TENNANTS DISTRIBUTION LIMITED
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PRODUCT SPECIFICATION

Product Name	Zinc Sulphate Hexahydrate
Alternative Name	
Product Grade	Technical
Specification Reference	ZISUH/3 (17(13/05)/11/0024548)

SALES SPECIFICATION

$ZNSO_4.6H_2O$	97.28% min
Zn	23.6% min
Cl	0.3%
Fe	10 ppm w/w max
Pb	5 ppm w/w max
Cd	10 ppm w/w max
Ni	15 ppm w/w max
Mn	50 ppm w/w max
Cu	10 ppm w/w max

Further information

This product is sold with a shelf life of 3 years from date of sale after which time it should be subject to re-testing to verify compliance with specification. The shelf life date is conditional on the product being stored at ambient temperatures (5 – 30ºC) in sealed containers as supplied. Packages supplied meet with UN performance standards where appropriate

NOTES

Exclusion of Liability

Information contained in this publication is accurate to the best of the knowledge and belief of Tennants.

Any information or advice obtained from Tennants otherwise than by means of this publication and whether relating to Tennants materials or other materials, is also given in good faith. However, it remains at all times the responsibility of the customer to ensure that Tennants materials are suitable for the particular purpose intended.

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Health and Safety

A Material Safety Data Sheet has been issued describing the health, safety and environmental properties of this product, identifying the potential hazards and giving advice on the handling precautions and emergency procedures. This must be consulted fully before handling, storage and use.

SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

1.1 Product Identifier

Chemical Name (EINECS)	ZINC SULPHATE HEXAHYDRATE
Synonyms	SULPHURIC ACID, ZINC SALT
CAS Number	7446-19-7
EINECS Number	231-793-3
HS Tariff No.	28332600
REACH Registration Number	01-2119474684-27-XXXX

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified use(s)	Used in the following industries: Agriculture, Chemical, Pharmaceutical, Brewing, Pigments, Mining
Uses advised against	No information supplied at present

1.3 Details of the supplier of the safety data sheet

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1.4 Emergency telephone number

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2. HAZARDS IDENTIFICATION

Classification
Classification (EC 1272/2008)

Physical	Not classified
Health	Acute Tox. 4 – H302; Eye Dam. 1 – H318
Environmental	Aquatic Chronic 1 – H410

LABEL IN ACCORDANCE WITH (EC) NO. 1272/2008

Signal Word Danger

Hazard Statements
H302 Harmful if swallowed.
H318 Causes serious eye damage.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statements
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P301/312 IF SWALLOWED: Call a POISON CENTRE or doctor/physician if you feel unwell.
P305/351/338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTRE or doctor/physician.
P391 Collect spillage.

Supplementary Precautionary Statements
P501 Dispose of contents/container to.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Gross formula	CAS-No.	EC No.	EU Index No.
ZnSO4, H2O	7446-19-7	231-793-3	030-006-00-9

4. FIRST AID MEASURES

General Information
Keep the affected person warm and at rest. Get prompt medical attention.

Notes to the physician
No recommendation given, but first aid may still be required in case of accidental exposure, inhalation or ingestion of this chemical. If in doubt, GET MEDICAL ATTENTION PROMPTLY!

Inhalation
Move into fresh air and keep at rest. Get medical attention if any discomfort continues.

Ingestion
Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable seek hospital and bring these instructions. DO NOT induce vomiting. Get medical attention immediately.

Skin contact
Remove contaminated clothing. Wash the skin immediately with soap and water. Get medical attention promptly if symptoms occur after washing.

Eye contact
Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyes wide apart. Get medical attention immediately. Continue to rinse.

5. FIRE FIGHTING MEASURES

Extinguishing Media
Use: Water spray, foam, dry powder or carbon dioxide. This product in not flammable.

Special fire fighting procedures
Keep up-wind to avoid fumes. Beware, risk of formation of toxic and corrosive gases.

Unusual fire & explosion hazards
Oxides of: Sulphurous gases (SO_x)

Specific hazards
Closed containers can burst violently when heated, due to excess pressure build-up.

Protective measure in fires
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear protective clothing as described in Section 8 of this safety data sheet.

Environmental precautions
Do not allow ANY environmental contamination. Spillages or uncontrolled discharges into watercourses must be IMMEDIATELY alerted to the Environmental Agency or other appropriate regulatory body.

