
ZDHC Leather Wastewater Guidelines Addendum

Version 1.0

April 2021

NOTES

These Guidelines do not guarantee the following:

- a) Compliance with, or take the place of, legal or regulatory requirements. For example, where stricter legal, local or regional wastewater limits are in place, those limit values shall supersede the limit values as set forth in these Guidelines.
- b) Compliance with, or conformance to, any national or international environmental or workplace safety requirements including, but not limited to, relevant regulations and/or standards.
- c) Nor do the Guidelines replace any national or international environmental or workplace safety requirements including, but not limited to, regulations and/or standards.

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 manufacturing facilities are accountable for reporting on their wastewater and sludge discharges, in accordance with applicable laws. These Guidelines are not intended as a statement of legal requirements.

DISCLAIMERS

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- c) for any results obtained or not obtained from the use of the ZDHC Leather Wastewater Guidelines Addendum.

Introduction

The ZDHC Leather Wastewater Guidelines (referred to as “Guidelines”) were developed to expand the scope to include the leather industry, and serve as an addendum to the current [ZDHC Wastewater Guidelines Version 1.1](#). These ZDHC Leather Wastewater Guidelines must be read in collaboration with [ZDHC Wastewater Guidelines Version 1.1](#) and the instructions given in sections 9.0-16.0 must be followed.

These Guidelines set a single unified expectation for sampling, testing and reporting of industrial wastewater and sludge resulting from leather processing. They were developed in collaboration with the global leather industry including manufacturers, brands, chemical suppliers and laboratories. Sections 9.0-16.0 of the [ZDHC Wastewater Guidelines Version 1.1](#) apply to textiles and leather, and describe the requirements for sampling, testing and reporting into ZDHC Gateway, as well as conformance to these Guidelines.

The tables in these Guidelines set out the limits for conventional, MRSL and sludge parameters for leather wastewater.

Revision History

Version Number	Changes	Time of Publication
Version 1.0	Initial publication of Leather Wastewater Guidelines Addendum	January 2021
Version 1.0	Faecal Coliform replaced with test for E.coli.	April 2021

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In Scope

These Guidelines apply to process-related discharged wastewater and sludge, associated with leather processing from different raw materials feedstock sources and various facility type tanning processes, such as, but not limited to:

Raw materials within the scope of these Guidelines are:

- Hides from animal origin.

Facility type tanning process within the scope of these Guidelines are:

- 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.
- Vertical facilities with integrated production that include any kind of dyeing or finishing processes, for example: beamhouse, tanning, wet-end and finishing.
- Vacuum dryers (toggle, paste dryers).

To ensure the application of these Guidelines, Suppliers must select the relevant raw materials and processes in the ZDHC Gateway Supplier Profile.

These Guidelines apply to Suppliers with direct discharge, indirect discharge and on-site Zero Liquid Discharge (ZLD) treatment plants.

Where a Supplier combines its industrial wastewater with domestic wastewater, the combined wastewater is classified as industrial wastewater, to which these Guidelines would apply.

Out of Scope

These Guidelines do not apply to:

- Slaughterhouses.
- Facilities with only mechanical processes/phases e.g. only embossing, polishing, staking or dry milling.
- Discharges of domestic wastewater only, for instance from a sewing/garmenting (e.g. staking) facility that employs workers but has no in-house wet processing unit, or domestic wastewater that is not blended with industrial wastewater.
- Wastewater management and treatment systems beyond the property boundaries of the Suppliers. This includes any third-party, off-site, centralised (or common) effluent treatment plants (CETP) that are not under direct control and/or ownership of the Supplier.

Related Work

This document is part of a set of guidelines and solutions provided by ZDHC. All stakeholders (Suppliers, manufacturing facilities, brands and retailers, and laboratories) are expected to follow the most current guidance documents and practical tools given below:

- [ZDHC Wastewater Guidelines Version 1.1](#)
- [ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan \(SAP\)](#)
- [ZDHC List of Accepted Laboratories for ZDHC Wastewater Guidelines Testing](#)
- ZDHC Root Cause Analysis and Corrective Action Plan Template found on ZDHC Gateway, or from March 2021 on the Supplier to Zero Platform.

