Rural Training Center – Thailand (RTC-TH)

F CUS

Community-based Environmental Education for the Self-sufficiency and Sustainability of Small Rural Family Farms

Advanced MEWS Weather Observing Lesson A4:

Measuring Rainfall

2012 Ed

MEWS Lesson A4

A Mobile Emergency Weather Station (MEWS) Training Series presentation

Rural Training Center-Thailand
Emergency Communications Program

Ready to serve and sustain our community

For other lessons in the series e-mail hsØzhm@gmail.com
www.neighborhoodlink.com/RTC-TH_Tech/pages

A part of the RTC-TH EmComm Program

The Rural Training Center-Thailand Emergency Communications program is a volunteer effort to provide emergency amateur radio communications for local community self-sufficiency and sustainability in times of need.

The Rural Training Center-Thailand (RTC-TH)

is an all volunteer organization providing community-based environmental education for self-sufficiency and sustainability of small rural family farms

www.neighborhoodlink.com/org/rtcth

E-mail: rtc2k5@gmail.com

MEWS adapts weather lessons from two existing RTC-TH programs

E-mail: rtc2k5@gmail.com

www.neighborhoodlink.com/RTCTH_Tech/pages

The Rural Training Center-Thailand was created to honor the life and memory of Mr. Tang Suttisan, a father, farmer and former custodian of Ban Na Fa Elementary School who appreciated and valued education.


Photo from the Internet; educational fair use clause

Floods can occur due to heavy rains, landslides blocking streams, or failed dams.

Photos from the Internet; educational fair use clause

When flooding force roads and bridges to be closed, relief cannot get to the survivors.

Heavy rains can cause landslides that block road delaying relief help coming to survivors.


Photo from the Internet; educational fair use clause

Local EmComm HAMs can provide important local weather conditions for flight crews.

Measuring rainfall is one important way that people can know when a flood may happen.

Photo from the Internet; educational fair use clause

For disaster survivors, rain can be a source of drinking water.

The water may need to be treated to make it safe to drink; See lesson EP-3.

Get clever and make use of materials on hand. Or plan ahead to have rain catching materials as part of your emergency preparedness kit.

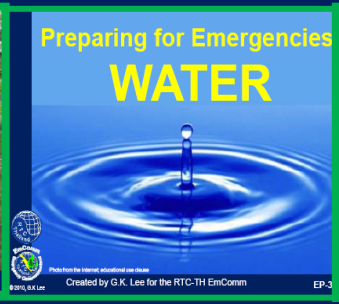
Small photos from the Internet;
educational fair use clause

The water may need to be treated before drinking; See lesson EP-3.

The EP Lesson Series

EP-1

EP-2



EP-3

EP-4

EP-5

EP-6

EP-7

EP-8

EP-9

EP-10

EP-11

EP-12

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Precipitation is any form of solid or liquid water falling from a cloud.

For Nan Province, rain is the most common form of precipitation.

Most other forms of precipitation are less likely to occur in Thailand

- Snow
- **Hail**
- Sleet
- Freezing Rain

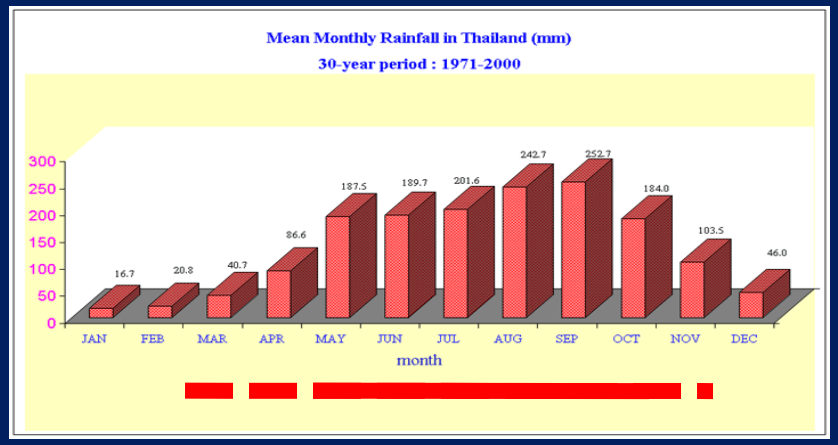
Hail might occur during severe thunderstorms and can be very damaging to people and property. Past records show hail occurred in northern Thailand.

When does it rain in Nan?

From North Thailand Climate Data During 54 years (1951 - 2004)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
North	-	-	-	-	5	2	9	17	23	15	1	-	72
Seasons	Winter (NE M)		Summer			Rainy (SW Monsoon)					Winter (NE Monsoon)		
Ave Temp	23.1°C		28.0°C			27.3°C					23.1°C		
Temp Range	17.1-30.8°C		21.4-35.8°C			23.7-32.2°C					17.1-30.8°C		
Ext Temp	0.8°C		44.5°C								0.8°C		
Rainfall (mm)	105.5		182.5			952.1					105.5		1240.10
Thawangpha Rainfall (mm)	11.0	12.6	29.2	108.0	206.2	202.4	244.1	302.3	175.6	80.4	22.7	5.9	1400.04
				T-storms			SW Monsoons						

Most rain falls in May-Oct during the monsoon season; though thunderstorms can occur in summer.

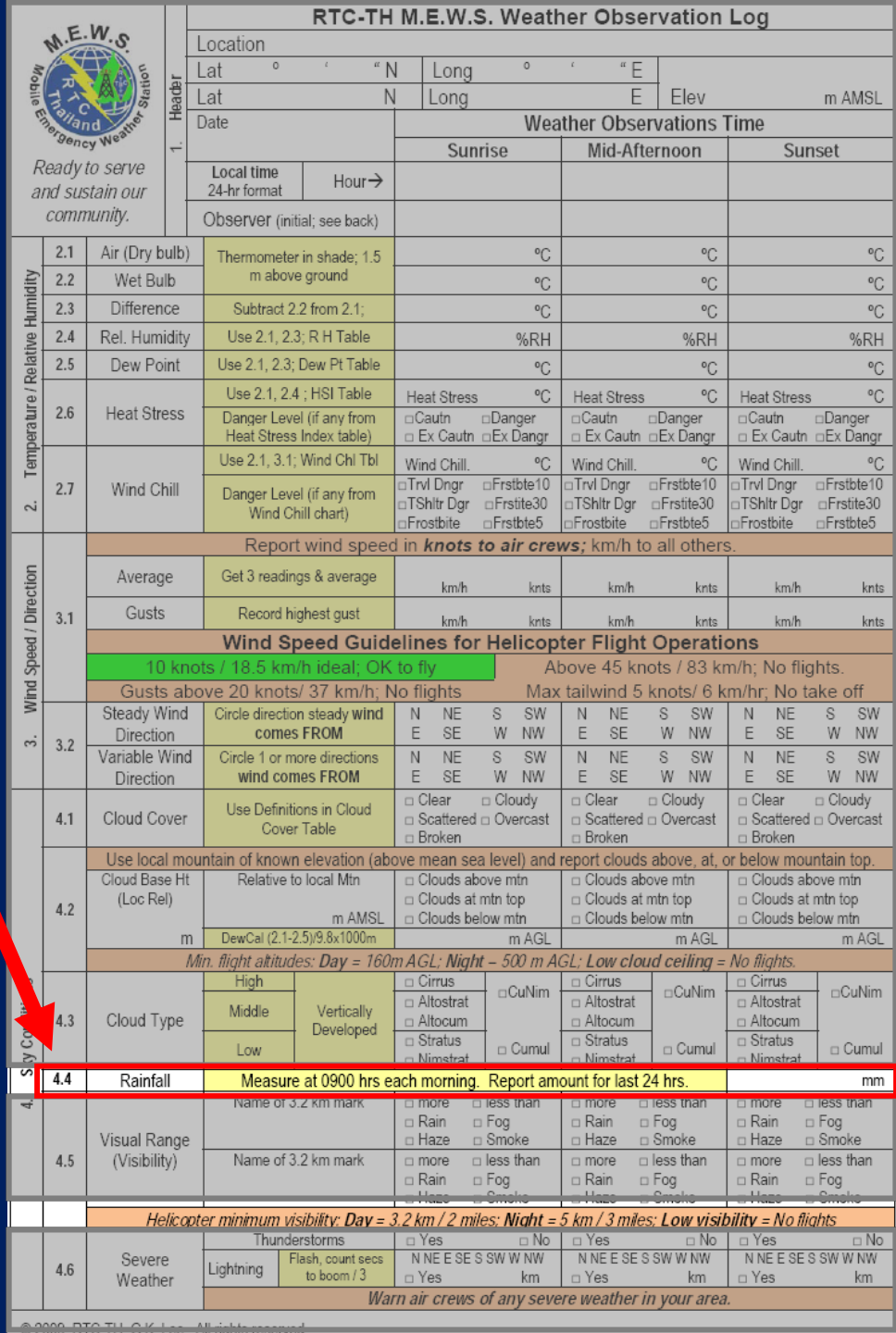


Record the precipitation amount using mm units in Section 4.4

Guide notes are on the front of the form

Rainfall is measured 1 time a day (at 0900 local time for MEWS).

