सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

GLORIUS YEARS OF EXCELLENCE
(1950 - 2025)

सीएसआईआर–सीजीसीआरआई

सुरक्षा पुस्तिका

कार्यस्थल पर सुरक्षा हमारी सामूहिक जिम्मेदारी है

CSIR-CGCRI

SAFETY BOOKLET

Safety at workplace is our collective responsibility

सीएसआईआर–केंद्रीय काँच एवं सिरामिक अनुसंधान संस्थान
CSIR-Central Glass & Ceramic Research Institute
वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद
Council of Scientific & Industrial Research
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Bikramjit Basu
Director

प्रिय साथियों,

सीएसआईआर-केंद्रीय काँच एवं सिरामिक अनुसंधान संस्थान परिवार और व्यक्तिगत रूप से मेरी ओर से,मैं आपसभी से सुरक्षा संबंधी दिशा-निर्देशों को पढ़ने और समझने का आग्रह करता हूँ।

पेशेवर रूप से,हम हर समय उच्चतम स्तर की सुरक्षा बनाए रखते हुए रचनात्मकता और वैज्ञानिक खोज के प्रति जुनून रखने के लिए प्रतिबद्ध हैं। सीएसआईआर-सीजीसीआरआई मेंसुरक्षा भी अनुसंधान का एक अभिन्न अंग है। सीएसआईआर-सीजीसीआरआई के सभी शोधकर्ता,चाहे वे छात्र हों, तकनीकी अधिकारी/तकनीशियनहों या वैज्ञानिकहों;कार्यस्थल परसुरक्षित वातावरण सुनिश्चित करने के लिए सभी हर समय सुरक्षा और आपातकालीन प्रोटोकॉल का सख्ती से पालन करने के लिए जिम्मेदार हैं। एक सुरक्षित कार्यालय वातावरण की शुरुआत सभी को संभावित खतरों के बारे में जागरूक करने और सुरक्षा संबंधी दिशानिर्देशों का पालन करने से होती है। मैं आप सभी से कार्यस्थल पर स्वच्छता बनाए रखने,असुरक्षित स्थितियों की रिपोर्ट देने और व्यक्तिगत सुरक्षा उपकरणों (पीपीई) का उचित उपयोग करने का आग्रह करता हूँ।

प्रयोगशाला के भीतर किसी भी प्रयोग को सुरक्षित रूप से करने की अंतिम जिम्मेदारी मुख्य रूप से प्रयोगकर्ता की ही होती है। सुझाए गए दिशानिर्देश, दुर्घटनाओं को रोकने तथा उनकी गंभीरता को कम करने और जोखिम को न्यूनतम करने में सहायता कर सकते हैं,जिसकी वजह से कर्मचारी कल्याण और कार्यस्थल प्रभावशीलता बेहतर होगी।

मुझे उम्मीद है कि हम सीएसआईआर-सीजीसीआरआई को सर्वोत्तम सुरक्षा कार्यप्रणाली के साथ एक उत्कृष्टराष्ट्रीय संस्थान बनाने के लिए मिलकर काम करेंगे।

आप अनुसंधान, तकनीकी सेवाओं या प्रशासनमें कहीं भी कार्य कर रहे हों,आपका योगदान भारत और इसके बाहर उन्नत सामग्रियों के भविष्य को आकार देने में महत्वपूर्ण भूमिका निभाएगा।

शुभकामनाओं सहित,

प्रोफेसर बिक्रमजीत बसु, एफएनए, एफएनएई, एफएनएएससी, एफएएससी, एफएएमएस
निदेशक

Bikramjit Basu
Director

Dear Colleague,

On behalf of CSIR-CGCRI family and on my personal behalf, I welcome you to read and understand the safety related guidelines.

Professionally, we are committed to fostering creativity and a passion for scientific discovery, while maintaining the highest standards of safety at all times. At CSIR-CGCRI, safety is an integral part of research, and it is the responsibility of all researchers — whether Students, Technical Officers, Technicians, or Scientists — to strictly adhere to safety and emergency protocols. Ensuring a safe working environment starts with awareness of potential hazards and consistent compliance with safety guidelines. I urge everyone to maintain a clean workspace, report unsafe conditions promptly, and use personal protective equipment (PPE) appropriately.

The ultimate responsibility of performing any experiment safely within the laboratory resides primarily with the experimenter herself/himself. The suggested guidelines can help prevent and mitigate accidents and minimize risk, which in turn support employee well-being and workplace effectiveness.

I hope that we will work together to make CSIR-CGCRI, a national institute of excellence with the best safety practices.
Whether you are working in research, technical services, or administration, your contributions will play a key role in shaping the future of advanced materials in India and beyond.

With best wishes,

Professor Bikramjit Basu, FNA, FNAE, FNASc, FASc, FAMS
Director

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CSIR - CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE
196, Raja S. C. Mullick Road, Jadavpur, Kolkata - 700 032, India

SAFETY MANUAL

Version 2.0

This document contains safety protocols to be followed in all laboratories of CSIR-CGCRI. It also enlists steps to be taken during emergencies and all emergency contact telephone numbers.

Last updated on 29.04.2025.

Safety Security and Disaster Management Committee, CSIR-CGCRI

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2. Environmental Health Safety, Princeton University.
3. Institute Laboratory and Biosafety Committee, ISM Dhanbad.

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Safety, Security and Disaster Management (SSDM) Cell

The Safety, Security and Disaster Management (SSDM) Cell has been constituted at CSIR-CGCRI with the approval of the Director, with the aim of ensuring the effective implementation of safety protocols, security coordination, and disaster preparedness across the Institute.

The SSDM Cell operates from Room No. 01 (main office), while Room No. 08 has been designated for the storage of PPEs and other safety-related items. The Cell comprises the following members:

- **Mr. Krishnendu Adhikari, Principal Scientist; Mob: 9432351772**
- **Mr. Sk. Md. Mursalin, Technician (2); Mob: 9232476767**
- **Mr. Samir Kumar Kopai, Technician (2) ; Mob: 8348213783**
- **Ms. Tanima Kundu, Technician (1) ; Mob: 7044908556**

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Authorized SSDM members will conduct regular visits to all R&D divisions and Institute units, and may issue safety and disaster management advisories to foster a culture of safety, security, and preparedness throughout the Institute.

CSIR – Central Glass & Ceramic Reseach Institute (CSIR–CGCRI)

Key Facts:

* Established in 1950
* The only national lab with core competence in ceramics and glass for traditional to technologically challenging applications

Highlights:

Contribution in –

* Advanced Ceramics and glasses for strategic sectors
* Green energy technologies
* Ceramic membranes for water filtration
* Fiber lasers and sensors
* Skill development in potteries, tiles, clay products

Key Research Areas

- Advanced Ceramics & Composites
- Biomaterials & Medical Devices
- Energy Materials & Devices
- Fibre Optics & Photonics
- Multiscale Microstructure & Mechanics of Materials
- Functional Materials & Devices
- Membrane & Separation Technology
- Refractory & Traditional Ceramics
- Specialty Glass

This safety manual provides general guidance and recommendations for safe practices. Laboratory-specific critical experiments may require separate safety protocols which should be strictly followed. It is the users' responsibility to ensure their own safety and the safety of their co-workers and to follow all applicable safety regulations and procedures.

Contents

1. Introduction

The aim of this safety manual document is to spread awareness among all staffs of CSIR-CGCRI regarding the safety and emergency protocols to be followed at all times in order to ensure a safe working environment for all. The aim is to provide general guidelines about safe working practices to be followed to reduce chances of injury or illness of laboratory workers. Each Division of CSIR-CGCRI should have a copy of the Safety Manual available at an accessible place.

Although an attempt has been made to cover a wide variety of laboratory hazards, the document cannot cover each and every hazard and emergent situation that might arise during working in a laboratory. All users are instructed to be alert and vigilant while conducting experiments. The ultimate responsibility of performing any experiment safely within the laboratory resides primarily with the experimenter herself/himself.

CSIR-CGCRI needs to use several hazardous chemicals, high temperature furnaces, as well as precision equipment for its work mandate. The Institute allows us to work with considerable degree of autonomy within the laboratory and expects us to maintain the highest standards of safety at all times. Consistent and wilful violation of safety protocols could be penalized.

Safety is an integral part of research; and all researchers, be it students or Technical Officers/ Technicians or Senior Scientists. All are expected to remain vigilant regarding the safety of manpower and equipment.

Remember: Majority of laboratory accidents are avoidable and occur due to human carelessness or lack of knowledge about safe laboratory practices. Your alertness could save lives.

This safety manual provides general guidance and recommendations for safe practices. Laboratory-specific critical experiments may require separate safety protocols which should be strictly followed. It is the users' responsibility to ensure their own safety and the safety of their co-workers and to follow all applicable safety regulations and procedures.

2. General safety

This section enumerates few safe practices to be followed while working in any laboratory at CSIR-CGCRI.

2.1 Safe Laboratory Practices

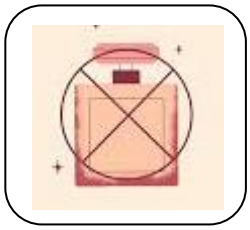
1. The Divisional Chairperson is responsible for the overall safety of their whole group. Besides, each laboratory should have an overseeing Scientist who is responsible for ensuring safety in all day-to-day activities within the lab. Each laboratory should have a safety manual displayed as per the requirements at a prominently visible area.
2. All new users should be given training before starting work in the laboratory. Existing users should also be trained whenever any new equipment is installed or a hazardous chemical is introduced in the lab.
3. Equipment's in safe operating condition should be used. All equipment's that are malfunctioning, unsafe or undergoing maintenance should be clearly labelled as shown below.

4. Before undertaking a new experiment, please read the respective material safety datasheet (MSDS) of new chemicals and the user manual of the equipment. If in doubt, consult your lab in-charge before you start the experiment.
5. Emergency equipment, such as fire extinguishers and First-aid kits should be placed at easily visible and accessible locations and should be in proper working condition. Ensure that all items in First-aid kits are within their expiration date.

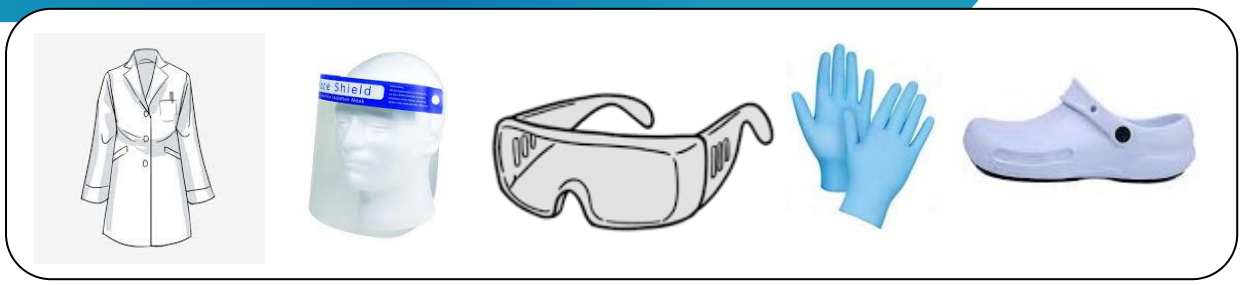
6. No food or drink should be allowed inside the laboratory to avoid contamination and health safety and proper instruction should be there in front of laboratory entrance. Ensure that foods and drinks are not stored in refrigerators used for storing chemicals. Label the refrigerator clearly with an appropriate sticker indicating "For Chemical Storage Only".

7. All labs must maintain a list of all emergency contact numbers displayed at a prominent location. Each laboratory must have a functional landline telephone with emergency phone number clearly displayed beside the landline phone.
8. No cell phone or ear phone usage in the active portion of the laboratories, or during conducting of experiments to avoid distraction.

9. Never work alone in a lab after normal working hours or on weekends. You should always have another co-worker around who can take prompt action in case of any accident.
10. Keep all workbenches free from clutter. Put back all containers of chemicals or labware in their proper places after each use
11. Tie long hair, and do not wear loose-fitting clothes or dangling jewellery in the lab as these may snag and get pulled in moving machinery. Also avoid using body spray, cosmetics when you are working in the laboratory.



12. Always wash your hands properly with soap after working with chemicals.
13. Wear proper gloves as per work requirement, such as nitrile gloves while working with chemicals, heat-resistant gloves while working with furnaces and ovens and cryogen gloves while handling liquid nitrogen or liquid helium, etc.
14. Wear full-sleeve aprons, safety goggles, face shields and covered lab shoes while working with chemicals. Properly mark and store your personal protective equipment (PPE) at the designated place inside the laboratory. Avoid using PPE assigned to your lab mates.



15. Inspect all equipment for wear or deterioration at regular interval. Maintain all equipment as per the manufacturer's specified requirements. Retain records of calibration/ certification, maintenance and repairs for the life of the equipment.
16. Ensure that all laboratory buildings are equipped with a proper earthing system. Additionally, an emergency electrical switch must be installed to prevent any unwanted incidents.

3. Laboratory chemicals: safe handling and dealing with emergencies

A wide variety of hazardous chemicals are used in the laboratories of CSIR-CGCRI. Therefore, all users are expected to study relevant MSDS documents of the chemicals and be aware of potential hazards before starting an experiment. The main routes of entry of chemicals into the human body are through inhalation into the lungs, ingestion through mouth and absorption through bare skin.

3.1 Basic Safety Rules

Whenever working in a laboratory, follow the basic laboratory safety rules. Some of the salient safety rules are listed below:

- Be aware of the locations of nearest laboratory safety shower, eye wash station, and fire extinguisher.
- Familiarize yourself with the emergency exit routes.
- Take precaution to protect your skin and eyes from all chemicals.
- Stay safe from all chemical exposures. Never taste or sniff any chemical.
- Maintain decorum inside the laboratory.
- Practice safety and chemical hygiene at all times. Wash exposed areas of the skin prior to leaving the laboratory.
- Strictly avoid eating and/or storing food or beverages in areas where hazardous chemicals are used or stored.
- No contact lenses should be worn around hazardous chemicals – even when wearing safety glasses.
- Always wear laboratory safety goggles whenever working in any area where chemicals are used or stored. They should also be worn any time there is a chance of splashes or particulates to enter the

eye. Prescription glasses DONOT serve the purpose of eye protection. Always wear safety goggles over your prescription glasses while working with hazardous chemicals. Only closed toe shoes will be allowed within the laboratory. Sandals are inappropriate.