Only ZDHC Accepted Laboratories, for ZDHC Leather Wastewater Guidelines testing, can perform sampling, testing and report into the ZDHC Gateway. These laboratories must follow these Guidelines and the [ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan \(SAP\)](#). The SAP provides a detailed framework for laboratories to determine the concentration of parameters in wastewater and sludge. In the current ZDHC Wastewater Guidelines, under section '9.6.0 Methods for Analysis/Testing' it is important to highlight that ZDHC supports Suppliers wishing to optimise sampling and testing to demonstrate both legal compliance and conformance to these Guidelines, if certain conditions are met – refer to current [ZDHC Wastewater Guidelines](#) for more information.

When a non-conformance is found, Suppliers should utilise the Root Cause Analysis (RCA) and Corrective Action Plan (CAP) template available on the ZDHC Gateway and from March 2021 on the Supplier to Zero platform, to help to identify and make a plan to solve for the cause. In turn, Suppliers should share their RCAs and CAPs with brands, explaining reasons for the non-conformance and the plans to remediate.

Acknowledgements

We warmly thank the ZDHC contributors who provided their expertise, practical input, critical feedback, and constructive suggestions in the creation of these Guidelines. In particular the members of the Leather Task Team, Wastewater Council and the Laboratory Advisory Group, as well as the Leather Working Group.

APPENDIX A

Tables 1A-1B: Conventional Parameters for Wastewater, for direct discharge facilities

The conventional parameters, anions and metals showing foundational, progressive and aspirational limits, and the standard methods for analysis.

Suppliers with indirect discharge are expected to have: all conventional parameters complying with their legal wastewater discharge permit and/ or commercial agreements with the receiving central effluent treatment plant (CETP), explained further in [ZDHC Wastewater Guidelines](#).

Table 1A: Conventional Parameters and Anions

Parameter	Unit	Parameter limit values			Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC			
		Foundational	Progressive	Aspirational	International/ Europe	USA	China	India
Conventional Parameters								
pH	pH	6 - 9			ISO 10523	USEPA 150.1 SM 4500-H+	GB/T 6920	IS 3025 (Part 11) Electrometric method only
Temperature difference ^a	°C	Δ+15	Δ+10	Δ+5	DIN 38 404-4 or equivalent	USEPA 170.1 SM 2550	GB/T 13195	IS 3025 (Part 9)
E.coli ^b	Presence - Absence	Absence			ISO 9308-3 followed by EC-MUG	SM 9221 B presumptive, and SM 9221 F EC-MUG		
Persistent Foam	Refer to respective information in section 9.6.A of the ZDHC Wastewater Guidelines							
Colour ^c (436nm; 525nm; 620nm)	m-1	7; 5; 3	5; 3; 2	2; 1; 1	ISO 7887-B			
Ammonium-Nitrogen	mg/L	15	10	1	ISO 11732 ISO 7150	USEPA 350.1 USEPA 350.3 SM 4500 NH3 - D, E, F, G, or H	HJ 536	IS 3025 (Part 34) phenate or ammonia- selective electrode only
Biochemical Oxygen Demand 5-days concentration (BOD ₅) - sample and report only. ^d	mg/L	50	30	20	ISO 5815-1	USEPA 405.1 SM 5210-B	HJ 505	IS 3035 (Part 44) seeded dilution water (BOD ₅)

^a Take the temperature of the discharged wastewater and the receiving body of water upstream. Subtract the temperature of the receiving body from the temperature of the discharge 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.

^b To be aligned with the next update of the Wastewater Guidelines.

^c Colour must be tested and reported in accordance with standard method ISO 7887-B for ZDHC Leather Wastewater Guidelines purposes. Local regulations may require an additional test method.

