

## KAGRA Safety Rule

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## 1. Objectives

- ① The objective of this safety rule is to determine regulations to ensure and improve safety in the KAGRA tunnel.

## 2. Scope

- ① This safety rule is applied to the staff and students of the University of Tokyo, collaborators from other universities/institutes, and other persons concerned, who could utilize the KAGRA tunnel.
- ② This safety rule is also applied to persons from vendors/contractors, except for some part of “qualification for entering the KAGRA tunnel” (see section 3). However, it is not applied to contractors who perform the safety management of KAGRA.
- ③ Visitors are not subject to this safety rule. However, visitors must submit an application to enter the KAGRA tunnel, always be escorted by KAGRA members, and obey them. Here “visitors” are defined as those who do not conduct any work or work-related actions in the KAGRA tunnel and are permitted for a visit to the KAGRA tunnel by the director of KAGRA Observatory. A KAGRA collaborator could be a visitor.

## 3. Qualification for entering the KAGRA tunnel

- ① Workers must submit the workers questionnaire to the KAGRA safety control office. (This is a one-time obligation, but workers must resubmit the questionnaire if the contents are changed.) This does not apply to persons from

vendors/contractors.

- ② Workers must attend the safety and health lecture given by the University of Tokyo, or must read the safety manual by the University of Tokyo Kashiwa campus and submit a pledge. Since the safety manual is revised every year, even workers who have attended the safety and health lecture must read the safety manual every year. The rule in this section does not apply to persons from vendors/contractors.
- ③ Workers must read and obey this KAGRA safety rule.
- ④ Workers must have attended the KAGRA safety lecture within one year prior to entering the KAGRA tunnel. The lecturer is selected by the KAGRA safety control office. If they cannot attend the regular KAGRA safety lecture, they must consult with the KAGRA safety control office in advance, and they must attend the special KAGRA safety lecture before entering the KAGRA tunnel. The KAGRA safety lecture for persons from vendors/contractors must be given by the KAGRA member in charge of the work, if the person in charge is a member of the KAGRA safety control office. If the KAGRA member in charge is not a member of the KAGRA safety control office, the person in charge must ask the KAGRA safety control office to choose a lecturer.
- ⑤ Workers must have both “personal accident insurance” and “liability insurance”. Although employees of universities or institutes are automatically covered by those insurances, students and some postdocs need to obtain the insurances by themselves. Students must submit a copy of the insurance certificate. Postdocs must submit to the KAGRA safety control office either a document that proves that they are covered by the insurances in their university or institute, or, if not covered, a copy of the insurance certificate. Persons from vendors/contractors are strongly encouraged to obtain the insurances. They must report the insurance status to the KAGRA safety control office.
- ⑥ Workers, who are in charge of each task, must submit the application of entering the KAGRA tunnel after consulting with the project manager and scheduler.

#### 4. Working hours

- ① The regular working hours in the KAGRA tunnel are between 8:30 and 17:00 on weekdays. However, if the KAGRA safety control office approves, work is allowed outside the regular working hours, as long as there are two or more workers including a safety responsible person in the same area, even if nobody is in the data analysis building. If workers need to have extended work hours,

they must inform the KAGRA safety control office and obtain permission before 5PM on the same day. Before carrying out out-of-hours work on weekends or holidays, the workers must inform the KAGRA safety office of the work before 5PM of the previous working day, obtain permission, and then submit an application to enter the KAGRA tunnel. The daily working time in the KAGRA tunnel must not exceed 10 hours. The safety responsible person must notify the KAGRA safety control office by e-mail or so when they leave the KAGRA tunnel.

5. Management of entering and leaving the KAGRA tunnel

- ① Before entering the KAGRA tunnel workers must write down their names, scheduled leaving time, and work area on the white boards in the data analysis building and the fan hut. It must be also indicated who is the safety responsible person.
- ② On leaving the KAGRA tunnel workers must erase the names etc. on the white boards.

6. Number of workers and carry items

- ① There must be always two or more workers in each area. (One area is defined as an area where one person can reach other person within three minutes in an emergency.) Persons from vendors/contractors are also counted as workers.
- ② Workers must carry an item with which they can contact other workers in the same area in an emergency.

7. Safety responsible person

- ① There must be one safety responsible person in each area.
- ② Only staff are eligible as a safety responsible person. However, a person from vendors/contractors can be a safety responsible person if the KAGRA safety office approves the person to be a safety responsible person and the person also agrees to serve. In case that a person from vendors/contractors is a safety responsible person, work by only students in the same area is prohibited.
- ③ Safety responsible persons must always carry a PHS and an O<sub>2</sub>/CO sensor.
- ④ Safety responsible persons must immediately contact an appropriate person on the emergency contact list if an unsafe situation is detected, and, if necessary, must evacuate all the workers from the KAGRA tunnel.
- ⑤ Safety responsible workers must inform the safety control office when it is anticipated that the workers will stay in the KAGRA tunnel longer than

indicated on the white boards.

8. Emergency contact list

- ① The safety control office must put several emergency contact lists where workers can easily recognize the lists.

9. Stop work policy

- ① Workers must immediately inform the safety responsible person if the workers feel that they cannot ensure a safe working environment. Then the safety responsible person must immediately stop the work.

