Olfactory Measurement Method Safety Management Manual

Chapter 1 Purpose

When implementing the olfactory measurement method, it is necessary to be aware of safety measures when collecting samples at the source, and safety measures for the panels and operator during the sensory test.

Collecting exhaust gas samples and measuring the flow rate of exhaust gas can be hazardous, allowing for dangers such as falling from high locations, burning oneself, and being exposed to harmful gases. Collecting effluent samples can also be dangerous, as there is the possibility of falling into the water, being exposed to harmful gases, and coming in contact with pathogenic microorganisms. Meanwhile, in the sensory test, there is the danger of the panels and operator being exposed to harmful gases in the sample, or coming in contact with pathogenic microorganisms while sniffing the odor of the sample.

This manual compiles the aspects that should be taken into account for safe management when implementing the olfactory measurement method, and was created for the purpose of implementing the olfactory measurement method safely.

Moreover, even if there are cases in which it is difficult to fully implement the safety management systems and safety measures given in this manual, refer to this manual to develop systems, etc. in a possible range, as it is preferred to implement the olfactory measurement method further safely.

The structure of this manual is as shown in Figure 1.1.

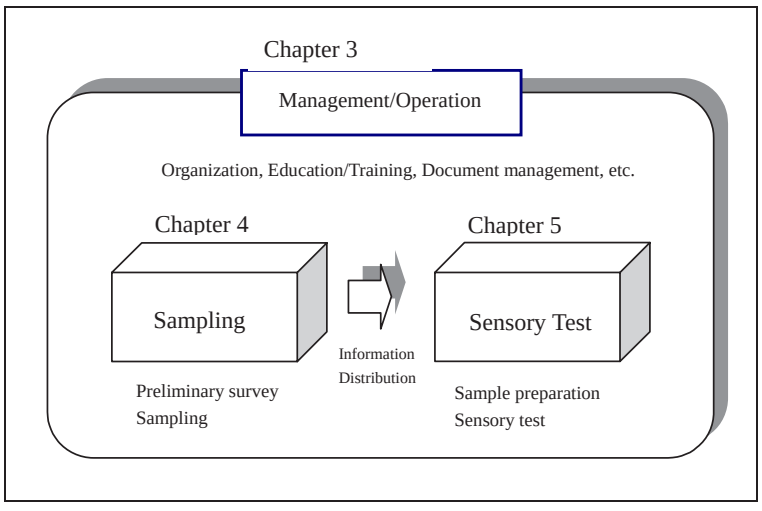


Figure 1.1 Structure of this Manual

Chapter 2 Range of Safety Measures

2.1 Applicable Range of Safety Measures

As shown in Figure 2.1, this manual designates the preliminary survey, sampling, sample preparation, and assessment, as part of the series of workflows related to the olfactory measurement method, as applicable to safety measures.

In accordance, the people applicable to safety measures at each respective level are the person who conducts the preliminary survey, the person who collects samples, and the operator and panels for olfactory measurement.

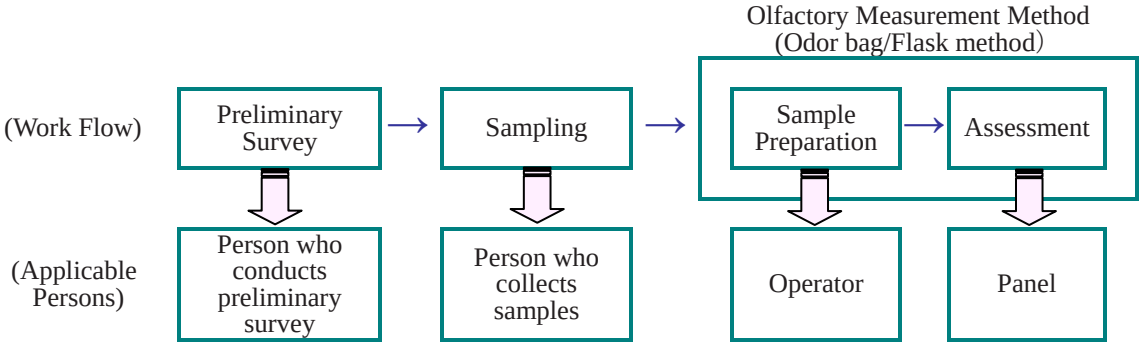


Figure 2.1 Work Flow and Applicable Persons for Olfactory Measurement Method

2.2 Areas and Classifications of Safety (Hazard)

The areas and classifications of the safety (and hazard) concepts introduced in this manual are as shown in Figure 2.2.

As odors are chemical substances, depending on the exposed concentrations, they can be hazardous to the human body. It is necessary to be aware of hazards, mainly of acute toxicity, such as exposure to the person who collects samples when at the workplace, to the operator when preparing samples, and to the panel during assessment.

In the case of odor index measurement of an effluent, there is also a hazard of infection due to contact with pathogenic microorganisms in effluent at each stage, from when the sample is collected up until assessment.

In addition to the hazards mentioned above, depending on the conditions of the workplace when sampling, it is necessary to be adequately careful, as there can be hazards due to oxygen deficiency, burns, and falling.

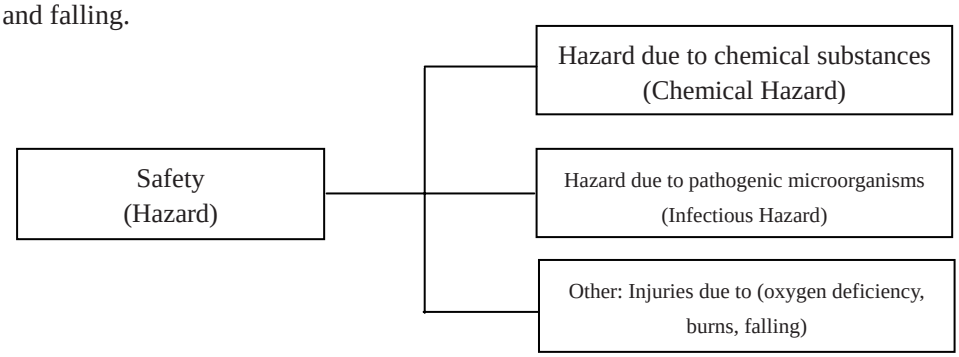


Figure 2.2 Safety (hazards) covered in this manual

Column 1 Concept of Hazards due to Chemical Substances and Safety in the Olfactory Measurement Method

～Are dioxins safe?～

In regards to hazards due to inhalation exposure of chemical substances, there can be acute toxicity from short-term inhalation exposure, and toxicity due to a long-term inhalation exposure. In work related to the olfactory measurement method (sampling to sample preparation, assessment), however, as long-term exposure is not likely, it would be appropriate to consider acute toxicity only.

In terms of acute toxicity, a method comparing to the “maximum allowable concentration” of the Japan Society for Occupational Health or “TLV-C (upper limit value)” or “TLV-STEL (15-minute value) established by ACGIH[*1], which are regularly used as safety standards for instantaneous or short-term exposure in work (operations) environments, is advisable. Substances displayed with these allowable concentrations are generally limited to those with a strong acute toxicity of mucosal acridity. Meanwhile, substances with "allowable concentration" other than those displayed with "maximum allowable concentration" are displayed with an arithmetic mean value of the exposure concentration when conducting non-strenuous physical work approximately 8 hours a day, 40 hours a week, and are not appropriate as targets for instantaneous or short-term inhalation exposure.

Health effects due to dioxins and polychlorinated biphenyl, which have become controversial in recent years, depend on long-term exposure, and in the case that there is a possibility of these chemicals present in samples collected at gas outlet ports (regularly, in terms of long-term exposure, they are reduced to below the discharge standard value of an extremely low concentration), they do not generally pose a problem. For other volatile organochlorine compounds for which there are concerns of chronic toxicity, there is usually no possibility of exceeding the target value of the allowable intake as displayed in terms of long-term affects[*2].

However, in the case that a sample that was not processed properly is distributed, as there is a possibility that it may contain various unforeseen hazardous components, it is necessary to thoroughly confirm safety beforehand.

Column 2 Hazard of Pathogenic Microorganisms in Olfactory Measurement

When collecting or preparing samples of effluent that have not undergone a sterilization process, such as disinfection, or when assessing with the triangular odor flask method, it is necessary to be cautious of hazards due to pathogenic microorganisms in the effluent. If unnecessary contact is avoided and areas of the skin that have come into contact with the effluent by some chance are properly washed, the possibility of an infection is extremely low[*2].