^d Sample and report only: no limit values exist for these parameters, for monitoring purposes, Suppliers should continue to sample and report on them.

Table 1A: Conventional Parameters and Anions (continued)

Parameter	Unit	Parameter limit values			Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC			
		Foundational	Progressive	Aspirational	International/ Europe	USA	China	India
Conventional Parameters (continued)								
Chemical Oxygen Demand (COD)	mg/L	250	150	100	ISO 6060 ISO 15705	USEPA 410.4 SM 5220-D	HJ 828 GB/T 11914 ^e	IS 3025 (Part 58) ^e
Oil & Grease	mg/L	20	10	5	ISO 9377-1	SM 5520-B/C USEPA 1664 revision B	HJ 637 (total oil and grease)	IS 3025 (Part 39) partition gravimetric or partition Infra-red
Phenol	mg/L	0.5	0.3	0.1	ISO 14402 ISO 6439	SM 5530-B/C	HJ 503 must meet required reporting limit	IS 3025 (Part 43)
Total Nitrogen	mg/L	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	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 Dissolved Solids (TDS) ^f	mg/L	Sample and report only ^d				SM 2540-C USEPA 160.1		IS 3025 (Part 16) 179°C to 181°C
Total Suspended Solids (TSS)	mg/L	70	50	20	ISO 11923	USEPA 160.2 SM 2540D	GB/T 11901	IS 3025 (Part 17) 103°C to 105°C

^d Sample and report only: no limit values exist for these parameters, for monitoring purposes, Suppliers should continue to sample and report on them.

^e Validated cuvette methods can be used alternatively.

^f Conductivity can be used for in-house monitoring.

Table 1A: Conventional Parameters and Anions (continued)

Parameter	Unit	Parameter limit values			Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC			
		Foundational	Progressive	Aspirational	International/ Europe	USA	China	India
Anions								
Chloride	mg/L	Sample and report only ^d			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
Sulfide	mg/L	1	0.5	0.2	ISO 10530	SM 4500-S2-D, E,G, or I	GB/T 16489	IS 3025 (Part 29) Methylene blue only
Sulfate	mg/L	Sample and report only ^d			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)

^d Sample and report only: no limit values exist for these parameters, for monitoring purposes, Suppliers should continue to sample and report on them.

Table 1B: Metals

Parameter	Unit	Parameter limit values			Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC			
		Foundational	Progressive	Aspirational	International/ Europe	USA	China	India
Metals								
Chromium, total	mg/L	1.5	0.8	0.3	ISO 17294 ISO 11885	USEPA 200.7 USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7466 must meet reporting limit HJ 700	IS 3025 (Part 52) IS 3025 (Part 2) IS 3025 (Part 65)
Chromium (VI)	mg/L	0.15	0.05	0.02	ISO 18412	USEPA 218.6	GB 7467 must meet reporting limit	IS 3025 (Part 52) must meet reporting limit
Antimony	mg/L	0.1	0.05	0.01	ISO 17294 ISO 11885	USEPA 200.7 USEPA 200.8 USEPA 6010C USEPA 6020A	HJ 700	IS 3025 (Part 65)
Cobalt	mg/L	0.05	0.02	0.01			HJ 700	IS 3025 (Part 65)
Copper	mg/L	1	0.5	0.25			GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 42) AAS Instrumental Method
Nickle	mg/L	0.2	0.1	0.05			GB 11907 HJ 700	IS 3025 (Part 65) IS 3025 (Part 54) AAS Instrumental Method
Silver	mg/L	0.1	0.05	0.005			GB 11907 HJ 700	IS 3025 (Part 65)
Zinc	mg/L	5.0	1.0	0.5			GB 7472 GB7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 49) AAS Instrumental Method
Arsenic	mg/L	0.05	0.01	0.005			HJ 700	IS 3025 (Part 65)
Cadmium	mg/L	0.1	0.05	0.01			GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 41) AAS Instrumental Method

