

CReSIS Anechoic Chamber

FUNDED BY THE NATIONAL SCIENCE FOUNDATION (NSF)

chamber@ku.edu • chamber.ku.edu • 785.864.2185

The CReSIS Anechoic Chamber is located at:

The University of Kansas
M2SEC building
1536 W 15th St
Lawrence, KS 66045

SAFETY MANUAL

Safety Manual Components

KU Health and Safety Information

KU-Lawrence Campus Health and Safety Policy

KU-Lawrence Campus Emergency Assistance Information

CReSIS Anechoic Chamber Safety Manual

Section 1: Purpose of Manual

Section 2: Anechoic Chamber Induction – Overview

Section 3: Anechoic Chamber Safety Precautions

Glossary Terms

Appendix

The University of Kansas - Lawrence Campus

General Health and Safety Policy

It is the policy of the University of Kansas-Lawrence to conduct all educational, research and campus activities safely and in a manner that protects the health of employees, students, and the public.

Each administrator is committed to the enforcement of the health and safety policies of the University and to promulgating appropriate safety practices within his or her area of responsibility.

All faculty members and others involved in instructional and/or research programs are responsible for seeing that the students in their courses and laboratories are properly trained and educated about applicable safety and health policies and practices prior to exposure to instructional or research hazards.

Each employee and student is entitled to have access to information about the University's health and safety policies and practices and is responsible for knowing and adhering to health and safety policies and practices as they are applicable to the instruction, research and work settings in which he or she participates.

Each employee is responsible for maintaining a safe work place. Employees have a continuing responsibility to develop and follow practices that achieve these goals.

Each employee who manages or supervises the work of others is additionally responsible for seeing that employees and students for whom they are responsible are properly trained and educated about safety and health practices.

Each guest of the University is expected to adhere to the health and safety policies of the University while on campus.

All University-related facilities, activities, and programs shall be designed, conducted, and operated in a manner which reasonably protects human health and safety. Adherence to these principles is necessary in order for the University to achieve its mission of providing quality instruction, research, and services.

The University strives to provide training and education conducive to the establishment and maintenance of safe educational, research and work environments.

KU CAMPUS EMERGENCY ASSISTANCE INFORMATION

Dial 911 in any event (actual or potential) which is an immediate threat to health and safety:

- Fire
- Explosion
- Medical Emergency
- Hazardous Material Release
- Natural/Weather Related Disaster
- Bomb Threat
- Criminal Activity

What Happens After You Dial '911'?

- On campus, this will contact the KU Public Safety Emergency Communications Center
- A KU Police Officer and/or other appropriate emergency assistance will be immediately sent to the scene
- In some instances you should evacuate the building to a safe area and for others you may need to seek safe shelter within the structure.
- If you know something or were a witness to what caused the emergency, then please report to the first responding KU Police personnel

CReSIS & KU Emergency Phone Numbers:

KU Center for Remote Sensing of Ice Sheets (CReSIS)

- Daytime Emergencies & General Queries (M-F, 8:00 am - 5:00 pm) 785-864-2185
- EHS Emergency On-Call Pager (24 hrs/day, 7 days/week). 785-838-7421

KU Public Safety (KU-PS)

- **Emergency – 911**
- **Non-emergency 785-864-5900**

KU Environment, Health & Safety (KU-EHS)

- Daytime Emergencies (M-F, 8:00 am - 5:00 pm) 785-864-4089
- EHS Emergency On-Call Pager (24 hrs/day, 7 days/week). 785-838-7421

KU Facilities Operations (KU-FO)

- Daytime Emergency Maintenance (M-F, 7:30 am - 5:00 pm) --864-4770
- After Hours/Weekend Emergency Maintenance -- 864-5900

Routine Assistance Contacts

EHS Emergency Info Page http://www.ehs.ku.edu/ehs_information/emergency_info.aspx

Section 1: Purpose of Manual

The purpose of this Safety & Maintenance Manual is to document the necessary Emergency Contact information, safety precautions and required procedures for operating or working in close proximity to the CReSIS Anechoic Chamber. This information is outlined here to primarily ensure the safety of the pre-authorized user. Technical aspects and properties of the chamber and its associated equipment are also highlighted so that user activities are conducive to repetitive use of the chamber and to general instrument and equipment care. The instruction in this manual applies only to this specific CReSIS Anechoic Chamber instrument – otherwise referred to as the “laboratory”.

For the purposes of this instruction, an anechoic chamber is defined as any device or installation in which quantities of absorbers are used to reduce electromagnetic wave echoes. The radio absorbing material (RAM) that lines the CReSIS Anechoic Chamber is highly absorbent of acoustic (e.g. voice) energy. The chamber is also an enclosed construction so once the chamber door is closed it becomes a confined space. The chamber door can only be opened from the outside. Consequently, the chamber poses a number of personal safety considerations. A person locked inside the chamber may not be heard, even if shouting. Mobile phone devices may also not pick up a signal inside the chamber and there is no telephone or method of communication once the chamber door is closed.

Bookings:

Research, educational and university use of the CReSIS Anechoic Chamber is strictly controlled via a booking process. Please email chamber@ku.edu for details and to make a reservation.

Contractual hire and industrial use of the CReSIS Anechoic Chamber is also available. Please contact Stephen Yan, Assistant Research Professor to discuss: Email: syan@ku.edu; Phone : 785-864-2185.

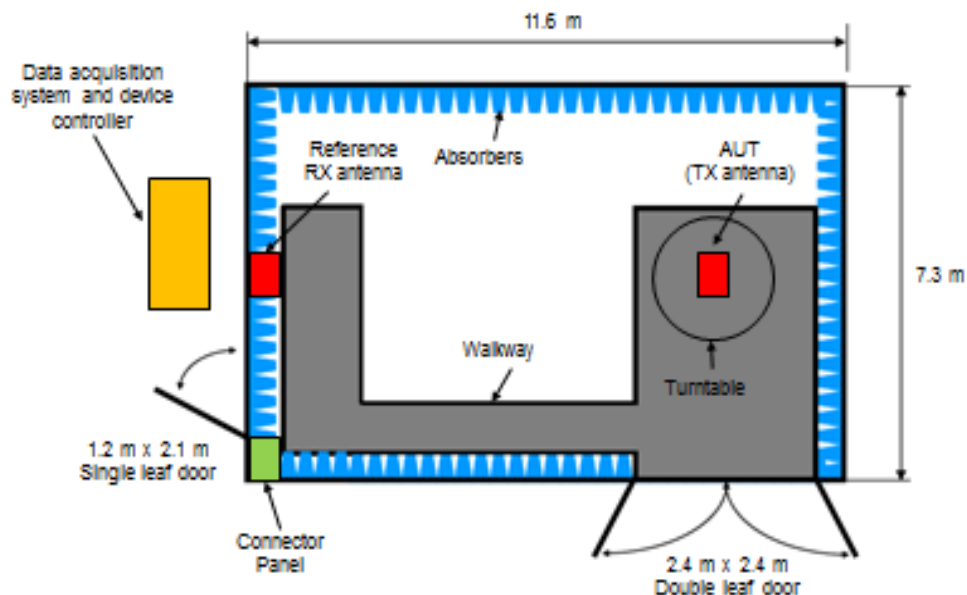
All pre-authorized chamber users are required to review this Safety Manual which can be read online here: chamber.cresis.ku.edu

Section 2: Anechoic Chamber Induction – Overview

The CReSIS Anechoic Chamber provides an electromagnetically quiet environment for measuring the radiating properties of a device-under-test. It is enclosed by an external metallic shielding to provide isolation from the outside environment. The interior is lined with radio frequency/microwave absorbers and nickel-ferrite tiles to minimize unwanted multiple internal signal reflections within the chamber. The chamber can be used to emulate a “free space” environment for testing.

The properties of the radio absorbing material (RAM) and absorbers lining the interior of the chamber create a safety consideration. It is not possible for a person inside the chamber to be heard calling for help or to secure mobile phone signals. Under no circumstances should a person be locked or left in the chamber with the door closed.

Chamber Floor Plan



Key chamber features include:

- Electromagnetic measurement and characterization from 30 MHz to 18 GHz
- 10 m measurement range
- Biggest chamber within ~500 miles in the area
- Capable of accommodating small UAV of up to 1,000 lbs
- ~100 dB shielding from external environment

Potential chamber applications include:

- Characterization of intentional radiators or the scattering of electromagnetic energy, such as antenna radiation pattern and radar cross section (RCS) measurements
- Determining the level of radiation/noise from unintentional radiators. For instance electromagnetic interference (EMI) measurement for digital devices/systems
- Determining the level of immunity of an electronic device/system when exposed to ambient electromagnetic signal/noise

Equipment and tools include:

Hardware

- Agilent N5230C PNA-L 4-port Network Analyzer (10 MHz – 20 GHz)
- Agilent 8052D calibration kit
- Agilent E4446A PSA Spectrum Analyzer (3 Hz – 44 GHz)
- ETS-Lindgren Standard Antennas (see next slides)
- ETS-Lindgren 7-TR/POL Antenna Tower (max. load: 13.5 kg)
- ETS-Lindgren 2090 Dual-Device Controller
- ETS-Lindgren 4340 Shielded Camera System
- Bosch DLK Digital Distance Measurer
- Skil MT 8201 Self-Leveling Cross Line Laser
- Assorted RF cables and connectors/adaptors

Software

- Ansys HFSS v14
- Agilent ADS 2011.01
- CST Microwave Studio
- MATLAB 2011b

Section 3: Anechoic Chamber Safety Precautions

Chamber Door Operation The anechoic chamber door is double-leaf and illustrated in the Chamber Floor Plan illustration above. It merits special mention as it poses considerable safety issues if the following requirements are not followed:

- The chamber door is very heavy and does not open from inside the chamber.
- Always ensure there is no one in the chamber prior to closing the door.
- The door of the chamber must be closed in order to operate the chamber. However there should never be anybody inside the instrument during operation.
- Never leave objects in the door way when closing the door.
- The area around and under the door jamb must be left clear. For example a cable under the door will damage both the cable and the absorbers on the perimeter of the door.

Chamber Absorbers

- The chamber absorbers contain nickel-ferrite which is fire-treated. However it should be kept away from all heat, flame, liquid and anything that may damage, spill or cut into the material. This includes shoes.
- As signage indicates on the chamber exterior – high heel or pointed heel shoes should not be worn in the chamber as they cause very costly damage to the absorbers.
- Do not touch the chamber absorbers as wear and tear on the materials occurs rapidly. The absorbers are highly sensitive and very expensive to replace.

Absorber Storage and Handling

Only CReSIS personnel, directed by the chamber manager, may handle or move absorbers. Racks outside of the chamber are provided for storage. Follow these points if directed to handle the absorbers:

- Always hold the absorbers by the base, never by the tips.
- Never put absorbers on top of one another as doing so will damage the tips – if bent these ultimately break off and again – absorbers are very expensive to replace.
- Always report all damage of absorbers, or even damage to tips.
- Always wash your hands after handling the absorbers, especially before eating, drinking or smoking (which you do – again only outside the building!).
- Never attempt to extinguish an absorber as the fumes may be very toxic. Evacuate the chamber and call 911 in that instance.
- Heat affects the absorbers, as detailed below. Never turn off the air-conditioning in or around the chamber or alter the settings. Report any increase in heat or A/C issues to the chamber manager.

Sources of Ignition

- Any potential sources of ignition shall not be permitted inside of or in the vicinity of the chamber except by special approval of the anechoic chamber manager.
- Soldering, oxyacetylene, arc welding and high intensity lights are prohibited inside the anechoic chamber. Extreme caution should be used when using soldering guns and high-intensity lights in the surrounding chamber operating room.
- Do not leave equipment running or operating in the chamber, while the chamber is unattended unless required for operational needs. Equipment that is left operating for required and pre-approved purposes must be kept at least 3 inches away from the absorber lining, and positioned so air can circulate freely around it. It should not generate enough heat to feel hot to the touch.
- Flammable or combustible liquids shall not be handled or stored inside the chamber. The chamber manager's approval must be obtained before any starting repair operations using volatiles or solvents, or tests that involve the use of fuels. Alcohol, commonly used to clean electrical components, should be replaced by nonflammable, non-ozone-depleting materials such as Genesolv 2004 or Inonox MC. If the use of flammable liquids is approved, personnel shall wear electrically conductive shoes or grounding straps to bleed off static electricity.
- Portable fluorescent lights are cooler and should be used when portable lights are required.

Threshold Limit Values

These are recommended structural limits to maintain quality control and safety within the chamber. These are not legally enforceable limits like a permissible exposure limit, but can be identified as prudent practice safety precautions.

