2. To: (Receiving Organization) Characterization Equipment Development	3. From: (Originating Organization) Nuclear Analysis and Characterization	4. Related EDT No.:
5. Proj./Prog./Dept./Div.:	6. Cog. Engr.: Ralph D. Crowe	7. Purchase Order No.:
8. Originator Remarks: Surface Moisture Measurement System Electromagnetic Induction Probe Calibration Technique.		9. Equip./Component No.:
		10. System/Bldg./Facility:
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		13. Permit/Permit Application No.:
		14. Required Response Date:

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-WM-CN-025	A11	0	Surface Moisture Measurement System Electromagnetic Induction Probe Calibration Technique	NA			

16. KEY											
Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)					
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 2. Release 3. Information		4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)		1. Approved 2. Approved w/comment 3. Disapproved w/comment		4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged			
(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)						(G)	(H)		
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1		Cog. Eng. R. D. Crowe	<i>Ralph D. Crowe</i>	6/30/96	HO-32						
3		Cog. Mgr. A. E. Waltar	<i>A. E. Waltar</i>	6/30/96	HO-32						
		QA									
		Safety									
		Env.									
1		Peer Review W. D. Wittekind	<i>W. D. Wittekind</i>	6/30/96	HO-32						

18. Signature of EDT Originator <i>Ralph D. Crowe</i> Date: 6/30/96	19. Authorized Representative Date for Receiving Organization G. F. Vargo Jr. <i>G. F. Vargo Jr.</i> Date: 6/30/96	20. Cognizant Manager Earl E. Walter <i>Earl E. Walter</i> Date: 6/30/96	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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SURFACE MOISTURE MEASUREMENT SYSTEM ELECTROMAGNETIC INDUCTION PROBE CALIBRATION TECHNIQUE

Ralph D. Crowe

Westinghouse Hanford Company, Richland, WA 99352

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Abstract:

The Surface Moisture Measurement System (SMMS) is designed to measure the moisture concentration near the surfaces of the wastes located in the Hanford Site tank farms. This document describes a calibration methodology to demonstrate that the Electromagnetic Induction (EMI) moisture probe meets relevant requirements in the *Design Requirements Document (DRD) for the Surface Moisture Measurement System* (Stokes et al. 1995). The primary purpose of the experimental tests described in this methodology is to make possible interpretation of EMI in-tank surface probe data to estimate the surface moisture.

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V. L. Berkland 7/1/96
Release Approval Date

Approved for Public Release

**SURFACE MOISTURE MEASUREMENT SYSTEM
ELECTROMAGNETIC INDUCTION PROBE
CALIBRATION TECHNIQUE**

Ralph D. Crowe

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SURFACE MOISTURE MEASUREMENT SYSTEM ELECTROMAGNETIC INDUCTION PROBE CALIBRATION TECHNIQUE

1.0 INTRODUCTION

The Surface Moisture Measurement System (SMMS) is designed to measure the moisture concentration near the surfaces of the wastes located in the Hanford Site tank farms. This document describes a calibration methodology to demonstrate that the Electromagnetic Induction (EMI) moisture probe meets relevant requirements in the *Design Requirements Document (DRD) for the Surface Moisture Measurement System* (Stokes et al. 1995). The primary purpose of the experimental tests described in this methodology is to make possible interpretation of EMI in-tank surface probe data to estimate the surface moisture.

2.0 STANDARD PREPARATION

In order to interpret data from the SMMS one must have a way of determining the response of the EMI instrumentation to moisture in material similar to the waste encountered in the tanks. It is not possible to perform the calibrations on actual waste because the waste is radioactive and the actual moisture content is not controlled. The waste will be simulated using containers of liquids with known electrical conductivities. This process will also be used to support the calculational models of the EMI probe response.

2.1 BACKGROUND

The electromagnetic induction (EMI) probe is being developed to measure the amount of water remaining in waste stored in the high-level waste tanks (Wittekind and Crowe 1996). It uses a magnetic field to induce electrical currents in the surrounding waste proportional to the waste electrical conductivity. The waste moisture is estimated based on the measured waste conductivity. The purpose of these tests are to determine the response of the EMI as a function of waste electrical conductivity, depth of penetration into the waste and probe lift off. Lift off is the term used to identify the distance between the probe and the surface of the waste. The data measured from the standards will allow determination of the average moisture concentration and development of a method to estimate the profile of the moisture concentration for the actual tanks.

Results of initial probe design development using both computer modeling and prototype testing may be found in *Electromagnetic Induction Probe Calibration for Conductivity Measurements and Moisture Content Determination of Hanford High Level Waste* (Wittekind and Crowe 1996).

2.2 MATERIALS, SIZES, GEOMETRY, AND LIST OF CALIBRATION STANDARDS

The calibration standards solutions are contained in 10 gallon (37.85 liter) cylindrical polyethylene tanks (33 cm diameter, 50.8 cm high). The tanks will be systematically filled with solutions of known conductivities to measure and calibrate the response of the EMI probe. Additional tanks will be used to prepare and store conducting liquids. Although at least six solutions with different conductivities will be prepared, only two to three storage tanks will be required. The conductivity of a prepared solution is easily measured with a conductivity probe, therefore, the solution with the different conductivities will be prepared as needed.

The conductivity of the liquid is adjusted by adding measured quantities of salt to water. Solutions with conductivities from 0 mS/cm to 100 mS/cm will be measured. At least two different salts will be used: sodium chloride and potassium chloride.

2.3 METHODOLOGY FOR PREPARATION OF STANDARD SOLUTIONS

2.3.1 Material Surrounding Standards for Infinite Detector Response

Experience indicates that, especially for the low moisture standards, structures outside of the calibration tanks may influence the probe responses (Crowe and Wittekind 1995). While these influences are expected to be relatively small, they need to be minimized. The tanks, while being used, will be isolated from nearby structures such as the concrete floor and nearby metal structures by a distance of at least 25 cm (10 in).

2.3.2 Calibration of Measurement Tools and Instruments

The tools that will be used in these tests that will need calibration are the following:

- Scale for weighing individual salt samples
(100 g $\pm$ 0.1 g)
- Linear scale for measuring the heights of fills
(60 cm $\pm$ 0.1 cm)
- Graduated volume for measuring the volume of liquid additions
(1000 ml $\pm$ 10 ml)
- Temperature compensated electrical conductivity probe
(0 - 100 mS/cm)
- MIZ-40A, Eddy Current Test Instrument (ZETEC 1995a)
- DDR-1, Data Recorder (ZETEC 1995b)

The model name and serial number of each calibrated tool used in the preparation or tests will be recorded in an appropriate logbook. A copy of the current calibration sheet, when applicable, will also be obtained and placed in a logbook.

2.3.3 Mixing of Solutions

The materials will be mixed in a storage tank. The tank will be cleaned and dried before mixing of the solution. The required quantity of the salt will be weighed and poured into the storage vessel. Water will be added to the vessel and stirred with a mixer. The mixer will be run for about 5 minutes and the conductivity measured. The conductivity will be adjusted by either adding salt or water until the desired conductivity is obtained. The room temperature will be recorded on the day of mixing. A description of the preparation of the solution including amount of salt and water used, will be recorded for each solution as mixed. The solution will be considered homogeneous when the electrical conductivity measurement following the stirring of the tank gives the same conductivity value for three sequential stirrings.

3.0 SURFACE MOISTURE MEASUREMENT SYSTEM VERIFICATION

3.1 DESCRIPTION OF PROBE AND DATA ACQUISITION SYSTEM

The EMI probe consists of a cylindrical polyethylene tube (8.9 cm OD) containing two identical wire coils. A alternating signal is sent to both coils via a pair of coaxial cables from the MIZ-40A analyzer (ZETEC 1995a). The MIZ-40A compares and quantifies the difference between the signals from the reference coil and the coil near the surface of the waste. The amplitude and phase information from the differential signal is recorded for interpretation as waste moisture content.

3.2 EXPERIMENTAL METHODOLOGY

3.2.1 Safe Operation and Handling

The primary potential safety hazards are mechanical hazards associated with the lifting of heavy objects and with the use of a mixer and mechanical pump. The EMI probe does not introduce any unique safety hazards. The safety concerns during the testing with the Surface Moisture Monitoring Systems (SMMS) EMI probe are for the handling of chemical solutions and use of electrical equipment. The Material Specification Data Sheets (MSDS) will be posted for the salt solutions used. The chemical salts were selected because they are familiar and common compounds with minimal hazard. Normal electrical safety precautions regarding the handling of electrical equipment will minimize the electrical hazard.

3.2.2 Setup and Turn On

The EMI probe will be connected, via the signal/support cable, to the MIZ-40A analyzer and DDR-1 data recorder (Zetec 1995b). The signal circuit will include the probe related circuit components (intrinsic safety barriers, connectors, cable and slip ring) as will be used in the field. The MIZ-40A analyzer is used to obtain and process the probe signals. The analyzer also provides the driving signal to the probe, through intrinsically safe

electrical barriers. The intrinsic barrier requires a few minutes after the signal is applied to the probe to reach a stable (no drifting) condition. The probe signal null will be monitored to identify when a stable condition has been reached and the length of time required to reach this condition will be noted.

3.2.3 Temperature Measurements and Equilibrium

The temperature of the probe should have little effect upon the electrical circuit response. However, since the electrical conductivity of the salt solutions change with temperature, it is important to know the temperature of the surrounding media. Since the conductivity meters to be used are temperature compensated, they also provide the solution temperature. Calibration tests for the conductivity meters will be performed using standard solutions providing traceability to National Institute of Standards and Technology (NIST) temperature standards. Temperature equilibrium will be defined as all probe measuring less than a 1°C change in temperature over a time interval of 5 minutes.

3.2.4 Calibration Data Collection

Detector response data will be collected and recorded for each prepared electrical conductivity solution. A logbook will be maintained that provides a record of measured detector responses for each solution. This information will include the following information:

- date and time of day,
- temperature of room,
- volume of solution prepared,
- weight of all salts mixed into solution, and
- temperature and conductivity of the solution,
- intrinsic barrier data collection time interval,
- front panel settings for the MIZ-40A analyzer,
- DDR-1 data file index number,
- depth (or volume) of the liquid,
- height of probe above surface, and
- magnitude and phase of the measured signal.

The raw data collected by the analyzer will be stored electronically in indexed files on DDR-1 Data Recorder.

In addition to acquiring the probe response using the solutions, the response of the isolated probe will be measured. For this measurement, the probe will be suspended in air at least 50 cm from the floor or any walls. With the probe essentially isolated from outside materials that could provide signal to the probe, a measurement of the detector response will be made.

3.2.5 Data Storage and Archival

Data storage will initially be in a Data Logbook for most data. Data collected electronically using the removable hard drive on the analyzer data recorder. This data can be later transferred to a computer with access to the WHC common file storage for archival. A summary of the data collected will be included in the calibration report document.

included in the calibration report document.

3.2.6 Data Comparison with Calculations

The EMI probe measurements will be compared to calculational model predictions to demonstrate it is functioning as designed. The primary model input parameters are the geometry and material properties of the probe and the standards. Physical dimensions, within mechanical tolerances, may need to be adjusted in each part of the geometry to obtain best agreement with measured results.

4.0 TEMPERATURE DEPENDANCE TESTS

The insensitivity of the EMI probe to elevated temperatures needs to be demonstrated. The experiments described here will demonstrate the effect of temperature and should provide information that will enable corrections to be applied to in-tank data based upon temperature data if needed.

4.1 EXPECTED CONDITIONS FOR THE EMI PROBE

While the EMI probes are expected to operate in a field of up to 50 R and temperatures up to 45 - 50°C, these conditions should have no effect on the probe response. The tests described here are to demonstrate the insensitivity of the probe to this range of conditions.

4.2 DETECTOR GAMMA-RAY EXPOSURE TESTS

No gamma ray tests will be performed. Unlike the neutron moisture probe, the gamma field does not affect the EMI probe signal. The EMI electronics are in the MIZ-40A which is remote from gamma field. The voltage across the EMI coil is less than the 16 volts peak to peak voltage source in the MIZ-40A. The electrical circuit in the EMI probe is a simple device using only coils of wire without any discrete electrical components. For these reasons, there is no expected gamma effect. Material specifications for the materials used in the construction of the EMI probe will be used to demonstrate that the accumulated gamma fluence will not degrade the probe function within the lifetime of the EMI.

4.3 TEMPERATURE TESTS

A thermal blanket is to be wrapped around the each detector for the temperature dependence measurement. The probe response will be measured and recorded before the heater is turned on. The probe temperature probe will be raised using the heater and the probe response and temperature will be measured and recorded. The probe will be allowed to cool down and a final measurement made.

5.0 REFERENCES

- Crowe, R. D. And W. D. Wittekind, 1995, *Ferrocyanide Safety Program: In-Tank Application of Electromagnetic Induction (EMI) Moisture Measurements FY 1995 Report*, WHC-SD-WM-ER-520 Rev. 0,
- Stokes, T. I., W. T. Watson, M. Gimera, J. H. BusseII, A. Dabiri, D. T. Holslin, F. Johansen, 1995, *Design Requirements Document (DRD) for Surface Moisture Measurement System (SMMS)*, WHC-SD-WM-DRD-002, Rev. 0., Westinghouse Hanford Company, Richland, Washington.
- W. D. Wittekind and R. D. Crowe, 1996, *Electromagnetic Induction Probe Calibration for Electrical Conductivity and Moisture Content Determination Of Hanford High Level Waste*, WHC-SD-WM-ER-531 Rev. 0., Westinghouse Hanford Company, Richland, Washington.
- ZETEC, 1995a, *MIZ-40A, Eddy Current Test Instrument, Operating Guide*, Zetec Inc, Issaquah, Washington.
- ZETEC, 1995b, *DDR-1, Data Recorder, Operating Guide*, Zetec Inc, Issaquah, Washington.

APPENDIX A
Sodium Chloride MSDS

Appendix A - Sodium Chloride MSDS

Sigma Chemical Co.	Aldrich Chemical Co., Inc.	Fluka Chemical Corp.
P.O. Box 14508	1001 West St. Paul	980 South Second St.
St. Louis, MO 63178	Milwaukee, WI 53233	Ronkonkoma, NY 11779
Phone: 314-771-5765	Phone: 414-273-3850	Phone: 516-467-0980
		Emergency Phone: 516-467-3535

SECTION 1. - - - - - CHEMICAL IDENTIFICATION- - - - -

CATALOG #: 223514

NAME: SODIUM CHLORIDE

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - -

CAS #: 7647-14-5

EC NO: 231-598-3

SYNONYMS

COMMON SALT * DENDRITIS * EXTRA FINE 200 SALT * EXTRA FINE 325 SALT * HALITE * H.G. BLENDING *
NATRIUM CHLORID (GERMAN) * PUREX * ROCK SALT *SALINE * SALT * SEA SALT * STERLING * TABLE SALT *
TOP FLAKE * USP SODIUM CHLORIDE * WHITE CRYSTAL *

SECTION 3. - - - - - HAZARDS IDENTIFICATION - - - - -

LABEL PRECAUTIONARY STATEMENTS

IRRITANT

IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

WEAR SUITABLE PROTECTIVE CLOTHING.

SECTION 4. - - - - - FIRST-AID MEASURES- - - - -

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.

IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION.

IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.

CALL A PHYSICIAN.

SECTION 5. - - - - - FIRE FIGHTING MEASURES - - - - -

EXTINGUISHING MEDIA

NONCOMBUSTIBLE.

USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS.

SPECIAL FIREFIGHTING PROCEDURES

FOR FIRES INVOLVING THIS MATERIAL, DO NOT ENTER ANY ENCLOSED OR CONFINED FIRE SPACE WITHOUT PROPER PROTECTIVE EQUIPMENT. THIS MAY INCLUDE SELF-CONTAINED BREATHING APPARATUS TO PROTECT AGAINST THE HAZARDOUS EFFECTS OF THE NORMAL PRODUCTS OF COMBUSTION OR OXYGEN DEFICIENCY.

SECTION 6. - - - - - ACCIDENTAL RELEASE MEASURES- - - - -

WEAR RESPIRATOR, CHEMICAL SAFETY GOGGLES, RUBBER BOOTS AND HEAVY RUBBER GLOVES.

SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL. AVOID RAISING DUST.

VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - HANDLING AND STORAGE- - - - -

REFER TO SECTION 8.

ADDITIONAL INFORMATION

REACTS VIOLENTLY WITH BROMINE TRIFLUORIDE AND LITHIUM.

SECTION 8. - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - -

CHEMICAL SAFETY GOGGLES.

USE PROTECTIVE CLOTHING, GLOVES AND MASK.

SAFETY SHOWER AND EYE BATH.

MECHANICAL EXHAUST REQUIRED.

DO NOT BREATHE DUST.

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

WASH THOROUGHLY AFTER HANDLING.

IRRITANT.

KEEP TIGHTLY CLOSED.

STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - -

APPEARANCE AND ODOR

WHITE CRYSTALLINE POWDER

PHYSICAL PROPERTIES

MELTING POINT: 801 C

VAPOR PRESSURE: 1MM 865 C

SPECIFIC GRAVITY: 2.165

SECTION 10. - - - - - STABILITY AND REACTIVITY - - - - -

INCOMPATIBILITIES
 STRONG OXIDIZING AGENTS
 STRONG ACIDS
 PROTECT FROM MOISTURE.
 HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
 NATURE OF DECOMPOSITION PRODUCTS NOT KNOWN.

SECTION 11. - - - - - TOXICOLOGICAL INFORMATION - - - - -

ACUTE EFFECTS
 MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.
 CAUSES EYE IRRITATION.
 CAUSES SKIN IRRITATION.
 MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER
 RESPIRATORY TRACT.

RTECS #: VZ4725000
 SODIUM CHLORIDE

IRRITATION DATA

SKN-RBT 50 MG/24H MLD	BIOFX* 20-3/71
SKN-RBT 500 MG/24H MLD	28ZPAK -,7,72
EYE-RBT 100 MG MLD	BIOFX* 20-3/71
EYE-RBT 100 MG/24H MOD	28ZPAK -,7,72
EYE-RBT 10 MG MOD	TXAPA9 55,501,80

TOXICITY DATA

ORL-RAT LD50:3 GM/KG	TXAPA9 20,57,71
IHL-RAT LC50:>42 GM/M3/1H	BIOFX* 20-3/71
ORL-MUS LD50:4 GM/KG	FRPFAO 27,19,72
IPR-MUS LD50:6614 MG/KG	COREAF 256,1043,63
SCI-MUS LD50:3 GM/KG	ARZNAD 7,445,57
IVN-MUS LD50:645 MG/KG	ARZNAD 7,445,57
ICV-MUS LD50:131 MG/KG	TYKNAQ 27,131,80
SKN-RBT LD50:>10 GM/KG	BIOFX* 20-3/71

TARGET ORGAN DATA

BEHAVIORAL (SOMNOLENCE)
 BEHAVIORAL (CONVULSIONS OR EFFECT ON SEIZURE THRESHOLD)
 BEHAVIORAL (MUSCLE CONTRACTION OR SPASTICITY)
 CARDIAC (OTHER CHANGES)
 ENDOCRINE (ESTROGENIC)
 MATERNAL EFFECTS (OVARIES, FALLOPIAN TUBES)
 MATERNAL EFFECTS (OTHER EFFECTS ON FEMALE)
 EFFECTS ON FERTILITY (PRE-IMPLANTATION MORTALITY)
 EFFECTS ON FERTILITY (POST-IMPLANTATION MORTALITY)
 EFFECTS ON FERTILITY (ABORTION)
 EFFECTS ON EMBRYO OR FETUS (FETOTOXICITY)
 EFFECTS ON EMBRYO OR FETUS (FETAL DEATH)
 SPECIFIC DEVELOPMENTAL ABNORMALITIES (MUSCULOSKELETAL SYSTEM)
 ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
 (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
 COMPLETE INFORMATION.

SECTION 12. - - - - - ECOLOGICAL INFORMATION - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - DISPOSAL CONSIDERATIONS - - - - -

CONTACT A LICENSED PROFESSIONAL WASTE DISPOSAL SERVICE TO DISPOSE OF
 THIS MATERIAL.
 OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - TRANSPORT INFORMATION - - - - -

CONTACT SIGMA CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - REGULATORY INFORMATION - - - - -

EUROPEAN INFORMATION

IRRITANT
 R 36/37/38
 IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.
 S 26
 IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF
 WATER AND SEEK MEDICAL ADVICE.
 S 36
 WEAR SUITABLE PROTECTIVE CLOTHING.

REVIEWS, STANDARDS, AND REGULATIONS

OEL-MAK
 EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
 FERECAC 54,7740,89
 NOES 1974: HZD 68880; NIS 265; TNF 63391; NOS 163; TNE 630453
 NOES 1983: HZD E0256; NIS 1; TNF 403; NOS 5; TNE 4029; TFE 2015
 NOES 1983: HZD 68880; NIS 336; TNF 69628; NOS 211; TNE 1743954; TFE

817249

EPA GENETOX PROGRAM 1988, NEGATIVE: IN VITRO CYTOGENETICS-NONHUMAN;
SPERM MORPHOLOGY-MOUSE

EPA GENETOX PROGRAM 1988, INCONCLUSIVE: MAMMALIAN MICRONUCLEUS

EPA TSCA SECTION 8(B) CHEMICAL INVENTORY

EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES

EPA TSCA SECTION 8(E) RISK NOTIFICATION, 8EHQ-0892-9201

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, OCTOBER 1995

SECTION 16. - - - - - OTHER INFORMATION - - - - -

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APPENDIX B

Potassium Chloride MSDS

Appendix B - Potassium Chloride MSDS

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St. Louis, MO 63178
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Aldrich Chemical Co., Inc.
1001 West St. Paul
Milwaukee, WI 53233
Phone: 414-273-3850

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779
Phone: 516-467-0980
Emergency Phone: 516-467-3535

SECTION 1. - - - - - CHEMICAL IDENTIFICATION- - - - -

CATALOG #: 60130
NAME: POTASSIUM CHLORIDE

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - -

CAS #: 7447-40-7
MF: CLK
EC NO: 231-211-8

SYNONYMS

CHLORID DRASELNY (CZECH) * CHLOROPOTASSURIL * DIPOTASSIUM DICHLORIDE *
EMPLETS POTASSIUM CHLORIDE * ENSEAL * KALITABS * KAACHLOR * KAON-CL *
KAON-CL 10 * KAON-CL TABS * KAY CIEL * K-LOR * KLOTRIX * K-LYTE/CL *
K-PREDNE-DOME * MONOPOTASSIUM CHLORIDE * PFILOR * POTASSIUM
MONOCHLORIDE * POTAVESCENT * REKAWAN * SLOW-K * TRIPOTASSIUM
TRICHLORIDE *

SECTION 3. - - - - - HAZARDS IDENTIFICATION - - - - -

LABEL PRECAUTIONARY STATEMENTS

HARMFUL

HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.

IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF

WATER AND SEEK MEDICAL ADVICE.

WEAR SUITABLE PROTECTIVE CLOTHING.

SECTION 4. - - - - - FIRST-AID MEASURES- - - - -

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF

WATER FOR AT LEAST 15 MINUTES.

IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS

AMOUNTS OF WATER.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL

RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.

CALL A PHYSICIAN.

WASH CONTAMINATED CLOTHING BEFORE REUSE.

SECTION 5. - - - - - FIRE FIGHTING MEASURES - - - - -

EXTINGUISHING MEDIA

WATER SPRAY.

CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.

SPECIAL FIREFIGHTING PROCEDURES

WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO

PREVENT CONTACT WITH SKIN AND EYES.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS

EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

SECTION 6. - - - - - ACCIDENTAL RELEASE MEASURES- - - - -

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY

RUBBER GLOVES.

SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.

AVOID RAISING DUST.

VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - HANDLING AND STORAGE - - - - -

REFER TO SECTION 8.

SECTION 8. - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - -

CHEMICAL SAFETY GOGGLES.

RUBBER GLOVES.

NIOSH/MSHA-APPROVED RESPIRATOR.

SAFETY SHOWER AND EYE BATH.

MECHANICAL EXHAUST REQUIRED.

AVOID CONTACT AND INHALATION.

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

WASH THOROUGHLY AFTER HANDLING.

HARMFUL SOLID.

IRRITANT.

KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - -

APPEARANCE AND ODOR
WHITE CRYSTALS

PHYSICAL PROPERTIES
MELTING POINT: 770 C
SPECIFIC GRAVITY: 1.984

SECTION 10. - - - - - STABILITY AND REACTIVITY - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS
STRONG ACIDS
PROTECT FROM MOISTURE.
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
HYDROGEN CHLORIDE GAS

SECTION 11. - - - - - TOXICOLOGICAL INFORMATION - - - - -

ACUTE EFFECTS
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.
CAUSES EYE AND SKIN IRRITATION.
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER
RESPIRATORY TRACT.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND
TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

ADDITIONAL INFORMATION
INGESTION OF LARGE QUANTITIES CAN CAUSE WEAKNESS, GASTROINTESTINAL
IRRITATION AND CIRCULATORY DISTURBANCES.

RTECS #: TS8050000
POTASSIUM CHLORIDE

IRRITATION DATA
EYE-RBT 500 MG/24H MLD 28ZPAK -,8,72

TOXICITY DATA

ORL-INF LDLO:938 MG/KG/2D	JAMAAP 240,1339,78
ORL-MAN LDLO:20 MG/KG	LANCAO 2,919,80
ORL-RAT LD50:2600 MG/KG	28ZPAK -,8,72
IPR-RAT LD50:660 MG/KG	FCTXAV 3,597,65
IVN-RAT LD50:142 MG/KG	ARZNAD 14,1128,64
ORL-MUS LD50:1500 MG/KG	IYKEDH 21,257,90
IPR-MUS LD50:1181 MG/KG	COREAF 256,1043,63
IVN-MUS LD50:117 MG/KG	EJTXAZ 8,188,75
ORL-GPG LD50:2500 MG/KG	JPETAB 35,1,29

TARGET ORGAN DATA
BEHAVIORAL (CONVULSIONS OR EFFECT ON SEIZURE THRESHOLD)
BEHAVIORAL (CHANGE IN MOTOR ACTIVITY)
BEHAVIORAL (COMA)
CARDIAC (ARRYTHMIAS)
LUNGS, THORAX OR RESPIRATION (DYSFNAE)
LUNGS, THORAX OR RESPIRATION (CYANOSIS)
LUNGS, THORAX OR RESPIRATION (OTHER CHANGES)
GASTROINTESTINAL (NAUSEA OR VOMITING)
BLOOD (CHANGE IN CLOTTING FACTORS)
NUTRITIONAL AND GROSS METABOLIC (CHANGES IN: K)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
(RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
COMPLETE INFORMATION.

SECTION 12. - - - - - ECOLOGICAL INFORMATION - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - DISPOSAL CONSIDERATIONS - - - - -

CONTACT A LICENSED PROFESSIONAL WASTE DISPOSAL SERVICE TO DISPOSE OF
THIS MATERIAL.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - TRANSPORT INFORMATION - - - - -

CONTACT FLUKA CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - REGULATORY INFORMATION - - - - -

EUROPEAN INFORMATION
HARMFUL
R 20/21/22
HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
R 36/37/38
IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.
S 26
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF
WATER AND SEEK MEDICAL ADVICE.

S 36

WEAR SUITABLE PROTECTIVE CLOTHING.

REVIEWS, STANDARDS, AND REGULATIONS

OEL=MAK

NOHS 1974: HZD 60360; NIS 97; TNF 14471; NOS 88; TNE 122749

NOES 1983: HZD 60360; NIS 147; TNF 16061; NOS 125; TNE 387624; TFE
175287

EPA TSCA SECTION 8(B) CHEMICAL INVENTORY

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, OCTOBER 1995

SECTION 16. - - - - - OTHER INFORMATION - - - - -

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