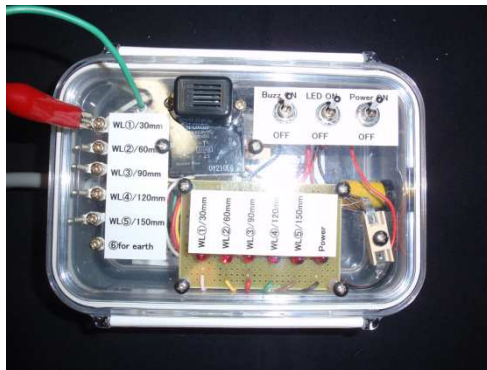


# Simple Water level/Rainfall Monitoring & Warning System Water-level/Rainfall Gage for Community Early Warning INSTRUCTION MANUAL



# **Simple Water level/Rainfall Monitoring & Warning System**

## **Water-level/Rainfall Gage for Community Early Warning**

**- VCEW Volunteers for promotion of Community Early Warning-**

### **Features**

Once the accumulated rain or water level exceeds predetermined level, the buzzer notifies of it. This function is useful for early warning for evacuation from danger of slope failure, landslide, flash flood and debris flow in small mountainous basins. However it must be noted that the water level gage may be destroyed by debris flows.

The water level/rainfall gage consists of a water level gage or rain gage installed at an appropriate location and a monitor connected using a 6-line cable. For this system, parts and components that are available anywhere in the world are used, except a relay which is used to activate the buzzer. The picture below shows Nepalese government officers assembling a monitor in Nepal.



### **Assembly of apparatus**

The levels determined in advance may correspond to a warning level for protecting vulnerable residents from disasters or to a warning level for resident evacuation. The pictures on the cover show a simple water level/rainfall monitoring & warning system with sensors at 5 levels. The cost of instrument fabrication is about 5,000 yen for the monitor, 2,000 yen for the rain gage and 4,000 yen for the water level gage. The cable to connect the sensor with the monitor costs 120 yen per meter.

## **INSTALLATION**

### **(RAIN GAGE)**

The rain gage may be installed in gardens or decks that are free from the influence of fences, roofs and trees, and convenient for observers. It is advisable to encase the rain gage in a frame so the storage tank can be removed for emptying or checking. It is also recommended to separate the rain collection component and the storage tank by installing the rain collection component at the edge of the roof and the storage tank indoor. The pictures below show examples of installation at a balcony.



Iron frame  
(Fiji 2011)



Top of roof (Nepal 2010)



Balcony (Japan 2012)



Garden  
(Japan 2009)



Balcony of apartment



Details of iron frame  
used at Fiji



Wood frame

### (WATER LEVEL GAGE)

The water level gage should be installed at the location that represents conditions of the river or stream near the village. Such places are vulnerable from debris and uprooted trees; therefore installation needs be done with care. Since hydrological observations are not the objective of this instrument, the gauge can be installed on bank slope or flat low land where water does not exists at normal condition. The water level gage may be secured with a wooden pile, an iron angle pile driven into the ground or a tree. The cable connecting the gage and monitor can be embedded underground using a casing tube or brought into operators' house via trees and/or power poles.

Following pictures show examples.



Installation on iron angle pile  
(Fiji 2011)



Cable in casing tube  
(Fiji 2011)

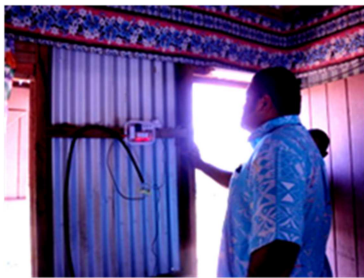


Installation on a revetment (Nepal  
2010)

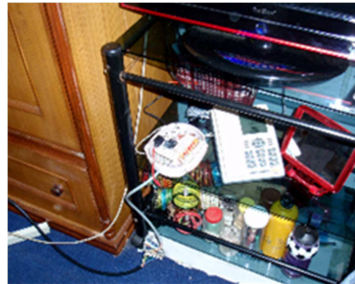
**(MONITOR)**

The 12 volt DC electricity can be supplied by (1) an AC converter, (2) batteries and (3) solar panels with batteries, or combination of them. Considering the possibility of power failure due to storm, combination of (1) and (2) or (1) and (3) are desirable. Solar panels are recommended for rural areas where electricity supply is not stable or not available.

It is recommended to install the monitor at locations which are convenient for operators such as at the entrance of their houses or in their living rooms.