1) Abbreviation of the American Conference of Governmental Industrial Hygienists

2) Reference document: Masahiro Osako, Kumiko Shigeoka, "Is the panel safe or not in the sensory test (Rept. 1) Risk assessment from viewpoints of chemical-hazard and bio-hazard", Journal of Odor Research and Engineering, Vol. 29, No. 4, 1998.

Chapter 3 System for Safety Management

3.1 Framework for Safety Management

In addition to establishing an organization concerned with safety measurement when implementing the olfactory measurement method and defining a responsibility system, reliable and rapid information distribution should be expected as well. Measuring laboratories that conduct olfactory measurement should be cautious of the following points, appoint a person responsible for safety management, and strive to maintain a safety management system.

(1) Try to establish a system where information relating to toxic substances at the odor source can be distributed properly to the person who collects samples and the operator, and where the person who collects samples and the operator can sufficiently obtain information relating to safety. Make efforts to relay information relating to safety to the panel in an adequate range.

(2) Make efforts to establish an organization related to a responsibility system concerned with safety management, an information distribution system, and an educational guidance system.

It is not necessary to establish a safety management organization relating to the olfactory measurement method separately; it is rather more common to establish one as part of a safety management system of the laboratory as a whole.

3.2 Education and Training

The person responsible for safety management should make efforts to establish a manual related to securing safety, thoroughly carry out educational guidance and training related to safety management for workers involved in the olfactory measurement method, and plan for improvements in the qualifications and skills of each of the workers in charge on a regular basis.

3.3 Managing Documents and Records

The person responsible for safety management and the workers involved with the olfactory measurement method should properly create and store the documents and records as stated in this manual, and appropriately record the information concerning problems and unforeseen accidents, which will be useful in future safety management countermeasures.

Column 3 Method of Education Training for Safety Management

Educational training on a regular basis is necessary for safety management. For educational training, there are methods such as conducting it within the facilities, participating in training sessions, and implementing it before starting work.

Generally, for the method of education at factories, there are KY activities. KY stands for “Kiken Yochi” in Japanese or danger forecast, and by understanding what kind of dangers exist before starting work, and thinking of measures for these dangers, there are many cases in which danger can be avoided even if, for example, accidents occur. Conduct training of KY activities within the facilities, and carry out KY at safety check meetings before starting work at the measurement site.

In the facilities, the leader makes the workers conduct brainstorming (a thinking method of extracting original ideas by giving opinions freely) and extract danger forecast contents by using illustrations of work sites (diagram below) and illustrations of analysis work.

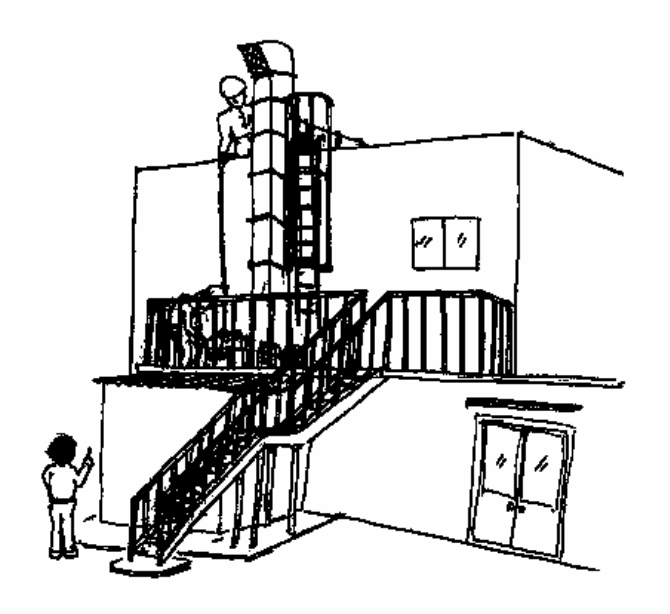
Next, think of measures regarding the dangers that were extracted, and set up safety goods. It is recommended to refer to examples of sites at which there was actual experience, or examples of past accidents that have been disclosed to the public.

At the measurement site, confirm the contents of the work to be conducted on that day with each other, and examine danger forecasts based on the conditions of the preliminary inspection information of the site and the actual site, and always keep these dangers in mind when working.

As a reference, an illustration for danger forecast activities is shown. Use it as material for extracting what kind of hazards lie, and how to take measures against these hazards.

In addition, refer to Reference Material 4 in this manual as materials for educational training.

— What kind of hazards lie? —



[Situation] Preparation for odor measurement

[Example of potential hazard]	[Example of necessary countermeasures]
Tools may fall off of the roof	The person standing at the bottom must wear a helmet

Chapter 4　Safety Measures when Sampling

4.1　General Issues of Safety Measures

As work that involves working at high altitudes and handling toxic exhaust gas of high temperature and pressure is likely when collecting samples at the business place, conduct safety measures while being cautious of the following points as necessary. As a part of safety management, the following points should also be made clear on a regular basis to the people collecting samples.

(1) Equipment for safety measures

① **Clothing and equipment**

Confirm the conditions at the workplace, and prepare safety devices in addition to the equipment that will be used.

② **Entering hazard areas, observing safety signs**

At the factory workplace, do not enter hazard areas or restricted areas without prior permission.

③ **About health conditions**

When not feeling well, or when there is sleep deprivation, do not conduct measurement work forcibly. Inform the supervisor.

The supervisor does not allow people of these conditions to work.

Equipment for safety measures

- ☑ Work site: KY (danger forecast) board, work indication board, working clothes (of which the hems can be fixed), helmet, safety shoes, work gloves, division net
- ☑ Measures for high altitude: safety belt, safety sheet
- ☑ Measures for high temperature: jumpsuit, heat-resistant gloves, heat-resistant apron, heat-resistant safety shoes, heat-resistant sheet, fan, plaster board
- ☑ Measures for toxic gas/oxygen deficiency: gas mask, air-supplied respirator, protective glasses, protective shield
- ☑ Measures for dust: dust mask, protective glasses, jumpsuit
- ☑ Measures for short circuit/mist: jumpsuit, oil-resistant boots, oil-resistant gloves, dust mask, protective glasses, earth leakage breaker
- ☑ Measures for dark places: flashlight, floodlight
- ☑ Other: Transceiver, ear plugs, rain gear, other devices necessary for weather measures and special operations

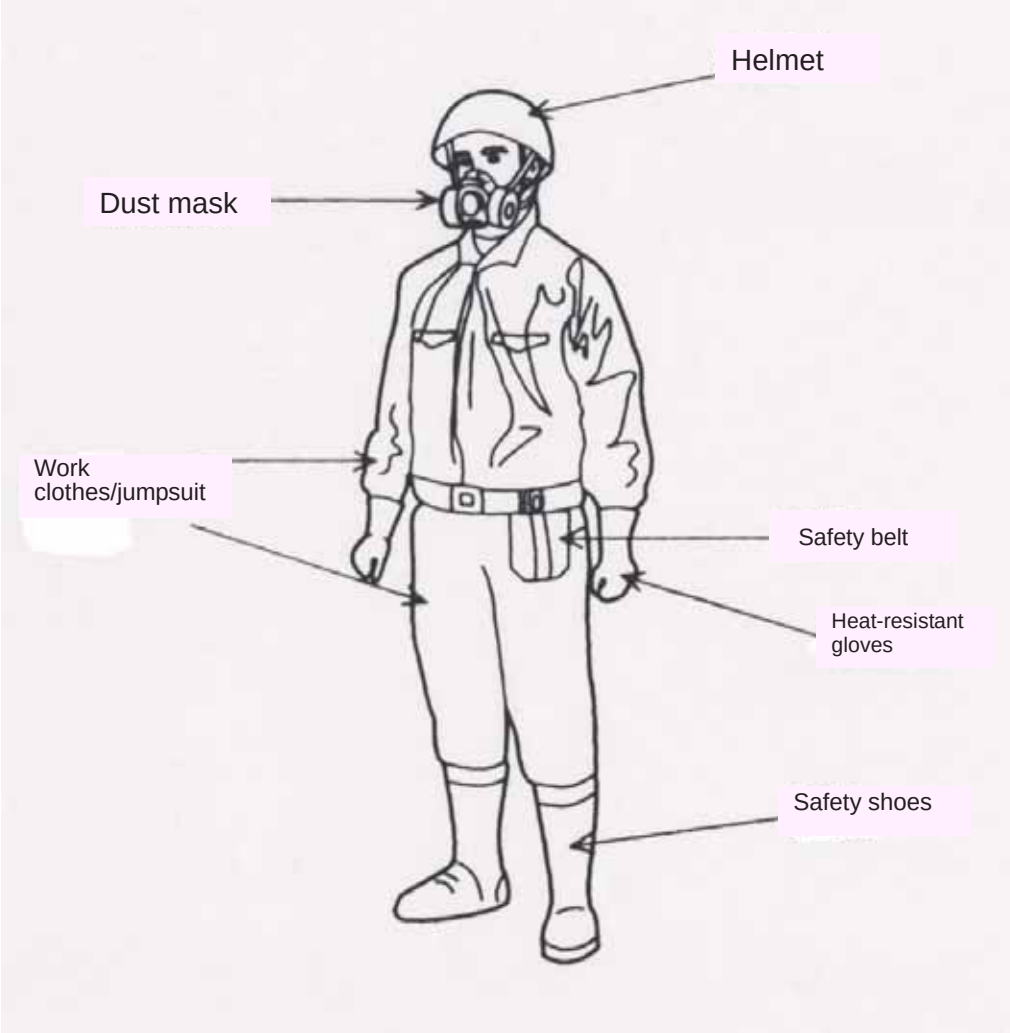


Figure-4.1 Example of how to wear protective gear

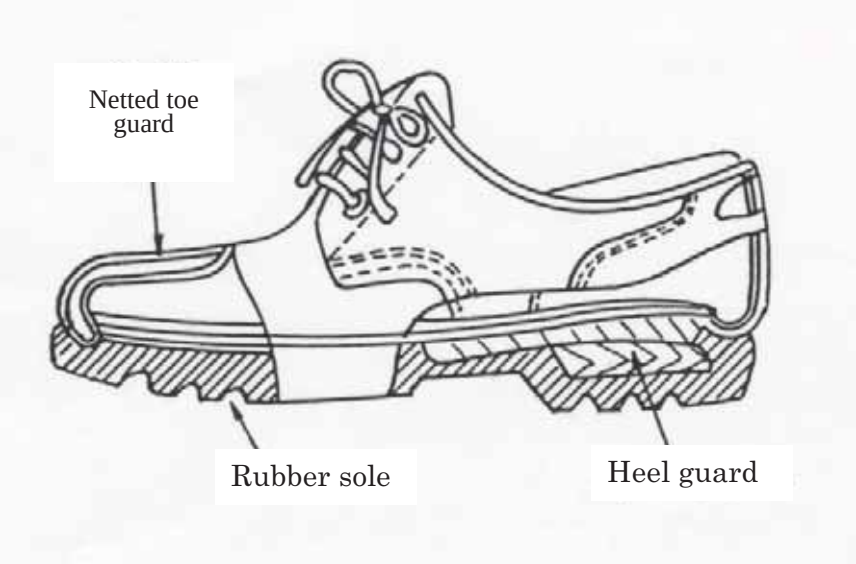


Figure-4.2 Example of structure of safety shoes

(2) Preliminary survey

A preliminary survey is conducted before the actual survey, for the purpose of reviewing the sampling location beforehand, by inspecting the workplace through examining the work contents of the workplace, the operation conditions, and deodorization measures. In the preliminary survey, to ensure safety when sampling, a safety confirmation of the sampling location is conducted for the presence of toxic substances (particularly substances with high acute toxicity) that may be discharged, their type, acridity, and infectiveness, and to grasp the discharge amount of toxic substances. Based on the results of the preliminary survey, it is necessary to be ready for the actual survey, by reviewing countermeasures and preparing equipment.

① Topics for hearing at the office

Before viewing the sampling location, have the person in charge explain the precautions for safety management (confirmation of hazardous locations, determining whether there is a necessity to use explosion-proof devices) including the manufacturing process, main primary materials used, substances used at the subject measuring facility, whether it is a batch operation or a continuous operation, the presence of a deodorizing apparatus or drainage processing equipment, operation status, presence of past measurement data, countermeasures conducted up until the time being, toxic substances of which discharge is expected and their discharge concentration, exhaust gas flow rate, exhaust gas temperature, and fluids.

② Confirmation at the sampling location

At an outlet port sampling location, check the safety of footholds, and if there are problems concerning safety that cannot be handled in preliminary preparations, request for specific improvement measures from the person in charge of the business place.

A structure such as the one in Figure-4.3, as shown in JIS Z 8808 (Method of measuring dust concentration in flue gas) is recommended when setting up the foothold.

Items for confirmation include the transporting route for equipment, foothold of the working space, the corrosion and deterioration conditions of stairs and handrails, and the height and width. Check for leaks at the gas duct, the high-temperature areas, ambient noise, and whether the exhaust gas at the measurement hole is of positive or negative pressure as well.

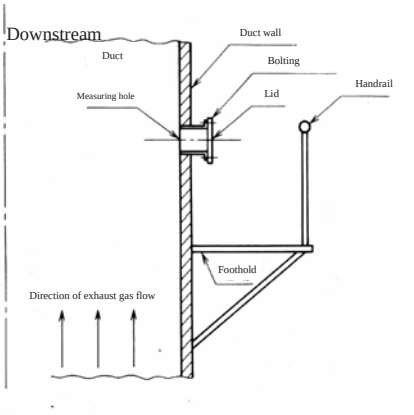


Figure-4.3 Structural example of foothold at measurement hole

At a water sampling location, confirm the foothold conditions and discharge conditions of toxic substances such as hydrogen sulfide. In particular, if the water sampling location is indoors, be careful of oxygen deficiency and toxic gas discharge.

In the case that the exhaust gas contains toxic gas, or that there is a possibility of toxic gas discharge at the water sampling location, conduct a safety check using a detecting tube and various sensors (hydrogen sulfide meter, oxygen meter, flammable gas meter, etc.).

③ Creating a safety checklist

Create a safety management checklist based on the hearing items and confirmation of the measuring location, and arrange the problems of safety management with their respective countermeasures so that they are prepared on the day of the survey.

Example 1 shows how to fill out the "Safety Checklist for Preliminary Survey". In addition, the Measures column lists some examples of viewpoints and measures that must be taken into consideration.

Example 1 (sample entry)

Safety Checklist for Preliminary Survey

Recorded by

Factory name	ABC Factory		
Address	1 xx Town, yy City	Telephone number	000-222-3333
Position of person in charge	General Affairs Division	Name	Ms. Kaori Shuki
Industry type	xx manufacturing industry	Manufacturing process	Process diagram [Yes] ・ No
Main raw materials, etc.	Product name Reference substance of hydrogen sulfide Amount used x mg [Batch use] / Continuous use		
Facilities subject to measurement	1 location with odor stack in exhaust facilities of laboratory, 1 location with final effluent in effluent processing facility of laboratory, 2 locations for measuring lot with downwind		
Deodorizing apparatus	[Yes] No (Arrangements for diagram)	Effluent processing	[Yes] ・ No(Arrangements for diagram)
Operational state	Work 8:30 to 17:00 Facilities10:00 to 15:00	Complaints in past	Yes ・ [No]
Past measurement data	[Yes] ・ No (Obtain if possible.)	Measures in past	Yes ・ [No] (Check contents)

Items to check		Conditions	Measures
Substances used at facilities subject to measurement		Hydrogen sulfide	
Toxic substances with predicted discharge and their concentrations		Substance name Predicted concentration Odor stack: Hydrogen sulfide 0.3 ppm Effluent: Hydrogen sulfide, concentration unclear Sterilization with sodium hypochlorite	Measures for acute toxicity Measures for substances with acridity Measures for infection [Confirm concentration with detecting tube when analyzing]
Ambient air sample	Conditions when going to candidate measuring position	Can be easily reached・[Areas for caution along the way](Areas for caution: near air blower)	[Instruct to put cover on exposed part of belt]
	Conditions of candidate measuring position	[None in particular]・Caution during sampling (Points for caution)	
	Power source near candidate measuring position	[In front of office]・None at all	[1 cord reel] Hand vacuum pump used
exhaust port sample	Flow rate of exhaust gas	360 m^3_N/h	
	Temperature of exhaust gas	50°C	Measures for high temperature, measures for radiation heat
	Water content	5.0%	
	Sampling position	Can be easily reached without using anything, Can be reached with stepladder, [Foothold present 10m above ground], Assemblage of foothold necessary	[Helmet, safety belt] Safety shoes Impossible to measure due to lack of foothold
	Gas pressure at measurement hole	Positive pressure・[Negative pressure] (+, [-0.01 kPa])	Mask, glasses, protective shield
	Power source near measuring position	Within 30 m・[At approx. 40 m]	[2 cord reels]
	Occurrence of hazardous gas	Yes・[No]	Detecting tube・Complex gas monitor
Collecting effluent from outlet	pH of effluent	pH ( )・[No information]	[Confirm with all-around test paper during sampling]
	Conditions when going to water sampling position	Can be reached easily・[Caution areas along the way] (Caution area: pass by the side of the effluent pit)	[Adhere to safety passages]
	Conditions of water sampling position	None in particular・[Cautions during sampling] (Caution: oxygen deficiency inside manhole)	In the case of an underground room In the case of a manhole [Observe with oxygen monitor]
	Sampling instruments used	Direct sampling・Ladle (long/short) [Bucket・Rope 3 m]	Rubber gloves・Clean water for washing [Water supply nearby]
Necessity of gas monitor ([Yes]・No), Necessity of explosion-proof devices (Yes・[No])			

(3) Safety confirmations before sampling on-site

Check, with the “Safety Checklist for Preliminary Survey” as a basis, to make sure that safety equipment has not been forgotten, and head to the site.

At the sampling site, before starting the sampling operation, conduct a safety confirmation through a safety check meeting with all workers (in which work contents and methods, preparatory plans, and problems are discussed, and instructions are conveyed) before starting work, and examine the measuring position.

For work at locations with high danger, make sure that at least two people go together. Carry out fundamental procedures, such as cleaning and arranging the workplace, and carrying a transceiver to communicate accordingly at locations that have significant noise.

Example 2 shows how to fill out the “Safety Checklist for Sampling”.

Example 2 (sample entry)

Safety Checklist for Sampling

Factory name	xxx Factory		
Address	1 xx Town, yy City	Telephone number	000-222-3333
Position of person in charge	General Affairs Division	Name	Ms. Kaori Shuji
Industry type	xx manufacturing industry		
Facilities subject to survey	1 location with odor stack in exhaust facilities of laboratory, 1 location with final effluent in effluent processing facility of laboratory, 2 locations for measuring lot with downwind		

Check 1

Confirm preliminary inspection information of site.

Check 2

Emergency contact system

Name of administrative person in charge
Taro Shuki
Mobile phone number 090－1111－0000

⇔

Name of person in charge of factory
Kaori Shuki
Telephone number 000－222－3333

⇕

Name of person responsible for measurement
Taro Shuko
Mobile phone number 090－1111－0000

⇕

Names of people who conducted measurement		
Taro Sagyo	Saburo Shiryo	
Representative mobile phone number 090-2222-3333		

Check 3

Training and Measures for Danger Forecast before Working

Work content	What kind of hazards lie?	Priority	Measures
Lot measurement After borrowing the power supply in front of the office and depressurizing the suction bottle, it is brought to the measurement spot. Samples are collected after waiting for odors to come.	Electric shock from short circuit of vacuum pump		Check switch and cord before using pump
	The belt of the air blower gets tangled on the passageway	○	Transport after checking the belt cover
	Accidents can occur from traffic of cars on premises		When emerging from corners or passages, check using signals
Outlet port measurement Sampling instruments are lifted by rope to the measuring hole position (10 m high), and samples are collected with suction equipment set up on the ground.	Instruments can fall when hoisted down using rope		After checking how the rope is tied, hoist down using signals
	A forklift can run over the power cord, cutting the cord		Trail the cord along the wall so that it does not protrude onto the passageway
	A bolt drops to the ground when unfastening the flange of the measuring hole	○	Place a safety sheet over the foothold, and wear a helmet while working
	Falling from between spaces of handrails at measuring position		Wear a safety belt, and while working, hook the belt
Sampling effluent from outlet Transport sampling instruments to the manhole, and use a bucket with a rope to draw samples. Transfer them to a sampling bottle.	Falling into effluent pit		Do not walk anywhere else other than on the safety passage
	Fainting due to oxygen deficient gas in manhole	○	Examine the manhole using a oxygen monitor, open the cover a little to confirm whether there are leaks. Monitor while sampling water as well
	Effluent gets on hands		Wear rubber gloves, and if effluent gets on hands, wash it off immediately with running water. After confirming the pH, take the sample back.

The ○ marks under Priority are items to be strictly enforced as goals for safety activities!

Next, safety measures for each kind of work are explained.

(1) Safety measures for working at high altitudes

When working at high altitudes, as even a small mistake can be linked to a large accident, close attention is necessary. Pay particular attention to the following.

1) To avoid accidents due to falling when climbing up and down the ladder, the next person must wait until the previous person has finished climbing up the ladder before climbing up the ladder themselves. The same applies for climbing down the ladder as well.

2) To avoid accidents due to falling when hoisting measuring instruments with a rope, warn the person directly below not to come near.

3) To ensure that tools do not fall when conducting work at high altitudes, clean and arrange the workplace. When working on a net-like floor, use a sheet to block the holes.

4) During times of unfavorable weather, such as rain and wind, do not perform work outdoors at high altitudes.

5) When working at high altitudes, wear a safety belt as necessary.

6) Set up and operate suction pumps and gas meters in a location separate from the measurement hole.

(2) Safety measures for working at high temperatures

When working at high temperatures, pay attention to the following so that there are no accidents such as burns.

1) Use protective gear such as heat-resistant gloves and heat-resistant safety shoes as necessary, and prevent the skin from coming in direct contact with high-temperature parts.

2) If the internal pressure of the gas duct is positive, as the gas will blast out when opening the measurement hole, be careful so that the gas does not hit the face. When opening the measurement hole, it is recommended to open the flange little by little, and check whether the gas will blast out.

3) As there is a risk of a fire when the rubber tube and rag come in contact with the high temperature areas, do not place any combustible material in the surrounding area.

(3) Safety measures for facilities that discharge toxic gas

When sampling exhaust gas that contains toxic substances, pay attention to the following so that there is no exposure to the gas.

1) As toxic gas may have collected in closed spaces or depressed areas and there may be an oxygen deficiency, check using an oxygen meter before entering these kinds of places.

2) Use protective gear, such as a gas mask, as necessary.

3) If the internal pressure of the gas duct is positive, be careful not to become directly exposed to toxic substances that may leak from the gas duct or measurement hole. In particular, as the gas will blast out when opening the measurement hole, be careful so that the gas does not hit the face.

4) It is recommended to use a detecting tube to examine the concentration of toxic gases.

5) At facilities that use strong acids, there is a possibility of gas with acridity of high concentration being discharged.

6) Secure a working location keeping evacuation in mind, and clean and arrange the measuring instruments.

7) When feeling dizzy or nauseous, stop work immediately and evacuate.

8) Flames are strictly prohibited at sites where explosive gases are handled. Use explosion-proof instruments, and securely ground these devices.

(4) Safety measures for sampling effluent

Pay attention to the following when collecting effluent samples. It is also recommended to measure the pH beforehand when collecting effluent samples.

1) To avoid coming in contact with toxic substances and pathogenic microorganisms, use protective gear, such as rubber gloves and rubber boots, as necessary.

2) When collecting effluent samples indoors, if oxygen deficiency or toxic gas discharge can be expected, conduct work while confirming that the location is of workable condition by using an oxygen meter and compound gas monitor. In the case that wastewater has collected, and sludge has accumulated at the bottom and conditions are anaerobic, even if it is not detected by measurement beforehand, as it may be that case that hydrogen sulfide gas may emerge at once due to an impact of a disruption of the wastewater while working, establish measures such as checking with a hydrogen sulfide monitor and ventilating the air.

3) In the case that the cover of the manhole is opened, do not leave the site until work is finished. Do not enter the manhole, as there is a risk of oxygen deficiency or toxic gas discharge.

(5) Handling samples

Pay attention to the following when confirming and transporting the collected samples.

1) Confirm samples above ground at a location where plenty of air passes through. When sniffing sample gas that contains toxic substances, be careful not to sniff the sample gas directly from the sampling bag, and instead, sniff using a glass syringe to avoid being exposed to the sample gas more than necessary.

2) For samples that contain toxic substances, be careful of the sample bag breaking during

transport or storage, and of being directly exposed to the toxic substances.

3) When sampling effluent, as there is a risk of injury or coming in contact with pathogenic microorganisms due to breakage of the sampling container, transport it by storing it in a cooler.

4.2 Checkpoints for Confirming Safety at Each Facility

As it is often the case that odor measurement is first conducted at factories and business places due to complaints, measurement of outlet ports must be conducted on roofs even though there are no measurement holes or footholds. There are also cases when it is difficult for the workers in charge to understand safety issues specific to each business place. In addition, when inspecting factories/business places due to complaints, there are cases in which the person in charge may be uncooperative, or where it may be difficult to obtain safety information even when conducting a preliminary survey because the person in charge is a clerical worker and does not know the conditions of the site well. In particular, at chemical factories, in the case that source information is not obtained beforehand, it may be necessary to postpone measurement.

To understand the site conditions beforehand, if possible, through the person in charge of the factory subject to measurement, and from the person in charge of the corresponding site, ask about the operation conditions of the facility, odor occurrence conditions, and information about past abnormal periods. Make it a point to confirm the preliminary conditions of the work site in a safety check meeting before starting work, become familiar with hazardous locations, and then start sampling. After finishing sampling, it is important to take important measures related to safety, such as checking to make sure that the screws of the measuring hole are tightened, and that nothing has been forgotten.

The safety measures stated in 4.1 are all integral in any kind of work, but it is necessary to be constantly aware of fundamental safety measures such as checking helmets and work gloves even for the preliminary survey before departing, and to always wear them at the site. Inside the facilities, it is necessary to be careful of gas blowing out from pits, manholes, and pipe fittings of each part. In particular, as there is vulnerability while climbing up and down smokestacks, it is necessary to be cautious of the conditions around the ladder.

Acid gas that is generated in metal cleaning or while processing waste batteries has high acidity, and as it affects the throat directly, its concentration should be confirmed beforehand using a detecting tube to see whether measurement can be performed.

The following is a checkpoint for safety confirmation at common facilities.

(1) Sewage treatment plant

It is common for sewage treatment plants to have a completely closed structure due to odor measures, and to be constructed half or entirely underground. For this reason, as long-term accumulation of sludge can occur, the sedimentation tank is of a condition where there can easily be oxygen deficiencies or where it can easily be filled with generated gas.

Therefore, before entering these kinds of facilities, it is necessary to confirm the conditions of the air inside using a compound gas monitor (Photo-4.1). It is also critical to constantly monitor the concentration while sampling, and to continue work in a state where immediate evacuation by warnings is possible, if there is a case in which the concentration becomes high. In this case, it is necessary to confirm an evacuation passage beforehand. It is also necessary to set up a surveyor at the entrance of locations where there is a possibility of toxic gas being generated. If, by some chance, a worker collapses, the surveyor is important in that they must call for help immediately. As long as it cannot be confirmed that the inside is safe, the surveyor cannot enter by any means.

Photo-4.1 Example of a portable complex gas monitor

There are reports that gases generated at sewage treatment plants have high concentrations, for example, carbon monoxide in 2850 ppm, hydrogen sulfide in 1200 ppm, hydrogen cyanide in 1200 ppm, and a few percentages of methane, especially in the underdrain areas and entrance to the treatment equipment area.

(2) Final Landfill Disposal Site for Wastes

At final disposal sites for wastes that have been established in recent years, a gas collection pipe for gases generated due to reactions of the landfill objects is set up, and emissions of methane gas and hydrogen sulfide can be seen. For old landfill disposal sites that do not have a gas collection pipe, as gas can generate from unpredictable locations, it is necessary to operate a compound gas monitor before entering the area, and enter the site with utmost attention.

At disposal sites where daily earth cover of landfill objects is not performed, be careful of inhaling dust dispersed from the landfill objects by wind, and of injuries by landfill objects such as glass. Put on a dust respirator and safety shoes.

When measuring at a landfill site, as there may be accidents due to drivers of hauling trucks and operators of heavy machinery working without knowing that a person conducting measurement who is unfamiliar with the site has entered the site, it is necessary to become thoroughly familiar with measurement by having a preliminary discussion with the person responsible for the disposal site.

In an example of a landfill disposal site for city waste, there are reports that the percentage of

methane gas exceeds 80%, and that it exceeds 10% after 3 years.

(3) Metal melting furnace

Metal melting furnaces include reverberatory furnaces, crucible furnaces, cupola furnaces, arc furnaces, and electric induction furnaces.

Recently, there is exhaust gas processing equipment set up at each of the sources, but in the case of crucible furnaces and electric induction furnaces, there are cases in which exhaust gas is emitted in factory buildings where there are no processing equipment. In these kinds of cases, gases discharged from furnaces can mix with gas generated from casting molds after casting, and there may be complaints about odor caused by gas leaking from the building.

In measuring at these kinds of sources, when melting material is infused into the furnace, refrain from entering when feeding or tapping procedures are taking place, as hot water may spatter. If measurements must be taken, it is necessary to use a Teflon tube and collect samples from a remote place.

Hot air-type cupola furnaces use coke as fuel, and regularly, there is about 14 to 16% of carbon monoxide in the exhaust gas generated from the top of the furnace. This gas undergoes second combustion the heat exchanger, and is sent in as air for combustion.

In the exhaust gas processing apparatus after the second combustion, be careful, as there may be a variation in the concentration of carbon monoxide due to changes in cast or problems in the factory line, and the concentration of carbon monoxide may become high even in the processed gas.

In the exhaust gas processing apparatus of cupola furnaces and arc furnaces, there may also be an open-type filtration dust collector. In this case, if the person conducting measurement stands near the lever portion of the dust collector cover when measuring the outlet opening, they will be directly exposed to exhaust gas. In particular, with arc furnaces, even if the concentration of carbon monoxide is usually low, when the lid is opened in order to feed additional materials, it will be of high concentration instantaneously. As it is often the case that the measuring position of the outlet opening of sources and exhaust gas processing apparatus are at a faraway distance, set up a person who can confirm the source conditions, and, by using radio transmission to communicate with the person conducting measurement, it is effective to conduct sampling from a remote distance using a Teflon tube.

In modern factories, there is increased use of a battery-operated forklift, which may lead to cases where footsteps cannot be heard. In the lot, strictly enforce people to walk on the safety passage belt.

(4) Waste incinerator and sludge incinerator

It is often the case that the measuring positions of waste incinerators and sludge incinerators are set up at high locations. Depending on the facility, it is also often seen that the floor of the measuring position is an open grating. In recent years, for measures against dioxin, there are incinerators with combustion temperatures of over 900°C, or at over 1000°C for incinerators at private, intermediate processing sites. When measuring these kinds of incinerators, it is important to put on a safety belt, use a sheet to prevent falling objects, wear a protective shield as a measure against radiation heat, and wear working clothes with long sleeves even in the summer. In addition, it may also be necessary to prepare heat-resistant clothing.

Recently, there have been many complaints regarding small incinerators, but in these cases, it is often the case there is no work stage at the measuring hole position. Subsequently, it is necessary to take measures such as using makeshift footholds or high-altitude industrial vehicles. As it appears that radiation heat from small incinerators are higher than that from large incinerators, naturally, workers must take measures for themselves and also be careful of sampling equipment , such as by using a heat-resistant board. To ensure safety during measurement, it is necessary to set up secure footholds and handrails.

When coming in close proximity of the waste pit and the feeding hopper, put on a safety belt to prevent falling, and conduct work with extreme caution, by communicating with nearby workers operating cranes.

With sludge incinerators, there are actual instances when hydrogen cyanide at the entrance of processing apparatus has exceeded the upper limit value of 11 ppm, and was displayed as 35 ppm. In such cases, if the inside of the gas duct even when sampling is of positive pressure, it is necessary to put on a gas mask or air line mask, and then examine the concentration of the collected sample using a detecting tube, prepare an appropriate diluted sample, and conduct analysis.

At these facilities, there have also been reports that the concentration of hydrogen monoxide, which cannot be processed in a general exhaust gas processing apparatus, has exceeded 1800 ppm. It is necessary to take the same measure as those regarding hydrogen cyanide.

(5) Rendering plants, etc.

Rendering plants are where by-products, such as the meat, skin, uncooked fat, bones, and internal organs of wild animals and domestic livestock that are generated when livestock such as cows, pigs, and chickens are slaughtered, are processed, and produced into meal and animal fat and oil, which become ingredients for items such as fertilizer, feed, and soap detergent. Because livestock by-products, which are the materials for rendering, have a characteristic of easily

decomposing, they may be assembled in the daytime and processed in the night. Accordingly, it may be necessary to conduct preliminary surveys and measurements in the nighttime, and there may be cases in which there can never be enough caution in the night, though the same dangers may be noticed in the daytime. In particular, as bodily movements become slower in the winter due to coldness in conjunction with the nighttime, it is necessary to pay attention to each single operation.