- Absorber Walkway: Cannot withstand a weight of more than 1,000 LBS
- Turntable: Cannot withstand a weight of more than 1,000 LBS
- Turntable: Do not operate continuously for more than 2 hours
- Power Limit: Do not operate with peak RF power levels higher than 100 W in the chamber without authorization. Always make sure that the power level applied to the input of any of the ports of the network analyzer is below +20 dBm.
- Do not reorganize absorbers or the walkway without pre-authorization from the chamber manager.

Connectors and Equipment Care

The equipment in the CReSIS Anechoic Chamber, and the chamber itself, are very expensive. As a university teaching laboratory and an instrument that outside industry partners will use – it is paramount that the equipment is treated with the upmost care and respect. The equipment is designed to perform repeatable tests and give reliable results so precision of the parts is critical. The **network analyzer (NA)** alone is worth more than \$100,000. Other items such as **cables, connectors, amplifiers** and **standard gain horns** also cost hundreds of dollars each; and are very expensive to repair and/or replace. The following rules must be followed when using the CReSIS Anechoic Chamber Equipment:

Network Analyzer:

- Only trained personnel can be pre-authorized to use the NA
- A torque wrench must be used to connect to the NA RF ports and calibration module
- Dust caps must be replaced when cables are removed from the RF ports or calibration module
- Only the chamber technician is permitted to move the NA from its trolley. If you need the NA to be moved, you must consult with the chamber technician first.
- All cables to the NA must be disconnected before wheeling the NA around the lab.
- Never remove the SMA to N type connectors on the NA's RF input and output ports. These are designed to protect the NA's OEM connectors.
- Use the Windows Start Menu to shut down the NA – not the "On/Off" push button on the NA.

Connectors:

- Always use dust caps on unterminated connectors so dust does not render the connector and the measurement data useless. This includes the loose/inter-series connectors and the N/A connectors, horns, amplifiers and cables.
- N type connectors should be only hand-tight – nothing tighter than that.
- Use a torque wrench only to tighten SMA connectors. Over tightening will damage the center pin and result in permanent damage to the connector.
- Always turn the freely moving barrel on the connector head – not the connector body itself. The mating faces of the connectors must never be turned in respect to each other as scratches will affect repeatability of measurement data and permanent damage the connector.
- Use only lint-free tissue dipped in IPA or compressed air to clean a connector.

Cables:

- Always replace dust caps on unconnected cables

- Never bend a cable beyond its bending radius and consult a data sheet if you need to bend it beyond its natural flex.
- Support the cable wherever possible to avoid stress, strain or pull on the cable.
- Remove all cables from lying across the floor and under the chamber door to avoid falls, trips or a cable being snagged or crushed. Cables will also damage the absorbers in some instances so watch for this.
- Never store cables on hooks or where the length of the cable is unsupported.
- Never use rigid cables to connect to equipment – but use flexible cables.

Summary Safety Checklist:

- No food, drinks or smoking in the anechoic chamber or the anechoic operating room
- Keep all sources of ignition away from inside the chamber
- No flammable liquid or materials inside the chamber
- Do not close the chamber door while working inside the chamber
- Check if someone else is inside the chamber when closing the chamber door
- Beware of the potential hazards of radiofrequency (RF) electromagnetic (EM) fields:
- The World Health Organization's International Agency for Research on Cancer (WHO IARC) classified radiofrequency fields as “possibly carcinogenic to humans.”
- More information regarding biological effects and potential hazards of RF EM fields can be found at:
http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf
- (see Tables 1 and 2 for FCC’s limits for maximum permissible exposure and localized exposure)
- The microwave absorber’s power handling capability is 0.5 W/inch² or 775 W/m², and the ferrite tile’s maximum safely handling exposure to continuous RF field intensity is 200 V/m. Contact the chamber manager before doing any high power measurement (> 100 W or 50 dBm)
- Do not stay inside the chamber while measurement is being performed, especially for measurements with power > 100 W or 50 dBm
- Never run the turntable continuously for more than two hours
- Always wear the ground strap when using the network analyzer and spectrum analyzer. Electrostatic sparks can cause ignition and/or explosive hazards, which are dangerous given the toxic materials in the absorbers, should they catch fire. Electrostatic discharge (ESD) can damage a sensitive electronic component resulting in failures, reduced reliability and increased rework costs, or latent component failures in equipment in the field. The cost of a single ESD failure can be astonishing.
- Evacuate from the building and call 911 when smoke or fire is seen inside the chamber
- Avoid touching the microwave absorber; wash with water after contact