At entrance of house (Fiji 2011)



Under TV set in living room (Nepal 2010)

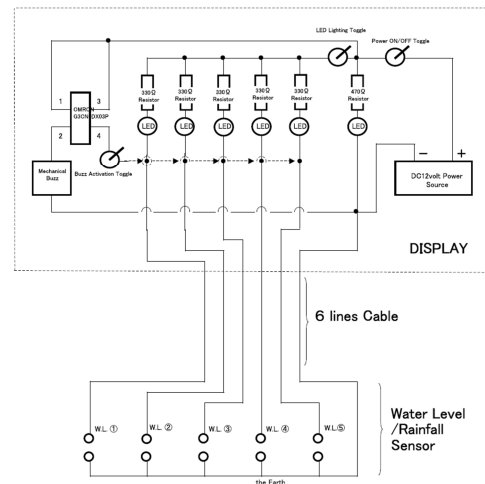
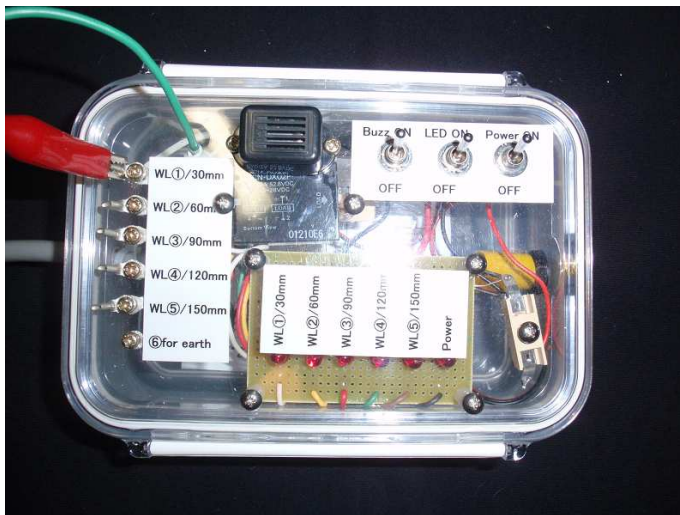


Complete set of rain gage with solar panel and battery

**DETAILS OF APPRATUS**

**MONITOR (Monitor/warning component)**

The monitor can be used for either the water level gage or the rain gage.



**Circuit of the system**

## RAIN GAGE

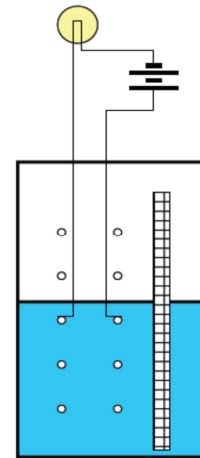
Rain gage is consisted with a storage tank with sensor rods and rain collecting cup.



Appearance

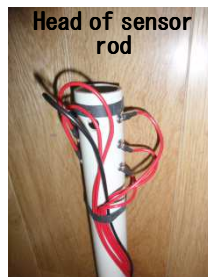
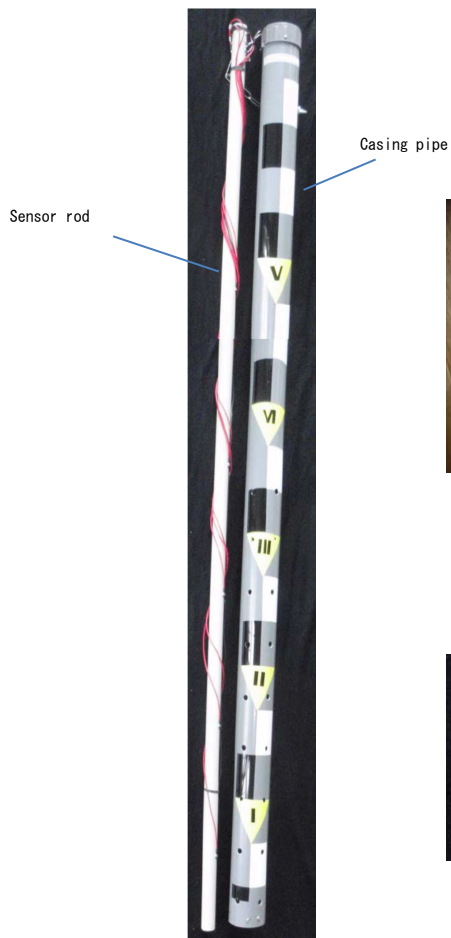


Sensor

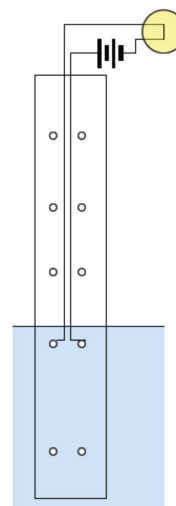
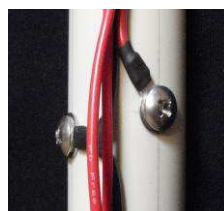


## WATER LEVEL GAGE

The water level gage consists of a casing pipe and a sensor rod with stainless steel sensor terminals on its side.



Sensor terminal



## OPERATION AND MAINTENANCE

### (MONITOR)

- 1) At the beginning of the rainy season: (1) check power source; (2) check the connection of the monitor, extension cable and water level gage or rain gage. Points to be checked are cable breakage, corrosion and weathering; check the LED lamps and buzzer by submerging or short-circuiting the sensor of the water level gage or rain gage.
- 2) Leave the power OFF in normal conditions to avoid electric corrosion of sensors. Check the power source once a week and when a heavy rain is expected.

