partition gravimetric or partition Infra-red
Total Phenols / Phenol Index	mg/L	0.5	0.01	0.001	0.5	0.3	0.1	ISO 6439	SM 5530-B/C	HJ 503 must meet required reporting limit	IS 3025 (Part 43)
Total Chlorine[a]	mg/L	1			1			ISO 7393-2	EPA 330.5 SM4500-Cl-G	HJ 586	
Total Dissolved Solids (TDS)	mg/L	Sample and Report			Sample and Report				SM 2540-C USEPA 160.1	GB/T 5750.4-2013 180oC (180 degree centigrade)	IS 3025 (Part 16) 179° C to 181° C
Total Nitrogen	mg/L	20	10	5	35	20	10	ISO 11905 - Part 1 ISO 29441	USEPA 351.2 SM 4500P-J SM 4500N-B SM 4500N-C	HJ 636	IS 3025 (Part 34) measure and total all forms of nitrogen (ammonia,nitrate, Nitrite, organic)
Total Phosphorus	mg/L	3	0.5	0.1	3	1	0.5	ISO 17294 ISO 11885 ISO 6878	USEPA 365.4 SM 4500P-J USEPA 200.7 USEPA 200.8 USEPA 6010C USEPA 6020A	GB/T 11893	IS 3025 (Part 31) IS 3025 (Part 65)
Total Suspended Solids (TSS)	mg/L	50	15	5	70	50	20	ISO 11923	USEPA 160.2 SM 2540D	GB/T 11901	IS 3025 (Part 17) 103° C to 105° C
Anions											
Chloride	mg/L	Sample and Report only			Sample and Report only			ISO 10304-1 ISO 15923-1	SM 4110-B SM 4110-C SM 4500-Cl D or E USEPA 300	HJ 84-2016	IS 3025 (Part 32) potentiometric or automated ferricyanide only

Table 3: ZDHC Conventional Parameters and Anions for Wastewater

Parameters	Unit	Parameter Limit Values - TEXTILES			Parameter Limit Values - LEATHER			Standard Methods for Analysis and Testing Equivalent Methods Can Be Used, Must Be First Communicated to and Approved by ZDHC			
		Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	Wastewater Foundational	Wastewater Progressive	Wastewater Aspirational	International/ Europe	United States	China	India
Cyanide, Total	mg/L	0.2	0.1	0.05	0.2	0.1	0.05	ISO 6703-1,-2,-3, ISO 14403-1,-2	US EPA 335.2, APHA 4500-CN	HJ 484	
Sulphate	mg/L	Sample and Report only			Sample and Report only			ISO 10304-1 ISO 15923-1	SM 4500 SO4, E, F, G SM 4100 B, C USEPA 300 USEPA 9038	HJ 84-2016	IS 3025 (Part 24)
Sulphide	mg/L	0.5	0.05	0.01	1	0.5	0.2	ISO 10530	SM 4500-S2-D, E,G, or I	HJ 1226-2021	IS 3025 (Part 29) Methylene blue only
Sulphite	mg/L	2	0.5	0.2	2	0.5	0.2	ISO 10304-3	SM 4500-SO32-C	HJ84 - 2016	

a= For direct discharge type of facilities the following parameters must be measured on-site every hour by the sampler during the composite sampling: pH, temperature difference, persistent foam, wastewater flowrate, total chlorine and dissolved oxygen. Refer to the ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan for more information. For flow rate, the applicability of testing is based on < or > $15m^3$/day as per table A.

PART B

Sludge

ZDHC sludge disposal pathways, parameters and limits, Table 4A-4C

Purpose of sludge testing

Wastewater treatment sludge (referred to as “sludge”) is a necessary and inevitable by-product of proper wastewater treatment. Poor sludge disposal can result in negative impacts on human health and the environment.

> The detection of ZDHC MRSL substances in sludge is an indicator of the deliberate use of these restricted substances in input chemical formulations and therefore would need a Root Cause Analysis and Corrective Action Plan for the input chemical inventory.

Sludge testing is required to be done for the following:

- ZDHC MRSL substances:
  - The detection of ZDHC MRSL substances above the reporting limits should trigger a Root Cause Analysis (RCA) and Corrective Action Plan (CAP) by the supplier for the input chemical inventory to ensure that necessary steps are taken to eliminate the presence of ZDHC MRSL substances in the sludge.
  - The absence of ZDHC MRSL substances in the sludge are also conformance requirements for Disposal Pathways D-G. If these requirements are not met, suppliers should explore a possible move to Disposal Pathways A, B or C, where ZDHC MRSL substances requirements are not applicable for approval of the sludge disposal pathway.