Spill clean-up methods
DO NOT TOUCH SPILLED MATERIAL! Avoid generation and spreading of dust. Shovel into dry containers. Cover and move the containers. Flush the area with water.

7. HANDLING AND STORAGE

Usage precautions
Avoid inhalation of dust and contact with skin and eyes. Eye was facilities and emergency shower must be available when handling this product. Avoid handling which leads to dust formation. Observe occupational exposure limits and minimise the risk of inhalation of vapours and mist.

Storage precautions
Store in tightly closed original container in a dry, cool and well-ventilated place. Keep in original container.

Storage Class
Corrosive storage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	Std	TWA-8 hrs	STEL-15 min	Notes
ZINC SULPHATE HEXAHYDRATE	OES	4 mg/m^3 resp. dust	10 mg/m^3 total dust	

Process conditions
Provide eyewash.

Engineering measures
Provide adequate ventilation. Observe occupational exposures limits and minimize the risk of inhalation of dust.

Respiratory equipment
In case of inadequate ventilation or risk of inhalation of dust, use suitable respiratory equipment with particle filter (type P2).

Hand protection
Use protective gloves.

Eye protection
Wear goggles/face shield.

Other protection
Wear appropriate clothing to prevent any possibility of skin contact.

Hygiene measures
DO NOT SMOKE IN WORK AREA! Wash at the end of each work shift and before eating, smoking and using the toilet. Wash promptly if skin becomes wet or contaminated. Promptly remove any clothing that becomes contaminated. When using do not eat, drink or smoke.

Skin protection
Wear apron or protective clothing in case of contact.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Crystalline Powder
Odour	Odourless
Volatility description	N/A
Solubility	Soluble in water
Mol. Weight	269.6 g/mol
Melting point (ºC)	N/A
Bulk density	1000 kg/m3
Vapour density (air=1)	N/A
Evaporation rate	N/A
Volatile by vol. (%)	N/A
pH-value, diluted solution	4 – 6 @ 5% w/v
Saturation concentration (ppm)	N/A
Decomposition temperature	680
Odour threshold, upper	N/A
Auto ignition	N/A
Temperature (ºC) flammability	
Limit – upper (%)	N/A
Refractive index	N/A
Volatile organic compound (VOC)	N/A
Boiling point (ºC)	N/A
Relative density	2.072 20
Particle size (Micron)	N/A
Vapour pressure	< 10 Pa 20
Evaporation factor	N/A
pH-value, conc. solution	N/A
Viscosity	N/A
Critical Temperature (ºC)	N/A
Odour threshold	N/A
Flash point (ºC)	N/A
Flammability Limit – lower (%)	N/A
Partition coefficient	N/A
(N-Octanol/Water)	
Solubility value (g/100g H2O@20ºC)	96.5

10. STABILITY AND REACTIVITY

Stability
Stable under normal temperature conditions. Closed containers can burst violently when heated, due to excess pressure build-up.

Conditions to avoid
Avoid excessive heat for prolonged periods of time.

Hazardous polymerisation
Will not polymerise.

Materials to avoid
No incompatible groups noted.

Hazardous decomposition products
Fire creates: Sulphurous gases (SO_x). Oxides of: Zinc.

11. TOXICOLOGICAL INFORMATION

Toxic dose 1 – LD 50 >2500 $ZnSO_4$, $6H_2O$ mg/kg (oral rat)
Toxic dose 2 – LD 50 1000 – 2000 $ZnSO_4H_2O$ mg/kg (oral rat)

Inhalation
Dust is severely irritating to the upper respiratory system.

Ingestion
May cause burns in mucous membranes, throat, oesophagus and stomach.

Skin Contact
Irritating to skin. Prolonged or repeated exposure may cause severe irritation.

Eye contact
Risk of serious damage to eyes. Causes burns.

Route of entry
Inhalation. Ingestion. Skin and/or eye contact.

Target organs
Skin. Eyes.

12. ECOLOGICAL INFORMATION

Ecotoxicity
The product contains a substance which is toxic to aquatic organisms and which may cause long term adverse effects in the aquatic environment.

LC 50, 96 Hrs, FISH mg/l	1.24 (24hrs): 2.4 – 5 (48hrs)
EC50, 48 Hrs, DAPHNIA, mg/l	0.15
IC 50, 72 Hrs, ALGAE, mg/l	0.52 (5 days) anhydrous substance

Mobility
No information available.