Table 1B: Metals
(continued)

Parameter	Unit	Parameter limit values			Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC			
		Foundational	Progressive	Aspirational	International/ Europe	USA	China	India
Metals (continued)								
Lead	mg/L	0.1	0.05	0.01	ISO 17294 ISO 11885	USEPA 200.7 USEPA 200.8 USEPA 6010C USEPA 6020A	GB 7475 HJ 700	IS 3025 (Part 65) IS 3025 (Part 47) AAS Instrumental Method
Mercury	mg/L	0.01	0.005	0.001	ISO 12846 ISO 17852	USEPA 245.1 USEPA 245.2 USEPA 1631 E USEPA 200.8 SIM USEPA 6020A SIM	HJ 597	IS 3025 (Part 48) Cold Vapor AAS only IS 3025 (Part 65) [SIM] must meet required RL

Abbreviations

- °C Degree Celsius
- CFU Colony Forming Units
- GB Guojia Biaozhun (Chinese required national standard)
- GB/T Guojia Biaozhun/Tujijian, (Chinese recommended national standard)
- HJ Chinese required environmental protection standard
(Chinese industry standard)
- HJ/T Chinese recommended environmental protection standard
(Chinese industry standard)
- IS Bureau of Indian Standards
- ISO International Organisation for Standardisation
- mg/kg Milligram(s) per kilogram
- mg/L Milligram(s) per litre
- ml Millilitre
- N/A Not Available or Not Applicable
- SM Standard Methods for the Examination of Water and Wastewater
– 22nd Edition
- USEPA United States Environmental Protection Agency

APPENDIX A

Tables 2A-2M: ZDHC MRSL V1.1 Parameters for Wastewater

Reporting limits mentioned in the following tables apply to each single chemical substance of the respective substance group.

Table 2A:

Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): Including All Isomers

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Nonylphenol (NP), mixed isomers	104-40-5 11066-49-2 25154-52-3 84852-15-3	5	NP/OP: ISO 18857 -2 (modified dichloromethane extraction) or ASTM D7065 (GC-MS or LC-MS(-MS)) OPEO/NPEO (n>2): ISO 18254-1 OPEO/NPEO (n=1,2): ISO 18857-2 or ASTM D7065
Octylphenol (OP), mixed isomers	140-66-9 1806-26-4 27193-28-8		
Octylphenol ethoxylates (OPEO)	9002-93-1 9036-19-5 68987-90-6		
Nonylphenol ethoxylates (NPEO)	9016-45-9 26027-38-3 37205-87-1 68412-54-4 127087-87-0		

Table 2B:

Chlorobenzenes and Chlorotoluenes

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Monochlorobenzene	108-90-7	0,2	USEPA 8260B, 8270D. Dichloromethane extraction followed by GC-MS
1,2-Dichlorobenzene	95-50-1		
1,3-Dichlorobenzene	541-73-1		
1,4-Dichlorobenzene	106-46-7		
1,2,3-Trichlorobenzene	87-61-6		
1,2,4-Trichlorobenzene	120-82-1		
1,3,5-Trichlorobenzene	108-70-3		
1,2,3,4-Tetrachlorobenzene	634-66-2		
1,2,3,5-Tetrachlorobenzene	634-90-2		
1,2,4,5-Tetrachlorobenzene	95-94-3		
Pentachlorobenzene	608-93-5		
Hexachlorobenzene	118-74-1		
2-Chlorotoluene	95-49-8		
3-Chlorotoluene	108-41-8		
4-Chlorotoluene	106-43-4		
2,3-Dichlorotoluene	32768-54-0		
2,4-Dichlorotoluene	95-73-8		
2,5-Dichlorotoluene	19398-61-9		
2,6-Dichlorotoluene	118-69-4		
3,4-Dichlorotoluene	95-75-0		
3,5-Dichlorotoluene	25186-47-4		
2,3,4-Trichlorotoluene	7359-72-0		
2,3,6-Trichlorotoluene	2077-46-5		
2,4,5-Trichlorotoluene	6639-30-1		