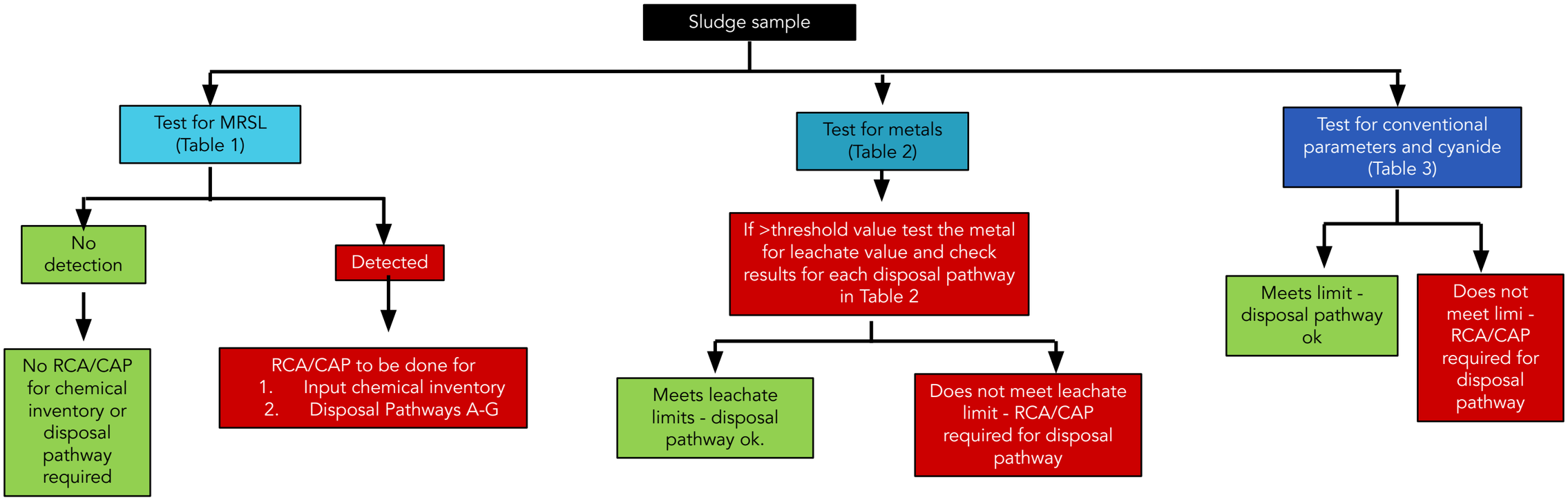
Metals and leachate metals:

- For pathways D-G, in addition to the ZDHC MRSL parameters, the listed metals are tested to check if they exceed the threshold limit values.
- In case a listed metal(s) exceeds the threshold value, leachate testing of the metal(s) is done to check for conformance to the permissible limit values for leachates in Disposal Pathways D-G.
- Non-conformance to these requirements should motivate a Root Cause Analysis (RCA) and corrective actions to meet the threshold limit metal values. In addition, immediate action must be taken to stop the use of the disposal pathway until the requirements are met. Alternatively, suppliers should explore a possible move to Disposal Pathways A, B or C.

Conventional parameters and cyanide (anions):

- For Disposal Pathways D-G, the sludge sample should additionally be tested for conventional parameters (pH, faecal coliform, % solids and paint filter test) and cyanide where applicable.
- Non-conformance with the limit values should trigger immediate action to stop the use of the disposal pathway until the requirements are met. Suppliers should also explore a possible move to Disposal Pathways A, B or C.

The flow chart below outlines testing requirements for sludge samples.



Testing of sludge sample flow chart

Testing requirements for sludge sample

- Table 4A: ZDHC MRSL Substances, Reporting Limits and Test Methods.
- Table 4B: Threshold Metal Values, Leachate Testing Limit Values for Each Disposal Pathway and Test Methods.
- Table 4C: Conventional Parameters, Cyanide and Limit Values for Each Disposal Pathway.