- Clothing made of synthetic yarns easily catch fire, melt and stick to human skin. These should not strictly be worn while working with flammable liquids.
- Laboratory coats should not be carelessly left in sitting areas or wash-rooms to stop spreading contaminates.
- Use equipment only for its designated purpose. To prevent accidents, avoid using chairs with wheels when retrieving chemicals from the chemical rack.
- Hard copies of the Material Safety Data Sheets (MSDS) for all chemicals used in the laboratory should be organized and stored in a designated folder. This folder should be easily accessible to facilitate the identification of chemicals available in the laboratory and ensure safety and compliance.
- A chemical log book should be maintained in the following format

NO.	DESCRIPTION / Name	LIQUID / SOLID	CONTAINER TYPE & MATERIAL (box, bottle, jar, pail) (glass, metal, plastic)	SIZE EACH (oz, gal.,lbs.)	NUMBER OF CONTAINERS	MSDS Y/N	Supplier

- Assume that all chemicals of unknown toxicity are highly toxic.
- Post warning signs when unusual hazards or other special conditions are present.
- Combine reagents in their appropriate order, such as adding acid to water.
- Avoid adding solids to hot liquids.
- Never leave chemical containers open.
- Ensure all your reaction vessels are properly marked; specifically when it is unattended. All containers must have appropriate labels. Unlabeled chemicals should never be used. Ensure that no expired chemicals are used under any circumstances.
- Any unknown chemical produced in the laboratory should be considered hazardous.
- Exercise caution when handling Hydrofluoric Acid (HF), as it can cause severe burns and intense pain. Always wear gloves and a face shield to prevent accidents. Ensure that the first aid kit is stocked with appropriate ointments for treating HF exposure.
- Do not use mouth suction for pipetting or starting a siphon.
- Volatile or unstable materials should be stored in lab refrigerators in properly sealed containers.
- Procedures should be developed to minimize the formation and dispersion of aerosols.

- Do not pour chemicals down drains.
- All sink traps (including cup sink traps and floor drains) are to be kept filled with water by running water down the drain at least monthly.
- Fume hoods should not be used for evaporation and disposal of volatile solvents.
- Always work with hazardous chemicals in a properly working fume hood to minimize potential exposures. While using the fume hood, do not put your head inside the fume hood. Avoid keeping chemicals near the outer edges of the fume hood to avoid their falling on the laboratory floor.
- Access to laboratories and support areas such as stores, or service areas, etc. should be limited to approved personnel only.
- Waste storage locations should be designated and well-marked.
- Never carry bottles of chemicals by hand. Use bottle carriers or carts.
- Certain chemicals degrade certain container materials, ex. hydrofluoric acid degrades glass and cannot be stored in glass bottles; while organic solvents should be stored in fluorocarbon or glass bottles.
- Store larger or heavier bottles on lower racks.
- Toxic chemicals must be stored in ventilated cabinets.

3.2 Chemical Storage and Handling

There are several effective strategies for working with chemicals that help minimize both the likelihood of accidents and the severity of their consequences. Risk reduction is achieved through the implementation of safe work practices, appropriate engineering controls, correct use of Personal Protective Equipment (PPE), limiting the quantity of chemicals used, and substituting hazardous substances with safer alternatives whenever possible. Chemical safety is closely connected with overall laboratory safety and can be significantly enhanced by following a few basic guidelines.

- Laboratory personnel should label all chemical containers with the date of receipt and the date of first opening, indicating the day, month, and year. This practice is essential for substances that may form organic peroxides over time and is strongly recommended for all other chemicals as well.
- Laboratories should store only the chemicals that are actively in use, minimizing excess storage. Laboratory doors must remain closed at all times to maintain safety and containment.
- Personnel must not handle chemicals or operate equipment unless they have received proper training.
- Remember fume hoods are not for storing chemicals or waste, but meant for carrying out reactions.

Use appropriate symbols to store different chemicals as shown below:

- A liquid with a flash point below 60°C and a vapor pressure under 40 psi is considered flammable.
- A liquid with a flash point between 38°C and 94°C is classified as combustible.
- An oxidizer produces oxygen in chemical reactions, making fire burn much more vigorously.
- An oxidizer releases oxygen during chemical reactions, intensifying the combustion process and causing fire to burn more vigorously.
- Explosive materials are substances that can undergo violent reactions on their own, without requiring the presence of another chemical. These reactions are typically triggered by specific conditions such as moisture, heat, oxygen, or high pressure.

Follow these chemical storage guidelines to ensure safe handling and minimize risk:

Acids

- Store large acid containers on low shelves, in trays within acid storage cabinets, or in cabinets clearly labeled “Corrosives.”
- Keep oxidizing acids separate from organic acids, as well as from flammable or combustible materials.
- Store acids away from bases, reactive metals viz. sodium, potassium, and magnesium, and other incompatible substances.
- Always use bottle carriers or carts when transporting acid containers.
- Ensure that spill control pillows or acid-neutralizing agents specifically designed for acids are readily available. Avoid using bases to neutralize acid spills, as this can cause a dangerous reaction.

Bases

- Store bases separately from acids and other incompatible substances to prevent hazardous reactions.
- Store large containers of liquid bases in trays within a cabinet labeled “Bases” or “Corrosives.”
- Solutions of inorganic hydroxides should be stored in plastic containers.

- Keep spill control pillows or caustic neutralizers readily available for spills involving bases. Do **not** use acids to neutralize these spills.

Flammables

- Keep flammable liquids only in approved flammable storage cabinets or flammable-safe refrigerators.
- Keep all flammable materials away from ignition sources.
- Ensure fire extinguishing and spill control equipment is easily accessible.
- When working with flammable metals, keep a Class D fire extinguisher nearby. Refer to fire extinguisher guidelines for proper usage.

Oxidizers

- Store oxidizing agents in a cool, dry location.
- Keep them away from flammable or combustible substances such as paper, wood, and solvents.

Peroxide-Forming Chemicals

- Clearly label containers with the date of receipt and the date they were first opened.
- Store in tightly sealed containers in a cool, dry, and dark environment.
- Periodically check for peroxide formation using appropriate test strips.
- Dispose of peroxide-forming chemicals by the expiration date or within one year of opening—whichever comes first.

3.2.1 Chemical handling guidelines

When handling chemicals, follow these essential practices to ensure safety:

1. Use only the quantity of chemicals required for the task at hand—avoid removing excess amounts.
2. Ensure all chemicals are properly sealed, clearly labeled, and stored in suitable containers immediately after use.
3. Regularly inspect stored chemicals for signs of deterioration, damage, or leaking containers.
4. Keep chemicals away from heat sources, direct sunlight, and reactive substances that could trigger dangerous reactions.
5. Never dispose of hazardous chemicals by pouring them down sink drains.
6. Promptly clean up any spills or leaks using approved spill response procedures.
7. Familiarize yourself with emergency protocols related to chemical exposures and spills.
8. Dispose of chemicals strictly in accordance with established disposal procedures.

3.3 Guidelines in case of laboratory emergencies

While regular inspections and proper maintenance of laboratory equipment help prevent accidents, it is equally important to know how to respond if an emergency occurs. Your first priority should always be your own safety. If necessary, contact local emergency services immediately. Notify others in the area about the emergency and inform them of any potential hazards. Take appropriate measures to minimize injury or property damage, based on the nature and severity of the incident. Your response should align with documented laboratory emergency protocols. Stay calm, assess the situation carefully, and act accordingly to ensure an effective and safe response. In case of chemical splashes on bare skin, the affected part must be immediately flushed under running water. If splash occurs on clothed body parts, the clothing is to be first removed, followed by flushing with running water. Chemical splash in the eyes should be treated with copious flushing of water. Refer to safety data sheets for more information. Seek medical assistance immediately.

Chemical Spills

Chemical spills are among the most frequent accidents in laboratories that handle chemicals. Such spills can occur due to improper or careless opening, handling, or storage of chemical substances. Even a minor spill of a hazardous chemical—or a large spill of a non-hazardous one—can pose serious risks to laboratory personnel. Therefore, it is crucial to exercise caution at all times and to wear appropriate Personal Protective Equipment (PPE) to prevent exposure.

In the event of a chemical spill, follow these steps:

1. First, wear appropriate PPE to protect against potential exposure—never attempt to handle a spill without proper protection.
2. If possible, stop or modify the source of the spill to prevent it from spreading further.
3. Shut down any nearby heat or ignition sources immediately if the chemical is flammable.
4. Avoid inhaling chemical vapors, particularly from volatile or toxic substances. Work in a well-ventilated area or use a fume hood if available.
5. Locate the spill kit and use its tools to cordon off and contain the affected area.
6. Apply an appropriate absorbent material to the spill. If the chemical is acidic or basic, use a neutralizing agent suitable for the substance.
7. Collect the absorbed material and any residues, then place them into a compatible, labeled waste container for proper disposal.
8. Restock or refill the spill kit after use so it is ready for future incidents.

Taking swift, informed, and cautious action can significantly reduce the risks associated with chemical spills.

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Taking swift, informed, and cautious action can significantly reduce the risks associated with chemical spills.

4. Laboratory waste disposal

We should dispose all chemical wastes as per Pollution Control Board rules. All spent chemicals should be put in suitable containers with screw-on caps and labelled clearly for disposal. As a general rule, store waste chemicals in similar type of containers in which it came packaged. Try to avoid large glass containers as they can easily shatter. Corrosive solutions (acids and alkalis) should not be stored in metal cans.

All hazardous chemicals are to be kept in the designated "Hazardous Chemical Store". Label all containers of hazardous chemicals clearly, such as corrosive acid, corrosive base, flammable, oxidiser, toxic, etc. CSIR-CGCRI enlists the services of a certified waste disposal vendor who collects the waste chemicals from time to time for safe disposal according to Government protocols.

5. Gases and cryogenics

Gas Safety

Compressed gases are stored under high pressure and may be inert, oxidizing, flammable, corrosive or toxic in nature. Thus appropriate caution should be exercised in handling, storage and transportation of gas cylinders. Main parts associated with pressure systems are gas cylinders, piping and hoses, pressure gauges and shut-off valves.

Hazards

Following hazards are associated with storage and handling of compressed gases in the laboratory:

1. Asphyxiation: Inert gases are colourless and odourless and hence often go undetected in case of leakages. They can quickly reduce the oxygen concentration in the vicinity to life-threatening levels and lead to asphyxiation of people working nearby.

2. Fire and explosion: Flammable gases, Hydrogen, Oxygen and other oxidizing gases can be potential sources of fire and explosion. Flammable gases can be easily ignited by an electric spark or open flame. Leakage of oxygen/ oxidizing gases will lead to the increase in oxygen concentration and faster rate of combustion and may cause fire hazard.

3. Chemical burns: Corrosive gases can cause serious damage to skin and eyes and can even attack fire-resistant clothing.

4. High pressure: All compressed gases are stored under high pressure in cylinders. A sudden release of pressure can cause serious damage to life and property by propelling the cylinder and great speed and force.

General Rules

1. All gas cylinders are to be clearly labelled. Flammable and toxic gases must be distinguishable by the colour tags and should be stored in segregated, well-ventilated areas. Appropriate gas sensors and alarms may be installed in such areas.

2. All cylinders should be kept chained individually to the wall either at half height or at one-third and two-third heights to ensure that they stay erect even in the event of failure of the cylinder valve.

Fig. Colour-coded gas cylinders in use

3. **Never** roll cylinders horizontally for transportation. Always use a cart to move it in a standing position.

4. Cylinders should not be located near any other potential hazards, such as fire or other heat sources, electricity, etc.

5. Always install gas cylinders with dedicated output pressure gauges and shut-off valves. This will enable to monitor line pressure and to turn off the gas supply during an emergency.

Fig. Gas regulator

6. Always use good quality piping, hoses and regulators of matched ratings to minimize chances of gas leakage.
7. Use only appropriate wrenches to open cylinder valves. Never use screwdrivers or pliers for this purpose.
8. Keep only minimum number of cylinders in the laboratory. Return empty or unused cylinders to Stores.
9. Get the gas lines tested for any leakage by an authorised person at regular intervals.
10. Inspect all piping at regular intervals and replace when necessary.
11. In case of leaking cylinders, move the cylinder to an isolated and well-ventilated area and inform the Gas Stores immediately.

Steps to use a gas cylinder

1. Attach a regulator that is specific to the particular gas to be used. Ensure that the threads of the cylinder outlet and the regulator inlet match properly. Never try to force mismatched threads.
2. Open the cylinder valve slowly until the inlet pressure gauge of the regulator shows the line pressure. In case pressure is lesser than expected, there might be a leakage at the cylinder outlet valve.
3. Open the flow control valve of the regulator until the desired delivery pressure is achieved.
4. Check for any leaks at all connections using soap solution.
5. When your job with the gas is done, close the cylinder valve and release the regulator pressure.

Cryogenic Safety

Cryogenic liquids are liquefied gases maintained under extremely low temperatures. Since these liquids are very cold and can expand to large volumes, they are categorized as hazardous. Special dewars and transfer cryocans are used for storing and handling cryogenic liquids.

Hazards

1. Extreme cold: Cryogenic liquids and their cold vapours can cause frostbite to human skin (cold burn). The skin appears waxy yellow. After initial contact, there is no pain, but extreme pain occurs when the frozen tissue thaws. Bare skin may stick to the metal cooled by these cryogenic liquids and the skin may tear when pulled away. Even brief exposure can cause serious damage to eyes. Prolonged breathing of very cold vapours can damage the lungs. Always use personal protective equipment such as face shields, gloves, apron, closed shoes, etc. while handling cryogens.

2. Asphyxiation: Vapours of cryogenic liquids are very cold and heavier than air. They tend to collect near the floor and displace the air present. Reduction in oxygen concentration in enclosed spaces may lead to asphyxiation and death. Small amounts of liquid can evaporate to very large volume of gases, eg. 1 lit. of liquid nitrogen can produce 695 lit. of nitrogen gas at room temperature (21°C).

3. Toxicity: Liquid carbon monoxide can release large amounts of CO gas, which can cause death almost immediately. Refer to the MSDS of each cryogen carefully before working with them.

4. Explosion: When cryogenic liquids are stored in containers without proper pressure relief devices, there can be enormous pressure build-up and result in “boiling liquid expanding vapour explosion”. An external fire or break in the vacuum lining of the container can cause a rapid pressure rise which the pressure relief valves might not be able to handle. Therefore all containers must have another backup arrangement, such as a frangible or bursting disc.

General Rules

1. Use cryogenic liquids in a well-ventilated area.
2. Always wear proper personal protective equipment (PPE) while working with cryogenic liquids.
3. Use proper dewars and cryocans designed specifically for cryogenic liquids.

Fig. Liquid dewars of different capacities

4. Periodically inspect all containers and pressure relief valves for signs of defect and immediately remove defective containers from service.

5. Boiling and splashing of the liquids will occur while transferring to a warm container or while immersing an object into the liquid. These processes should be done slowly to minimize the boiling process.

6. Take care to avoid any direct contact with skin or eyes.

7. Never touch uninsulated metal pipes or vessels cooled by these liquids as unprotected skin may stick to these surfaces and result in flesh tears while pulling away.

6. Fire and Electrical safety

The best fire defense is proactive prevention. Everyone, including students, staff and contractual employees at CGCRI are expected to know how to operate a basic fire extinguisher. Fire-fighting trainings are organized at regular intervals in the Institute and all members should participate and learn these basic skills. In case of fire, follow the evacuation plan as displayed in the building.