- Report immediately to the chamber manager any problems with the ventilation systems inside the chamber. The system is centralized within the M2SEC building. If for any reason it fails to turn on – immediately notify the chamber supervisor.
- No high-heeled shoes inside the chamber
- Never perform unauthorized work or experiments
- The fire extinguisher tanks outside the chamber should have sufficient clearance from supplies and laboratory equipment
- Be familiar with the location of emergency equipment - fire alarm, fire extinguisher, emergency kit in the chamber area and the location of the eye wash and safety shower in the M2SEC building.
- Report any accident, however minor immediately
- Keep work area clean
- It is the responsibility of each user to identify all research involving the use of human beings and/or animals as subjects of research and secure prior approval from the appropriate university committee
- If there is an immediate danger to life and health call **KU Police at 785-864-2185**

House Keeping

All equipment in the chamber, and in the chamber operating room, must be returned to its rightful place after use. There are clearly marked equipment cupboards and shelves in the chamber operating room for this purpose. Retrieve and remove any items that do not belong in the lab that you may have arrived with. A quick house-keeping list to follow requires that all users:

- **Return all equipment to its rightful place**
- **Remove anything you brought into the chamber and chamber operating room**
- **Reconnect all cables**
- **Attach the source antenna to its mount**
- **Ensure the receive antenna structure is assembled and on the turn-table**
- **Check that all connectors have dust caps replaced.**

GLOSSARY

Access

Access to laboratories with easily damaged expensive equipment may be restricted to individuals with specific types of training. The Laboratory Entrance Posting (LEP) at the CReSIS Anechoic Chamber indicates who is permitted to enter without personal supervision by a properly trained individual. See also "restricted access."

Administration

CReSIS is primarily authorized to determine who can access the CReSIS Anechoic Chamber

Authorized Laboratory Supervisor (ALS)

A person who is responsible for a "laboratory" (see definition below) and has the necessary authorizations/permits to carry out the activities associated with his/her laboratory. Note: An ALS must also be an Authorized User (see definition below) for the level of activities the ALS performs in the laboratory. ***Dr. Carl Leuschen is the Principal Investigator overseeing the CReSIS Anechoic Chamber.***

Authorized Occupant (AO)

An individual who requires unsupervised access or presence in an area or laboratory who has received all of the documented training necessary to avoid the hazards associated with the area or room. ***Stephen Yan is the primary Authorized Occupant of the chamber; in addition to the CReSIS Chamber Technician (name to be confirmed).***

Authorized User (AU)

An individual who has all of the documented training and experience required by this plan for activities in which the user is engaged.

Note: There are many types and levels of training specified in the Anechoic Chamber Training Manuals. The requirements are commensurate with the type and levels of research involved in specified activities. The four user-types who will avail of the Chamber include:

- Pre-Authorized CReSIS Staff/Faculty/Student User

- Pre-Authorized KU Staff/Faculty/Student User
- Pre-Authorized Contractual (Paying) Using (KU Internal)
- Pre-Authorized Contractual (Paying) Using (KU External)

Caution

Typically used as a header on hazard warning signage to indicate that a hazard is present, which if not avoided, could result in moderate or minor injury. OSHA requires its use to caution employees against potential hazards or unsafe practices. Caution signs shall have a yellow background, with the word caution spelled out in yellow letters on a black panel. There is a Caution Sign indicating the hazards of closing the chamber while you are inside the chamber.

Danger See Caution.

Department of Environment, Health and Safety (EHS)

The administrative support unit under the Associate Provost for Support Services at the University of Kansas - Lawrence Campus that is responsible for administering the campus environment, health & safety program

Emergency

An unexpected, serious occurrence or situation urgently requiring prompt action. In the laboratory, emergencies can result from hazardous materials spills/releases, malfunctioning equipment, fire, and/or personal injury/ need for medical assistance, etc.

Flammable Liquids

Alcohol and acetone are present in the office space surrounding the chamber. **These are NOT ALLOWED inside the chamber.**

Guests

All guests are expected to become either Authorized Users or Authorized Occupants or both if they are to have unsupervised access to the CReSIS Anechoic Chamber.