Table 2B:

Chlorobenzenes and Chlorotoluenes (continued)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
2,4,6-Trichlorotoluene	23749-65-7	0,2	USEPA 8260B, 8270D. Dichloromethane extraction followed by GC-MS
3,4,5-Trichlorotoluene	21472-86-6		
2,3,4,5-Tetrachlorotoluene	76057-12-0		
2,3,5,6-Tetrachlorotoluene	29733-70-8		
2,3,4,6-Tetrachlorotoluene	875-40-1		
Pentachlorotoluene	877-11-2		

Table 2C:

Chlorophenols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
2-chlorophenol	95-57-8	0.5	USEPA 8270 D. Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC-MS ISO 14154:2005
3-chlorophenol	108-43-0		
4-chlorophenol	106-48-9		
2,3-dichlorophenol	576-24-9		
2,4-dichlorophenol	120-83-2		
2,5-dichlorophenol	583-78-8		
2,6-dichlorophenol	87-65-0		
3,4-dichlorophenol	95-77-2		
3,5-dichlorophenol	591-35-5		
2,3,4-trichlorophenol	15950-66-0		
2,3,5-trichlorophenol	933-78-8		
2,3,6-trichlorophenol	933-75-5		
2,4,5-trichlorophenol	95-95-4		
2,4,6-trichlorophenol	88-06-2		
3,4,5-trichlorophenol	609-19-8		
2,3,4,5-tetrachlorophenol	4901-51-3		
2,3,4,6-tetrachlorophenol	58-90-2		
2,3,5,6-tetrachlorophenol	935-95-5		
Pentachlorophenol	87-86-5		

Table 2D:

Dyes – Azo (Forming Restricted Amines)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
4,4'-methylene-bis-(2-chloro-aniline)	101-14-4	0.1	EN 14362-1 EN 14362-3 Reduction step with sodium dithionite, solvent extraction, GC-MS or LC-MS
4,4'-methylenedianiline	101-77-9		
4,4'-oxydianiline	101-80-4		
4-chloroaniline	106-47-8		
3,3'-dimethoxybenzidine	119-90-4		
3,3'-dimethylbenzidine	119-93-7		
6-methoxy-m-toluidine	120-71-8		
2,4,5-trimethylaniline	137-17-7		
4,4'-thiodianiline	139-65-1		
4-aminoazobenzene	60-09-3		
4-methoxy-m-phenylenediamine	615-05-4		
4,4'-methylenedi-o-toluidine	838-88-0		
2,6-xylydine	87-62-7		
o-anisidine	90-04-0		
2-naphthylamine	91-59-8		
3,3'-dichlorobenzidine	91-94-1		
4-aminodiphenyl	92-67-1		
Benzidine	92-87-5		
o-toluidine	95-53-4		
2,4-xylydine	95-68-1		
4-chloro-o-toluidine	95-69-2		
4-methyl-m-phenylenediamine	95-80-7		
o-aminoazotoluene	97-56-3		
5-nitro-o-toluidine	99-55-8		

Table 2E:

Dyes – Carcinogenic or Equivalent Concern

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
C.I. Direct Black 38	1937-37-7	500	Liquid extraction LC-MS
C.I. Direct Blue 6	2602-46-2		
C.I. Acid Red 26	3761-53-3		
C.I. Basic Red 9	569-61-9		
C.I. Direct Red 28	573-58-0		
C.I. Basic Violet 14	632-99-5		
C.I. Disperse Blue 1	2475-45-8		
C.I. Disperse Blue 3	2475-46-9		
C.I. Basic Blue 26 (with Michler's Ketone > 0.1%)	2580-56-5		
C.I. Basic Green 4 (Malachite Green Chloride)	569-64-2		
C.I. Basic Green 4 (Malachite Green Oxalate)	2437-29-8		
C.I. Basic Green 4 (Malachite Green)	10309-95-2		
Disperse Orange 11	82-28-0		

