Rural Training Center – Thailand (RTC-TH)



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

Basic MEWS Weather bserving Lesson B1: Temperature Measurement





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)



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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







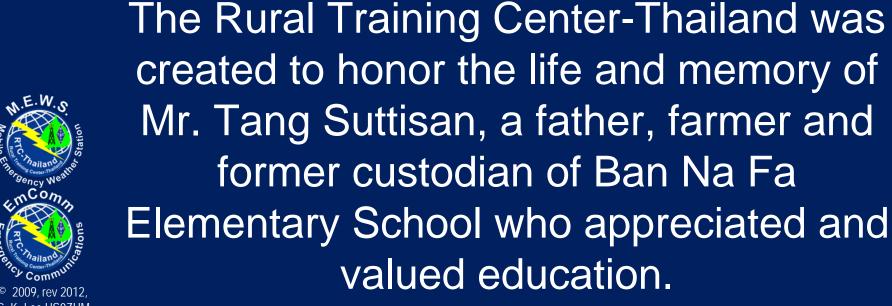
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When disaster strikes, accurate local weather data may not be available.

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





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.

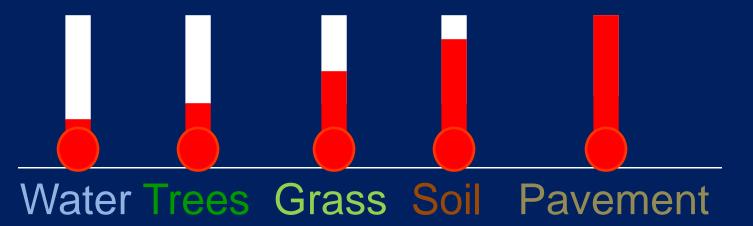
Lowest temp in 24 hour period

Highest temp in 24 hour period



Morning Noon Afternoon Evening

The temperature can be different over different surfaces.

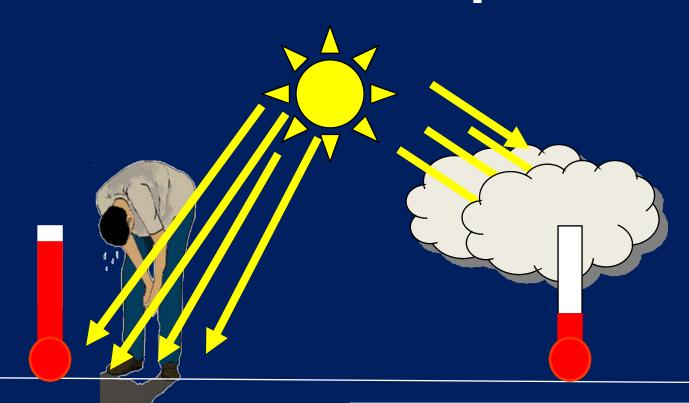




Place thermometer in the shade, 30 m from large paved area, in open level area about 9 m diameter; grass or bare soil preferred.

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

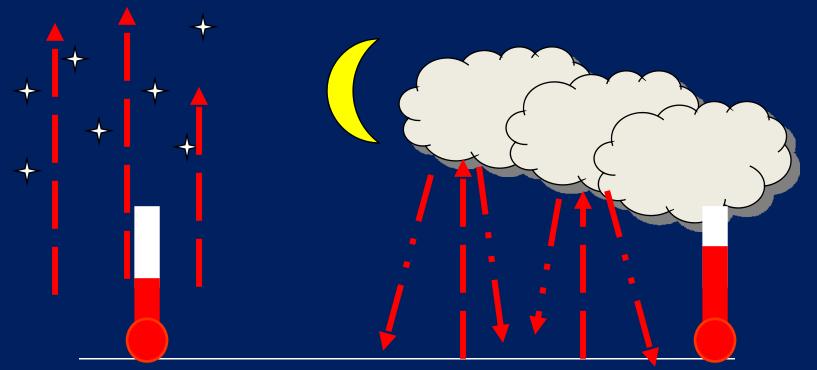
During the daytime, clouds can reduce surface temperature.





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.

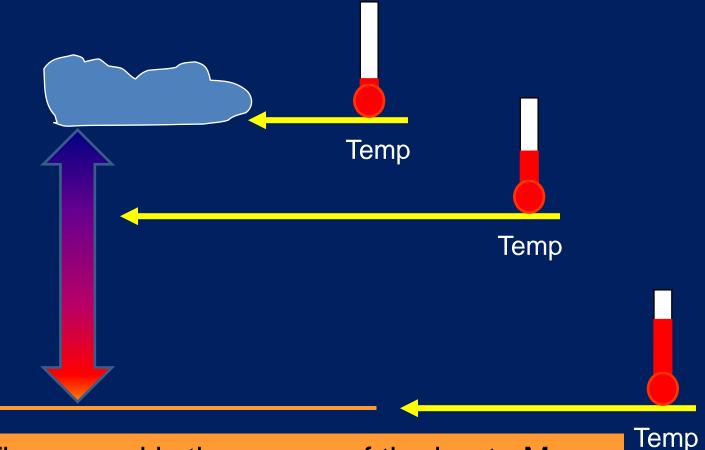




Clear skies, cooler for survivors. They may need more clothing, fuel and shelter; morning dew possible

