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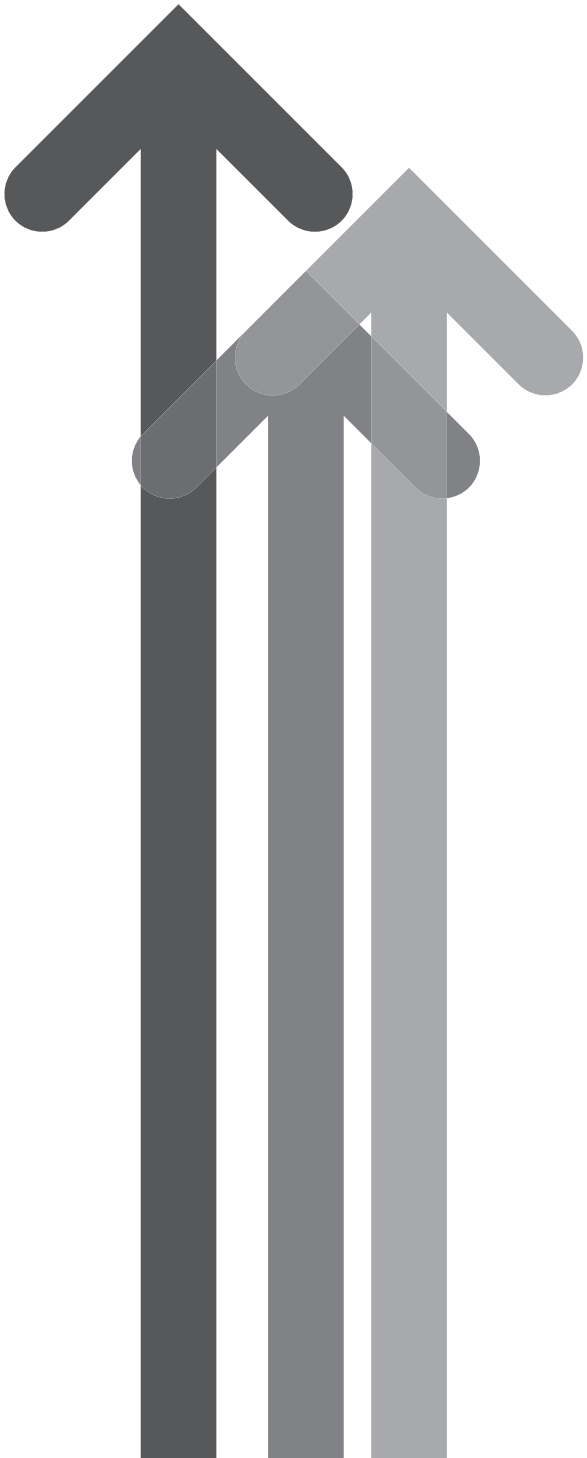
Section 1

Purposes of Formulating Safety Management Guidelines



Section 1 Purposes of Formulating Safety Management Guidelines

These Safety Management Guidelines (Safety and Health Management Guidelines of Saitama University Graduate School of Science and Engineering) provides the code of conduct that every school staff member and student must follow so that any research activities at Saitama University Graduate School of Science and Engineering (the Organization) can be performed safely and smoothly. At the same time, they define the duties of the personnel in administrative positions.

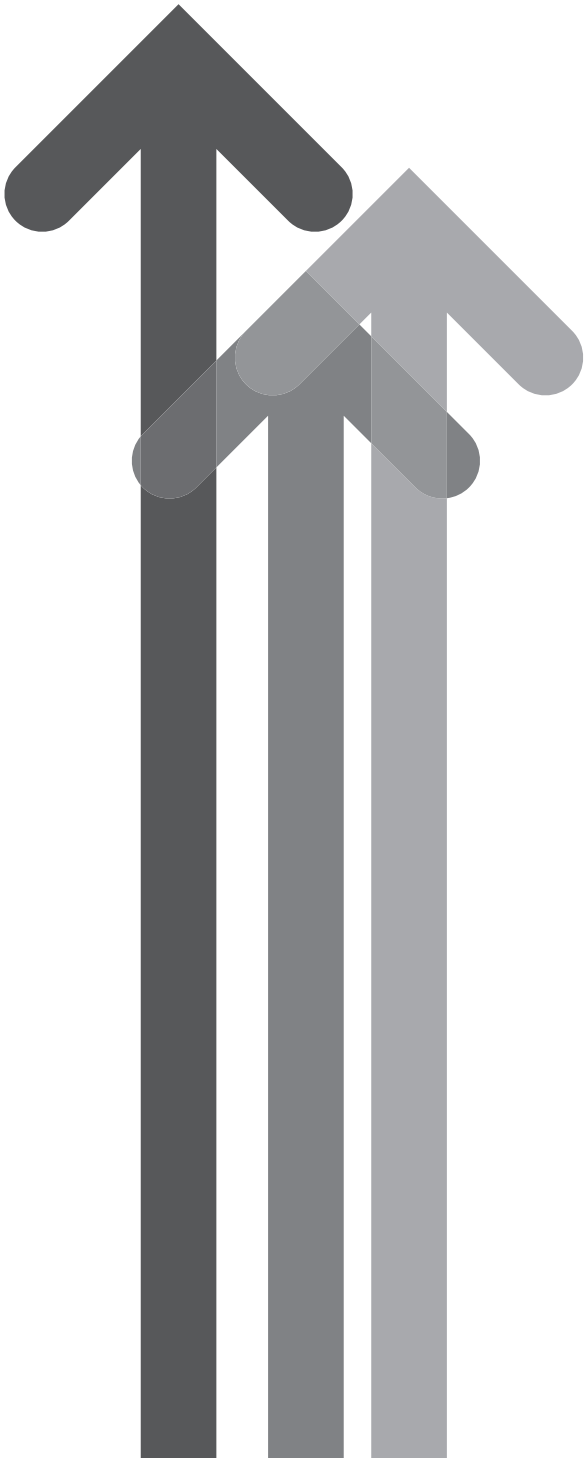
Safety management is a matter that relates to the health of staff members and students in the school and people of the community, and conservation of the environment. Safety management is an obligation and a lifeline of the Organization that must be fulfilled with the highest priority in all research activities. It means the Organization must prevent the occurrence of fires and accidents and protect the health of school staff members and students by managing the Organization complying with the regulatory provisions of the Labor Standard Act, Industrial Safety and Health Act, and other regulations. An accident may be caused by negligence in safety management, which discloses inadequate safety management systems and can suspend research activities. All school staff members must always remember the following points.

Disclosure of as much information as possible should be maximized in executing safety management. It is necessary to prevent the occurrence of accidents and to respond quickly and effectively when an accident occurs to minimize the damage. It is also necessary that the responsibility structure and the decision-making process of safety management are clearly defined and indicated to all school staff members to be properly accountable to society. It means that school staff members must know their duties, the management structure, and assignment of duties. These Safety Management Guidelines are formulated in consideration of providing the whole picture of safety management based on the purpose explained above.

These Safety Management Guidelines form the basis of safety and health management as provided by the School of Science and Engineering Safety and Health Committee to each department of the Research Division and each course of the Education Division.

Section 2

Guidelines for Safety Management



Section 2 Guidelines for Safety Management

The safety management guidelines of the School of Science and Engineering in complying with the related laws and regulations (Industrial Safety and Health Act, Poisonous and Deleterious Substances Control Act, Fire Service Act, High-Pressure Gas Safety Act, Sewerage Act, Water Pollution Prevention Act, Waste Management and Public Cleansing Act, and Act on Preventing Environmental Pollution of Mercury) are as follows. First, the responsibility structure in safety management and walk-around checks for safety management are explained. Article 1 [Purpose] of the Industrial Safety and Health Act clearly requires the establishment of the responsibility structure, and periodic safety walk-around checks by the Health Supervisor are mandated by Article 11 of the Ordinance on Industrial Safety and Health.

2.1 Responsibility Structure in Safety Management

(1) The basic policy of safety management is formulated by the Saitama University Graduate School of Science and Engineering Safety and Health Committee, but the actual safety and health management operations must be made in the respective courses under the responsibility of the Course head, and the Health Supervisors and Health Promoters must implement the operations. Safety and health management is implemented by the Safety and Health Committee of the School of Science and Engineering. The Dean of the Graduate School of Science and Engineering will chair the Safety and Health Committee, and the Health Supervisors and Health Promoters of the respective courses are assigned as members of the Safety and Health Committee. Each laboratory must assign a Safety Management Supervisor (Instructor Level) who must be responsible for the safety and health management of the school staff members and students belonging to the laboratory.

(2) Instructions for safety management should be given by way of the Dean of the Graduate School of Science and Engineering, Course head, and Safety Management Supervisor. All school staff members with supervising authority should assume legal liability in the case of an accident.

(3) The Dean of the Graduate School of Science and Engineering must ensure the performance of the duties provided in the relevant laws and regulations (Industrial Safety and Health Act, Poisonous and Deleterious Substances Control Act, Fire Service Act, High-Pressure Gas Safety Act, Sewerage Act, Water Pollution Prevention Act, Waste Management and Public Cleansing Act, and Act on Preventing Environmental Pollution of Mercury), such as the formulation of Management Manuals, review of Approval or Authorization Application Forms, and execution of periodical inspections as required by such laws and regulations.

  (a) Implement operations required for compliance with the Fire Service Act, appoint the Fire Warden, and conduct emergency drills

  (b) Implement operations required for compliance with the Industrial Safety and Health Act and Poisonous and Deleterious Substances Control Act

  (c) Implement operations required for compliance with the High-Pressure Gas Safety Act

  (d) Implement operations required for compliance with the Sewerage Act and Water Pollution Prevention Act

(e) Implement operations required for compliance with the Waste Management Act

(f) Implement operations required for compliance with the Act on Preventing Environmental Pollution of Mercury

(g) In addition, implement required operations for the approval or authorization of required regulatory matters, such as experiments using radiation, X-rays, and involving genetic recombination

(4) The Dean of the Graduate School of Science and Engineering must ensure that school staff members receive a physical examination (general) and the special physical examination for the school staff members engaged in the hazardous operations using hazardous materials, radiation, and X-ray for the period for one month or longer as a rule as provided in the Industry Safety and Health Act.

(5) In the case of a natural disaster, such as an earthquake, fire, or accident, the Safety and Health Committee must lead the action to respond to the situation and analyze the cause. Accordingly, the Safety and Health Committee should prepare to establish the response task force for the possible type of accident considered under the direction of the School Crisis Management Office. Staff members responsible for rescue operations and for communication with the regulatory authorities should be assigned in the response task force, and periodic drills should be conducted.

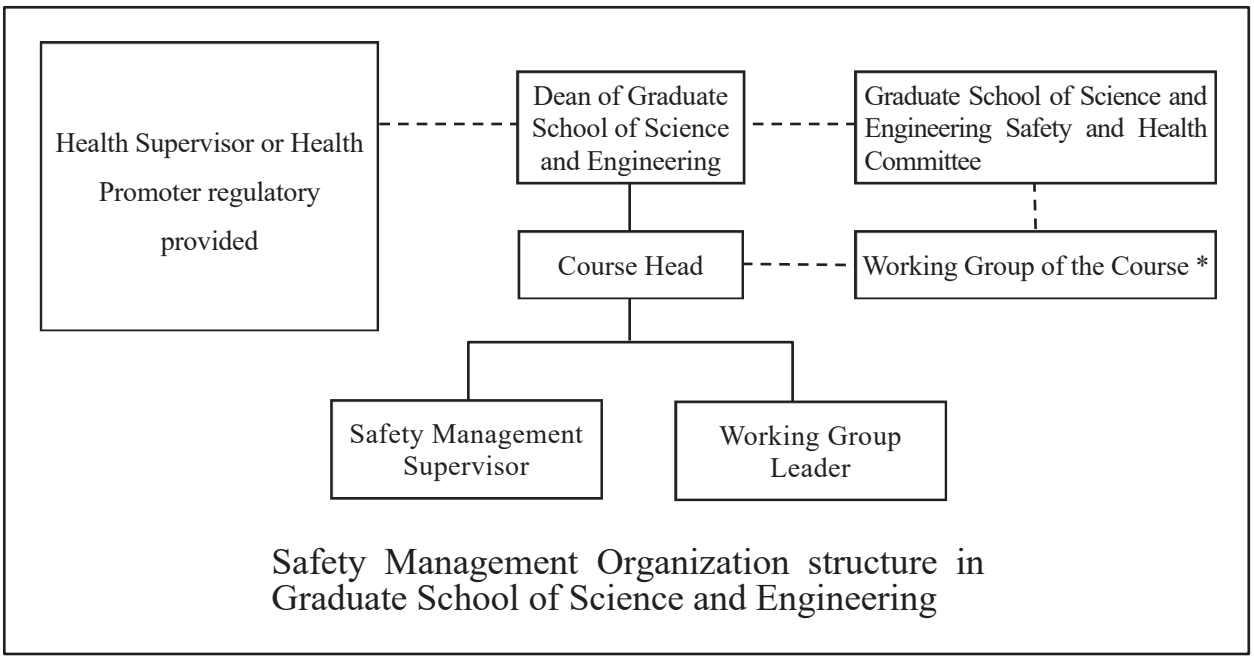
(6) When the Dean of the Graduate School of Science and Engineering considers that safety management is neglected or fears that safety management may be neglected, from the viewpoint of safety management of the Graduate School of Science and Engineering, the person should be advised to improving the operational procedures compliance with safety management through the Department head and/or Course head. The Dean of the Graduate School of Science and Engineering can advise the President of the University to recommend punishments for school staff members who do not adhere to the safety management requirements.

2.2 Safety Walk-around

(1) The responsible person of each laboratory (Safety Management Supervisor) must perform the safety checks based on the Laboratory Walk-Around Checklist (Forms 3-1 and 3-2) once every week. The completed checklist must be submitted to the respective Course head (or to the Health Supervisor or Health Promoter).

(2) The Member of the Safety and Health Committee of the Course must conduct the laboratory walk-around check with or based on interviews with the Safety Management Supervisor once a week based on the submitted checklist.

(3) The Member of the Safety and Health Committee must make a record of the walk-around checks. The Member of the Safety and Health Committee can order improvement of any problems found. A Safety Management Supervisor who received such an improvement order should consider and respond to the improvement plan promptly.



Safety Management Organization structure in Graduate School of Science and Engineering

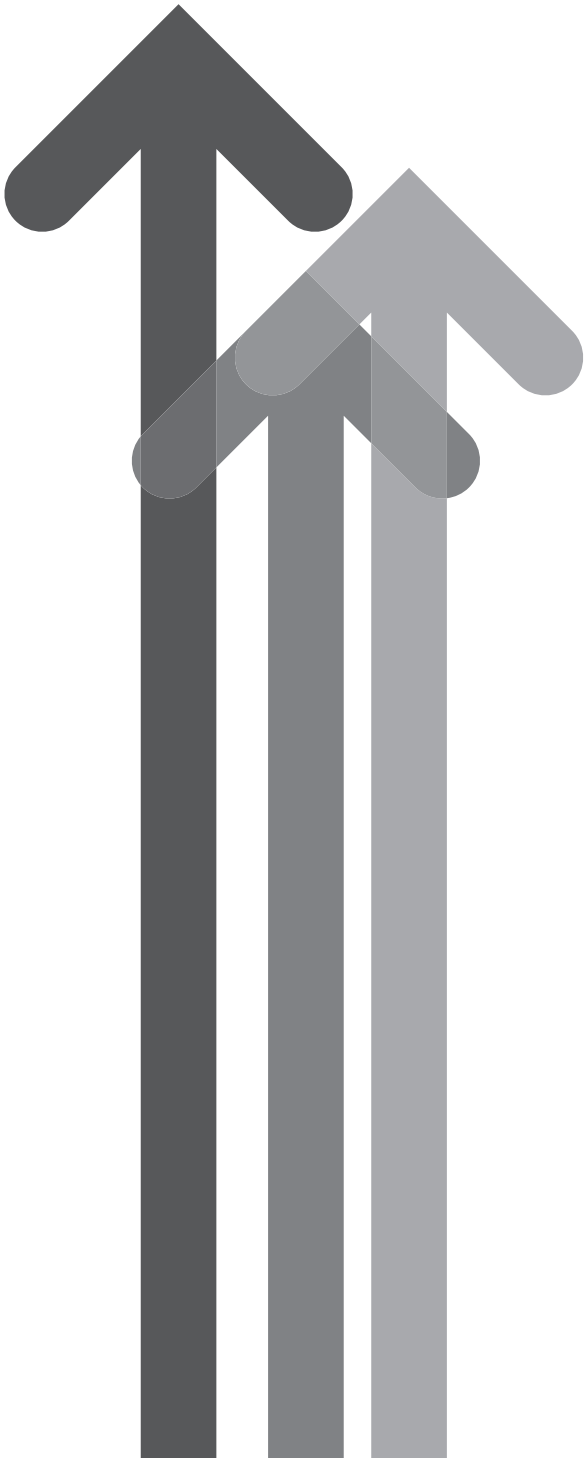
* Some Courses establish the Safety and Health Committee of the Course at its discretion. The staff members of the course should be appointed as the Health Supervisor and Health Promoter.

2.3 Use of Facility Outside Office Hours

The Graduate School of Science and Engineering buildings are open from 8:00 AM to 8:00 PM on weekdays (Monday to Friday). When the facility is used outside those hours, authorization must be obtained from the Safety Management Supervisor of the Laboratory to which the person belongs. When the facility needs to be used necessarily only by a student and/or graduate research student, the process required for the use of the facility outside office hours determined in the respective course must be followed after authorization by the Safety Management Supervisor of the laboratory. The experiments made outside the office hours must be performed by multiple persons avoiding a single person.

Section 3

Steps for Safety Training before Starting Research Activities



Section 3 Steps for Safety Training before Starting Research Activities

(1) Any persons consistently engaged in research activities, such as the school staff members, students, and graduate research students in the Graduate School of Science and Engineering (or Faculty of Science and Faculty of Engineering) must receive safety training according to these Safety Management Guidelines before starting any research activities.