When it is necessary to measure inside the product ingredients tanks, pits, or underground tanks, as it is likely that hydrogen sulfide and ammonia are generated, or that there is oxygen deficiency, particularly if stored at room temperature, it is necessary to use a toxic gas monitor, and to confirm the conditions of the air inside. Constantly monitor the conditions while sampling as well, and conduct work in a state where it is possible to evacuate immediately via warnings, in the case that conditions become hazardous.

There is an example where there was hydrogen sulfide in 19 ppm, and ammonia at 95 ppm at the entrance to a deodorizing apparatus upon measurement at a feather factory.

4.3 Emergency Measures for Accidents

It is most important to not cause an accident, but in the case that one occurs, saving human lives should be the first priority. It is also important to take safety measures promptly to prevent the accident from escalating.

(1) Accidents involving physical injury

① Measures after the accident

a. In addition to calling the fire department and an ambulance immediately, call the nearest police station.

●Disaster overview
・Occurrence of disaster (When): xx:xx (approximately xx minutes beforehand)
(Where): At xx work site
・Afflicted person(s) (Who):
・Work contents (How): While doing xxxx work
・Hazardous substance (What):
・Location of injury (Where): There are injuries around the xxx (head, etc.)

●Condition of afflicted person:
: <Consciousness> Yes / No
: <Respiration> Yes / No
: <Bleeding> Acute / Light / None from ( )
: <Pulse> Yes / No
: <Complexion> Normal / Pale
: <Bone fracture> Yes / No
: <Other> Presence of nausea, etc.

b. Move the afflicted person(s) to a safe location and give them first aid. Depending on the circumstances, administer emergency first aid, such as mouth-to-mouth resuscitation and cardiac massage.

c. Take approaches so that there will not be any other afflicted person(s).

d. Report the details of the accident to superiors or involved parties, and wait for instructions.

② Measures if there is an injured person

a. Arrange for an ambulance or call for a medical physician immediately.

b. Administer emergency measures as necessary.

- Examine whether there are any injuries to the head, chest, or abdominal areas.
- When there is acute bleeding, try to stop the bleeding as fast as possible.
- When respiration has stopped, give mouth-to-mouth resuscitation as soon as possible.
- When there is cardiac arrest, give cardiac massage as soon as possible.

c. Lay the afflicted person down so that they can rest in a comfortable position.

- Move the afflicted person to a safe location immediately, and in principle, lay them down horizontally. If their complexion is pale, or if their pulse is weak, lay them down so that their feet are slightly elevated. If they are conscious, it is recommended to place them in a position that is most comfortable for them.
- If there is vomiting, turn the person's face sideways so that they do not choke on vomit. If there is no consciousness, be particularly careful so that they do not choke on vomit or secretions.
- As long as the afflicted person is in a safe location, do not move them or warm them more than necessary; to maintain body temperature, keep them warm simply by wrapping a blanket around them. In particular, when there is no consciousness, it is better not to move the afflicted person if there are suspected injuries to the head or spine, or to the abdominal area or internal organs.
- Keep bystanders or unnecessary people away at a distance. Make sure that someone stays near the afflicted person until an ambulance comes, so that they can be supportive and relieve anxiety.

d. Generally, in the following cases, it is safer to not make the afflicted person drink anything.

- When there are injuries to the head, chest, abdominal area and internal organs.
- If they are unconscious or have nausea.

e. If the afflicted person can speak, ask about the conditions of the accident. (If there are any locations where they were hit, whether there is pain, etc.)

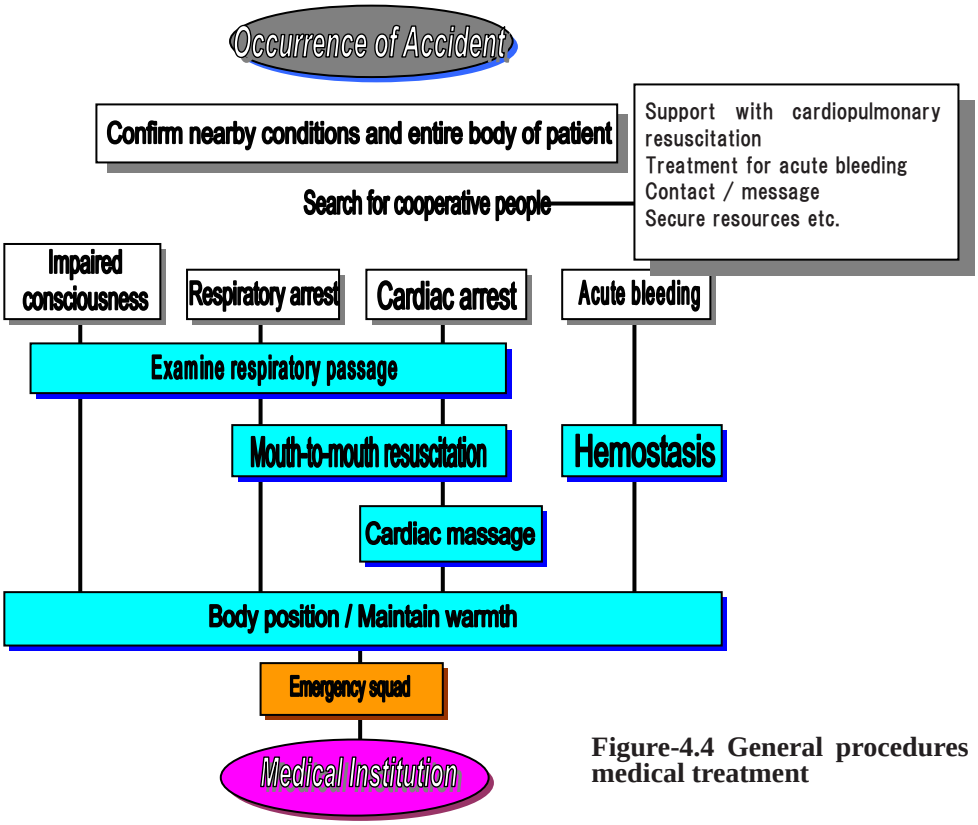


Figure-4.4 General procedures for medical treatment

Accident involving equipment only

a. Report the details of the accident to the superior or involved parties with the most responsibility, and wait for instructions.

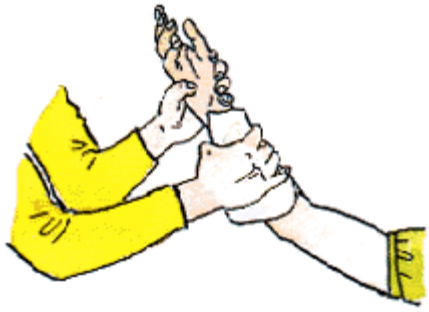
b. Call the nearest fire department or police station as necessary (if the accident involves offensive odors, report it to the local government as well).

c. In addition to taking the above measures, prevent damages and secondary disasters. For example, if a fire occurs, take fire-fighting measures and make efforts to confine damages to a minimum.

(2) Emergency measures for general injuries

① **Cuts**

a. Acute bleeding



- The person giving treatment must clean t heir hands first before proceeding.
- Stop the bleeding. To stop the bleeding, place clean gauze or cloth on the cut, ho ld it down, and apply pressure.
- If bleeding does not stop even though pressure is applied, apply pressure on the "pressure point" (where a pulse can be felt) between the bleeding site and the heart.
- Receive medical treatment from a doctor promptly.

b. Mild bleeding

- Wash off any dirt with clean water, such as tap water, and after disinfecting the area around the cut, place gauze on it and apply pressure to stop the bleeding.

② **Burns**

a. Burns due to hot air or hot water

- Cool the burned area with water or ice water immediately.
- For burns underneath clothing, do not remove the clothing and let the water run over the clothing.
- If there is no running water nearby, or if being transported to a hospital, cool the burned area with a towel or washcloth thoroughly soaked in cold water that is as clean as possible.
- As burned skin is vulnerable to bacterial infection, be careful so that dirty objects do not come in contact with the affected area, and that the blister does not rupture.

- In the case of burns to the eyes, do not, under any circumstances, rub the eyes, as it will cause the cornea to become damaged.
- In the case of severe burns, or if the burned area is large, consult a medical physician immediately.

b. Burns due to chemicals

- For burns caused by chemicals such as acid and alkali, as there is a danger that the chemical can permeate deeply into the skin, wash off the chemical fluid immediately with tap water.
- If chemical agents get onto clothing or shoes, remove them as soon as possible.
- Consult a medical physician immediately.

