

Laboratory Safety Manual



Office of Facilities
Safety Management Team

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Chapter 1 General Provisions

Article 1 (Purpose) The purpose of this manual is to secure the safety of the scientific laboratory of Yonsei university (hereinafter “this school”), develop a pleasant environment while protecting the health of the users, stipulate the matters regarding obligations and pollution prevention stipulated in the Act On The Establishment Of Safe Laboratory Environment (hereinafter ‘Laboratory Safety Act’) to efficiently manage research resources and contribute to invigoration of experiments and research activities.

Article 2 (Definitions) The definitions of the terms used in this manual shall be as follows.

1. “Laboratory” refers to the laboratories, practical exercise rooms, lab work preparation rooms installed by universities/research institutions, etc., equipped with facilities/equipment/research materials, etc. for the research activities.
2. “Research activity” refers to systematic and creative activities (including experiments/practical exercises, etc.) that utilize accumulated knowledge in order to accumulate scientific and technological knowledge or to discover new application methods.
3. “Head of a research entity” refers to the representative of this school.
4. “Laboratory safety and environment officer” refers to the personnel supporting the Head of a research entity in technical matters related to the laboratory safety and performing advisory/guidance tasks to Research workers such as Laboratory managers, etc.
5. “Laboratory manager” refers to the Research worker directly guiding/managing/supervising Research workers of the laboratory.
6. “Laboratory safety manager” refers to the Research worker performing the safety management and Laboratory accident prevention tasks in each laboratory.
7. “Research worker” refers to personnel engaging in research activities, including professors, undergraduate students, graduate students, lab teaching assistants, professional employees, affiliated researchers and company employees, etc. engaged in the laboratory work.
8. “Safety inspection” refers to the act of investigating Hazardous factors inherent in laboratories by a skilled personnel with experience in laboratory safety management, either visually or using inspection tools, etc.
9. “Precise safety diagnosis” refers to the investigation/assessment performed with the purpose of detecting potential risks and establishing improvement measures thereto in order to prevent Laboratory accidents.
10. “Laboratory accident” refers to Research workers suffering physical harm such as injuries/illnesses/physical disabilities/death, etc., or the laboratory facility/equipment being damaged in relation to research activities within the laboratory.
11. “Serious laboratory accident” refers to accidents of severe damage or injury among Laboratory accidents, such as fatal accidents, etc. defined by the Decree of the Ministry of Science and ICT.
12. “Hazardous factor” refers to elements that may cause Laboratory accidents or may harm the health of Research workers, such as chemical/physical/biological hazard elements, etc.
13. “Preliminary hazardous factor analysis” refers to analysis of Hazardous factors prior to the commencement of research development activities.

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14. “Laboratory safety” refers to matters related to all types of safety, health, environment that may occur within a laboratory, etc.
 15. “Maintenance” refers to the daily inspection, repair and modification to upkeep laboratory functions at normal levels and to obtain user safety.
 16. “Head of Affiliated Institution” refers to the dean of affiliated university, head of research institution, residing business representative or the representative of the laboratory.
 17. “Laboratory Safety Management Department (hereinafter “management department”)” refers to the Safety Management Team of Office of Facilities.

Article 3 (Range of Application)

- ① This manual shall be applied to the laboratories of Yonsei University Shinchon Campus and International Campus. Provided that, in consideration of the type and scale of the laboratory, whole or parts of this manual may not be applied.
- ② Matters not stipulated in this regulation shall be in accordance with the Laboratory Safety Act.

Chapter 2 Safety Management Organization

Article 4 (Head of a Research Entity)

- ① The head of a research entity has the responsibility to acquire safe environment of the laboratory by thorough maintenance/management of laboratory safety and prevention of Laboratory accidents, and shall actively participate in preventive measures against Laboratory accidents.
- ② The head of a research entity shall handle matters not set by this laboratory regulations in accordance with the laboratory installation/operation standards set and published by the Minister of Science and ICT, in accordance with the Laboratory Safety Act.
- ③ The laboratory manager shall be held responsible for the safety of education and research activities performed within the laboratory, and shall actively participate in preventive measures against laboratory accidents.
- ④ The research worker shall observe the various standards and regulations, etc. for the laboratory safety management and the prevention of laboratory accidents as set in this law, and shall actively participate in laboratory safety environment promotion activities.

Article 5 (Laboratory Safety and Environment Officer)

- ① The head of a research entity shall designate a laboratory safety and environment officer in order to support the head of a research entity on technical matters related to the laboratory safety or to guide the laboratory safety manager.
- ② The laboratory safety and environment officer shall handle each of the following for the task on the safety of the laboratories of this school.
 1. Matters on safety management organization system and its tasks
 2. Matters set through consultation at the laboratory safety management committee

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3. establishment and implementation of laboratory safety inspection and precise safety diagnosis implementation plans
 4. Matters on laboratory safety education plans and implementations
 5. Investigation for cause of laboratory accident occurrence and technical guidance/advice for the prevention of recurrences
 6. Maintenance/management of statistics on laboratory safety environment and safety management status
 7. Matters on emergency measure methods and behavioral know-how in case of laboratory accident or serious laboratory accident (hereinafter “accident”) occurrence
 8. Matters on accident investigation and follow-up measures establishment
 9. Matters on laboratory safety management expenses appropriation and usage
 10. Matters on safety management by laboratory types
 11. Matters on medical screenings and purchase of accident insurance of Research workers
 12. Other matters on safety management prescribed by the Laboratory Safety Act
- ③ In case of temporarily being unable to perform the tasks due to reasons such as travels, illnesses or other causes, a substitute must be designated so that the tasks of the laboratory safety and environment officer shall be performed in proxy. Provided that, the proxy period of the substitute shall not exceed 30 days (including holidays) from the date on which the grounds for substitute designation has occurred.

Article 6 (Laboratory manager)

- ① In order to prevent laboratory accidents and to obtain research workers’ safety, the head of a research entity shall designate a person with all of the following conditions to each laboratory as the laboratory manager.
1. Research manager or faculty with the title of teaching assistant or higher.
 2. Must be a person directly guiding/managing/supervising the research activity and the research workers of the laboratory.
 3. Must be a person with authority and responsibility on the usage and safety of the laboratory.
- ② The laboratory manager shall have each of the following responsibilities and obligations.
1. Responsibility on safety regarding education and research development activities implemented within the laboratory
 2. Responsibility on prevention of laboratory accidents occurring within the laboratory
 3. Analysis of laboratory safety status, risk analysis by hazardous factors of the laboratory, establishment of laboratory safety plans, performance of preliminary Hazardous factors risk analysis prior to the commencement of the research development activity
 4. Responsibility to perform laboratory hazardous factor education on the research workers
 5. Furnishing of protective gears appropriate to the research development activities of the laboratory and implementation of wearing obligation of the research workers
 6. Other necessary matters in relation to laboratory safety/health

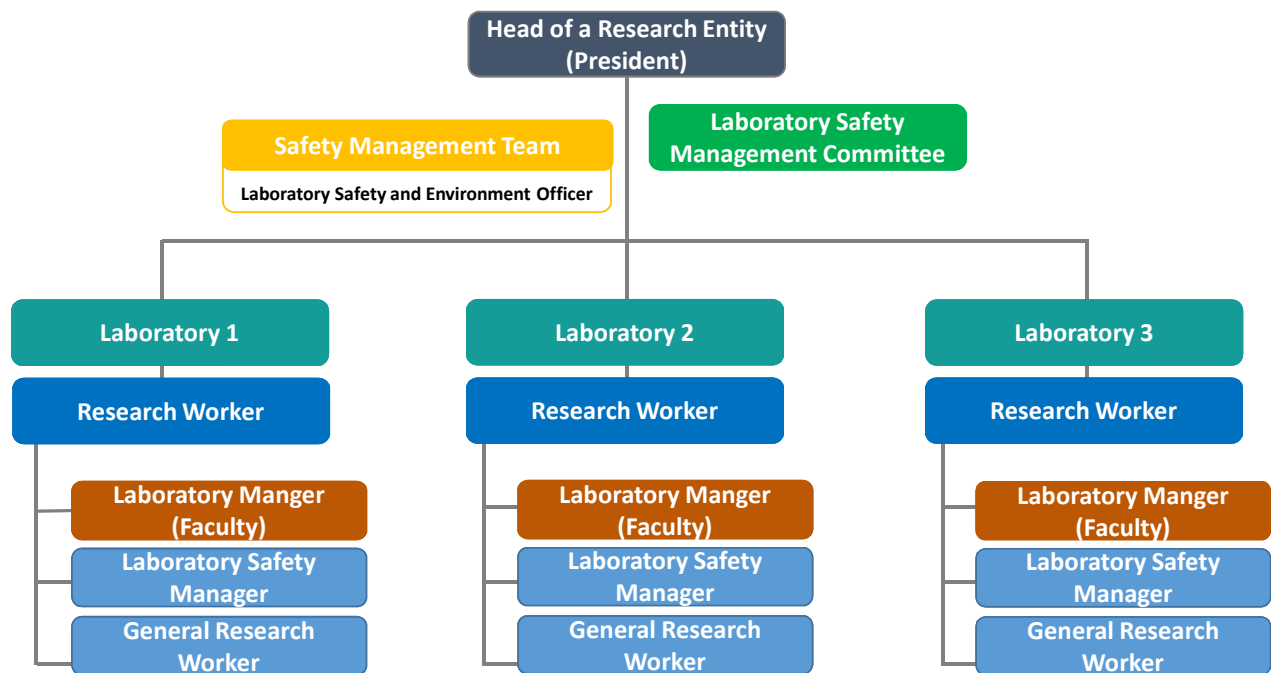
Article 7 (Chief of Laboratory Safety Management)

- ① In order to efficiently perform the safety management tasks of the laboratory, the laboratory manager shall designate a laboratory safety manager among the research workers of the laboratory.
- ② Laboratory safety manager shall have the following responsibilities and obligations.
 1. Performing the daily inspections of the laboratory and reporting the results thereof to the laboratory manager.
 2. Supplementing and improving incomplete items of the laboratory and reporting the results thereof to the laboratory manager.
 3. Management of safety related items such as material safety data sheet (MSDS) and safety protective gears, etc. of the laboratory.
 4. Other necessary matters related to the safety/health of the laboratory.

Article 8 (Research worker)

- ① Research workers shall have the following responsibilities and obligations.
 1. Reporting accidents occurring in laboratories, etc. to laboratory manager and laboratory safety manager.
 2. Wearing of safety protective gears appropriate for research development activities.
 3. Obligations to enroll in safety educations for research workers.
 4. Obligations to undergo medical screenings in accordance with hazardous factors handled.
 5. Management of other necessary matters related to the safety/health of the laboratory.

[Laboratory Safety Management System]

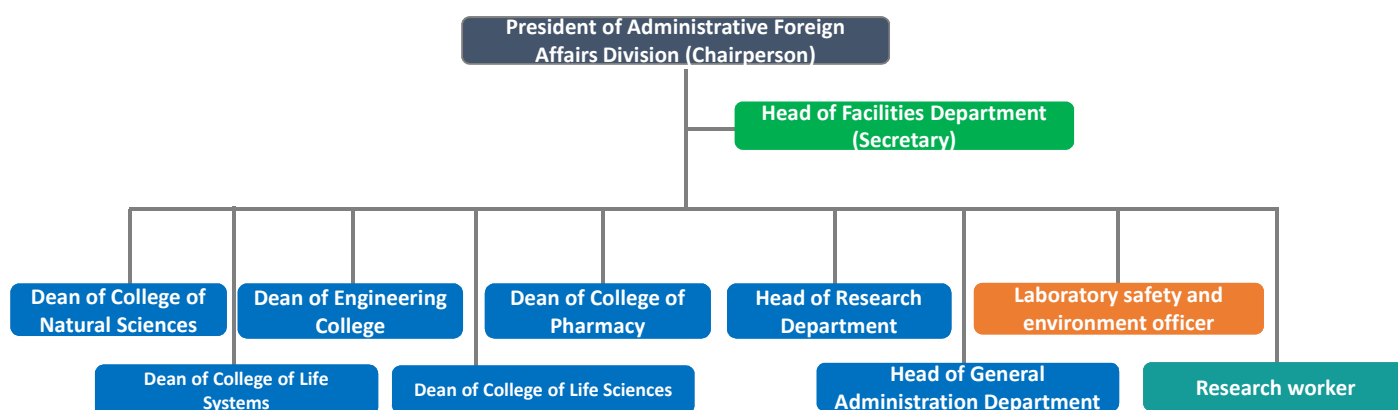


Chapter 3 Laboratory Safety Management Committee

Article 9 (Installation / Operation of the Committee)

- ① A laboratory safety management committee (hereinafter “Committee”) shall be installed for the deliberation of matters on development of the laboratory’s safety environment.
- ② The committee shall deliberate on each of the following matters.
 1. Establishment of policies regarding laboratory safety
 2. Preparation or amendment of laboratory safety management regulations
 3. Establishment, implementation and assessment of laboratory Safety inspection plans
 4. Matters on laboratory safety educations
 5. Matters on development and assessment of laboratory safety environment programs
 6. Matters on disposal of waste fluids from experiments, hazardous wastes, infectious designated wastes
 7. Disposal measures of various hazardous substances
 8. Corrective measures on occurrences of Laboratory accidents, inadequate inspection results and regulation violations
 9. Important matters on other measures to promote laboratory safety
 10. Matters on safety management by laboratory types
- ③ The committee shall be composed of 10 official members including the president of administrative / foreign affairs division (chairperson), dean of college of natural sciences, dean of engineering college, dean of college of pharmacy, head of research department, head of facilities department (secretary), head of general administration department, safety environment manager, etc. and 10 Research workers (safety managers) appointed by the president.
- ④ The chairperson shall be the head of administration / foreign affairs division, the secretary position shall be filled by the head of facilities department and the term of the appointed members appointed by the president shall be two years, with possible reappointment.
- ⑤ The committee shall be convened by the chairperson, opened by the attendance of more than half of registered members and resolved with the consent of more than half of all attending members.

[System of Laboratory Safety Management Committee]



Chapter 4 Safety Education / Training

Article 10 (Safety Education / Training Enrollment)

- ① The head of the research entity shall perform education / training necessary for the prevention for and countermeasure against laboratory accidents regarding research workers.
- ② The head of the research entity shall perform the education / training in accordance with the following classification to the research workers.
 1. New Education / Training : Education / training performed on Research workers newly participating in research activities.
 2. Periodic Education / Training : Education / training performed on a regular basis to research workers participating in research activities.
 3. Faculty in charge of experiments / practical training subjects shall provide guidance so that all Research workers such as master's/doctorate students, undergraduates and researchers, etc. participating in the experiments / practical training may enroll in the course.

[Research worker Safety Education]

Classification	New Education / Training	Regular Education / Training
Subject	<ul style="list-style-type: none"> Research workers such as new engineering faculty, master's/doctorate courses, undergraduates, employees, etc. 	<ul style="list-style-type: none"> Research workers such as new engineering faculty, master's/doctorate courses, undergraduates, employees, etc.
Education Period	<ul style="list-style-type: none"> 1st Semester : Every March - May 2nd Semester : Every September - November 	<ul style="list-style-type: none"> 1st Semester : Every March - August 2nd Semester : Every September – Next February
Education Time	<ul style="list-style-type: none"> 2 hours / Online 	<ul style="list-style-type: none"> 6 hours / Online
Education Contents	<ul style="list-style-type: none"> Safety management tasks of new research workers (2 subjects) 	<ul style="list-style-type: none"> Laboratory safety regulations and know-how in cases of accidents (2 subjects) Safety management by Research activity sectors (4 subjects)
Assessment	<ul style="list-style-type: none"> Completion acknowledged upon 100% attendance 	<ul style="list-style-type: none"> Online test (mandatory) after 100% attendance Completion acknowledged upon passing
Enrollment Method	<ul style="list-style-type: none"> Enrollment by accessing the laboratory environment safety management system (http://safetylab.Yonsei.ac.kr) <ul style="list-style-type: none"> School constituents : Engineering faculty, undergraduates, graduate students are linked in to the academic network log in system Other constituents : Other personnel such as employees, researchers, etc. shall log in after signing up as new users After completion of education, individual education completion certificates may be printed out 	

Chapter 5 Safety Inspection / Diagnosis

Article 11 (Daily Inspection)

- ① Daily inspections shall be performed once every day before the commencement of the research development activities.
- ② Research workers shall visually confirm the storage status of machinery / mechanisms / electricity / chemicals / pathogens, etc. used in research activities and management situation of protective gears, etc. and shall record the online daily checklist on the laboratory environment safety management system.
- ③ After performing the daily inspection on the laboratory environment safety management system on the day, the research worker shall obtain the approval from the laboratory manager.

Article 12 (Periodic Inspection)

- ① Periodic inspections shall be performed by the laboratory safety management department once a year, and Safety inspection for all laboratories of this school shall be performed.
- ② The management department shall perform a detailed inspection using the storage status of machinery / mechanisms / electricity / chemicals / pathogens, etc. used in research activities and management situation of protective gears, etc.
- ③ The management department shall notify the results of the periodic inspection to the department, division, research institution, etc., and the laboratory manager of the laboratory shall submit the results of the supplementation / improvement measures to the management department.

Article 13 (Precise safety diagnosis)

- ① Precise safety diagnosis shall be performed by the safety management department once every two years, and precise safety diagnosis shall be performed on all laboratories of this school.
- ② Laboratories corresponding to each of the following shall perform a precise safety diagnosis.
 1. Laboratories handling hazardous chemical substances in accordance with Clause 7, Article 2 of the 「Chemical Substances Control Act」 in research activities
 2. Laboratories handling hazardous factors in accordance with Article 104 of the 「Occupational Safety and Health Act」 in research activities
 3. Laboratories handling toxic gases set by the Decree of the Ministry of Science and ICT in research activities
- ③ The management department shall notify the results of the precise safety diagnosis to the department, division, research institution, etc., and the laboratory manager of the laboratory shall submit the supplementation / improvement measures of the indicated items to the management department.