(2) The safety training provided before the start of research activities must be provided by the Safety Management Supervisor (school staff;or Health Supervisor, Health Promoter). The person who provides the safety training must thoroughly explain the contents of these Safety Management Guidelines. After completing the safety training, the persons who provided and received the training must sign the Confirmation Sheet on Safety Management (Form 1).

(3) The persons who provided and received the safety training must submit the Confirmation Sheet (Form 1) in Paragraph (2) above to the Course head (Department head; or Member of the Safety and Health Committee), and the fact that the proper conduct of safety training must be verified by the Safety Training Interrogation Record (Form 2). The Safety Training Interrogation Record and the Confirmation Sheet must be compiled by the Administrative Office of the Course and submitted to the Support Office of the Graduate School of Science and Engineering in electronic format.

(4) After completion of the steps above, the start of the research activities is authorized. No operations, such as an experiment, can be performed without completing these steps.

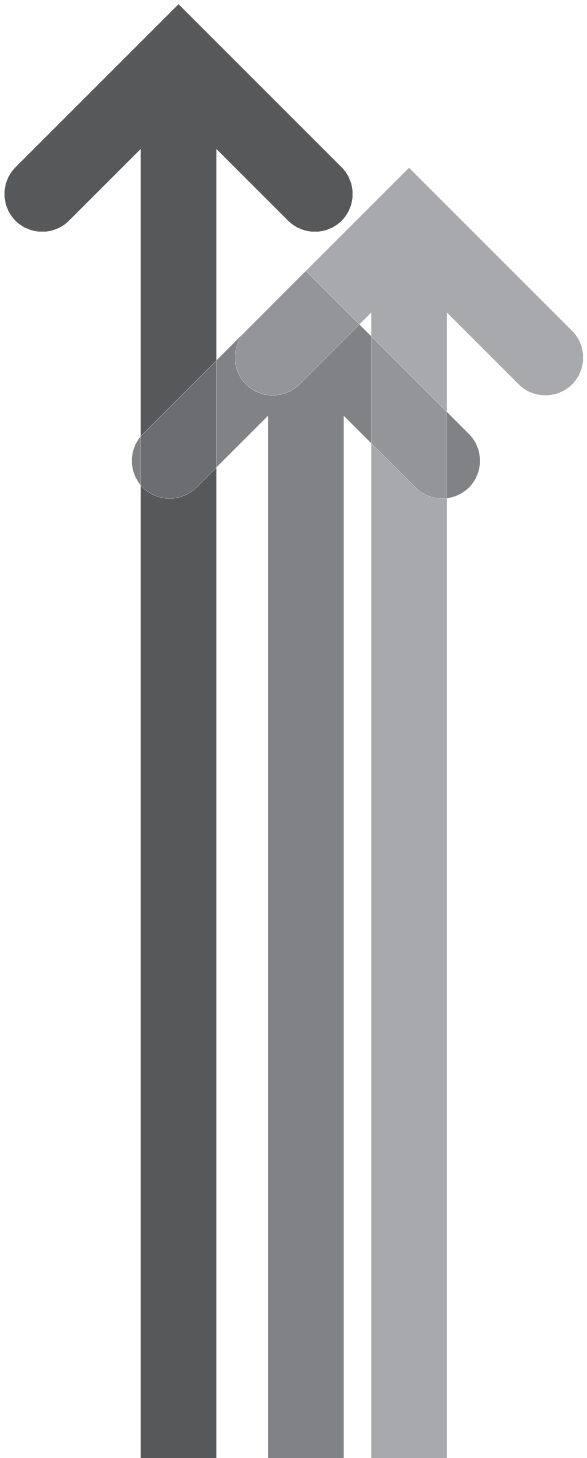
(5) The Safety Training may be exempted when the period of operation, such as the experiment, is less than two weeks in aggregate in each year, and the operation is made with the full attendance of school staff members, considering that such operation is a laboratory or visitor tour. To the persons who are considered to receive equivalent safety training by a different organization, safety training considering the actual state of the Graduate School must be provided.

(6) Provision of safety training should not be limited to the time when the research activities are being started. Safety training should be provided by the Safety Management Supervisor as appropriate when the operation procedure is changed or during the periodic inspection, and the safety training herein defined is the minimum requirement.

(7) The administrative office staff members need to receive safety training up to Section 4 “General Precautions” of these Safety Management Guidelines. Persons who are engaged in the research of special subjects involving experiments must receive explanations of all related subjects within and following Section 5.

Section 4

General Precautions



Section 4 General Precautions

The matters described in this section are related to all school staff members and students engaged in research activities. Precautions related to the research of special subjects involving experiments are described within and following Section 5. In this section, common matters, such as the application and delivery of keys/card keys and matters related to waste, are explained, and no detailed steps are described. The administrator of the clerical work (Office Manager), the Dean of the Graduate School of Science and Engineering, and the Course head should lead and supervise the operations so that these steps can be processed smoothly without omissions.

4.1 Comprehensive Precautions

(1) The Safety Management Supervisor must know the emergency contact information of school staff members and the students for emergency cases of sudden illness, injury, or accident.

(2) The person who leaves the usual place of research activities for a long time must report the location of such place to the Safety Management Supervisor.

(3) Short-circuiting, electric leakage, and overheating of the electrical system should be avoided considering the required electric energy, capacity of the wiring, and extensions and by avoiding the accumulation of dust.

(4) When a person returns home from the laboratory, turn off the electricity, except for the equipment that must be operated continously. When the equipment or devices must be operated continously, authorization by the Safety Management Supervisor must be obtained.

(5) At least two evacuation routes must be established in the respective places of research activities, which must not be blocked with obstacles. A path of at least 80 cm in width must be established.

(6) Heating appliances without earthquake-proof units must not be used.

4.2 Matters Related to Locking of Rooms

(1) As a rule, entrance doors to the laboratory must always be closed.

(2) The office, study/discussion room, and laboratory must be locked when no one is inside. Before leaving the room, the safety of the inside must be checked.

(3) As a rule, keys to the discussion room and laboratory, which are commonly used by multiple persons, should be stored in the key storage box.

4.3 Matters Related to Keys/Card Keys

(1) Handling of keys must follow the handling manuals of keys for the respective support rooms, offices, and laboratories.

(2) When a person enters or leaves the Graduate School of Science and Engineering building during nighttime hours (20:00 to 8:00) and on holidays, the staff ID or student ID registered for the respective buildings must be used.

(3) When a person entering the university buildings using the staff ID or student ID should not let strangers pass

through. When entering the building with an accompanying person using a valid ID, the accompanying person also should check the ID.

4.4 Matters Related to Fire Wardens

(1) As a rule, the Fire Warden should be appointed by the Dean of the Graduate School of Science and Engineering from school staff members. When one person is assigned as a Fire Warden for four or more rooms, approval by the Course head and Dean of the Graduate School of Science and Engineering must be obtained.

(2) When the appointment of the responsible person for the handling of hazardous materials in the room is mandated, as a rule, the Fire Warden should also assume such responsibility to merge the responsibilities for each room.

(3) The Fire Warden can ask the purpose and method of use of the room managed by the warden when the room under his/her control is used by other school staff members and/or students. Use of the room must not be allowed unless authorized by the Fire Warden.

(4) The Fire Warden must provide the necessary information for safety management of the room under his/her control before authorization to use the room.

(5) Retention of keys and registration of the key storage box must be authorized by the Fire Warden.

4.5 Emergency Responses for Fire, Earthquake, Accident, and Other Emergencies

In the event of an emergency such as a fire or earthquake, all persons involved must behave according to the Earthquake Response Manual and Hazard Response Manual of Saitama University and to the Safety Guidelines of the Graduate School of Science and Engineering. The principles of such response are (1) ensure personal safety, (2) provide notification, (3) fight fires, and (4) evacuation, guidance, and rescue. In addition, firefighting and rescue operations must not be made by a single person.

In the event of a fire, accident, theft, or other emergencies, the Safety Management Supervisor must fill in the necessary information in the prescribed Irregularity Report (Form 4) and submit it promptly to the Course head and the Dean of the Graduate School of Science and Engineering through the Member of the Safety and Health Committee of the Course. The Dean of the Graduate School of Science and Engineering must verify the contents of the Irregularity Report received from the Safety Management Supervisor and must make the school staff members and students other than those belonging to the course concerned promptly aware of the details of such irregularity through the Graduate School of Science and Engineering Safety and Health Committee for preventing similar accidents.

4.6 Matters Related to Waste

The Waste Management and Public Cleansing Act (Waste Management Act) defines that the waste as any refuse, bulky waste, combustion residues, sludge, excreta, waste oil, waste acid, waste alkali, bodies of animals, and other pollutants or undesired substances in solid or liquid form (but excluding radioactive substances and radioactively contaminated substances). The Organization (Saitama University) must assume

responsibility for the refuse (waste) generated within the Organization from the time such waste is discharged from the Organization until such waste is finally disposed. Accordingly, any person who generates waste on campus must comply with the following rules of the University.

(1) General waste related to daily life must be collected according to Table 1.

(2) The method of discharge and discharging place for waste must follow the instructions given by the University (cf. pp. 46–47).

(3) Industrial waste must be discharged according to Table 2. When the industrial waste is discharged, the process must follow the instruction given by the Asset Management Center of Finance Division.

(4) Matters related to the liquid water, drain water, gas emissions, and other wastes generated by the experiment closely related to the research are explained in Section 5.

4.7 Matters Related to the Operation of IT Equipment

(1) Operations using IT equipment should not be continued more than one hour, and a 10- to 15-minute break should be taken before starting the next operation. Consecutively use of tablet and smartphone for a long time should be avoided.

(2) The display of the desktop PC should be preferably placed so that its upper side is at the level of or slightly below the eyes. When using a laptop PC or tablet, the operator should assume the appropriate posture, and depending on the type of operation, auxiliary equipment (display, keyboard, mouse, etc.) should be used.

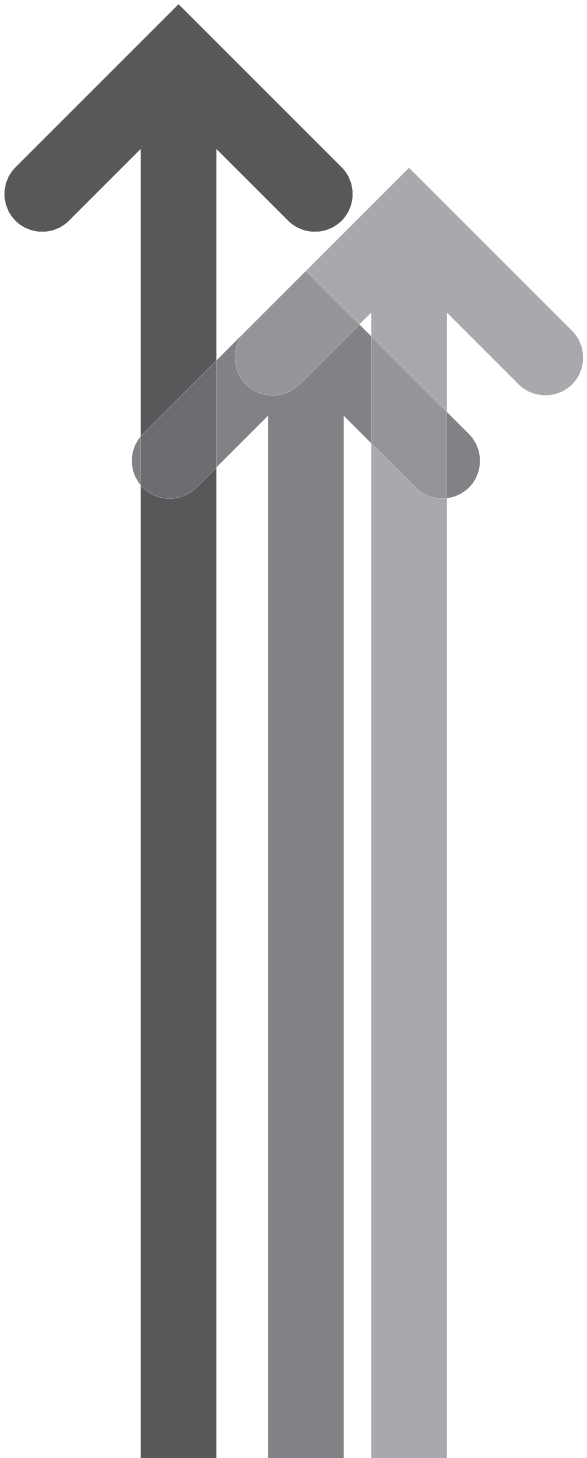
(3) IT equipment should be used under moderate lighting while preventing the incidence of sunrays and background reflection of lighting equipment.

(4) Among school staff members and students who are constantly engaged in the operation using IT equipment for more than four hours per day and such operation needs to be made in considerably binding conditions or those feeling certain subjective feelings, although engaged in different conditions, must receive a periodic physical examination for IT equipment operation.

* With respect to the Industrial Safety and Health Act, the Occupational Safety and Health Management Guideline in Operations using IT Equipment (https://www.mhlw.go.jp/content/000539604.pdf) is available. This guideline should be followed depending on the situation.

Section 5

Precautions Specific to Experiments and Research



Section 5 Precautions Specific to Experiments and Research

Precautions related to the research of special subjects involving experiments are described in this section.

5.1 General Precautions in Research Activities

(1) Permanent or part-time office staff must not be assigned operations, such as experiments related to research activities that require special knowledge. However, this will not be applicable for the toxic and deleterious substance registration service in the Comprehensive Technical Service Center.

(2) Operations involving hazards must be performed by multiple persons and not a single person. As a rule, such operations should not be performed on holidays and during the night.

(3) When the student and/or graduate research student performs hazardous operations or operations involving the handling of hazardous substances in experiments, authorization by the Safety Management Supervisor of the laboratory to which they belong must be obtained.

(4) When the student and/or graduate research student performs an experiment in the place other than the designated place, authorization by the Safety Management Supervisor of the laboratory to which they belong and by the Fire Warden of the place where the experiment is performed must be obtained.

(5) Always keep the inside of the laboratory clean and organized.

(6) Do not leave too many chemicals or reagents on the laboratory table. In particular, never leave the chemicals on the floor.

(7) Make sure that the cap or cover of the container for chemicals and liquid waste is closed.

(8) In the laboratory where volatile solvents are used, the use of fire, including a heater with an open flame, must not be used.

(9) Garments and shoes worn (including helmet) in the experiment should be selected depending on the type of experiment.

(10) When unmanned equipment is used, the necessary safety precautions approved by the instructor must be taken, and the emergency contact must be posted in a prominent place, such as the entrance to the door.

(11) Once every week, the Member of the Safety and Health Committee of the Course must conduct a laboratory walk-around with or a check based on an interview with the Safety Management Supervisor according to the submitted Check Sheet (Forms 3-1 and 3-2).

5.2 Matters Related to Chemicals

5.2.1 General Precautions for Chemicals

(1) Before handling a chemical, its toxicity (acute and chronic toxicity), flammability, and explosivity must be investigated in advance. The Safety Data Sheet (SDS) provided by the supplier and/or manufacturer should be used. Management of chemicals must be made using the Management System for Lab Chemicals (IASO).

(2) When handling a chemical, investigation as to whether such substance is regulated by laws and regulations in advance shall be made. When a certain legal procedure is required, the fact must be reported to the Health Supervisor, and such procedure should be made by the Safety management Supervisor.

(3) With respect to the especially hazardous substances due to toxicity, flammability, or explosivity, whether the use of such substance cannot be avoided, whether an alternative substance is available, and other information should be examined from the planning stage of the experiment to minimize the use of such especially hazardous substance.

(4) In this subsection, the substances specified by the following laws and regulations are regarded as hazardous chemicals whose handling must be made with special care. Even though a chemical is not designated as hazardous, the provisions here must be applied if equal hazard levels are anticipated.

(a) Organic Solvent (Ordinance on the Prevention of Organic Solvent Poisoning, (Organic Solvent Ordinance))

Total 44 types of solvents in Classes 1, 2, and 3 and the mixtures thereof [Table 3]

(b) Specified Chemical Substances (Ordinance on the Prevention of Hazards Due to Specified Chemical Substances)

Total 74 types of specified chemical substances in Classes 1, 2, and 3 [Table 4]

(c) Toxic Substance (Poisonous and Deleterious Substances Control Act)

Total 27 types of toxic and specified toxic substances and the substances specified separately [Table 5]

(d) Deleterious substance (Poisonous and Deleterious Substances Control Act)

93 types of deleterious substances and the substances specified separately. [Table 6]

(e) Hazardous Materials (Fire Service Act)

Categories 1 to 6 [Table 7]

(5) Handling of the hazardous chemicals must comply with the laws and regulations above and the Hazardous Material Storage Management Manual of the Graduate School of Science and Engineering.

(6) The hazardous chemicals must not be used for a purpose other than research activities. The hazardous chemicals must not be brought outside the School.

(7) Carriage and handling of hazardous chemicals must be made by the person who has adequate knowledge of such chemicals.

(8) When handling hazardous chemicals, adequate care must be taken to prevent scattering, leakage, loss, and inhalation of the vapor of the hazardous chemicals. A strong container with the cap or lid installed must be used to prevent spillage, leakage, seepage, or dispersion of hazardous chemicals.

(9) The Safety Management Supervisor of the laboratory where hazardous chemicals are handled must check the storage condition and the quantity of the hazardous chemicals in the laboratory as appropriate and must implement the actions required to maintain the health and safety of all persons. The Safety Management Supervisor of the laboratory must conduct a risk assessment once every year based on the Questionnaire (Form 8) and must submit the survey results to the Support Office of the Graduate School of Science and Engineering according to the Industrial Safety and Health Act.

(10) Never dispose of hazardous chemicals commingled with general waste. Disposal of such chemicals must follow the procedure provided by the Safety Management Supervisor or Member of the Safety and Health Committee.

(11) The appropriate safety precautions must be provided to prevent damage to the container when it falls, tips over, or impacts during an earthquake. Chemicals must be separated for storage according to the provisions of the Fire Service Act to prevent a fire, explosion, or other accident due to spillage or mixture of the chemicals even when the container is broken.