**Table 2F:**

Flame Retardants

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Tris(2-chloroethyl)phosphate (TCEP)	115-96-8	5	USEPA 8270 ISO 22032, USEPA 527 and USEPA 8321B. Dichloro-methane extraction GC-MS or LC-MS (-MS)
Decabromodiphenyl ether (DecaBDE)	1163-19-5		
Tris(2,3,-dibromopropyl) phosphate (TRIS)	126-72-7		
Pentabromodiphenyl ether (PentaBDE)	32534-81-9		
Octabromodiphenyl ether (OctaBDE)	32536-52-0		
Bis(2,3-dibromopropyl) phosphate (BIS)	5412-25-9		
Tris(1-aziridinyl) phosphine oxide (TEPA)	545-55-1		
Polybromobiphenyls (PBB)	59536-65-1		
Tetrabromobisphenol A (TBBPA)	79-94-7		
Hexabromocyclododecane (HBCDD)	3194-55-6		
2,2-bis(bromomethyl)-1,3-propanediol (BBMP)	3296-90-0		
Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8		
Short-chain chlorinated Paraffins (SCCP) (C10-C13)	85535-84-8		

**Table 2G:**

Glycols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Bis(2-methoxyethyl)-ether	111-96-6	50	USEPA 8270 Liquid extraction LC-MS GC-MS
2-ethoxyethanol	110-80-5		
2-ethoxyethyl acetate	111-15-9		
Ethylene glycol dimethyl ether	110-71-4		
2-methoxyethanol	109-86-4		
2-methoxyethylacetate	110-49-6		
2-methoxypropylacetate	70657-70-4		
Triethylene glycol dimethyl ether	112-49-2		

Table 2H:

Halogenated Solvents

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
1,2-dichloroethane	107-06-2	1	USEPA 8260B Headspace GC-MS or Purge-and-Trap-GC-MS
Methylene chloride	75-09-2		
Trichloroethylene	79-01-6		
Tetrachloroethylene	127-18-4		

Table 2I:

Organotin Compounds

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Mono-, di- and tri-methyltin derivatives	Multiple	0.01	ISO 17353
Mono-, di- and tri-butyltin derivatives	Multiple		Derivatisation with NaB(C ₂ H ₅) ₃
Mono-, di- and tri-phenyltin derivatives	Multiple		GC-MS
Mono-, di- and tri-octyltin derivatives	Multiple		

Table 2J:

Perfluorinated and Polyfluorinated Chemicals (PFCs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
PFOS	1763-23-1	0.01	DIN 38407-42 (modified)
PFOA	335-67-1		Ionic PFC: Concentration or direct injection, LC-MS(-MS);
PFBS	375-73-5 29420-49-3 29420-43-3		
PFHxA	307-24-4	1	Non-ionic PFC (FTOH): derivatisation with acetic anhydride followed by GC-MS
8:2 FTOH	678-39-7		
6:2 FTOH	647-42-7		

Table 2K:

Ortho-Phthalates – Including all ortho esters of phthalic acid

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Di(ethylhexyl) phthalate (DEHP)	117-81-7	10	USEPA 8270D ISO 18856 Dichloromethane extraction GC-MS
Bis(2-methoxyethyl) phthalate (DMEP)	117-82-8		
Di-n-octyl phthalate (DNOP)	117-84-0		
Di-iso-decyl phthalate (DIDP)	26761-40-0		
Di-isononyl phthalate (DINP)	28553-12-0		
Di-n-hexyl phthalate (DnHP)	84-75-3		
Dibutyl phthalate (DBP)	84-74-2		
Butyl benzyl phthalate (BBP)	85-68-7		
Dinonyl phthalate (DNP)	84-76-4		
Diethyl phthalate (DEP)	84-66-2		
Di-n-propyl phthalate (DPRP)	131-16-8		
Di-isobutyl phthalate (DIBP)	84-69-5		
Di-cyclohexyl phthalate (DCHP)	84-61-7		
Di-iso-octyl phthalate (DIOP)	27554-26-3		
1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4		
1,2-benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6		