[Major Inspection Articles for Precise safety diagnosis for Laboratories]

Laboratory Precise safety diagnosis Checklist						
Date of Inspection		20 . .		Name of Laboratory		
Laboratory Manager				Lab. Safety Manager		
Inspection Result		Cases of incongruity		Inspector		(Name) (Signature)
Sector	Inspection Items		Fit	Unfit	N/A	Reason of Incongruity
Chemical	Handling/Management Register of Hazardous Factors		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Material Safety Data Sheet Furnishing, Education		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Reagent Bottle Warning Sign		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Conduction Prevention for Reagent Shelves		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Chemical Reagent Container Management Status		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Locking Mechanism for Reagent Shelves		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Storage Status of Unused Reagents for Appropriate Periods of Time		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Classification and Storage of Chemicals by Characteristics		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation and Management of Washing Facilities such as Eye Washing and Shower Stations, etc.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Waste Liquid Container	Storage Status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Classification by Characteristics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Storage in Designated Container	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Characteristic Classification Name Attachment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Toxic Materials	Usage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Storage Status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Leak Status		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Organic	Biosafety Sign	Gate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Storage Location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Organisms, Tissues, Cells, Blood	Storage Management Status such as Containers, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Maintenance Status of Storage Records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Furnishing Status of Sterilization Equipment such as Disinfection Sterilization, etc.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Furnishing/Management Status of Container Designated for Medical Wastes		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Medical Waste Management	Mixed Status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Biological Activation Removal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Waste Disposal Procedure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Animal Testing	Separation of Experiment Spaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Installation/Management of Breeding Facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Management Measures for Insects and Rodents		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Minimization of Aerosol Generation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Management of Organism Handling Laboratory Installation/Operation Records		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	SOP by Situation(Leak of pathogens, etc.)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

[Major Inspection Articles for Precise safety diagnosis for Laboratories]

Gas	Conformity to Charging Period		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation of Conduction Prevention Devices		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Protective Caps		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Appropriate Location for Container Storage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Indication of Pipeline Names, Input and Flowing Direction		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Backfire Prevention Device for LPG and Acetylene Containers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Gas Pipeline and Components Corrosion		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Usage of T-type Connection in Gas Hoses		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Flammable · Oxidizing · Toxic Gas Container Storage and Management Status		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Gas Pipeline Shockproof Protective Cover Installation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Mixture of Flammable · Oxidizing Gases		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Neglecting of Unused Pipelines and Sealing Measures to End-points		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Storage of Unused Gas Containers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation and Operational Status of Toxic Gas Neutralization Decontamination Devices		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Gas Leak Confirmation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Alarm Devices		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Machinery	Machinery Subject to Safety inspection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Safety Regulations for each Dangerous Machinery/Mechanism		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Operation Manual for each Dangerous Machinery/ Mechanism		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation of Protective Devices		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation of Safety Lids		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Power Cutoff Device or Emergency Stop Device		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Periodic Inspection by Machinery/Mechanism		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Installation of Safety Fences such as Robot Safety Fences, etc.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Safety inspection Performance		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Safety	Performance of Daily Inspection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Publishing of Safety Management Regulations		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Attachment of Safety Health Sign		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Posting of Preliminary Hazardous Factor Risk Analysis, Laboratory Safety Status		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Organization, Cleanliness		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Prohibition of Sleeping, Cooking and Smoking		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Establishment of Accident Countermeasure Procedure		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Separation of Experiment and Office Spaces		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Performance of Safety Education		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Normal Operation in Operation Tests for Safety Facility/Equipment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Health	Attachment of Safety Health Sign		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Mixture of Reagents, Foods inside the Refrigerator		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Furnishing / Management of First-aid Accessories		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Furnishing / Wearing of Protective Gears		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Maintaining Appropriate Illumination Levels		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Noise and Vibration		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Local Ventilation Equipment (Fume 0.4m/s or more)	Local Ventilation Equipment Operation Status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Chapter 6 Laboratory Safety / Health Measures

Article 14 (Laboratory Registration and Risk Rating)

- ① The laboratory manager or the laboratory safety manager shall prepare and submit the laboratory registration (change) application form to the managing department in case there are changes such as new usages of the laboratory, changes of location, etc.
- ② Laboratories shall be classified into each of the following ratings, in accordance with the level of risks.
 1. A Grade : Laboratories emitting combustible gases, flammable reagents, hazardous chemicals and large amounts of waste fluids, handling toxins, organisms and animals, radioactive isotopes, equipped with high-risk machinery
 2. B Grade : Laboratories generating small amounts of general reagents, small batch flammable reagents, nonflammable gases, and small amounts of waste fluids
 3. C Grade : Electric, design, computer related laboratories not conducting physical and chemical experiments

[Laboratory Registration (Change) Application Form]

Annex No. 1 **Laboratory Registration (Change) Application Form**

Affiliation	ex) College of Natural Sciences	Department	ex) Physics Department
Name of Laboratory	Before Change : ex) Solid Physics Laboratory After Change (or New) : ex) High Molecule Substance Laboratory	Location (Building/No.)	Before Change : ex) Science Hall Rm. 201 After Change (or New): ex) Engineering Hall No. 1, Rm. 101
* Must fill in laboratory information prior to/after changes, in case of new laboratories, please fill in the 'After Change' box			
Laboratory Classification	<input checked="" type="checkbox"/> Machinery/Physics <input type="checkbox"/> Electric/Electronic <input type="checkbox"/> Chemical/Chemical Engineering <input type="checkbox"/> Medical/Biology <input type="checkbox"/> Construction/Environment <input type="checkbox"/> Energy/Resources <input type="checkbox"/> Other		
Laboratory Danger Level	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		
* Calculation Basis for Laboratory Danger Level A Level : (High-risk Laboratory) Laboratories with flammable/toxic gas, flammable reagent, hazardous chemical substances, large amounts of waste fluids discharged, toxic substances, handling of organisms and animals, radioactive isotopes, equipped with high-risk machinery B Level : Laboratories generating general reagent, small scale flammable reagent, non-flammable gas, small amounts of waste water C Level : Electric, design, computer related laboratories not conducting chemical experiments			
Laboratory Manager (Managing Professor)		Contact	Landline: Mobile:
Laboratory Safety Manager		Contact	Landline: Mobile:
Number of Research Activity Workers	Professor : Grad. Student : Undergraduate : Practical Exercise Assistant : Total :	Detailed Status of Research Activity Workers (Student No. / Name)	ex)2021000111 / HONG, GIL DONG
Purpose of Laboratory	<input checked="" type="checkbox"/> Laboratory <input type="checkbox"/> Practical Exercise Room <input type="checkbox"/> Experiment Preparation Room <input type="checkbox"/> Experiment/Practical Exercise Room		
* Laboratory Purpose Standard - Laboratory : Space where research activities without set outcomes are performed. Usually used by researchers of graduate students (master's degree) level or higher. - Practical Exercise Room : Space where practical capabilities of previously performed researches, experiments, etc. are taught to students. Usually used by researchers of undergraduate students (bachelor's degree) levels or lower.			

Experiment Preparation Room : Space where materials for experiments, practical exercises are stored and a space where researchers prepare for experiments and practical exercises. Includes reagent storage room, breeding room, storage, etc.
 Experiment/Practical Exercise Room : Space where experiment (research) and practical exercise (education) is simultaneously carried out in accordance with the set curriculum

Relevance to Preparation of Preliminary Hazardous Factor Risk Analysis Report	<input type="checkbox"/> O <input type="checkbox"/> X	Relevance to Preparation of Hazardous Factor Handling and Management Register	<input type="checkbox"/> O <input type="checkbox"/> X														
* Laboratories subject to preparation of preliminary hazardous factor risk analysis report/handling and management register : Laboratories with danger levels A and B A Level : (High-risk Laboratory) Laboratories with flammable/toxic gas, flammable reagent, hazardous chemical substances, large amounts of waste fluids discharged, toxic substances, handling of organisms and animals, radioactive isotopes, equipped with high-risk machinery B Level : Laboratories generating general reagent, small scale flammable reagent, non-flammable gas, small amounts of waste water																	
Waste Discarding	<input type="checkbox"/> Medical/Organism/Waste <input type="checkbox"/> Designated (Chemical) Waste <input type="checkbox"/> Waste Reagent Bottle <input type="checkbox"/> Waste Reagent																
Waste Water Discharging	<input type="checkbox"/> O <input type="checkbox"/> X	Handling of Living Genetically Modified Organisms (LMO)	<input type="checkbox"/> O <input type="checkbox"/> X														
Handling of Radioactive Isotopes	<input type="checkbox"/> O <input type="checkbox"/> X	Handling of Toxic Substances	<input type="checkbox"/> O <input type="checkbox"/> X														
Status of Major Hazardous Factors	<table border="1"> <tr> <td>Chemical Substance Handling Status (In case of various substances handled, list mainly the major hazardous substances)</td> <td>Type / Volume / Quantity</td> </tr> <tr> <td>ex) Benzene / 100ml / 1EA</td> <td></td> </tr> <tr> <td>High-pressure Gas Handling Status</td> <td>Type / Volume / Quantity</td> </tr> <tr> <td>ex) Argon (Ar) / 47L / 2EA</td> <td></td> </tr> <tr> <td>Organic Solvent Handling Status</td> <td>Type / Volume / Quantity</td> </tr> <tr> <td>ex) Ethyl Alcohol / 50ml / 3EA</td> <td></td> </tr> <tr> <td>Dangerous Machinery Apparatus Handling Status</td> <td>ex) Industrial Robot, Pressurized Container, Press, Shearer, Crane, Lift, etc.</td> </tr> </table>			Chemical Substance Handling Status (In case of various substances handled, list mainly the major hazardous substances)	Type / Volume / Quantity	ex) Benzene / 100ml / 1EA		High-pressure Gas Handling Status	Type / Volume / Quantity	ex) Argon (Ar) / 47L / 2EA		Organic Solvent Handling Status	Type / Volume / Quantity	ex) Ethyl Alcohol / 50ml / 3EA		Dangerous Machinery Apparatus Handling Status	ex) Industrial Robot, Pressurized Container, Press, Shearer, Crane, Lift, etc.
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ex) Ethyl Alcohol / 50ml / 3EA																	
Dangerous Machinery Apparatus Handling Status	ex) Industrial Robot, Pressurized Container, Press, Shearer, Crane, Lift, etc.																