* When the glass ampoule containing a hazardous liquid chemical is opened, the operation must be made in a large vessel because the liquid may scatter.
* When an old reagent bottle is opened, the cap may not be easily opened because it sticks to the bottle. In such a case, apply force using a soft cloth to prevent breakage of the bottle.

5.2.2 Handling of hazardous materials (including dust and powder)

The hazardous materials (including dust and powder) must be handled with great care as indicated below. Especially in the case of organic solvents (Table 3) and the specified chemical Substances (Table 4), the handling procedure is strictly regulated by the Ordinance on the Prevention of Organic Solvent Poisoning and Ordinance on the Prevention of Hazards Due to Specified Chemical Substances.

(1) A local exhaust device of a fume hood (draft chamber) must be used in handling Class 1 and Class 2 organic solvents (Note 1) and Category 1 and Category 2 specified chemical substances (Note 2).

(2) The draft chamber must have controlled air velocity of at least 0.4 m/s at the face of the hood when an organic solvent is handled. The controlled air velocity must be at least 0.5 m/s when handling a specific gaseous chemical substance and at least 1.0 m/s in the case of a specific particle chemical substance.

(3) Self-inspection of the draft chamber must be conducted once every month. In addition, the required regulatory self-inspection must be conducted once every year, and a record of the self-inspection must be retained for three years.

(4) When the draft chamber is installed, the notification must be submitted to the local labor standards office.

(5) Protective garments, goggles, respiratory protective equipment (masks), and protective gloves must be provided and should be used as required.

(6) The emergency wash facility (eyewash station, shower, etc.) must be installed when getting in touch with chemicals. The emergency wash facility must be inspected periodically to maintain it as readily available.

(7) Laboratories where Classes 1 and 2 organic solvents and the specified chemical substances are handled, must not be used as study/discussion rooms.

(8) The sign indicating Authorized Personnel Only must be posted in a prominent place of any laboratory handling Classes 1 and 2 specified chemical substances.

(9) Working environment measurements must be performed for Laboratories where Classes 1 and 2 organic solvents and Categories 1 and 2 specified chemical substances are used once every six months, and the Control Class must be assessed, and appropriate actions must be taken. The record of such measurement and

assessment must be retained for 30 years in the case of the substances subject to special control (43 substances in Table 4 such as benzene, chloroform, etc.) and for three years for other substances.

(10) In the laboratory where organic solvents are used, the type of organic solvent must be posted (red for Class 1 and yellow for Class 2, and blue for Class 3) in a prominent place. The sign indicating the effect of organic solvents on the human body, precautions for handling, and first aid treatment in the case of intoxication (in the format regulatory defined) must also be posted.

(11) When a substance subject to special control (benzene etc.) is handled, it must be handled in the draft chamber wearing the appropriate personal protective equipment to avoid direct contact of such substance to the skin.

(12) When the substance subject to special control is handled, the monthly record of such operations (with the name of the person, the outline of the operation, period, pollution caused, etc.) (Forms 7-1 and 7-2) must be prepared and be retained for 30 years. The record of operations must be submitted to the Support Office of the Graduate School of Science and Engineering in electronic format once every year.

(13) In the laboratory where the substance subject to special control is handled, the sign indicating the name of the substance subject to special control, the effect of the substance on human body, precautions for handling, and the personal protective equipment to be used must be posted in a prominent place in the laboratory or near the entrance to the laboratory (the format of the sign can be downloaded from http://www.saitama-u.ac.jp/koho/teacher/disappear/kaigi/anei/index.html).

(14) Persons who are engaged in operations involving hazardous chemicals must receive a special physical examination (Note 3).

(15) Where consumption of the organic solvent per hour is not exceeding the acceptable consumption provided by the law (Note 4), (Case 1) all of the above provisions should not be applied, or (Case 2) only the paragraphs (7), (9), and (14) should be applied, and other provisions will not be applied.

(Note 1) Classes 1 and 2 organic solvents have a higher degree of hazard and higher vapor pressure than Class 3 organic solvents. Class 3 organic solvents are a mixture of a variety of hydrocarbons and are petroleum or vegetable-based solvents having a boiling point generally below 200°C, and less strictly regulated.

(Note 2) The Ordinance on the Prevention of Hazards due to Specified Chemical Substances is established to prevent health problems, like cancer, dermatitis, and neurologic dysfunction. Category 1 of the Specified Chemical Substances is a hazardous substance, and the manufacturing of which requires a permit under Article 56 of the Industrial Safety and Health Act. Category 2 of the Specified Chemical Substances is a substance that may cause chronic disorders. Category 3 of the Specified Chemical Substances is a substance that may cause acute toxicity by spillage in large amounts, and the rules preventing chronic health effects are less strict than Categories 1 and 2 specified chemicals.

(Note 3) The Ordinance on the Prevention of Organic Solvent Poisoning and Ordinance on the Prevention of Hazards due to Specified Chemical Substances provide items and record retention requirements for the physical examinations in detail to protect the health of persons engaged in the operations (school staff members and students).

(Note 4) The acceptable consumption of organic solvent W (grams) is expressed as follows using the air volume of the laboratory A (m^3).

In the case of Class 1 organic solvent: W=(1/15)A

In the case of Class 2 organic solvent: W=(2/5)A

Air volume is the interior volume of the laboratory with a ceiling height not exceeding 4 m, and when the volume exceeds 1500 m^3, 1500 m^3 should be used in the calculation. Case 1 is a case where consumption does not consistently exceed W, and Case 2 is the case where consumption as an hourly average does not exceed W.

5.2.3 Handling of toxic and deleterious substances

Great care must be paid in handling substances specified by the Poisonous and Deleterious Substances Control Act (Tables 5 and 6) as given below. Because toxic and deleterious substances have a small fatal dose and can be easily used in a criminal act. Storage and control methods of such substances are emphasized in the Poisonous and Deleterious Substances Control Act.

(1) The toxic and deleterious substances must be stored separated from other chemicals in the chemical cabinet, and the cabinet must be locked.

(2) The sign of Non-medical Toxic Substance or Non-medical Deleterious Substance must be posted on the chemical cabinet storing the toxic or deleterious substance.

(3) The amount used and the inventory of the toxic and deleterious substances must be entered in the Management System for Lab Chemicals (IASO) each time they are used.

(4) Storage conditions of the toxic substance must be checked at least once every month with respect to the status of the lock, no sign of use by unauthorized persons, and the number of reagent bottles even when it is not used for a long time.

(5) When school staff members or students request the purchase of a toxic substance, the Safety Management Supervisor must examine its necessity before a decision regarding any purchases.

(6) Containers used for food and drink must not be used for toxic substances. Containers used for toxic substances must not be damaged or corroded and must not be ripped and crack free.

(7) Protective garments, protective goggles, respiratory protective equipment (masks), and protective gloves are required to wear when handling toxic and deleterious substances.

(8) Liquid waste containing toxic or deleterious substances must be disposed of using the proper method. When the method to dispose of such waste is unclear, contact the Comprehensive Analysis Center for Science.

(9) Liquid waste containing toxic or deleterious substances must be stored using the proper method. When the method and category of storage of such waste is unclear, contact the Comprehensive Analysis Center for Science.

(10) The condition of the toxic and deleterious substances must be entered on the check sheet (Form 5) for any abnormal condition at least once every year according to the Poisonous and Deleterious Substances Control Act (Standards for Structure and Equipment for Storage of Toxic and Deleterious Substances), and the results of the check must be retained for three years. Such check sheets must be submitted to the Support Office of the Graduate School of Science and Engineering once every year.

5.2.4 Handling of metallic mercury and mercury compounds

Any person who is in possession of mercury (metallic mercury, mercury reagent, etc.) must implement the measures for storage based on the guidelines for the storage of mercury according to the Act on Preventing Environmental Pollution by Mercury. Any person who stores mercury exceeding a certain amount must submit the information on the amount of storage and usage periodically. The method of disposal of materials containing mercury will vary depending on the concentration of mercury compounds contained under the Waste Management and Public Cleansing Act.

(1) Mercury to which appropriate storage is particularly required for environmental considerations under the Act on Preventing Environmental Pollution by Mercury are the following compounds:
   (a) Mercury (including amalgam with other metals)
   (b) Mercury chloride
   (c) Mercury dioxide
   (d) Mercury disulfate
   (e) Mercury dinitrate and its hydrate, and mercury disulfate (including those contained in cinnabar)

(2) The following rules must be followed with respect to the guideline for storage of mercury:
   (a) The container that can ensure no scattering or spillage of mercury must be used, and the name of mercury contained must be indicated in a prominent place on the container.
   (b) The name of mercury must also be posted in the place where mercury is stored.
   (c) The place where mercury is stored must be constantly locked.

(3) The purchase amount and consumption of chemicals containing mercury must be registered in IASO. If dead storage of such a chemical is found, it must also be registered in IASO.

(4) When liquid waste containing a mercury compound is brought out of the premises, the concentration of such a mercury compound must be indicated. Accordingly, when liquid waste is stored in the laboratory, adequate care must be paid.

(5) When solid waste containing a mercury product is brought out of the premises, the fact that the waste contains a mercury product must be indicated. Accordingly, adequate care must be paid when the device containing a mercury product is brought out of the premises.

5.2.5 Handling of hazardous materials with ignitability, flammability, and explosivity

Great care must be paid as shown below with respect to the hazardous materials with ignitability, flammability, and explosivity specified by the Fire Service Act (Table 7).

(1) Hazardous materials equal to or greater than a certain quantity (multiples of the designated quantity specified by the Fire Service Act for the respective buildings) must be stored in hazardous material storage shed.
(2) The total storage quantity of hazardous materials in the respective building must not exceed 1/5 of the designated quantity.
(3) In the area where hazardous substances are handled, strict control of the ignition source and detonation sources, such as open flame, electric sparks, intensely heated articles, static charge, impact, and friction, must be implemented for safety. Firefighting equipment must be provided in a readily available condition.
(4) Because the solvent vapor is generally heavier than air and is likely to spread over the floor and may ignite and/or explode from an ignition source in a remote location, attention must be paid.
(5) When handling a chemical that can produce an explosive mixture of vapor and air, adequate ventilation must be provided. When such a chemical is stored in a refrigerated condition, an explosion-proof refrigerator must be used.
(6) Appropriate control must be implemented when the hazardous materials are stored to prevent theft and to prevent an increase in the degree of hazard by deterioration or commingling of foreign substances. As explained in item (11) of 5.2.1, chemicals in Category 1 and Categories 2, 3, 4, and 5 of Table 7, Category 2 and Categories 3 or 6, Category 3 and Categories 5 and 6, Category 4 and Category 6, and Category 5 and Category 6 must not be placed in the same storage shelf in order to avoid fire and explosion in the event of an earthquake.
(7) When handling hazardous materials, especially explosive chemicals, protective goggles, aprons, gas masks, and protective shields must be used as required to ensure safety.

5.3 Matters Related to Drains

While Saitama University is an educational and research institution, it is considered a business establishment with a specified facility like a manufacturing plant. It can only discharge drain water satisfying the exclusion standards under the relevant laws and regulations, such as the Sewage Act and the ordinance and regulations of Saitama City. To comply with such requirements, do not discharge chemicals into a sink whether or not the waste contains a regulated substance. Any person who uses hazardous materials, such as chemicals, must always pay attention not to spill the chemicals.

In addition to the self-analysis of the drain by Saitama University, inspection by Saitama City officials at the final discharge point entering the premises of the University is conducted more than once every year. If the concentration of hazardous materials in drain water exceeds the exclusion standards in the water quality inspection, an operation improvement order is issued to Saitama University, and tremendous efforts are required to resolve the situation. Accordingly, drains must be treated by paying attention to the following points not only for chemicals but also for rinsing solutions of any apparatus.

(1) Never discharge chemicals into the sink whether or not they are hazardous.
(2) Rinse the apparatus with the minimum quantity of rinsing solution repeatedly, and the used solution must be recovered as liquid waste (do not discharge the solution in the sink because the quantity is too small or the concentration is lean). (Note 1)

(Note 1) If only one drop of dichloromethane is mixed in 1000 liters of water, the concentration is about 0.07 ppm, which is 1/3 of the effluent standard of 0.2 ppm.

In addition, periodic inspection under the Water Pollution Prevention Act must be conducted once every year based on the Check Sheet (Form 6) according to the *Management Manual of Saitama University* [For Research and Laboratory Activities] (Attachment 1). The results of such an inspection must be submitted to the Support Office of the Graduate School of Science and Engineering. As amended, table 8 should be referenced for the hazardous materials specified in the Sewerage Act and Water Pollution Prevention Act.

5.4 Matters Related to Gas Emissions

Gas emissions must be treated with great care as described below from the aspect of the Air Pollution Control Act, Offensive Odor Control Act, Ordinance on the Prevention of Hazards due to Specified Chemical Substances, and Pollution Control Ordinances of the local governments (Saitama Prefecture and Saitama City).

(1) Gas emissions from the draft chamber where hazardous materials, such as organic solvents and specified chemical substances, are used must be discharged into the atmosphere after the hazardous substances are removed by the gas emission treatment system (scrubber etc.).
(2) The gas emission treatment system must be constructed by combining water or alkaline cleaning, activated carbon treatment, and other methods (oxidation method, incineration method, etc.) as appropriate so that clean emission of the gas can be attained.
(3) In the laboratory where the draft chamber is used, daily checks of corrosion, abnormal noise, and airflow rate must be made.
(4) When the gas emission treatment system is installed, the notification must be submitted to the local labor standards office.

5.5 Matters Related to Liquid, Solid, and Other Waste in Experiments

5.5.1 Matters related to handling and discharge of liquid waste and solid waste in experiments

Liquid waste and solid waste produced in research activities are classified as Special Control Industrial Waste in the classification of waste, and stricter control than general industrial waste is required. It is also necessary to contract disposal of such waste to a waste management contractor capable of proper disposal of such waste and to submit the data indicating what types of substances are contained in the waste when it is handed over. The Waste Management and Public Cleansing Act further provides that the responsibility of the entity which produced the waste does not terminate when such waste is delivered to the contractor but continues from the time it is delivered to the contractor to completion of disposal.

To comply with such requirements, persons who conduct experiments must follow the requirements below with utmost care according to the Classification in Collecting Liquid Waste and Solid Waste in Experiment (Table 9).

(1) Concentrated liquid waste, such as solvent waste and waste oil, containing general heavy metals, acids, alkalis, and other hazardous substances, and wash water used to wash the beaker and flask up to **three times** must be stored separately in a dedicated plastic container according to the Classification in Collecting Liquid Waste and Solid Waste in Experiment.

(2) Because the liquid waste generated in experiments is not general liquid waste but material to be properly disposed of, such liquid waste must be filled only to the specified capacity of the tank avoiding spillage of such liquid.

(3) Such liquid waste must be collected to the respective tanks, and the Liquid Waste Disposal Request Form prepared using the Management System for Lab Chemicals (IASO). The constituents and the concentration information must be recorded in Japanese on the Liquid Waste Disposal Request Form without using chemical formulas. The same process must also be used for the disposal of solid waste.

(4) The liquid waste generated in experiments must be disposed of in the waste liquid tank by its properties according to the classification in collecting waste, as shown in Table 9.

(5) Disposal of solids like filter paper and silica gel attached to hazardous materials must follow the procedure for solid waste disposal.

(6) Cyanides, such as potassium cyanide and sodium cyanide, must be stored as cyanide liquid waste preferentially and must be stored with alkalis (pH 10.5 and up). Cyanides, such as potassium ferrocyanide and sodium ferrocyanide, must also be stored as liquid cyanide waste (pH adjustment is not required).

(7) Because the effluent standard of mercury is lower by one or two orders of magnitude compared to other hazardous substances, liquid waste containing mercury must be stored separately even when the mercury content is minimal such as contained in a washing solution.

(8) Solids or sediments that may clog the drain piping system must not be included in the liquid waste.

(9) The presence of sulfur compounds in the liquid waste must be entered on the Liquid Waste Disposal Request Form without omission because hydrogen sulfide gas may be produced due to the mixture with other liquid waste in the processing facility, causing severe accidents.

(10) When an organic substance emitting an offensive odor is contained in the inorganic liquid waste, the information must be entered in the remarks column.

(11) When a gas is produced by mixing different liquid waste substances (e.g., nitric acid and alcohol), plastic containers containing such mixture may burst; accordingly, attention must be paid to the tank's condition when such liquid waste is stored.

(12) In order to prevent exposure from the solvent, a cap of the liquid waste tank must always be closed except when used (note that the solvent easily vaporizes and is hazardous).

(13) Do not store the container for liquid waste in the laboratory for a long time for safety reasons.

(14) Handling and carriage of liquid waste in the experiment must be done by a person who is familiar with such liquid waste.

(15) To ensure safety while the liquid waste tank is carried, the inner cover of the tank must be in place. The liquid waste must not exceed the following limits (a line shown on the tank body).

Because overfilling may result in an accident during carriage, pay attention to overfilling.

Organic liquid waste: 16 liters (cyanides or photographic liquid waste)

20 liters (combustible solvent waste, flame retardant/incombustible solvent waste, waste oils, or solvent waste containing heavy metals)

Inorganic Liquid Wastes: 16 liters

(16) Because the difference in temperature between the laboratory and the collecting place of liquid waste in the experiment is large in summer, the gas in the liquid waste tank will expand, and the tank may distort or burst. Gases in the liquid waste tank must be removed inside a draft chamber before the liquid waste in the experiment is brought out.

(17) Solid waste generated in experiments (waste cloth, filter paper, silica gel, etc.) must be sealed in a strong plastic bag that must be contained inside a strong collecting container (18-liter square can).

(18) Liquid and solid waste of experiments must be carried to the collecting place (located on the north side of the Department of Applied Chemistry Building, Faculty of Engineering) by a person belonging to the entity that generated such waste with the Liquid Waste Disposal Request Form once every month (the fourth Thursday of each month as a rule).

(19) When the waste liquid tank is carried on a handcart, the cart must have a guard, or the tank must be secured using belts to prevent falling off the tank for safety reasons.

(20) Before carrying the tank, check that the Liquid Waste Disposal Request Form is correctly filled in and sealed by the supervising instructor.

(21) When you have a question about liquid waste disposal, contact the Comprehensive Analysis Center for Science (Ext. 5103 or 048-858-3728).