③ **External injury to eyes**

a. If a chemical substance gets into the eye

- Put the entire face into a sink, and while letting the tap water flow slowly, wash the eyes by opening and closing them. Consult an eye doctor as soon as possible.

b. If a foreign substance gets into the eye

- Do not, under any circumstance, rub the eyes. It is often the case that the foreign substance will come out along with tears. If the foreign substance does not come out, gently wipe it off with clean gauze or absorbent cotton moistened with water.
- If glass or iron powder gets stuck on the eyeball, do not try to take it out. Cover the eye with clean gauze and receive first aid from an eye doctor immediately.

④ **Anoxia and hydrogen sulfide poisoning**

- When anoxia or hydrogen sulfide poisoning are suspected, stop work immediately and evacuate to a location where there is fresh air.
- To rescue a person who has collapsed due to anoxia or hydrogen sulfide poisoning, make sure to put on protective gear (air line mask, etc.), and move the person to a location with fresh air.

- Transport the person to a hospital with facilities as soo n as possible.
- In the case of respiratory arrest, give mouth-to mouth resuscitation immediately.
- Conduct oxygen inhalation, and be careful of heat-retention.

(3) Emergency measures for heat strokes

When conducting work outdoors in the summertime, or indoors at hot temperatures and high humidity, if dizziness, numbness and spasms of the hands and feet, nausea and vomiting, headaches, syncope, impaired consciousness, or difficulty breathing occur and there are no other sideration causes, there is a high possibility of a heat stroke. This was stated in detail, as there has been an increasing tendency in cases of sideration due to continuing heat waves in recent years.

A) If there is little or no consciousness

① Examine the respiratory passage of the sick person, and if there is no respiration, conduct mouth-to-mouth resuscitation.

② If the pulse is extremely weak, or if it has stopped, give cardiac massage.

③ While cooling down the sick person's body, call an ambulance and have them transported to a hospital with facilities.

④ If it is possible to move the sick person, move them to a cool location while cooling down their body.

[Example of cooling down the body]

・Massage with a cold water towel, blow air

Remove as much clothing as possible and squirt water on the body. Massage the entire body (to prevent contraction of the cutaneous vessels), especially the hands and feet (distal portions) and trunk area, with cold water or a cold towel. Rather than using cold water, use lukewarm or water that is of room temperature. For blowing air on the body, fan by using a paper fan, towel, or clothes.

・Cooling using ice (ice bag, ice pack)

Cool down the blood by placing ice bags or ice packs at the infra-axillary area (under the armpits of both arms), and at the carotid (at the sides of the neck, on both sides).

⑤ If there is consciousness

①Let the sick person rest in a cool location (an air-conditioned room or a breezy, shady area).

②Loosen clothing (remove, if necessary) and let the body cool down, until it is deemed cold.

③Supply fluids (drinks that contain electrolytes such as sports drinks, or 0.9% salt water), only if the sick person has clear consciousness.

④If there are spasms of the calves or abdominal region (not the entire body), supply fluids (same as in (3)) and massage the areas with spasms using a cold towel.

⑤If their complexion is red, make the person sit up so that their upper body is somewhat

elevated, rather than having them lay down.

⑥If syncope (to an extent of a few seconds) occurs, have the person lay down sideways, and position them so that there is an increased blood flow to the heart, such as by elevating their feet higher than their heart.

⑦If their complexion is white and their pulse is weak, have the person lay down in a position so that their feet are elevated higher than their heart.

⑧If an intake of fluids is difficult due to nausea or vomiting, as fluids cannot be supplied, transport the person to a hospital immediately.

⑨Even if the sick person is conscious, make sure they consult a medical physician.

Chapter 5　Safety Measures at Time of Olfactory Measurement

To secure the safety of the panel and operator when implementing olfactory measurement, knowledge related to safety judgment standards for sample gas is necessary.

In addition to deciding the initial dilution ratio, it is necessary for the operator to take considerations so that the panel does not inhale toxic substances of high concentrations. When deciding the initial dilution ratio, through using information from the person who collected the sample as materials to aid in setting the dilution ratio, the operator must be careful not to inhale toxic substances of high concentration himself/herself.

5.1 About safety judgment standards

Refer to the allowable concentration as established by the Japan Society for Occupational Health and ACGIH for concentrations of toxic substances that pose problems in securing the safety of the operator and panel.

(1) Ambient air sample

As ambient air samples are of low concentration, they do not fundamentally pose a problem to safety, but when high concentration is expected, such as when sampling near an outlet port, it is necessary to be careful in the same way as for a exhaust port sample in (2).

(2) Exhaust port sample

In the olfactory measurement method for a exhaust port sample, a sample with the highest concentration is sniffed at the initial dilution stage. In the case that there is a possibility of a substance with an upper limit value of the allowable concentration of ACGIH existing as exceeding this upper limit value, the operator must decide the initial dilution value by measuring the concentration with a detecting tube beforehand, and sniffing it after diluting it sufficiently so that the concentration is lowered to below the upper limit value. If an odor cannot be detected after doing so, it is determined that the sample is unsuitable for olfactory measurement, and thus is not measured.

In the case that there is a possibility of a substance with a 15-minute value as established in ACGIH existing with an extremely high concentration exceeding the allowable concentration, the operator must determine the initial dilution ratio by measuring the concentration beforehand using a detecting tube, and sniffing it after diluting it sufficiently so that the concentration is lowered to below the 15-minute value. When confirming the odor of the sample gas, to avoid being exposed to the sample gas more than necessary, the operator must be careful to dilute it in an odor bag and sniff it, and not sniff the sample gas directly from the sampling bag.

Table 5.1 shows a list of substances selected by taking into consideration the actual conditions of exhaust concentrations in relation to odor threshold, ACGIH allowable concentration, and Reference Material 1 that is separately attached (Source and Exhaust Conditions According to Industry Type). These substances should be handled with caution during olfactory measurement. The substances listed in the table were selected roughly based on the following perspectives.

1) Substance of which the levels of allowable concentration and odor threshold are close to the corresponding ACGIH allowable concentration (upper limit value or 15-minute value)[*1] (As a target, a substance of which the 17-fold value[*2] of the odor threshold exceeds the allowable concentration)

2) Substance that corresponds to the upper limit value of ACGIH, and for which there have been cases where its exhaust concentration has exceeded the allowable concentration

3) Substance that corresponds to the 15-minute value of ACGIH, and for which there have been cases where its exhaust concentration greatly has exceeded the allowable concentration

*2 About the 17-fold value of the odor

If it is assumed that 4 stages of dilution are necessary until a panel answers incorrectly, then there is a risk of sniffing a concentration of approximately 17-fold the odor threshold at the initial dilution stage. If the 17-fold concentration of the odor threshold is of a substance with concentration higher than the allowable concentration of the ACGIH (upper limit value or 15-minute value) dominates the odor threshold, it is necessary to be careful due to a possibility of the panel sniffing at a concentration above the allowable concentration at the initial dilution stage.

Panel	100	300	1000	3000	Individual Threshold
A	○	○	○	×	3.24

$10^{3.24} \rightarrow 1700$
$1700 / 100 = 17$

*2 Masahiro Osako, Kumiko Shigeoka,:Is the Panel Safe or not in the Sensory Test –Risk Assessment from Viewpoints of Chemical-Hazard and Bio-Hazard" Journal of Odor Research and Engineering Vol. 29, No. 4, pp.64-71,1998.