Bioaccumulation
No data available on bioaccumulation.

Degradability
No data available

Acute fish toxicity
Very toxic to aquatic organisms.

13. DISPOSAL CONSIDERATIONS

General information
Waste is classified as hazardous waste. Disposal to licensed waste disposal site in accordance with the local Waste Disposal Authority.

Disposal methods
Dispose of waste and residues in accordance with local authority requirements. Contact specialist disposal companies.

14. TRANSPORT INFORMATION

Proper shipping name	Environmentally hazardous substance, solid, N.O.S (Zinc Sulphate)		
UN No. Road	3077	UK road pack. Gr.	III
ADR Class No	9	ADR Class	Class 9: Other dangerous substances.
ADR Pack Group	III	Hazard No (ADR)	90 Environmentally hazardous substance; miscellaneous dangerous substances.
UN No Sea	3077	IMDG Class	9
IMDG Pack Gr.	III	Marine pollutant	

UN No Air	3077	Air Class	9
Air pack Gr.	III		

15. REGULATORY INFORMATION

UK Regulatory References
Chemicals (Hazard Information & Packaging) Regulations.

EU Directive
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of chemicals (REACH), establishing a European chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

Statutory Instruments
The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (S.I 2009 No 716).

Approved Code of Practice
Classification and Labelling of Substances and Preparations Dangerous for Supply. Safety Data Sheets for Substance and Preparations.

Guidance Notes
Workplace Exposure Limits EH40.

Source of key data used to compile the data sheet
Supplier information

Modifications from last revision
The Specification has incurred revision. The Safety Data Sheet remains the same
Date: 09/11/17

Introduction to (short) Generic Exposure Scenarios (GES): $ZnSO_4$

For assessment of exposures at local scale, several generic exposure scenarios (GES) were developed in the chemical safety report (CSR) for each zinc substance. This was necessary because of the significant number of uses that was identified for each of the substances. The multitude of identified uses was assigned to the respective GES based on similarity of process, and, consequently, similarity in exposure and risk management measures. So, GES are relevant for the different identified uses that they group at the same time.

Approaches for local exposure assessment

- Assessment of workers exposure is related to the place /process the worker is involved in. The GES group different processes; exposure assessment is done using the worst case approach by considering full shift exposure at the workplace with highest potential for exposure. Risk management measures are specified accordingly.
- Environmental emissions (notably to water) are usually integrating the totality of emissions from a given site, and cannot be distinguished for each process. Therefore assessments in the GES are done for the site as a whole.

Shortened GES for annexing to the e-SDS

For reasons of clarity, shortened versions of the GES as documented in the CSR have been listed below. These shortened versions focus on a) operational conditions and b) risk management measures. Repetition of information contained in the SDS has been avoided by cross-referencing.

How to identify the GES related to a given use?

In table below, the generic exposure scenarios (GES) developed for $ZnSO_4$ are presented.

Table: Generic exposure scenarios (GES) for $ZnSO_4$ (ref: CSR $ZnSO_4$, version Nov 2010)

Number	Sector	Uses	Code
0	Zinc sulphate production	Manufacture Substance	GES_{ZnSO4} 0
1	Formulation step	Formulation general	GES_{ZnSO4} 1
2	First tier applications	Manufacturing of other zinc compounds	GES_{ZnSO4} 2
3		Laboratory reagent	GES_{ZnSO4} 3
4		As component for solid blends & matrices	GES_{ZnSO4} 4
5		As component for production of dispersions, pastes and other viscous matrices	GES_{ZnSO4} 5
6	Second tier applications	DU of ZnSO4-containing solid preparations	GES_{ZnSO4} 6
7		DU of ZnSO4-containing liquid & pasty preparations	GES_{ZnSO4} 7

To facilitate the identification of the GES related to a given downstream use, the table below lists the different uses that were identified for $ZnSO_4$. In this table, the downstream user can look up its use(s) and find the corresponding GES for attachment to his e-SDS.