Laboratory

The Anechoic Chamber as a "laboratory" falls outside of the standard KU definition for HAZMAT laboratories. However, for reporting and other purposes, the CReSIS Anechoic Chamber is referred to as a "teaching laboratory" and also as an "instrument". The chamber itself is referred to as an "instrument". The room surrounding the chamber is referred to as the "chamber operating room". These two spaces combined constitute a teaching laboratory.

Laboratory Entrance Posting (LEP)

The chamber as a laboratory has EHS approved entrance posting which indicates there are no hazards present but specifies access restrictions, and the name and phone number of the authorized supervisor and one or more designated EHS-approved alternate.

Occupant (see definition above). This category also includes those who are already Authorized Occupants. (All actual and prospective occupants are included). Examples are Laboratory personnel/students/guests (see definition of guests above) who do not use and are not (will not be) trained to use or handle all of the hazardous materials and/or sources of radiation in the area.

Laboratory Personnel

Any individuals who work in the laboratory with activities that are part of the function of that laboratory and are directly responsible to the Authorized Laboratory Supervisor for their activities and who are employees of the University. This includes, for example, students on the pay roll, research assistants, post-docs, and laboratory technicians.

Laboratory-Specific Safety Plan (LSSP)

This is a laboratory-specific safety plan which evaluates the need for and specifies safety requirements that go beyond those provided in the KU Laboratory Safety Manual; for the Anechoic Chamber specifically. The proposed Laboratory-Specific Safety Plan has to be submitted to the EHS for review and approval

Restricted Access See also Laboratory Entrance Posting.

Laboratories may have to restrict access to specifically qualified individuals and exclude unsupervised access to all other individuals. The nature of such restrictions shall be posted at the entrance on the "Laboratory Entrance Posting." The CReSIS Anechoic Chamber will only allow pre-authorized visitors and users into this lab.

"Sharps"

Any sharp objects which could readily puncture or cut the skin of an individual when accidentally encountered, including but not limited to: scalpels, broken glass, pieces of metal, antenna ends and any other objects capable of skin penetration.

Standard Operating Procedures (SOP's)

The safety procedures that shall or should (as specified) be followed in order to ensure reasonable safety in the use of the chamber.

Stop Work Order

A verbal or written order by the EHS mandating cessation of all activities in a specified laboratory until the imminent danger or serious violation in the laboratory has been eliminated by appropriate corrective action. CReSIS and EHS approval is required before activities may be resumed after a Stop Work Order has been issued.

Training

All individuals who access the chamber must be pre-authorized even if they have documented training appropriate to their responsibilities. There will be a trained authorized user on site to accompany un-trained pre-authorized individuals before they can access, or work in the chamber.

Threshold Limit Values

These are recommended structural limits to maintain quality control and safety within the chamber. These are not legally enforceable limits like a permissible exposure limit, but can be identified as prudent practice safety precautions.

- Absorber Walkway: Cannot withstand a weight of more than 1,000 LBS
- Turntable: Cannot withstand a weight of more than 1,000 LBS
- Turntable: Do not operate continuously for more than 2 hours
- Power Limit: Do not operate more than 100 W of power in the chamber without preauthorization

University Safety & Health Manual

The KU-Lawrence Campus manual which specifies the university-wide safety practices applicable to all faculty and staff members, students, and visitors on the Lawrence campus. The manual is also applicable in the laboratory setting. The requirements of the Laboratory Safety Program/Plan are in addition to the those of the University Safety & Health Manual.

University Health and Safety Policy See Health and Safety Policy

who is not an Authorized Occupant or Authorized User. Such an individual must be under the direct physical supervision of a qualified Authorized User or Authorized Laboratory Supervisor who has the responsibility of informing the visitor of the nature of the hazards and of ensuring that the visitor will not be exposed to hazardous materials and/or radiations at levels that are greater than those permitted for members of the general public.

Waste

In the general sense, defined as any material (non-hazardous or hazardous) which has served its purpose, is no longer wanted and is intended to be discarded. Every material should be evaluated as to its potential recycling (reuse, redistribution, or reclamation) before being discarded. Normal solid waste such as: paper, cardboard, plastics, metals, glass, dirt, sand, food, garbage, refuse, etc. which is FREE FROM ANY HAZARDOUS COMPONENTS or RESIDUE, may be recycled if feasible, or disposed of into normal trash baskets or dumpsters.

Any materials which are identified as being hazardous or which are contaminated with hazardous residue, when they become waste, must be collected and given to EHS for evaluation as to their potential recycling or need for special waste disposal.