Rain can limit visual range and so affects flight safety. Refer to MEWS B7 for more details.



M.E.W.S. Mobile Emergency Weather Station — RTC Thailand

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RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location

Lat ° ' " N | Long ° ' " E

Lat N | Long E | Elev m AMSL

Date

Weather Observations Time	Sunrise	Mid-Afternoon	Sunset
Local time 24-hr format / Hour→			
Observer (initial; see back)			

2. Temperature / Relative Humidity

				Sunrise	Mid-Afternoon	Sunset
2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground		°C	°C	°C
2.2	Wet Bulb			°C	°C	°C
2.3	Difference	Subtract 2.2 from 2.1;		°C	°C	°C
2.4	Rel. Humidity	Use 2.1, 2.3; R H Table		%RH	%RH	%RH
2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table		°C	°C	°C
2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table		Heat Stress °C	Heat Stress °C	Heat Stress °C
		Danger Level (if any from Heat Stress Index table)		□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl		Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
		Danger Level (if any from Wind Chill chart)		□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5

3. Wind Speed / Direction

Report wind speed in ***knots to air crews;*** km/h to all others.

			Sunrise	Mid-Afternoon	Sunset
3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
	Gusts	Record highest gust	km/h knts	km/h knts	km/h knts

Wind Speed Guidelines for Helicopter Flight Operations

10 knots / 18.5 km/h ideal; OK to fly — Above 45 knots / 83 km/h; No flights.

Gusts above 20 knots/ 37 km/h; No flights — Max tailwind 5 knots/ 6 km/h; No take off

			Sunrise	Mid-Afternoon	Sunset
3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
	Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW

4. Sky Condition

			Sunrise	Mid-Afternoon	Sunset
4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken

Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.

			Sunrise	Mid-Afternoon	Sunset
4.2	Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
	m	DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL

*Min. flight altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*

				Sunrise	Mid-Afternoon	Sunset
4.3	Cloud Type	High	Vertically Developed	□ Cirrus □ Altostrat □ Altocum □CuNim	□ Cirrus □ Altostrat □ Altocum □CuNim	□ Cirrus □ Altostrat □ Altocum □CuNim
		Middle				
		Low		□ Stratus □ Nimstrat □ Cumul	□ Stratus □ Nimstrat □ Cumul	□ Stratus □ Nimstrat □ Cumul
4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.				mm
4.5	Visual Range (Visibility)	Name of 3.2 km mark		□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		Name of 3.2 km mark		□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke

*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*

				Sunrise	Mid-Afternoon	Sunset
4.6	Severe Weather	Thunderstorms		□ Yes □ No	□ Yes □ No	□ Yes □ No
		Lightning	Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km

Warn air crews of any severe weather in your area.

M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand Rural Training Center-Thailand

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Additional brief guide notes are on the back of the form

Full instructions and all needed reference tables are in the MEWS Weather Observer Handbook (Section 4.4, 26-27).

All weather observers write their initials and clearly print their name using block letters

M.E.W.S. Summary Weather Observation Log Instructions

Header

Location: Local Place Name
Latitude, Longitude from GPS, survey records or map measurement.
Elevation: Survey records or map measurement (GPS elevations are not reliable).
Date/Hour: Use local Thai standard time in 24-hour format.
Observer: initials in box. Full name (print clearly) on top/back of form

RTC-TH M.E.W.S. Weather Observation Log					
Location					
Lat ° ' " N	Long ° ' " E				
Lat N	Long E	Elev m AMSL			
Date	Weather Observations Time				
	Sunrise		Mid-Afternoon		Sunset
Local time 24-hr format	Hour->				
Observer (initial, see back)					

Temperature / Relative Humidity

2.1 Air (Dry Bulb) Temp: Read thermometer kept in the shade, 1.5 m above the ground.
2.2 Wet Bulb Temp from hyrgrometer kept in the shade, 1.5 m above the ground.
2.3 Difference between Dry and Wet Bulb temperatures.
2.4 Relative Humidity: Use Dry Bulb Temp (2.1), Difference (2.3) and Relative Humidity table to find % Relative Humidity.
2.5 Dew Point Temperature: Use Dry Bulb Temp (2.1), Difference (2.3) and Dew Point Temp table to find Dew Point Temp.
2.6 Heat Stress Temperature: Use Dry Bulb Temp (2.1), % Relative Humidity (2.4) and Heat Stress Index Table to find Heat Stress Temperature and relevant advisory warning.
2.7 Wind Chill: Use the Dry Bulb Temp (2.1) and Wind Speed (3.1) and Wind Chill Table to find the Wind Chill Temperature and relevant advisory warning.

2. Temperature / Relative Humidity						
2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
2.2	Wet Bulb		°C	°C	°C
2.3	Difference	Subtract 2.2 from 2.1.	°C	°C	°C
2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C	°C	°C
2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
		Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □Ex Cautn □Ex Dangr	□Cautn □Danger □Ex Cautn □Ex Dangr	□Cautn □Danger □Ex Cautn □Ex Dangr
2.7	Wind Chill	Use 2.1, 3.1; Wind Chi Tbl	Wind Chill °C	Wind Chill °C	Wind Chill °C
		Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frostbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frostbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frostbite5

Wind Speed / Direction

3.1 Average and Gust Wind speeds: Use Beaufort Table or direct measurements 3 times and average results. Gusts are short, strong blasts of wind. *Report wind speeds in knots to air crews. Advise air crews when wind speeds are close to affecting helicopter flight operations.*
3.2 Steady or Variably blowing winds. If steady, circle letter for direction. If variable, circle all appropriate letters for directions.

3. Wind Speed / Direction						
		Report wind speed in *Knots to air crews*; km/h to all others.				
3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts	
	Gusts	Record highest gust	km/h knts	km/h knts	km/h knts	
		Wind Speed Guidelines for Helicopter Flight Operations				
		10 knots / 18.5 km/h ideal; OK to fly	Above 45 knots / 83 km/h; No flights.			
		Gusts above 20 knots/ 37 km/h; No flights	Max tailwind 5 knots/ 8 km/hr; No take off			
3.2	Steady Wind Direction	Circle direction steady wind comes FROM	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW	
	Variable Wind Direction	Circle 1 or more directions wind comes FROM	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW	