Table: Identified uses for $ZnSO_4$ and corresponding Generic Exposure Scenario (GES) (ref: CSR $ZnSO_4$ version Nov 2010)

IU number	Identified Use (IU) name	GES code
1	Zinc Sulphate production -Wet	GESZnSO4 0
5	Component for production of inorganic zinc compounds	GESZnSO4 2
6	Electrogalvanizing	GESZnSO4 2
7	Electroplating	GESZnSO4 2
8	Zinc production by electrowinning	GESZnSO4 2
9	Laboratory reagent	GESZnSO4 3
10	Ore dressing (mining metallurgy)	GESZnSO4 0, GESZnSO4 1
11	Zinc production by pyrometallurgy	GESZnSO4 2
12	Component for production of organic zinc compounds	GESZnSO4 2
13	Component for production of Inorganic pigments, i.e. Lithopones	GESZnSO4 1, GESZnSO4 4
14	Component for production of Coatings / paints, inks, enamels, varnishes	GESZnSO4 1, GESZnSO4 4
15	Component for production of surface treatment preparations	GESZnSO4 1, GESZnSO4 4
16	Component for Paper coating	GESZnSO4 1, GESZnSO4 5
17	Use of ZnSO4-containing paper coatings	GESZnSO4 6
18	Component for Textile & leather coating / treatment	GESZnSO4 1, GESZnSO4 5
19	Use of ZnSO4-containing textile & leather coatings	GESZnSO4 6
20	Additive for the production of Lubricants / Grease / Metal working fluids	GESZnSO4 1, GESZnSO4 5
21	Use of ZnSO4-containing Lubricants / Grease / Metal working fluids	Generic consumer/environment*
22	Use of ZnSO4-containing catalysts	GESZnSO4 1, GESZnSO4 5
23	Additive for the formulation of animal feedstuffs	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
24	Additive for the formulation of biocidal products	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
25	Additive for the formulation of cleaning products	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
26	Use of ZnSO4-containing cleaning products	GESZnSO4 6, GESZnSO4 7, Generic consumer/environment
27	Additive for the formulation of fertilizers	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
28	Use of ZnSO4-containing fertilizer's formulations	Generic consumer/environment
29	Additive in the formulation of cosmetics	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5

30	Use of cosmetics	GESZnSO4 6, GESZnSO4 7, Generic consumer/environment
31	Additive in the formulation of pharma / veterinary products	GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
32	Use of Pharma / veterinary products	GESZnSO4 6, GESZnSO4 7, Generic consumer/environment

* corresponds to “GES 8” in IUCLID

GES ZnSO4-0: Industrial use of primary or secondary zinc bearing material in the manufacture of Zn SO4 in several process steps, collection of the substance produced and packaging.

SU: 2a, 3, 8, 9, 10 0, (Nace 7.2.9.)

PROC: 2, 3, 5, 8b, 9, 22, 26

PC: 19, 20, 21

AC: not applicable

ERC: 1

Description of activities and processes covered in the exposure scenario:

- Reception of zinc-bearing materials, (e.g.: the Intermediate Zinc sulphate solution), and transfer to the reaction tank (sulphate media)
- Feeding of the primary materials (e.g. ZnO or Zn(OH)2) into the mixing tank. The leaching reaction with sulphuric acid solutions is kept at the proper pH and temperature.
- Separation of the leach-residue (insoluble sulphates and steriles) occurs in covered settlers; if needed, the leachate may be filtered on adapted filters,
- Purification steps will be applied sequentially:
    - By oxidation (with air or oxygen) of some of the present elements (i.e. Fe) followed by another sedimentation or filtration step, if needed
    - By hydrolysis (with ZnO-rich reagent) of some of the hydrolysable elements (i.e. Fe, Al, …) followed by another sedimentation or filtration step, if needed
    - By cementation (with zinc powder) of some of the present elements (i.e. Cu, Cd, Ni, Co, …) followed by another sedimentation or filtration step, if needed
- Concentration by water evaporation, under exhaust hood.
- Pouring on a cooling belt
- Crystallisation and occasionally drying, in closed reactor.
- Discharge and packaging of produced zinc sulphate crystals. Workers have to place and adjust the bag or drum under the discharge pipe and to set the process in motion. Filled bags or drums are subsequently closed and carried to the storage area.
- Exposure to dust can occur during packing of the powder. Solutions are packed in intermediate bulk containers (ca. 1 m^3 capacity); solids are packed in bags or drums.
- Maintenance activities

Contributing scenario (1) controlling environmental exposure

Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS

ZnSO4 is produced in minimum 80% purity; higher grades (>95%) are usual.