Table 5.1 Substances for which caution is necessary from standpoint of acute toxicity in olfactory measurement method

Substance name	Major sources	Allowable concentration (ppm)	Odor threshold (ppm)
Formaldehyde	Rubber factory, organic chemical products manufacturing, textile factory, lumber factory, casting factory	0.3 (Upper limit value)	0.5
Hydrogen chloride	Semiconductor factory, pharmaceuticals factory, waste incinerators, plating factory	5 (Upper limit value)	10
Acetonitrile	Chemical factory, pharmaceuticals factory, synthetic resin factory	60 (15-minute value)	13
Sulfur dioxide	Heavy oil combustion facilities, waste incinerators	5 (15-minute value)	0.87
Tetrachloroethylene	Dry cleaning (adsorption processing)	100 (15-minute value)	0.77
Benzene	Organic chemical products manufacturing, cokemaking factory, printing factory, paint factory	2.5 (15-minute value)	2.7
Bromine	Chemical industry, pharmaceuticals factory, dye factory	0.2 (15-minute value)	0.047
Methanol	Gravure printing	250 (15-minute value)	33
Carbon tetrachloride	Plastics factory, organic chemical products manufacturing	10 (15-minute value)	4.6
Trichloroethylene	Textile manufacturing, metal processing, semiconductor factory, dry cleaning (washing process)	100 (15-minute value)	3.9
MIBK (Methyl isobutyl ketone)	Automobile paint	75 (15-minute value)	0.17
Hydrogen sulfide	Nightsoil treatment plant, sewage treatment plant, final disposal site of wastes	15 (15-minute value)	0.00041

5.2 **Safety Confirmation During Olfactory Measurement**

The operator conducts a safety check during olfactory measurement at the analysis preparation stage. The operator checks equipment and apparatus that they themselves use, and avoids handling the sample primary odor and stock solution when there is no information.

The operator obtains information from the "Safety Checklist for Preliminary Survey," "Sampling Record Form (attached to the Quality Control Manual)," and from the hearings of the person who collected the sample.

Example 3 shows how to fill out the "Safety Checklist for Olfactory Measurement".

Example 3 (entry sample)

Safety Checklist for Olfactory Measurement”

Operator

Check 1: Confirmation during preparation

When measuring lot and outlet port

☑ Check how to handle the syringe needle and where to place it

☑ Check for cracks on glass syringe

When measuring effluent

☑ Check for cracks on flasks

☑ Prepare tissues for panel

☑ Check points for caution if, by some change, sample fluid gets on hands or nose

Common items for confirmation

☑ Check ventilation condition of sample preparation room

☑ Check ventilation condition of sensory test room

Check 2: Confirmation of for safety based on Safety Checklist for Preliminary Survey, Sampling Record Form, and hearings

☑ Examine for toxic substances → Judge whether suitable for sample measurement ☑ Suitable, □ Unsuitable

(Substance name: hydrogen sulfide)

☑ Examine concentration of toxic substance

(Detecting tube value 0.05 ppm) → Judge whether suitable for sample measurement ☑ Suitable, □ Unsuitable

☑ Check pH of sample in case of effluent

(pH 6.4)

☑ Information from hearing ☑ None in particular □ Information available( )

Check 3: Primary odor check by operator

☑ Check with detecting tube when unclear of concentration of toxic substances

(Detecting tube value 0.05 ppm) → Judge whether suitable for sample measurement ☑ Suitable, □ Unsuitable

☑ Confirm initial dilution ratio

If unsuitable, sample is excluded from measurement.

5.3 Safety Management for the Triangular Odor Bag Method

When implementing the triangular odor bag method, it is necessary to pay attention to safety management for the following source samples. Pay particular attention, as it is likely that the sample gas on the entrance side of the exhaust gas processing apparatus (deodorizing apparatus, etc.) is of high concentration. For samples related to accident measures as stated in Article 10 of the Offensive Odors Control Law, it is necessary to handle them in a particularly cautious manner, and to judge the adequacy of the sensory test.

(1) Sewage treatment plant

① Sludge processing facility

There are cases in which the concentration of hydrogen sulfide is high. Compared to the allowable concentration (15-minute value, 15 ppm), the odor threshold value (0.00041 ppm) of hydrogen sulfide is low, and though it is not likely that the panel will have to sniff a sample of high concentration, it is necessary for the operator to not directly sniff the undiluted sample gas.

It is also necessary to take hydrogen sulfide into consideration in regards to nightsoil treatment plants as well.

② Sludge incinerator exhaust gas

There are cases in which the concentration of hydrogen cyanide (upper limit value, 4.7 ppm) and carbon monoxide (time weight average (TLV-TWA)) are high, and it is necessary to take this into consideration when determining the initial dilution ratio.

(2) Metal melting furnace

There are cases in which the concentration of carbon monoxide is high, and it is necessary to take this into consideration when determining the initial dilution ratio.

(3) Semiconductor production facilities

In the forefront industries, there are occurrences of odors from organic solvents, but as various types of specific material gas are used, there are cases when these gases with organic solvents are discharged. Specific material gases with high toxicity include phosgene (time weight average, 0.1 ppm), arsine (time weight average, 0.05 ppm), and hydrogen fluoride (upper limit value, 3 ppm). It is necessary to secure the safety of the operator and panel by understanding which materials are used in the process at the facilities, and to conduct a thorough survey of the discharge system of the exhaust gas. Gases with reaction systems should be handled with particular caution.

(4) Paint coating furnace

As unintentionally generated substances, aliphatic aldehydes, such as formaldehyde (upper limit value, 0.3 ppm), are produced. Aliphatic aldehydes other than formaldehyde (acetaldehyde, etc.) have a low threshold concentration, and it is unlikely that the panel will sniff high concentrations, but it is necessary for the operator to be careful not to sniff non-diluted sample gas directly.

(5) Plating facilities

There are facilities with high concentration of hydrogen chloride (upper limit value, 5 ppm). It is necessary to confirm the concentration with a detecting tube when sampling.

As hydrogen chloride in waste incinerators is eliminated by removal of water by condensation during sampling, there are no particular problems present.

Chapter 6 General Overview

6.1 Summary of the Safety Management Flow

The following are items for which precautions should be taken, starting with preliminary preparations, to sampling, up until olfactory measurement, which have been summarized as the flow of safety management.

<Preliminary preparations> (Type of documents)

Compare discharge concentration data of industry type and sources to allowable concentration data

From the table on Reference Material 1, confirm whether there are cases in which discharge concentration (existing data) of the facilities subject to survey are higher than allowable concentrations. For sources without existing data, use a database related to chemical substances.

↓

The data for discharge concentration is higher

(! Danger of being exposed to toxic substances during survey)

↓

Prepare for protective measures

As there is the possibility that the person collecting samples sniffs the primary odor, prepare safety measures so that there is no exposure to toxic substances when sampling.

Safety Checklist for Preliminary Survey (Example 1)

<Sampling>

Confirm actual discharge concentration of toxic substances with detecting tube, compare with allowable concentration

As there is also a possibility of exceeding the data from existing materials, confirm the concentration of the actual sample again

Safety Checklist for Sampling (Example 2)

↓

Actual discharge concentration is higher

(! Danger of being exposed to toxic substances when sniffing primary odor)

↓

Be careful not to sniff primary odor as is

As there is the possibility that the operator sniffs the primary order in deciding the initial dilution ratio and in examining the odor quality, inform them assuredly.

<Olfactory measurement>

Compare initial dilution concentration (17*Cth) to allowable concentration

To ensure that they are not exposed to toxic substances, confirm that the initial dilution ratio (17-fold the odor threshold), which is the highest concentration that the operator and panel sniff, does not exceed the allowable concentration.

Safety Checklist for Olfactory Measurement (Example 3)

↓

Initial dilution concentration is higher

(! Danger of being exposed to toxic substances when measuring)

↓

Judge as unsuitable for olfactory measurement method

As a sample that is unsuitable for the olfactory measurement method, stop olfactory measurement.

～Countermeasures for Samples Unsuitable to Olfactory Measurement～

Measure using an ambient air sample only: *As there is a high possibility of being exposed to high concentrations of toxic substances with the exhaust port sample, measure only an ambient air sample collected at a site boundary of comparatively low concentration*

Handle with related regulations: *Handle with Air Pollution Control Law, laws related to waste disposal and cleaning, ordinances by local governments, etc.*

6.2 Supplying Information Related to Safety to the Examinee

If proper safety management measures are taken by following this manual, the safety of samples supplied in the olfactory measurement method can be secured, but as the examinees are entitled to receiving information concerning securing safety in the olfactory measurement method, it is necessary to convey appropriate information to them and receive their consent to serve as an examinee.

However, as giving them information that is more than necessary can possibly influence the examinees' judgment, such as by causing worry or preconceived opinions regarding the odor quality of samples, it is necessary to adequately refrain from doing so. Generally, they should be supplied with information concerning the procedures that were taken to confirm the safety of the samples that will be distributed to them.

6.3 About the Necessity of Follow-ups in the Future

As there are various odor sources, it is very likely that there are cases other than the ones given in this manual that pose problems to safety management. It is important to properly store records of information relating to problems and unforeseen accidents that occurred in the process of advancing safety management measures at each laboratory, and to accumulate this information and to constantly improve the safety management measures based on this manual at each laboratory in the future.