Sky Conditions

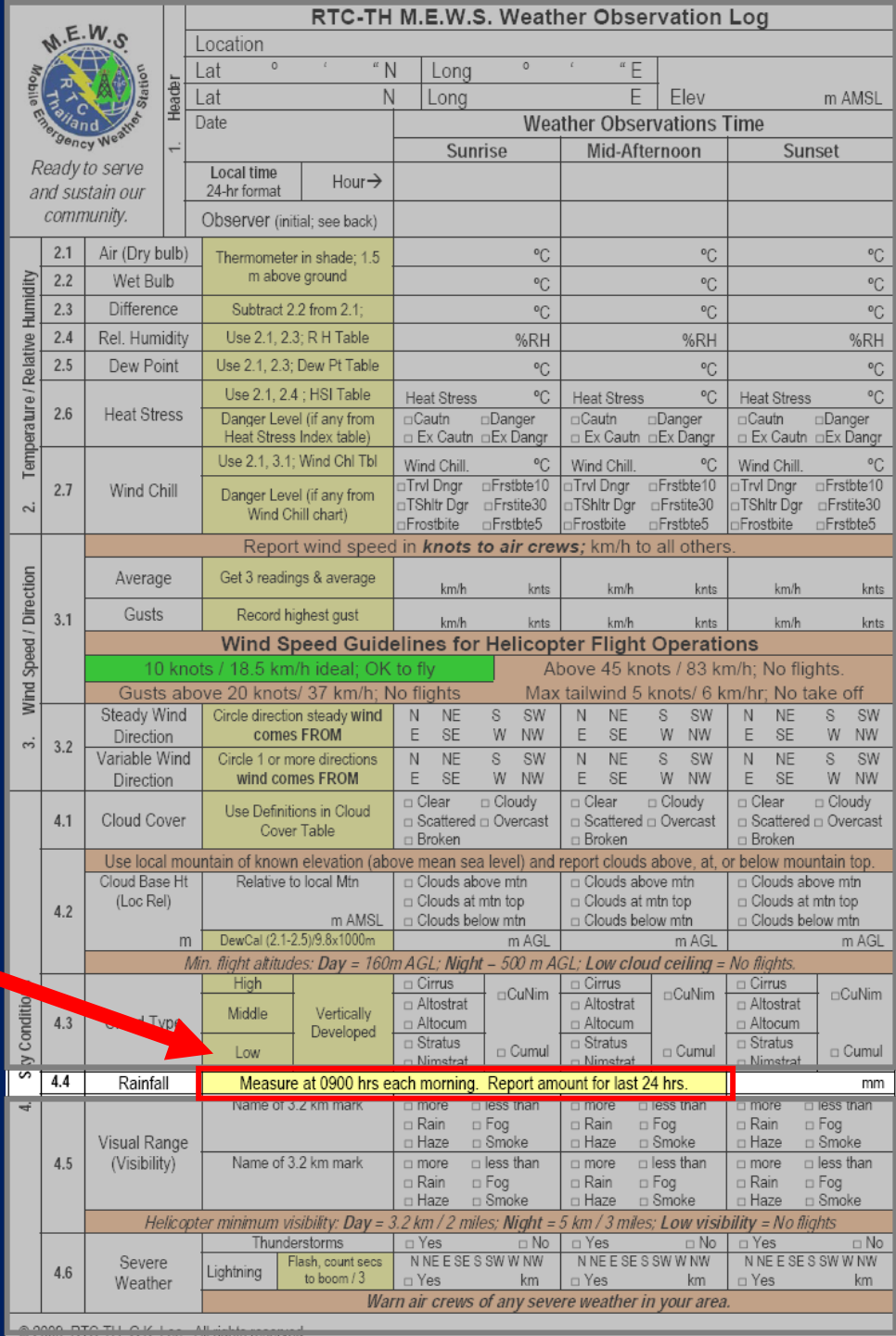
4.1 Cloud cover: Look at the sky and follow the definitions for each cloud cover classification.
4.2 Cloud Base Height: If relative to a local mountain, give its name and elevation above mean sea level. Note Local Relief in meters. If using the Dew Point method, subtract Dew point temp (2.5) from Dry temp (2.1) and divide result by 9.8; multiply quotient by 1000m. *Advise air crews when cloud base height (ceiling) are close to affecting helicopter flight operations.*
4.3 Cloud Type: Check the appropriate box based on cloud description in the guide book
4.4 Rainfall: Measure water in rain gauge each day at 0900 hrs. Rain gauge should be in open area, away from tall objects, with top of gauge 50 cm above ground to avoid splash water from entering gauge.
4.5 Visual Range: Pick landmarks 3.2 km and 5 km from your observation site. Report when visual range is more or less than the known distances to these landmarks. *Advise air crews when visual range is close to affecting helicopter flight operations.* Check appropriate boxes for reasons of reduced visibility.
4.6 Severe Weather: Primary concerns and thunderstorms and lightning. Check the appropriate boxes. If lighting, watch for flash, count seconds until you hear the thunder, divide by 3 = approximate distance in km. Circle direction to storm.

4. Sky Conditions						
4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□Clear □Cloudy □Scattered □Overcast □Broken	□Clear □Cloudy □Scattered □Overcast □Broken	□Clear □Cloudy □Scattered □Overcast □Broken
	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.				
4.2	Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□Clouds above mtn □Clouds at mtn top □Clouds below mtn	□Clouds above mtn □Clouds at mtn top □Clouds below mtn	□Clouds above mtn □Clouds at mtn top □Clouds below mtn
	m	DewCal (2.1-2.5/9.8x1000m	m AGL	m AGL	m AGL
		Min flight altitudes: Day = 160m AGL; Night – 500 m AGL; Low cloud ceiling = No flights.			
4.3	Cloud Type	High / Middle / Low — Vertically Developed	□Cirrus □Altostrat □Altocum □Stratus □Nimbstrat □Cumul □CuNim	□Cirrus □Altostrat □Altocum □Stratus □Nimbstrat □Cumul □CuNim	□Cirrus □Altostrat □Altocum □Stratus □Nimbstrat □Cumul □CuNim
4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
4.5	Visual Range (Visibility)	Name of 3.2 km mark	□more □less than □Rain □Fog □Haze □Smoke	□more □less than □Rain □Fog □Haze □Smoke	□more □less than □Rain □Fog □Haze □Smoke
		Name of 5 km mark	□more □less than □Rain □Fog □Haze □Smoke	□more □less than □Rain □Fog □Haze □Smoke	□more □less than □Rain □Fog □Haze □Smoke
		Helicopter minimum visibility: Day = 3.2 km / 2 miles; Night = 5 km / 3 miles; Low visibility = No flights.			
4.6	Severe Weather	Thunderstorms	□Yes □No	□Yes □No	□Yes □No
		Lightning — Flash, count secs to boom / 3	N NE E SE S SW W NW □Yes km	N NE E SE S SW W NW □Yes km	N NE E SE S SW W NW □Yes km
		Warn all crews of any severe weather in your area.			

A brief note on the form reminds you to check the rain gauge once each day.

Measure at 0900 (local time) each morning. Report rainfall for the past 24 hrs.

Brief notes on the back of the form give more details



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RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location				
Lat ° ' " N	Long ° ' " E			
Lat N	Long E	Elev m AMSL		
Date	Weather Observations Time			
		Sunrise	Mid-Afternoon	Sunset
Local time 24-hr format	Hour→			
Observer (initial; see back)				

2. Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
3. Wind Speed / Direction		Report wind speed in ***knots to air crews;*** km/h to all others.				
	3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
		Gusts	Record highest gust	km/h knts	km/h knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations				
		10 knots / 18.5 km/h ideal; OK to fly		Above 45 knots / 83 km/h; No flights.		
		Gusts above 20 knots/ 37 km/h; No flights		Max tailwind 5 knots/ 6 km/h; No take off		
	3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
		Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
4. Sky Condition	4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken
	4.2	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.				
		Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
		m	DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL
		*Min. flight altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*				
	4.3	Cloud Type	High / Middle / Low — Vertically Developed	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul
	4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*				
	4.6	Severe Weather	Thunderstorms	□ Yes □ No	□ Yes □ No	□ Yes □ No
			Lightning — Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km
		Warn air crews of any severe weather in your area.				

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EmComm Emergency Communications — RTC-Thailand Rural Training Center-Thailand

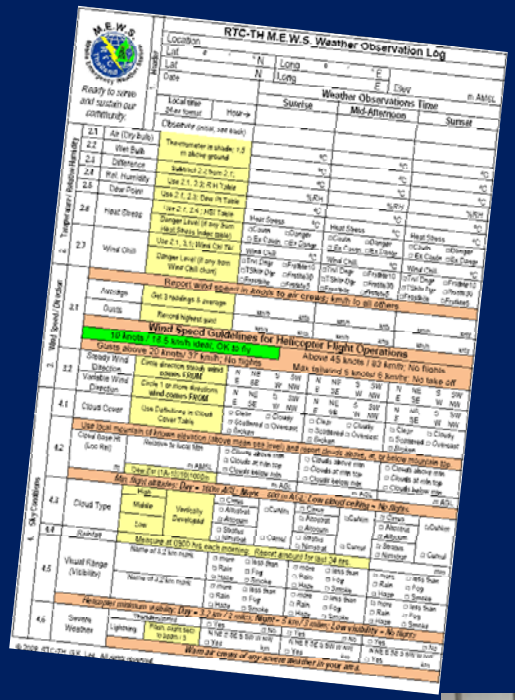
To measure rainfall you need

Calculator

Ruler or tape measure

Pencil

MEWS Log Form



Rain gauge or empty jar

Graduated cylinder

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EmComm Emergency Communications RTC-Thailand Rural Training Center-Thailand

A rain gauge is used to measure the rainfall in an area.

Photo from the Internet; educational fair use clause

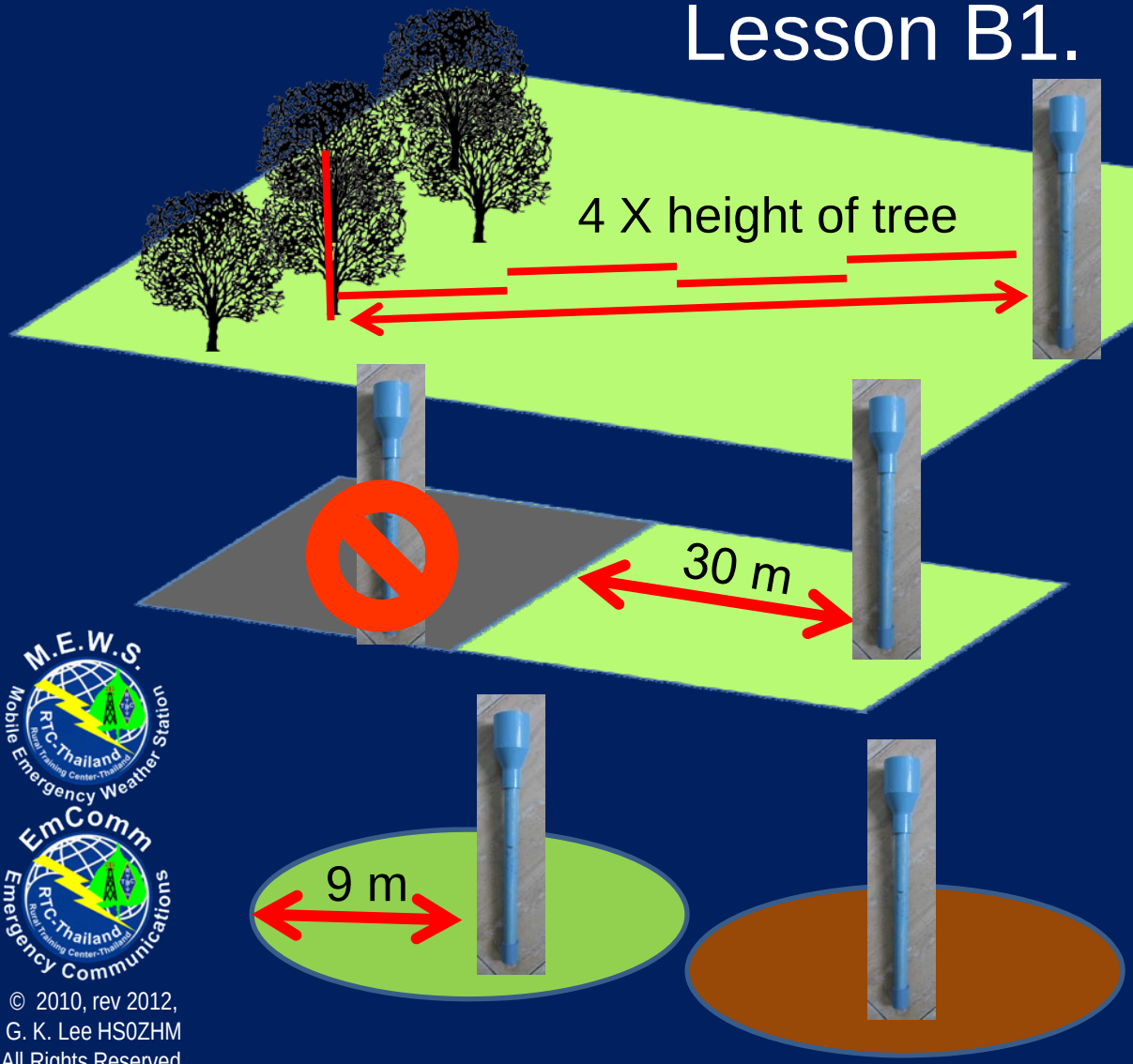
You can make a simple rain gauge…

…using an empty jar,

or some PVC pipe.

Rain Gauge Placement

Follow same guidelines as for Temperature in Lesson B1.



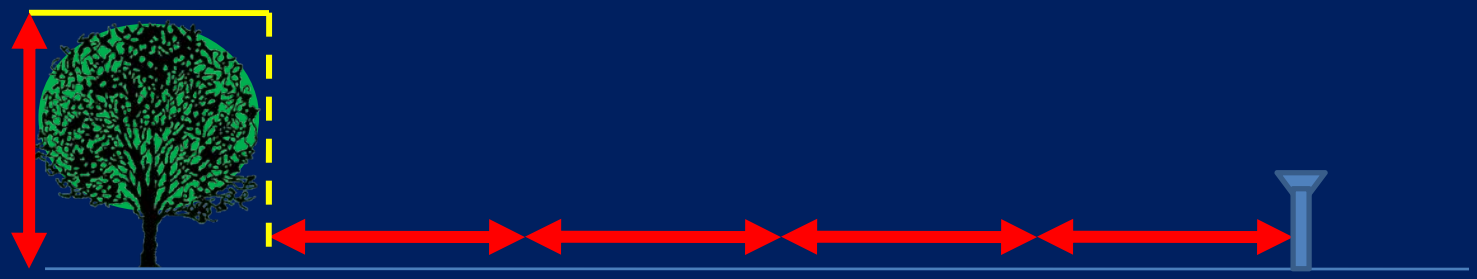
Avoid to tall obstructions

Avoid large paved areas

Best over short grass or bare soil (~9 m radius)

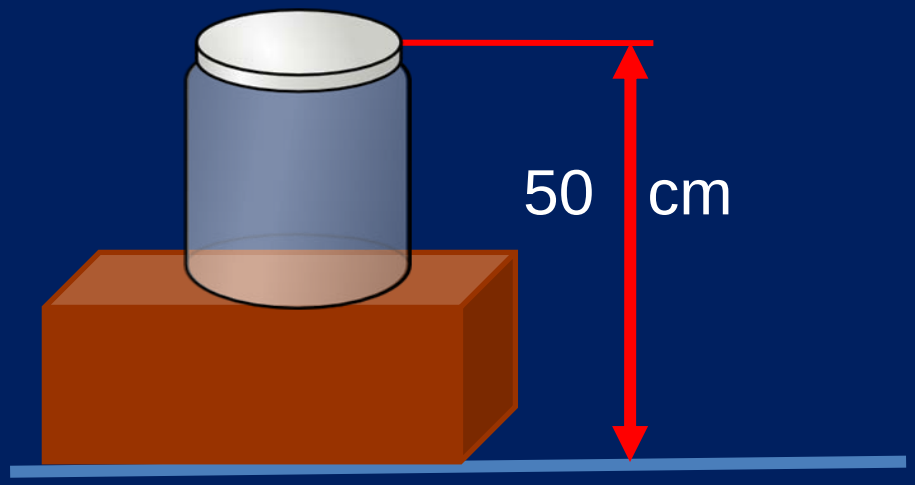
Put the rain gauge in an open level area far from buildings and trees.

Look at the tallest building or tree, multiply the height by 4.



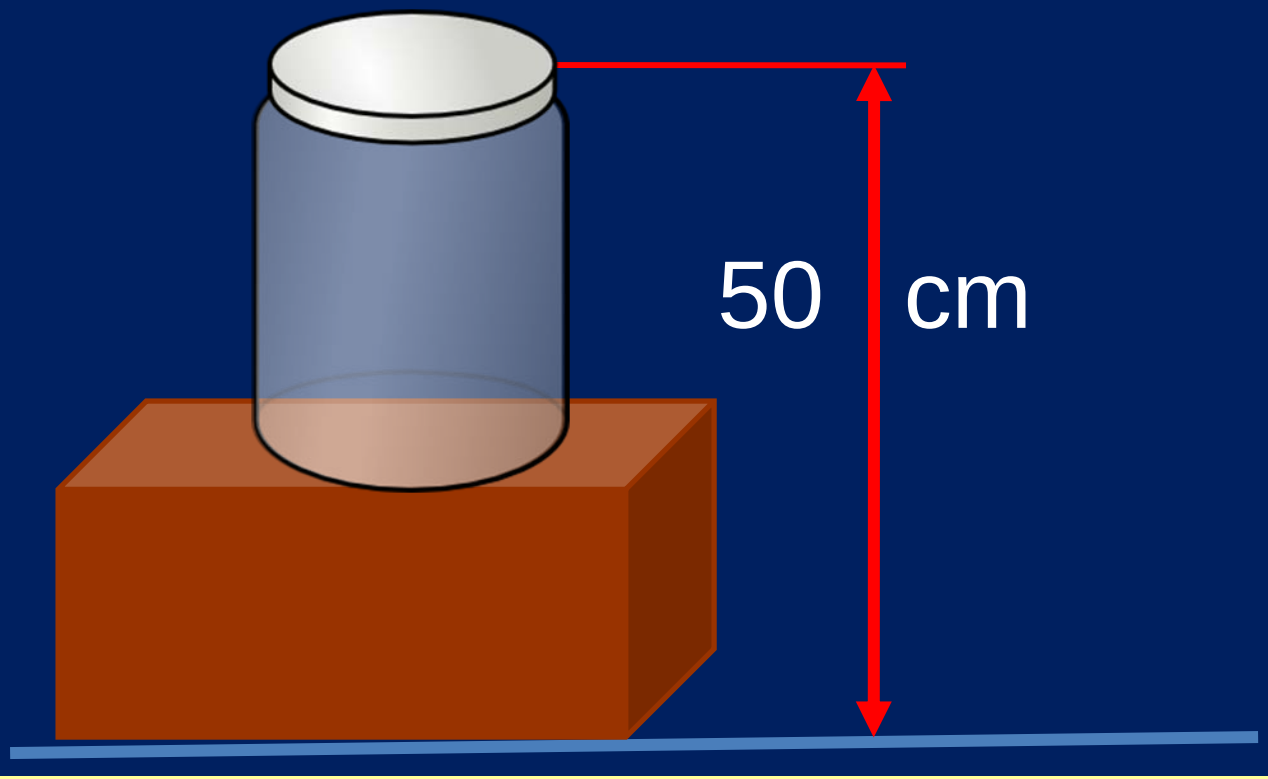
The rain gauge should be this distance from the building or tree.

It can be put on the ground or on a pole.



Some storms have strong winds. Make sure your rain gauge won't be blown over.

If put on the ground, the top of the rain gauge should be 50 cm above the ground.



This helps make sure water splashing from the ground doesn't get into your rain gauge.

If put on a pole, the rain gauge should be above the top of the pole.

This keeps water from the ground or the top of the pole from splashing into the rain gauge.

When the rain stops, remove the collector bottle from the rain gauge.

Measuring the rainfall amount depends on the equipment and time you have.

Quick and Simple

- ruler or tape measure

Slow and Accurate

- graduated cylinder
- pocket calculator

RTC-TH Recommendation

Quick and Simple

ruler or tape measure

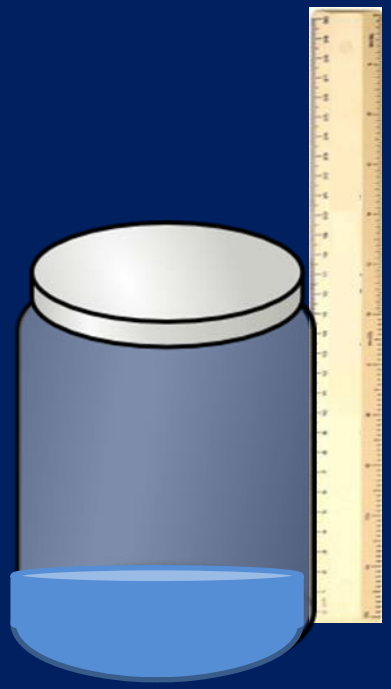
Rough estimate OK for disaster response

Slow and Accurate

- graduated cylinder
- pocket calculator

More accuracy needed for resource management

You can simply measure the depth of the water in the collecting bottle to get a rough rain fall amount



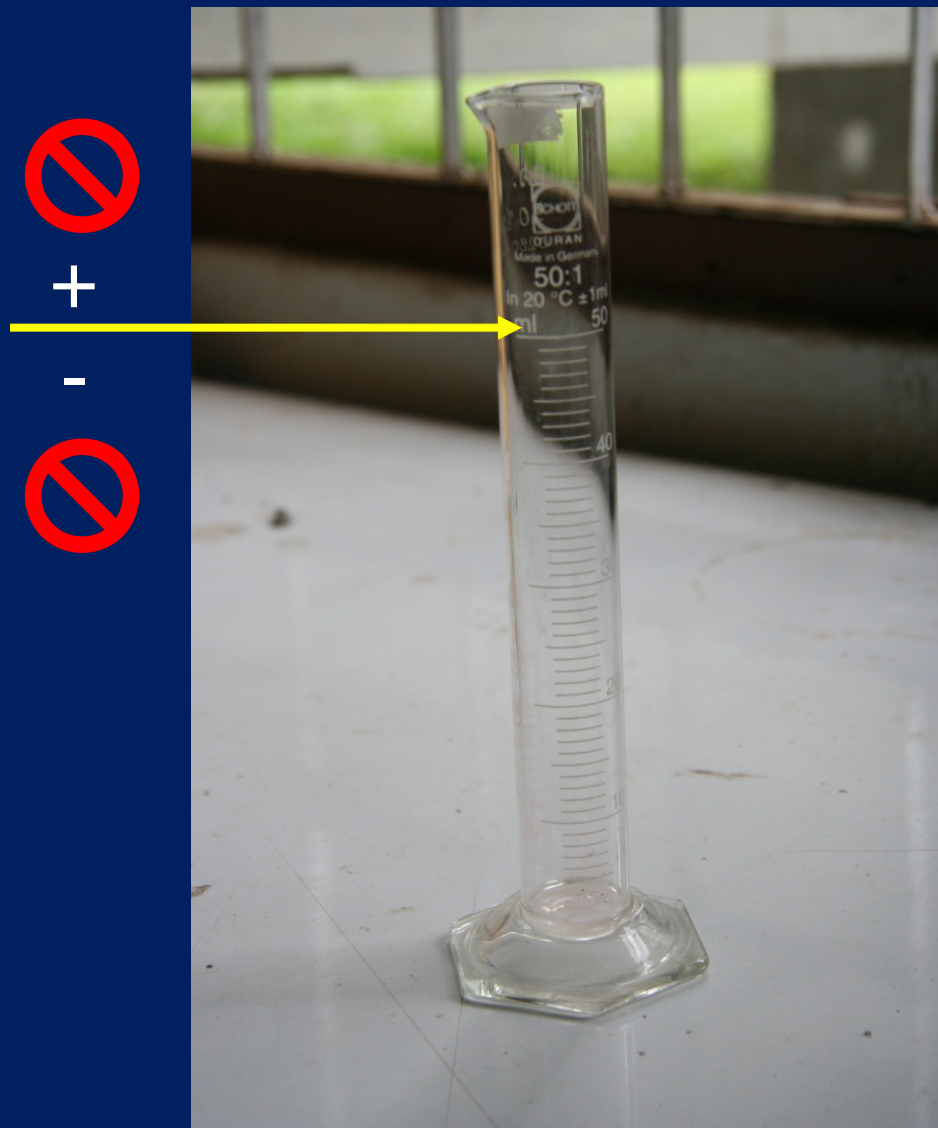
To measure the rain in the gauge more accurately, you need a graduated cylinder.

When the rain stops, remove the collector bottle from the rain gauge.

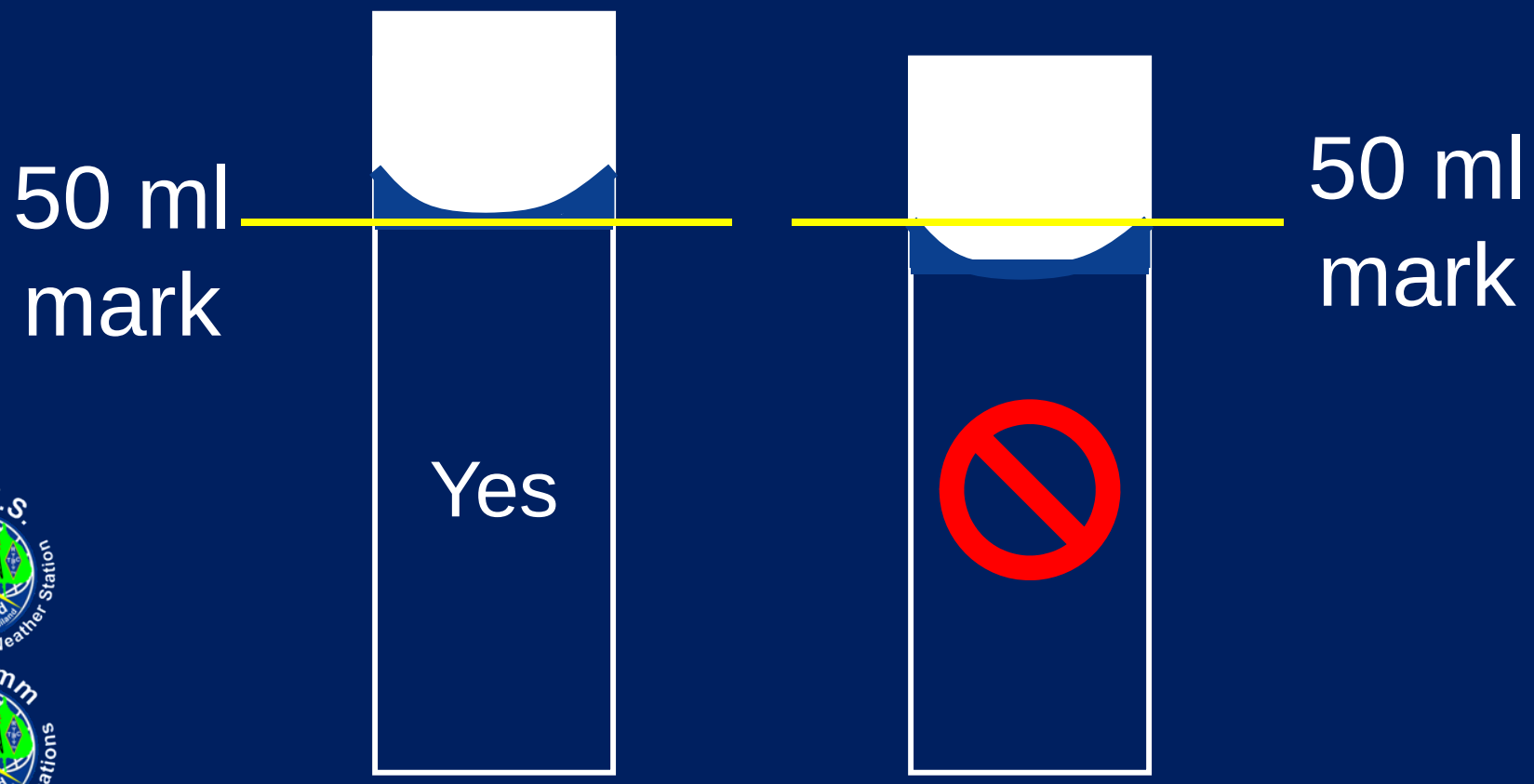
Use a graduated cylinder to measure the amount of rain you collected.

Watch carefully as you measure.

Fill the water up to the measuring mark. Not more, and not less.



It sounds easy, but the water does NOT stay flat.



Record the total number of milliliters of rain.

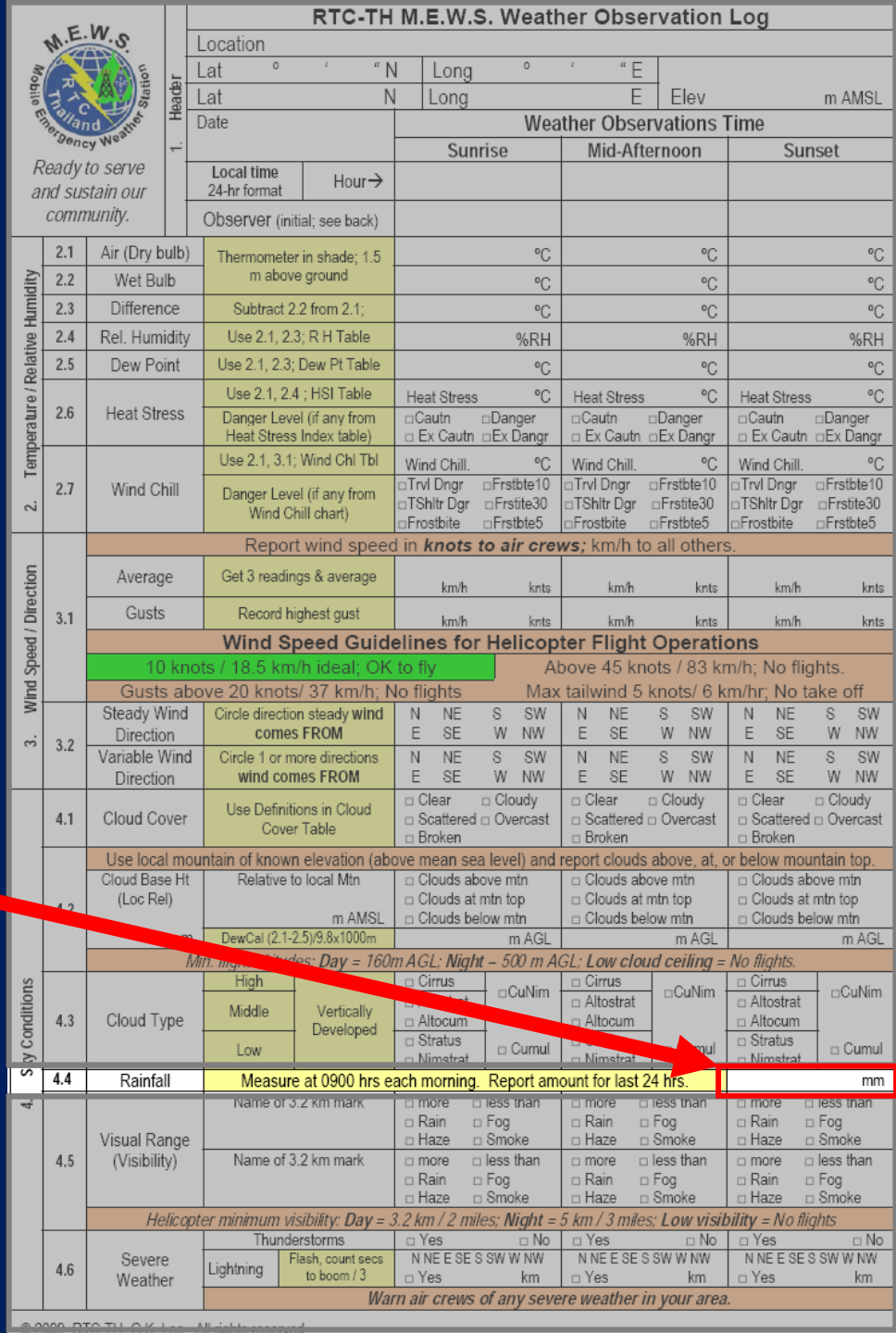
Now do some arithmetic.

You measured the volume of water and need to report rainfall in linear units.

1 milliliter of water = 0.001 mm of rainfall

Multiply to total number of milliliters by 0.001

Record the precipitation amount using mm in Section 4.4



M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand

Ready to serve and sustain our community.

RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location

Lat ° ' " N | Long ° ' " E

Lat N | Long E | Elev m AMSL

Date | Weather Observations Time: Sunrise | Mid-Afternoon | Sunset

Local time 24-hr format | Hour→

Observer (initial; see back)

2. Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
3. Wind Speed / Direction		Report wind speed in ***knots to air crews;*** km/h to all others.				
	3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
		Gusts	Record highest gust	km/h knts	km/h knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations				
		10 knots / 18.5 km/h ideal; OK to fly		Above 45 knots / 83 km/h; No flights.		
		Gusts above 20 knots/ 37 km/h; No flights		Max tailwind 5 knots/ 6 km/h; No take off		
	3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
		Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
4. Sky Conditions	4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken
	4.2	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.				
		Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
			DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL
		*Min. [illegible] altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*				
	4.3	Cloud Type	High	□ Cirrus □ [illegible] □ Altocum	□ Cirrus □ Altostrat □ Altocum	□ Cirrus □ Altostrat □ Altocum
			Middle	Vertically Developed □CuNim	□CuNim	□CuNim
			Low	□ Stratus □ Nimstrat □ Cumul	□ [illegible] □ Nimstrat □ Cumul	□ Stratus □ Nimstrat □ Cumul
	4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*				
	4.6	Severe Weather	Thunderstorms	□ Yes □ No	□ Yes □ No	□ Yes □ No
			Lightning / Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km
		Warn air crews of any severe weather in your area.				

M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand

EmComm Emergency Communications — RTC-Thailand

Warning Signs

100 mm of rainfall in 24-hours = increased chances of landslides especially on slopes over 15%

250+ mm of rainfall in 24-hours = increased chances of floods in hillside and low lying areas near rivers and streams. Flashfloods especially in narrow canyons/valleys

Areas below dams may get flooded if water must be released from the dams to keep the dams safe.

Alternative Methods to Report Rainfall

Rate of Fall

Intensity	Criteria
Light	2.54 mm / hr or 0.254 mm / 6 minutes 0.1 inch / hr or 0.01 inch / 6 minutes
Moderate	2.79 mm – 7.62 mm / hr or 0.254 mm – 0.762 mm / 6 minutes 0.11 inch -0.30 inch / hr or 0.01 inch – 0.03 inch / 6 minutes
Heavy	More than 7.62 mm / hr or more than 0.762 mm / 6 minutes More than 0.30 inch / hr or more than 0.03 inch / 6 minutes

This may be difficult to do if you are alone or are very busy. We suggest keeping it simple and use the linear measuring method.

Alternative Methods to Report Rainfall

Estimating the Intensity of Rain

Intensity	Criteria
Light	Scattered drops; do not wet surface regardless of duration of rain; individual rain drops are easily seen.
Moderate	Individual drops not readily seen; spray easily seen just above surface of pavement or other hard surface.
Heavy	Rain falling in sheets; individual drops not easily seen; spray to the height of several cm above the pavement or other hard surface.

This is easier to do especially if you are working alone.

Alternative Methods to Report Rainfall

Estimating the Intensity of Drizzle by Visibility

Intensity	Criteria
Light	Visibility > 0.8 km or > 0.5 mile
Moderate	Visibility > 0.4 km but </= 0.8 km; or >0.25 mi but </= 0.5 mi
Heavy	Visibility <0.4 km or <.025 mile

You need to know the distance to local landmarks for reference.

Unfortunately, these visual ranges are already well below safe flight requirements.

Important Note

Normally MEWS observations are made 3 times a day. However, if flight operations are in progress, try to provide flight crews with weather updated prior to landings and take-offs for flight safety.

Report a Flight Advisory any time cloud base height is ***near to, at, or less*** than the warning limits listed on the Log Form.

For flight operations, make and report observations to flight crews before landings and take-offs

Cross out the headings for Sunrise, Mid-Afternoon, Sunset

Record the specific local time of your observations

	Weather Observations Time		
	~~Sunrise~~	~~Mid-Afternoon~~	~~Sunset~~
Hour→	1430		
al; see back)	HSØZHM		
shade; 1.5	°C	°C	°C
ground	°C	°C	°C
from 2.1;	°C	°C	°C

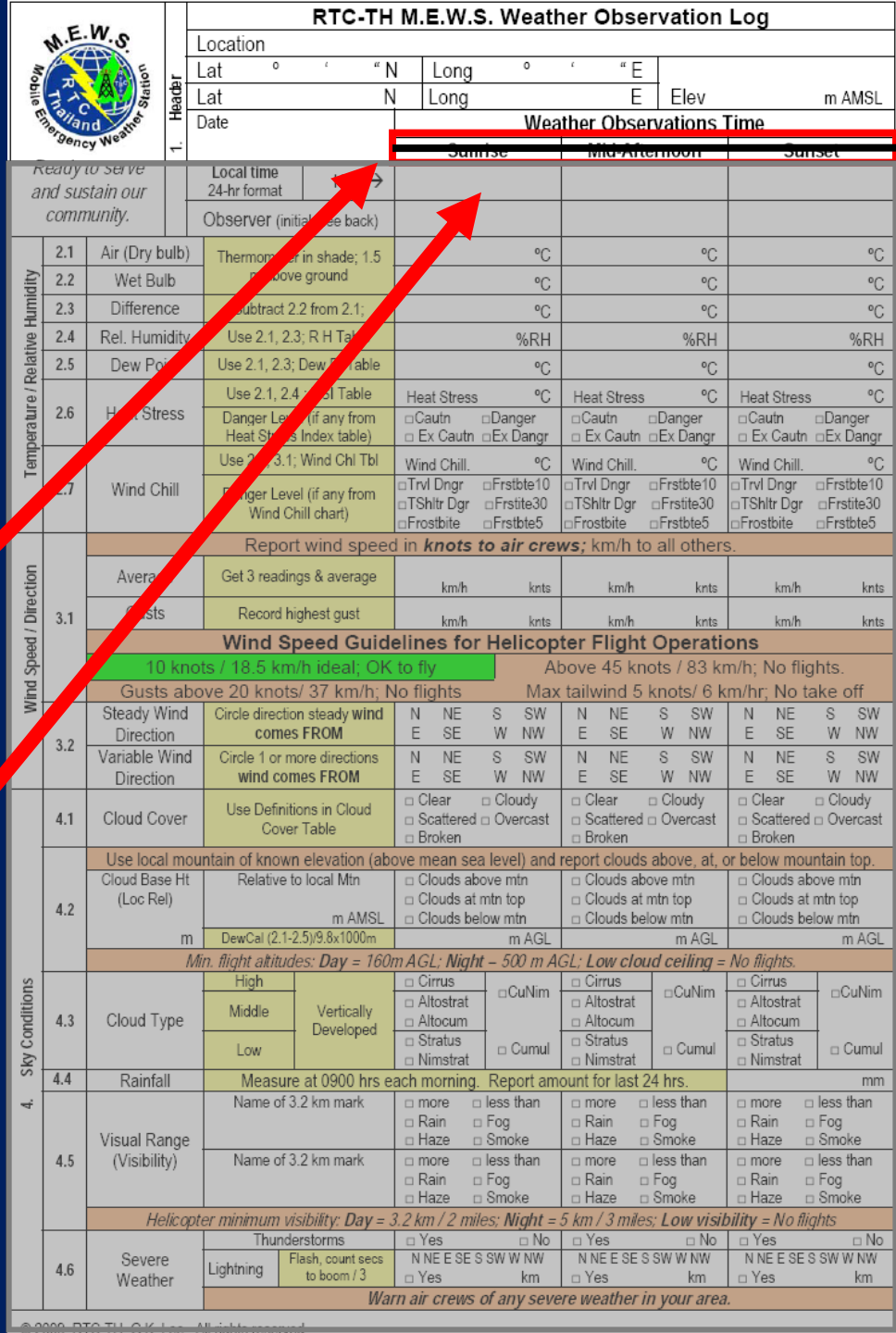
If a HAM, print your call sign (or name if no call sign)

Record the Rainfall in Section 4.4

Weather observations to support flight operations are critical for safety of flight crew and LZ area.

If more frequent observations are done to support flight operations...

…cross out the headings "Sunrise", etc. and record the time of the observations in the space provided.



RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location

Lat ° ' " N | Long ° ' " E

Lat N | Long E | Elev m AMSL

Date

Weather Observations Time

			Sunrise	Mid-Afternoon	Sunset
Ready to serve and sustain our community.		Local time 24-hr format			
		Observer (initials see back)			
Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Point Table	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4; HI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
Wind Speed / Direction		Report wind speed in ***knots to air crews;*** km/h to all others.			
	3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
		Gusts	Record highest gust	km/h knts	km/h knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations			
		10 knots / 18.5 km/h ideal; OK to fly		Above 45 knots / 83 km/h; No flights.	
		Gusts above 20 knots/ 37 km/h; No flights		Max tailwind 5 knots/ 6 km/h; No take off	
	3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
		Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
4. Sky Conditions	4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken
		Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.			
	4.2	Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
		m	DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL
		*Min. flight altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*			
	4.3	Cloud Type	High / Middle / Low — Vertically Developed	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul
	4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*			
	4.6	Severe Weather	Thunderstorms	□ Yes □ No	□ Yes □ No	□ Yes □ No
			Lightning — Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km
		Warn air crews of any severe weather in your area.			

For flight operations, make and report observations to flight crews before landings and take-offs

Advanced Weather Reports for Flight Crews

- 2.1 Temperature
- 2.4 Relative Humidity
- 3.1 Wind Speed
- 3.2 Wind Direction
- 4.1 Cloud Cover
- 4.2 Cloud Base Height
- 4.3 Cloud Type
- 4.4 Rainfall
- 4.5 Visual Range
- 4.6 Severe Weather

Weather observations to support flight operations are critical for safety of flight crew and LZ area.

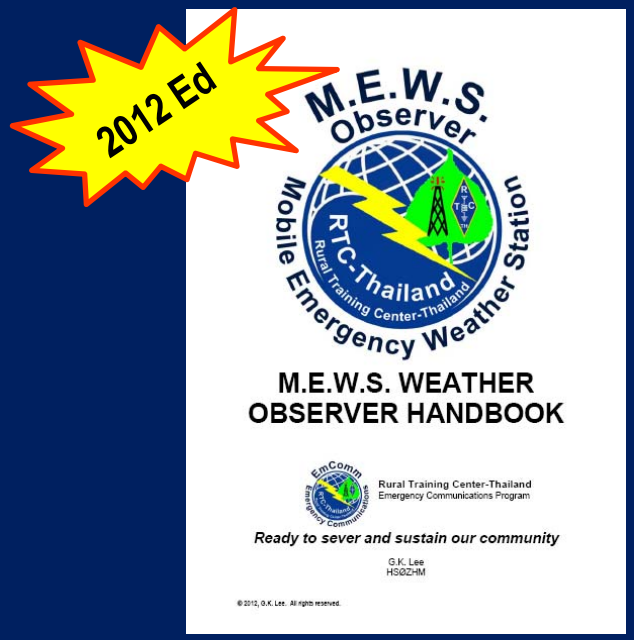
Now you know how to measure precipitation.