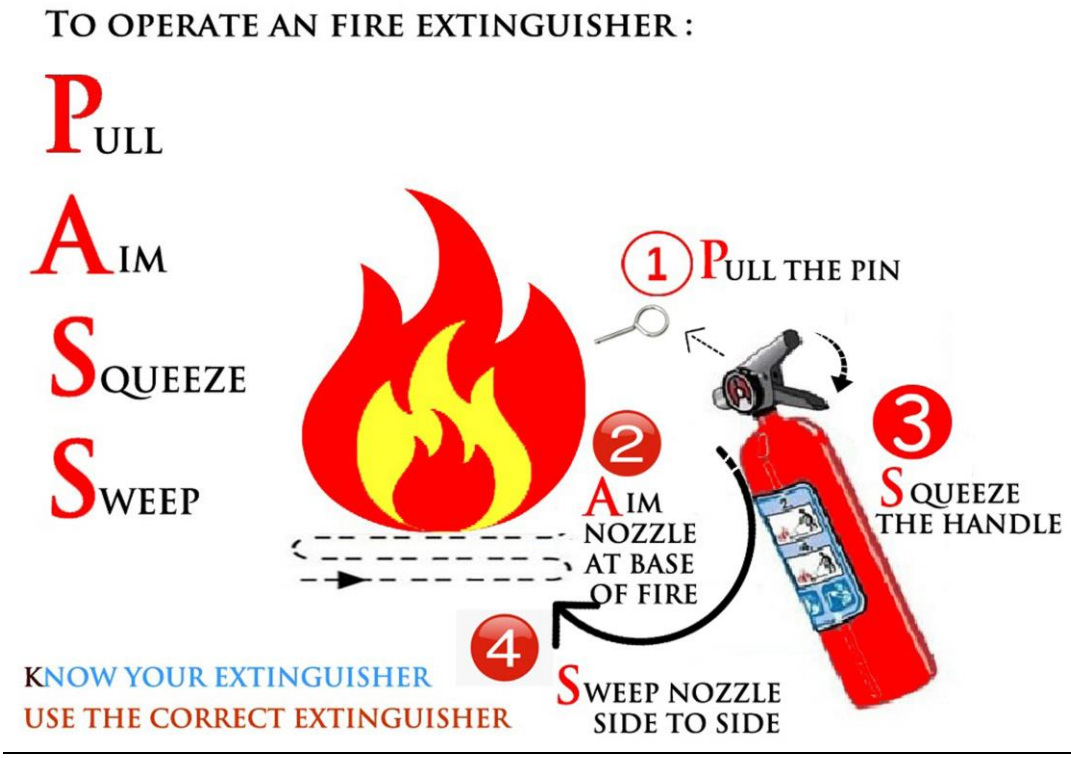
Fire extinguishers for Fire due to Electrical short circuit:

Fire extinguishers labeled 'suitable for use on electrical fires' are designed for circuits with voltages lower than those found in traction, signaling, and industrial power supply systems. Fire extinguishers and fire hoses must never be used on live electrical equipment in traction, signaling, or industrial power supply systems.

FOR EXTINGUISHING THE FIRE, there are mainly four types of fire extinguishers namely a) **water, b) foam, c) CO_2 and d) powder. They are used for different application based on the type of fire source.** PRESENT, **FOAM, CO_2 AND ABC POWDER TYPE FIRE EXTINGUISHERS** ARE INSTALLED AT DESIGNATED AREAS OF THE CSIR-CGCRI PREMISES.

Instructions for using fire extinguishers

- Sweep the extinguisher from side to side at the base of the fire — where the fuel source is — until the flames are fully extinguished.
- Never use a fire extinguisher on flames caused by escaping gas. Only attempt to tackle a fire in its very early stages.
- Do not approach the fire unless it is safe to do so, and always maintain minimum distance of one metre..



Fire blankets, hoses and buckets

These fire extinction methods serve as valuable supplements to fire extinguishers:

- Fire Buckets:
  These can be filled with water for use on Class A fires (involving ordinary combustibles), or with sand to absorb Class B fires (involving spilled flammable liquids). Never use water from fire buckets on burning fat or oil, or on electrical fires.

- Fire Hoses:
  Designed to deliver water at high pressure, fire hoses can be effective against Class A fires. However, they are heavy and may be difficult to handle without proper training.

- Fire Blankets:
  Ideal for smothering small fires, fire blankets work best when a complete seal is achieved. They are also suitable for wrapping around a person whose clothing is on fire. Made from fibreglass, these blankets can withstand temperatures up to 500°C, are compact, portable, and require no maintenance. However, they are single-use items.

Electrical Safety:

Do's

1. Inspect electrical equipment thoroughly before each use.
2. Report any electrical issues or malfunctions immediately.
3. Always follow warnings and keep clear of live electrical circuits and locked-out equipment.
4. Read and adhere to the manufacturer's instructions for the safe operation of electrical equipment.

5. Use extension cords only when authorized, and ensure they are of the correct type and capacity for the task.
6. Inspect cords and wires regularly to ensure their insulation is intact and in good condition.
7. Keep Electrical equipment's away from water.
8. Make sure there are no cuts or joints, cracks, abrasions on the cables or wires.
9. Ensure proper Earthing of electrical equipment.
10. Unplug or disconnect machines before servicing or repairing.

Don'ts

1. Run cords along the floor.
2. Touch anything electric with wet hands.
3. Never insert anything other than a proper plug into an electrical outlet.
4. Never leave electrical equipment or machinery running unattended beyond working hours.
5. Avoid allowing cords to become twisted, tangled, or damaged.
6. Wear metal jewellery when working with electrical equipment.
7. Over Plug in a single outlet.
8. Use steel ladder during electrical works/connections.
9. Ignore any signs and electrical warnings.
10. Throw water towards electrical Fires.
11. Bypass a safety device, such as, electrical fuse of equipments.

Precautionary measure during working within electric and magnetic fields:

Personnel working in areas with electric and magnetic fields must be adequately protected from potential hazards.

This includes protection from the nuisance of electric discharges caused by strong electric fields, as well as the potential biological effects linked to exposure to extremely strong electric and magnetic fields.

Individuals with implantable medical devices—such as cardiac pacemakers—should consult their physician and the designated organizational safety officer before entering areas where strong electric or magnetic fields are present, to assess any risk of electromagnetic interference with their devices.

Unrestricted Less than	10 kV/m
Short term	10 kV/m to 30 kV/m
Alternative controls	More than 30 kV/m

Exposure Guidelines for Electric Fields:

- No time limits apply for exposure levels below 10 kV/m.
- Short-term exposure to electric fields between 10 kV/m and 30 kV/m is allowed, provided the product of field strength (in kV/m) and exposure time (in hours) does not exceed 80 over a full day.
    - *For example, exposure to a 20 kV/m field is permissible for up to 4 hours.*
- For field strengths exceeding 30 kV/m, alternative protective measures must be implemented. These may include:
    - Wearing earthed or bonded conductive suits

- Screening and earthing of vehicles
- Screening of work platforms and access pathways
- De-energising nearby electrical equipment

a. 50 Hz

Magnetic fields Whole working day	0.5 milliTesla (5000 milliGauss)
Short term (Two hours per day)	5 milliTesla (50,000 milliGauss)
Limit for limbs (e.g. extended arm)	25 milliTesla (250,000 milliGauss)

b. Static or direct current (DC) magnetic fields:

The 2009 International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for limits a, b and c of occupational exposure to static or DC magnetic fields are as follows:

Head and trunk	2000 milliTesla
Limbs	8000 milliTesla

Special Notes:

1. Caution: Due to potential indirect adverse effects, ICNIRP (International Commission on Non-Ionizing Radiation Protection) emphasizes the need for practical policies to prevent unintentional exposure of individuals with implanted electronic medical devices or implants containing ferromagnetic materials. To ensure safety, this may require setting much lower exposure limits, potentially as low as 0.5 milliTesla.

2. In specific occupational settings, exposure levels of up to 8000 milliTesla may be acceptable, provided the environment is strictly controlled and appropriate safety protocols are followed to manage movement-induced effects.

Victim rescue:

Personnel must receive training in victim rescue techniques relevant to their specific job functions. Prior to attempting a rescue near or involving live exposed conductors, the rescuer must carefully assess all potential hazards and implement appropriate control measures to ensure the rescue can be conducted safely.

These control measures may include:

- De-energising the circuit,
- Using insulated rescue sticks, and
- Maintaining the Safe Approach Distance (SAD) during the rescue.

Rescuers must immediately contact the Engineering Services Division (ESD) to arrange for isolation or de-energisation of the equipment, and must wait for official confirmation that the equipment has been de-energised before attempting to shift the victim from the particular place.

Victim rescue training and assessment must be conducted by qualified personnel in accordance with relevant National Competency Standard Units.

Fire, smoke from high voltage apparatus:

Electrical equipment failure can cause fires and release large amounts of smoke. Additionally, burning or damage to certain types of electrical insulation may emit toxic fumes.

Fire extinguishers and hoses must not be used on live high-voltage equipment. Immediately contact the ESD to arrange for the de-energisation and/or isolation of the affected equipment.

Negative and electrolysis return circuits:

When working on negative return or electrolysis circuits, extra caution is required because hazardous voltages may occur under abnormal conditions. Consequently, certain tasks on these circuits must be carried out in accordance with the specific access authorities outlined in these regulations.

All work on such circuits should strictly follow the organisational procedures established to ensure safety.

7. Safe work practices with heavy machinery and furnaces

Do's:

1. Operation and maintenance manual must be made available near equipment/instruments. Read and understand them thoroughly before working on these machineries. Ask your supervisor in case of any doubt.
2. To be operated by trained persons only.
3. Follow proper SOP with startup procedure.
4. Display start up and shut down procedure in heavy equipment.
5. Check for proper earthing during installation and commissioning.
6. Proper safety precautions must be taken during operation of high temperature furnace such as safety goggles, heat protective face shield, recommended hand gloves, safety shoe and apron.
7. Proper exhaust /ventilation should be ensured during operation of high temperature furnace.
8. Proper ventilation shall be ensured in the UPS with large number of batteries.
9. Maintain recommended electric connection during installation of equipment. Ensure electrical circuit drawing is made available in operation and maintenance manual.
10. Maintain proper distance from rotating device or equipment and provide a shield to the rotating part/components. Only trained person should work on rotating equipment.
11. Follow proper procedure during maintenance of heavy equipment (more than **10 kW rating)** such as:

a. Submit requisition for maintenance (to Electrical section)

b. Disconnect the electrical connection from main power prior to maintenance shut down (to Electrical section).

c. Place maintenance Tag during the period of maintenance.

d. Electrical section should restore electrical connection and then remove the Tag.

Don'ts

1. Do not allow unauthorized person near the furnace/ heavy equipment.

2. High power equipment should not be installed in single phase (that will create phase imbalance). Installation of such equipment should be carried out in prior intimation of Electrical Section.

3. Equipment should not be shut down by switching off directly from the electrical main (Push emergency button /follow emergency shutdown procedure if required).

4. Do not allow operation of furnace without safety precaution. Without using hand gloves, face shield, shoe etc. glass melting operation like batch charging, stirring, casting should not be performed.

5. Crowding during melting must be avoided. Keep only recommended person in the operation zone.

8. Biosafety guidelines: Mammalian Cells & Tissue Culture

Scope

As per the recognized biosafety standards and lab practices, In vitro Tissue Culture Laboratory (ITCL) of the Biomaterials and Medical Devices Division (BMDD) is classified as **Biosafety Level 2 (BSL-2) Laboratory**. All laboratory users and other personnel entering this BMDD-ITCL are required to know, understand the Biosafety Guidelines: Mammalian Cells (including human stem cells or primary cells) & Tissue Culture, follow safe operating procedures and practices described in this manual. All personnel, including the Principal Investigator (PI), must perform a comprehensive risk assessment prior to initiating any proposed work that requires review and approval by the divisional Biosafety Officer, Dr. Vamsi Krishna Balla (vamsiballa@cgcri.res.in). All personnel must know and understand the potential biological and other hazards they might encounter, and be trained / qualified in appropriate safety precautions and procedures. Biological safety and laboratory operation training will be provided by divisional Biosafety Officer and all users of the laboratory must demonstrate competence in laboratory safety, operations and policies before admittance to utilize the BMDD-ITCL facilities. This Standard Operating Procedure outlines the steps for performing a risk assessment in activities involving mammalian cell and tissue cultures. It also offers recommendations for minimizing potential injuries or exposures identified during the assessment.

Biosafety Level 2 (BSL-2) Laboratories

BSL-2 laboratories are designed for work involving biological agents that pose moderate risks to personnel and the environment. While they share certain features with standard biological labs, BSL-2 facilities include additional safety measures and operational protocols. Key distinctions and requirements include:

1. **Specialized Training and Supervision**
   Personnel must be specifically trained in handling pathogenic agents and operate under the supervision of a designated principal investigator or laboratory manager.
2. **Controlled Access**
   Access to BSL-2 laboratories is strictly limited to trained and authorized individuals. Entry is further restricted while work is in progress. Unauthorized visitors are not permitted.
3. **Compliance with Biosafety Procedures**
   All laboratory users and relevant personnel must be fully aware of and comply with the procedures detailed in this manual, as well as with the policies outlined in the divisional *Biosafety Manual*.
4. **Use of Containment Equipment**
   All laboratory procedures involving hazardous agents must be conducted within certified biological safety cabinets or other approved containment devices.
5. **Adherence to BSL-2 Standards**
   The laboratory must implement all applicable standard and special practices, utilize appropriate safety equipment, and meet facility requirements necessary for handling agents classified under Biosafety Level 2.

Risk Assessments

The following considerations are essential for conducting a thorough risk assessment, which guides to decide the suitable containment level for tissue and cell culture activities. A primary concern in this process is the potential presence of pathogenic agents, whether inherent to the cells or introduced through laboratory procedures.

1. **Species of Cell Origin**
   The risk to human health increases with the genetic similarity of the source species to humans. This is due to factors such as host specificity and the human immune response. Risk levels generally decrease in the following order: human heterologous cells > non-human primates > other mammals > birds > invertebrates. However, exceptions exist and should be considered—e.g., rodent cells harboring lymphocytic choriomeningitis virus or canine cells infected with rabies virus significantly raise the risk profile.
2. **Type of Tissue Origin**
   The origin of the tissue also influences risk. In descending order of risk: pluripotent stem cells > blood and lymphoid tissues > neural tissues > endothelial cells > gastrointestinal mucosa and epithelial cells > fibroblasts.
3. **Culture Type**
   Risk varies depending on the type of culture. Generally, whole tissues pose the highest risk, followed by primary cultures, continuous (immortalized) cell lines, and finally, extensively

characterized lines. Biosafety related guidance often provided by the commercial suppliers based on cell characterization. When working with primary human cells, factors to consider include the use of recombinant or vectors synthetic or nucleic acids, cell quantity per sample, number of donor specimens, and the potential risk associated with the donor population.

4. **Culture Media**
   Media and supplements derived from human or animal sources may be contaminated with biological agents. To mitigate this risk, source materials from trusted suppliers and examine the supplier's Certificate of Analysis to confirm testing for potential contaminants such as mycoplasma, prions, and viruses, including Hepatitis B and Rabies. Media should always be prepared aseptically, following established administrative and engineering controls.
5. **Growth Conditions**
   Alterations in culture conditions—such as changes in temperature, supplementation, or growth surfaces—can trigger oncogene activity, activate latent viruses, or modify the behavior of recombinant and endogenous viral elements.
6. **Viral Contamination**
   The presence of viruses or viral genetic materials within or used in conjunction with a cell line must be factored into the containment decision-making process.
7. **Bloodborne Pathogens**
   The OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030) may apply to researchers and laboratory personnel handling human cell lines or animal cells that are intentionally infected with bloodborne pathogens.

Risk Assessments

The following considerations are essential for conducting a thorough risk assessment, which guides the selection of the appropriate containment level for cell and tissue culture activities. A primary concern in this process is the potential presence of pathogenic agents, whether inherent to the cells or introduced through laboratory procedures.

1. **Species of Cell Origin**
   The risk to human health increases with the genetic similarity of the source species to humans. This is due to factors such as host specificity and the human immune response. Risk levels generally decrease in the following order: human heterologous > nonhuman primate > other mammalian sources > avian > invertebrate. However, exceptions exist and should be considered—e.g., rodent cells harboring lymphocytic choriomeningitis virus or canine cells infected with rabies virus significantly raise the risk profile.
2. **Type of Tissue Origin**
   In decreasing order of risk: pluripotent stem cells > hematogenous cells and tissue, (blood, lymphoid tissue) > neural tissue > endothelium > gut mucosa, epithelial cells > fibroblasts.
3. **Culture Type**
   Risk varies depending on the type of culture. Generally, the order of risk : whole tissue > primary cell cultures > continuous cell lines (immortalized cells),> intensively characterized cells (including human diploid fibroblasts). Commercial suppliers often provide biosafety guidance based on cell characterization. When working with primary human cells, factors to consider include the use of recombinant or synthetic nucleic acids or vectors, cell quantity per

sample, number of donor specimens, and the potential risk associated with the donor population.

4. **Culture Media**
   Media and supplements derived from human or animal sources may be contaminated with biological agents. To reduce this risk, procure materials from reputable suppliers and review the supplier's Certificate of Analysis for information on testing against contaminants such as mycoplasma, prions, and viruses like Hepatitis B or Rabies. Media should always be prepared aseptically, following established administrative and engineering controls.
5. **Growth Conditions**
   Alterations in culture conditions—such as changes in temperature, supplementation, or growth surfaces—can trigger oncogene activity, activate latent viruses, or modify the behavior of recombinant and endogenous viral elements.
6. **Viral Contamination**
   The presence of viruses or viral genetic materials within or used in conjunction with a cell line must be factored into the containment decision-making process.
7. **Bloodborne Pathogens**
   The Occupational Safety and Health Administration (OSHA) Blood borne Pathogens Standard (29 CFR 1910.1030) may apply to researchers and laboratory personnel handling human cell lines or animal cells that are intentionally infected with blood borne pathogens.

Standard Safe Microbiological Practices

To ensure safety and prevent exposure to biological hazards in BSL-2 laboratories, the following foundational microbiological practices must be strictly observed:

1. **Controlled Access**
   Access to the laboratory is restricted while work is being conducted. Doors must remain closed during experiments and must not be propped open under any circumstances.
2. **Surface Decontamination**
   Laboratory work surfaces must be disinfected at least once daily and immediately following any spills involving biohazardous materials.
3. **Waste Decontamination**
   All waste materials—both liquid and solid—that have been contaminated must be properly decontaminated prior to disposal in accordance with institutional and regulatory guidelines.
4. **Use of Mechanical Pipetting Devices**
   Only mechanical pipettes are permitted. Mouth pipetting is strictly forbidden.
5. **Prohibited Activities**
   Eating, drinking, smoking, chewing gum or tobacco, and the application of cosmetics or contact lenses are strictly prohibited within the laboratory environment.
6. **Hand Hygiene**
   Personnel must wash their hands thoroughly before and after handling biohazardous materials, and upon entering or exiting the laboratory.
7. **Aerosol Minimization**
   All procedures must be executed with care to reduce the generation of aerosols and splashes that could lead to contamination or exposure.

Laboratory Clothing Requirements

To maintain biosafety and prevent contamination in BSL-2 laboratories, the following clothing and personal protective equipment (PPE) protocols must be followed:

1. **Lab Coats and Gloves**
   Laboratory coats and disposable gloves are mandatory within the BSL-2 laboratory. These items must remain within the laboratory and are not to be worn in non-laboratory areas such as hallways, break rooms, or galleys.
2. **Minimum PPE Standards**
   At a minimum, all personnel must wear a lab coat, disposable gloves, safety goggles, and a protective mask while conducting work in the laboratory.
3. **Hair Restraint**
   Long hair must be securely tied back or covered with a hairnet to prevent visual obstruction and to avoid contamination of the work area.

Material Handling

To prevent contamination and ensure safe material transfer within and outside the BSL-2 laboratory, the following protocols must be observed:

1. All contaminated materials intended for removal from the laboratory must be securely bagged and kept outside the lab area.
2. The transport of all materials into and out of the laboratory must occur via the designated transfer chamber provided within the BSL-2 facility.
3. Prior to being placed in a biological safety cabinet or removed from the lab, all containers and equipment must be disinfected using a 70% ethanol solution or an approved alternative disinfectant.

Special Practices

The following specialized practices are mandatory for maintaining biosafety and regulatory compliance in BSL-2 laboratories:

1. Biohazardous waste must be placed in sealed, leak-proof containers before being transported to other areas for decontamination.
2. Laboratory access is restricted while experiments are in progress. Children, pregnant individuals, and those who are immune-compromised are not permitted entry. Final authority over access rests with the lead laboratory personnel.
3. Only individuals who have been informed of the associated risks and who meet the specified entry criteria are permitted access to BSL-2 laboratories, as determined by supervisory staff.
4. Laboratory doors, equipment, containers, and materials must display appropriate biohazard signage. The main entrance must include the name of the responsible supervisor and clearly state any special entry requirements (e.g., PPE, respiratory protection).
5. All laboratory-generated waste must undergo appropriate decontamination procedures prior to final disposal.

6. Gloves must be worn for all procedures conducted in biological safety cabinets and when handling reagents or chemicals in the BSL-2 lab. Used gloves must be discarded as biohazardous waste.
7. Any spills, accidents, or suspected exposures to biohazardous materials must be reported immediately to the lab supervisor or designated safety officer.
8. The use or transport of human-derived materials—such as blood, tissues, or primary cells—must be pre-approved by the laboratory supervisor. A special set of rules apply for these types of work.
9. A safety and operations manual detailing known and potential hazards, along with mitigation procedures, is posted on the inner side of laboratory doors. Personnel are required to review this document and follow all outlined safety protocols.

Containment Equipment

To ensure safe handling of biohazardous materials and to minimize exposure risks, the following equipment-related practices must be followed in BSL-2 laboratories:

1. All high-risk procedures—including centrifugation, blending, vigorous mixing or shaking, opening containers containing biohazards, and handling human or animal-derived tissues or fluids—must be conducted inside a certified Class II Biological Safety Cabinet or using appropriate personal protective equipment (PPE).
2. All sharp items such as needles, glass slides, coverslips, and microchips must be disposed of in designated biohazardous sharps containers to prevent injury and contamination.

Spill Response Procedures

Proper spill response is critical for preventing contamination and exposure. The following procedures apply based on the severity and nature of the spill:

1. **Minor Spills (≤ 50 mL, Low Concentration)**
    - **Immediate Action:** Notify other lab personnel of the spill.
    - **Disinfection:** Wearing gloves, spray the affected area with a 10% bleach solution.
    - **Absorption:** Cover the spill with absorbent paper and allow the disinfectant to act for 15 minutes.
    - **Clean-Up:** Wipe the area with fresh absorbent paper and dispose of it in regular waste.
    - **Residue Removal:** Use 70% ethanol wipes to remove bleach residue.
    - **Final Step:** Dispose of gloves in a biohazardous waste container and wash your hands thoroughly.

2. **Major Spills (> 50 mL, High Concentration, or Aerosol Risk)**
    - **Initial Action:** Immediately spray the spill area with a 10% bleach solution (full strength if necessary).
    - **Notification:** Alert everyone present and exit the lab.

- **Emergency Response:** Contact CSIR-CGCRI safety personnel without delay. Emergency contact numbers are posted on lab doors.
- **Ventilation Control:** Air circulation systems may need to be shut down and full-room disinfection initiated by trained personnel.

3. **Contaminated Instrument Decontamination**
    - **Preferred Method:** Autoclaving is the recommended method for sterilizing contaminated instruments.
    - **Alternative Method:** Instruments may also be decontaminated using a 10% bleach solution with a minimum contact time of 10 minutes. Any remaining bleach residue should then be removed using 70% ethanol wipes.

Biohazardous Waste Disposal

Proper disposal of biohazardous materials is essential for maintaining laboratory safety and environmental compliance. The following procedures must be observed:

1. All personnel must review and follow the waste management procedures outlined in the divisional **"Biosafety Manual"**, which is available within the laboratory.
2. Biohazardous waste bags or containers must be replaced when they reach two-thirds (⅔) of their capacity. Securely tie the top of the filled bag, replace it with a new one, and transport the full bag to the designated autoclave room.
    - **Leakage Prevention:** If there is a possibility of leakage, double-bag the waste to prevent contamination during transport.
    - **Post-Autoclaving:** Once autoclaving is complete and the materials have cooled, the treated waste may be disposed of with regular trash, in accordance with local regulations.
3. Full sharps containers designated for biohazardous waste must also be autoclaved prior to final disposal.

Emergencies/Injuries

1. For emergencies and urgent medical needs, Call CSIR-CGCRI Security Office immediately.
2. Contact in-charge of the research or the contact person from the "Door Post" and report the incident.
3. You may also send an email to vamsiballa@cgcri.res.in or sbodhak@cgcri.res.in or contact Dr. Subhadip Bodhak, Mobile: 8910902562 for further clarification or suggestions.

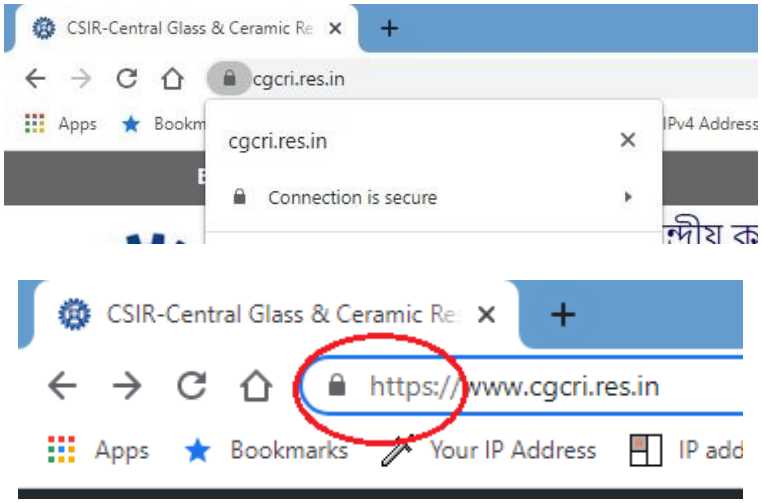
9. Cyber security

With the advent of Information Technology, it is nearly impossible to run any organisation without computers and the Internet. This has given rise to incidents of cyber fraud/crimes. Cybercrime refers to any illegal activity that involves the use of a computer, a networked device, or a network.Cases of identity theft, malware attacks, ransomware attacks, copyright infringements, theft and sale of

organisational data, cyber spying are not unheard of anymore. Cybersecurity is the protection of computer systems and networks from these cyber crimes.It is true that modern technology eases our lives but it is also the responsibility of a user to update themselves with these technologies from time to time and take preventive measures. Some safety tips are listed below:

DOs

- Create strong passwords that are at least eight characters long using uppercase letters, lowercase letters, numbers, and special characters.
- Avoid creating common passwords such as your name, DOB, family member's names, address etc.
- Use unique passwords for each of your accounts to ensure that, in the event one password is compromised, your other accounts remain secure.
- Change passwords every 45 days.
- Ensure that your passwords or passphrases remain confidential. Refrain from sharing them with others or recording them in written form.You are responsible for all activities associated with your credentials.
- Perform regular backups of important data and maintain an offline backup of your critical data.
- Download and install open-source software only from online sources you trust. Further, use authorized and licensed software only.
- Close windows displaying pop-up advertisements or unexpected warnings by selecting the 'X' button located at the top-right corner of the window, rather than clicking anywhere within the window itself. To minimize future interruptions, enable pop-up blocker settings in the web browsers on both your computer and mobile devices.
- Install enterprise antivirus client offered by the Institute on your official desktops/laptops. Ensure it is regularly updated with the latest virus definitions, signatures, and security patches.
- Ensure that your operating system and BIOS firmware are consistently updated with the latest patches and security updates.
- All portable media such as USB drives and DVDs must be scanned for malware.
- Educate yourself about phishing scams and remain highly vigilant toward emails, phone calls, and flyers. Attackers often impersonate trusted individuals or organizations to deceive recipients into revealing credentials, clicking malicious links, or opening attachments that may infect systems with malware, trojans, or zero-day exploits—potentially resulting in ransomware attacks.
- Disable GPS, bluetooth, NFC and other sensors when you don't need it. Devices can be hacked via these features and subsequently your private information can be stolen.
- Ensure your internet connection is secure by utilising a trusted VPN service.
- Use a standard (non-administrator) user account when performing routine tasks on your computers or laptops to minimize security risks.
- While performingonline purchases, bankingor paying bills online, check if the website's URL begins with 'https' instead of 'http'. Also, look for the padlock icon, which indicates that the connection is secure and encrypted.



- Make online purchases only through secure websites that provide encrypted connections, as you will be required to enter sensitive information such as credit card or bank account details—data highly targeted by cybercriminals.
- Avoid storing your credit or debit card information on websites or within web browsers to reduce the risk of unauthorized access.
- Exercise caution when clicking on shortened URLs (e.g., tinyurl.com/ab534), as they may obscure the destination and potentially lead to malicious sites.
- Be vigilant when opening links received via SMS or social media, especially those accompanied by enticing offers, discounts, or news claims, as they may redirect to phishing or malware-infected websites that could compromise your device.
- Maintain awareness of your surroundings when handling sensitive information by printing, copying, faxing, or discussing it. Collect printed or faxed documents promptly to prevent unauthorized access.
- Enable two-factor or multi-factor authentication wherever possible to add an extra layer of security beyond standard password protection.
- Store your data and files on a secondary drive (e.g., D:) to ensure better organization and protection.
- Before leaving the office, ensure that your computer and printers are properly shut down to safeguard information and equipment.
- Setup unique passcodes for shared printers.
- Download applications only from official app stores such as Google Play Store (for Android) and Apple App Store (for iOS). Prior to downloading, verify the app's popularity and review user feedback. Exercise caution when installing apps with poor reputations or a limited user base.
- Follow the security advisories issued by NIC-CERT and CERT-In to stay informed about current threats and best practices.
- Always log out of your online accounts after use, particularly when accessing them from public or shared computers, to protect your information.
- Always use Uninterruptible Power Source (UPS) for running a computer as it not only protects unsaved data from getting lost during a power outage but also protects the system from crashing during lightning to certain extent.
- Immediately report any suspicious emails or security incidents to the IT Department.

DON'Ts

- Never select the "Remember My Password", 'Keep me logged in' or 'Remember me' option on a shared or an unlocked computer.
- Do not record passwords, IP addresses, or any other sensitive information on unsecured materials such as sticky notes.
- Avoid posting private or sensitive information—including credit card numbers and passwords—on public websites or social media platforms. Additionally, do not send such information via email unless you have proper authorization. Utilize privacy settings on social media to restrict access to your personal data.
- Do not leave your device unattended without a screen lock or logging out.
- Never reply to e-mails requesting financial or personal information. Avoid making financial transactions in an unsecure network and public WiFi.
- Do not connect personal and unsecured devices to Institute's LAN.
- Do not install peer-to-peer (P2P) file-sharing programs, such as µTorrent, which may facilitate the illegal download of copyrighted content.
- Do not install and/or use pirated copies of software and Operating Systems.
- Do not upload or store any internal, restricted, or confidential government data on non-government cloud services (e.g., Google Drive, Dropbox).
- Avoid using third-party anonymization services such as NordVPN, ExpressVPN, Tor, proxies, or similar tools.
- Refrain from installing third-party toolbars (e.g., download managers, weather toolbars, AskMe toolbar) in your web browser.
- Don't use any unauthorized remote administration tools (ex: Teamviewer, Ammyy Admin etc.)
- Do not use unauthorized third-party video conferencing or collaboration tools for conducting sensitive internal meetings and discussions.
- Avoid using external email services for official communications.
- Refrain from using external mobile app-based scanning services (e.g., CamScanner) to scan internal government documents.
- Do not utilize external websites or cloud-based services for converting or compressing government documents (e.g., Word to PDF conversion or file size reduction).
- Avoid accessing inappropriate websites or any sites whose security and content you are uncertain about.
- Disable automatic file and media sharing and download as far as possible.
- Don't jailbreak or root your mobile phone as it disables some of the built-in security features of the operating system.

10. LASER Safety:

LASER, an acronym for *Light Amplification by Stimulated Emission of Radiation,* is a crucial tool in modern scientific laboratories. Many machines incorporate lasers either as integral components or as standalone instruments. The primary characteristics that distinguish lasers are their monochromatic

nature and coherence. Additionally, with proper collimation, laser light can travel long distances with minimal beam divergence, setting it apart from regular light sources.

Lasers are categorized based on several factors, including nature laser active medium (solid state, Excimer, Dye, Gas and Diode based), average power (low, medium, or high), operating wavelength (UV-Vis, IR, or NIR), mode of operation (continuous-wave [CW] or pulsed), and beam quality (single-mode or multimode). They are widely used across diverse fields such as modern science, biomedical research, industrial applications, and strategic sectors.

Laser Safety Guidelines for High-Power Laser Labs

Adhering to stringent safety protocols is essential when working with high-power lasers to ensure the safety of personnel and equipment. Below are the recommended measures for maintaining a safe laser-controlled environment:

1. **Authorized Access and Documentation**
    - Maintain an authorized *Laser User Notebook* for high-power laser labs.
    - Strictly follow the user manual during all laser operations.
2. **Warning Systems and Access Control**
    - Ensure that "LASER ON" warning lights are activated whenever the laser is in use.
    - Install a door interlock system to restrict access to the high-power laser lab, preventing unauthorized personnel from entering the controlled area.
    - Display appropriate laser warning signs prominently at all entrances to the lab.

3. **Workspace Safety**
    - Remove all objects that could interfere with the beam path or pose a hazard.
    - Be vigilant about specular and diffuse reflections that could redirect laser beams unpredictably.
4. **Personal Safety Measures**
    - Use appropriate protective eyewear designed for the laser's specific wavelength and Optical Density (OD).
    - Ensure adequate skin protection against potential laser exposure.
    - Remove jewellery, ties, and any loose or dangling clothing or objects.
    -

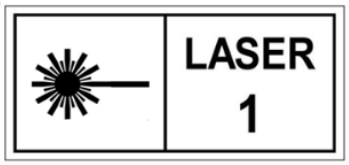
5. **Pre-Operation Checks**
    - Double-check all safety systems and confirm their functionality before powering on the laser.
    - Turn the key control switch to the “ON” position and follow the manufacturer’s recommended procedures for operation.
6. **Beam Alignment and Control**
    - For invisible laser beams, use suitable devices like IR viewers or alignment cards to locate the beam.
    - Operate the laser at the lowest possible power level during beam alignment.
    - Use beam blocks or protective barriers to prevent stray beams from entering uncontrolled areas.
    - Employ shutters or beam blocks behind optics to ensure stray beams do not escape during alignment.
7. **Beam Path Management**
    - In high-power application, proper precaution should be taken to terminate all beams and reflections.
    - Maintain the beam path above or below eye level for both standing and sitting positions.
    - Enclose the laser in a protective housing to minimize exposure risks.
8. **Control Mechanisms and Barriers**
    - Use a master switch (key or coded access) to control the initiation and termination of the laser beam.
    - Install viewing windows and diffuse display screens to keep radiation levels below the Maximum Permissible Exposure (MPE) limit.
    - Utilize visible or audible warning devices, such as a single red light on the laser or control panel, to indicate the laser is active.
    - Ensure the warning light signal is visible through protective eyewear.
    - Use black curtains, screens, or blocking barriers to prevent the laser beam from exiting the controlled area.
9. **Operation Restrictions and Supervision**
    - Repairing and maintenance of Class 3B and Class 4 lasers should be performed only by trained and authorized personnel.
    - Spectators are permitted in the laser-controlled area only with the explicit approval of the laser supervisor.

By following these safety measures, laser-related risks can be minimized, creating a safer working environment for all personnel.

Classifications of Lasers and their safety:

Class 1:

This type of Lasers is safe since they are either have very low power or they are enclosed completely which cannot be accessed at normal condition.



Class 1M

Laser products operating within the wavelength span of 302.5 nm to 4000 nm, with output levels exceeding the standard limits for Class 1 laser products, are classified as Class 1M. These lasers are considered safe for normal use due to their low power density and compliance with Class 1M measurement standards.

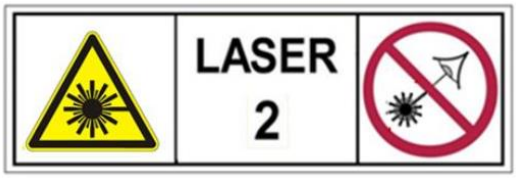
However, they can become hazardous if their beams are viewed through collimating optical instruments, such as binoculars or telescopes, which can concentrate the beam and significantly increase its intensity. Appropriate safety measures should be implemented to mitigate this risk.

Class 1C

Instrument or product specifically intended for direct contact with the skin or tissue, where ocular hazards are mitigated through engineering safeguards, is classified in this category. These safeguards ensure that the accessible emission is either clogged or abridged to below the Class 1 accessible emission limits when the instrument/product is detached from contact with the skin or tissue, thus preventing any potential eye hazards during operation.

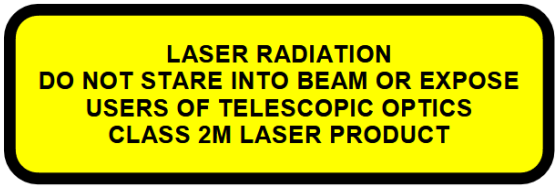
Class 2

Lasers that operate in the visible region (400-700 nm) with output levels below the Class 2 accessible emission limit (AEL), are considered safe for accidental viewing. The eye's natural aversion responses, such as the blink reflex, provide sufficient protection against potential hazards.



Class 2M

1. Any instrument or product using Class 2M generally operate in the visible region (400-700 nm) whose total output can cross the limits typically allowed for Class 2 lasers, but operating at low power level, are considered harmless for accidental viewing during regular routine use. These lasers comply with the measurement conditions for a Class 2M product. Nonetheless, they can pose a risk to the eyes under certain conditions if some optics are used to view them directly. Under these circumstances, eye protection is necessary to prevent potential harm.



Class 3R

In Class 3R Lasers, laser light emitting in the wavelength range of 180 nm to 1 mm pose a potential hazard for direct intrabeam viewing, though it exhibits less damage compared to that of Class 3B lasers. These lasers are subject to fewer manufacturing requirements and can be used with lesser stringent precautionary measures compared to class 3B lasers. Conventionally AEL for these lasers is 5 times compared to Class 2 laser operating at visible wavelengths more than 5 times than Class 1 operating in other wavelengths.

Class 3B

This particular class of lasers are generally hazardous under direct intrabeam exposure, specifically if the distance is less than the Nominal Ocular Hazard Distance (NOHD) or radiant exposure exceeds the Maximum Permissible Exposure limits are known as Class 3B lasers. However, viewing diffuse reflections is generally considered safe.

Class 4

This class is the most hazardous one and beyond AELs of class 3B that can produce hazardous diffuse reflections leading to skin injuries, a fire hazard, can produce hazardous fumes along with harmful hazard to the eyes. Accordingly using class 4 laser needs extreme attention.

Values of AELs:

For He-Ne lasers operating at 633 nm in CW mode with narrow beam the AELs values are as follows and can be typically apply to any other laser operating in the visible range (400-700 nm):

- For class 1 and 1M: Power is ~ 0.39 mW
- For class 2 and 2M: Power is ~ 1 mW
- For class 3R: Power is ~ 5 mW
- For class 3B: Power is ~ 500 mW

The potential hazards other than optical hazards are as follows:

• **Electrical Hazards** – High voltages and capacitors associated with pulsed lasers can pose significant risks, particularly during maintenance and servicing.

• **Radiation Hazards** – These involves x-rays, ultraviolet (UV), radiofrequency (RF), visible, and infrared (IR) radiation.

• **Fume Hazards** – Some fumes can form from burning of chemicals or other during surgery.

• **Fire and Explosion Hazards** – This is caused by Class-4 lasers only.

• **Mechanical Hazards** – Risks include handling gas cylinders, tripping on trailing cables or cuts from sharp objects.

• **Noise Hazards** – Some lasers, especially pulsed or air-cooled models, can generate loud noise, including from discharging capacitor banks.

11. Activities of CSIR-CGCRI security

Security Section of CSIR-CGCRI is headed by the Security Officer and assisted by one Security Assistant. Both the persons are telephonically connected for 24 hrs. Apart from regular office hours, they are available even in odd hours for patrolling or to attend other emergent situations. Security Supervisors and Security Guards are functioning directly under the command of Security Officer and Security Assistant. Security Supervisors and Guards are deployed at CSIR-CGCRI for 24 hours at their respective posts in 8 hours rotational shift. Security guards are performing their duties round the clock under the direct mandate given by the Security Supervisors. At CSIR-CGCRI, currently the strength of Security Supervisors is 03 and the strength of Security Guards is 19. Each shift consists of 5-6 Security Guards and one Security Supervisor.

From the aspect of physical security of CSIR-CGCRI, all the strategic locations of the Institute are covered under CCTV surveillance system. It has got strong gates, concrete perimeter wall with concertina wire on the top. The pedestrian entry gate is protected with Door frame metal detector. Security guards are equipped with hand held portable walkie- talkie sets, hand-held metal detectors and also with the under- vehicle search mirror. For protection from fire, smoke detectors are installed at different laboratories. Fire alarm has been installed at the Main gate Security kiosk of this Institute. Fire trainings are organized frequently for the employees and students of the Institute by the Security staff. To handle any unforeseen events or natural calamities, the essential phone numbers are provided at the security kiosk. A Safety and Security and Disaster Management Committee headed by a Chief Scientist has been constituted and is functioning to enhance the Safety and Security standards of the Institute.

APPENDIX A: IMPORTANT TELEPHONE NUMBERS (For CSIR-CGCRI Kolkata)

CSIR-CGCRI EMERGENCY EPBAX EXTENSION NUMBERS:

Security Officer: 3356

Engineering Services: 3247/3336

Electrical: 3211

Main Gate: 3353

Chairman SSDM Committee: 3252

Safety Officer: 3213

SIRSA Security Post: 8436029810

SIRPA Security Post: 7797049995

Emergency Vehicle: 9007917847

APPENDIX B: LIST OF HAZARDOUS CHEMICALS

Following is a list of some hazardous chemicals used at CSIR-CGCRI. Please exercise due caution while working with these. Also please note that this list is only an indicative one and not comprehensive. Always consult the MSDS before handling any new chemical.

- Aluminum phosphide
- Arsenic pentoxide
- Arsenous oxide
- Arsenous trichloride
- Arsine
- Boron trichloride
- Boron trifluoride
- Boron trifluoride compound with dimethyl ether (1:1)
- Bromadiolone
- Bromine
- Cadmium oxide
- Cadmium stearate
- Calcium arsenate
- Carbon disulfide
- Chloroacetic acid
- 2-chloroethanol
- Chloroform
- Chloromethyl ether
- Chloromethyl methyl ether
- Chromic chloride
- Cobalt carbonyl
- Diborane
- Diethyl chlorophosphate
- Dimethyl phosphorochloridothioate
- Formaldehyde
- Formaldehyde cyanohydrin
- Formetanate hydrochloride
- Gallium trichloride
- Hexamethylenediamine, N,N'-dibutyl-

- Hydrazine
- Hydrocyanic acid
- Hydrogen chloride (Hydrochloric Acid)
- Hydrogen fluoride (Hydrofluoric Acid)
- Hydrogen peroxide (conc > 52%)
- Hydrogen selenide
- Hydrogen sulfide
- Hydroquinone
- Manganese, tricarbonyl methylcyclopentadienyl
- Mercuric acetate
- Mercuric chloride
- Mercuric oxide
- Methyl bromide
- Methyl chloroformate
- Methyl hydrazine
- Methyl isocyanate
- Methyl isothiocyanate
- Methyl thiocyanate
- Methyl vinyl ketone
- Nickel carbonyl
- Nitric oxide
- Nitric Acid
- Nitrobenzene
- Nitrocyclohexane
- Nitrogen dioxide
- Peracetic acid
- Phenol
- Phenol, 2,2'-thiobis(4-chloro-6-methyl)-
- Phenol, 3-(1-methylethyl)-, methylcarbamate
- Phenylhydrazine hydrochloride
- Phenylmercury acetate
- Phosphonothioic acid, methyl-, O-ethyl O-(4-(methylthio)phenyl) ester
- Phosphonothioic acid, methyl-, S-(2-(bis(1-methylethyl)amino)ethyl) O-ethyl ester

- Phosphonothioic acid, methyl-, O-(4-nitrophenyl) O-phenyl ester
- Phosphoric acid, dimethyl 4-(methylthio)phenyl ester
- Phosphonothioic acid, O,O-dimethyl-S-(2-methylthio) ethyl ester
- Phosphorus
- Phosphorus oxychloride
- Phosphorus pentachloride
- Phosphorus trichloride
- Physostigmine, salicylate (1:1)
- Potassium arsenite
- Potassium cyanide
- Potassium silver cyanide
- Selenious acid
- Semicarbazide hydrochloride
- Silane, (4-aminobutyl)diethoxymethyl-
- Sodium arsenate
- Sodium azide
- Sodium cacodylate
- Sodium cyanide
- Sodium fluoroacetate
- Sodium pentachlorophenate
- Sodium selenate
- Sodium selenite
- Sulfur dioxide
- Sulfur tetrafluoride
- Sulfur trioxide
- Sulfuric acid
- Tellurium
- Tellurium hexafluoride
- Thallium sulfate
- Thiocarbazide
- Thiophenol
- Thiosemicarbazide
- Thiourea, (2-chlorophenyl)-
- Thiourea, (2-methylphenyl)-

- Titanium tetrachloride
- Toluene 2,4-diisocyanate
- Toluene 2,6-diisocyanate
- Trans-1,4-dichlorobutene
- Trichloro(chloromethyl)silane
- Trichloro(dichlorophenyl)silane
- Trichloroacetyl chloride
- Trichloroethylsilane
- Trichlorophenylsilane
- Triethoxysilane
- Trimethylchlorosilane
- Trimethylolpropane phosphite
- Trimethyltin chloride
- Vinyl acetate monomer
- Zinc phosphide

APPENDIX C: INCIDENT REPORT FORM

CSIR-Central Glass & Ceramic Research Institute
196,Raja S.C.Mullick Road,Kolkata-700032
West Bengal,India

INCIDENT REPORT

INSTRUCTION:

1. It is mandatory to use this form while reporting any accidents or incident at work place as soon as possible, but not later than 24 hours.
2. Examples of accidents/incidents include but not restricted to: safety alarm triggers (true and false alarms); chemical spills; accidents involving humans or equipment; explosions; fires; gas-leaks; arcing; unauthorized access.; major damage in civil and electrical infrastructure
3. All incident reports must be sent to Conveners/ Chairman of Safety, Security and Disaster Management Committee (SSDM) with a copy to Head, ESD and Security Officer.
4. Incident reports will be kept confidential, unless mandated otherwise by law or Institute administration.
5. On receipt of incident report, investigation will be performed to implement corrective actions.

1.	**Name of R&D Division / R&D Support Division / Administration**				
2.	**a. Name of person reporting the incident:**				
	b. Name of witnesses:				
3.	**Date and time of the incident:**				
4.	**Place of occurrence:**				
5.	**Brief details of the incident:**				
6.	**Type of incident** *(check what is applicable)*	Fire/Smoke		Gas leakage	
		Accident		Explosion	
		Chemical/ acid spillage		Other	
7.	***Was anybody injured***	Yes ☐	No ☐		
8.	*If yes, was first aid/medical treatment provided*	Yes ☐	No ☐	Not required ☐	
9.	***Any Damage*** *In Brief, If Yes :-*	Yes ☐	No ☐		
10.	**Current Status** (Is the e*vent resolved or is still activd?)*				

ROOT CAUSE:

Human Error	Environment	Machines/Equipment	Methods
☐ Poor communication	☐ Heavy rain	☐ Poor maintenance	☐ Lack of policies or procedure
☐ Lack of skill/knowledge	☐ Pest infestation	☐ Malfunction	☐ Lack of training
☐ Lax attitude	☐ Lightning	☐ Insufficient capacity or incorrect usage	☐ Lack of structured safety planning
☐ Lack of team spirit	☐ Natural disaster	☐ Poor design	☐ Lack of periodic oversight/verification
☐ Poor management and oversight	☐ Excessive vegetation	☐ Subsystem failure	☐ Failure to follow procedures
☐ Lack of ownership	☐ Flooding	☐ Lack of safety infrastructure	
☐ Fatigue, stress, etc.		☐ Obsolence	

Divisional Safety Champion / Witnesses **Person reporting the incident**

Head of Division/Section

List of Emergency Contact numbers

- **Police:** 112
- **Fire Brigade:** 101
- **Medical Helpline:** 108
- **Senior Citizen Helpline:** 14567
- **Child Helpline:** 1098
- **Women Helpline:** 1090
- **Traffic Helpline:** 103
- **Tourism Helpline:** 1363
- **Electricity Helpline:** 1912
- **Centralized Emergency Helpline:** 112

The **112** number is a unified emergency helpline introduced in India to provide a single point of contact for all emergency services, including police, fire, and medical assistance **.**

APPENDIX D: INVESTIGATION REPORT FORM

CSIR-Central Glass & Ceramic Research Institute
196,Raja S.C.Mullick Road,Kolkata-700032
West Bengal,India

SSDM INVESTIGATION REPORT

INSTRUCTIONS:

1. Use this form for investigation against accidents/incidents/near misses.
2. Divisional Safety champions/ PIs, victims and eye witnesses should be present with SSDM officers on the incident site during investigation.
3. All Investigation reports must be sent to dept. safety champion /Concerned PIs either by email /hard copy
4. Investigation reports will be kept confidential, unless mandated otherwise by law or Institute administration.

Details

1	Name of the division	
2	Date and time of the incident	
3	Date of Investigation	
4	Location	
5	Nature of incident *(check what is applicable)*	a) Violation b) Alarm c) Accident d) Other
6	Investigation performed by	
7	Was anyone injured	Yes ☐ No ☐
8	Was Medical treatment provided	Yes ☐ No ☐ Not required ☐
9	*Any Damage* *In Brief, If Yes :-*	Yes ☐ No ☐
10	Current Status (*Event is still active or resolved?)*	
11	Observations of SSDM incident site during investigation	
12	SSDM Recommendations	

Brief Description of the Event

With a reasonably detailed event timeline

Action Taken by the division

Persons responsible for action against SSDM recommendations

Root Cause

What caused the event?

Investigation performed by

Appendix E: Personal Protective Equipment

CSIR-Central Glass & Ceramic Research Institute
196,Raja S.C.Mullick Road,Kolkata-700032
West Bengal,India

General Guidance on Personal Protective Equipment (PPE)

1 Generic classification of the common hazards

This document provides basic guidelines for the use of personal protective equipment (PPE) when working in laboratories at CSIR-CGCRI with one or more of the following occupational hazards:

i) Chemical hazards such as labs having chemicals, acids or gases;
ii) Laser radiation hazard;
iii) Electrical hazards such as high-voltages;
iv) Radiation hazards such as X-rays and/or radio-active material.
v) Biological hazards such as infectious molecules/organisms, blood samples, etc.
vi) Mechanical hazards such as in a mechanical workshop that involves material machining processes including turning, milling, drilling, sharp object, rotating equipment etc.; and
vii) High Temperature Hazard like Process involving furnace operation.

2 Minimum Laboratory PPE

When working in laboratories with at least one of the hazards listed in Section 1, SSDM recommends that the following minimum PPE be worn at all times.

Body Area	PPE
Eyes/face	Safety Glasses, face shield
Hands	Disposable thin-nitrile gloves. Avoid latex since it is permeable and allergic. High temperature gloves for high temperature process.
Body	Long pants or equivalent leg covering (no shorts). **Synthetic clothing not allowed when working with any fire hazard.**
Hair	**Tied Hair:** No loose long-hair anytime. All long beard and hair should be properly tied or covered.
Feet	Close toed shoes: Laboratory footwear should fully cover the feet. **No sandals or flip flops**.
Body	**Lab apron:** To protect body from acid or chemical.
Mouth	**Mask:** Chemical, powder, dust etc.

	Task	Potential Consequence	Additional PPE
1.	Working with equipment that exposes users to pressures >2 bar or vacuum <400 mmHg requires caution. Examples include: - Pressurized gas nozzles - High-pressure systems - Vacuum chambers	1. Skin damage 2. Eye damage 3. Implosion	**Face Protection** When working with equipment that poses implosion or explosion risks, wear a face shield if no other protective barrier is present. For additional guidelines on compressed gas safety, refer to Section 9.
2.	When working with high-temperature equipment or objects, take necessary precautions to prevent burns and injuries.	1. Burns 2. Fire 3. Splash	Personal Protective Equipment (PPE) for High-Temperature Work When working with high temperatures, wear: • Gloves: Suitable for the working temperature • Handling Hot Objects (>50°C): Use an extra set of thermal gloves for direct handling • Body Protection: Lab coat or apron suitable for the working temperature
3.	Working with inert cryogens (He, Ar, N_2, etc.)	• Frostbite • Eye damage • Hypoxia in confined spaces	Cryogenic Safety Precautions **For ≤ 10 Liters:** 1. Body: Lab coat or apron 2. Eyes: Safety goggles 3. Hands: Inner disposable nitrile gloves + outer insulated cryogenic gloves (when handling objects exposed to cryogens) **For ≥ 10 Liters:** 1. Eyes: Safety goggles 2. Face: Face shield 3. Hands: Inner disposable nitrile gloves + outer insulated cryogenic gloves 4. Body: Lab coat or cryogenic apron **Additional Precaution:** - Use only in well-ventilated areas to prevent gas buildup. Proper PPE and ventilation help prevent cryogenic-related injuries.

3 Additional PPE for Specialized Laboratories

In sections 4 to 10, PPE for specialized laboratories and/or situations are listed out with respect to certain common tasks expected in laboratories at CSIR-CGCRI. The PPE prescribed in sections 4 to 10 is in addition to the minimum PPE suggested in section 2. Any task that is not listed here does not necessarily mean that it is safe to perform without PPE. When in doubt, users are encouraged to use their judgement and follow best practices. Always err on more PPE!

4 PPE for General Safety

	Task	Potential Consequence	Additional PPE
4.	Working at Elevated Locations	1. Fall and subsequent injury	**When working at heights: ≤ 3m** - Use ladders with a stable base - Avoid using ad-hoc platforms, stools, or chairs as substitutes for ladders - Ensure proper ladder safety protocols are followed to prevent falls and injuries. **When working at heights : > 3m** 1. Safety harness 2. Hard-toed safety shoes 3. Hard safety hat/ safety helmet.
5.	**Falling Object Hazards**	1. Serious or fatal injuries to head and other body parts.	1. Safety helmet/ Safety-hat. 2. Hard-toed safety shoes
6.	High-speed machinery	1. Entangled hair. 2. Possibility of flying scrap or high speed particles	1. Tie long hair in a bun or use hair-nets. 2. Hard-toed safety shoes 3. Use of Safety Goggles

5 PPE for Chemical Safety

	Task	Potential Consequence	Additional PPE
1.	Working with solids of low hazard	1. Skin damage 2. Eye damage	Minimum PPE as described in section 2

2.	Working with moderate hazard chemicals, small volumes (<100 ml.).	1. Skin damage 2. Eye damage	Minimum PPE as described in section 2
3.	Working with moderate hazard chemicals (moderate volumes (<4000 ml.).	1. Skin damage 2. Eye damage	1. Eyes: Safety goggles 2. Body: Chemical resistant apron or Lab Coat.
4.	Working with moderate hazard chemicals, large volumes (>4 litres).	1. Skin damage 2. Eye damage 3. Splash	1. Eyes: Safety goggles 2. Face: Face shield 3. Hands: Disposable chemical-resistant gloves (thick) as a second layer of protection 4. Body: Chemical-resistant apron or lab coat
5.	Working with high hazard chemicals E.g. corrosive (acids or caustics) or hazardous materials that may splash.	1. Skin damage 2. Eye damage 3. Splash 4. Toxic 5. Inhalation	1. Eyes: Safety goggles 2. Face: Face shield (if quantity > 4 liters or splash hazard) 3. Hands: Disposable chemical-resistant gloves (thick) as a second layer 4. Body: Chemical-resistant apron 5. Inhalation: Suitable face mask (if quantity > 4 liters or material is noxious)
6	Working with volatile solvents. E.g. • Ethanol, Isopropanol • Propylene • Oxide Xylene • Methanol • Chloroform • Phenol • Etc.	1. Skin damage 2. Eye damage 3. Fire	• Eyes: Safety goggles • Hands: Suitable chemical-resistant gloves (thin) • Nitrile for alcohols • Butyl for propylene oxide and xylene • Face: Face shield (if quantity > 4 liters or splash hazard) • Body: Lab coat or apron • Inhalation: Suitable face mask (if quantity > 4 liters or material is noxious)
7	Working with chemicals of acute toxicity e.g., hydrogen fluoride, hydrogen cyanide.	1. Inhalation 2. Skin damage 3. Eye damage 4. Toxic by skin	1. Eyes: Safety goggles 2. Face: Face shield (if quantity > 4 liters or splash hazard) 3. Hands: Chemical-resistant gloves (thick) as a second layer; use special gloves

		contact	designed for specific hazards 4. Body: Chemical-resistant apron 5. Inhalation: Suitable face mask (if quantity > 1 liter/kg or material is noxious)
8	Handling Long-Term Toxins like carcinogens, mutagens, nanoparticles, or other long-term toxins:	1. Inhalation 2. Skin damage 3. Eye damage 4. Toxic by skin contact	• Eyes: Safety goggles • Hands: Chemical-resistant gloves (appropriate for the chemical) • Body: Chemical-resistant apron • Face: Face shield (if quantity > 1 liter/kg or splash hazard) • Inhalation: Suitable face mask (if quantity > 1 liter/kg)
9	Handling Air or Water-Reactive Chemicals.	1. The sudden release of gases or energy 2. Chemical hazards associated with by- products.	PPE appropriate for the by-products. Face shield if there is a chance of splash or splatter.

6 PPE for Biosafety

	Task	Potential Consequence	Additional PPE
1	**Handling Biological Hazards**	Exposure to infectious material	Face: Face mask or shield Body: Lab coat or disposable gown/apron
2	**Working with Fixatives** like formalin or paraformaldehyde:	Exposure to fixative used to preserve the specimen. If tissue is fixed, there is no longer exposure to infectious material.	Eye: Safety goggles Hand: Impermeable glove suitable for preserved specimens Face: Face mask Body: Lab coat or Disposable gown

3.	**BSL-2 Precautions** When working with Risk Group 2 agents (recombinant DNA, cell lines, viruses, bacteria) requiring Biosafety Level 2 (BSL-2)	Risk Group 2 Agents Biological agents posing moderate infection risks through: - Injection - Skin exposure - Ingestion - Inhalation Examples include certain bacteria, viruses, and fungi. Handling these agents requires Biosafety Level 2 (BSL-2) precautions to minimize exposure risks.	1. Eye: Safety googles 2. Hand: Nitrile gloves 3. Face: Face mask 4. Body: Lab coat or Disposable gown
4.	BSL-2+ Precautions When working with Risk Group 3 agents in a BSL-2 facility with BSL-3 practices	Risk Group 3 Agents Biological agents posing moderate to serious infection risks through: - Injection - Skin exposure - Ingestion - Inhalation Examples include certain bacteria, viruses, and fungi that can cause severe diseases. Handling these agents requires Biosafety Level 3 (BSL-3) precautions to minimize exposure risks.	1. Eye: Safety goggles 2. Hands: Nitrile gloves (double) 3. Body: Lab coat + disposable gown that ties in back 4. Inhalation: Respiratory protection like N95 mask
5.	**BSL-3 Precautions**	Risk Group 4 Agents Biological agents posing serious or lethal infection risks through: - Injection - Skin exposure - Ingestion	• Eye: Safety goggles • Hands: Nitrile gloves (double) • Body: Full disposable coverall suit + head cover • Foot: Shoe cover • Face: N95or other triple-layered mask + Face shield.

		- Inhalation Examples include highly pathogenic viruses. Handling these agents requires Biosafety Level 4 (BSL-4) precautions and maximum containment to prevent exposure and transmission.	
6	**Working with Live Animals** (e.g., mice, rats, chicken eggs):	1. Animal bites. 2. Exposure to animal allergens. 3. Potential Staph &Strep exposure.	1. Animal bites: Restraints or bite-resistant gloves 2. Animal allergen: N95 respirator. 3. Eye: Safety goggles 4. Body: Lab coat or apron, Hair bonnet + gown 5. Foot: Shoe covers

7 PPE for Radiation Hazards

Radiation safety is managed by AERB (Atomic Energy Regulatory Board-a governmental regulatory agency). AERB appoints safety officers. All radiation-related work must be done under rules of AERB and with permission from AERB safety officers.

	Task	**Potential Consequence**	**Additional PPE**
1.	Working with sealed sources.	1. Exposure	1. Minimum PPE unless the dosage is above safe limits 2. TLD badges, if mandated by AERB safety officer
2.	Working with solid radioactive material or solid radioactive waste.	1. Cell damage 2. The potential spread of radioactive	1. Hands: Disposable nitrile or other impermeable gloves (double) 2. Face: N95 mask 3. Body: Lab coat or apron 4. TLD badges, if mandated by AERB safety officer

8 PPE for Lasers and Intense Light Sources

	Task	Potential Consequence	Additional PPE
1.	Using an open-beam laser of Class 3 or above in a setup that is not fully contained or interlocked.	1. Eye damage 2. Skin damage	1. Eye: Appropriate laser safety goggles/glasses with optical density based on individual beam parameters. 2. Skin: Fully covered arms and feet. Flame-resistance clothing. Avoid synthetics. 3. Avoid reflective jewelry.
2.	Working with intense light sources, infrared-emitting equipment, UV sources (<400 nm)	1. Eye damage 2. Skin-burn	1. Eye: Appropriate laser safety goggles/glasses with optical density based on individual beam parameters. 2. Skin: Fully covered arms and feet. Flame-resistance clothing. Avoid synthetics.

9 PPE for Compressed Gas Cylinders& Cryogens

	Task	Potential Consequences	Additional PPE
1.	Transport or handling of inert gas cylinders	1. Cylinder falling over 2. Breaking off the valves	1. Hand: Wear mechanically resistant-gloves when handling cylinders. 2. Foot: Closed-toed shoes
2.	Transport of handling of flammable gases	1. Cylinder falling over 2. Breaking off the valves 3. Fire or explosion due to a sudden release	1. Skin: Flame resistant antistatic safety clothing. 2. Hand: Wear mechanically resistant-gloves when handling cylinders 3. Foot: Closed-toed shoes.
3.	Toxic gases	1. Cylinder falling over 2. Breaking off the valves 3. Poisoning	Respiratory protection-Toxic gas mask or self-contained breathing apparatus

10 PPE for Electrical Safety

	Tasks	Potential Hazards	Additional PPE
1.	Maintenance and repairing electrically powered equipment	1. Electrocution	1. Hands: Insulated electrical gloves 2. Foot: Electrical safety shoes 3. Work: Only trained electrical technicians should perform electrical work
2.	High Voltage (> 400 V)	1. Electrocution 2. Arc flash	1. Body: Arc flash clothing (flame-resistant materials) 2. Hands and Feet: Electrical-rated gloves and steel-toe cap boots with rubber insulation 3. Head: Electrical-rated safety helmet 4. Tools and Procedures: Use specified electrical standard tools and switch off mains/incoming supply during maintenance/repair work

Appendix F: Emergency Response Plan

Safety, Security & Disaster Management (SSDM)

CSIR-Central Glass & Ceramic Research Institute
196,Raja S.C.Mullick Road,Kolkata-700032
West Bengal,India

Office of Laboratory Safety

POLICY OF CSIR-CGCRI: EMERGENCY RESPONSE PLAN (ERP)

This document serves as the official emergency response plan for CSIR-CGCRI, outlining step-by-step procedures for each actor to follow during a laboratory emergency.

Table of Contents

List of Emergency Contact numbers

- **Police :** 100
- **Fire Brigade :** 101
- **Ambulance :** 102
- **Medical Helpline :** 9830079999
- **Women Helpline :** 1091
- **Centralized Emergency Helpline :** 112

In India, the 112 number serves as a unified emergency helpline, providing a single point of contact for all emergency services, including police, fire, and medical assistance.

1.0 Introduction

In emergencies, every second counts. Delays can lead to loss of life and property. Please memorize and save the important numbers mentioned earlier for quick access.

1.1 What is an emergency response plan (ERP)?

An Emergency Response Plan (ERP) is a structured, step-by-step guide to managing emergencies, clearly defining roles and responsibilities for all participants. It addresses key questions: who, what, when, how, and where.

1.2 What is the scope of this document?

The Emergency Plan is designed to address lab emergencies and includes:

1. Standard operating procedures for emergency response
2. List of personnel responsible during emergencies
3. Sequence of actions for medical emergencies or injuries
4. List of infrastructure to be maintained by divisions and security

1.3 How should I prepare?

Response actions vary by role.

a) For lab users, who may be both victims and witnesses, it's crucial to understand these roles and, at a minimum, memorize emergency contact numbers. In Summary:

a) **Scientist or PI**: Scientists and Principal Investigators (PIs) are responsible for implementing safety protocols in their labs, including:

1. Personal Protective Equipment (PPE)
2. Proper storage and housekeeping
3. Clear signage
4. Stocking lab-specific safety items (spill kits, masks, gloves, gas detectors)
5. Developing a documented lab-specific emergency plan

This plan should be included in new user orientations, with regular refreshers recommended for existing users.

b) **Safety Champion (SC) or convener, member or HoD**: **First responders** may not be aware of specific hazards. During an emergency, they can contact divisional safety **champions** or the designated **convener**, **member**, or HoD for critical information.

c) **SSDM** must ensure division-level fire infrastructure is properly maintained, including:

1. Clear safety signage
2. Functional fire extinguishers
3. Operational fire alarm systems

d) **Security**: On-site security personnel and their supervisors are the first responders.They are the primary response team of the Institute. Security will conduct regular training to ensure their preparedness.

1.4 Good Practices

a) **Familiarize yourself with your surroundings by knowing:**
   - **i. The nearest exit**
   - **ii. The location of the nearest fire extinguisher**
   - **iii. The nearest safety shower and eyewash stations"**

b) **Display critical information to ensure preparedness:**
   - **i. Poster displaying emergency numbers in the lab**
   - **ii. Complete and display a hazard information sheet outside the lab**

c) **Know the Emergency Response Plan (ERP) and take personal responsibility to educate yourself:**
   - **i. Know the emergency contact sequence (who to call first, second)**
   - **ii. Understand procedures for self-injury response**
   - **iii. Be aware of protocols for responding to others' injuries**

d) **Stay vigilant and report any hazards or suspicious situations to ensure a safe environment**

1. Emergency Response Plan

	Who	Informed By?	When informed?	Immediately	Follow-up action(s)
1.	Victim	--	--	Call for help or Security	1. Try to remove yourself from the hazard 2. Use safety shower if needed. 3. Use eyewash station.
2.	Witness	--	--	Call Security OR Ambulance	1. If you can do so safely, help the victim/Onsite security guard. 2. Trigger alarm. 3. Guide first responder. 4. Call PI/Lab in-charge.
3.	On-site Security guard	Witness/ Victim	While waiting for first responders	Call Security In-charge	1. Trigger alarm. 2. Help victim. 3. Use fire extinguisher 4. Escort first responders
4.	Main gate (Security)	Witness or victim or on-site guard	Right after the incident.	[Critical injury]Call ambulance. [Non-critical injury] Call Security In-charge [Fire] Call fire brigade	5. Inform on-site guard. 6. Call SSDM Chair. 7. Call Divisional Head.
7.	SSDM Officer	Security	As per follow-up actions	Reach location	1. Assist first responders 2. Conduct follow-up investigation
8.	HoD	Security	As per follow-up actions	If needed, reach the location	1. Assist first responders 2. Inform PI/lab in-charge
9.	PI or Lab-in-charge	HoD	As per follow-up actions	If needed, reach the location	1. Assist first responders 2. Help with information on lab-specific hazards

Note:

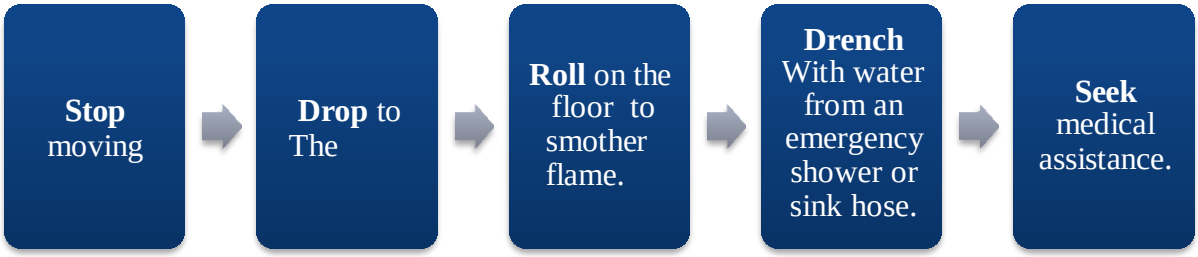
1. Share pertinent information with the Emergency Response Team (ERT) or security guard.

2. Stay in the designated assembly area and avoid wandering off until the "all-clear" is given.

3. Only the ERT can declare an "all-clear," and re-entry is strictly prohibited until then.

2.1 Action items for victim

1. Alert others (lab buddy, security guards, etc.) to raise the alarm.
2. Remove yourself from the hazard if possible.
3. Call the Security room or ambulance if able.
4. If you're on fire, follow proper protocols (e.g., Stop, Drop, and Roll)."



Did you know?

Anyone can call ambulance. There is no need to take permission from PI, Health Centre, Safety Champion, or SSDM.

Chemical exposure response:

1. Skin exposure: Immediately remove contaminated clothing and flush the area with running water for at least 20 minutes, prioritizing thorough decontamination.

2. Eye exposure: Use the eyewash station to flush eyes with water for 20 minutes, ensuring thorough rinsing.

2.2 Action items for witness

1. Raise the alarm, inform the security control room or SSDM office, and trigger the department-wide alarm if needed.
2. Assess your own safety:
a) Evacuate if you're in danger.
b) If safe, attend to the victim.
3. Evaluate the injury's severity, erring on the side of caution:
a) For serious injuries, call an ambulance directly or through the control room (see Section 3.2 for examples).
b) Provide first-aid if possible.
4. Meet the ambulance at the main gate and guide them to the victim.
5. Keep the SSDM control room or main gate security room informed while waiting.
6. Once the victim is stable or transported, notify the Principal Investigator (PI) and Divisional Chair.

2.3 On-site Security Guard Action Items:

1. Assist victims and witnesses.
2. Use fire extinguishers if necessary.
3. Trigger the department-wide alarm if needed.
4. Notify the SSDM office or Main gate security control room.
5. Meet and guide emergency responders (ambulance/patrol vehicle) to the site.

During Department-Wide Alarm:

a) Evacuate the building via designated routes to assembly areas.
b) Direct occupants to safe exits and stairs, away from the fire.
c) Ensure no one uses elevators.

How to extinguish a fire?

- Never turn your back to a fire.
- Always keep a clear exit path so you can retreat.
- Use the appropriate extinguisher for the fire(Type A,B,C,D).
- Remember P.A.S.S.

2.4 Action items for Security ControlRoom

1.	Note contact information of the witness		
2.	Dispatch emergency vehicle		
3.	Meet on-site security guard		
4.	Get information about the nature of the emergency		
	Fire or Gas leak	***Minor Injury***	***Major Injury***
5.	If the fire is large, contact the fire brigade	Provide First aid	Call ambulance via the security control room
6.	Call SSDM Chair or Convener		
7.	Coordinate with ambulance or Institute vehicle for further actions		

2.5 Action items for SSDM staff

1.	Immediately reach the place of accident or incident			
2.	Talk to the victim(if possible),witness, and the on-site safety champion to assess the situation			
	Fire	***GasLeak***	***MinorInjury***	***MajorInjury***
3.	Identify the source of fire	Trigger alarm or announce to evacuate the building	Remove the victim from the hazard	If possible, remove the victim from the hazardous place

4.	Use appropriate extinguisher to control fire	If needed, wear Breathing set or mask to approach the site	Provide first-aid.	Call ambulance via the security control room
5.	For uncontrollable fire, call the fire brigade via the SSDM office or Security control room	Close the cylinder at the source.	If needed, call an Ambulance, the SSDM office or Security control room.	Stabilize the victim
6.	Deploy fire hydrants, if possible	Ventilate the area	Coordinate with medical cell to transport the victim to medical cell.	Resolve the underlying fault/ issue
7.	Cordon off the area			
8.	Debrief the witnesses. Ensure that all victims are accounted for.			
9.	Evaluate next steps after conferring with the SSDM Chair			
10.	Once it is safe to do so, declare all-clear so that users can go back into the lab.			

Note:

1. SSDM and Security to organize regular training and mockdrills to train the team

2.6 Action items for on-call SSDM Officer

1. Respond promptly to the incident site.
2. Provide technical support to first responders.
3. Conduct a thorough follow-up investigation.

2.7 Action items for Divisional Chair/Head

i. Respond to the incident site if necessary.

ii. Provide technical support to first responders.

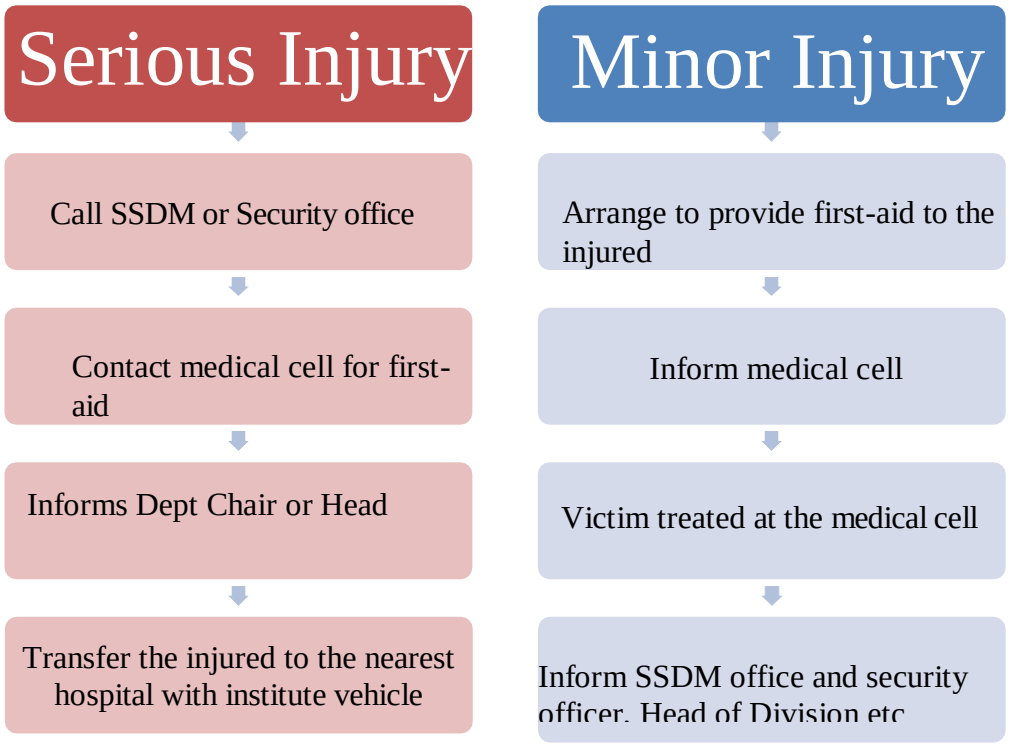
iii. Keep PI or Department Safety Champion informed.