*** Following the registration, the laboratory environment safety regulation, emergency measure know-hows shall be received, attached to laboratories and inspection logs shall be recorded.**

Date of Application: YEAR, MONTH, DAY

Laboratory Manager (Managing Professor): SEAL

Head of Affiliate Institution (Dean or Department Head): SEAL

To the Chairperson of Laboratory Safety Management Committee

Article 15 (Safety and Health Sign)

- ① Laboratory manager shall furnish the laboratory sign provided by the school and shall have the risk status and information of the laboratory indicated.
- ② Laboratory risk status and information sign provided by the laboratory safety management department shall be as follows.
 1. Laboratory Environment Safety Regulation
 2. Research Worker Safety Education Enrollment Status
 3. Laboratory Hazardous Substance Handling Guideline
 4. GHS Hazardous Chemical Substance Sticker

[Laboratory Environment Safety Regulation – Furnished within the Laboratory]

[Research worker Safety Education Enrollment Status – Attached to the Laboratory Door]

[Laboratory Hazardous Substance Handling Guideline – Attached to the Laboratory Door]

[GHS Hazardous Chemical Substance Sticker]

Attaching hazard signs corresponding to the laboratory

- ③ The laboratory manager shall install or attach prohibition, warning, indicational, directional, prohibition signs, etc. regarding facilities or substances, etc. in which hazardous / risk elements exist or have possibilities of accident occurrence to locations identifiable by the personnel accessing the laboratory.
- ④ Types of the safety health signs are as follows.
1. Prohibition signs
 2. Warning signs
 3. Indicational signs
 4. Directional signs
 5. Other safety health related signs

[Types and forms of Safety Health Sign – Attached Form No. 6, Enforcement Decree of the Occupational Safety and Health Act]

1 Prohibition Signs	101 Access Prohibited	102 Passage Prohibited	103 Passage of Vehicles Prohibited	104 Usage Prohibited	105 Embarkation Prohibited	106 Smoking Prohibited	107 Fires Prohibited	
108 Object Moving Prohibited	2 Warning Signs	201 Flammable Substances Warning	202 Oxidizing Substance Warning	203 Explosive Substance Warning	204 Acute Toxicity Substance Warning	205 Corrosive Substance Warning	206 Radioactive Substance Warning	
207 High-voltage Electricity Warning	208 Hanging Object Warning	209 Falling Object Warning	210 High Temperature Warning	211 Low Temperature Warning	212 Loss of Balance Warning	213 Laser Beam Warning	214 Carcinogenicity-mutagenicity-reproductive toxicity-system toxicity-respiratory hypersensitivity substance warning	
215 Hazardous Location Warning	3 Indicational Signs	301 Wear Protective Goggles	302 Wear Gas Masks	303 Wear Dust Masks	304 Wear Facial Protective Plates	305 Wear Hardhats	306 Wear Earplugs	
307 Wear Safety Shoes	308 Wear Safety Gloves	309 Wear Protective Clothing	4 Directional Signs	401 Green Cross Sign	402 Emergency Aid Sign	403 Stretcher	404 Eye Wash Device	
405 Emergency Apparatus	406 Emergency Exit	407 Emergency Exit on the Left	408 Emergency Exit on the Right	5 Authorized Personnel Only	501 Substances Subject to Approval Workshop Authorized Personnel Only (Name of Approved Substance) Manufacturing/In Use/In Storage Wear Protective Gears and Clothes Smoking and Food Intake Prohibited		502 Asbestos Handling/Dismantling Workshop Authorized Personnel Only Handling/Dismantling Asbestos Wear Protective Gears and Clothes Smoking and Food Intake Prohibited	
503 Laboratories Handling Prohibited Substances, etc.		6 Example of Adding Texts						
<div>Authorized Personnel Only Handling Carcinogens</div> <div>Wear Protective Gears and Clothes</div> <div>Smoking and Food Intake Prohibited</div>								

Article 16 (Hazardous Waste from Experiments)

- ① Research workers must plan a disposal method regarding hazardous wastes (designated wastes such as those containing hazardous substances, waste organic solvents, waste oils, waste poisons, medical wastes, etc.) from experiments generated in the process of research activities.
- ② When handling hazardous wastes from experiments, management shall be conducted in observing each of the following clauses.
 1. Furnishing of designated (chemical) and medical wastes storage facility and containers in accordance with the Waste Management Act.
 2. Installation of signs listing storage capacity by waste type, storage period, cautions in handling, manager, etc. to the waste storage facility and attachment of storage sign (type, amount, cautions, etc. listed) to containers
 3. Storage by classification of the characteristics and types of wastes (waste acids, waste alkalis, waste organic solvents, waste oils, etc.)
 4. Minimization of waste storage within the laboratory (Usage of capacity within 80% of the waste fluid collection container and regular discharge / discarding)

[Classification of Laboratory Wastes and Management Departments]

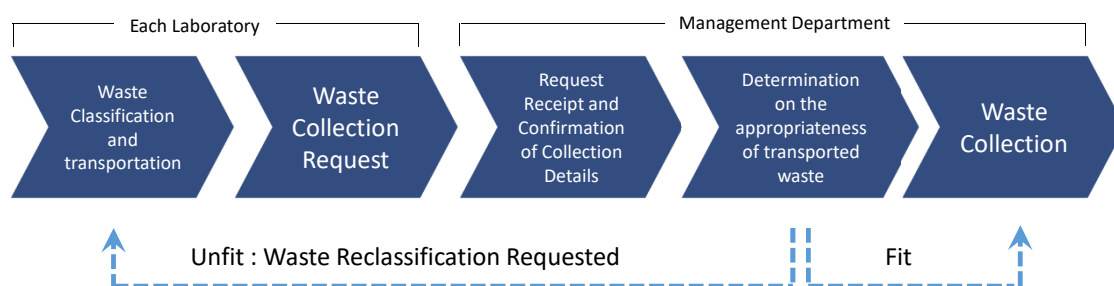
Classification		Type	Management Department
Hazardous Wastes from Experiments	Designated Waste	Solid hazardous wastes from experiments, waste reagents, waste fluids, empty reagent bottles, vials, ampoules, glassware, etc.	Safety Management Team
	Medical Waste	Wastes with hazard risks such as human infection, etc. (Animal carcass, pathogenic, tissues, damage wastes)	Safety Management Team
General Waste		Wastes generated in daily life (Papers, cans, glass and metals, etc.)	General Administration Team
Radioactive Waste		Radioactive substances and wastes contaminated by radioactive substances	Radiation Safety Management Center

- ③ In case of discharging designated wastes among the hazardous wastes from experiments generated in laboratories, the “facilities repair request” shall be made to the management department via the department office or university administration team.
- ④ In case of discharging medical wastes among the hazardous wastes from experiments generated in laboratories, request shall be made directly to the collection business designated by the management department.

[Guide on Collection of Medical Wastes from Experiments (Designated Wastes, Medical Wastes)]

Type	Designated Waste	Medical Waste
Subject	Buildings of Natural Sciences and Engineering Laboratories	
Date of Collection	Everyday	1-2 time(s)/week
Time of Collection	09:00(AM) - 16:00	04:00(AM) - 11:00
Collection Method	Collection by visiting the laboratories	
Order of Collection	<p>Samsung Hall → Science Hall → Advanced Science & Technology Center → IBS Hall → GS Caltex Industry-University Cooperation Hall → Industry-University Cooperation Research Hall → Engineering Hall No. 2 → Institute of Science → Institute of Engineering → Engineering Hall No. 1 → Engineering Hall No. 3</p> <p>Yonsei Milk (In case of occurrence)</p>	<p>Institute of Science → Samsung Hall → IBS Hall → Advanced Science & Technology Center → Engineering Hall No. 2 → Science Hall → Engineering Hall No. 1 → Institute of Engineering → Health Center</p> <p>GS Caltex Industry-University Cooperation Hall (In case of occurrence)</p>
Collection Request	“Facility Repair Request” application request related to waste collection made to department office or administrations team	<p>Collection request inquiry to the medical waste collection business that designates the management department</p> <p>* Inquiry of collection business to the management department</p>
Collection Period	Within 2-3 days following the receipt of request	Within 7 days following the receipt of request

[Process of Disposing Hazardous Wastes from Experiments]



- [Guide on Classification Method for Designated Wastes]

- ⑦ When disposing waste reagents among hazardous wastes from experiments, “Waste Reagent Disposal Request Application Form” shall be prepared and submitted in case of transportation.
- ⑧ When disposing liquid wastes among hazardous wastes from experiments, “Disposal Request Slip for Hazardous Wastes (liquid) from Experiments” shall be prepared and submitted in case of transportation.

[illegible]

Yonsei University Safety Management Team

- ⑨ Liquid wastes, of the hazardous wastes from experiments, shall be stored in designated containers in accordance with the characteristics by each description (alkalic, acidic, organic, inorganic) and shall have the waste fluid stickers prepared and attached thereto in cases of transportation.
- ⑩ The classification by type of hazardous wastes (liquids) from experiments as set by this school shall be as follows.