### (RAIN GAGE)

- 1) In the dry season, leave open the drain at the bottom of the storage tank.
- 2) At the beginning of the rainy season, (1) wash the storage tank, (2) visually inspect the condition of the sensor bolt, (3) visually inspect and pull the cord, and if necessary replace the sensor bolt and/or nut and the terminal of the cord.
- 3) The sensor bolt and nut erode due to submergence and electricity while the level is nominal. When stored rainwater is severely colored, wash the tank and check the condition of the sensor terminals and cords.
- 4) When a heavy rain is expected, (1) empty the storage tank, (2) put a pinch of salt\* in the collection cup, (3) connect the level selection clip to the rain level chosen by the operator, (4) turn ON the Power and Buzzer switches, turn OFF the LED switch.



\* Although rainwater is contaminated by polluted air, its electric nature is virtually the same as that of distilled water which does not conduct electricity. Ground water, river water and tap water contain enough minerals from soil and rocks, and conduct electricity.



- 5) Actions at the time of heavy rain are as follows:
  - (1) When a warning is issued or a dangerous heavy rain is forecasted by authorities:
    - record the time, empty the storage tank and close the tap, put salt in the collection cup, connect the level selection clip to the 60mm level, switch ON the power and buzzer, switch OFF the LED, and stand by.
  - (2) When the accumulated rain reaches the 60mm level:
    - record the time, inform local authorities, inform local residents and lead them to prepare for emergency, set the selection clip to the 90mm level (next level), and stand by (refrain from going out).
  - (3) When the accumulated rain reaches the 90mm level:
    - record the time, inform local authorities, inform local residents and lead them to commence evacuation of senior residents and residents with disabilities, set the selection clip to the 120mm level (next level), and continue to stand by (refrain from

going out).

- start monitoring with 20-minute intervals by visual observation of the storage tank: Record the time and depth upon every observation. 10mm increase in 20 minutes is equivalent to 30mm/hr in intensity; the level going up one step within 1 hour indicates it has already reached the danger level (30mm/hr) for an outbreak of flash flood and sediment disaster.

### **(WATER LEVEL GAGE)**

The water level gage is often installed at riverbanks or wasteland which is isolated with little supervision, and vulnerable from sediment, debris, driftwood, garbage, robbery and vandalism. Therefore, the location and method of installation must be selected carefully. To prevent vandalism, explain to local residents the need and importance of the facilities as an essential part of disaster mitigation education program. For the water level gage, in addition to inspection and maintenance required for the rain gage, daily maintenance should be conducted in accordance with the purposes and conditions of the location.

### **(SETTING OF WARNING LEVEL)**

The “rain gage” and “water level gage” presented in this booklet are developed as a tool to provide key information to grasp the situation and to take appropriate actions in order to protect life and property from flood and sediment disasters caused by heavy rains. The rain gage detects accumulated rainfall at 5 levels (30mm, 60mm, 90mm, 120mm, and 150mm). While 5 levels of warning may seem too many as indices to start preparation and actions, determining which level is appropriate to prompt preparation and to take necessary actions may be difficult. The following is a procedure to determine action levels such as preparation and evacuation: install gages taking in to account past events, carefully accumulate experiences for 1 to 2 years, and finally choose the levels to start preparation and evacuation respectively from these 5 levels. Relocation of gages and adjustment of predetermined action levels can be done as required. It is also important to provide local residents with specific action programs including evacuation routes, shelters, communication with local authorities, communication among family members, and things to bring upon evacuation.

### **CONTACT DETAILS**

For further information, please contact us.

Representatives, Volunteers for promotion of Community Early Warning

Hidetomi OI            Email : [h-oi@waltz.plala.or.jp](mailto:h-oi@waltz.plala.or.jp)

Toshikatsu OMACHI   Email : [omachi-t@m6.gyao.ne.jp](mailto:omachi-t@m6.gyao.ne.jp)

# VCEW RAIN MONITORING RECORD

Year: 20

Place:

Observer:

	Date (MM/DD)	Time (HH/MM)	Note
Start of monitoring	/	:	
Level-1 (30mm)	/	:	
Level-2 (60mm)	/	:	
Level-3 (90mm)	/	:	
Level-4 (120mm)	/	:	
Level-5 (150mm)	/	:	
1 <sup>st</sup> Drain	/	:	Drained depth=        mm
Level-1 (    +30mm)	/	:	
Level-2 (    +60mm)	/	:	
Level-3 (    +90mm)	/	:	
Level-4 (    +120mm)	/	:	
Level-5 (    +150mm)	/	:	
2 <sup>nd</sup> Drain	/	:	Drained depth=        mm
Level-1 (    +30mm)	/	:	
Level-2 (    +60mm)	/	:	
Level-3 (    +90mm)	/	:	
Level-4 (    +120mm)	/	:	
Level-5 (    +150mm)	/	:	
	/	:	
	/	:	
End of monitoring	/	:	Total rain depth =        mm

Note: