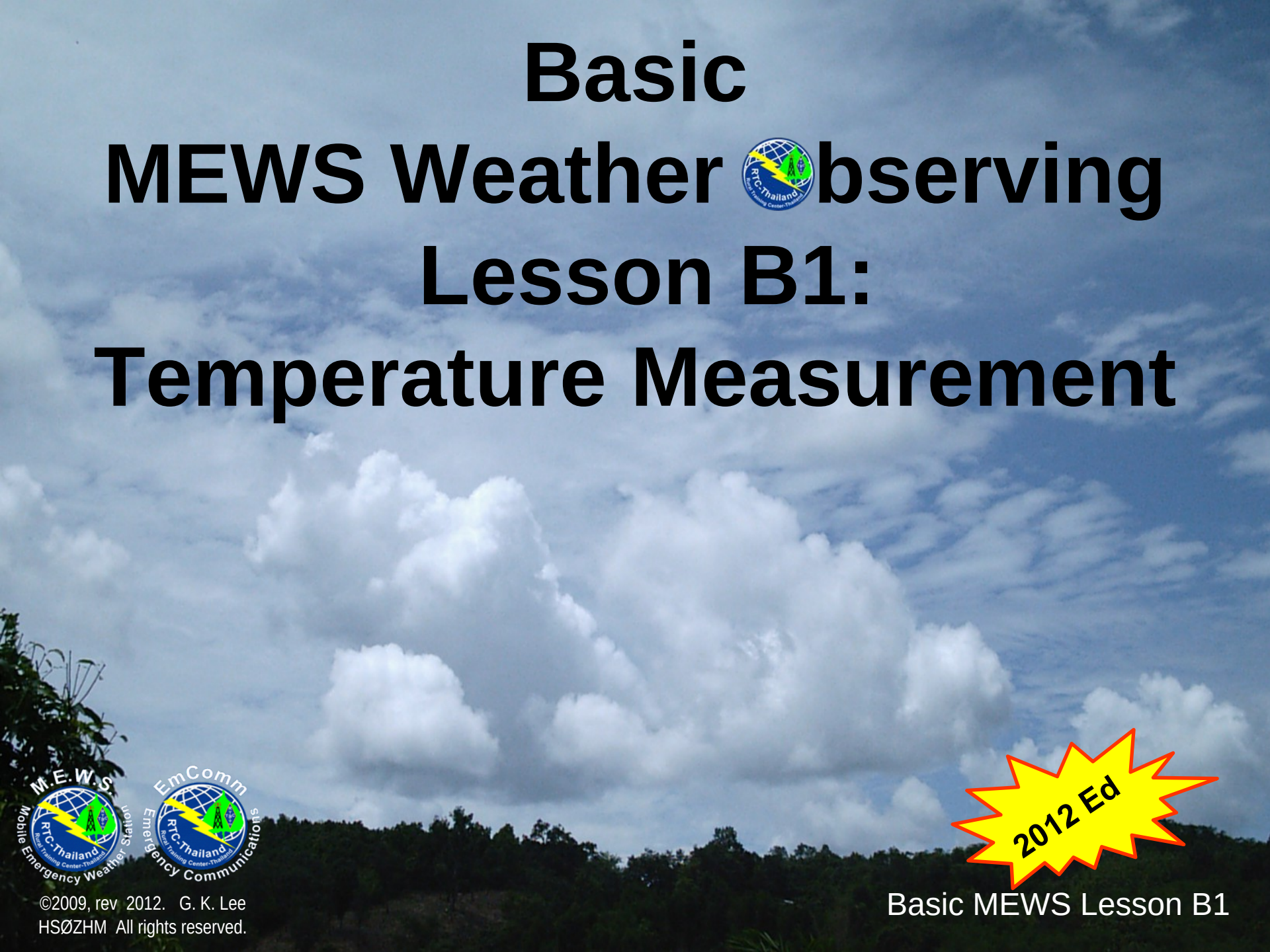
Rural Training Center – Thailand (RTC-TH)

FOCUS

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

Basic MEWS Weather Observing Lesson B1: Temperature Measurement



2012 Ed

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

When disaster strikes, accurate local weather data may not be available.

Survivors often lack shelter. Excessive temperature makes life difficult and stressful, increasing the need for water, food, clothing, medical care.

Photo from the internet; educational fair use clause

There are some general daily patterns of temperature that are handy to know

Photos from the Internet; educational fair use clause

This knowledge helps you to understand the value of daily temperature data in emergency relief work.

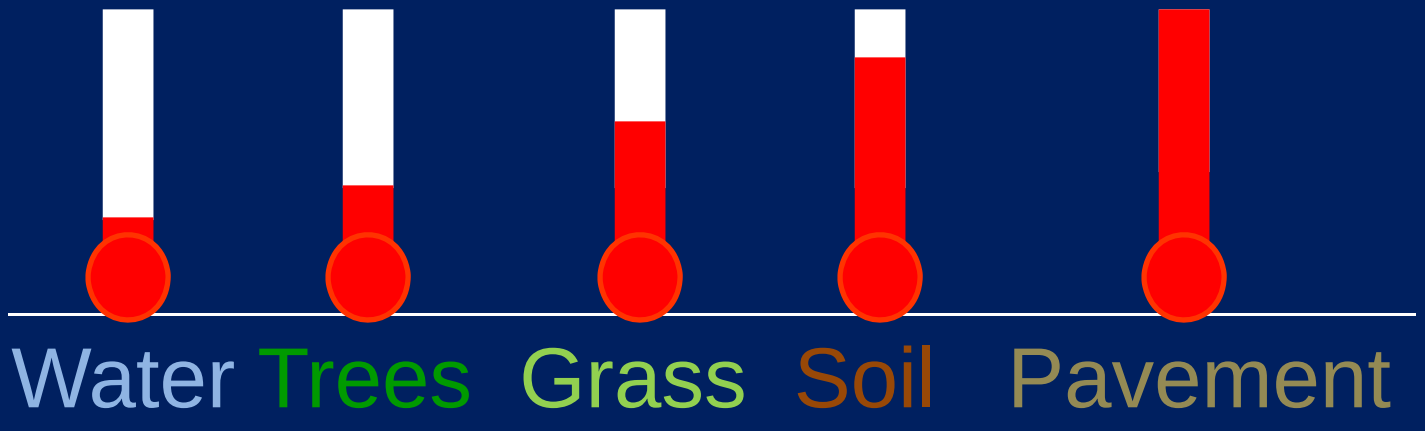
The temperature is different at different times of the day.

Lowest temp in 24 hour period

Highest temp in 24 hour period

Morning Noon Afternoon Evening

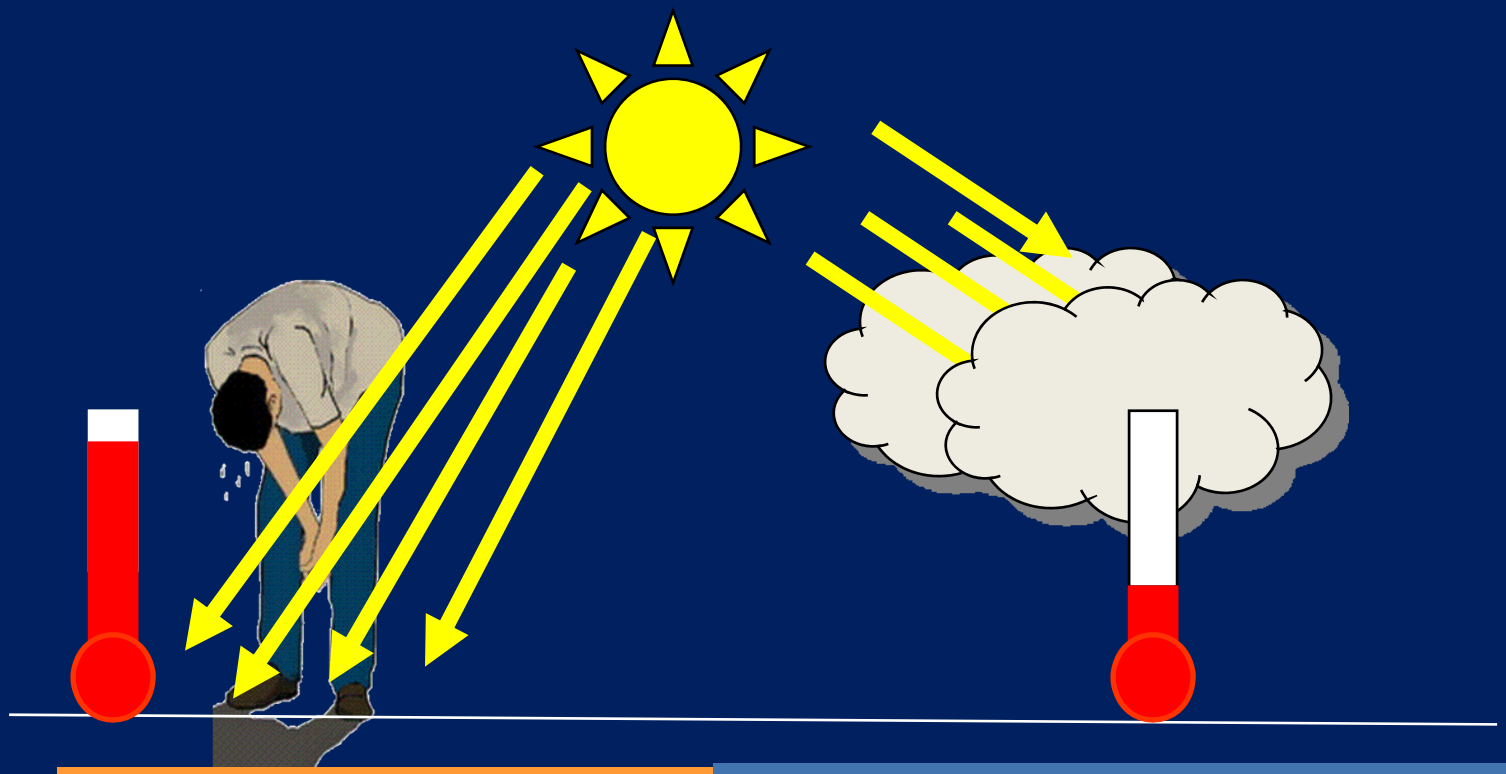
The temperature can be different over different surfaces.



Place thermometer in the shade, 30 m from large paved area, in open level area about 9 m diameter; grass or bare soil preferred.

Stay away from a vertical obstruction by at least 4 times the height of the obstruction.

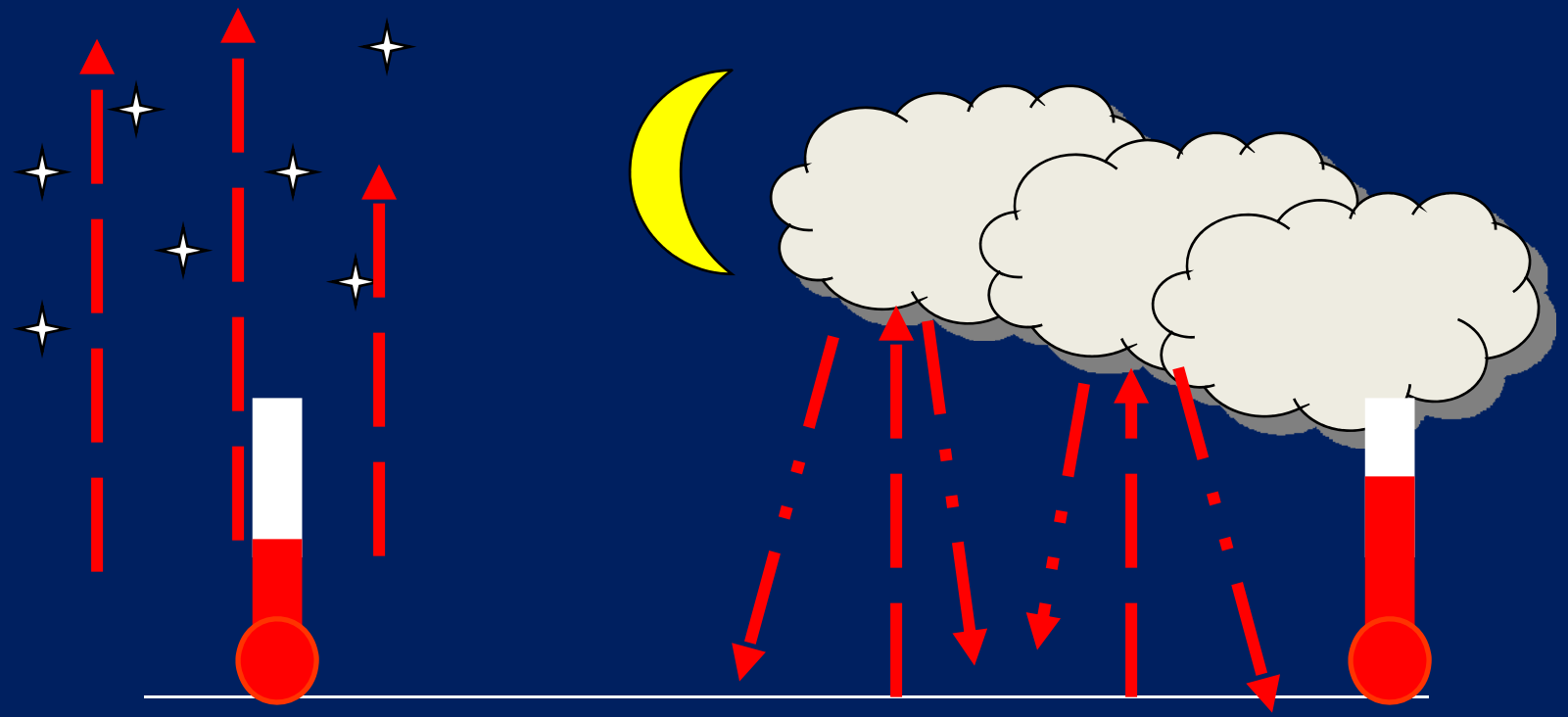
During the daytime, clouds can reduce surface temperature.



Clear skies; hotter; survivors need more water and shelter

Cloudy skies; cooler; survivors may not need as much water and shelter

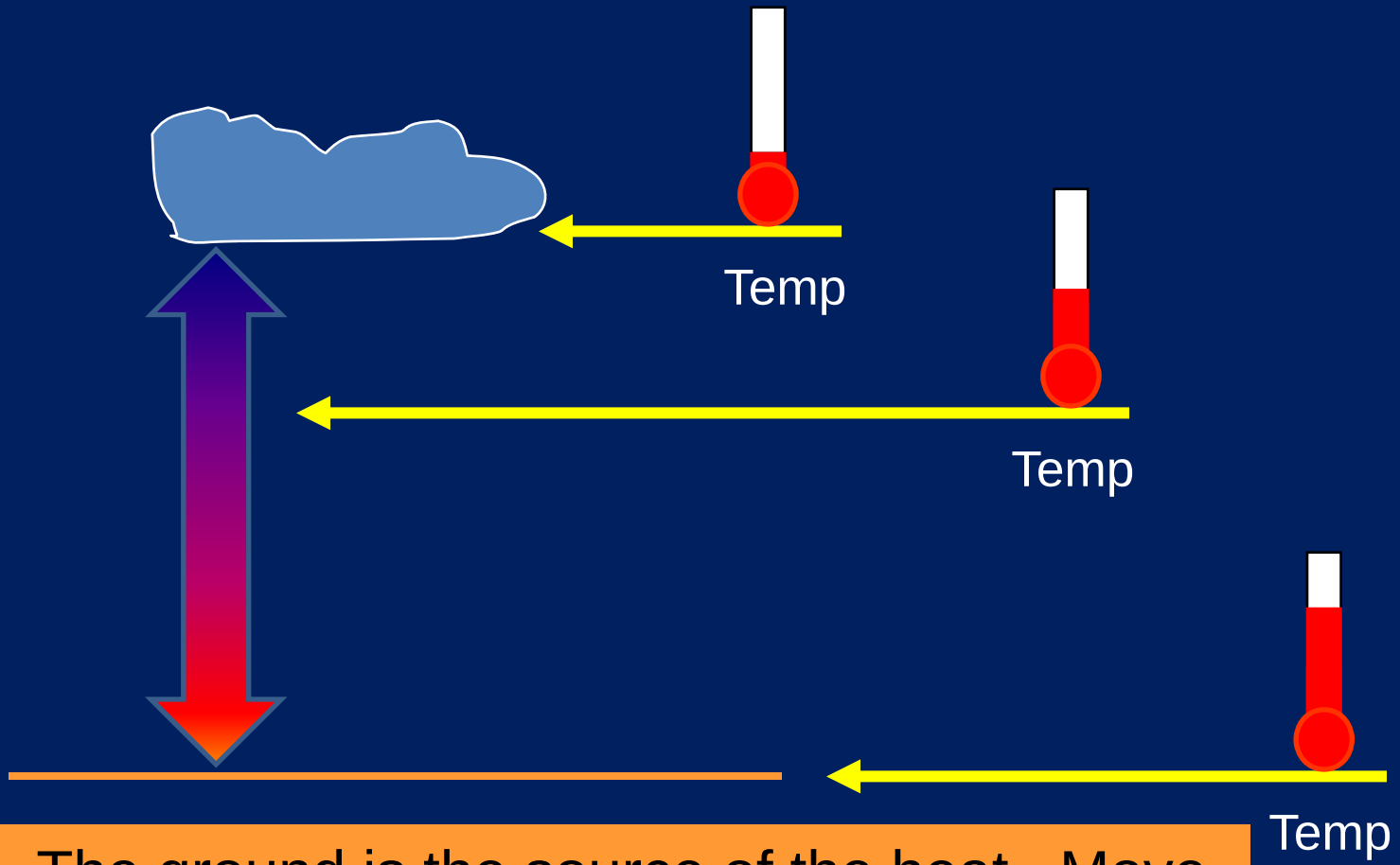
At night, clouds can increase the surface temperature.



Clear skies, cooler for survivors. They may need more clothing, fuel and shelter; morning dew possible

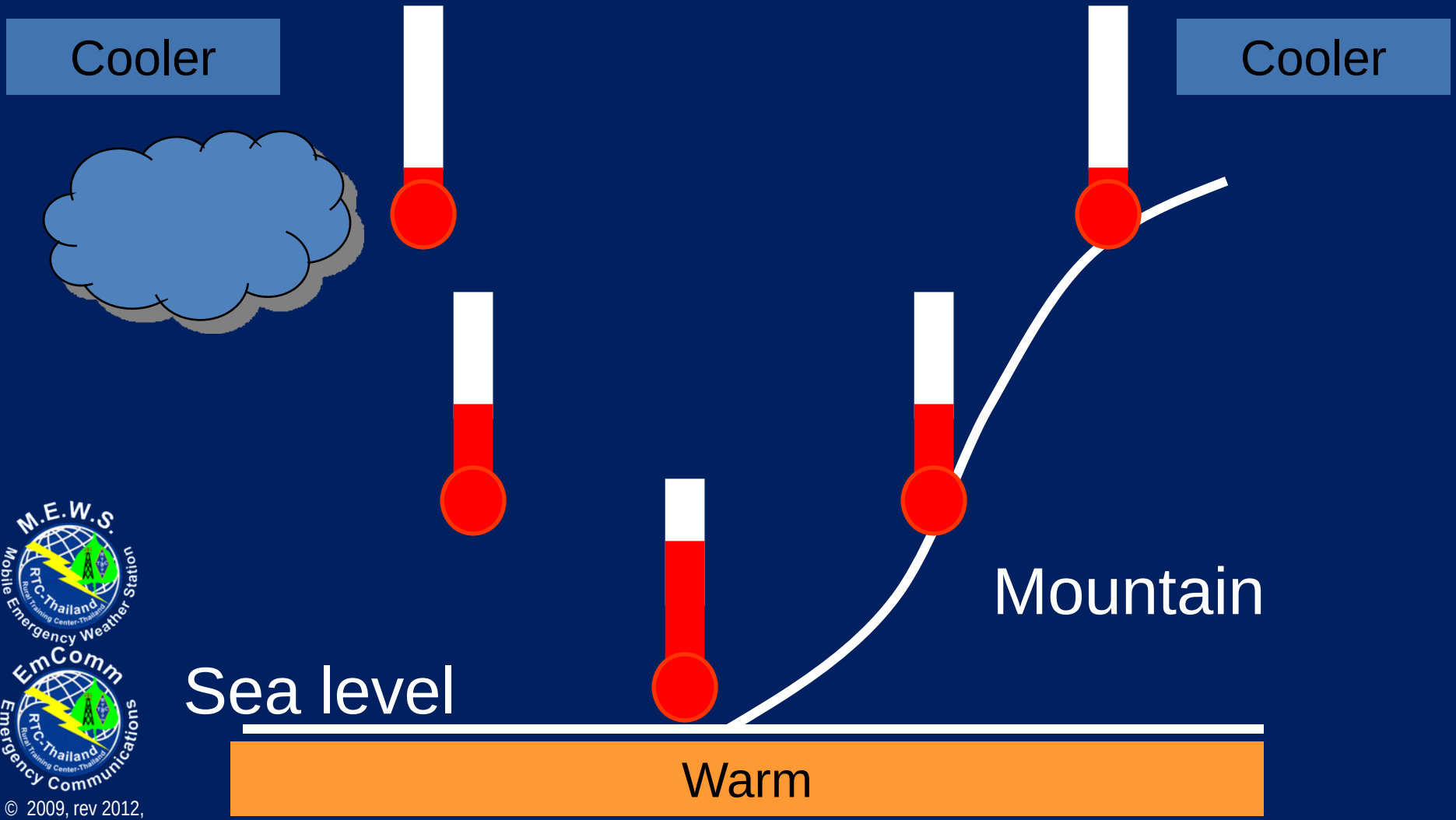
Cloudy skies, warmer for survivors. They may need less clothing, fuel, and shelter

As you go higher above the ground, the air temperature gets lower.



The ground is the source of the heat. Move away from the heat source and it is cooler.

As you go up a mountain, the air temperature gets lower.



Temperature and general weather patterns

	Sunrise	Mid-Afternoon	Sunset
Temp	Lowest	Highest	-----
Wind / turbulence	Low	Higher	Low
Clouds	Few	More	Varies
Visibility	Maybe poor but improving	Good	Maybe good but decreasing
Fog	Maybe	None	Maybe

High temperatures can produce thermals and updrafts (turbulence) posing a hazard to aircraft.

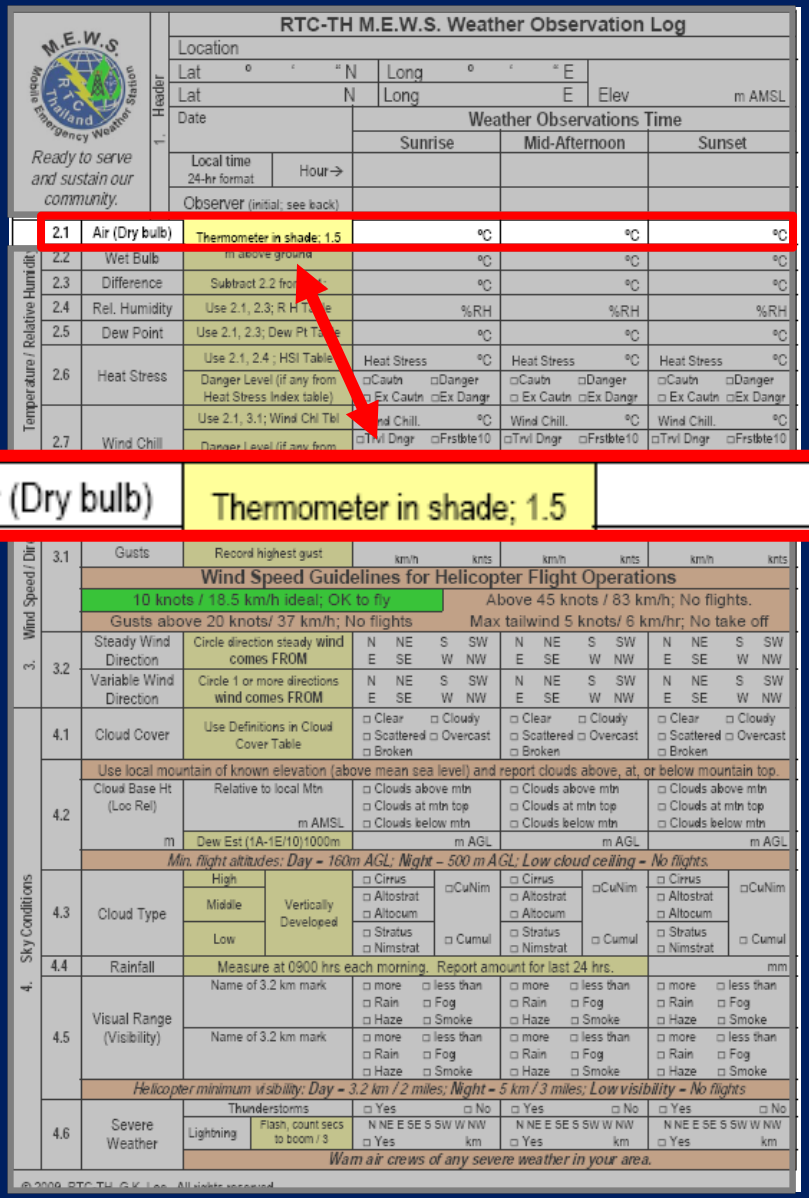
Local terrain and condition may cause different patterns and trends.

Temperature is a basic weather variable that connects to:

- Certain cloud types that indicate turbulence and affects aircraft
- Wind speed and direction affecting people on the ground and aircraft
- Relative humidity affecting human comfort / discomfort and aircraft take-off performance

These topics are covered in Advanced MEWS lessons.

The MEWS Weather Observation Log 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)			
2.1	Air (Dry bulb)	Thermometer in shade; 1.5	°C	°C	°C
2.2	Wet Bulb		°C	°C	°C
2.3	Difference	Subtract 2.2 fro	°C	°C	°C
2.4	Rel. Humidity	Use 2.1, 2.3; R H T	%RH	%RH	%RH
2.5	Dew Point	Use 2.1, 2.3; Dew Pt T	°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	□Trvl Dngr □Frstbte10	□Trvl Dngr □Frstbte10	□Trvl Dngr □Frstbte10

3.1	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/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
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) m	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
		Dew Est (1A-1E/10)1000m	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.

Basic Temperature measurements are recorded in Section 2.1 Air (Dry Bulb)

Dry Bulb is a more technical term for “Air” temperature when measuring Relative Humidity.

Relative Humidity is covered in Advanced MEWS Lesson A1.

Notes on the form help you make Temperature measurements with minimal training

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

Brief instructions are on the back of the Log form.

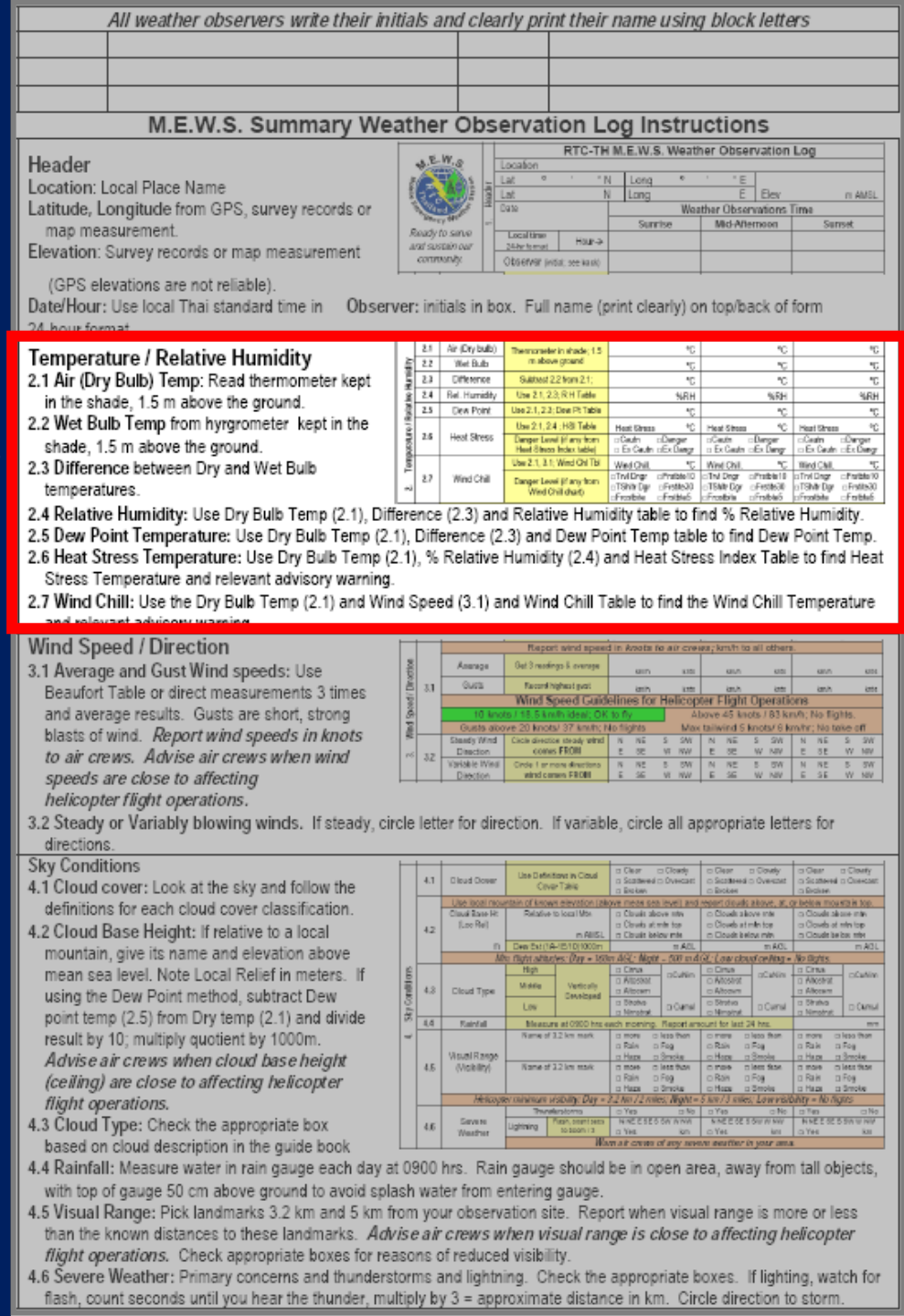
Full instructions and all needed reference tables are in the MEWS Weather Observer Handbook.

The Back of the MEWS Weather Observation Log Form

has more detailed notes to help observers in the field.

Full instructions and all needed reference tables are in the MEWS Weather Observer Handbook.

See Handbook: 2.1 Air (Dry Bulb) Temp, p. 9



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

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.

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.

Wind Speed Guidelines for Helicopter Flight Operations

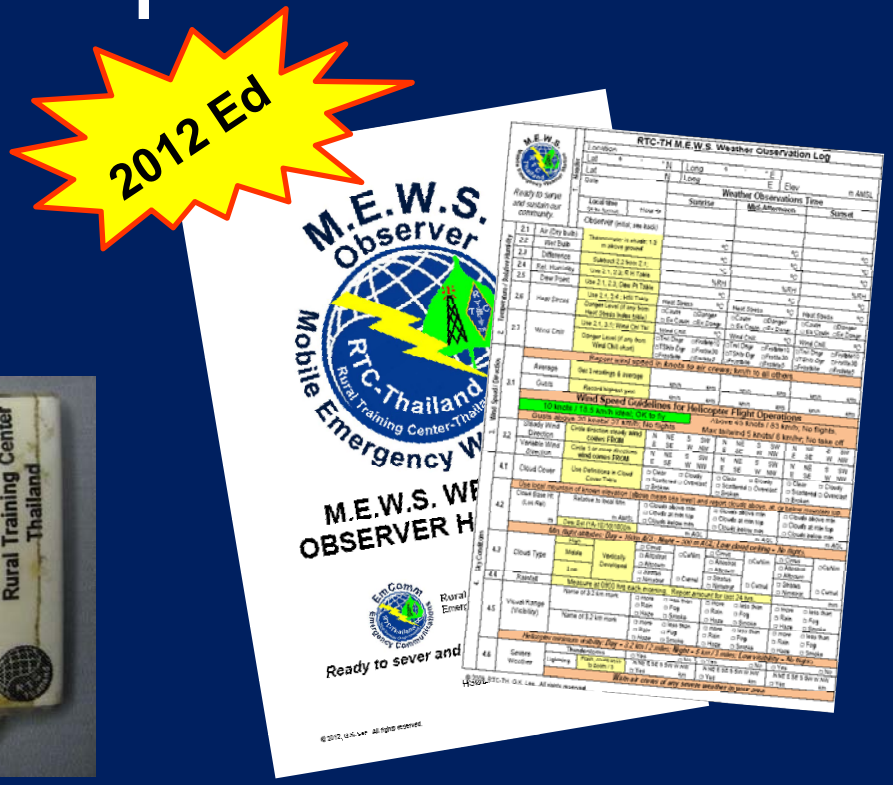
Sky Conditions

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 10; 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, multiply by 3 = approximate distance in km. Circle direction to storm.

What you need to make a Basic Temperature reading

Pencil

Thermometer



MEWS Handbook and Log Form

Optional Equipment

Umbrella; 1.5 m cord

All thermometers are not created equal

Common wall thermometers can be easily damaged in a disaster

Digital Thermometers need batteries and have fragile parts that can be easily damaged

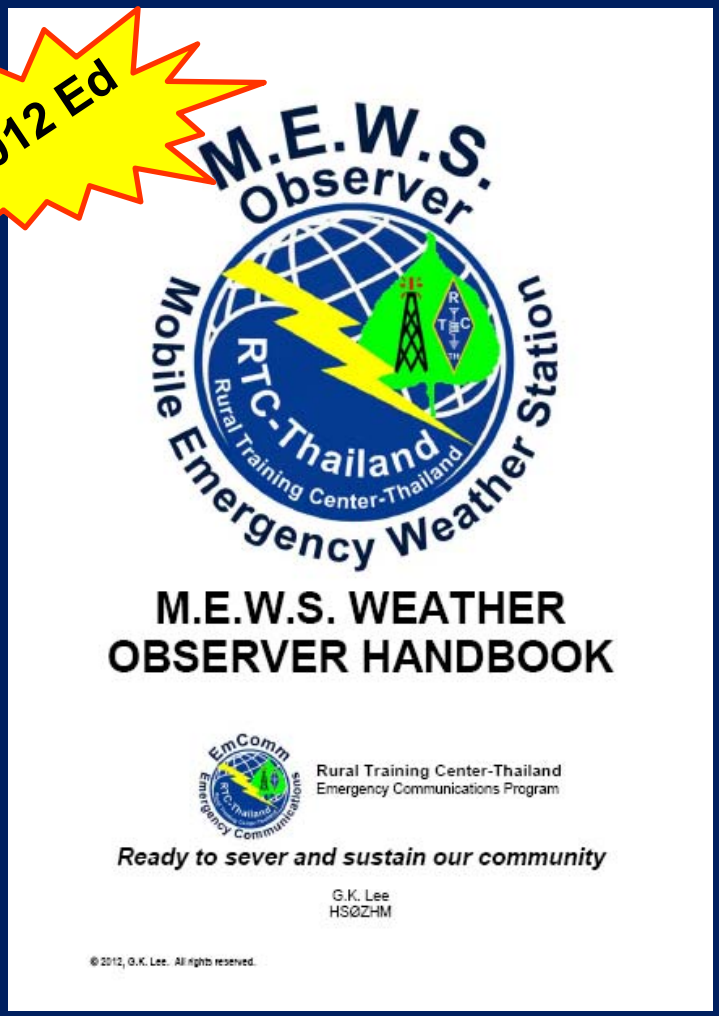
A thermometer enclosed in plastic is compact and may be more durable to survive a disaster

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

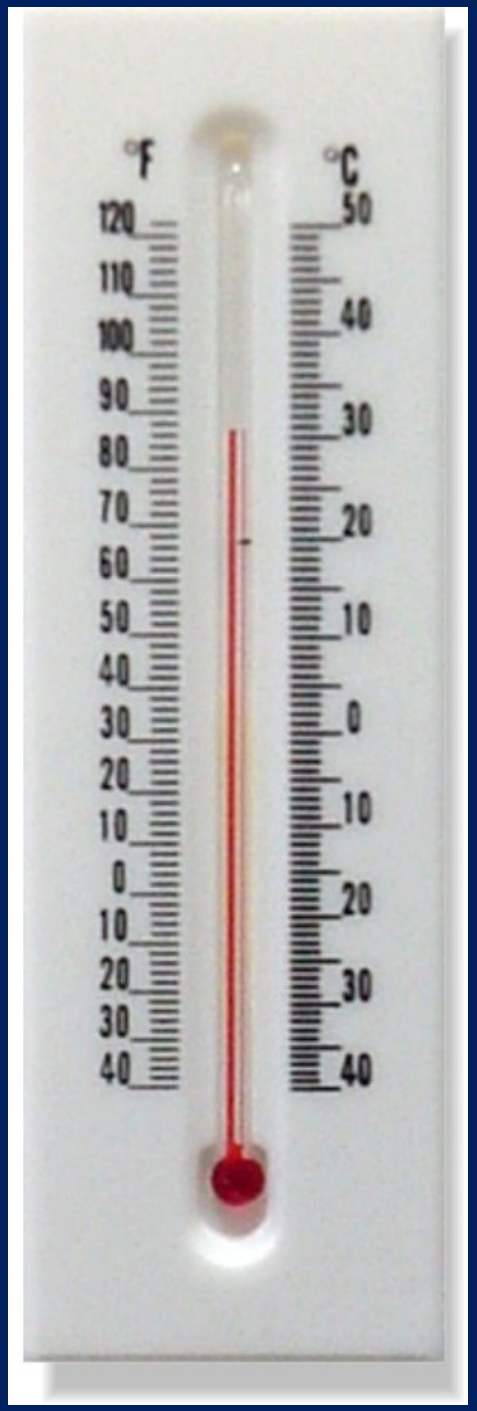
EmComm Emergency Communications
RTC-Thailand Rural Training Center-Thailand

The MEWS Weather Observer Handbook

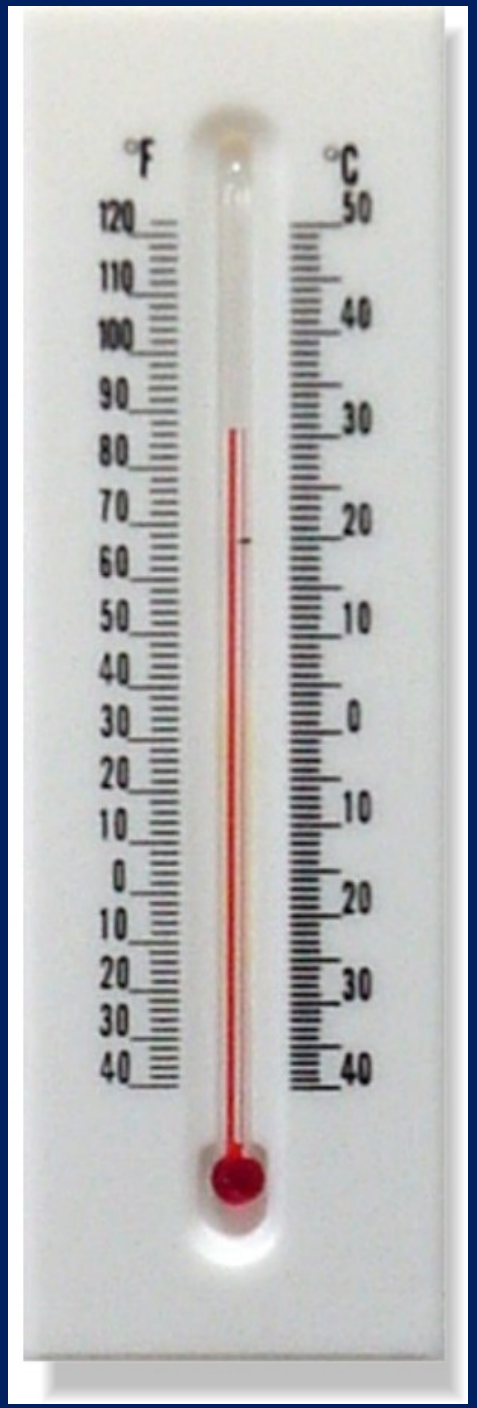
contains detailed instructions to complete the form and reference tables to speed calculations and math conversions.



Temperature is a measure of the amount of heat present.

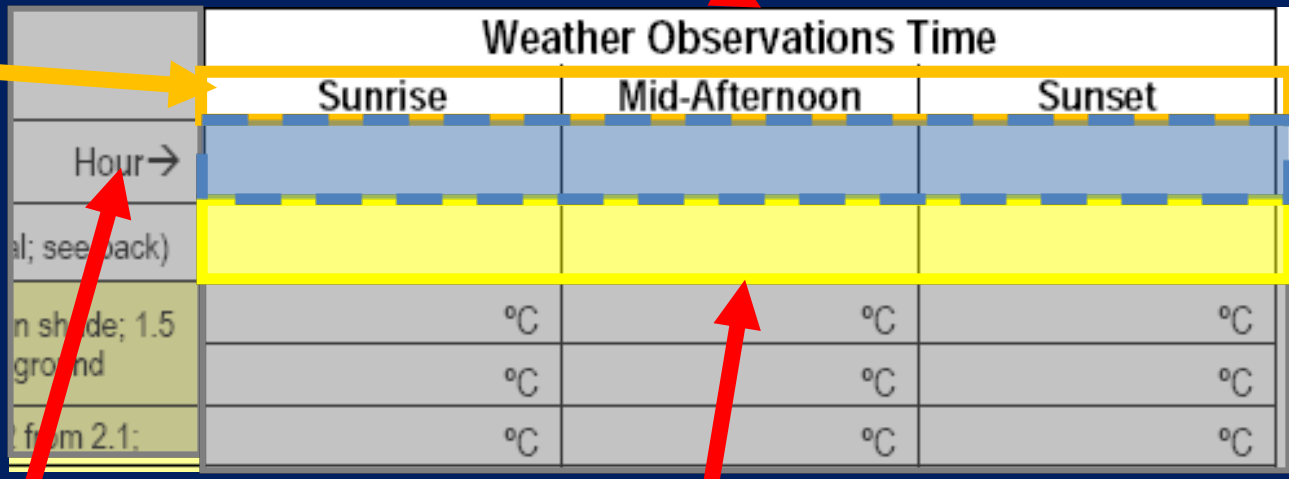


A thermometer is a tool to measure temperature.



MEWS tries to get at least 3 observations / day

Local Sunrise
~ 0500-0600 hrs,
Mid-Afternoon
~1400-1500 hrs,
Local Sunset
~ 1700-1800 hrs



	Weather Observations Time		
	Sunrise	Mid-Afternoon	Sunset
Hour→			
l; see back)			
n shade; 1.5 ground	°C	°C	°C
	°C	°C	°C
m 2.1;	°C	°C	°C

Record the specific local time of your observations

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

Record time and observer ID for each of the 3 daily observations made.

Record the Air Temperature Section 2.1

2.1	Air (Dry bulb)	Thermometer in shade; 1.5	°C
2.2	Wet Bulb	m above ground	°C
2.3	Difference	Subtract 2.2 from 2.1;	°C
2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH

It is best if you can make a minimum of 3 observations / day.

See Handbook: 2.1 Air (Dry Bulb) Temp, p. 9

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)

and sustain our community.

1. Header					
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 □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frstbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frstbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstbite30 □Frostbite □Frstbite5
	Report wind speed in *knots to air crews;* km/h to all others.					
		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/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
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	□ 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	m AMSL / Dew Est (1A-1E/10)1000m	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.					

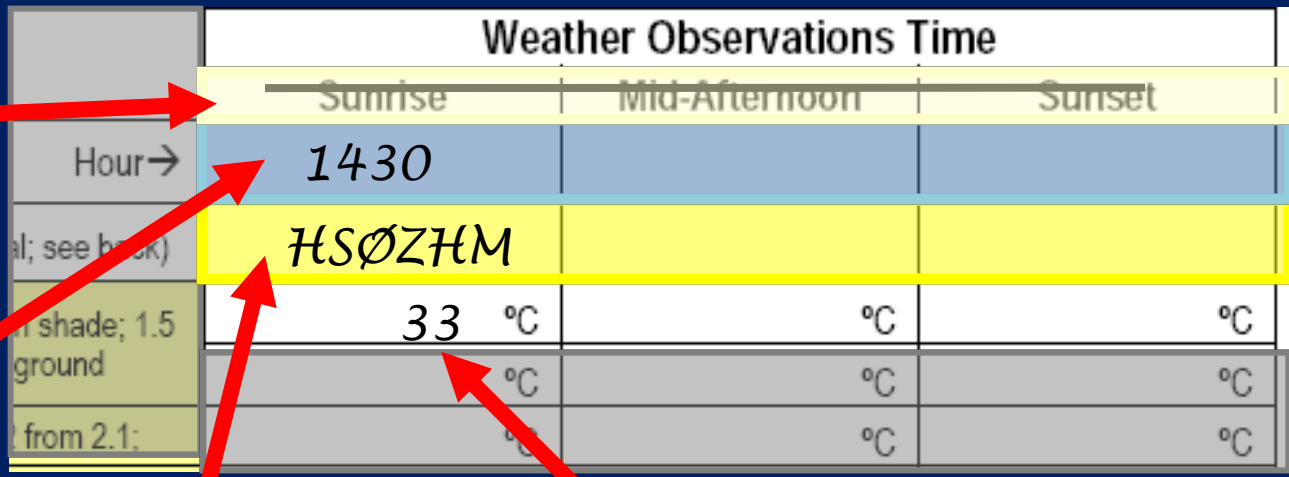
Important Note

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.

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



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

Record the temperature here

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

MEWS weather data…

Photos from the Internet; educational fair use clause

…may be used for many purposes in relief operations. It should conform to weather service standards as much as possible.

These standards are for official weather stations

Photos from the Internet; educational fair use clause

MEWS / EmComm situations will probably be less than ideal.

Thermometer Placement

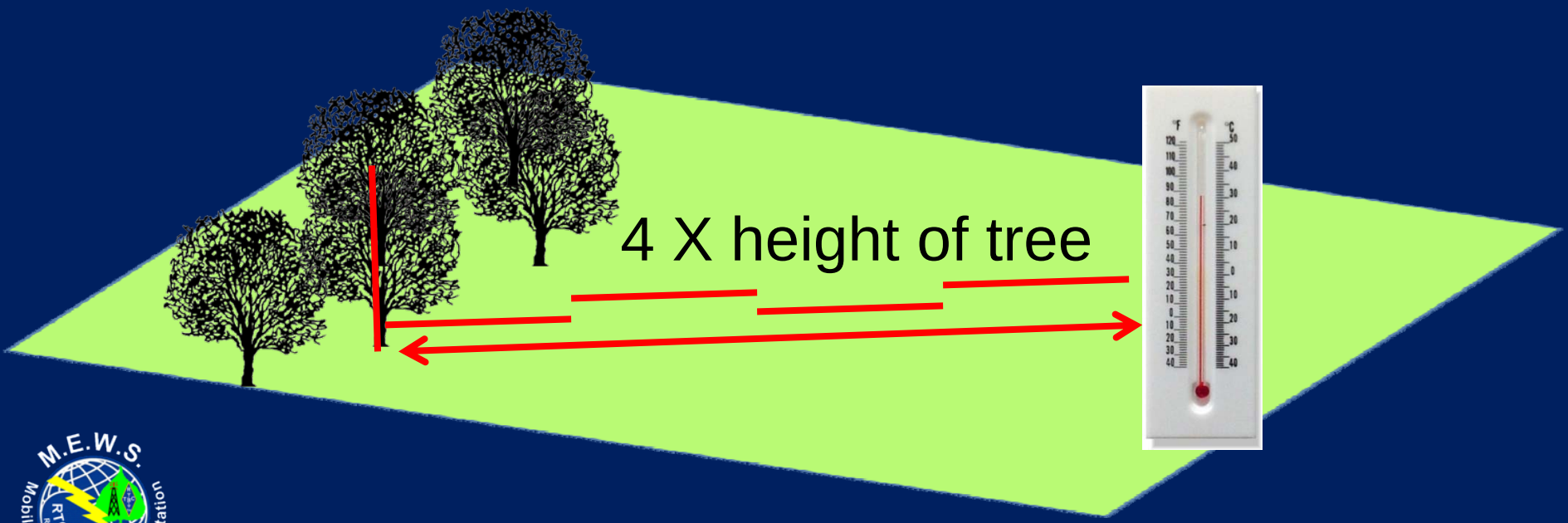
Standard practice is to house weather instruments in shaded, ventilated enclosures 1.5 m above the ground.

Photos from the Internet; educational fair use clause

Find an open, level area.

Keep away from tall obstructions.

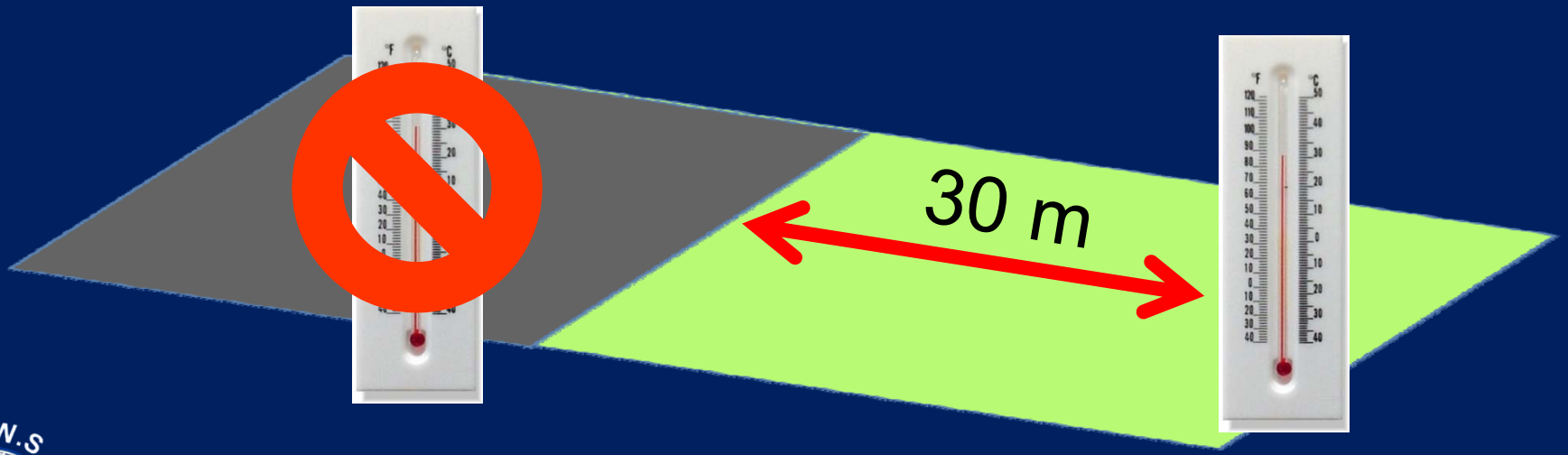
Stand off distance = 4X height of the obstacle.



See the Addendum after the lesson to learn how to use a sight ruler to estimate the height of tall objects.

Avoid Large Paved Areas

Stay 30 m away from any large paved area



If you don't have a long tape measure, see the Addendum after the lesson to learn how you can estimate the distance by pacing.

The Optimum Surface Type

Low grass or bare soil for ~ 9 m radius from the thermometer

If you don't have a long tape measure, see the Addendum after the lesson to learn how you can estimate the distance by pacing.

MEWS (PWIS)
Portable Weather Instrument Shelter

- Small Thermometer or hygrometer
- Umbrella
- 1.5 m long “Step cord”

After some types of disasters shade could be hard to find. An umbrella can useful.

The MEWS PWIS is suitable for nearly all EmComm situations.

Using the MEWS (PWIS) Portable Weather Instrument Shelter

- Select area to measure temperature
- Open MEWS PWIS
- Attach weather instruments
- Wait a few minutes to stabilize the instruments
- Note the date / time
- Take 3 measurements; average them
- Record the average on the MEWS log form

MEWS (PWIS)
Portable Weather Instrument Shelter

Step1. Open umbrella

Step 2. Attach instrument bridle chord to top ring

MEWS (PWIS)
Portable Weather Instrument Shelter

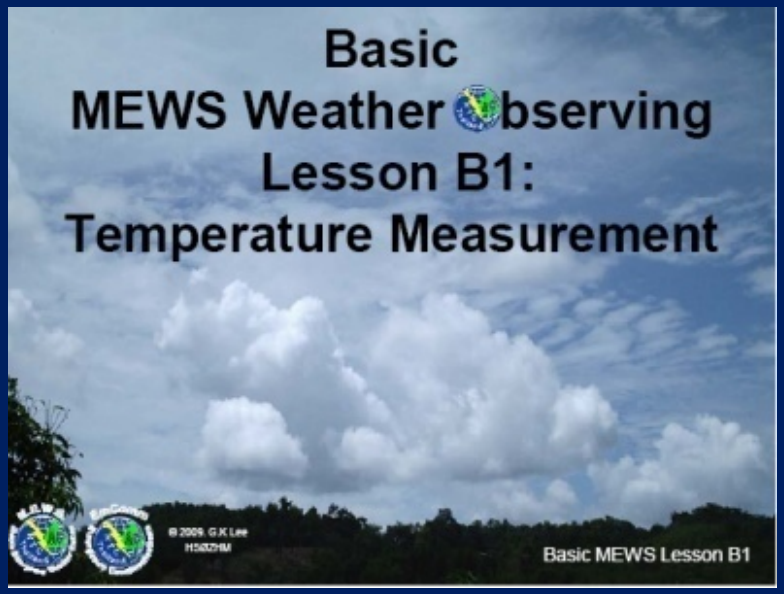
Step 3. Step on ground tether tab and lift up to 1.5 m operating height.

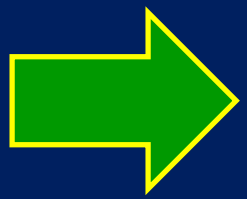
Step 4. Wait a few minutes to let instrument stabilize

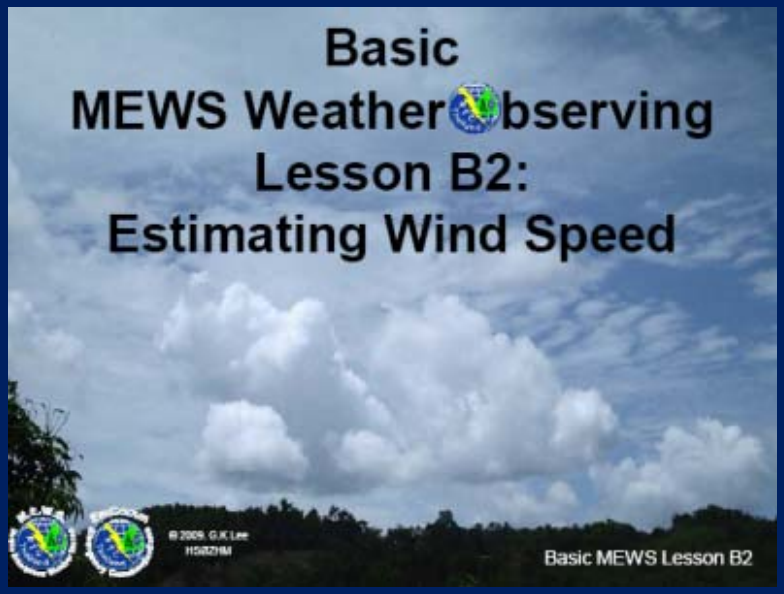
MEWS (PWIS)
Portable Weather Instrument Shelter

Step 5. Record date/ time; take 3 measurements; and record on log form

You have completed the Basic MEWS Temperature Lesson B1







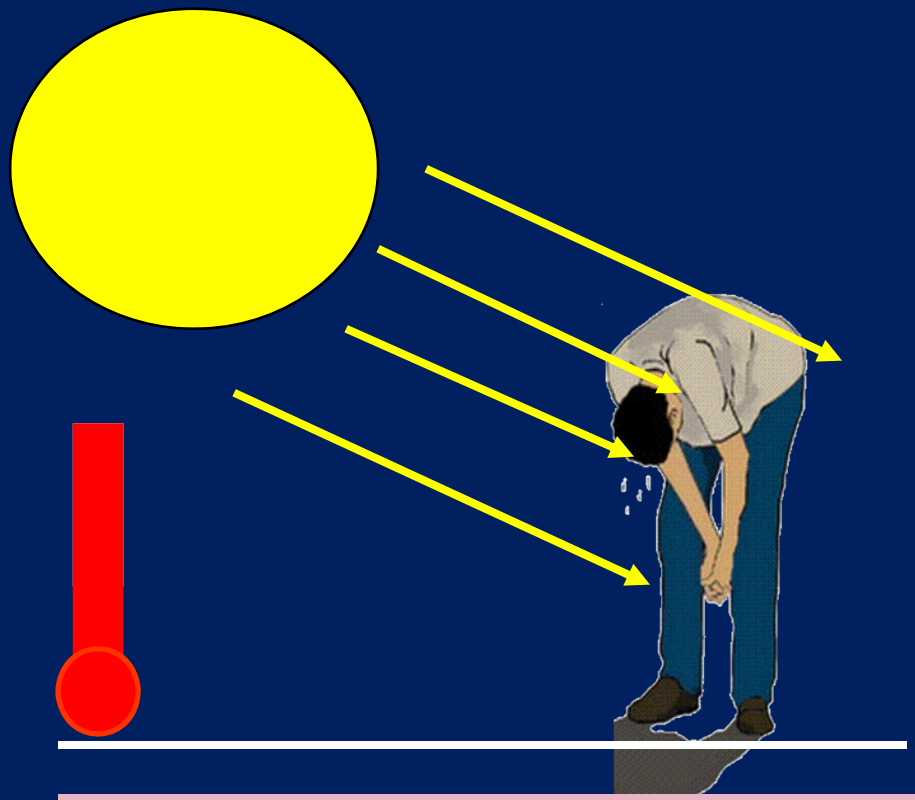
You are now ready for Basic MEWS Lesson B2: Estimating Wind Speed

Basic MEWS Temperature data is used for these Advanced MEWS calculations...

- Relative Humidity
- Dew Point Temperature
- Heat Stress Index
- Wind Chill Temperature
- Calculating Cloud base height

These calculations affect human health and safe flight operations.

High temperatures and high relative humidity…

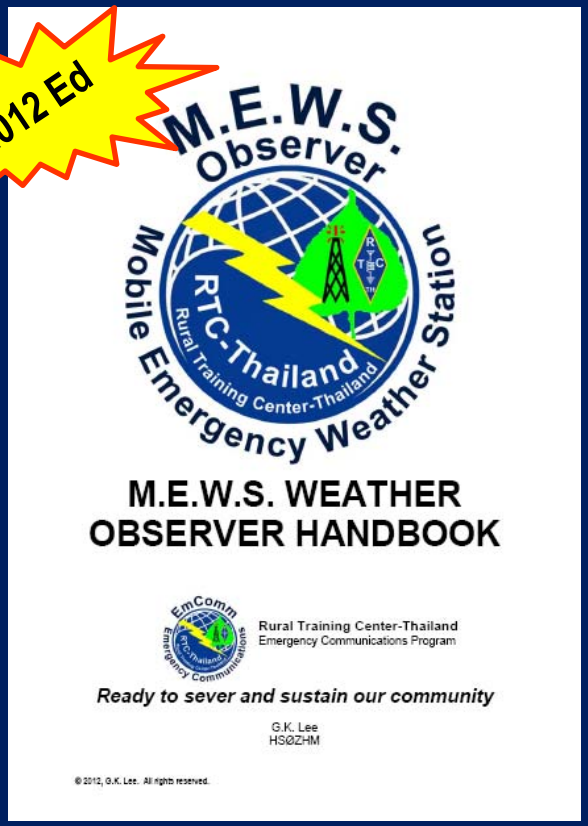


…can make it dangerous to work outside.

The amount of danger can be determined using the Heat Stress Index.

Measuring Relative Humidity and Heat Stress…

2012 Ed

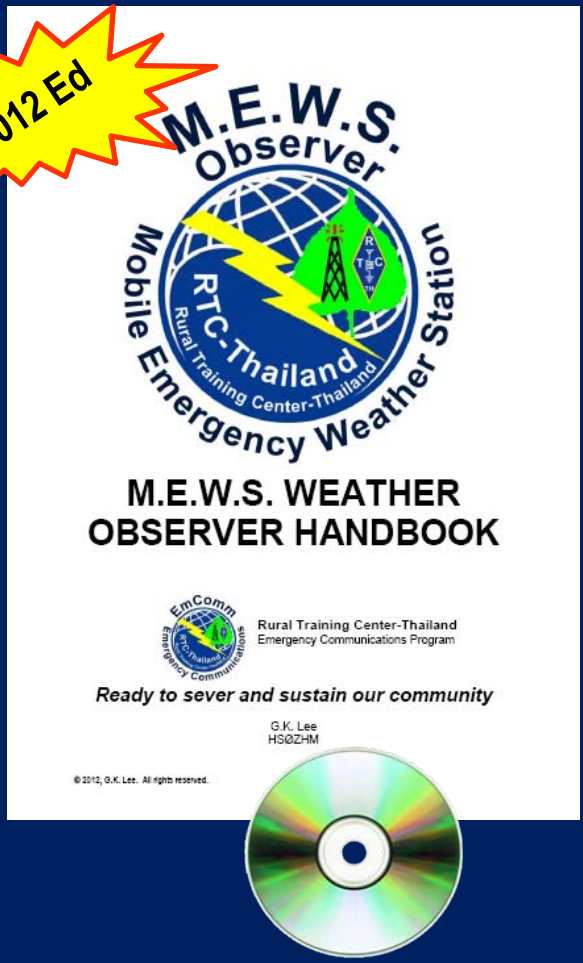


…are covered in Advanced MEWS Lesson A1 and in the MEWS Weather Observer Handbook.

Free Self-Study Materials by Internet

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

2012 Ed



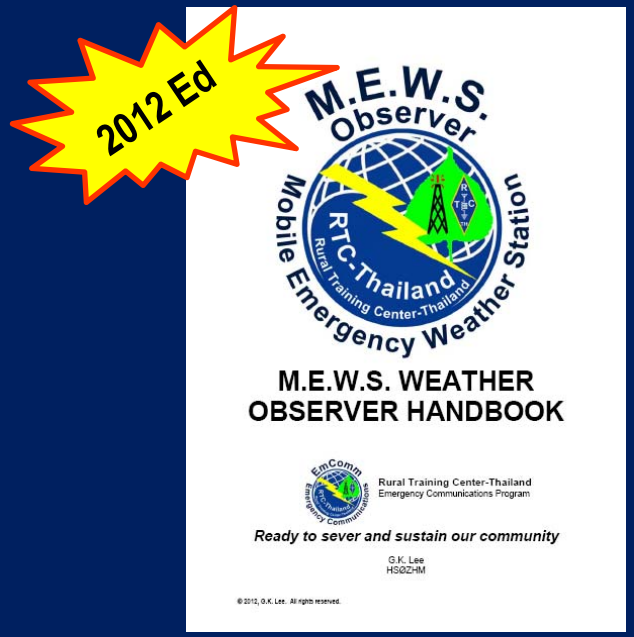
All of the lessons have been classroom and field proven.

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.

Questions or Comments

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



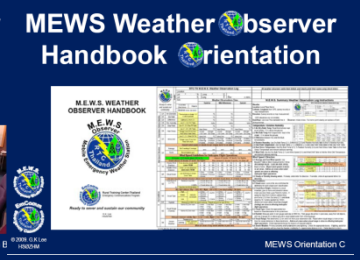
You may also contact us by e-mail:
hsØzhm@gmail.com
We are always trying to improve our lessons. Your comments and suggestions are welcomed.

Basic MEWS PDF Lessons

B 1: Measuring Temperature
B 2: Estimating wind speed
B 3: Measuring Wind Direction
B 4: Estimating Cloud Cover
B 5: Estimating Cloud Base Height
B 6: Identifying Cloud Types
B 7: Estimating Visual Range
B 8: Severe Weather Conditions

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

Basic MEWS PDF Lessons



2012 Ed

3 Orientation and 8 Basic lessons.
Some show how to build your own weather equipment.

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

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

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

Contact
Greg, HSØZHM
MEWS Creator / Mentor

Via E-mail / video chat
hsØzhm@gmail.com

Via Skype video
conference call: rtc_th

Community-based Environmental Education for

The End

Continue to see the Addenda on how you can estimate heights using a sight ruler and estimate distances by pacing.
Or you may go on to MEWS Lesson B2 Estimating Wind Speed

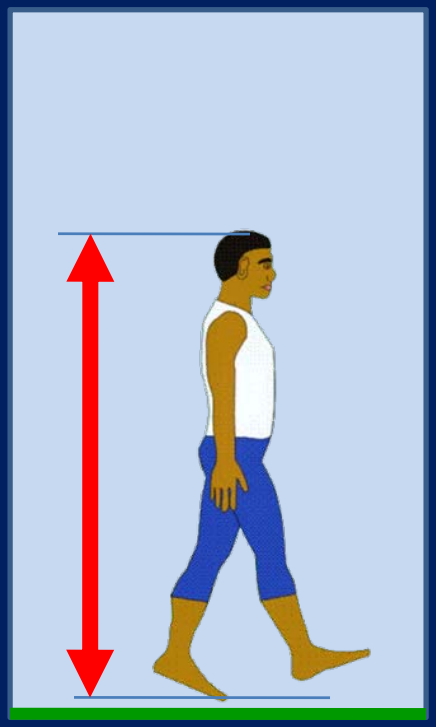
Estimating Height by Sight Ruler

To do this lesson, you need a calculator, a ruler, pencil, an assistant, and paper.

Sample	Height (cm) on sight ruler
Assistant Actual Ht (cm)	
Assistant Sight ruler Ht (cm)	
Object Sight ruler Ht (cm) #1	
Object Sight ruler Ht (cm) #2	
Object Sight ruler Ht (cm) #3	
Total of all Object Sightings (cm)	
Average Object Ht cm (divide total by 3)	
Ave Object Ht divided by Asst Sight Ht	
Estimated Actual Object Height	

Image from the Internet; educational fair use clause

Estimating Height by Sight Ruler

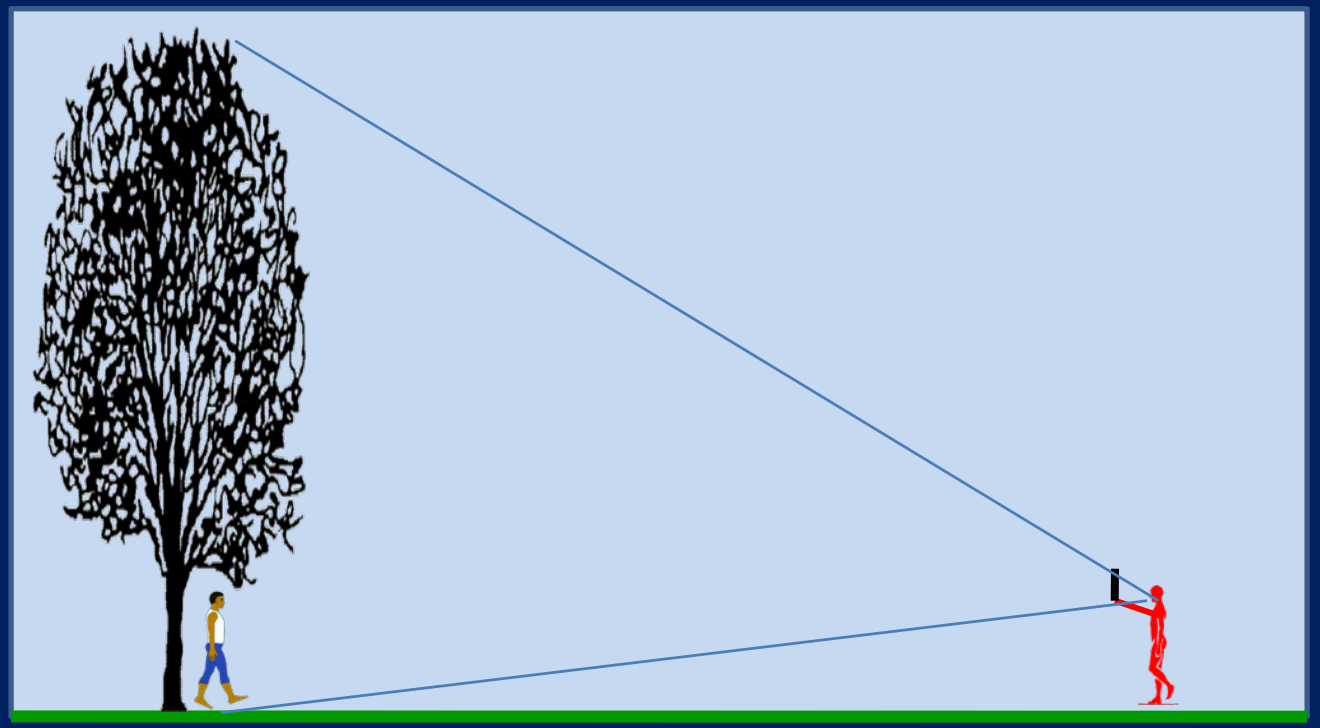


Step 1. Measure you assistant's height in cm.

Step 2. Record it on the form.

Sample	Height (cm) on sight ruler
Asst Actual Ht (cm)	
Asst Sight ruler Ht (cm)	
Sight #1	
Sight #2	
Sight #3	
Total Ht (cm)	
Ave Object Ht cm (divide total by 3)	
Ave Object Ht divided by Asst Sight Ht	
Estimated Actual Object Height	

Estimating Height by Sight Ruler



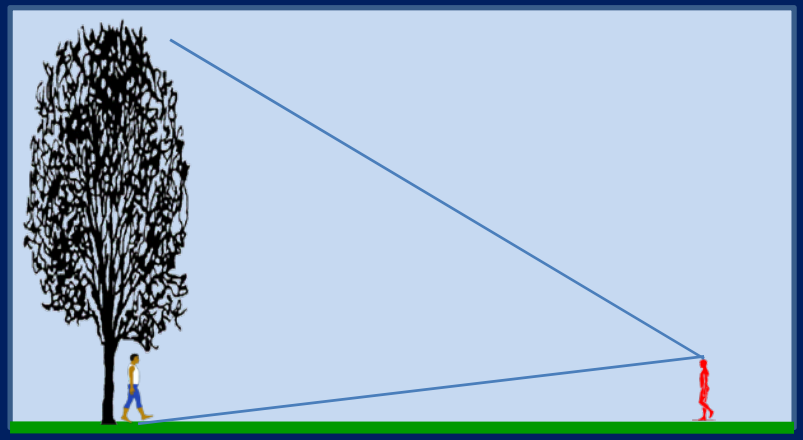
Step 3. Have your assistant stand by the tall object. Walk away from the object until it visually “fits” on the sight ruler.

Estimating Height by Sight Ruler

Step 4. With the bottom end of the ruler lined up to the base of the tall object, see where the top of your assistant's head is on the sight ruler. Record the "height" in cm.

Sample	Height (cm) on sight ruler
Asst Actual Ht (cm)	
Asst Sight ruler Ht (cm)	
Sight #1	
Sight #2	
Sight #3	
Total Ht (cm)	
Ave Object Ht cm (divide total by 3)	
Ave Object Ht divided by Asst Sight Ht	
Est Actual Object Height	

Estimating Height by Sight Ruler



Step 5. With the bottom end of the ruler lined up to the base of the tall object, see where the top of the tall object is on the sight ruler. Record the "height" in cm.

Sample	Height (cm) on sight ruler
Asst Actual Ht (cm)	
Asst Sight ruler Ht (cm)	
Sight #1	
Sight #2	
Sight #3	
Total Ht (cm)	
Ave Object Ht cm (divide total by 3)	
Ave Object Ht divided by Asst Sight Ht	
Est Actual Object Height	

Repeat Step 5 to get a total of 3 sightings for the height of the tall object.

Image from the Internet; educational fair use clause

Estimating Height by Sight Ruler

Step 6. Add the 3 sighting heights and write the sum in the box

Step 7. Divide the total by 3 to get an average object sight height.

Step 8. Divide the Ave Ht by Asst sight height

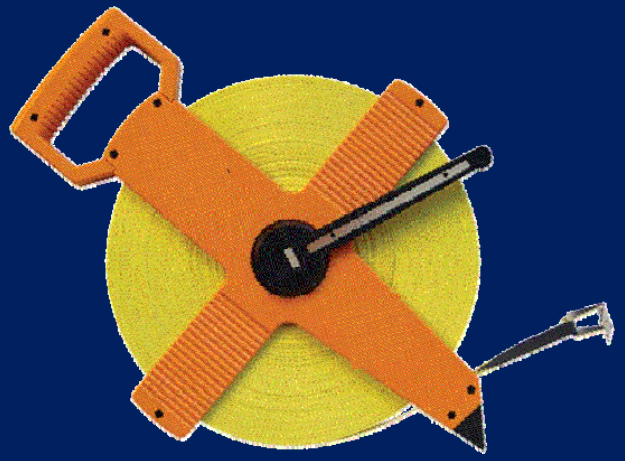
Step 9. Multiply Asst Actual Ht by result from Step 8.

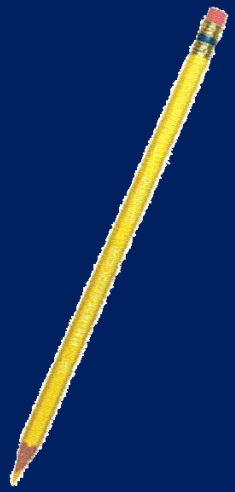
Sample	Height (cm) on sight ruler
Asst Actual Ht (cm)	
Asst Sight ruler Ht (cm)	
Sight #1	
Sight #2	
Sight #3	
Total Ht (cm)	
Ave Object Ht cm (divide total by 3)	
Ave Object Ht (cm) divided by Asst Sight Ht (cm)	
Est Actual Object Height	

4 X Step 9 result = distance of object to thermometer.

Estimating Distance by Pacing

To do this lesson, you need a long measuring tape, pencil, paper.



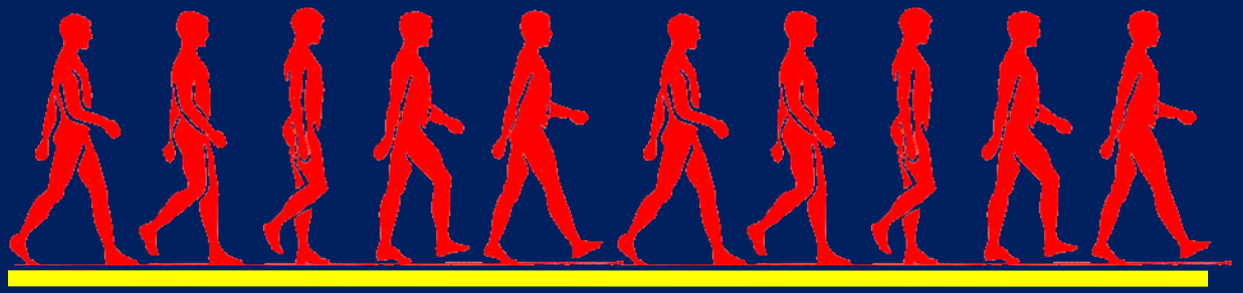


(calculator is optional)

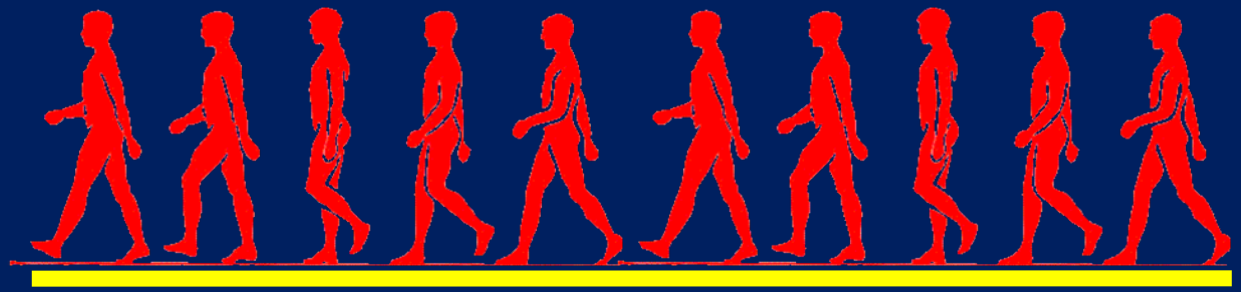
Sample	Number of Paces for 10 m
#1	
#2	
#3	
Total paces	
Average paces (divide total by 3)	

Estimating Distance by Pacing

Step 1. Mark off a distance of 10 m.

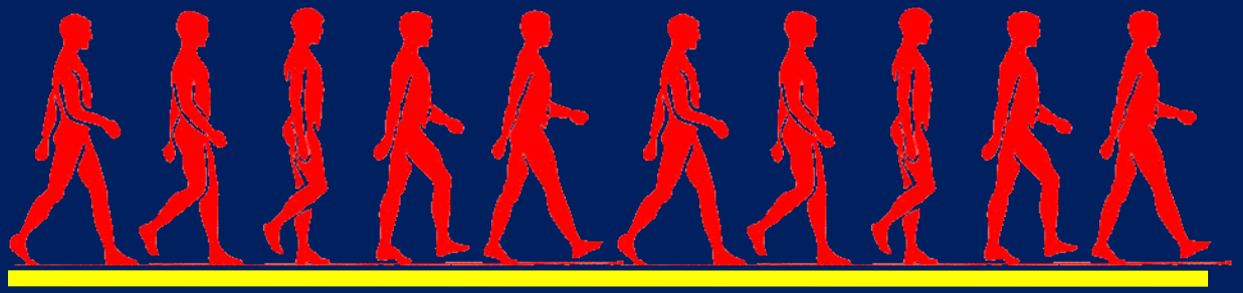


Step 2. Use your normal stride; walk the 10 m distance; count your steps from start to finish.



Step 3. Turn around and repeat Step 2.

Estimating Distance by Pacing



Step 4. Turn around and repeat Step 3.

Step 5. Get the average number of your steps to cover the 10 m distance.

Sample	Number of Paces for 10 m
#1	
#2	
#3	
Total paces	
Average paces (divide total by 3)	

Record your pace count for future use in estimating distances when you don't have a long measuring tape.

Community-based Environmental Education for

The End

You may now go to Basic MEWS Lesson
B2: Estimating Wind Speed