[Classification by Type of Hazardous Wastes (Liquids) from Experiments]

Classification	Type	Container Color	Sticker
Alkalic	Sodium Hydroxide, Potassium Hydroxide, Ammonia, Carbonate, Phosphate, etc. (pH 12.5 and higher)		<div> <div>Alkali Waste Fluid</div> <div> Affiliation (University/Laboratory) Laboratory Name Room Number Managing Professor (TEL No.) Lab. Safety Manager (TEL No.) Laboratory Management Grade </div> <div>A, B, C</div> <div> Caution 1. When handling waste fluids from experiments, safety protective gears must be worn prior to handling. 2. When collecting waste fluids from experiments, classification into organic, inorganic, acidic and alkali shall be made. 3. Substances that react when mixed must be sorted. 4. Collected and stored waste fluids shall be stored with airtight lids to prevent leaks and odors. 5. Collected containers shall be kept out of direct sunlight and in well ventilated areas and shall not be left in corridors, stairwells, etc. 6. When transporting, safe transportation methods must be used. </div> <div>Environment Management Office: 2123-4801</div> <div>Yonsei University Facilities Department Safety Management Team</div> </div>
Acidic	Nitric Acid, Sulfuric Acid, Hydrochloric Acid, Other Organic Acids, etc. (pH 2.0 and lower)		<div> <div>Acidic Waste Fluid</div> <div> Affiliation (University/Laboratory) Laboratory Name Room Number Managing Professor (TEL No.) Lab. Safety Manager (TEL No.) Laboratory Management Grade </div> <div>A, B, C</div> <div> Caution 1. When handling waste fluids from experiments, safety protective gears must be worn prior to handling. 2. When collecting waste fluids from experiments, classification into organic, inorganic, acidic and alkali shall be made. 3. Substances that react when mixed must be sorted. 4. Collected and stored waste fluids shall be stored with airtight lids to prevent leaks and odors. 5. Collected containers shall be kept out of direct sunlight and in well ventilated areas and shall not be left in corridors, stairwells, etc. 6. When transporting, safe transportation methods must be used. </div> <div>Environment Management Office: 2123-4801</div> <div>Yonsei University Facilities Department Safety Management Team</div> </div>
Organic	Halogen, Non-halogen Group, Dichloromethane, Trichloromethane, Chlorobenzene, Acetone, Ethanol, etc.		<div> <div>Organic Waste Fluid</div> <div> Affiliation (University/Laboratory) Laboratory Name Room Number Managing Professor (TEL No.) Lab. Safety Manager (TEL No.) Laboratory Management Grade </div> <div>A, B, C</div> <div> Caution 1. When handling waste fluids from experiments, safety protective gears must be worn prior to handling. 2. When collecting waste fluids from experiments, classification into organic, inorganic, acidic and alkali shall be made. 3. Substances that react when mixed must be sorted. 4. Collected and stored waste fluids shall be stored with airtight lids to prevent leaks and odors. 5. Collected containers shall be kept out of direct sunlight and in well ventilated areas and shall not be left in corridors, stairwells, etc. 6. When transporting, safe transportation methods must be used. </div> <div>Environment Management Office: 2123-4801</div> <div>Yonsei University Facilities Department Safety Management Team</div> </div>
Inorganic	Mercury, Cyanogen, Fluorine, Phosphoric Acid, Heavy Metals, etc.		<div> <div>Inorganic Waste Fluid</div> <div> Affiliation (University/Laboratory) Laboratory Name Room Number Managing Professor (TEL No.) Lab. Safety Manager (TEL No.) Laboratory Management Grade </div> <div>A, B, C</div> <div> Caution 1. When handling waste fluids from experiments, safety protective gears must be worn prior to handling. 2. When collecting waste fluids from experiments, classification into organic, inorganic, acidic and alkali shall be made. 3. Substances that react when mixed must be sorted. 4. Collected and stored waste fluids shall be stored with airtight lids to prevent leaks and odors. 5. Collected containers shall be kept out of direct sunlight and in well ventilated areas and shall not be left in corridors, stairwells, etc. 6. When transporting, safe transportation methods must be used. </div> <div>Environment Management Office: 2123-4801</div> <div>Yonsei University Facilities Department Safety Management Team</div> </div>

[Hazardous Waste from Experiments (designated wastes) Storage Status]



Article 17 (Substance Safety and Health Data)

- ① In handling hazardous factors such as chemical substances, gases, etc., the safety and health information of the hazardous factor shall be familiarized in full degree using the material safety data sheet (MSDS) beforehand.
- ② The laboratory manager or the safety manager shall receive the material safety data sheet (MSDS) of all hazardous factors such as chemical substances, gases, etc. used in the laboratory from the supplier and shall store them.
- ③ Contents to be included in the MSDS are as follows.

1. Information on the chemical product and the company
2. Hazardous risk
3. Names and content of ingredients
4. Emergency measure know-how
5. Countermeasure in case of explosive fires
6. Countermeasure in case of leakage accident
7. Handling and storage method
8. Leakage prevention and individual protective gear

9. Chemical characteristics of the substance
10. Safety and reactivity
11. Information on toxicity
12. Environmental impact
13. Cautions in discarding
14. Information necessary for transport
15. Status of legal regulations
16. Other reference details

[Material Safety Date Sheet]

MSDS Summary Information		
Name of Substance	Sulfuric Acid	
1. General Information		
CAS No. : 7664-93-9	KE No. : KE-32570	
Substance Characteristic: Liquid	Molecular Weight: 98.079	
Boiling Point : 337°C	Freezing Point : 10.4~10.94°C	
Flash Point : No Data		
Major Purpose : No Data		
2. Substance Information		
Name of Substance	CAS No.	Content (%)
Sulfuric Acid	7664-93-9	100%
3. Pictograms		
4. Hazard/Danger Phrases		
May corrode metals. Causes severe skin burns and eye damage. Causes severe damage to eyes. Fatal when inhaled. May cause cancer. Causes damage to (L) of human body. Harmful to aquatic organisms due to long-term effects.		
5. Emergency Measure Methods		
When in contact with eyes	When in contact with the eye, rinse carefully with water for several minutes. Remove contact lens if possible. Keep washing. Receive emergency medical care.	
When in contact with skin	Remove contaminated clothes and shoes, quarantine the contaminated area. When in contact with the substance, rinse skin and eye under running water for at least 20 minutes. In case of light contact with skin, prevent the spreading of contaminated area. In case the fusion substance becomes fixed on the skin, receive medical help when removing such. Receive medical (doctor's) examination immediately. Move to a location with fresh air. Keep warm and stable.	
When inhaled	When leaked or in concern of leakage, seek medical measures advices. When the substance has been eaten or inhaled, do not perform oral artificial respiration, but instead use appropriate respiratory medical devices.	
When eaten		
6. Storage Method		
This is a metal-humic substance, so store in a corrosion-resistant container (designated by manufacturer or administrative office). Empty drum cans shall be completely drained and properly sealed, immediately returned to drum regulator or appropriately placed. Contain only in the original container. Store at locations with locking mechanisms. Beware of substances and conditions to avoid.		
7. Conditions and Substances to Avoid		
Conditions to Avoid	Ignition sources such as heat, sparks, flames	
Substances to Avoid	Flammable substances (wood, paper, oil, clothes, etc.) / Metals / Water	
8. Countermeasures in Cases of Leakage, Explosion-Fire		
Leakage	Keep away from flammable substances and heated substances. Personnel without measures to access or those not equipped with protective gears, shall not enter. Reduce causes to spraying water but keep water away from leaked substance or containers. Immediately wipe spills and follow the preventive measures regulated in the protective gears clause. Quarantine the contaminated area. Stop the leak if not dangerous. Do not touch the broken containers or the leaked substances without appropriate protective gears. Beware of the substances and conditions to avoid. In case of leaks without fires, wear complete protection steam protective clothing.	
9. Legal Regulation Status		
Exposure Standard	No Data	
Special Medical Screening Term	12 months for special medical screening subject substances	
Work Environment Measurement Term	6 months for work environment measurement subject substances	
Occupational Safety and Health Act	Hazardous substances subject to management Special management substance	
Regulation in accordance with the Chemical Substances Control Act	Toxic substances Accident preparation substances	
Regulation in accordance with the Act on the Safety Control of Hazardous Substances	No Data	
10. Caution in Handling		
Wear Individual Protective Gears	Operate ventilation facilities / Seal containers	No Smoking / Fires Prohibited
Wear aeration vapor masks in sealed spaces Wearing of cotton masks, normal dust gas masks prohibited		

Sulfuric Acid	
CAS No. 7664-93-9	
Signal Language	Hazard / Danger Phrase
Danger	May corrode metals Causes severe burns to skin and damages eyes Causes severe damage to eyes
Preventive Measures Phrase	
Prevention	
Obtain handling manual prior to usage. Do not handle until reading and understanding all safety preventive measure phrases. Contain in the original container only. Do not inhale (dust / fume / gas / mist / steam / spray).	
Countermeasure	
When swallowed, wash the mouth. Do not try to vomit. When coming into contact with the skin (or hair), take off all contaminated clothing. Wash the skin with water / take a shower. When inhaled, move to a place with fresh air, relax in a posture that allows easy breathing. When coming into contact with the eyes, wash carefully with water for several minutes. If possible, remove contact lens. Keep washing.	
Storage	
The containers shall be firmly sealed and stored in areas with good ventilation. Store in storage location with locking mechanisms As this is a metal-humic substance, store in the corrosion-resistant containers (as designated by manufacturer or administrative office).	
Discarding	
Discard the contents and the container (in accordance with the provisions of relevant statutes).	
Supplier Information:	

Article 18 (Preliminary Hazardous factor Risk Analysis)

- ① “Preliminary hazardous factor risk analysis” refers to the act of analyzing Hazardous factors prior to the commencement of the research activities, the series of processes in which the laboratory manager establishes and implements necessary measures for the purpose of investigating/discovering the hazardous factors of the laboratory, prevention of accidents, etc.
- ② High-risk laboratories (laboratories with risk levels A and B grades) must perform the “preliminary hazardous factor risk analysis”.
- ③ The laboratory manager shall perform a preliminary hazardous factor risk analysis composed of each of the following clauses.
 1. Analysis of laboratory safety status
 2. Risk analysis of hazardous factors by each research activity
 3. Establishment of laboratory safety plan
 4. Establishment of emergency measure plan
- ④ The laboratory manager shall prepare the relevant form with each analysis results in accordance with Clause 3, submit it to the management department and shall have it furnished/stored in the laboratory

[Preliminary Hazardous factor Risk Analysis Relevant Form]