5.5.2 Matters Related to Infectious Waste

(1) Infectious waste (blood, items with attached blood, body of experimental animal, and other infectious waste produced in the experiment) cannot be disposed of as general waste. Disposal must follow the collection and disposal instructions given by the Comprehensive Analysis Center for Science.

(2) Syringe needles, surgical knives, and razors used in experiments must be treated as infectious waste whether or not blood is attached to them. Accordingly, disposal of these items must follow the collection and disposal instructions given by the Comprehensive Analysis Center for Science.

5.6 Matters Related to High-Pressure Gas

When high-pressure gas is used, the High-Pressure Gas Safety Act must be complied with. The technical standards and the rules for safety management provided by the High-Pressure Gas Safety Act must be complied with in the manufacturing facility, consuming facility, and storage facility regulated by such Act.

If a high-pressure gas leaks, a large volume of the substance can spread rapidly across a wide area, causing extreme danger. In particular, when the high-pressure gas is combustible, explosive, and/or toxic, leakage can

easily cause a severe accident, so great attention must be paid to leakage from the piping, corrosion, operation of valves, or location of the gas cylinder. When the high-pressure gas is supplied by a pipeline, the High-Pressure Gas Safety Act is applied. Safe handling of liquefied gases, such as liquid nitrogen, must be implemented in accordance with the High-Pressure Gas Safety Act.

Gases are classified into the following four types by the General High-Pressure Gas Safety Regulations.

(a) Inert gas: 9 species, such as helium, argon, and nitrogen

(b) Combustible gas: 40 species, such as acetylene and hydrogen, and the gases whose explosion limit satisfies certain conditions.

(c) Toxic gas: 33 species, such as carbon monoxide and hydrogen sulfide, and the gases whose maximum limit (acceptable concentration) does not exceed 200 ppm.

(d) Special high-pressure gas: 7 species consisting of arsine, disilane, diborane, hydrogen selenide, phosphine, monogermane, and monosilane

5.6.1 Handling of gases from a pipeline

(1) Always pay attention to gas leakage.

(2) Install gas detectors when combustible or toxic gas is used.

(3) Try to reduce consumption to the required minimum.

(4) Always shut off the main valve when the gas is not used.

(5) Do not connect the line to the enclosed vessel whose pressure is higher than the supply pressure. Do not connect pipelines directly.

(6) The oxygen supply nozzle must not be contaminated with oil.

5.6.2 Handling of high-pressure gas cylinder

(1) When the experiment is conducted using the gas supplied from the high-pressure cylinder with the pressure reduced by the pressure reducing valve, authorization by the Safety Management Supervisor and Course head must be obtained, and the legal process should be implemented when required when the gas pressure reduction is 1 MPa or above (0.2 MPa or above in the case of acetylene gas or liquefied gas).

(2) Before handling the high-pressure gas cylinder, investigation of the hazards of toxicity, combustibility, and explosivity of the gas must be made.

(3) Major precautions in handling a high-pressure gas cylinder are as follows.

(a) The handcart for use in gas cylinder carriage must be used.

(b) The high-pressure gas cylinder must be secured using the stand or tied with the chain to prevent tipping over.

(c) The equipment used, such as the reducing valves and pressure gages, must be specially designed for the gas used and be checked periodically.

(d) The main valve of the high-pressure gas cylinder must be opened/closed slowly, and when the gas is not used, the main valve must always be closed. Before opening the main valve, check that the valve at the outlet is closed and pressure is not applied to the reducing valve. Open/Close signs must be affixed to the

main valve for easy identification.

(e) The gas should not be released into the atmosphere more than necessary.

(f) No open flame must be used within 2 m distance from the gas cylinder containing a combustible gas unless special measures are implemented. Flammable and ignitable items must not be placed nearby.

(g) Do not make the temperature of the gas cylinder increase not more than 40°C. Measures to block direct sunlight must be provided.

(h) Do not use a gas cylinder placed in a corrosive atmosphere.

(i) Return of the empty used gas cylinders must be requested promptly.

5.6.3 Handling of liquefied gas (liquid nitrogen, liquid helium, etc.)

Liquid nitrogen

(1) When liquid nitrogen is pumped out, the person should be staying in the windward direction to prevent suffocation. When liquid nitrogen is taken out, the door of the shed must be kept open, and the person must wait outside the shed.

(2) Do not touch liquid nitrogen or any metal surface with unprotected hands or fingers at very low temperatures. Use the cryogenic protection gloves as appropriate to prevent frostbite.

(3) Attention must be paid to prevent tipping over of the liquid nitrogen vessel during carriage.

(4) The liquid nitrogen vessel must not be sealed because liquid nitrogen easily vaporizes in normal temperatures and expands to about 700 times its liquid volume.

(5) Adequate ventilation must be provided when liquid nitrogen is used in the laboratory.

(6) When liquid nitrogen is carried, only the vessel containing liquid nitrogen must be placed in the elevator car. The placard indicating the liquid carried (with laboratory name and the contact person) must be attached to the vessel. This is necessary to prevent the danger of suffocation by nitrogen gas when the vessel tips over or when a person is trapped in the elevator car for a long time due to a power outage.

(7) The same attention must be paid to handling liquefied gases other than liquid nitrogen, such as liquid helium as liquid nitrogen. In particular, contact of liquid oxygen with oils and fats or other igniting substances must be avoided.

5.6.4 Handling of Special Material Gas

(1) When the special material gas (Table 9) is handled, the Safety Management Supervisor must obtain authorization from the Course head, and the legal process should be taken as appropriate.

(2) With respect to handling the special material gas, the Safety Management Supervisor must provide safety training for the person who uses the special material gas for the first time.

(3) The Safety Management Supervisor must provide the required training for hazards and precautions for use of the special material gas for school staff members and students of the laboratory.

(4) The consuming equipment, detoxification equipment, and disposal duct of the special material gas must be constructed as provided in the High-Pressure Gas Safety Act with respect to gas tightness, strength, and corrosion resistance.

5.7 Matters Related to Radioactive Isotopes and Radiations

(1) The radioactive isotope is an element quantity where the concentration exceeds the lower limits specified for such type of element.

(2) A person who uses radioactive isotopes or radiation equipment must comply with the provisions of the Radiation Hazard Prevention Act and the Saitama University Radiation Hazard Prevention Rules.

(3) A person engaged in the radiation handling operation must receive the training specified in the Saitama University Radiation Hazard Prevention Rules in advance.

(4) A person engaged in the radiation handling operation must receive the special physical examination specified in the Saitama University Radiation Hazard Prevention Rules in advance.

(5) A person engaged in the radiation handling operation must be registered as the radiation handler.

(6) A person engaged in the radiation handling operation must follow the instructions given by the Radiation Handling Supervisor and the Manager of the Radioisotope Experiment Facility of Saitama University.

(7) When the radioactive isotope (including the case where purchase quantity does not exceed the lower limit) or radiation equipment is purchased, the instructions given by the Radiation Handling Supervisor must be followed.

(8) When the radioactive isotope or radiation equipment is used, a person must wear a dosimeter.

(9) When the radioactive isotope or radiation equipment is used, radiation exposure of the person who uses such isotope or equipment must be protected, and considerations must be given to the hazard of persons other than the user.

(10) After the radioactive isotope (including the case where the quantity does not exceed the lower limit) is used, the isotope must be promptly stored in a secured place where the risk of theft or loss can be avoided.

(11) When the radioactive isotope (including the case where the quantity does not exceed the lower limit) and radiation generator are disposed of, the instructions given by the Radiation Handling Supervisor must be followed.

5.8 Safety Matters in Experimental Animal Breeding Room

The Saitama University Animal Experimentation Rules provides matters related to animal experimentation from the aspect of animal protection, the safety of the person involved in the experiment, and environment conservation within and outside the University, according to the Act for the Protection and Management of Animals, Act for the Welfare and Management of Animals, Standards for Breeding and Safekeeping of Experimental Animals, and the notice Animal Experimentation in Universities. According to such Animal Experimentation Rules, the animals used in the animal experimentation conducted at Saitama University must be bread in the breeding and management facility or the laboratory approved by the Saitama University Animal Experimentation Committee, and the animal experimentation must be conducted according to the plan approved by the same Committee.

(1) Use of the Experimental Animal Breeding Room (8F, No. 3 Building of Faculty of Science)

The application for use must be submitted to the Comprehensive Analysis Center for Science, and permission for use will be issued after attending the training and guidance to fully understand the Saitama University

Animal Experimentation Rules, *Manual for Use of the Animal Breeding Room*, and *Accident Response Manual*.

(2) The *Manual for Use of the Animal Breeding Room* provides the rules for entry into and exit from the breeding room, carrying in of the animals and articles, breeding management of the animals, operations within the breeding room, cleaning and maintenance of the breeding room. The descriptions in the manual must be read and understood carefully in using the breeding room.

(3) The *Accident Response Manual* provides the actions to be taken in the case of an accident and hazard. When an accident occurs related to breeding of the experimental animal or animal experimentation, or for responses to a hazard, actions should be taken according to the *Accident Response Manual* posted in the breeding room. When the necessary actions are taken, the report for the accident or hazard must be submitted promptly through the supervising instructor.

(4) For the use of the Class 1 pressure vessel (autoclave), a separate session for the training of the user must be received. A person who wants to use the autoclave must submit an application to the Class 1 Pressure Vessel Supervisor through the supervising instructor.

(5) For handling of genetically modified animals, follow the Saitama University Code of Practice for Genetic Recombination Experiments.

(6) When the experimental animal is used in the student's practical exercise, instructions given by the instructor in charge must be followed.

(7) Breeding and management of the experimental animals, experiments, and use of the breeding room must always keeping animal protection in mind and consider that the breeding room is the facility for shared use.

* The Saitama University Animal Experimentation Rules and the *Manual for Use of the Animal Breeding Room* can be downloaded from the website of Comprehensive Analysis Center for Science.
http://www.mlsrc.saitama-u.ac.jp/_forms/animal_guidance_jp.pdf

5.9 Matters Related to X-ray Generating Equipment

(1) When the X-ray generating equipment is used, a person must be qualified as the Operations Chief of Radiography with X-rays with authorization by the Dean of the Graduate School of Science and Engineering and the Course head.

(2) When the student or graduate research student uses the X-ray generating equipment, the person must be qualified as the Operations Chief of Radiography with X-rays after approval from the Safety Management Supervisor (instructor in charge) and authorization by the Health Supervisor and the Course head.

(3) The Operations Chief of Radiography with X-rays must comply with the provisions with respect to protection from X-ray hazards of Saitama University and of the Ordinance on the Prevention of Ionizing Radiation Hazards, and must follow the instructions given by the Responsible Person of Equipment and the Chief of Radiography with X-rays appointed for the respective controlled area.

(4) The Safety Management Supervisor must provide training on hazards associated with X-rays to human bodies to school staff members and students of the laboratory.

(5) Persons who are engaged in X-ray operations must receive a special physical examination.

(6) When the X-ray generating equipment is used, the following principal precautions must be followed (however, equipment where only its interior is the controlled area is excluded).

  (a) When the X-ray generating equipment is used, the sign indicating that the equipment is operating must be posted.

  (b) Wear a device to measure radiation exposure, such as a glass badge, in the designated position of the body.

  (c) Articles, such as the X-ray protective partitions, should not be moved without permission from the Responsible Person of Equipment.

  (d) After the handling of the X-ray generating equipment is completed, details of the operation must be recorded.

  (e) When the X-ray generating equipment is not used for a long time, the main power must be cut off.

(7) In the management of the X-ray generating equipment, the following items must be followed.

  (a) When the new X-ray generating equipment is purchased, a notification must be submitted to the local labor standards office.

  (b) The sign indicating the controlled area of X-ray must be posted.

  (c) The name and the contact point of the responsible person for the respective X-ray generating equipment must be shown.

5.10 Matters Related to Laser Devices

The laser devices are classified according to the Accessible Emission Limit based on the hazardous effect on human body, and the following are the precautions for the respective classes.

Class 1 and Class 2 (including 1M and 2M): No specific precautions apply when aiming the laser beam onto the human body is avoided.

Class 3R: Direct observation of the laser beam by the magnifying optical instrument, such as a telescope, is dangerous.

Class 3B and Class 4: The following requirements must be complied with:

(1) The Safety Management Supervisor must explain the hazards of laser beams to school staff members and students of the laboratory.

(2) The Dean of the Graduate School of Science and Engineering must appoint the Laser Device Safety Officer to implement hazard prevention measures.

(3) The Laser Device Safety Officer must implement the following items as hazard prevention measures:

  (a) Establish the Laser Controlled Area for the area open to exposure from the laser beam emitted from the laser device.

  (b) Post the appropriate warning sign at the entrance or on the safety fence of the area where the laser device is placed.

(c) Provide the sign of Laser Device Operating while it is used. When the Class 4 Laser Device is used, a warning of Laser Device Operating should be provided by the warning lamp as appropriate.

(d) When high-voltage power is used, the sign or warning lamp as defined in 5.11 (2) must be provided.

(e) Name and contact of the Laser Device Safety Officer and the operating environment of the laser device (use condition of electricity, water, gas, etc.) must be posted in a prominent place near the Class 4 laser device. The same information may also be posted for Class 3B laser devices.

(f) Provide the training for safe use of the laser device to the person engaged in laser operation.

(4) The person engaged in laser operation must implement the following measures for use of the laser device and pay special attention to safety.

(a) Pay attention to the protection of eyes.

(i) Establish the laser beam path avoiding the eye height of the operator.

(ii) Check that the reflectors and prisms are securely installed at the correct angles and points, and they are not broken.

(iii) Do not place an unnecessary item on the optical bench. The laser beam may cause unexpected accidents when it is reflected or scattered.

(iv) Wear protective glasses capable of shielding the laser beam used.

(v) The laser beam path should be shielded by the cover as much as possible to prevent an accident caused by unexpected reflection or scattering of the beam.

(b) Attention must be paid as skin burns may be caused when the laser beam hits the skin directly.

(c) When the laser beam path is checked, use the fluorescent screen, thermal paper, or observation camera to allow observation from a remote location. Wear gloves with a protective function as appropriate.

(d) Pay attention not to allow ignitable and combustible items to intersect with the laser beam path.

(i) Do not place flammable and combustible materials (solvent, oil, paper, etc.)

(ii) Flame retardant or noncombustible material must be used for the cover of the laser beam path.

(iii) Material with adequate heat resistance must be used for the beam stopper.

(e) High voltage compartments should not be opened usually. When a component is opened for repair, follow the precautions to prevent electrical shock in 5.11 (3).

(f) When toxic gas such as fluorine is used with high pressure as the stimulating substance of the laser, follow the precautions for the high-pressure gas described in 5.6. The handling procedure described in 5.2.3 must also be followed.

* Preventive Measures for the notification Ki/Hatsu No. 0325002 of March 25, 2005, Hazard Protection by Laser Beam of Notification is available related to the Industrial Safety and Health Act.

5.11 Matters Related to High Magnetic Field Generation Equipment

High magnetic fields exceeding 1T can be easily generated owing to progress of the superconducting coil, but a human cannot sense such high magnetic fields. The effects of magnetic fields on the human body are not sufficiently clear at present, but possible adverse effects on the human body are suggested based on epidemiological research and animal experimentation. General precautions are provided in this subsection. The

Person Responsible for the Equipment must prepare the Operation Manual considering safety for the respective equipment and operation of the equipment must follow such manual.

(1) Danger sign warning generation of high magnetic field must be posted at the entrance to the room where the equipment is located to prohibit entry by a person other than authorized persons. Attention by authorized persons must be called for the equipment by indicating dangerous areas with the white line.

(2) Pay attention because a strong magnetic force is generated when a material that is easily magnetized is brought close to the high magnetic field generating equipment.
   (a) When a bolt, nut, and tool are used, make sure that these items will not fly away.
   (b) Do not bring the metal carts that easily move close to the equipment.
   (c) The wheeled stretcher to carry the patient in an emergency case must not be brought close to the equipment.

(3) Caution must be used because even a low magnetic field may affect the human body or other devices.
   (a) The pacemaker for the heart may function incorrectly in the magnetic field of 500 μT or higher. Adequate magnetic shields must be provided so that the magnetic field at the entrance to the equipment room will not exceed 500 μT, and entry of a person wearing a pacemaker must not be allowed.
   (b) A watch, magnetic card, USB flash drive, or other devices can be destroyed in the magnetic flux density of 1.0 mT or higher. Do not wear these items when using the equipment.

(4) An electric current may be induced in the metal body placed in the magnetic field due to the rapid change of the magnetic field. Entry of a person who has a metal object implanted in the body for medical treatment must not be allowed.

(5) When the low temperature superconducting coil is disturbed by the earthquake or by the attraction of liquid nitrogen (i.e., electric resistance appears) and vaporizing of liquid helium because of Joule heat. Measures for oxygen deficiencies caused by leakage of liquid nitrogen or liquid helium must be implemented, and if leakage occurs, evacuate immediately and report to the Person Responsible for the Equipment.

(6) As explained earlier, many points remain unclear with respect to the effect of magnetic fields on the human body. Operation using high magnetic field generating equipment by a person with declining physical strength or by a pregnant woman must be prohibited.

5.12 Matters Related to High-Voltage Equipment

(1) When high-voltage equipment is used, the equipment must be placed ensuring an adequate distance with an adequate space, and the protective covers, enclosures, or fences must be provided for the equipment to prevent unintended contact by any person nearby. Ensuring adequate space is also effective for the prevention of secondary accidents.

(2) The High Voltage sign must be posted on the high-voltage equipment, and the warning lamp indicating such equipment is operating should also be provided as appropriate.

(3) When the high-voltage equipment fails and its inspection becomes necessary, the following procedures must be used:
   (a) Inspections must be made under the attendance of a professional person with proper experience.
   (b) High-voltage rubber gloves, electrical shock protection hardhats, insulated rubber boots, and insulation

mats (rubber mats) must be used.

(c) Before opening the cover of the equipment, cut out the power to the equipment and check that the voltage indicated is zero.

(d) Grounding must be provided to the important points of the equipment using the grounding rod. It may take considerable time until electricity is discharged completely, so use the voltmeter to check complete discharge.

* Special knowledge is required to prepare and install the grounding rod.

(e) After confirming there is no water leakage, first touch the equipment with the back of the right hand.

* If struck by electricity, gripping of the hand occurs spontaneously, the hand easily moves from the equipment. The right hand is also distant from the heart.

5.13 Matters Related to Machinery

When the motor, machine tool, or other device is the direct subject of the research and slinging and the machine tool or electrically powered equipment are used in the installation, the following laws and regulations must be complied with:

Industrial Safety and Health Act (Article 61 etc.)

Ordinance on Industrial Safety and Health (Articles 36, 78, etc.)

Administrative Notification: Guideline for Safety of Slinging Operation (Ki-Hatsu No. 96 of February 24, 2000)

The most fundamental precautions for the major equipment used in the research activity processes in machinery field are explained below.

5.13.1 Power conversion and transmission equipment

(1) Safety cover, enclosure, sleeve, and cross bridge must be provided for the rotating device, such as motor, belt, or pulley or other devices that may cause a hazard to the person, and also to prevent a person from being caught by such device or scattering of broken pieces due to cutting.

(2) The power cutoff device, such as the switch or clutch, must be installed for individual machines and must be a type that can prevent the start of the machine due to unintended vibration or contact. (e.g., embedded push button switch when the push button type is used.)

(3) When experimental research using the high-speed rotating device, such as the bench test of the motor of an automobile, fuel, or high temperature heat source is conducted, manuals for the operation procedure and precautions for emergency stop must be prescribed as much as possible, and the experimental research should be conducted following these procedures.

Protective measures should be provided to the place where dangerous condition occurs during experiments or measures to establish a safe distance from the dangerous place must be taken by remote control of the operation from another room.

When the high speed rotating body is involved, do not position yourself in the plane of rotation.

5.13.2 Machine tools

(1) Wear the garment that allows quick motion in operating the machine tool covering the arms and legs (work clothing is preferable). Close all the buttons of the jacket including sleeves. When you have long hair, tie up the hair and wear a cap to prevent the hair from becoming caught. Operation wearing short pants or clothing that can be caught by a rotating element, such as a white coat, hooded jacket, or necktie, must be avoided.

(2) The operator should wear personal protective equipment, such as protective glasses.

(3) The floor may become slippery because of cutting fluid sprayed, accordingly wear non-slip and easy to move shoes (preferably safety shoes). Use of sandals with the toes and /or heels exposed is prohibited.

(4) Use of gloves is prohibited. However, the use of non-slip gloves when a heavy article is carried or flame resistant gloves in welding operation is allowed.

(5) Operation of the grinding machine, boring machine, and lathe must be made after receiving adequate training.

(6) When the machine tools in the workshop are for shared use, the rules of the Graduate School of Science and Engineering to receive the safety training must be followed.

(7) Appropriate protective measures must be provided to the rotating element (gears, belt, etc.) of machine tools where the operator can make contact. The operator must not be positioned in the plane of rotation.

(8) The enclosure or cover must be provided as the protective shield to the machines that produce chips or can fling the workpiece.

(9) The above requirements in (6) and (7) are not applicable when provision of the enclosure or cover is impractical due to the nature of the operation, provided that the operator wears the appropriate personal protective equipment.

5.13.3 Lifting and Slinging Operation

(1) Lifting and slinging operations of the load weighing 0.5 tons or higher must be made by the qualified person(s).

(2) Prior to the operation, safety devices of the crane, such as the over-winding prevention device and cable derailment prevention device, and slinging equipment must be inspected to confirm they are in sound condition. If anything abnormal is found, stop operation immediately and repair or replace the equipment.

(3) Protective equipment like safety caps etc. must be used properly.

5.13.4 Forklift Truck

(1) The forklift truck must be operated by a qualified person.

(2) Before starting operation, a startup inspection of the brake system and maneuvering system functions must be conducted.

(3) Follow the maximum load and maximum speed in carrying and avoid simultaneous lifting and traveling operation and making a sharp turn with the load up.

5.14 Matters Related to Handling of Heavy Loads

(1) Use non-slip gloves when handling heavy articles.

(2) Wear hard hats when operating under a heavy article.

5.15 Matters Related to Elevated Place Works, Field Experiments, and Research

(1) Always be careful when operating at an elevated place for the stability of the chair or stepladder.

(2) Check that no one is present in the area of operation and be careful not to drop tools.

(3) Safety ropes should be used when working in elevated places.

(4) Adequate safety measures must be implemented depending on the condition in the case of outdoor sites.

5.16 Matters Related to Biosafety

Biosafety means the measures implemented to prevent adverse effects of the genetically modified organism on the ecosystem. The Act for the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms was enacted in response to ratification by the Diet of the Cartagena Protocol on Biosafety in 2003 and its effectuation in February 2004, and the Saitama University Code of Practice for Genetic Recombination Experiments is put into effect in Saitama University. When the genetic recombination experiments are conducted, the Act, Cabinet Order, and Ministerial Ordinance applicable and the Code of Practice of the University must be followed.

5.16.1 Genetic recombination experiment

The Genetically Modified Organism means an organism having the nucleic acid or its duplication using the technology of modifying the nucleic acid outside the cell and the technology of the fusion of cells. The genetic recombination experiment means the experiment to create or use the genetically modified organism.

5.16.2 Measures for the prevention of spread of genetically modified organisms

With respect to the area to conduct the genetic recombination experiment, the level of measures for the prevention of spread to be implemented is defined depending on the characteristics of the nucleic acid and the species handled and to the host-vector system, which must be followed.

5.16.3 Matters related to storage and carriage

Samples and waste containing genetically modified organism must be stored in a designated place of the laboratory or experiment area or in a freezer or refrigerator with a label clearly indicating it is a Genetically Modified Organism. The record of the samples and waste containing genetically modified organism must be prepared and retained. Measures such as use of containers and application of labelling to prevent leakage, escape, or spread of the genetically modified organism during transportation must be implemented.

5.16.4 Matters related to provision of information

A person who intends to transfer or offer the genetically modified organism or to make someone to use the genetically modified organism must provide the information to such other person.

5.16.5 Establishment of safety and health management

Attention must be paid for the establishment of safety and health management according to the characteristics and usage of the genetically modified organism. Persons engaged in the genetic recombination experiment must follow the instructions given by the experiment supervisor for the methods employed in the recombination experiment with regard to the measures to prevent spread and establish safety.

5.17 Matters Related to Inspection of Equipment and Devices

The following equipment and devices must be inspected once every month. In addition, the regulatory self-inspection must be conducted once every year, and the record must be retained for three years.

(1) Draft chamber and bench hood (see Forms 9-1 and 9-2 for Check Sheet)
(2) Small pressure vessel (autoclave etc.)
(3) Centrifuge

Table 1 List of General Waste Classification

Class		Typical Items	Method of Transfer	Notes	Disposal Site	Trash Collection Day & Time
General Waste	Combustible Waste	・Kitchen garbage (Kitchen garbage, lunchbox waste, instant noodle cup waste, and other trash) ・PVC rubbish ・Leather products ・Cloth ・Branches and leaves	・Take out after separating and packing in clear PVC bags.	・Kitchen garbage should be properly dewatered and taken out. ・Branches should be cut to less than 90 cm and bundled before putting out.	Collection place on campus (combustible waste)	As required
	Recyclable Waste	・Wastepaper (newspapers, magazines, cardboard, etc.)	・Take out afer bundling with string.	・Brought outside the campus and recycled by the waste management contractor.	Collection place on campus (wastepaper and recyclable paper trash)	As required
		・Recyclable paper trash (paper trash, such as envelopes, paper pieces, shredded paper, paper file boxes, and used tissues)	・Take out after packing in clear PVC bags.			
		・Beverage cans, plastic bottles, glass bottles from vending machines, etc.	・Place in the recycle bins located near the vending machine.	・Brought outside the campus and recycled by the vending machine operator and college coop.	Beverage can recycle bin	As required

Table 2 List of Industrial Waste Classification

Class		Typical Items	Method of Transfer	Notes	Disposal Site	Trash Collection Day & Time
General Waste	Combustible Waste	・Kitchen garbage (Kitchen garbage, lunchbox waste, instant noodle cup waste, and other trash) ・PVC rubbish ・Leather products ・Cloth ・Branches and leaves	・Take out after separating and packing in clear PVC bags by type of waste.	・Kitchen garbage should be properly dewatered and taken out. ・Branches should be cut to less than 90 cm and bundled before putting out.	Collection place on campus (Combustible waste)	As required
	Recyclable Waste	・Wastepaper (newspapers, magazines, cardboard, etc.)	・Take out afer bundling with string.	・Brought outside the campus and recycled by the waste management contractor.	Collection place on campus (wastepaper and recyclable paper trash)	As required
		・Recyclable paper trash (paper trash, such as envelopes, paper pieces, shredded paper, paper file boxes, and used tissues)	・Take out by packing in clear PVC bags.			
		・Beverage cans, plastic bottles, glass bottles from vending machines, etc.	・Place in the recycle bins located near the vending machine.	・Brought outside the campus and recycled by the vending machine operator and college coop.	Beverage can recycle bin	As required
Industrial Waste	Incombustible Waste	・Reagent bottles	・Large items should be disposed of without packaging. ・Smaller items should be disposed of packed in clear PVC bags or solid containers (18-liter square cans etc.)	・Rinse inside the bottle before disposal. ・Dispose of without the cap.	Industrial waste Collection place	Tuesday, Thursday, and Friday 10:00–16:00 Advance notice is required for disposal (Ext.: 3178) To be brought in with the rolling door open. Be sure to close the door after delivery.
		・Plastics and PVC products, styrene foam (including items used in experiments) ・Either side open document folders (all metal)	・Take out by packing in clear PVC bags.	・Empty the container or bottle used in the experiment before disposal.		
		・Sharp glass rubbish (including those used in the experiment) (Broken glass rubbish, Pasteur pipettes, microsyringes, gas-tight syringes, etc.)	・Take out by packing in solid containers (18-liter square cans)	・Attach the label indicating the contents.		
		・Glass rubbish not sharp (including those used in the experiment) (Bottles other than the beverage bottles, vial bottles, sample bottles, and incandescent lamps (excluding bulb-type fluorescent lamp)etc.)	・Take out by packing in clear PVC bags or solid containers (18-liter square cans)	・Be sure to empty the contents before disposal.		
		・General syringe barrels (plastics), Terumo syringes, etc.	・Take out by packing in clear PVC bags.	・Attach the label indicating noninfectious waste.		
		・Disposable pipette tips, disposable centrifuge tubes, petri dishes, etc. used in experiments		・Be sure to empty the solution contained in the pipette tip before disposal.		
		・Spray cans, lighters, gas canisters, etc.		・Empty the spray can before disposal.		
		・Pottery rubbish and aluminum foil				
	Bulky Waste	・Furniture, fixtures, and equipment ・Tires ・Waste material of 90 cm or more in size ・CRT displays	・Transfer to the designated area in the industrial waste collection place.	・Maximize reuse of furniture, fixtures, equipment, etc. for effective use of resources and for cost reduction.		
	Hazardous Waste	・Fluorescent tubes (including bulb-type fluorescent lamps) ・Dry cells, rechargeable batteries, etc.		・Rechargeable batteries should be placed in the separate bin for dry cells.		

令和3年4月

分別回収にご協力をお願いします

構内7ヵ所集積所

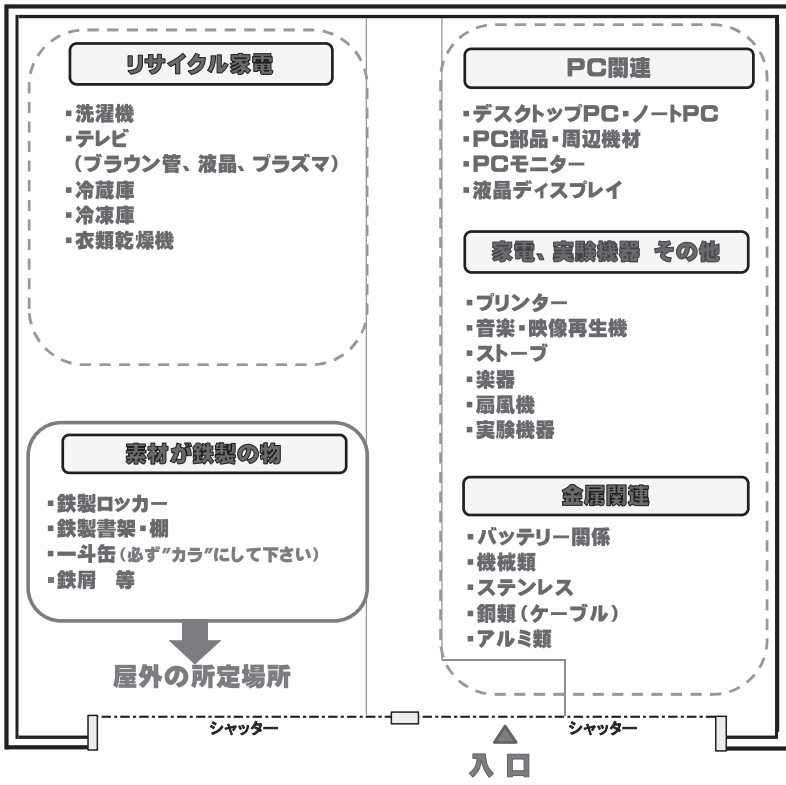
資源物（古紙・紙ゴミ）		一般廃棄物（燃えるゴミ）		
古紙類 ・新聞 ・雑誌 ・ダンボール　等	リサイクル紙ゴミ ・封筒 ・紙袋 ・シュレッダーゴミ ・紙コップ　等	ゴミ収集庫 ・生ゴミ ・弁当がら ・汚れた紙ゴミ ・布きれ　等		・剪定枝 ・枯れ葉 ・刈草　等

（注）空き飲料びん・カン・ペットボトルは、自動販売機近くに設置した「飲料缶等回収ボックス」に入れてください。
ペットボトルはつぶして出してください。

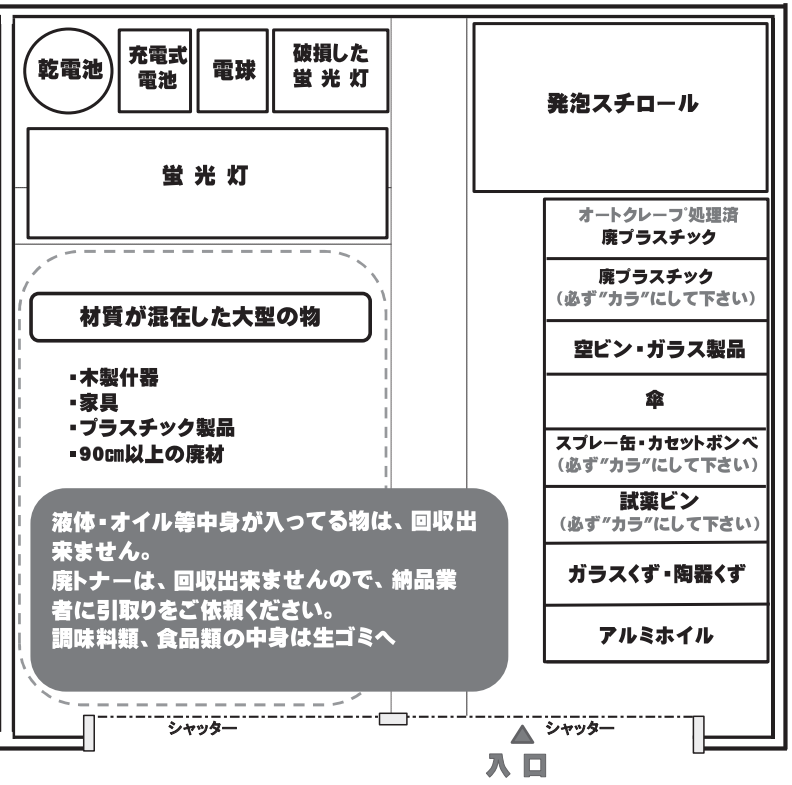
○資源物集積所及び産業廃棄物集積所（事務局東側倉庫）は、受入時間帯のみ開錠しています。
・受入は、火曜、木曜、金曜　10時～16時の間のみです。
・持ち込み前に、必ず、財務課資産管理センター　内線3178　に電話してください。
・分別表示に従って集積してください。
・内容物が外から確認できない場合は、内容物及び搬出者の連絡先の表示・貼付してください。

○状態の良い物品は、リユース可能か経理課の判断を受けてから廃棄してください。
・リユースについてのお問い合わせ先：経理課　事務局等担当係　内線5810
学部等担当係　内線5822、5832

資源物集積所　分別配置図



産業廃棄物集積所　分別配置図



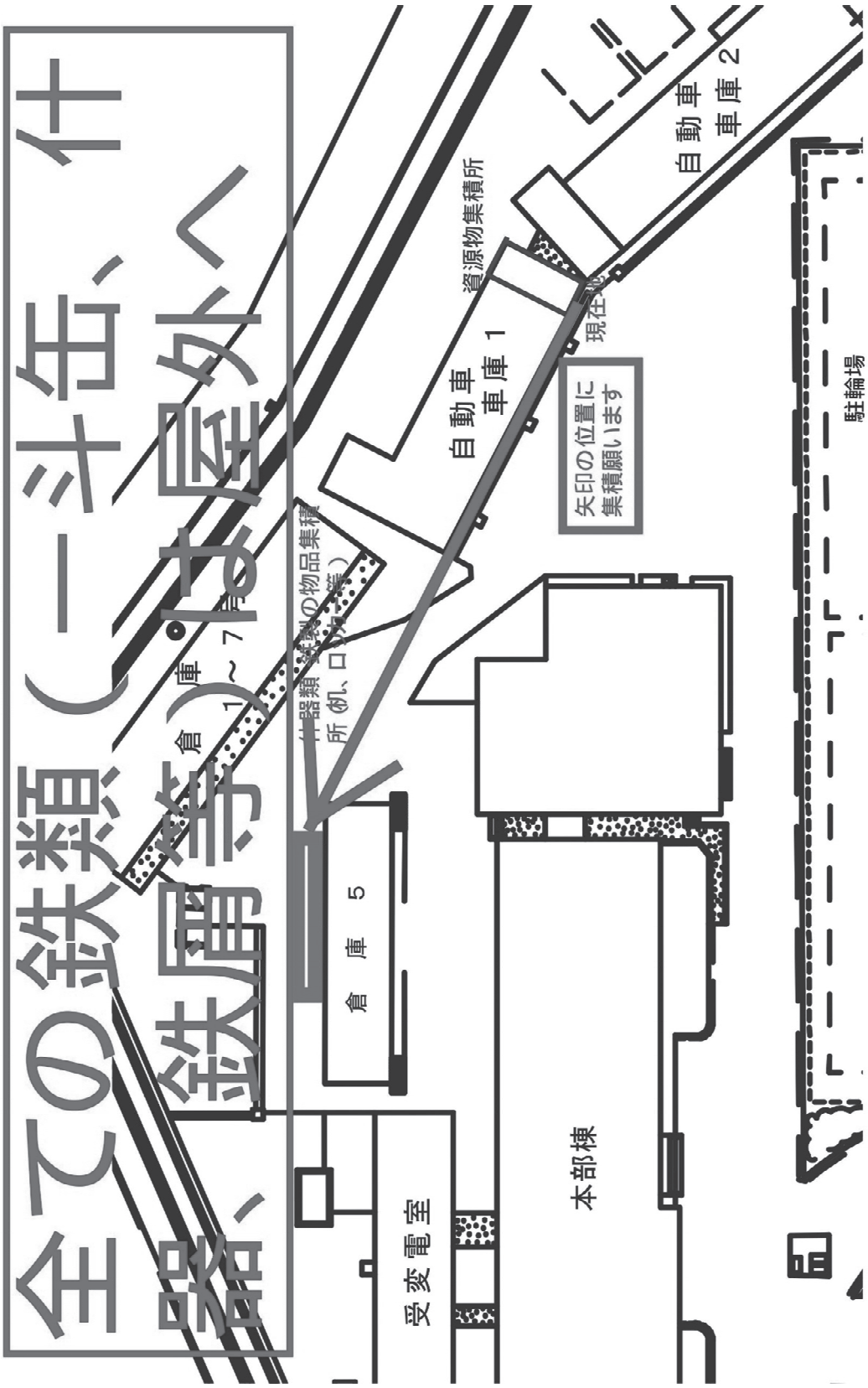

全ての鉄類（一斗缶、什器、鉄屑等）は屋外へ
倉庫1～7棟
什器類・試薬の物品集積所（例、口が広い容器）
倉庫5
受変電室
本部棟
自動車車庫1
資源物集積所
現在地
矢印の位置に集積願います
自動車車庫2
駐輪場

Table 3 Organic Solvent (Ordinance on Prevention of Organic Solvent Poisoning)

Class 1 Organic Solvent

(Halogenated hydrocarbon)

1,2-Dichloroethylene (Acetylene dichloride)

(Sulfide)

Carbon disulfide

Class 2 Organic Solvent

(Hydrocarbon)

Xylene
Toluene
n-Hexane

(Halogenated hydrocarbon)

o-Dichlorobenzene
Chlorobenzene
1,1,1-Trichloroethane

(Alcohol)

Isobutyl alcohol
Isopropyl alcohol
Isopentyl alcohol (Isoamyl alcohol)
Cyclohexanol
1-Butanol
2-Butanol
Methanol (Methyl alcohol)
Methylcyclohexanol

(Ether)

Ethyl ether
Ethylene glycol monoethyl ether (Cellosolve)
Ethylene glycol monoethyl ether acetate (Cellosolve acetate)
Ethylene glycol mono-n-butyl ether (Butyl cellosolve)
Ethylene glycol monomethyl ether (Methyl cellosolve)
Tetrahydrofuran

(Ketones)

Acetone
Cyclohexanone
Methyl ethyl ketone
Methylcyclohexanone
Methyl-n-butyl ketone

(Esters)

Isobutyl acetate
Isopropyl acetate
Isopentyl acetate (Isoamyl acetate)
Ethyl acetate
n-Butyl acetate
n-Propyl acetate
n-Pentyl acetate (n-Amyl acetate)
Methyl acetate

(Others)

Cresol
N,N-dimethylformamide

Class 3 Organic Solvent

(Refined petroleum products)

Gasoline
Coal tar naphtha (incl. solvent naphtha)
Petroleum ether
Petroleum naphtha
Petroleum benzine
Mineral spirit
(incl. mineral thinner, petroleum spirit white spirit, and mineral turpentine)

(Vegetable oils)

Turpentine

Mixtures composed of substances listed in the above items only

(Note) In case of mixtures, those with more than 5 wt.% are regulated by ordinance.

Table 4 Specified Chemical Substances (Ordinance on Prevention of Hazards Due to Specified Chemical Substances)

Class 1 Substance

Poly Chlorinated Biphenyl (PCB)
Dichlorobenzidine and its salt
Alpha naphthylamine and its salt
o-Tolidine and its salt
Dianisidine and its salt
Benzotrichloride *1
Beryllium and its compound *2

Class 2 Substance

(1) Specified Class 2 Substance

Hydrogen cyanide
Methyl bromide
Acrylamide
Acrylonitrile
Chlorine
Tolylene-diisocyanate
p-Nitrochlorobenzene *2
(hydrogen fluoride) *2
Methyl iodide
Hydrogen sulfide
Dimethyl sulfate
Ethyleneimine
Ethylene oxide
Polyvinyl chloride
Chloromethyl methyl ether
3,3'-Dichloro-4,4'-diaminodiphenylmethane
Nickel carbonyl
p-Dimethylaminoazobenzene
β-Propiolactone
Benzene
Propylene oxide
Dimethyl-2,2-dichlorovinyl phosphate (DDVP)
1,1-Dimethylhydrazine
Formaldehyde
Naphthalene
o-Toluidine

(2) Auramine etc.

Auramine
Magenta

(3) Class 2 Controlled Substance

Chromic acid and its salt
Dichromic acid and its salt
Arsenic and its compound (excl. Arsine and gallium arsenide)
Coal tar *2
Alkyl mercury compounds (limited to those with alkyl group is methyl or ethyl)
o-Phthalodinitrile
Cadmium and its compound
Vanadium(V) oxide
Potassium cyanide *2
Sodium cyanide *2
Mercury and its inorganic compounds (excl. mercury sulfide)
Nitroglycol
Pentachlorophenol (PCP) and its sodium salt
Manganese and its compound
Indium compounds
Cobalt and its inorganic compounds
Nickel compounds (limited to powder state items)
Refractory ceramic fibers
Diantimony trioxide
Welding fumes

(4) Special organic solvents etc.

Chloroform
Carbon tetrachloride
Ethylbenzene
1,2-Dichloroethane (ethylene dichloride)
1,2-Dichloropropane
Dichloromethane (methylene dichloride)
Trichloroethylene
1,1,2,2-Tetrachloroethane (acetylene tetrachloride)
Styrene
Tetrachloroethylene (perchloroethylene)
Methyl isobutyl ketone
1,4-Dioxane

Class 3 Substance

Sulfuric acid
Nitric acid
Hydrogen chloride
Sulfur dioxide
Carbon monoxide
Ammonia
Phosgene
Phenol *2

(Note 1) The underlined items are substances subject to special control.

(Note 2) In the case of mixtures, items containing more than 1 wt.% are subject to the laws and regulations. In addition, items with *1 that contain more than 0.5 wt.% and items with *2 that contain more than 5 wt.% are subject to the laws and regulations. Beryllium alloys containing more than 3 wt.% of beryllium are subject to the laws and regulations.

Table 5 Toxic Substance (Appended Table 1 to Poisonous and Deleterious Substances Control Act)

1 Ethyl p-nitrophenylthiono benzenephosphonate (EPN)
2 Yellow phosphorus
3 Octachlorotetrahydromethanophthalan
4 Octamethylpyrophosphoramide (Schradane)
5 Curare
6 4-Alkyl lead
7 Hydrogen cyanide
8 Sodium cyanide
9 Diethyl p-nitrophenyl thiophosphate (Parathion)
10 Dinitro-cresol
11 2,4-Dinitro-6-(1-methylpropyl) phenol
12 Dimethyl ethylmercaptoethyl thiophosphate (Methyl demeton)
13 Dimethyl-(diethylamino-1-chlorocrotonyl)-phosphate
14 Dimethyl p-nitrophenyl thiophosphate (Methyl parathion)
15 Mercury
16 Selenium
17 Thiosemicarbazide
18 Tetraethyl pyrophosphate (TEPP)
19 Nicotine
20 Nickel carbonyl
21 Arsenic
22 Hydrogen fluoride
23 Hexachloro-epoxy-a-octahydro-endo-endo-dimethano naphthalene (Endrin)
24 Hexachlorohexahydromethanobenzodioxathiepinoxide
25 Fluoroacetic acid
26 Fluoroacetic acid amide
27 Phosphorus sulfide
28 Other than the substances listed in the above items, formulations containing the substances listed above and other toxic substances that are specified by Cabinet Order

(e.g. Sodium azide, allyl alcohol, allylamine, tetramethyl orthosilicate, crotonaldehyde, methyl chloroacetate, phosphorus pentachloride, boron trichloride, 1,1-dimethylhydrazine, tetramethylammonium hydroxide, tributylamine, ethyl bromoacetate, etc.)

(Note) The underlined items are specified toxic substances.

Table 6 Deleterious Substance (Appended Table 2 to Poisonous and Deleterious Substances Control Act)

1 Acrylonitrile
2 Acrolein
3 Aniline
4 Ammonia
5 (2 Isopropyl-4-methyl pyrimidil-6)-diethyl thiophosphate (Diazinon)
6 Ethyl - N - (diethyldithiophosphoryl acetyl) - N-methylcarbamate
7 Ethylene chlorohydrin
8 Hydrogen chloride
9 Mercury chloride
10 Hydrogen peroxide
11. Sodium peroxide
12 Urea peroxide
13 Potassium
14 Alloy of potassium and sodium
15 Cresol
16 Ethyl chloride
17 Chlorosulfonic acid
18 Chloropicrin
19 Methyl chloride
20 Chloroform
21 Fluorosilicic acid
22 Sodium cyanide
23 Diethyl - 4 - chlorophenylmercaptomethyl dithiophosphate
24 Diethyl - (2,4 - dichlorophenyl)-thiophosphate
25 Diethyl - 2,5 - dichlorophenyl mercapto methyldithiophosphate
26 Carbon tetrachloride
27 Cycloheximide
28 Dichloroacetic acid
29 Dichlorobutyne
30 2,3 - dl - (Diethyldithiophosphoro) - paradioxan
31 2,4 - Dinitro - 6 - cyclohexylphenol
32 2,4-Dinitro - 6 - (1-methylpropyl) phenylacetate
33 2,4-dinitro - 6-methylpropylphenol-dimethyl acrylate
34 2,2' - Dipyridirium - 1,1' - ethylene - dibromide
35 1,2-Dibromoethane (EDB)
36 Dibromochloropropane (DBCP)
37 3,5 - Dibromo - 4 - hydroxy - 4' - nitroazobenzene
38 Dimethyl ethylsulfinyl isopropyl thiophosphate
39 O,O - dimethyl - S - ethylthioethyldithiophosphate (Thiometon)
40 Dimethyl 2,2-dichlorovinyl phosphate (DDVP)
41 Dimethyldithiophosphorylphenyl acetic acid ethylester
42 O,O - Dimethyl - 1,2 - dibromo - 2,2 - dichloroethylphosphate
43 Dimethyl - phthalylimide methyldithiophosphate
44 Dimethyl - methylcarbamylethyl thioethyl thiophosphate
45 O,O - Dimethyl - N - methylcarbamylmethyldithiophosphate (Dimethoate)
46 O,O - Dimethyl - O - 4 - (methylmercapto) - 3 - methylphenylthiophosphate
47 Dimethyl sulfate
48 Dichromic acid
49 Oxalic acid
50 Bromine
51 Nitric acid
52 Thallium nitrate
53 Potassium hydroxide
54. Sodium hydroxide
55 Sulfonal
56 Tetraethylmethylene bisdithiophosphate
57 Triethanolammonium - 2,4 - dinitro - 6 - (1 - methylpropyl) - phenolate
58 Trichloroacetic acid
59 Trichlorohydroxyethyl dimethylphosphonate
60 1,2,5 - Trithiocycloheptadiene - 3,4,6,7 - tetracarbonitrile
61 Toluidine
62. Sodium
63 Nitrobenzene
64 Carbon disulfide
65 Sulfuric acid, fuming
66 p - Toluylene - diamine
67 p - Phenylene diamine
68 Picric acid, excl. explosives
69 Hydroxylamine
70 Phenol
71 Blasticidin S
72 Ethyl bromide
73 Hydrogen bromide
74 Methyl bromide
75 Hexachloro - epoxy - octahydro - endo, exodimethnonaphtalene (Dieldrin)
76 1,2,3,4,5,6 - Hexachlorocyclohexane (Lindane)
77 Hexachloro hexahydro dimethanonaphatalene (Aldrin)
78 Beta - naphthol
79 1,4,5,6,7 - Pentachloro - 3a,4,7,7a - tetrahydro - 4,7 - (8,8 - dichloromethano) - indene (Heptachlor)
80 Pentachlorophenol (PCP)
81 Formaldehyde
82 Chromium acid anhydride
83 Methanol
84 Methyl sulfonal
85 N - Methyl - 1 - naphthylcarbamate
86 Monochloroacetic acid
87 Hydrogen iodide
88 Iodine
89 Sulfuric acid
90 Thallium nitrate
91 Zinc phosphide
92 Ethyl thiocyanoacetate
93 Rotenone
94 In addition to the items listed above, formulations and other deleterious substances specified by Cabinet Order (e.g. acrylamide, acrylic acid, thionyl chloride, chlorine, xylene, ethyl acetate, lithium hydroxide, inorganic tin salt, inorganic copper salt, toluene, methyl ethyl ketone, etc.)

Additional Substances due to Amendment of Cabinet Order for the Designation of the Poisonous and Deleterious Substances

Table 5･6 - Supplement

Toxic substance - Addition

1 5-Isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and its formulations
2 2‐Chloropyridine and its formulations
3 Cobalt(II) oxide and its formulations
4 (Dichloromethyl) benzene and its formulations
5 Dibutyltin dichloride
6 Benzotrichloride and its formulations
7 Bis(4-isocyanatocyclohexyl) methane and its formulations
8 2-Hydroxyethyl=acrylate and its formulations
9 2-Hydroxyethyl acrylate and its formulations

Deleterious substance - Addition

1 1-Amino-2-propanol and its formulations However, those containing 1-amino-2-propanol not exceeding 4% are excluded.
2 Sodium aluminate and its formulations
3 2-Isobutoxyethanol and its formulations However, those containing 2-Isobutoxyethanol not exceeding 10% are excluded.
4 Ethylenediamine and its formulations
5 Aluminum chloride and its formulations
6 4-Chloronitrobenzene and its formulations
7 Diethylenetriamine and its formulations
8 Cyclohexane-4-en-1,2-dicarboxylic anhydride and its formulations
9 2,4-Dichlorophenol and its formulations
10 Dicyclohexylamine and its formulations However, those containing dicyclohexylamine not exceeding 4% are excluded.
11 Didecyl (dimethyl) ammonium chloride and its formulations However, those containing didecyl (dimethyl) ammonium chloride not exceeding 0.4% are excluded.
12 3-(Difluoromethyl)-1-methyl-N-[(3R)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide and its formulations However, those containing 3-(Difluoromethyl)-1-methyl-N-[(3R)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide not exceeding 3% are excluded.
13 2-(Dimethylamino)ethanol and its formulations However, those containing dimethylamino ethanol not exceeding 3.1% are excluded.
14 N,N-Dimethylpropane-1,3-diamine and its formulations
15 Lithium hydroxide and its formulations
16 Lithium hydroxide monohydrate and its formulations
17 Thioglycolic acid and its formulations However, those containing thioglycolic acid not exceeding 1% are excluded.
18 Terephthaloyl chloride and its formulations
19 Triethylenetetramine and its formulations
20 1,2,3-Trichloropropane and its formulations
21 Nonylphenol and its formulations However, those containing nonylphenol not exceeding 1% are excluded.
22 1-Vinyl-2-pyrrolidone and its formulations However, those containing 1-vinyl-2-pyrrolidone not exceeding 10% are excluded.
23 Phenyltrichlorosilane and its formulations
24 2-tert-Butylphenol and its formulations
25 Ammonium fluoride and its formulations
26 Sodium fluoride and its formulations However, those containing sodium fluoride not exceeding 6% are excluded.
27 Hexanoic acid and its formulations However, those containing hexanoic acid not exceeding 11% are excluded.
28 Heptanoic acid and its formulations However, those containing heptanoic acid not exceeding 11% are excluded.
29 Benzoyl chloride and its formulations However, those containing benzoyl chloride not exceeding 0.05% are excluded.
30 Pentanoic acid (valeric acid) and its formulations However, those containing pentanoic acid (valeric acid) not exceeding 11% are excluded.
31 Phosphonic acid and its formulations
32 Glycidyl methacrylate and its formulations
33 Methanesulfonic acid and its formulations However, those containing methanesulfonic acid not exceeding 0.5% are excluded.
34 Morpholine and its formulations However, those containing morpholine not exceeding 6% are excluded.
35 Sodium hydrogen sulfide and its formulations
36 Sodium sulfide and its formulations
37 Diethyl sulfate and its formulations
38 Resorcinol and its formulations However, those containing resorcinol not exceeding 20% are excluded.

Reference: Yaku-Sei-Hatsu No. 0614 (Issue No. 1) of June 14, 2017 and the subsequent four issues

Table 7 Hazardous Materials (Fire Service Act)

Category	Properties	Typical Chemical Name
Category 1 (Oxidizing solids)	Noncombustible solids generally. Promotes combustion of surrounding combustible materials due to heating, impact, friction, etc.	Potassium chlorate, potassium perchlorate, potassium peroxide, potassium chlorite, potassium bromate, potassium nitrate, silver nitrate, potassium iodate, potassium dichromate, potassium permanganate, sodium periodate, sodium metaperiodate, chromium trioxide, potassium nitrite, calcium hypochlorite, trichloroisocyanuric acid, potassium persulfate, sodium peroxoborate
Category 2 (Combustible solids)	Easy to ignite during a fire. Easy to ignite at relatively low temperature (at lower than 40°C) Burns quickly and difficult to extinguish.	Phosphorus sesquisulfide, red phosphorus, sulfur, iron powder, aluminum powder, magnesium, solid alcohol
Category 3 (Pyrophoric and water-prohibiting materials)	When in contact with water, ignites or generates combustible gas. Ignites spontaneously in the air.	Potassium, sodium, triethylaluminum, n-butyl lithium, white phosphorus, calcium, diethylzinc, sodium hydroxide, calcium carbide, trichlorosilane
Category 4 (Inflammable fluid)	Highly flammable liquid. Generally lighter than water. The vapor is heavier than air.	Diethyl ether, carbon disulfide, acetaldehyde, propylene oxide, gasoline, benzene, toluene, ethyl acetate, acetone, acetonitrile, pyridine, methanol, ethanol, kerosene, diesel fuel, xylene, acetic acid, fuel oil, aniline, nitrobenzene, ethylene glycol, glycerin, lubricating oil, animal and vegetable oils
Category 5 (Self-reactive materials)	Combustible solid or liquid. Contains oxygen atoms in the molecule and self-combusts. Generally ignites and explodes by heating, impact, friction, etc. Some items self-ignite when left in air for a long time. Burns very quickly.	Benzoyl peroxide, methyl nitrate, nitroglycerin, picric acid, trinitrotoluene, dinitrosopentamethylenetetramine, azobis(isobutyronitrile), diazodinitrophenol, hydrazine sulfate, hydroxylamine, hydroxylamine sulfate, sodium azide, guanidine nitrate
Category 6 (Oxidizing liquid)	Incombustible liquid. But highly oxidizing and reacts with other combustible material (organic substance) and promotes its combustion.	perchloric acid, hydrogen peroxide, nitric acid, bromine trifluoride, bromine pentafluoride, iodine pentafluoride

Table 8 Collection Category of Liquid and Material Waste in the Experiment

Category		Subject	Summary	Container
Inorganic Liquid Wastes	General heavy metal containing liquid waste	Aqueous solution not containing hazardous metal and acidic and alkaline aqueous solution		Grey 16 L
	Hazardous metal-containing liquid waste	Aqueous solution containing hazardous metals, such as lead, arsenic, cadmium, chromium, and selenium		Grey 16 L
	Cyanide containing liquid waste	Aqueous solution containing cyanide	Store maintaining pH at 10.5 or above	Yellow 20 L
	Hexacyanide containing liquid waste	Aqueous solution containing ferrocyanide salt, ferricyanide salt, etc.	Adjustment of pH not required	Grey 20 L
	Mercury compound containing liquid waste	Aqueous solution containing mercury compound	Metallic mercury is not allowed	Green 20 L
Organic Liquid Wastes	Flammable solvent wastes	Water soluble organic liquid waste like methanol, ethanol, acetone, and non-water soluble organic liquid waste like benzene, toluene, xylene, hexane, and ethyl acetate	When containing ether, adjust ether percentage less than 10%.	White 20 L
	Flame resistant/incombustible solvent waste	Organic liquid waste containing halogen (chloroform, carbon tetrachloride, methylene chloride, etc.), nitriles		White 20 L
	Waste oils	Machine oil, engine oil, pump oil, insulating oil, vegetable oil, cutting fluid, etc.	Excluding the item containing PCB	White 20 L
	Cyanide containing solvent waste	Organic liquid waste containing cyanide	Store maintaining pH at 10.5 or above	Yellow 20 L
	Hexacyanide containing solvent waste	Organic liquid waste containing ferrocyanide salt, ferricyanide salt, etc.	Adjustment of pH not required	White 20 L
	Photographic liquid waste	Developing fluid and stop solution	Use the tank dedicated for photographic fluid waste.	Grey 20 L
		Fixing solution		
	Heavy metal containing solvent waste	Organic fluid waste containing heavy metals		White 20 L
	Mercury compound containing solvent waste	Organic fluid waste containing mercury compounds	Metallic mercury is not allowed	Green 20 L
Solids	General filter paper waste and cloth waste	Filter paper and cloth waste attached with oils, oil paints, poster paints, and hazardous substances		Strong container like an 18-liter square can
	Filter paper and cloth waste attached to hazardous metals	Filter paper and cloth waste attached with hazardous metals etc.	Lead, arsenic, cadmium, chromium, selenium (to be collected separately)	
	Filter paper and cloth waste attached to mercury compounds	Filter paper and cloth waste attached with mercury compounds	Avoid commingling of metallic mercury	
	General solid waste (1)	Solids, such as silica gel, molecular sieve, activated carbon, and calcium chloride, absorbing hazardous substances (solvents etc.)		
	General solid waste (2)	Solids like TLC plates		
	Hazardous metal attaching solid waste	Solids attached to hazardous metals etc.	Lead, arsenic, cadmium, chromium, selenium (to be collected separately)	
Others	Metallic mercury	Metallic mercury, mercury amalgam, mercury thermometer (broken), mercury manometer	Contact the Comprehensive Analysis Center for Science (Cost for disposal should be charged to those who discharge the waste).	
	Regent waste	Inorganic reagent waste, organic reagent waste, and solid waste		
Infectious Waste	Syringe needle	Syringe needles used for microsyringes, gas-tight syringes, Terumo syringes, disposable syringes, etc.	Contact the Comprehensive Analysis Center for Science	To be placed in the special box
	Body of the experimental animals etc.	Bodies of experimental animals and pathological waste, such as items attached to blood, organs, and tissues		

Note) Solids must be taken out by putting in the PVC bag and then in the container, such as an 18-liter square can, to prevent the contents from spilling.

Table 9 Special Gas Materials

Silicone system	Monosilane (SiH_4) Trichlorosilane ($SiHCl_3$) Silicon Tetrafluoride.(SiF_4)	Dichlorosilane (SiH_2Cl_2) Silicon Tetrachloride ($SiCl_4$) Disilane (Si_2H_6)
Arsenic system	Arsine (AsH_3) Arsenic fluoride (V) (AsF_5) Arsenic chloride (V) ($AsCl_5$)	Arsenic fluoride (III) (AsF_3) Arsenic chloride (III) ($AsCl_3$)
Phosphorus system	Phosphine (PH_3) Phosphorus fluoride (V) (PF_5) Phosphorus chloride (V) PCl_5)	Phosphorus fluoride (III) (PF_3) Phosphorus chloride (III) (PCl_3) Phosphorus oxychloride ($POCl_3$)
Boron system	Diborane (B_2H_6) Boron trichloride (BCl_3)	Boron trifluoride (BF_3) Boron tribromide (BBr_3)
Metal hydroxides	Hydrogen selenide (H_2Se) Hydrogen telluride (H_2Te) Tin hydride (SnH_4)	Monogermane (GeH_4) Stibine (SbH_3)
Halides	Nitrogen trifluoride (NF_3) Tungsten fluoride (VI) (WF_6) Germanium tetrachloride ($GeCl_4$) Antimony chloride (V) ($SbCl_5$) Molybdenum chloride (V) ($MoCl_5$)	Sulfur tetrafluoride (SF_4) Molybdenum fluoride (VI) ($MoCl_6$) Tin chloride (IV) ($SnCl_4$) Tungsten chloride (VI) (WCl_6)
Alkylmetal compounds	Trialkyl gallium (GaR_3)	Trialkyl Indium (InR_3)

Mixture of gases listed above

(Note) The underlined items are **special high-pressure gases**.

様式１

安全管理に関する確認書

コース長(学科長)

＿＿＿＿＿＿＿＿＿＿＿＿殿

安全管理ガイドライン、リスクアセスメント及び水質汚濁防止法に関する管理要綱、点検表を配布し、説明を行いました。また、安全管理ガイドライン付記事項で申告する事柄については、今後も十分な説明を行います。

年　　月　　日

安全教育担当者（□安全管理監督者　　□衛生管理者　　□衛生推進者）
所　属　＿＿＿＿＿＿＿＿＿＿＿＿
自　著　＿＿＿＿＿＿＿＿＿＿＿＿

安全管理ガイドライン、リスクアセスメント及び水質汚濁防止法に関する資料の配布を受け、説明を受けました。また、ガイドライン付記事項で申告する事柄についても安全管理監督者の指示に従って行動します。

年　　月　　日

安全教育修了者
所　属　＿＿＿＿＿＿＿＿＿＿＿＿
研究室　＿＿＿＿＿＿＿＿＿＿＿＿
学籍番号　＿＿＿＿＿＿＿＿＿＿＿＿
自　著　＿＿＿＿＿＿＿＿＿＿＿＿

〈 付 記 〉

１．使用する可能性のある危険薬品（有機溶剤、特定化学物質、消防法危険物、毒物･劇物等）は、以下のとおりです。（危険薬品を全く使用しない場合は空欄でよい。）

主な薬品名：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

２．使用する可能性のある高圧ガス、特殊材料ガス、液化ガスは、以下のとおりです。（上記のガスを全く使用しない場合は空欄でよい。）

主なガス名：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

３．使用する可能性のある電磁波等（エックス線、放射線、レーザー）は、以下のとおりです。（全く使用しない場合は空欄でよい。）

電磁波等の種類：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

様式２

安全教育面接記録

面接日　　年　　月　　日
面接者　（□コース長　□衛生管理者）
所　属
学籍番号
氏　名

１．安全教育担当者に対する設問

安全教育担当者　　所　属
氏　名

（１）安全管理ガイドラインを配布して、その内容を説明しましたか？　はい　いいえ
（２）危険薬品（有機溶剤、特定化学物質、危険物、毒物･劇物等）を使用させる場合、法規、危険性について説明をしましたか？　はい　いいえ
（３）パイプラインガス、高圧ガスボンベ、液体窒素、特殊材料ガスを使用させる場合、それについての説明をしましたか？　はい　いいえ
（４）電磁波等（エックス線、放射線、レーザー）、高電圧設備を使用させる場合、それについての説明をしましたか？　はい　いいえ
（５）火災･事故など、非常の場合の行動について説明をしましたか？　はい　いいえ
（６）リスクアセスメントに関する説明をしましたか？　はい　いいえ
（７）水質汚濁防止法に関する点検表の説明をしましたか？　はい　いいえ

２．安全教育を受けた者に対する設問

安全教育を受けた者　　所　属
氏　名
学籍番号

（１）安全教育担当者から安全管理ガイドラインについて説明を受けましたか？　はい　いいえ
（２）危険薬品（有機溶剤、特化物、危険物、毒物･劇物等）を使用する場合、危険性や法規に関する説明を受けましたか？　はい　いいえ
（３）パイプラインガス、高圧ガスボンベ、液体窒素、特殊材料ガスを使用する場合、それについての説明を受けましたか？　はい　いいえ
（４）電磁波等（エックス線、放射線、レーザー）、高電圧設備を使用する場合、それについての説明を受けましたか？　はい　いいえ
（５）火災･事故など、非常の場合の行動について説明を受けましたか？　はい　いいえ
（６）安全管理ガイドラインを遵守しますか？　はい　いいえ
（７）リスクアセスメントに関する説明を受けましたか？　はい　いいえ
（８）水質汚濁防止法に関する点検表の説明を受けましたか？　はい　いいえ

３．面接者の判断

安全教育担当者は安全衛生管理について十分に説明し、安全教育を受けた者はそれを理解したことを認める。　はい　いいえ

（注）「はい」、「いいえ」のいずれかを丸で囲む。該当しない設問の場合は、「はい」、「いいえ」に取消し線を記入する（ ~~「はい　いいえ」~~ ）

様式３－１

職場（居室）巡視チェックリスト

令和　　年　　月分　　部局等名：

巡視場所（　　）　　点 検 者：

チェック項目	チェックポイント	自己点検（○×を記入、該当しない項目には一を記入）					備考
		第１週	第２週	第３週	第４週	第　週	
作業環境	（１）十分な広さである（10㎥／人の気積が確保されている						
	（２）作業場の室温は適温である（夏季 28℃，冬季 20℃）						
空気の清浄度	（１）異臭・悪臭・刺激臭はしない						
	（２）ほこりっぽくない						
	（３）床面積の 1/20 以上の大きさの窓などの開口部、あるいは充分な換気能力を持つ換気設備がある						
採光・照明	（１）採光、照明による明るさは適当である						
	（２）まぶしさ（グレア）はない						
	（３）光源は汚れていない						
	（４）光源が老朽化していない						
騒音	（１）作業者を煩わすような騒音はない						
	（２）騒音が発生している場合、作業者が騒音用保護具をつけてる						
作業方法	（１）不自然な作業姿勢がない						
	（２）作業空間は充分である						
整理整頓	（１）つまずきやすい又は滑りやすい場所はない						
	（２）作業場内外は整理整頓されている						
	（３）避難経路が確保されている						
	（４）書棚等に転倒防止措置がとられている						
その他	（１）						
	（２）						
	（３）						
	（４）						
	（５）						
	衛生管理者（又は衛生推進者）　評　価	良　要改善	良　要改善	良　要改善	良　要改善	良　要改善	

	衛生管理者（又は衛生推進者）	活動記録	改善すべき点等	備考
第１週		巡視　聞取確認		
第２週		巡視　聞取確認		
第３週		巡視　聞取確認		
第４週		巡視　聞取確認		
第　週		巡視　聞取確認		

様式３－２

職場（実験室）巡視チェックリスト

令和　　年　　月分　　部局等名：

巡視場所（　　）　　点 検 者：

チェック項目	チェックポイント	自己点検（○×を記入、該当しない項目には－を記入） 第１週	第２週	第３週	第４週	第　週	備考
部屋管理	(1)室内は整理整頓されている						
	(2)部屋の出入口及び廊下に不要な物を置いていない						
	(3)避難通路の幅は確保されている						
	(4)実験台等に不要な薬品及び器具類を置いていない						
	(5)機器類の配線ケーブルが歩行時の障害となっていない						
	(6)コンセント、テーブルタップ等は、適正に使用している						
	(7)ガス用ホースは、不適合品や古い物を使っていない						
	(8)ガス用ホースの接続部は金具で止めている						
	(9)帰宅時に水道蛇口から水が出ていないか確認している						
	(10)帰宅時は、使用中の機器を除く全機器の電源を切っている						
	(11)重量物、大型実験装置には必要な安全措置がとられている						
	(12)帰宅時等に、無人運転機器がある場合は、必要な安全措置をとり、緊急時の連絡先を部屋の入口に掲示している						
薬品管理	(1)実験室内の薬品は必要最小限の数量にしている						
	(2)毒物は「医薬用外毒物」の表示をした保管庫に入れ施錠している						
	(3)劇物は「医薬用外劇物」の表示をした保管庫に入れ施錠している						
	(4)毒物、劇物を含め薬品の管理は、薬品管理システムを用いて適切に行っている						
	(5)発火性・引火性・爆発性物質を火気や熱源から隔離している						
	(6)有機溶剤、特定化学物質はドラフト内で使用している						
	(7)密栓不良や容器の破損している薬品ビンを置いていない						
	(8)仕切り板等により、薬品の転倒防止措置をしている						
ガス管理	(1)パイプライン供給ガスと同種のガスボンベを使用していない						
	(2)必要以上に大きなボンベを使用していない						
	(3)ガスボンベは、転倒しないように上下で固定している						
	(4)耐用年数を越えた貸出ボンベを使用していない						
	(5)使用していないボンベには、バルブ保護キャップをしている						
	(6)実験終了時は、パイプライン、ボンベの元弁を閉止している						
実験廃液・廃棄物等	(1)実験廃液処理要領を遵守している						
	(2)実験廃液を出すときは、カードに必要事項を記入している						
	(3)廃棄物は、分別して出している（ファイルを捨てるときは、留め金等の金属やプラスチックをはずし、分けている）						
	(4)事務系非常勤職員に研究廃液や危険薬品の運搬、液体窒素の汲み出し等の危険・有害な作業をさせていない						
その他	(1)局所排気装置の１ヶ月点検を行った（風量測定、目視点検）						
	(2)						
	(3)						
	(4)						
	衛生管理者（又は衛生推進者）　評　価	良　要改善	良　要改善	良　要改善	良　要改善	良　要改善	

	衛生管理者（又は衛生推進者）	活動記録	改善すべき点等	備考
第１週		巡視　聞取確認		
第２週		巡視　聞取確認		
第３週		巡視　聞取確認		
第４週		巡視　聞取確認		
第　週		巡視　聞取確認		

様式４

事　故　報　告　書

理工学研究科安全衛生委員会委員長　殿

令和　　年　　月　　日（　　）

<table>
<tr><td>発　信　者</td><td colspan="6">学科　　研究室　　氏名</td></tr>
<tr><td>事故の種類</td><td colspan="6">□火災・爆発　□発火・発煙　□漏洩　□異臭　□被ばく（薬品・ガス・放射線等）
□破裂・破損　□停電・漏電　□漏水　□転倒・転落　□その他（創傷）</td></tr>
<tr><td>発生日時</td><td colspan="6">令和　　年　　月　　日（　　）　　時　　分</td></tr>
<tr><td>発生場所</td><td colspan="6">学科　　名　称</td></tr>
<tr><td rowspan="6">人的被害</td><td colspan="6">□無　□有（有の場合、被災人数、性別、所属、身分、障害部位・傷病名を記入）</td></tr>
<tr><td colspan="6">被災人数　　人　　性別：男　　人　女　　人</td></tr>
<tr><td colspan="6">（常勤　　人、受入研究員　　人、学生　　人、その他（　　）　人）</td></tr>
<tr><td colspan="6">休業４日以上　　人、　休業１～３日　　人、　不休　　人</td></tr>
<tr><td colspan="6">所　属：</td></tr>
<tr><td colspan="6">障害部位・傷病名：</td></tr>
<tr><td>物的被害</td><td colspan="6">□無　□有（　　）</td></tr>
<tr><td>通報状況
（通報時刻等は「事故の対応」に記入すること）</td><td colspan="6">外部：□消防署　□警察　□労基署　□その他（　　）
□救急車　□病院（付添：　　）　□所属学部・学科　□家族</td></tr>
<tr><td colspan="6">内部：□研究科長　□部門長　□コース長　□衛生管理者　□安全管理監督者
□守衛所　□保健管理センター　□その他（　　）</td></tr>
<tr><td>事故の概要
（原因と発生状況を記入）</td><td colspan="6"></td></tr>
<tr><td>事故の対応
（応急措置及び通報の状況を時系列で記入）</td><td colspan="3"></td><td colspan="3" rowspan="2">事故概要図
（例：破裂の場合）
  </td></tr>
<tr><td>今後の対応
（防止対策）</td><td colspan="3"></td></tr>
<tr><td>別　紙</td><td colspan="3">□無　□有（　　）</td><td>保管番号</td><td colspan="2"></td></tr>
</table>

（注）可能な限り、写真を添付すること。また、被災者のその後の状況、原因究明結果等の続報を提出すること。

理工学研究科安全衛生委員会委員長確認欄	令和　　年　　月　　日	（署名）

様式５

毒物及び劇物点検表

部　局　名　　大学院理工学研究科
学 科 等 名
研究室等名

点検年月日	令和　　年　　月　　日

点検項目	点　　検　　内　　容	適 否	措置内容又は予定
保管施設	・雨水等の漏れはないか ・研究室等は鍵がかかるか ・研究室等の施錠確認・点検は責任ある者が行っているか ・鍵は責任ある者が管理しているか	□ □ □ □ □ □ □ □	
保管庫	・保管庫は毒物及び劇物専用となっているか ・保管庫は鍵がかかるか ・保管庫の施錠確認・点検は責任ある者が行っているか ・鍵の保管は毒別及び劇物使用責任者が管理しているか ・保管庫に毒物及び劇物の表示があるか ・転倒防止措置をしているか ・容器の倒壊等防止措置をしているか	□ □ □ □ □ □ □ □ □ □ □ □ □ □	
毒物等	・容器又は被包に異常はないか ・容器又は被包に毒物及び劇物の表示はあるか ・容器又は被包に毒物及び劇物の名称が明示してあるか ・保管庫以外のものに保管されていないか	□ □ □ □ □ □ □ □	
薬品管理システム	・薬品管理システムに登録しているか ・品名、数量、取得年月日、使用年月日、使用量、使用目的、使用者及び残量が適切に記入してあるか ・払い出された毒物及び劇物の適正使用の確認を行っているか ・定期的に数量と薬品管理システムとの照合を行っているか	□ □ □ □ □ □ □ □	
その他	・使用見込みがないものについて、速やかに廃棄処理しているか ・その他特記事項	□ □ □ □	

薬品使用責任者　職名・氏名

様式６

化学薬品を含む液体の取扱い等に係る点検表【研究･実験室用】

責任者		点　検　日	
		部　局　名	
点検実施者		研究室等名	
		部 屋 名 等	

場所等	No.	確　認　内　容	結果 ○、×、－ より選択
実験用流し等	1	実験用流し台及びドラフトチャンバー内の流し台に亀裂、損傷等がないか？	
床　面及び周　囲	2	床面（実験用流し等の下及び周囲）に、亀裂、損傷等の異常がないか？	
	3	化学薬品を含む液体が、床面に飛散・流出していないか？	
	4	化学薬品の飛散・流出に備えて吸着剤やウエス等が常備してあるか？	
排　水管　等（地上）	5	実験用流し台等に接続された排水管に亀裂、損傷、錆等がないか？	
	6	化学薬品を含む液体が漏洩等していないか？	
保管庫	7	保管庫に亀裂、損傷等の異常がないか？	
	8	保管庫内に化学薬品の漏洩等がないか？	
	9	保管庫周辺の床面に、化学薬品が飛散・流出していないか？	
	10	保管庫は転倒防止、保管庫内には容器の転倒防止策を講じているか？	
	11	保管場所は関係者以外立入禁止にするか、屋外に設置する場合には施錠しているか？	
	12	化学薬品の保管量は適切か？	
化学薬品を取扱う機器　類	13	機器類の動作に異常がないかを確認しているか？	
	14	機器類の排水管等付帯設備に異常がないかを確認しているか？	
	15	化学薬品を含む液体の補給は適正に行い、飛散・流出を防止しているか？	
作業時	16	化学薬品取扱い時には、十分な作業スペースを確保しているか？	
	17	化学薬品の小分け作業は、慎重に行い、飛散・流出を防止しているか？	
	18	化学薬品を含む液体は、すべて回収しているか？	
	19	抽出を行った時には、水相及び化学薬品を含む廃液は回収しているか？	
	20	化学薬品が付着した実験器具等の２次洗浄水までは、廃液として回収しているか？	
	21	定められた前処理方法に従い洗浄しているか？	
	22	流し等には、定められた前処理方法に従って洗浄した後の洗浄水しか流していないか？	
	23	廃液は適切に分類し回収しているか？	
	24	廃液の取扱いは、慎重に行い、飛散・流出を防止しているか？	
	25	廃液の回収時は、容器から漏れのないことを確認し、搬出しているか？	
飛　散、流出時	26	化学薬品の飛散・流出時には、吸着剤やウエス等で直ちにふき取り回収を行っているか?	
	27	化学薬品をふき取った吸着剤やウエス等は、洗浄・再利用はせず、適正に処分しているか?	
その他	28	購入した化学薬品及び廃液は、埼玉大学薬品管理システム（IASO R5）に登録しているか?	
	29	管理要領を、化学薬品を取扱う実験者に周知しているか？	
	30	前回の点検以降に実施した措置等について	

結果が「×」の部位について、措置等を以下に記載する。

措置等	No.
	状況の詳細
	措置内容

＊　化学薬品を含む液体が多量に床面等に流出した場合や地下へ浸透させた場合は、直ちに応急措置を講じ、事故の状況及び講じた措置の概要等を速やかに部局事務担当係及び部局安全衛生委員会等に報告すること。

別紙１

管理要領【研究・実験室用】

研究・実験室内での化学薬品を含む液体の取扱い等について、管理要領を以下のとおり定める。

①　化学薬品を含む液体の保管、保管場所からの運搬、及び実験などでの取扱いについて
・購入した化学薬品は、埼玉大学薬品管理システム（IASO R5）に登録していること。
・保管場所は、容器の転倒等により床下へ浸透しない材質・強度を有する構造の場所とすること。
・化学薬品の保管場所は関係者以外立入禁止にするか、屋外に設置する場合には施錠すること。
・保管庫に亀裂、破損等の異常がないこと。
・保管庫は転倒防止、保管庫内は容器の転倒防止措置を行うこと。
・保管庫内に化学薬品の漏洩等がないこと。
・化学薬品の小分け作業は、慎重に行い、飛散・流出を防止すること。
・化学薬品の取扱い時には、十分な作業スペースを確保すること。
・液体、廃液の運搬及び実験時には、飛散・流出した場合に備え、吸着剤やウエス等を常備すること。
・廃液は適切に分類し回収すること。
・廃液の取扱いは慎重に行い、飛散・流出を防止すること。
・廃液回収時は、容器から漏れのないことを確認し、搬出すること。
・廃液は、埼玉大学薬品管理システム（IASO R5）に登録していること。

②　化学薬品を取扱った器具類の洗浄について
・化学薬品を含む液体は、すべて回収すること。
・定められた前処理方法に従い洗浄すること。
・化学薬品が付着した実験器具等の２次洗浄水までは、廃液として回収すること。
・流し等には、定められた前処理方法に従って洗浄した後の洗浄水しか流さないこと。

③　化学薬品を含む液体を使用する機器類について
・機器類の動作に異常がないかを確認すること。
・機器類の配管等付帯設備に異常がないかを確認すること。
・化学薬品を含む液体の補給は適正に行い、受け皿内で行う等、飛散・流出を防止すること。

④　化学薬品を含む液体の飛散・流出時の措置について
・飛散・流出を止める措置を行うこと。
・飛散・流出した液体を可能な限り回収すること。
・多量に床面等に流出した場合は、直ちに応急措置を講じ、状況及び講じた措置の概要等を速やかに事務担当係及び部局安全衛生委員会等に報告すること。
（さいたま市担当課等へは、埼玉大学安全衛生委員会より報告する。）
・屋内の排水管からの漏洩が確認された場合、直ちに応急措置を講じ、状況及び講じた措置の概要等を速やかに事務担当係及び部局安全衛生委員会等に報告すること。

⑤ 管理要領に沿った各作業の実施確認等について
・本管理要領に沿った確認等は、別紙の点検表により、下記の点検頻度において目視等により行うこと。ただし、当該施設からの排水中の有害物質の濃度を検出限界下限以下まで下げることができる場合には、付帯する設備（排水管・枡等）は構造基準対象外となるため点検対象外とする。
特定施設本体：１回／年（＊１）
床面及び周囲、付帯する排水溝等（＊２）：１回／年（＊１）
・本管理要領を、化学薬品を取扱う実験者に周知すること。
・点検表は、点検の日から３年間、保存すること。
（＊１）水質汚濁防止法における配管等付帯設備の構造等基準に適応した点検頻度
（＊２）排水溝等は、特定施設からの排水管及び枡、ＰＨ監視槽等を指す。

様式７－１

特別管理物質使用記録

年　月分　　所属　○○○○○　氏名　△△△△△

日付	曜日	実験時間	使用場所	作業内容	使用量（mL）					保護対策等				教員チェック
					ｸﾛﾛﾎﾙﾑ	ベンゼン	スチレン			全体排気	局所排気	手袋	安全ﾒｶﾞﾈ	
1	火	10:00～17:00	××研究室(1)	反応 (抽出) カラム その他	5		20		(例)		○	○	○	
2	水	13:00～16:00	××研究室(2)	反応 抽出 カラム その他		15			(例)					
3	木	9:30～12:30	××研究室(1)	反応 抽出 カラム その他	20	5			(例)					
4	金	～												
5	土	～												
6	日	～												
7	月	～												
8	火	～												
9	水	～												
10	木	～												
11	金	～												
12	土	～												
13	日	～												
14	月	～												
15	火	～												
16	水	～												
17	木	～												
18	金	～												
19	土	～												
20	日	～												
21	月	～												
22	火	～												
23	水	～												
24	木	～												
25	金	～												
26	土	～												
27	日	～												
28	月	～												
29	火	～												
30	水	～												
31	木	～												
合計使用量（mL）					25	20	20	0	0					

〈注意事項〉 １週間ごとに安全管理監督者のチェックを受けてください。

様式７－２

特別管理物質使用記録

薬品名：　（例）ベンゼン

年月日	合計使用時間	使用場所	使用者名	作業内容	使用量（mL）	全体排気	局所排気	手袋	安全メガネ	教員チェック（1ヶ月ごと）	備考
2015.12.21	○○h	○○○研究室	△△△△△	(反応) 抽出 カラム その地（　　）	25		○	○	○		（例）
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
				反応 抽出 カラム その地（　　）							
使用量合計					（mL）						

〈注意事項〉 １ヶ月ごとに完全管理監督者のチェックを受けてください。

様式８

リスクアセスメント調査票 実施日：　　年　　月　　日	実施者（教員）：所属 氏名 安全管理監督者：氏名

作業場所	○○学部 ○○○学科　　研究室・室	作業者数：　　名

［管理リスク要素］ はい：０　いいえ：１		管理リスクレベル A：❶+❷+❸
❶ 教育：ガイドラインに沿って安全教育を行い、これを遵守している		
❷ 薬品管理体制：IASOを活用し、毒劇物を含めた薬品管理を実施している		購入薬品集計期間 ～
❸ 使用環境：使用する薬品の①危険度に応じた適切な作業環境※となっている		

薬品名	［薬品リスク要素］		B： 薬品リスク レベル ①+②	C： リスクレベル （リスクマトリックス参照）	備考
	① 危険度	② 使用頻度 ほぼ毎日使用する　：4 週に２～３回使用する　：3 月に２～３回使用する　：2 年に数回使用する　：1 ほとんど使用しない　：0			
物質 1					
物質 2					
物質 3					
物質 4					
物質 5					
物質 6					
物質 7					
物質 8					
物質 9					
物質 10					
…					

【リスク評価】

リスクアセスメント実施要項

表に掲げた薬品は、当該学科で購入量の多い化学物質です。所有しているものについて、以下の手順に従って、作業場ごとのリスクレベルを出してください。また、表に掲載された薬品以外で、所有量が多いもの、あるいは危険度が高いものについては、空欄に記入の上、同様にリスクレベルを算出してください。最後に算出したリスクレベルをもとに、作業場のリスク評価を行ってください。

1．管理リスク要素の問いに回答し、「A：管理リスクレベルの値」を出して下さい。
※ ❸ の「適切な作業環境」とは、作業環境測定において第Ⅰ管理区分であるか、必要な排気設備を使用している状態であることを指します。

2．表中の化学物質で、保有・使用しているものについて、②使用頻度を記入し、①危険度と②使用頻度をたして、「B：薬品リスクレベル」を記入してください。
なお、化学物質の①危険度は、以下の表によって決定しています（二つ以上の分類に相当する場合は、危険度の高い方の値を取っています）。

分　　類	危険度
特別管理物質、毒物	5
爆発性や自然発火性を有する物質	4
劇物	3
引火性を持つ有機溶媒	2
上記以外のもの	1

3．AとBの値から、以下のマトリックスを用いて各化学物質についてリスクレベルを出し、「C：リスクレベル」に記入してください。

薬品リスクレベル（B）

管理リスクレベル（A）	1～3	4～6	7～8	9
0	Ⅰ	Ⅰ	Ⅱ	Ⅲ
1	Ⅰ	Ⅱ	Ⅲ	Ⅲ
2	Ⅱ	Ⅲ	Ⅲ	Ⅳ
3	Ⅲ	Ⅲ	Ⅳ	Ⅳ

リスクレベルⅠ：現状を維持してください。
リスクレベルⅡ：リスクレベルが高くならないよう、注意して下さい。
リスクレベルⅢ：潜在的リスクがあるので、細心の注意を払い、可能な限りリスク低減を心がけてください。
リスクレベルⅣ：早急に改善の必要があります。使用環境、管理方法を見直してください。

4．リスク評価の欄に、リスクアセスメントの結果から、注意すべきこと、改善すべきことなど、お気づきのことを記入してください。なお、管理リスク要素のうち「❶ 教育」「❷ 薬品管理体制」に「1」がある場合は、上記リスクレベルに関わらず、改善をお願いします。

様式９－１

ドラフトチャンバー日常点検記録

年度

部　　局	理工学研究科
専　攻、　学 科 等	科
研究室名、部屋番号等	
製 造 会 社・ 型 式	
点　検　者	職名　　氏名

点　検　項　目		チ ェ ッ ク 内 容	年 / 月 / 方法	点検結果					
1	外装部の外観	局所排気装置の外観上の傷、錆、腐食、くぼみ、歪み、ビスのゆるみ等がないか？	目視 触手						
2	内装部の外観	ドラフトチャンバー内のエアー漏れ、異常音、異常振動はないか？	目視 触手 聴覚						
3	作業面の外観	作業面の外観上の傷、錆、腐食、くぼみ等はないか？	目視 触手						
4	ガラス扉の外観	ガラス扉に傷や、ひび、腐食等がないか？	目視 触手						
5	清掃状態の確認	作業面、ガラス扉等の清掃は十分か？	目視 触手						
6	照明灯・排気ファンの点検	スイッチを ON にしたとき、照明灯が点灯するか？	目視 操作						
		スイッチを ON にしたとき、給排気ファンが始動するか？	目視 操作						
7	給水栓、ガス栓の点検	給水栓、ガス栓の開閉操作においてバルブの重さは適切か、漏れはないか？	目視 触手						
8	排水トラップの点検	排水口にごみがたまっていないか？	目視 触手						
9	湿式スクラバー (1)	タンク内の水＊の pH は適切か？	目視 測定						
10	湿式スクラバー (2)	タンクまわりのバルブに異常はないか？タンク内や上部のシャワー部に汚れや異物はないか？	目視 触手						
11	吸い込み	風速の測定値を記入 (m/s)	測定						

＊湿式スクラバーのタンク内の水は、1 ～ 2 ヶ月に 1 度の頻度で交換してください。

交換日						

記　載　日	気づいたこと、修理等の記録

点検結果

0	問題なし
1	少し損傷等があるが、性能に問題ない　/　清掃等不十分である
2	少し損傷等があり、補修・部品交換が必要である（現在稼動している）
3	重大な損傷があり、使用できない

様式９－２

卓上フード日常点検記録

年度＿＿＿＿＿＿＿＿

部　　局	理工学研究科
専　攻、　学科等	科
研究室名、部屋番号等	
製造会社・型式	
点　検　者	職名　　氏名

点検項目		チェック内容	年 / 月 / 方法	点検結果					
1	外装部の外観	局所排気装置の外観上の傷、錆、腐食、くぼみ、歪み、ビスのゆるみ等がないか？	目視 触手						
2	内装部の外観	ドラフトチャンバー内のエアー漏れ、異常音、異常振動はないか？	目視 触手 聴覚						
3	作業面の外観	作業面の外観上の傷、錆、腐食、くぼみ等はないか？	目視 触手						
4	ガラス扉の外観	ガラス扉に傷や、ひび、腐食等がないか？	目視 触手						
5	清掃状態の確認	作業面、ガラス扉等の清掃は十分か？	目視 触手						
6	照明灯・排気ファンの点検	スイッチを ON にしたとき、照明灯が点灯するか？	目視 操作						
		スイッチを ON にしたとき、給排気ファンが始動するか？	目視 操作						
7	ガス栓の点検	給水栓、ガス栓の開閉操作においてバルブの重さは適切か、漏れはないか？	目視 触手						
8	吸い込み	風速の測定値を記入 (m/s)	測定						

記　載　日	気づいたこと、修理等の記録

点検結果

0	問題なし
1	少し損傷等があるが、性能に問題ない　/　清掃等不十分である
2	少し損傷等があり、補修・部品交換が必要である（現在稼動している）
3	重大な損傷があり、使用できない

Published by Saitama University Graduate School of Science and Engineering Safety and Health Committee

October, 2021