2.8 Action items for concerned scientist or Lab In-charge

i. Respond to the incident site.
ii. Provide technical support to first responders.
iii. Offer lab-specific expertise and inputs.

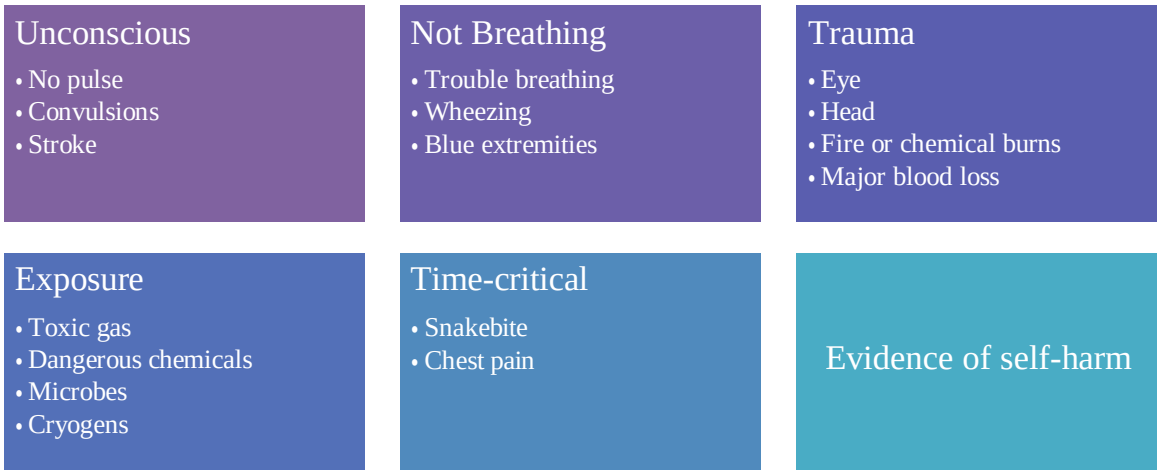
3.Response in Case of Injury

The following flowchart is a general guideline to the overall sequence of events.



3.1 Examples of Serious Injuries

Directly Call Ambulance or Institute vechile (Via informing SSDM office)



3.2 First-aid

Physical Injury

1. Blunt Trauma:
a) Immobilize the affected area to prevent further injury.
b) Apply ice packs to reduce swelling.

2. Penetrating/Cut Injury:
a) Apply consistent pressure to control bleeding.
b) Elevate the affected area above heart level if bleeding persists.
c) Dress or support the wound to protect it from further injury."

Splash in Eyes

1. Rinse the affected eye with low-pressure running water for at least 10 minutes.
2. Position your face with the injured eye down and to the side.
3. Keep the eyes open as wide as possible during rinsing.
4. Flush out contact lenses if present; gently remove them after flushing if they don't come out.
5. Avoid rubbing the eyes.

Splash Over Skin

1. Flush the affected area with running water for at least 20 minutes.

2. Exceptions:

a) Dry lime: Brush off before irrigation.

b) Phenols: Wipe off with glycerin.

c) Elemental metal fragments: Remove with dry forceps and cover with mineral oil.

d) Hydrofluoric acid exposure: After irrigation, apply 2.5% Calcium Gluconate gel and consider ice packs to slow ion diffusion.

Additional Step:

Remove contaminated jewellery, clothing, or articles."

Exposure to Toxic Gases:

1. Immediately move the victim to clean air.

2. Loosen tight clothing.

3. If the victim is not breathing, perform CPR until emergency help arrives, taking precautions to avoid chemical exposure yourself.

Burns

1. Move the person away from the heat source immediately.
2. Cool the burn with lukewarm running water for 20 minutes.
3. Avoid using ice, iced water, or grease on the burn.
4. Don't use fire extinguishers directly on the victim to prevent cold burns.
5. Remove jewelry or clothing near the affected area."

Needlepokeor cut with contaminated sharp item:

1. Wash Immediately the area with soap and water for at least 15 minutes.
2. Immediately after rinsing, obtain medical attention.

Exposure to HF

- - HF is a colorless, odorless gas or clear liquid.
- - Exposure is highly dangerous and initially painless.
- - Immediate treatment with calcium gluconate is crucial.
- **Precautions:**
- - Labs working with HF must store calcium gluconate.
- - Health Centre also stocks calcium gluconate.
- - Ensure calcium gluconate is not expired in both labs and Health Centre

3.3 Emergency Training

Regular Training Needed:

Due to the institute's rolling population, regular training sessions are crucial. These sessions should cover:

1. Basic Life Support: CPR, first aid, etc.
2. Fire Safety: Fire extinguisher usage and alarm protocols.

Voluntary Participation:

Contact SSDM to schedule workshops, ensuring lab users are equipped to respond in emergencies.

2. Infra structure to be maintained for Emergency Response

4.1 Medical cell

- Ready to transfer mechanism to the emergency of nearest listed hospital

- CSIR-CGCRI Ambulance or designated vehicle

3. Simple Emergency Phone Number:

Adopt an easy-to-remember number

1. Safety shower with enough privacy.
2. Eye wash station.
3. Stock disposable gowns so victims can quickly discard clothes.
4. Fire Extinguishers.
5. Availability of suitable PPE

4.2 Security and SSDM Control room

1. A Security control room that can efficiently and effectively work during an emergency.
2. Normal working hours:
   a) Manned by at least two people.
   b) - Non-office hours: On-call availability for emergencies
   c) One person must be fluent in Bengali because the fire department is not comfortable with any other language.
3. The SSDM control room/security control room must be in constant contact with all security guards posted on campus.
4. The SSDM control room/security control room should be able to call the Firebrigade ambulances.
5. The SSDM control room/security control room will maintain contacti nformation for Chairs of all departments and SSDM officers.

Manpower

6. Security guards or SSDM team should be empowered to quickly respond to an emergency, especially in case of fire and injury, where the first few minutes are crucial.
7. All security guards should be trained on fire extinguishers and basic life support (BLS).
8. Specialized Emergency Response Team:
   - Security personnel subset to be trained in:
     - Fire-hydrant operations
     - Chemical spill response
     - Self-Contained Breathing Apparatus (SCBA) usage
     - Gas safety protocols

Emergency vehicle

9. An emergency vehicle that is available to respond to an emergency.

4.3 SSDM committee (Safety Security and disaster Management committee)

SSDM team will ensure minimum fire safety infrastructure across departments. Departments should report any gaps to SSDM. Key requirements:

1. Adequate fire extinguishers (type and quantity) at accessible locations.
2. Compliance with Indian Building Code for fire hydrant loops and sprinkler systems.
3. Centralized fire alarm systems with hooters and strobe lamps in hazardous departments.
4. Clearly marked emergency exits and assembly points in all buildings.
5. Annual mock drills to ensure preparedness.

4.4 Divisions/Labs

Basic Safety Infrastructure Requirements:

All divisions must maintain the following basic safety infrastructure, with the Divisional Chair/Head ensuring compliance:

1. First-aid boxes in each lab, stocked according to lab-specific hazards.
2. Working service lift in departments with:
   - 2 or more floors with compressed gas cylinders or hazardous chemicals
3. Emergency lights in each lab that automatically turn on during power failure.
4. Hazard sheets (safety signage) displayed outside each lab.
5. Designated Lab-in-charge knowledgeable about lab-specific hazards.
6. Access system for locked labs (e.g., key collection or biometric system).
7. Clear and suitable safety signage.
8. Mains power disconnect switches at the lab or floor level.
9. Circuit breakers with suitable ratings to automatically disconnect power during faults

Special infrastructure for Hazardous Chemicals

Departments handling hazardous chemicals require:

1. Safety shower and eyewash station (ANSI Z358.1 compliant).
2. Chemical storage in segregated, safety cabinets.
3. Calcium gluconate storage for labs using or storing hydrofluoric acid

Gases or Cryogens:

1. Hazardous gases (NFPA > 2) must be stored in gas cabinets.
2. Labs with hazardous gases (NFPA > 2) require gas alarms.
3. Departments with hazardous gases (NFPA > 2) must have a Self-Contained Breathing Apparatus (SCBA).

Other Hazards:

1. Labs with high electrical loads require an external mains switch to cutoff power without entering the lab.
2. BSL3 labs must store hazard suits outside the lab for quick access by first responders in emergencies

3. Emergency Fire Response:

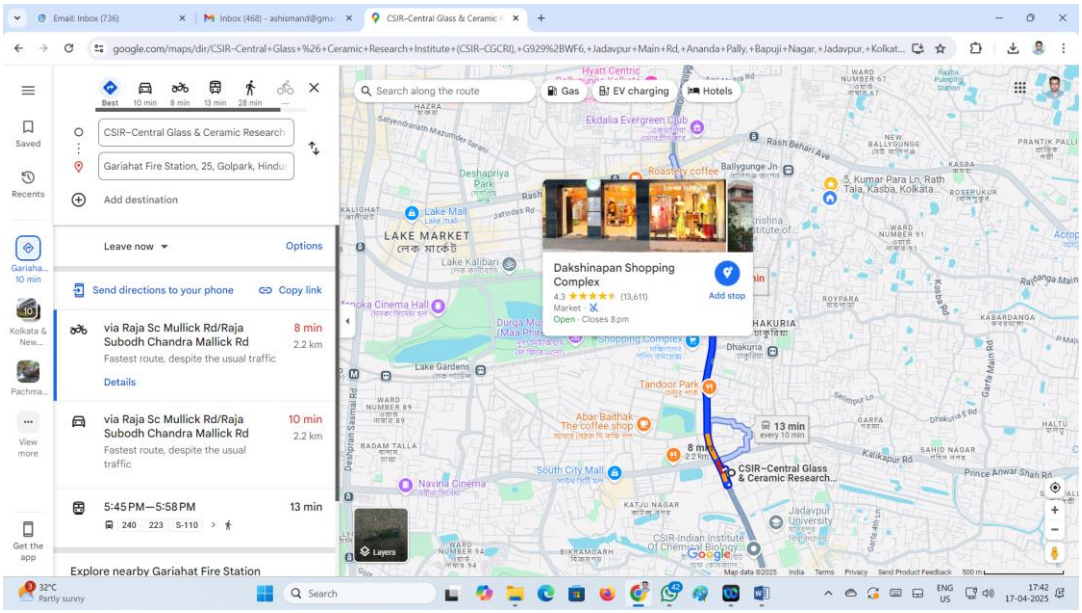
Fire Station Details:
Gariahat Fire Station
25, Golpark, Hindustan Park, Gariahat, Kolkata, West Bengal 700029
Distance from CSIR-CGCRI: 2.2 km
Phone: 033 2464 2841 (or 101)

Response Time:
- Fire team ready within 30 seconds
- Fire tender reaches CSIR-CGCRI in 5-7 minutes
- Available 24x7

Access and Escort:
- Fire tender can enter through main gate or second gate
- Security will escort to the location

Coordination:

- Security, SSDM, department, or PI may need to provide specific input to the fire team

1. 

[Location map of Gariahat Fire Station from CSIR-CGCRI, Kolkata]

Note: The security officer will guide the vehicle to the nearest gate.

Appendix G: Safety policy endorsement for daily wage workers (in Bengali)

CSIR-Central Glass & Ceramic Research Institute
196,Raja S.C.Mullick Road,Kolkata-700032
West Bengal,India

গুরুত্বপূর্ণ ল্যাব নিরাপত্তা নির্দেশাবলী

আপনার নিরাপত্তা আপনার দায়িত্ব। কর্মক্ষেত্রে নিরাপত্তা বজায় রাখুন ,যাতে দুর্ঘটনা এড়ানো যায়। যথাযথ প্রয়োজনীয় সুরক্ষামূলক সরঞ্জাম (যেমন – হেলমেট , হ্যান্ড গ্লাভস , সেফটি গগলস , ল্যাব কোট , সেফটি জুতো) পরে ল্যাব এ কাজ করতে হবে। কারোর প্রয়োজনীয় সরঞ্জাম ব্যবহার করতে যদি বুঝতে অসুবিধে হয় তাহলে আপনার বিভাগের বরিষ্ঠ বিজ্ঞানী ও কারিগরি কর্মকর্তাদের জানান ও তাদের সাহায্য নিন। অফিসের ল্যাবে যত্ন সহকারে রাসায়নিক ব্যবহার করা, কর্মক্ষেত্র পরিষ্কার রাখা আপনার কর্তব্য এবং আপনি এই বিষয়ে সতর্কতা অবলম্বন করবেন। আশা করি এই নির্দেশাবলী সম্বন্ধে আপনি অবগত হয়েছেন এবং নিয়মিত মেনে চলবেন। নিম্নে আপনার স্বাক্ষর একান্তভাবে কাম্য।

স্বাক্ষর-

নাম –

বিভাগ–

ফোন নম্বর –

তারিখ-

Appendix H: Safety policy endorsement for daily wage workers (in Hindi)

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महत्वपूर्ण प्रयोगशाला सुरक्षा निर्देश

आपकी सुरक्षा आपकी जिम्मेदारी

किसी भी दुर्घटना को रोकने के लिए कार्यस्थल पर सुरक्षा बनाए रखें। कार्यस्थल पर काम करते समय हमेशा आवश्यक सुरक्षात्मक उपकरण (जैसे हेलमेट, हाथ के दस्ताने, सुरक्षा चश्मे, सुरक्षा जूते, लैब कोट आदि) पहनें रखे। किसी भी उपकरण के संचालन में किसी भी प्रकार की समस्या होने पर कृपया अपने वरिष्ठ वैज्ञानिक या तकनीकी अधिकारी को सूचित करें और उनकी सहायता लें। कार्यस्थल की साफ-सफाई बनाए रखना तथा प्रयोगशाला रसायनों के साथ काम करते समय सावधानी बरतना आपका कर्तव्य है एवं इसके लिए सदैव सतर्क रहें।
यह अपेक्षित है कि आपको प्रयोगशाला सुरक्षा दिशा-निर्देशों और मानकों के बारे में अवगत करा दिया गया है और आप उनका पालन करेंगे।

हस्ताक्षर

नाम:

विभाग:

फोन न:

तारीख:

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