Disposal pathways

The **ZDHC Sludge Reference Document** details seven disposal pathways for sludge:

- Pathway A – On-site or off-site incineration at >1000'C
- Pathway B - Landfill with significant control measures
- Disposal Pathway C - Building products processed at >1000'C
- Disposal Pathway D - Landfill with limited control measures
- Disposal Pathway E - Off-site incineration and building products processed at <1000'C
- Disposal Pathway F - Landfills with no control measures
- Disposal Pathway G - Land application for a specific purpose in approved areas.

Table 4A: ZDHC MRSL Substances, Reporting Limits and Test Methods in Sludge

No	MRSL Group	Reporting Limits (mg/ kg – dry weight)	Description of Test Method	Intenrational/ EU Test Method	USA Test Method	China Test Method
4A.1	Alkylphenol (AP) and Alkylphenol Ethyloxates (APEOs): including all isomers	Textile and leather 0.4 mg/kg	Preparation: Modified dichloromethane extraction with mechanical agitation, soxhlet, or ultrasonic Analysis: GC-MS, LC-MS	Analysis: NP/ OP ISO 18857-2; ASTM D7065 OPEO/NPEO n>2 ISO 18254-1 OPEO/NPEO n=1,2 ISO 18857-2; ASTM D7065	Preparation: USEPA 3540/3541 Soxhlet USEPA 3550 ultrasonic	
4A.2	PAH	Textile and leather 0.2 mg/kg	Preparation: Dichloromethane extraction with mechanical agitation, soxhlet, or ultrasonic Clean up: GPC Analysis: GC-MS	Preparation: USEPA 3540/3541 Soxhlet USEPA 3550 ultrasonic Clean up: USEPA 3650 Analysis: USEPA 827		HJ 805-2016
4A.3	Chlorotoluenes	Textile and leather 0.2 mg/kg	Preparation: Dichloromethane extraction with mechanical agitation, soxhlet, or ultrasonic Clean up: GPC Analysis: GC-MS	Preparation: USEPA 3540/3541 Soxhlet USEPA 3550 ultrasonic Clean up: USEPA 3650, Analysis: USEPA 827		HJ 605

Applicability of ZDHC MRSL parameters for sludge disposal pathways:

- Disposal Pathway A, B and C: Not Applicable
- Disposal Pathway D, E, F and G: Does not meet if detected above the reporting limit values.

Table 4B: Testing of Metals – Threshold Values, Leachate Testing Limit Values per Disposal Pathway in the Sludge.

No.	Metals	Applicable to		Threshold Values (mg/kg)a	Sludge Disposal Pathway							Standard Method for Sludge Analysis/Testing Total Metals			
		Textiles	Leather		A, B	C	D	E	F	G		Description of Test Method	International/EU Test Method	USA Test Method	China Test Method
		Reporting Limit (mg/kg) dry weight	Reporting Limit (mg/kg) dry weight		Leachate Result (TCLP) in mg/l					Leachate Result (TCLP) in mg/l	Maximum Total Metals Limits in (mg/kg)b				
4B.1	Antimony	5	NA	12	Not Applicable	Not Applicable	7.8	0.6	0.6	0.6	Not Applicable	Preparation: Acid/ Peroxide digestion Analysis: ICP/OES or ICP/MS (For Leachate) Extraction: Toxicity Leachate Extraction Procedure followed by Acid Digestion Analysis: ICP/ OES, or ICP/ M		Preparation: EPA 3050 Analysis: EPA 6010D, or EPA 6020B Leachate Extraction: EPA 1311 followed by Acid Digestion EPA 3051A Analysis: USEPA 200.7 USEPA 200.8 USEPA 6010c USEPA 6020a	HJ 803
4B.2	Arsenic	5	2	10			2.75	0.5	0.5	0.5	41				
4B.3	Barium	200	NA	700			67.5	35	35	35	500				
4B.4	Cadmium	1	2	3			0.58	0.15	0.15	0.15	39				
4B.5	Cobalt	400	NA	1600			80	80	80	80	Not Applicable				
4B.6	Copper	50	NA	200			17.5	10	10	10	1500				
4B.7	Lead	5	2	10			2.75	0.5	0.5	0.5	400				
4B.8	Nickel	20	NA	70			11.75	3.5	3.5	3.5	420				
4B.9	Selenium	5	NA	10			0.75	0.5	0.5	0.5	36				
4B.10	Silver	50	NA	100					5	5	Not Applicable				
4B.11	Zinc	400	NA	1000			50	50	50	50	2800				
4B.12	Total Chromium	50	NA	100			5	5	5	5	1200				

Table 4B: Testing of Metals – Threshold Values, Leachate Testing Limit Values per Disposal Pathway in the Sludge.