**Table 2L:**

Polycyclic Aromatic Hydrocarbons (PAHs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Benzo[a]pyrene (BaP)	50-32-8	1	USEPA 8270 DIN 38407-39 Solvent extraction GC-MS
Anthracene	120-12-7		
Pyrene	129-00-0		
Benzo[ghi]perylene	191-24-2		
Benzo[e]pyrene	192-97-2		
Indeno[1,2,3-cd]pyrene	193-39-5		
Benzo[j]fluoranthene	205-82-3		
Benzo[b]fluoranthene	205-99-2		
Fluoranthene	206-44-0		
Benzo[k]fluoranthene	207-08-9		
Acenaphthylene	208-96-8		
Chrysene	218-01-9		
Dibenz[a,h]anthracene	53-70-3		
Benzo[a]anthracene	56-55-3		
Acenaphthene	83-32-9		
Phenanthrene	85-01-8		
Fluorene	86-73-7		
Naphthalene	91-20-3		

**Table 2M:**

Volatile Organic Compounds (VOC)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Benzene	71-43-2	1	ISO 11423-1
o-cresol*	95-48-7		Headspace- or Purge-and-Trap-GC-MS USEPA 8260
p-cresol*	106-44-5		
m-cresol*	108-39-4		

*cresol isomers are included in the Leather Wastewater Guidelines, recognising that its presence may be the result of complex reactions during the process and not as a result of its intentional use. This is based on preliminary studies. The use of a Root Cause Analysis and Corrective Action Plans should be followed to identify and work to eliminate its presence regardless of the sources.

APPENDIX A

Table 3: Sludge Parameters

For sampling and reporting only. If parameters detected above reporting limits, suppliers should utilise the Root Cause Analysis (RCA) and Corrective Action Plan (CAP) template available on the ZDHC Gateway or from March 2021 on the Supplier to Zero platform, to help to identify and make a plan to solve for the cause.

Table 3: Sludge Parameters

For information on single substances and CAS numbers please refer to *Tables 2A - 2M*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC		
			International/ Europe	USA	China
Conventional					
Dry Mass (total solids)	-	Analysis: Dry @ 105°C, gravimetric		USEPA 160.3 / 209A	
Metals					
Arsenic	2	Preparation: Acid/peroxide digestion		USEPA 3050	
		Analysis: ICP/OES (USEPA 6010D), or ICP/MS (USEPA 6020B)		USEPA 6010D USEPA 6020B	
Cadmium	2	Preparation: Acid/peroxide digestion		USEPA 3050	
		Analysis: ICP/OES (USEPA 6010D), or ICP/MS (USEPA 6020B)		USEPA 6010D USEPA 6020B	
Lead	2	Preparation: Acid/peroxide digestion		USEPA 3050	
		Analysis: ICP/OES (USEPA 6010D), or ICP/MS (USEPA 6020B)		USEPA 6010D USEPA 6020B	
Chromium (VI)	2	Preparation: Alkaline digestion		USEPA 3060A	
		Analysis: Colourimetric UV/VIS (USEPA 7196), or Colourimetric IC (USEPA 7199)		USEPA 7196 USEPA 7199	
Mercury	0.2	Preparation: Dissolution, acid digestion		USEPA 7471B USEPA 3051A	
		Analysis: CVAA (USEPA 7471B), or ICP/MS (USEPA 6020B)	USEPA 7471B USEPA 6020B SIM	USEPA 7471B USEPA 6020B SIM	

Table 3: Sludge Parameters (continued)

