

Offer Sheet

| | |
|------------------|--|
| Product | Ferrous Chloride byproduct stream |
| Quantity | 3 million gallons |
| Net weight | 4,000 gal/load, ~40,000 lbs. in tanker |
| Manufacture date | |
| Availability | Ongoing |
| Location | Nationwide & Canada |
| Date | 3/16/26 |
| COA & SDS | Attached below |



This material is a byproduct stream with zinc content >10,000 PPM.

Supplier can control the amount of free acid, up or down by a few points if needed, depending on the application. It does a good job of removing H₂S gas and serving as a coagulant for WWT. The zinc easily falls out with pH adjustment and precipitation.

1. Metal Recovery / Hydrometallurgical Processing

One of the **most common outlets**.

Ferrous chloride solutions containing zinc are used in **metal recovery circuits**, especially in:

- **galvanizing waste treatment**
- **zinc recovery from pickling liquors**
- **steel mill waste streams**

Typical processes:

- solvent extraction
- precipitation
- electrowinning

Here, the zinc is actually a **recoverable value metal**, not a contaminant.

2. Steel Pickling Regeneration Systems

Ferrous chloride solutions often originate from **hydrochloric acid pickling of galvanized steel**.

Facilities using **acid regeneration systems** can accept these streams because they already handle:

- iron chlorides
- zinc chlorides
- hydrochloric acid mixtures

The material can be:

- processed through **spray roasters**
 - converted back to **HCl + iron oxide**
-

3. Industrial Wastewater Treatment (Selective Applications)

It may still be usable as a **coagulant or sulfide control reagent**, but only in **industrial systems** where zinc loading is acceptable.

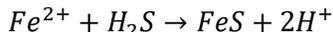
Applications include:

- **mining wastewater**
- **metal finishing wastewater**
- **industrial sludge conditioning**

Not typically used in **municipal wastewater plants**, because zinc adds heavy metal load to biosolids.

4. Hydrogen Sulfide (H₂S) Control in Industrial Systems

Ferrous salts react with sulfide:



This is used for:

- refinery wastewater
- oilfield water treatment
- industrial odor control

The zinc usually **does not interfere with sulfide precipitation**, making this a viable outlet.

5. Cement Kiln Feed / Hazardous Waste Fuel Blending

Some facilities accept iron-bearing chloride streams as **supplemental raw materials**.

Roles:

- iron source in clinker
- mineral feedstock

Zinc is tolerable in small concentrations in kiln feed.

6. Iron Pigment / Ferric Oxide Production (Selective)

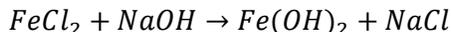
Some regeneration facilities oxidize ferrous chloride to produce:

- **ferric oxide pigments**
- **iron oxide for steel production**

However, **zinc >10,000 ppm may limit pigment applications** unless the zinc is removed first.

7. Neutralization and Metal Hydroxide Precipitation

When neutralized with alkali:



Both iron and zinc will precipitate as hydroxides.

This approach is used in:

- hazardous waste treatment
- sludge stabilization
- metal removal systems

Certificate of Analysis

Product: Ferrous Chloride Plus

Lot: P07012025CRO

| Test/Property | Specification | Result |
|---------------------------------------|-----------------|--------|
| Appearance | Green to Liquid | Pass |
| Specific Gravity | 1.28 - 1.44 | 1.33 |
| Ferrous Chloride (FeCl ₂) | 16 - 36 wt.% | 28.6% |
| Iron(II) | 7 - 16 wt.% | 12.6% |
| Free Acid (HCl) | < 1.5 wt.% | 1.3% |
| Zinc(II) | 0.5 -% 3.0 wt.% | 0.8% |

Tested By: *C. Barron, Laboratory Technician*

Test Date: *7/1/2025*

Approved By: *Drew Adkins, Lab Manager*

Approval Date: *7/1/2025*

Certificate of Analysis

Product: Ferrous Chloride, solution

Lot: CRO-03062501

| Test/Property | Specification | Result |
|---------------------------------------|-----------------------|---------------|
| Appearance | Green to Brown Liquid | pass |
| Specific Gravity | 1.28 - 1.44 | 1.30 |
| Ferrous Chloride (FeCl ₂) | 27 - 36 wt.% | 25.7% |
| Iron(II) | 12.0 - 16 wt.% | 11.3% |
| Free Acid (HCl) | < 1.5 wt.% | 0.3% |
| Zinc(II) | 0.5 -% 3.0 wt.% | 1.2% |