Amounts used: maximum 12500 T/y;

Frequency and duration of use: Continuous production

Environment factors not influenced by risk management

Flow rate of receiving surface water default: 18,000 m^3/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

• Most of the operations are in wet phase. • Even when no process waters some non-process water can be generated containing zinc (e.g. from cleaning) • All processes are performed indoor in a confined area. All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3 of SDS
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable, default size of the municipal STP (2000 m^3/d), unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal If any, all hazardous wastes are treated by certified contractors according to EU and national legislation
Conditions and measures related to external recovery of waste • All residues from the wet process are recycled. • By-products (ashes) from the dry process that are formed in the reactor are recovered and either recycled in the system or handled further according the waste legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS Zinc sulphate is hygroscopic in nature (especially the anhydrous form) and is produced in a dust-free crystalline form. Approximately 75% of the production of Zinc sulphate is in the form of the crystalline hexa- and hepta-hydrate.
Amounts used: Maximum 96 T/day, 32T/shift
Frequency and duration of use/exposure: 8hrs shift
Human factors not influenced by risk management
Uncovered body parts (potentially) face exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure All processes are carried out indoor in confined areas.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-1: Industrial use of ZnSO4 in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, possibly followed by packing
SU: 2a, 3, 8, 9, 10, Nace C7.2.9. PROC: 1, 2, 3, 4, 5, 8b, 9, 13, 14, 15, 22 PC: Not applicable (all) AC: not applicable ERC: 1, 2
In the described process, the zinc sulphate is: • Removed from the packaging and stored in silos after delivery. • Extracted from the silo, dosed and fed with the other reagents to the mixing tank. Mixing occurs batch-wise or continuously, according the process receipt. The mixing occurs in a closed tank/chamber. • The preparation (dry or wet (solvent/paste) matrix) is further used as such or packed for further treatment/use.
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS ZnSO4 is used in minimum 80% purity; higher grades (>95%) are usual
Amounts used: maximum 5000 T/y;
Frequency and duration of use: Continuous production is assumed as a worst case
Environment factors not influenced by risk management Flow rate of receiving surface water default: 18,000 m3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure • All processes are performed indoor in a confined area. All residues containing zinc are recycled. • Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc(e.g. from cleaning)
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3. of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3. of SDS
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: default size of the municipal STP (2000 m3/d), unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to waste legislation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS • The concentration of ZnSO4 in the mixtures can cover a broad range (<= 5% up to >25%) depending on the application. • The preparation can be solid or liquid. • When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form. In the

powder form, it can be characterised by high dustiness in a worst case situation.
Amounts used: Max 5000T/y = 14T/d = 5T/shift depending on the application.
Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point
Human factors not influenced by risk management Uncovered body parts (potentially) face can be exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure • elevated temperature steps (~=100°C) can occur • All indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1. of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1. of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2. of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-2: industrial use of ZnSO4 or ZnSO4-formulations in the manufacturing of other inorganic or organic zinc substances in a solvent-based matrix with potentially drying, filtering and packaging.
SU: 3, 8, 9, 10, 14, 15, 17, 0(Nace25.6.1., C24.4.3., E38.3) PROC: 1, 2, 3, 4, 8b, 9, 13, 15, 21, 22, 23, 26 PC : 7, 14, 19, 20, 21, 24, 29, 39 AC : 2, 7, 12 ERC : 1, 2, 5, 6a
Description of activities/process(es) covered in the Exposure Scenario • Reception of the ZnSO4 or ZnSO4-containing formulation, or ZnSO4-bearing raw material and inclusion in the reaction tank • Sequential addition of reagents for purification steps and filtration on press filter, when needed (ventilation adapted). • Concentration by water evaporation, under exhaust hood, is optional. • Possible pouring on a cooling belt, is optional as well • Discharge and packaging of produced zinc compounds. Workers place and adjust the bag or drum under the discharge pipe and set the process in motion. Filled bags or drums are subsequently closed and carried to the storage area. Exposure to dust can occur during packing of the powder. • Solutions are packed in intermediate bulk containers (ca. 1 m3 capacity). • Maintenance activities • For the specific process of electro-galvanising, the bath consists of one or more tanks, usually made of a ceramic material, which contain zinc sulphate in solution. The steel passes through the bath and its