No.	Metals	Applicable to		Threshold Values (mg/kg)a	Sludge Disposal Pathway							Standard Method for Sludge Analysis/Testing Total Metals			
		Textiles	Leather		A, B	C	D	E	F	G		Description of Test Method	International/EU Test Method	USA Test Method	China Test Method
		Reporting Limit (mg/kg) dry weight	Reporting Limit (mg/kg) dry weight		Leachate Result (TCLP) in mg/l					Leachate Result (TCLP) in mg/l	Maximum Total Metals Limits in (mg/kg)b				
4B.13	Chromium (VI)	20	2	50	Not Applicable	Not Applicable	3.75	2.5	2.5	2.5	50	Preparation: Alkaline digestion Analysis: Colourimetric UV/ VIS, or Colourimetric IC (For leachate) Preparation: Toxicity Leachate Extraction Procedure Analysis: Colourimetric UV/ VIS, or Colourimetric IC	Leachate Extraction: EPA 1311 Analysis: ISO 18412	Preparation: USEPA 3060a Analysis: USEPA 7196 or USEPA 7199 leachte Preparation: USEPA 1311 Leachte Analysis: USEPA 7196 or USEPA 7199	HJ 1802
4B.14	Mercury	1	0.2	1	Not Applicable	Not Applicable	1.25	0.5	0.5	0.5	17	Preparation Option 1: Dissolution, acid digestion Preparation Option 2: Dissolution, acid/ per-oxide digestion Analysis: CVAA or ICP MS (For Leachate) Preparation: Toxicity Leachate Extraction Procedure followed by Dissolution, acid digestion Analysis: CVAA or ICP MS	For Leachate Analysis: ISO 12846 or ISO 17852	Preparation Option 1: EPA 7471 b Preparation Option 2: EPA 3051a Analysis Option 1: EPA 7471b Analysis Option 2: 6020b (For leachate) Preparation: USEPA 1311 followed by EPA 7471b, or EPA 3051a Analysis: EPA 7471b, or EPA 6020b	GB/T 22105.1 HJ 923

- Threshold values are used to define if leachate testing is required. Leachate testing should be done only if the threshold value for a metal is exceeded in the sludge sample testing.
- Reference link for Pathway G: **https://extension.uga.edu/publications/detail.html?number=B1353**

Table 4C: Corresponding Conventional Parameters, Anion Limit Values and Test Methods

No	Parameter	Disposal Pathway A & B	Disposal Pathway C	Disposal Pathway D	Disposal Pathway E	Disposal Pathway F	Disposal Pathway G	Description of Test Methods	International / EU Test Method	USA Test Method	China Test Method
	Conventional										
4C.1	pH	Not Applicable	Not Applicable	5-11 s.u.	5-11 s.u.	6.5-9 s.u.	6.5-9 s.u.	Preparation: Suspension with Water Analysis: ISE		Preparation and Analysis: EPA SW 9045D or HJ962	HJ 962
4C.2	Faecal Coliform (MPN/g)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	<1000	<1000	Preparation: Blended suspension Analysis: Multiple Tube Fermentation		Analysis: EPA 1681	
4C.3	% solids[7]	Sample and Report						Analysis: Dry at 105₀C		Analysis: EPA 160.3, HJ613 at 105₀C	HJ 613 drying at 105₀C
4C.4	Paint Filter [8] test	Not Applicable	Not Applicable	Pass	Pass	Pass	Pass		Analysis: EPA SW-846 or EPA 9095B		
	Anions										
4C.4	Cyanide (mg.kg)	Not Applicable	Not Applicable	85	70	70	70	Preparation: CN converted to HCN by reflux-distillation to NaOH Analysis: Colourimetry (EPA 9014), or ISE (EPA 9213)		Preparation: USEPA 9013 Analysis: HJ745, EPA 9014 or EPA 9213	HJ 745

7 The purpose of the % solid test is to measure the amount of solids (or % moisture) present in the sludge. Any detection which is up to or less than 5% is an indicator that there is a high moisture in the sludge. In such scenarios the suppliers are expected to undertake suitable sludge drying or suitable dewatering techniques which reduce the moisture content in the sludge (except for those locations where it is legally mandated or allowed by the local regulation that liquid sludge can be safely transported to external agencies for safe treatment and disposal without impacting the enviornment).

8 The pupose of the paint filter test is to assess the suitabilty of sludge for transporation and management including incineration, landfill and land application.

Requirements for approval of sludge disposal pathways

Requirements for Disposal Pathway A, B, C

There are no testing requirements for approval of these pathways. Sludge documentation confirmation is required to demonstrate that these disposal pathways are used by the supplier.

However, the sludge sample is also tested for ZDHC MRSL substances for any detection above reporting limits as in Table 4A. This is to check for intentional use in input chemical inventory as root cause analysis and corrective action.

Requirements for Disposal Pathway D and E

Testing of ZDHC MRSL substances

The sludge sample is tested for ZDHC MRSL substances. If it exceeds the limits given in Table 4A, this indicates that the disposal pathway requirements are not met.

Testing of metals

The sludge sample is tested for all metals as listed in Table 4B.

If the test result for any metal exceeds the threshold limit values, leachate testing, for those metals only, should be conducted by the laboratory to approve this disposal pathway.

Testing of conventional parameters and anions

The sludge sample is tested for conventional parameters and anions (pH, % solids, paint filter test) and cyanide as given in Table 4C for approval of this disposal pathway.

Requirements for Disposal Pathway F and G

Testing of MRSL substances

The sludge sample is tested for ZDHC MRSL substances. If it exceeds the limits given in Table 4A, this indicates that the disposal pathway requirements are not met.

Testing of metals

The sludge sample is tested for all metals as listed in Table 4B.

If the test result for any metal exceeds the threshold limit values, leachate testing, for those metals only, should be conducted by the laboratory to confirm this disposal pathway.

Note: For Disposal Pathway G, the maximum limit value for total metals (in mg/kg) as given in Table 4B should not be exceeded. If the limit value is exceeded, the disposal pathway is not approved.

Testing of conventional parameters and anions

The sludge sample is tested for conventional parameters and anions (pH, faecal coliform, % solids and paint filter test) and cyanide as given in Table 4C for approval of this disposal pathway.

RCA/CAP for sludge

- If ZDHC MRSL substances are detected in the sludge sample, the supplier must conduct an investigation for intentional use of the ZDHC MRSL substances in the input chemical inventory (RCA) and implement a CAP to replace the source in input chemical formulations.
- If the disposal pathway requirements are not approved, immediate and long-term responses must be included in the CAP. The facility must immediately determine whether other options are available that are approved for sludge disposal and take steps to move the sludge generated from the facility to the approved disposal pathway. This is the case even as additional CAP activities are developed. Longer term CAP measures should include improving the quality of the sludge

such that it is approved and appropriate for the original disposal pathway via source reduction, treatment modifications and other actions. Wherever possible, Disposal Pathways A, B and C should be preferred.

Sludge documentation required to demonstrate applicable disposal pathway

Suppliers are expected to maintain information and records of their major sludge disposal pathway, along with the sludge manifest required for legal purposes. In cases where sludge is disposed of via authorised third-party waste contractors, suppliers should make an effort to get all relevant information of the disposal pathway from the waste contractor.

The following section includes declaration templates that suppliers should use to enter information for each disposal pathway. After inputting the information relevant to the supplier's major disposal pathway, the supplier should sign and give details of the signing authority and date in the declaration.

These declarations will be collected by samplers during the sludge sample collection and submitted to their lab.

- **Declaration for ZDHC Sludge Disposal Pathway A**
- **Declaration for ZDHC Sludge Disposal Pathway B**
- **Declaration for ZDHC Sludge Disposal Pathway C**
- **Declaration for ZDHC Sludge Disposal Pathway D**
- **Declaration for ZDHC Sludge Disposal Pathway E**
- **Declaration for ZDHC Sludge Disposal Pathway F**
- **Declaration for ZDHC Sludge Disposal Pathway G**

PART C

Microfibres/fibre fragmentation

Natural and synthetic textile fibres can fragment during wet processing and finishing, then enter the aquatic environment through discharged wastewater. The scientific definition of a microfibre is defined as a synthetic fibre with a diameter of less than ten micrometres.

Studies by Hohenstein, ZDHC and The Microfibre Consortium (TMC) have established a direct correlation between the Total Suspended Solids (TSS) of discharged effluent and the number of microfibres released from a wet processing facility; as determined by Dynamic Image Analysis (DIA). Thus, the TSS parameter can be used as an indicator or measure of fibre fragmentation and monitoring. Reducing the TSS in discharged wastewater can directly reduce the level of microfibre discharge in the wastewater stream.