Tested By: *C. Barron, Laboratory Technician*

Test Date: *3/6/2025*

Approved By: *Drew Adkins, Lab Manager*

Approval Date: *3/6/2025*

SAFETY DATA SHEET

FERROUS CHLORIDE, SOLUTION

FILE NO.:
SDS DATE: 3/03/15
Revised: 6/3/2024

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Identifier:

PRODUCT NAME: Ferrous Chloride, solution

SYNONYMS: Ferrous Chloride, Iron (II) Chloride, FeCl₂ aqueous, strip acid, Iron rich acid

PRODUCT CODES:

MANUFACTURER: AZZ Inc.

DIVISION: Galvanizing

ADDRESS: 3100 W. 7th Street, Ft Worth, TX 76107

EMERGENCY PHONE: 817-810-4978

CHEMTREC PHONE: 1-800-424-9300

OTHER CALLS:

FAX PHONE:

CHEMICAL NAME: Ferrous Chloride

CHEMICAL FAMILY: Inorganic salts

CHEMICAL FORMULA: FeCl₃

PRODUCT USE: Wastewater treatment, purifying factory effluents and deodorizing sewage, mordant in dyeing and printing textiles, pigments and inks, photoengraving

PREPARED BY: Jason Pence

SECTION 2: HAZARDS IDENTIFICATION

Classified as hazardous according to the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals.

Classification

Corrosive to Metals, Category 1

Acute Toxicity, oral – Category 4

Skin Corrosion/Irritation – Category 1B

Serious Eye Damage/Eye Irritation – Category 1

Specific Target Organ Toxicity (single exposure) – Category 3 (respiratory tract irritation)

Signal Word: DANGER



Hazard Statement:

H290 - May be corrosive to metals

H302 - Harmful if swallowed

H314 - Causes severe skin burns and eye damage

H318 - Causes serious eye damage

H335 - May cause respiratory irritation

Precautionary Statement(s):

Prevention:

P234 - Keep only in original container

P264 - Wash hands thoroughly after handling.

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P270 - Do not eat, drink or smoke when using this product.

P260 - Avoid breathing mist/vapors/spray

P271 - Use only outdoors or in a well-ventilated area.

Response:

P390 - Absorb spillage to prevent material damage

P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISON CENTER or doctor/physician if you feel unwell.

P330 - Rinse mouth

P303+P361+P353 - IF ON SKIN: Take off immediately all contaminated clothing. Rinse skin with water (or shower).

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SECTION 2: HAZARDS IDENTIFICATION (cont't)

P363 – Wash contaminated clothing before reuse
P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P310+P321 – Immediately call a Poison Center/doctor. Specific treatment (see First Aid Measures on this Safety Data Sheet)
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Disposal:

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

Storage:

P406 - Store in corrosive resistant container with a resistant inner liner.

Poisons Schedule (SUSMP): None allocated

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

| Components | CAS Number | Proportion | Hazard Codes |
|-------------------|------------|------------|------------------------|
| Ferrous Chloride | 7758-94-3 | >16-37 | H302, H314, H318 |
| Hydrochloric acid | 7647-01-0 | 0.5 - 3 | H290, H314, H318, H335 |
| Zinc Chloride | 7646-85-7 | 1-3 | H302, H314, H335, H410 |
| Water | 7732-18-5 | 63-84 | |

SECTION 4: FIRST AID MEASURES

In case of eye contact:

Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. Remove contact lenses if present and easy to do. Take care not rinse contaminated water into the unaffected eye or onto the face. Immediately obtain medical attention.

In case of skin contact:

Remove contaminated clothing, shoes, and leather goods (e.g., watchbands, belts), immediately. Wash affected area with plenty of soap and water. If irritation persists, continue washing the irritated area. Obtain medical advice. Completely decontaminate clothing, shoes, and leather goods before reuse or else discard.

If swallowed:

DO NOT INDUCE VOMITING! Never give anything by mouth to an unconscious person. Only when conscious have victim rinse mouth thoroughly with water. Have victim drink 2-8 oz. (60-240 mL) of water. If vomiting occurs naturally, have victim rinse mouth with water again. Immediately call a poison control center if victim feels unwell.

If inhaled:

Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing has stopped or is difficult, trained personnel should begin artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask and transport victim to an emergency care facility. Do not use mouth-to-mouth resuscitation.

Indication of immediate medical attention and special treatment needed:

Treat Symptomatically

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Not flammable or combustible. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Specific hazards arising from the substance or mixture:

Not a flammable or combustible material. When heated to decomposition, emits acrid chlorine fumes.

Special protective equipment and precautions for fire-fighters:

Use water, foam or dry chemical to extinguish fire. Firefighters should wear full fire-fighting turn-out gear and respiratory protection (SCBA – self-contained breathing apparatus). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

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SECTION 6: ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Clean up using methods which will minimize mist generation and splashing. Return uncontaminated spilled material to the process if possible. Use absorbant to collect liquid and place contaminated material in suitable labeled containers for later recovery or disposal. If necessary, neutralize the residue with a dilute solution of sodium carbonate. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with mist, splash or spray.

Environmental Precautions: This product can potentially pose risks to organisms living in both the aquatic and terrestrial environments. Any discharge to soil and water should be prevented.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling:

Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use outdoors or in a well-ventilated area. Minimize mist generation and splashing. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Avoid all situations that could lead to harmful exposure.

Conditions for safe storage, including any incompatibilities:

Store in a tightly closed container. Store in a cool, well ventilated area away from incompatible substances. Store in Corrosive Area with other corrosive items. Store protected from moisture. Protect against physical damage to containers. Keep containers closed when not in use – check regularly for spills.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Component Exposure Limits

No value assigned for this specific material by the National Occupational Health and Safety Commission. However, Exposure Standard(s) for constituent(s):

| Component | Organization (Country/Province) | | | | | | |
|--|---------------------------------|----------------|---------------------------------|--|--------------------------------------|----------------------------------|--|
| | OSHA (U.S.) | ACGIH (U.S.) | Safe Work Australia (Australia) | Occupational Health & Safety Commission (Quebec) | Ontario Ministry of Labour (Ontario) | HSE (U.K.) | Fed. Regulation of SHE on the Job (Mexico) |
| Iron Salts, soluble (as Fe) (mg/m ³) | - | 1 ^A | 1 ^A | 1 ^A | - | 1 ^A 2 ^B | 1 ^A 2 ^B |
| Hydrogen chloride (mg/m ³) | 7 ^C | 3 ^C | 7 ^C | 7.5 ^C | - | 2 ^A 8 ^B | 7 ^C |

A - 8-Hr. TWA: time-weighted average (TWA) of an airborne exposure concentration of a particular substance over an eight-hour work day, for a five-day work week.
B - Short Term Exposure Limit (STEL): a 15-minute time-weighted average of an airborne exposure concentration that is not to be exceeded at any time during the workday.
C - Ceiling Limit: a peak airborne exposure concentration that is not to be exceeded during any part of the workday.

Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below the exposure standards. Avoid generating and breathing in dusts. Use with local exhaust ventilation or while wearing dust mask. Keep containers closed when not in use.

Individual protection measures, such as Personal Protective Equipment (PPE):



PPE: Eyes/Face

Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled.

PPE: Skin

Use impervious gloves of chemically resistant material (rubber, neoprene or PVC) should be worn at all times. Wear overalls of chemical resistant material and impervious boots of chemically resistant material. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

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SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION (cont'd)

PPE: Respiratory

When mists are generated and ventilation is not sufficient to effectively remove them, appropriate NIOSH or MSA approved respiratory protection must be provided if airborne concentrations exceed exposure limits.

PPE: General

Use good industrial hygiene practices in handling this material. Eye wash fountain and emergency showers are recommended. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

| | |
|-----------------|--|
| Physical State: | Liquid |
| Appearance: | Dark gray green to black or greenish yellow liquid |
| Color: | Dark gray green/black to greenish yellow |
| Odor: | Iron/acid odor |
| Odor Threshold: | Not Available |

| | |
|--|-----------------------------|
| Meltingpoint/Freezing Point: | Not Available |
| Initial Boiling Point and Boiling Range: | 93,3 – 107.22 C (200-225 F) |
| Flammability (solid, gas): | Non Flammable |
| Upper /Lower Flammability or Explosive Limits: | Not Applicable |
| Flash Point: | Not Applicable |
| Auto-ignition Temperature: | Not Applicable |
| Decomposition Temperature: | Not Available |
| pH: | < 1.0 |
| Viscosity: | Not Available |
| Solubility(ies): | Soluble in water |
| Partition Coefficient: n-octanol/water: | Not Available |
| Vapor Pressure: | 40 mmHg (35 C/95 F) |
| Vapor Density: | Not Applicable |
| Evaporation Rate: | >1 |
| Relative Density: | 1.2-1.4 (Water=1) |

SECTION 10: STABILITY AND REACTIVITY

Reactivity: Stable under normal conditions:reacts with metals oxidizing agents, strong bases, reducing agents, alcohols, sulfides and monomers. Store in cool, dry environment.

Chemical Stability: Stable under normal conditions of use and storage.

Possibility of Hazardous Reactions: No data available

Conditions to Avoid: Incompatible materials, mist generation, splashing, excess heat, exposure to moist air or water.

Incompatible Materials: Strong oxidizing agents, alkali metals, ethylene oxide, sodium, potassium. Corrosive to all common metals.

Hazardous Decomposition Products: Hazardous decomposition products formed under fire conditions – hydrogen chloride gas, Chlorine, Ferric Chloride, Ferric Oxide, other metal oxides based on other metal impurities.

SECTION 11: TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion: Harmful if swallowed. Nausea, vomiting, burning, diarrhea, ulceration, convulsions, shock may occur after ingesting ferrous chloride.

Skin: Direct contact may cause severe irritation, pain, and burns. Repeated or prolonged contact may result in dermatitis or effects similar to acute exposure.

Eyes: Causes eye damage. Direct contact with the eye may cause burns, pain, blurred vision, and lacrimation. Repeated or prolonged contact may result in corneal erosion or loss of vision.

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Inhalation: Spray or mist may cause respiratory tract irritation, sore throat, cough, dyspnea, and labored breathing. Repeated or prolonged contact may cause mucous membrane irritation.

SECTION 11: TOXICOLOGICAL INFORMATION (cont'd)

Long Term Effects: Overdose of iron compounds may have a corrosive effect on the gastrointestinal mucosa and be followed by necrosis, perforation, and stricture formation. Several hours may elapse before symptoms that can include epigastric pain, diarrhea, vomiting, nausea, and hematemesis occur. After apparent recovery a person may experience metabolic acidosis, convulsions, and coma hours or days later. Further complications may develop leading to acute liver necrosis that can result in death due to hepatic coma.

Carcinogenicity:

Ferrous chloride is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the American Conference of Governmental Industrial Hygienists (ACGIH).

Toxicological Data:

Component Analysis – LD50/LC50:

Oral LD50 Rat 450 mg/kg (Ferrous Chloride)
Inhalation LC50 Rat 3124 ppm, 1 hour (Hydrochloric Acid)

Genotoxicity:

In vivo animal test determine the material does not meet the criteria for this hazard class

Respiratory or skin sensitization:

Respiratory Sensitization – not classified

Skin Sensitization – not classified

Germ Cell Mutagenicity:

No information Available

Reproductive Toxicity:

Not classified

Specific Target Organ Toxicity (STOT) – Single Exposure:

May cause respiratory tract irritation

Specific Target Organ Toxicity (STOT) – Repeated Exposure:

No information Available

Aspiration Hazard:

Not classified

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish (Ferrous Chloride): LC50 – Striped Bass (*Morone saxatilis*) – 4.0 mg/L – 96 h

Persistence and Degradability

No Data Available

Bioaccumulative Potential

No Data Available

Mobility in Soil

No Data Available

PBT and vPvB Assessment

No Data Available

Other Adverse Effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

SECTION 13: DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with local, state, and federal regulations. Empty and thoroughly clean all residues from containers before reuse or disposal. Do not discharge to surface water, ground water, or soils.

SECTION 14: TRANSPORT INFORMATION

U.S. DOT:

ID Number: UN1760
Class: 8
Packing Group: II
Proper Shipping Name: Corrosive liquids, n.o.s
(Ferrous Chloride, Solution)
Reportable Quantity (RQ): 100 lbs. (45.4 kg)
Marine Pollutant: No
Poison Inhalation Hazard: No
ERG No.: 154

Canada TDG:

ID Number: UN1760
Class: 8
Packing Group: II
Proper Shipping Name: Corrosive liquids, n.o.s
(Ferrous Chloride, Solution)
Reportable Quantity (RQ): 100 lbs. (45.4 kg)
Marine Pollutant: No
Poison Inhalation Hazard: No
ERG No.: 154

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SECTION 14: TRANSPORT INFORMATION

IMDG:

ID Number: UN1760
Class: 8
Packing Group: II
Proper Shipping Name: Corrosive liquids, n.o.s.
(Ferrous Chloride, Solution)
Reportable Quantity (RQ): 100 lbs. (45.4 kg)
Marine Pollutant: No
Poison Inhalation Hazard: No
ERG No.: 154

IATA:

ID Number: UN1760
Class: 8
Packing Group: II
Proper Shipping Name: Corrosive liquids, n.o.s.
(Ferrous Chloride, Solution)
Reportable Quantity (RQ): 100 lbs. (45.4 kg)
Marine Pollutant: No
Poison Inhalation Hazard: No

SECTION 15: REGULATORY INFORMATION

U.S.

TSCA Inventory: Ferrous Chloride (CAS #7758-94-3) is on the TSCA 8(b) Inventory.

Hazardous Under Hazard Communication Standard: Yes

CERCLA Section 103 Hazardous Substances: Ferrous Chloride – Yes – RQ: 100 lbs. (45.4 kg)

EPCRA Section 311/312 Hazard Categories: Immediate (Acute) Health Hazard

Canadian:

Ingredients Listed on DSL: Ferrous Chloride (CAS #7758-94-3) is on the DSL

WHMIS Classification: E, Corrosive Material

SECTION 16: OTHER INFORMATION

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists (ACGIH), 2020, *Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices*.
- Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident, 2020,
- <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2020-08/ERG2020-WEB.pdf>
- *Globally Harmonized System of Classification and Labeling Chemicals*, New York and Geneva: United Nations, 2017.
https://www.unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev07/English/ST_SG_AC10_30_Rev7e.pdf
- National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 2007,
<http://www.cdc.gov/niosh/npg/>
- Safe Work Australia, *Workplace Exposure Standards for Airborne Contaminants*, 2019.
<https://www.safeworkaustralia.gov.au/doc/workplace-exposure-standards-airborne-contaminants>
- Occupational Health and Safety Commission of Quebec, *Permissible Exposure Values for Airborne Contaminants*, 2020
<http://legisquebec.gouv.qc.ca/en/ShowDoc/cr/S-2.1.%20r.%2013>
- Ontario Ministry of Labour Occupational Health and Safety Act, *Control of Exposure to Biological or Chemical Agents*, 2020
http://www.e-laws.gov.on.ca/html/reg/english/elaws_regs_900833_e.htm
- Health and Safety Executive (HSE), *EH40/2005 Workplace Exposure Limits*, 2020.
<https://www.hse.gov.uk/pubns/books/eh40.htm>
- Federal Regulation of Safety Health and Environment on the Job, NOM-010-STPS-2014, Maximum Permissible Exposure Limits, 2014
http://dof.gob.mx/nota_detalle.php?codigo=5342372&fecha=28/04/2014

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration, and investigation. AZZ Inc. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

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