surface is coated with zinc/iron-zinc alloys. Because of the speed of the strip (up to 180 m/min) and the short exposure time, the coating consists of a very thin layer.
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS Zn-compounds are produced in their pure form e.g.: > 99%, or in solution
Amounts used: Up to 75 T/d of ZnSO4 is transformed to equivalent Zn compound
Frequency and duration of use: Continuous production is assumed as a worst case
Environment factors not influenced by risk management: Flow rate of receiving surface water default: 18,000 m3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure • Wet processes (leaching, filtering, purification) followed by drying (possible grinding), and packaging; • All indoor processes, in confined area.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS When applicable, process waters need to be specifically treated before release Dosing and packaging operations occur under a special ventilation hood
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3. of SDS
Organizational measures to prevent/limit release from site: see section 8.2.3. of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: use default size of the municipal STP (2000 m3/d) unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to waste legislation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS • Zinc sulphate is transformed to equivalent pure zinc compound • The formed zinc compound can be produced as a powder with varying particle size (worst case scenario) or can be in solution.
Amounts used: Up to maximum 25T/shift
Frequency and duration of use/exposure: 8hrs shift (worst case)
Human factors not influenced by risk management Uncovered body parts: (potentially) face exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure All processes are carried out indoor in confined areas.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2. of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-3: Industrial and professional use of ZnSO4 as active laboratory reagent in aqueous or organic media, for analysis or synthesis.
SU: 3,10, 22, 24 PROC: 1,2,3,4,5, 8a, 8b,9, 10, 15 PC: 19, 21, 28, 39 AC: not applicable ERC: 1,2, 4, 6a, 6b, 8a, 8b, 8d, 9a
The zinc sulphate is used for Analysis: sample (solid or liquid) treatment or preparation: the substance is in the sample or in the reagents Synthesis: manipulations are usually under ventilation (e.g. laminar flow, ventilation hood) The substance is used at the industrial scale, in industrial installations for air control and water treatment and at the professional scale by laboratories
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS ZnSO4 is used in minimum 80% purity; higher grades (> 95%) are usual
Amounts used maximum 5 T/y (industrial scale) maximum 0.5 T/y (professional scale)
Frequency and duration of use: Use is usually intermittent but continuous use is assumed as a worst case
Environment factors not influenced by risk management Flow rate of receiving surface water default used: 18,000 m3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure: All processes are performed indoor in a confined area, with dedicated laboratory equipment. All solid residues containing zinc are recovered for recycling.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3. of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil • Industrial scale: see section 8.2.3. • Professional scale, the emissions are treated usually by STP. Professional services will be used for treating waste streams e.g. for the recovery of metallic solids (for recycling), and for the recovery of e.g. acid solutions containing the substance
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: default size of the municipal STP (2000 m^3/d) will be used unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national

legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to waste legislation
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS
• ZnSO4 is used in minimum 80% purity; higher grades (> 95%) are usual • The sample can be solid or liquid. • When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form. In the powder form, it can be characterised by high dustiness in a worst case situation.
Amounts used • maximum 5 T/y (industrial scale) • maximum 0.5 T/y (professional scale)
Frequency and duration of use/exposure: Use is usually intermittent but continuous use is assumed as a worst case
Human factors not influenced by risk management
Uncovered body parts: (potentially) face can be exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure • high temperature steps can occur in protected zones (fume cupboards); • All indoor processes in confined area, including hazardous substances cabinets.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS For laboratories more specifically: • Local exhaust ventilation on work areas with potential generation of dust or fumes, dust capturing and removal techniques (fume cupboards). • Containment of liquid volumes and collection in special circuits
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS For laboratories more specifically: • Cleaning of process equipment and laboratory • Storage of Zn products in dedicated zones, e.g.: hazardous substances cabinets
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-4: Industrial use of ZnSO4 or ZnSO4-formulations as component for the manufacture of solid blends and matrices for further downstream use.
SU: 1, 3, 4, 5, 8, 9, 10,11, 12, 13, 14, 20 PROC: 1, 2, 3, 4, 5 ,8b, 9,13, 14, 15, 22 PC: 1,8, 9a,9b,9c, 12, 14,15,18, 20, 21, 26,28, 29, 32, 35, 37, 39 AC: na ERC: 1, 2, 3, 4, 5, 7, 8a, 8b, 8d, 10a, 10b
In the described process, the ZnSO4 (or Zn compound) containing preparation/mixture is optionally: • Pressed at high temperature (>1000°C), grinded and re-pressed or fritted at high temperature • Molten at high temperature (>500°C) and further cast as glassy material • Pressed and pelletized at low temperature And subsequently packed, or used as such, in further treatment/use
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS ZnSO4 (or Zn compound) in the preparation can be > 25%, usually <5%
Amounts used: maximum 5000 T/y;
Frequency and duration of use: Continuous production is assumed as a worst case
Environment factors not influenced by risk management Flow rate of receiving surface water default value 18,000 m3/d used unless specified otherwise
Other given operational conditions affecting environmental exposure • All dry processes throughout, no process waters. Even when no process waters occur (with dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning) • High temperature steps are possible. • All processes are performed indoor in a confined area. All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3 of SDS No process waters, so possible emissions to water are limited and non-process related
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: default size of the municipal STP (2000 m3/d) will be used unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according to the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to the waste legislation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS • The concentration of ZnSO4 in the mixtures can be up to >25% but is usually of the order of <= 5%, depending on the application. • The preparation is in the solid state, usually with a low level of dustiness; however, powder forms can occur, the high dustiness is therefore applied as a worst case.

Amounts used Max 5000T/y = 15T/d = 5T/shift depending on the application.
Frequency and duration of use/exposure 8 hour shifts (default worst case) are assumed as starting point
Human factors not influenced by risk management Uncovered body parts (potentially) face can be exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure • Dry processes: dry operational conditions throughout the process; no process waters; • high temperature steps can occur; • Indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-5: Industrial use of ZnSO4 or ZnSO4-formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices.
SU: 3,4, 5, 6b, 7, 8, 9, 10, 18, 20 PROC: 1, 2, 3, 4, 5, 6, 8b, 9, 10, 13, 14, 15 PC:, 2, 8, 9a, 9b, 12, 14, 15, 18, 19, 20, 21, 23, 24, 25, 28, 29, 32, 34, 35, 39, 40 AC: 1, 2, 7 ERC: 1, 2, 3, 4, 5, 6a, 6b, 6d, 8a, 8b, 8d, 9a, 9b, 10a, 10b, 11a
In the described process, the zinc sulphate containing preparation/mixture is: • unpacked and stored in silos • Extracted from the silo, dosed and fed with the other reagents and/or solvents to the mixing tank, batch-wise or continuously, according the process receipt. • The resulting zinc salt containing mixture (solution, dispersion, paste) is directly further processed, or packed, for further treatment/use.
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS $ZnSO_4$ in preparation can be > 25%
Amounts used: maximum 5000 T/y;
Frequency and duration of use: Continuous production is assumed as a worst case
Environment factors not influenced by risk management

Flow rate of receiving surface water default value: 18,000 m^3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure • In parallel, non-process water can be generated containing zinc (e.g. from cleaning) • All processes are performed indoor in a confined area. • All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3 of SDS
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: default size of the municipal STP (2000 m^3/d) will be used unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. • Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to the waste legislation.
Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS The concentration of $ZnSO_4$ in the mixtures can be >25%, depending on the application The preparation is in the liquid state, as a paste or dispersion or other viscous or polymerized matrix, with a low level of dustiness; however, powder forms can occur, medium dustiness is therefore applied as a worst case
Amounts used: Max 5000T/y = 20 T/d = 7 T/shift depending of application.
Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point
Human factors not influenced by risk management Uncovered body parts: (potentially) face can be exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure • Wet processes • All indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-6: Industrial and professional use of solid substrates containing less than 25%w/w of $ZnSO_4$.
SU: 3, 5, 6b, 9,10, 22 PROC: 4, 5 ,6, 8b, 9,10, 11,13, 19 PC: 1, 8, 9a, 9b, 9c,14,15, 18, 20, 21, 28, 29, 35, 39 AC: 0 (coatings for art and creative items) ERC: 8a, 8d, 10a, 11a
This scenario covers both the industrial scale processes and professional use. In the described process, the $ZnSO_4$ containing preparation/mixture is further processed, involving potentially the following steps: • Reception/unpacking of material • Final application, embedding, or shaping to produce the end product or article.
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS $ZnSO_4$ (or Zn compound) in the article is < 25%
Amounts used Typical quantities for both Industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting).
Frequency and duration of use: Continuous production is assumed as a worst case
Environment factors not influenced by risk management
Flow rate of receiving surface water default for generic scenario: 18,000 m^3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure • Solid, so in principle all dry processes throughout, no process waters. Even when no process waters occur (with dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning) • In industrial and professional setting, all processes are performed indoor in a confined area. All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3 of SDS In industrial and professional setting, the following applies: • No process waters, so possible emissions to water are limited and non-process related. • By exposure modelling it is predicted that at use quantities of >100T/y, refinement of the exposure assessment to water and sediment needs to be made (exposure assessment based on real measured data and local parameters). Treatment of the emissions to water may be needed under such conditions.
Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS
Conditions and measures related to municipal sewage treatment plant In cases where applicable: default size of the municipal STP (2000 m^3/d) used unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.

• Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products • Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
Conditions and measures related to external recovery of waste All residues are recycled or handled and conveyed according to the waste legislation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS The concentration of $ZnSO_4$ (or Zn compound) in the mixture is < 25% The mixture is in the solid state, with a low level of dustiness; however, powder forms can occur, the medium dustiness is therefore applied as a worst case
Amounts used Typical quantities for both Industrial and professional are 50 T/y (typical), or 0.15 T/day, 0.05 T/shift Maximum use quantity is 500T/y (1.5T/d, 0.5T/shift) in industrial setting
Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point
Human factors not influenced by risk management Uncovered body parts: (potentially) face can be exposed as a result of the nature of the activity
Other given operational conditions affecting workers exposure Industrial / Professional: • Dry processes: dry operational conditions throughout the process; no process waters • indoor processes in confined area
Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)

GES ZnSO4-7: Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of $ZnSO_4$.
SU: 9, 20,22 PROC: 8b, 9, 10, 11, 13, PC: 8, 20, 21,28, 29, 35, 39 AC: na ERC: 8a

This scenario covers both the industrial scale processes and professional use. In the described process, the $ZnSO_4$ containing preparation/mixture is further processed, involving potentially the following steps:

- Reception/unpacking of material
- Final application, spraying, embedding or to produce the end product or article.

Contributing scenario (1) controlling environmental exposure

Product characteristics: see sections 3 (composition) and 9 (phys-chem properties) of SDS

$ZnSO_4$ (or Zn compound) in the article is < 25%

Amounts used Typical quantities for both industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting).

Frequency and duration of use: Continuous production is assumed as a worst case

Environment factors not influenced by risk management

Flow rate of receiving surface water default for generic scenario: 18,000 m^3/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

- Wet processes. All process and non-process waters should be recycled internally to a maximal extent. Even when no process waters occur, some non-process water can be generated containing zinc (e.g. from cleaning)
- In industrial and professional setting, all processes are performed in a confined area. All residues containing zinc are recycled.

Technical conditions and measures at process level (source) to prevent release: see section 8.2.3 of SDS

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil: see section 8.2.3 of SDS

By exposure modelling it is predicted that at use quantities of >100T/y, refinement of the exposure assessment to water and sediment needs to be made (exposure assessment based on real measured data and local parameters). Treatment of the emissions to water may be needed under such conditions

Organizational measures to prevent/limit release from site: see section 8.2.3 of SDS

Conditions and measures related to municipal sewage treatment plant

In cases where applicable: default size of the municipal STP (2000 m^3/d) is used unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

- If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.
- Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products
- Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Conditions and measures related to external recovery of waste

All residues are recycled or handled and conveyed according to waste legislation.

Contributing scenario (2) controlling worker exposure

Product characteristic: see sections 3 (composition) and 9 (phys-chem properties) of SDS

- Particles can occur sporadically, the low level of dustiness is basically applied.
- Most of the processes imply the use of solutions or pastes; the “solution status” is therefore taken as the worst case.

Amounts used

- Typical quantities for both Industrial and professional are 50 T/y (typical), or 0.15 T/day, 0.05 T/shift.
- Maximum use quantity is 500T/y (1.5T/d, 0.5T/shift) in industrial setting

Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point

Human factors not influenced by risk management

Uncovered body parts: (potentially) face can be exposed as a result of the nature of the activity

Other given operational conditions affecting workers exposure

Industrial / Professional: Wet processes, all indoor in confined area.

Technical conditions and measures at process level (source) to prevent release: see section 8.2.1 of SDS
Technical conditions and measures to control dispersion from source towards the worker: see section 8.2.1 of SDS
Organisational measures to prevent /limit releases, dispersion and exposure: see section 8.2.1 of SDS
Conditions and measures related to personal protection, hygiene and health evaluation: see section 8.2.2 of SDS

Exposure estimation and reference to its source: not relevant, refer to CSR.
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.4.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES.
Occupational exposure/environmental emissions
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.4.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.4.)