These studies clearly indicate that failure to meet foundational limits for TSS potentially results in undesirable levels of release of microfibres into the environment and any non-conformance should be viewed as a very high priority regarding this newly identified environmental threat.

Furthermore, ZDHC stakeholders should be aware that achieving Progressive and, ultimately, Aspirational Levels for TSS will reduce microfibre releases by an average of ~70% and ~94% respectively, compared to an average Foundational Level conformance.

Facilities should consider determining their own microfibre release profile using a Dynamic Image Analysis (DIA) method, after which TSS tests can be used to monitor microfibre releases with a good degree of accuracy.

Microfibre releases in discharged effluent can be effectively minimised by optimising the operation of the clarifiers in an Effluent Treatment Plant (ETP). If operated and maintained efficiently, such measures should meet Foundational Levels and in most instances are capable of meeting Progressive Levels. Additional investments in ultrafiltration, reverse osmosis or MBR (membrane bio reactor) effluent treatment technology can also be explored to ensure conformance to Aspirational Levels.

TSS test results will be reviewed on an ongoing basis and it is anticipated that limits are likely to be revised downwards in future updates.

Click here for an article on fibre fragmentation

Requirements for monitoring microfibre discharge

- Monitor the TSS results and ensure that it meets at least the Foundational Level of ZDHC Wastewater Guidelines V2.2. If the values of TSS are higher than the Foundational Level, suppliers must undertake a RCA and upload a CAP to the ZDHC Gateway.
- Suppliers should make all efforts to meet the Progressive and ultimately the Aspirational Levels of TSS in the ZDHC Wastewater Guidelines V2.2.
- In a properly functioning ETP, microfibre emissions are settled by gravitation in ETP clarifiers and become part of the sludge. To minimise releases to the environment, it is recommended not to dispose to land applications (Disposal Pathways F and G).

PART D

Candidate List

ZDHC Wastewater Candidate List

The ZDHC Wastewater Candidate List is a signal of intended changes to future updates of the WW Guidelines.

The aim of this ZDHC Wastewater Candidate List is to give advance notice to the industry of what to expect in future updates and therefore gives the industry enough time to prepare for these, thus facilitating wide-scale industry adoption and implementation.

There is no mandatory requirement to conduct testing, or any Root Cause Analysis (RCA), or develop a Corrective Action Plan (CAP) for Candidate List entries, but it is strongly advised that a proactive approach is adopted.

Updates to the ZDHC Wastewater Candidate List

Parameter	Intention
ZDHC MRSL V3.1 Substances	To include the substances newly added in the ZDHC MRSL V3.1 in the Wastewater Guidelines V3.0 for testing in wastewater and sludge.
Effluent Toxicity	ZDHC will in the future examine the impact of wastewater discharge to the environment and biodiversity through water toxicity indicators.
Water Consumption/ Efficiency	There is a growing requirement from brands and other industry initiatives (such as Higg FEM) for suppliers to improve their water use in textile and leather manufacturing. This includes measuring and tracking water consumption, implementing water-saving processes and technologies and investing in wastewater recycling and reuse (partially or fully). Current industry benchmarks for water consumption are generalised (normally spread over a range) and do not address specific operations performed in textile and leather production. This makes the target setting for water reduction quite ambiguous and the measurements done, if any, are not precise. ZDHC intends to set water use targets in the textile and leather industries that take into account the complexities of these operations (in terms of the type of the substrate, production processes, fibre absorption, material to liquor ratio, type of the machinery used, inefficiencies, reuse of water, etc). Further, these targets will be categorised into Foundational, Progressive and Aspiration Levels to outline a continuous improvement journey for suppliers.
Smart, Intelligent Testing	ZDHC WW Guidelines require that all ZDHC MRSL, conventional (inc. anions) and metals are tested twice per year. In the future, ZDHC intends to review the current wastewater testing protocol and transition to a dynamic and pragmatic approach that incentivises input chemical management including ZDHC MRSL conformance of chemical inputs (InCheck) and is based on product and process-specific risks (smart testing grid), performance test history (ClearStream Reports) and ETP performance (ETP Efficiency Evaluation Protocol). This is to provide real-time impact measurements on water quality and biodiversity as well as connect wastewater testing into the ZDHC focus area of input chemical management.

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