Guide on Implementation of Laboratory Preliminary Hazardous Element Risk Analysis [Annex Form No. 1]					
Laboratory Safety Status Chart ¹⁾					
(Preservation Period : 3 years from the end date of the research)					
Name of Institution	Classification		<input type="checkbox"/> University <input type="checkbox"/> Corporate (JAB) <input type="checkbox"/> Research Institute <input type="checkbox"/> Affiliation <input type="checkbox"/> Other		
Laboratory Overview	Name of Laboratory ²⁾				
	Laboratory Location	Ward	Floor	Rm. No.	
	Field of Research (Multiple Selection Available)	<input type="checkbox"/> Chemical/Chemical Engineering <input type="checkbox"/> Machinery/Physics <input type="checkbox"/> Electric/Electronic <input type="checkbox"/> Medical/Biology <input type="checkbox"/> Construction/Environment <input type="checkbox"/> Energy/Resources <input type="checkbox"/> Others			
	Name of Laboratory Manager	Contacts (Including e-mail)			
	Name of Laboratory Safety Manager	Contacts (Including e-mail)			
Emergency Contact ³⁾		Laboratory Safety Environment Manager:		Hospital :	
		Accident Handling Institution (Fire Station, etc.):		Other :	
Name of Research Activity ⁴⁾ performed by the Laboratory (Name of Experiment/Research Task)		1. 2. 3.			
Research Activity Worker Status	Serial No.	Name (Mark Gender)	Title ⁵⁾ (Professor/Researcher/Student, etc.)		
Major Apparatus Status	Serial No.	Name of Apparatus (Research Apparatus-Machinery Equipment)	Standard (Quantity)	Utilization Purpose	Remarks

Guide on Implementation of Laboratory Preliminary Hazardous Element Risk Analysis [Annex Form No. 2]					
Element Risk Analysis Report by Research Development Activity (by Experiment/ Practical Exercise/Research Task) ¹⁾					
(Preservation Period : 3 years from the end date of the research)					
Name of Research (Name of Element/Practical Exercise/Research Task)		Research Period (Experiment/Practical Exercise/Research Task)			
Major Contents of the Research (Experiment/Practical Exercise/Research Task)					
Research Activity Worker ²⁾					
Hazardous Element	Basic Information of Hazardous Element ³⁾				
	CAS NO ⁴⁾ Substance Name	Holding Quantity (Year of Manufacture)	GHS Level ⁵⁾ (Danger, Warning)	Distinction and Characteristics of chemical substance ⁶⁾ (Type 1~6)	Risk Analysis
	①				
	②				
1) Chemical Substance	③				
2) Gas	Gas Name	Holding Quantity	Gas Type (Specific, Toxicity, flammable, high-pressure, liquefaction and compression, etc.)		Required Protective Gear ⁷⁾
	①				
	②				
	③				
3) Organism ⁸⁾ (High-risk Pathogen and Risk Groups 3 and 4)	Name of Organism	Relevance to High-risk Pathogens	Risk Group Sorting	Risk Analysis	Required Protective Gear ⁷⁾
	①				
	②				
	③				
4) Physical Hazardous Factors ⁹⁾	Name of Apparatus	Type of Hazardous Factor	Size ¹⁰⁾	Risk Analysis	Required Protective Gear ⁷⁾
	①				
	②				
	③				

1) Prepared for each and all experiments (experiment/practical exercise, research task included) performed within the laboratory.
 2) Fill in the name of the research activity worker performing the research activity. Provided that, in case large groups of people performing or participating in the experiment such as department experiment, etc., fill in only the number of research activity workers and experiment hours.
 3) List the chemical substances, gases, organisms, physical hazardous factors, etc. used in the research activity.
 4) CAS No (Chemical Abstract Service Register Number, Serial No. allotted to chemical substances) shall be filled in by referring to the information provided by the manufacturer/supplier.
 5) In reference to <Regulations on Classification and Labelling of Chemicals>, GHS pictograms and sign language (Danger, Warning, etc.) shall be prepared.
 6) Distinction and Characteristics of Chemical Substances
 ※ In accordance with the Enforcement Decree of the <Act on the Safety Control of Hazardous Substances> Attached Form 1 (Hazardous substances and designated quantities) shall be filled in by classifying the distinction of chemical substances (types 1~6) and characteristics (oxidizing solid, flammable solid, spontaneous ignition substance and water reactive substance, etc.)
 7) Necessary protective gears shall be prepared in reference to the individual protective gear status prescribed in 'Laboratory Safety Status Analysis Chart (Annex Form No. 1)'.
 8) The term organism refers to the term that includes microbes and animals, etc., including all genetically modified organisms.

Distinction and Characteristics of Chemical Substances						
Distinction	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Characteristics	Oxidizing Solid	Flammable Solid	Spontaneous ignition substance and water reactive substance	Flammable Liquid	Self-reactive Substance	Oxidizing Liquid

Article 19 (Handling and Management by Hazardous factor)

- ① The laboratory manager shall perform education on the characteristics and handling cautions of the hazardous factors stored / used in the laboratory to the research workers, and shall be held responsible for the safety thereof.
- ② The research workers shall handle / manager the hazardous factors in accordance with their characteristics.
- ③ The laboratory manager shall prepare a handling and management register for hazardous factors such as dangerous machinery, facilities, chemicals, etc. of the laboratory to obtain the safety of the laboratory subject to precise safety diagnosis. The matters to be included in the management register are as follows.
 1. Name of Substance (Name of Equipment)
 2. Storage Location
 3. Current Holding Amount
 4. Handling Cautions
 5. Other matters determined as necessary by the Laboratory manager
- ④ In case grounds for amendments such as purchase, usage, disposal, etc. of hazardous factors have occurred the management register shall be supplemented.
- ⑤ Prepared management registers shall be published or furnished at each laboratory and such shall be notified to the Research workers. High-risk laboratories (laboratories with risk levels A and B grades) must prepare management registers.

[Format and Preparation Example of Hazardous factors Handling and Management Register]

[Attached Form No. 5]

Hazardous Element Handling and Management Register (Relevant to Clause 4, Article 13)

* Name of Laboratory: _____ * Preparing Person: _____ (SEAL)
 * Date of Preparation: Year _____ Month _____ Date _____ * Laboratory Manager: _____ (SEAL)

Serial No.	Name of Substance (Equipment Name)	CAS No. (Specification)	Holding Amount (No. of Units Held)	Storage Location	Hazard / Risk Sorting		Relevance	
					Physical Danger	Health and Environmental Hazard	Detailed Safety Diagnosis	Work Environment Measurement
1	(Preparation Example) Benzene	71-43-2 (Liquid)	700mL	Reagent Shelf-1			O	O
2	(Preparation Example) Acetylene	74-86-2 (Vapor)	200mL	Sealed Reagent Shelf-3			O	X
3	(Preparation Example) Centrifuge	MaxRPM : 8,000	1EA	Experiment Stand1	Caution in high speed spins (acquiring of sample balances, etc.)		-	-
4	(Preparation Example) Flash Tester	Measuring Range (80°C to 400°C)	1EA	Experiment Stand2	Caution in fires and explosions in using propane gas		-	-
5								
6								
7								

Remarks

- Substance Name / CAS No. : Fill in regarding the hazardous elements (chemical substances, research equipment, safety facilities, etc.) used and stored within the laboratory (Provided that, chemical substances and research equipment (facility) may be separately filled in / managed)
- Holding Amount : Fill in the amount of units held regarding the hazardous elements stored or used within the laboratory (Fill in units)
- Substance Storage Location : Fill in the location at which the chemical substance is stored or kept
- Hazard / Risk Sorting : Chemical substances shall be filled in by confirming the MSDS (Refer to No. 2, Hazard/Risk Sorting on the MSDS and Attached Form No. 1, "Chemical Substances Sorting/Indication and Standards on Substance Safety Health Data."), and as for equipment, handling cautions, etc. shall be listed.
- Relevance : Relevance to management as set by Chemical Substances Act Statutes (Relevance to detailed safety diagnosis, Article 9, Enforcement Decree of Laboratory Safety Act, Relevance to hazardous elements subject to work environment measurement, Attached Form 11-5, Occupational Safety and Health Act)

※ The form may be changed as necessary by the laboratory manager (Provided that, the substance names, storage locations, holding amounts, handling cautions stipulated in Clause 3, Article 13 must be included)

[Attached Form No. 5]

Hazardous Element Handling and Management Register (Relevant to Clause 4, Article 13)

* Name of Laboratory: Nano Madrepore Application Lab * Preparing Person: PARK, WAN JAE (SEAL)
 * Date of Preparation: 2021. 08. 18 * Laboratory Manager: BAE, YOON SANG (SEAL)

Serial No.	Name of Substance (Equipment Name)	CAS No. (Specification)	Holding Amount (No. of Units Held)	Storage Location	Hazard / Risk Sorting		Relevance	
					Physical Danger	Health and Environmental Hazard	Detailed Safety Diagnosis	Work Environment Measurement
1	Toluene	108-88-3 (Liquid)	500mL (1EA)	Organic Solvent Reagent Shelf			-	-
2	Xylene	1330-20-7 (Liquid)	200mL (1EA)	Organic Solvent Reagent Shelf			-	-
3	Centrifuge	MaxRPM : 20,000	1EA	Experiment Stand1	Caution in high speed spins (acquiring of sample balances, etc.)		-	-
4	Vacuum Oven	25°C ~ 250°C	1EA	Right-side Experiment Stand in Lab.	Caution : High Temperature		-	-
5	High-temp. Oven	25°C ~ 250°C	1EA	Right-side Experiment Stand in Lab.	Caution : High Temperature		-	-
6	Acetylene	74-86-2 (Vapor)	1	Gas Storage Shelf			-	-
7	Ethylene	74-85-1 (Vapor)	1	Gas Storage Shelf			-	-

Remarks

- Substance Name / CAS No. : Fill in regarding the hazardous elements (chemical substances, research equipment, safety facilities, etc.) used and stored within the laboratory (Provided that, chemical substances and research equipment (facility) may be separately filled in / managed)
- Holding Amount : Fill in the amount of units held regarding the hazardous elements stored or used within the laboratory (Fill in units)
- Substance Storage Location : Fill in the location at which the chemical substance is stored or kept
- Hazard / Risk Sorting : Chemical substances shall be filled in by confirming the MSDS (Refer to No. 2, Hazard/Risk Sorting on the MSDS and Attached Form No. 1, "Chemical Substances Sorting/Indication and Standards on Substance Safety Health Data."), and as for equipment, handling cautions, etc. shall be listed.
- Relevance : Relevance to management as set by Chemical Substances Act Statutes (Relevance to detailed safety diagnosis, Article 9, Enforcement Decree of Laboratory Safety Act, Relevance to hazardous elements subject to work environment measurement, Attached Form 11-5, Occupational Safety and Health Act)

※ The form may be changed as necessary by the laboratory manager (Provided that, the substance names, storage locations, holding amounts, handling cautions stipulated in Clause 3, Article 13 must be included)

- ⑥ The Research workers shall identify the characteristics of the chemicals handled in the laboratory and shall prevent beforehand the issues such as chemical reactions due to mixed storage, etc.

[Unfit / Fit Example Cases of Reagent Storage]



Non-implementation of classification
by substance characteristics



Classified by characteristics and stored

[Substances Not to be Mixed or Stored Together]

Classification	Acids Inorganic	Acids Oxidizing	Acids Organic	Alkalis (Bases)	Oxidizers	Poisons Inorganic	Poisons Organic	Water- reactives	Organic Solvents
Acids Inorganic			X	X		X	X	X	X
Acids Oxidizing			X	X		X	X	X	X
Acids Organic	X	X		X	X	X	X	X	
Alkalis (Bases)	X	X	X				X	X	X
Oxidizers			X				X	X	X
Poisons Inorganic	X	X	X				X	X	X
Poisons Organic	X	X	X	X	X	X			
Water- reactives	X	X	X	X	X	X			
Organic Solvents	X	X		X	X	X			

Article 20 (Safety and Protective Gear)

- ① The laboratory manager shall furnish protective gears appropriate for the research activities within the laboratory and shall have the research workers to wear such.
- ② The research workers must wear necessary safety protective gears before commencing the research activities.

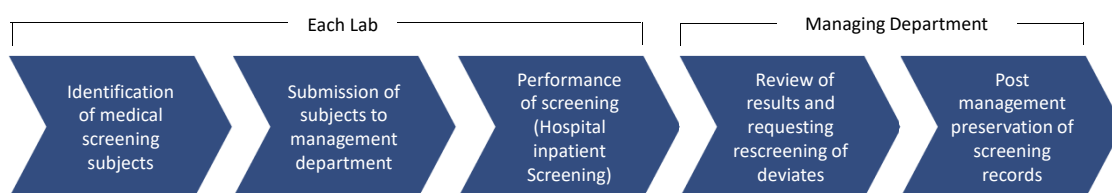
[Types and Functions of the Safety Protective Gears]

Respiratory Protective Gears				
	Protective Goggles	Gas Mask	Cartridge (For Combined Gases)	Prefilter for Dusts
	Prevents chemical contact to the face and to the eyes	Prevents chemical intake into the body	Protection from gases and steam	Protection from dust particles
Body Protective Gears				
	Protective Clothing	Protective Apron	Protective Gloves	Protective Boots
	Protects the body from chemicals	Protects the body from chemicals (In lieu of protective clothing)	Protects the hands from chemicals	Protects the feet from chemicals
Emergency Equipment and Kits				
	Absorbent Cloth, absorbent fence		Counteragent	pH Paper
	Absorbs the leaked chemicals		Absorbs the chemicals and solidifies into neutral matter	Measures the acidity of chemicals

Article 21 (Medical Screening)

- ① The head of the research entity shall perform general and special medical screenings on a regular basis for research workers at risk of exposure to hazardous factors.
- ② The head of the research entity shall perform general and special medical screenings for research workers handling hazardous factors set by law in accordance with the Laboratory Safety Act and the Occupational Safety and Health Act.
- ③ Hazardous factors requiring mandatory performance of general and special medical screenings are as follows.
 1. Chemical Elements
 - A. Organic compounds (109 types)
 - B. Metals (20 types)
 - C. Acids and alkalis (8 types)
 - D. Gas-state substances (14 types)
 - E. Substances subject to approval (12 types)
 - F. Meta; Processing
 2. Dusts (7 types)
 3. Physical elements (8 types)
 4. Night work (2 types)
- ④ Implementation cycle of general and special medical screenings shall be once a year. Provided that, research workers handling each of the following hazardous factors shall undergo a special medical screening every six months.
 1. N,N-Dimethyl acetamide
 2. Dimethyl Formamide
 3. Benzene
 4. 1,1,2,2-Tetrachloroethane
 5. Carbon tetrachloride
 6. Acrylonitrile
 7. Vinyl chloride
- ⑤ Medical screenings of the research workers shall be performed by the laboratory safety management department and the laboratories shall correctly identify and submit those subject to medical screenings and hazardous factors by each laboratory.

[Medical Screening Task Process]

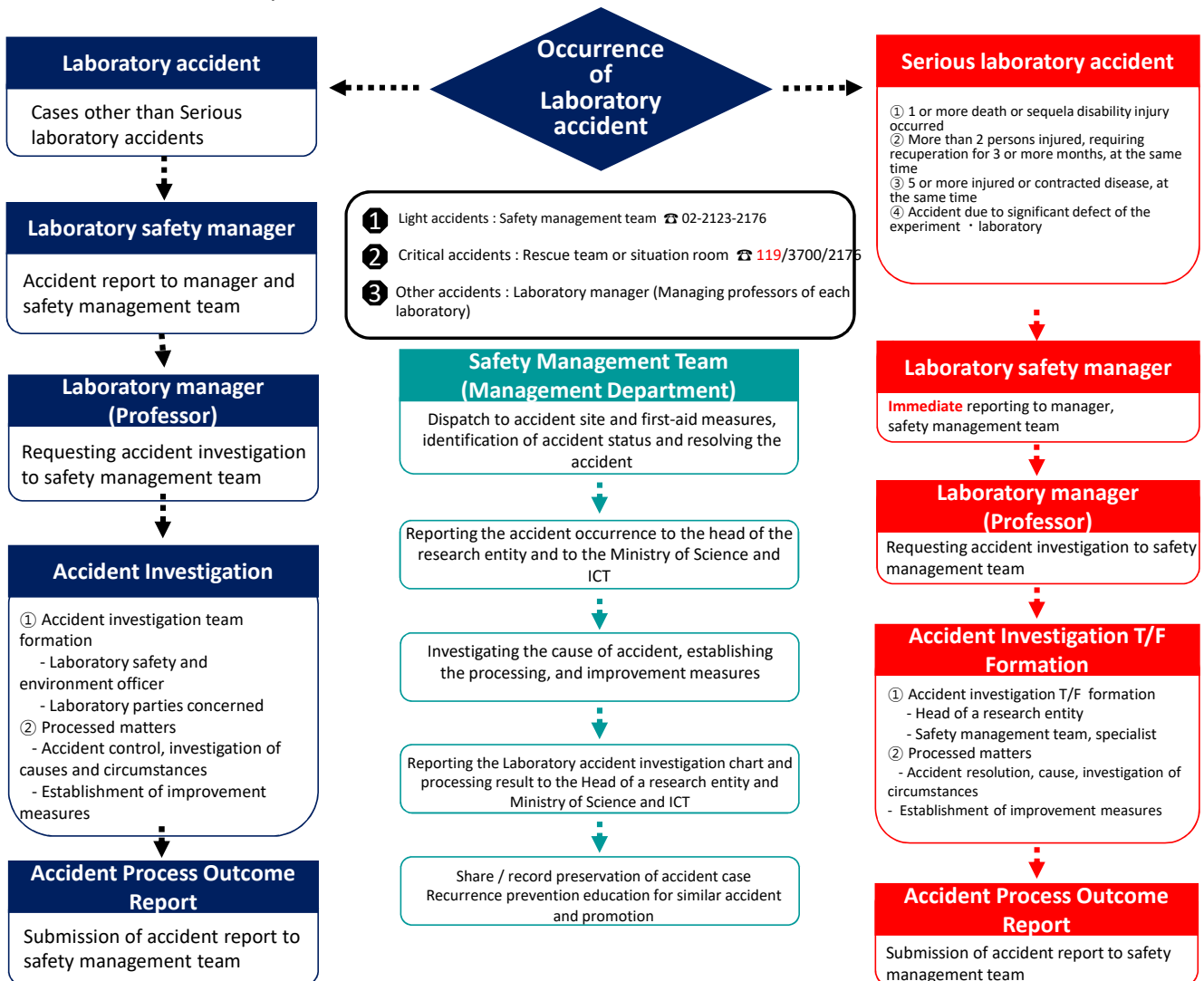


Chapter 7 Laboratory accidents

Article 22 (Accident Report)

- ① In case accidents occur within the laboratory, the manager of such laboratory shall notify the accidental circumstances, details and damages of the accident, etc. without delay to the management department.
- ② In case serious laboratory accidents set in Laboratory Safety Act occurs, the head of the research entity shall report each of the following to the Ministry of Science and ICT without delay. Provided that, in case inevitable causes such as natural disasters occur, reporting may be done once such cause ceases to exist.
 1. Summary of accident occurrence and damages situation
 2. Details of accident measures
- ③ In case laboratory accidents of Research workers occur, the head of the research entity shall prepare the laboratory accident investigation chart set by the law within 1 month and submit it to the Ministry of Science and ICT.

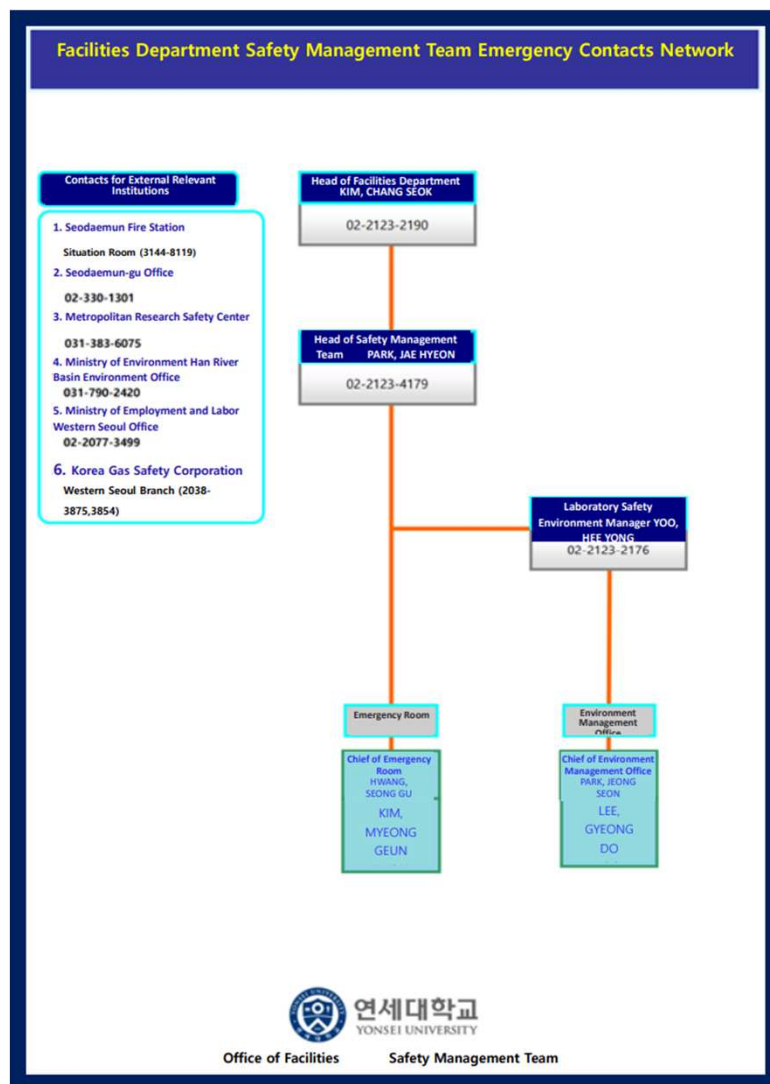
[Flowchart of Laboratory accident Process]



Article 23 (Accident Investigation)

- ① Management Department shall promptly perform saving of lives in case of accident occurrences and request support from competent fire stations, etc. when necessary.
- ② The laboratory safety and environment officer shall investigate the accident status such as accidental circumstances, causes and damage levels, etc., and shall report to the laboratory safety management committee or notify the department safety committee in accordance with the severity of the accident.
- ③ In case of critical accidents or in case technical investigation of causes is required, the head of the research entity may commission accident investigation to outside specialists or specialized organizations.
- ④ Departments and relevant departments shall review the accident report, establish recurrence prevention measures and follow-up measures for the prevention of accidents and notify such to the managing department.
- ⑤ The head of the research entity shall publish the accident cases to prevent occurrences and recurrences of accidents.

[Laboratory Safety Management Emergency Contact Network]



Chapter 8 Insurance

Article 24 (Insurance)

- ① Head of a research entity shall purchase insurance that holds the research workers as the insurant and beneficiaries, in preparation for injuries / deaths of research workers, in accordance with the standards set by the Act on the Establishment of Safe Laboratory Environment and the expenses required for the purchase of insurance shall be appropriated into the budget.
- ② The type of the insurance shall be such that includes details on compensating life, such as injuries / illnesses / physical disabilities / death, etc., and bodily damages due to accidents occurring in laboratories.
- ③ Compensation amount standards by insurance benefits shall be as follows.
 1. Recuperation Benefit : Medical expenses that must actually be covered within the maximum limit (2 billion KRW)
 2. Disability Benefit : More than the amount determined and publicly notified by the Minister of Science and ICT for each level of sequela disability
 3. Hospitalization Benefit : 50,000 KRW or more per day of hospitalization
 4. Survivor's Benefit : 200 million KRW or more
 5. Funeral Expenses : 10 million KRW or more

Article 25 (Subjects of Insurance)

- ① Subjects of insurance shall be selected by the department of management each year, and shall purchase insurance in accordance with the standards set by relevant statutes. Provided that, research workers corresponding to any of the following clauses shall be excluded from subjects of insurance.
 1. Industrial Accident Compensation Insurance Act
 2. Public Official's Compensation Act
 3. Pension for Private School Teachers and Staff Act
 4. Military Accident Compensation Act
- ② Subjects of insurance shall be limited to research workers performing research and development activities after accessing the laboratory. Moreover, acknowledgment is made only in cases of injuries / deaths caused by accidents that have occurred during research and development activities.
- ③ Various documents required for claiming insurance are as follows.
 1. Copy of Resident Registration
 2. Receipt of Medical Expenses
 3. Detailed Calculation Statement of Medical Expenses
 4. Outpatient Certificate
 5. Copy of Bankbook
 6. Other documents required for claiming insurance

Chapter 9 Laboratory Safety Management Expenses

Article 26 (Appropriation of Laboratory Safety Management Expenses)

- ① The head of the research entity shall appropriate the expenses required for each of the following clauses for securing laboratory safety, development of safety environment, etc. as laboratory safety management expenses in the budget annually.
 1. Insurance premium
 2. Spreading of safety culture such as acquisition/dissemination expenses for safety related materials and education/training expenses, etc.
 3. Medical screening
 4. Installation, maintenance and repair of facilities
 5. Purchase of protective gear
 6. Safety inspection and precise safety diagnosis
 7. Environment improvement expenses for matters pointed out
 8. Instructor fees and professional utilization expenses
 9. Fees
 10. Travel expenses and conference expenses
 11. Facility safety inspection expenses
 12. Accident investigation expenses and travel expenses
 13. Preliminary harmful element risk analysis expenses
 14. Laboratory safety and environment officer labor expenses
 15. Safety management system
 16. Expenses used for other laboratory safety matters
- ② The head of the research entity shall assign the amount corresponding to at least 1% of the total labor expenses for the research project as laboratory safety management budget in setting research expenses for the performance of the research project.

Article 27 (Laboratory Safety Management Expenses Aid)

- ① The department of management shall provide aid in laboratory safety and maintenance management expenses in construction for development of laboratory safety environment, purchase of equipment and other safety management matters.
- ② Laboratory safety management expenses aid is made once per semester. Provided that, in case the budget execution by the department of management is difficult, the aid may be postponed or be not made.
- ③ In providing aid for the laboratory safety management expenses, the department of management may make complete or partial aid for the request for aid in consideration of priority, necessary budget, scope of aid, etc. after a sufficient review.

④ Subject articles of laboratory safety management expenses aid are as follows in each clauses.

1. Major Structure
2. Safety Facilities and Equipment
3. Waste Disposal
4. Other Safety Management Matters

[Detailed articles of laboratory safety management expenses aid]

Items		Details	Other
Major Structure	Separation of Laboratory	- Separation of research (experiment) and office spaces	
	Ceiling	- Replacement of asbestos ceiling in research spaces	
	Floor	- Demarcation of safety zones for high-risk laboratories	
Safety Facilities	Ventilation Facility	- Installation of exhaust ducts (connection of reagent spaces, research equipment, fume hoods, etc.) - Installation of secondary exhaust facilities such as sirocco fans	
	Alarm Facilities for Gas Facilities	- Installation of gas leak detection alarm devices within laboratories handling toxic, combustible and specific high-pressure gases	
	Reagent Storage Facility	- Safety cabinet for reagents (exhaust type, filter type, wood type) - Cabinet for flammables (designated for organic solvents)	
Safety Equipment	Gas Conduction Prevention Device	- Installation of conduction prevention devices designated for high-pressure gas containers (stand type, table-fixed type)	
	Emergency Shower / Eye Washing Station	- Emergency shower station (for entire body), eye wash station (for both eyes)	
	Gas Cylinder Cabinet	- Harmful gases such as ammonia, chlorine, etc.	
	Safety Protective Gear Box	- Provision of safety protective gear box	Common standard
Waste Disposal	Solid / Liquid Waste Matter	- Collection of waste organic solvents (waste fluids from experiments, waste acids/waste alkali, waste reagent bottles, etc.) - Collection of waste halogen organic solvents [waste reagent, toxic substances, high-density waste acid/waste alkali, radioactive waste (filter, jerrycan), etc.]	Facility repair request made to Facilities Department Safety Management Team -> Containers for waste fluids provided and collection proceeded
	Medical Waste	- Collection of tissue-type waste (solid matter), pathologic waste, damaged waste, general medical waste - Provision of designated containers and lids for general medical waste	
Other	Provision of Laboratory Safety Signs	- Laboratory safety regulations board - Laboratory risk rating (NFPA) sign - Laboratory safety training enrollment status board	Facility repair request made to Facilities Department Safety Management Team -> Provided

[Cases of Laboratory Safety Management Expenses Aid]

Major Structure			
	Separation of Laboratory and Office Space	Replacement of Asbestos Ceilings	Establishment of Laboratory Safety Zones
Safety Facilities			
	Ventilation Facilities	Alarm Facilities for Gas Facilities	Reagent Storage Facility
Safety Equipment			
	Gas Conduction Prevention Device	Emergency Shower / Eye Washing Station	Safety Protective Gear Box
Waste Disposal			
	Treatment of Hazardous Waste From Experiments	Collection of Hazardous Waste Fluid From Experiments	Aid in Medical Waste Supplies