For information on single substances and CAS numbers please refer to *Tables 2A - 2M*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC		
			International/ Europe	USA	China
ZDHC MRSL V1.1					
Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): including all isomers	0.4	Preparation: Modified dichloromethane extraction with mechanical agitation		USEPA 3540/3541 soxhlet USEPA 3550 ultrasonic USEPA 3560SFE	
		Analysis: NP/OP, GC-MS, LC-MS	ISO 18857-2 ASTM D7065		
		Analysis: OPEO/NPEO (n>2): GC-MS; LC-MS	ISO 18254-1		
		Analysis: OPEO/NPEO (n=1,2), GC-MS, LC-MS	ISO 18857-2 ASTM D7065		
Chlorobenzenes and Chlorotoluenes	0.2	Preparation: Dichloromethane extraction with mechanical agitation		USEPA 3540/3541 soxhlet USEPA 3550 ultrasonic USEPA 3560 SFE	
		Clean up: GPC		USEPA 3650	
		Analysis: GC-MS		USEPA 8270	
Chlorophenols	0.05	Preparation: Acid/base liquid extraction, acetylation, liq/liq extraction	ISO 14154		
		Analysis: GC electron capture	ISO 14154		
Dyes – Azo (forming restricted amines)	0.2	Preparation: Reduction with sodium thionite, solvent extraction			
		Analysis: GC-MS (ISO 14362-1), or LC-MS (ISO 14362-3)	ISO 14362-1, 14362-3		
Dyes – Carcinogenic or equivalent concern	10	Preparation: Liquid extraction			
		Analysis: LC-MS	ISO 16373, 2014		
Flame Retardants	1	Preparation: Dichloromethane extraction	ISO 22032		
		Analysis: GC-MS or LC-MS-MS	ISO 22032		

Table 3: Sludge Parameters (continued)

For information on single substances and CAS numbers please refer to *Tables 2A - 2M*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard methods for analysis and testing Equivalent methods can be used, must be first communicated to and approved by ZDHC		
			International/ Europe	USA	China
ZDHC MRSL V1.1 (continued)					
Glycols	10	Preparation: Liquid extraction		USEPA 8270D	
		Analysis: LC-MS, GC-MS	ISO 22892, 2006		
Halogenated Solvents	2	Preparation: Purge and trap (USEPA 5035), or headspace (USEPA 5021)		USEPA 5035 USEPA 50211	
		Analysis: GC electrolytic conductivity HECD, GC-MS		USEPA 8010	
Organotin	0.2	Preparation: Derivatisation NaB (C ₂ H ₃)	ISO 23161, 2009		
		Analysis: GC-MS	ISO 23161, 2009		
Perfluorinated and Polyfluorinated chemicals (PFCs)	0.10 ionic 1 non-ionic	Preparation: Ionic: concentration. Non-ionic: derivatisation with acetic anhydride.			
		Analysis: Ionic: LC-MS-MS. Non-ionic (FTOH): GC-MS	DIN 38407-42		
Ortho Phthalates - including all ortho esters of phthalic acid	2	Preparation: Dichloromethane extraction using soxhlet (USEPA 3540/3541), or ultrasonic (USEPA 3550), or SFE (USEPA 3560)		USEPA 3540/3541 USEPA 3550 USEPA 3560	
		Analysis: GC-MS	ISO 18856		
Polycyclic Aromatic Hydrocarbons (PAHs)	0.2	Preparation: Dichloromethane extraction with mechanical agitation		USEPA 3540/3541 soxhlet USEPA 3550 ultrasonic USEPA 3560 SFE	
		Clean up: GPC Analysis: GC-MS		USEPA 3650 USEPA 8270	
Volatile Organic Compounds (VOC)*	2	Preparation: Solvent extraction, purge and trap (USEPA 5035), or headspace (USEPA 5021)		USEPA 5035 USEPA 5021	
		Analysis: GC-MS	DIN 38407 part 43	USEPA 8260	

*Excluding Xylene