You have completed the Advanced MEWS Lesson A4: Measuring Rainfall

You are now ready for Advanced MEWS Lesson A5: Reporting Severe Weather

Questions or Comments

Refer to the MEWS Weather Observer Handbook for more details on any of the procedures in this lesson.



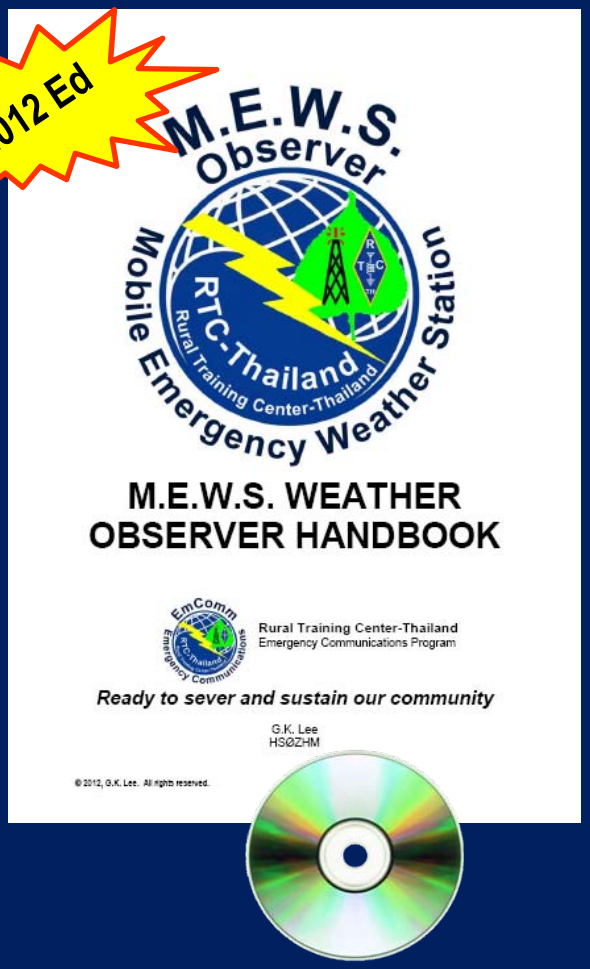
You may also contact us by e-mail:
hsØzhm@gmail.com
We are always trying to improve our lessons. Your comments and suggestions are welcomed.

Free Self-Study Materials by Internet

- RTC-TH Weather Observer manual
- Illustrated PDF topical lessons

All of the lessons have been classroom and field proven.

Send e-mail to hsØzhm@gmail.com to request free training materials for non-commercial use only.



These materials are in English. Volunteer assistance for Thai translation to is welcome and will be acknowledged and cited.

Advanced MEWS PDF Lessons

A 1: Measuring Relative Humidity and Heat Stress

A 2: Measuring Wind Speed and Wind Chill

A 3: Using Dew Point Temperature to Calculate Cloud Base Height

A 4: Measuring Rainfall

A 5: Reporting Severe Weather

A 6: Weather Forecasting

Be sure to check www.neighborhoodlink.com/RTC-TH_Tech/pages for the latest updated editions of MEWS lessons

Advanced MEWS PDF Lessons

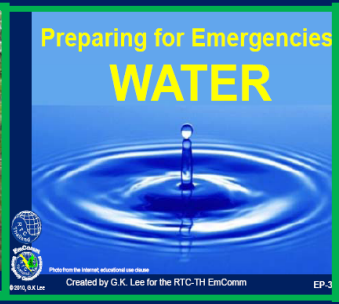
2012 Ed

Six slide show lessons;
Some show how to build your own weather equipment

The EP Lesson Series

EP-1

EP-2



EP-3

EP-4

EP-5

EP-6

EP-7

EP-8

EP-9

EP-10

EP-11

EP-12

www.neighborhoodlink.com/RTC-TH_Tech/pages

For More Information about M.E.W.S.

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MEWS Creator / Mentor

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Via Skype video
conference call: rtc_th

Community-based Environmental Education for

Self-Sufficiency and Sustainability for Small Rural Family Farms

RTC-Thailand

Rural Training Center-Thailand

The End

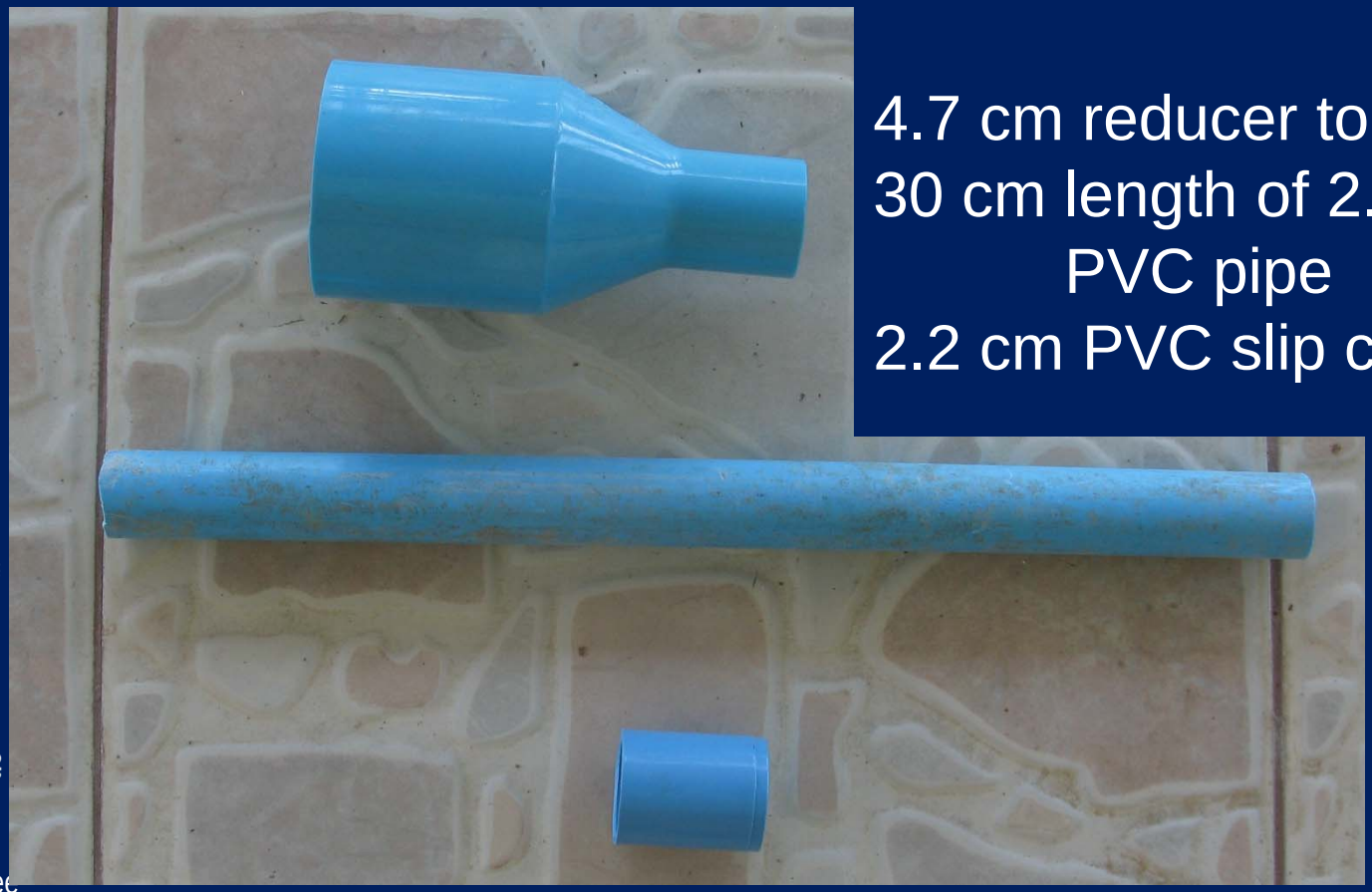
Continue this slide show and learn how to make your own rain gauge.

M.E.W.S. Mobile Emergency Weather Station

EmComm Emergency Communications

Make your own rain gauge

I made this rain gauge out of PVC because the parts were salvaged from “junk” on the farm.



4.7 cm reducer to 2.2 cm
30 cm length of 2.2 cm PVC pipe
2.2 cm PVC slip cap

Make your own rain gauge

Cement the pieces together to complete the rain gauge.

Locate and set up the rain gauge following the instruction in this lesson.

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Rural Training Center-Thailand

The End

www.neighborhoodlink.com/org/rtcth

E-mail: rtc2k5@gmail.com

M.E.W.S. Mobile Emergency Weather Station

EmComm Emergency Communications