Waste Minimization & Reduction

Methods, practices and procedures developed and implemented to prevent and reduce the amount of waste being generated and needing disposal.

APPENDIX

Samwha Tile Absorber Safety Data Sheet

Product and Company Identification

Product Identification: NIKEL-ZINC FERRITE POWDER

Date of MSDS: 11/19/1985

Technical Review Date: 06/30/1995

FSC: 6520 NIIN: LIIN: 00N016376

Submitter: N EN

Status Code: CMFN: 01Article: N

Kit Part: N

Manufacturer's Information

Manufacturer's Name: SAMWHA ELECTRONICS CO. LTD.

Manufacturer's Address1: 211-1 JANGJI-RI, DONTAN-MYUN

Manufacturer's Address2: WHASUNG-CITY, KYUNGKI-DO

Manufacturer's Country: KOREA

General Information Telephone: 82-31-370-8411

Emergency Telephone: 82-31-370-8411

Emergency Telephone: 82-31-370-8411

MSDS Preparer's Name: N/P

Proprietary: N

Reviewed: N

Published: Y

CAGE: 28733

Special Project Code: N

Contractor Information

Contractor's Name: SAMWHA ELECTRONICS CO. LTD.
Contractor's Address1: 211-1 JANGJI-RI, DONTAN-MYUN
Contractor's Address2: WHASUNG-CITY, KYUNGKI-DO
Contractor's Telephone: 82-31-370-8411 Contractor's CAGE: 28733

Hazards Identification & Emergency Overview

Health Hazards Acute & Chronic:

ACUTE: NO TOXIC EFFECTS IN SOLID FORM. CHRONIC: IF CUT AND GROUND IMPROPERLY. INHALATION OF DUST IS NOT RECOMMENDED.

Signs & Symptoms of Overexposure: NONE SPECIFIED BY MANUFACTURER.

Medical Conditions Aggravated by Exposure: NONE

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:

Inhalation: YES

Skin: NO

Ingestion: NO

Carcenogenicity Indicators:

NTP: NO

IARC: NO

OSHA: NO

First Aid Measures

INHALE: MOVE TO FRESH AIR.

EYE: FLUSH WITH WATER FOR AT LEAST 15 MINUTES.

SKIN: WASH WITH SOAP & WATER.

INGEST: CALL MEDICAL DOCTOR / 911 IMMEDIATELY.

Fire Fighting Measures

WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).

RELATIVELY INERT CERAMIC. Unusual Fire or Explosion Hazard: IF IN INSTANT CONTACT WITH ANY OPEN FLAME, MAY TEND TO SHATTER. Extinguishing Media: USE MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).

Exposure Controls & Personal Protection

Respiratory Protection:

NIOSH/MSHA APPROVED DUST-FUME TYPE IF NOT GROUND WITH LIQUID COOLANT

Respiratory Protection: NIOSH/MSHA APPROVED DUST-FUME TYPE IF NOT GROUND WITH LIQUID COOLANT.

Ventilation: GENERAL VENTILATION.
Protective Gloves: WATERPROOF GLOVES.
Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).
Other Protective Equipment: NONE.
Work Hygiene Practices: GRIND WET TO ELIMINATE DUST

Physical & Chemical Properties

HCC: N1 NRC/State License Number: Net Property Weight for Ammo: Boiling Point:
Boiling Point Text: SUPP DATA Melting/Freezing Point: Melting/Freezing Text:
2732F,1500C Decomposition Point: Decomposition Text: N/K Vapor Pressure: NIL
Vapor Density: NIL Percent Volatile Organic Content: Specific Gravity: 5.1 (H*2O=1)
Volatile Organic Content Pounds per Gallon: pH: N/K Volatile Organic Content Grams
per Liter: Viscosity: N/P Evaporation Weight and Reference: N/K Solubility in Water: NIL
Appearance and Odor: BLACK Percent Volatiles by Volume: N/K Corrosion Rate: N/K

Stability & Reactivity Data

Materials to Avoid: ACIDS.
Stability Condition to Avoid: NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products: MAY FORM HYDROGEN IF DISSOLVED IN ACIDS.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization: NOT RELEVANT

Disposal Considerations

Waste Disposal Methods: CAN BE DISPOSED OF AS NON-HAZARDOUS SOLID WASTE
WITH LOCAL, STATE AND FEDERAL LAW.