10. Emergency evacuation

- ① The safety responsible person must evacuate all the workers from the KAGRA tunnel swiftly in an emergency, and also must contact an appropriate person on the emergency contact list. The safety control office, if necessary, must contact safety responsible persons in other areas and evacuate all the workers from the KAGRA tunnel. The safety responsible person, if necessary, can contact safety responsible persons in other areas and evacuate all the workers from all areas of the KAGRA tunnel, before contacting an appropriate person on the emergency contact list.
- ② When workers evacuate, they must wear a helmet (compliant with safety standards; hereinafter simply called “helmet”) and evacuate immediately. If they are working inside a clean booth, they must evacuate with clean suits on.
- ③ Workers must not enter the KAGRA tunnel until the evacuation is terminated. The safety control office decides when the tunnel may be re-entered following evacuation.
- ④ Workers must not assume that alarm is false. Workers must not enter the KAGRA tunnel when an alarm is on.

11. X-end

- ① The safety control office must store air, water, and food, and maintain the facility inside the shelter to ensure the minimum standard of living for workers confined in the shelter until they are saved.

12. Work at height

- ① “Work at height” is defined as work at a place more than 2 m above the floor.

- ② While working at height a dedicated working floor must be provided, otherwise workers must wear a safety harness and a helmet. The second floor of the KAGRA clean booths is regarded as a dedicated working floor. However, even on the second floor of the KAGRA clean booth, if a part of the floor is removed without fence around the missing floor or if work takes place outside the fence around the dedicated floor, workers must wear a safety harness and a helmet.
- ③ A dedicated license is required to operate an aerial vehicle.
- ④ Working on a ladder is prohibited.
- ⑤ Adequate light must be used while working at height.

### 13. Crane and forklift

- ① Workers who use a crane or a forklift must conduct start-up inspection and verify that there is no malfunction prior to use.
- ② They must record in the log notebook the result of the start-up inspection, operation time, and other necessary information.
- ③ When they use a crane, they must inform workers around and obtain their agreement.

### 14. Helmet

- ① Workers must wear a helmet inside the KAGRA tunnel. However, they do not have to do so in the PSL room and the computer room
- ② Inside a clean booth workers must wear simple helmet. However, they must wear a helmet while using a crane or working at height.

### 15. Safety shoes

- ① Workers must wear safety shoes when they handle heavy goods.

### 16. Passage through the access tunnel

- ① When passing through the access tunnel, pedestrians and bicycle drivers must wear a safety vest and turn on a flashlight.
- ② As for cars, only electric cars or diesel cars are allowed to pass through the access tunnel.
- ③ The speed limit is 20 km/hour.
- ④ Pedestrians and drivers of cars/bicycles must pay enough attention to each other to pass through the access tunnel safely.

17. Passage through the arm tunnel

- ① When passing through the arm tunnel, workers must wear a safety vest and turn on a flashlight.
- ② Drivers of cars/bicycles must pay enough attention and pass through the arm tunnel safely.

18. Clothes

- ① Workers must wear work clothes with long sleeves and long pants.

19. Laser

- ① The laser management person must determine the laser hazard area. For a laser with wavelength of 1.06  $\mu\text{m}$  the hazard area is defined as an area where an eye could be exposed to laser light with a power of more than 1.95 mW. The laser management person must put a sign with necessary information, which indicates the status of the laser.
- ② Workers must wear proper safety goggles inside the hazard area.
- ③ A task responsible person who wants to use laser must obtain permission from the project manager in advance and must inform all the workers of the hazard area.
- ④ The laser management person must construct the laser interlock system.

20. Power supply connection

- ① The earth electrode of all instruments must be connected to the earth of the power supply. When using a cable extension for dedicated power supply, a power strip, or a cable reel, they must be equipped with an earth electrode and an electrical leakage breaker.
- ② All instruments must be connected to a power supply with sufficient power capacity. Power strips and cable reels must have sufficient power capacity. A cable reel must not be used with cable wound in the drum. Piggybacked electrical outlets must be avoided.
- ③ Outlets of cable extensions for dedicated power supply, power strips, and cable reels must be protected against dust and water properly. The outlets must be placed with socket holes facing horizontally and more than 20 cm above the floor level. The outlets must be equipped to lock plugs in order to prevent accidental disconnection.
- ④ All the dedicated cables including the power supply cable must not be put on

the floor, but be placed in a proper place.

- ⑤ Permanent instruments must be connected to a dedicated power supply. The equipment information (Name of the person who made the connection, contact information, and date of the connection) must be indicated next to the dedicated power supply breaker and the power supply cable. A power strip and a cable reel may be used only for a temporary use.

#### 21. High-pressure gas cylinder

- ① When using a high-pressure gas cylinder in the KAGRA tunnel, one must register and control it properly.
- ② High-pressure gas cylinders must be placed in a dedicated holder.

#### 22. Chemicals

- ① Workers must follow the “internal rules of KAGRA Observatory, Institute for Cosmic Ray Research, The University of Tokyo regarding the handling of chemicals”.

#### 23. Incandescent lamp and halogen lamp

- ① Incandescent lamps and halogen lamps are prohibited in the KAGRA tunnel, because they could cause fire.

#### 24. Welding

- ① Welding is in principle prohibited in the KAGRA tunnel. However, if the KAGRA safety control office approves, welding is allowed with the condition that the related law is observed and a fire extinguisher and a ventilation system are placed nearby.

#### 25. Evacuation drill

- ① There must be an evacuation drill once a year.

#### 26. Report of accident and near accident

- ① Workers must report accidents and near accidents to the safety control office.

#### 27. Eating and drinking

- ① Drinking water etc. to prevent dehydration is allowed outside a clean booth and inside a front room of a clean booth.

28. Others

- ① No drinking alcohol. (including 6 hours before entering the KAGRA tunnel)
- ② No smoking.
- ③ No using fire.