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

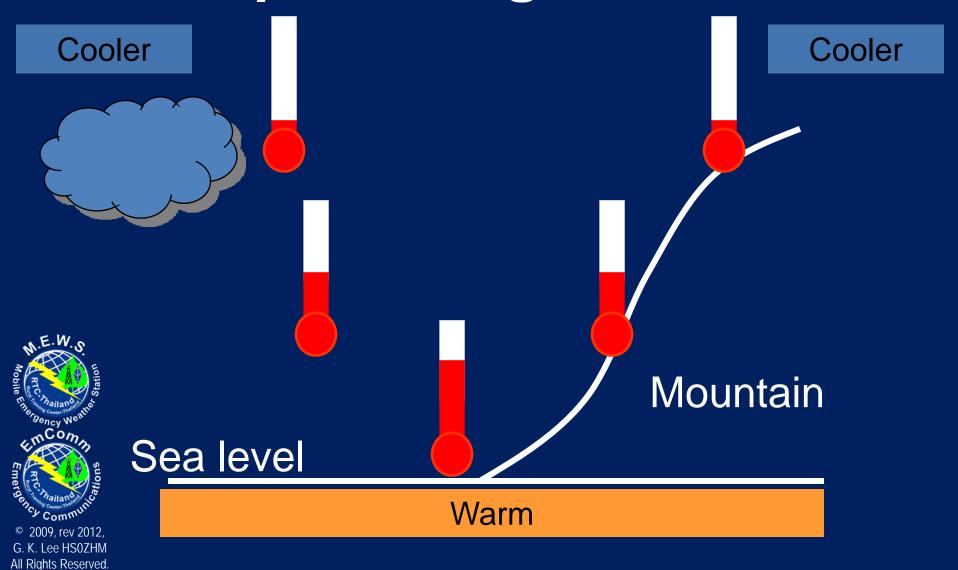
As you go higher above the ground, the air temperature gets lower.





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

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Į	2.3	Differen	nce	Subtract	2.2 from			°C		°C		°C
Ne	2.4	Rel. Hum	idity	Use 2.1, 2	2.3; R H T. Ve			%RH		%RH		%RH
Relative Humidit	2.5	Dew Po	int	Use 2.1, 2.3	B; Dew Pt Talle			°C		°C		°C
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atri	2.6	Heat Str	ess		vel (if any from	□Cautn	□Da	nger	□Cautn	□Danger	□Cautn	□Danger
per				Heat Stres	ss Index table)	n Ex Ca	utn ⊝Ex	Dangr	□ Ex Cautr	□Ex Dangr	□ Ex Cautn	□Ex Dangr
Temperature				Use 2.1, 3.	1; Wind Chl Tbl	nd Ci	ill.	°C	Wind Chill.	°C	Wind Chill.	°C
	2.7	Wind C	hill	Danger Lei	vel (if any from	□Tivl Dn	gr □Frs	tbte10	□Trvl Dngr	□Frstbte10	□Trvl Dngr	□Frstbte10

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

2.1 Air (Dry bulb) The

Thermometer in shade; 1.5

°C l

°C

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	Pij			ve 20 kno	its/ 37 km/h; N	lo flig	ghts	Max	tailv	vind 5	knot	ts/6 k	m/hr;	No t	ake d	off
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WASSI	S	4.4	Rainfall Measure at 0900 hrs each morning. Report amount for last 24											mm		
~ / 1 · 1	4.			Name o	f 3.2 km mark	o m		less than	o m		a less	than	□ mo		less	than
T A W E			Visual Range			□Rain □Fog □Haze □Smoke		□ Rain □ Fog □ Haze □ Smoke		ke	n Rai		⊐ Fog ⊐ Smol	ke		
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G. K. Lee HS0ZHM						mair	crews i	of any seve	ere we	eather	in you	ur area				
All Rights Reserved.	മാ	רם מחח	CTH GK I AA A	Il sinhte sacas	e-cal											

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

	2.1	Air (Dry bulb)	Thermometer in shade; 1.5	°C			
dity	2.2	Wet Bulb	m above ground	°C			
lumi	2.3	Difference	Subtract 2.2 from 2.1;	°C			
ive	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH			
e lat	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C			
re/F			Use 2.1, 2.4 ; HSI Table	Heat Stress °C			
Temperature / Relative Humidity	2.6	Heat Stress	Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr			
Cern			Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C			
2.	2.7	Wind Chill	Danger Level (if any from Wind Chill chart)	□TrvI 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



M.F.W.C. Cumanan Weether Chemistian Law Instruction

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

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

(GPS elevations are not reliable)

Date/Hour: Use local Thai standard time in Observer: initials in box. Full name (print clearly) on top/back of form

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

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.

			Report wind speed	2 ID R	220 ER	10.4	I CLA	en, s	STEAT O	Q REI	OLIVER				
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		Susts	Facord highest gvot		kmh		kete		kmh		kete		kmh		kette
형			Wind Speed Guid	eline	es for	He	licop	ter i	light	(Op	erati	ons			
â		10 kmo	to / 18.5 km/h ideal; OK	to fly			Al	bove	45 km	ots /	83 k	mAh; I	No fil	ghts.	
3		Gusta aloc	rve 20 knots/ 37 km/h; h	40 file	pints	-	Max	tally	vind 5	knot	M B N	mhr	: No t	ake o	ıπ
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26	32	Direction	comis FROM		55	W	IWW	E	88	W	NIV	E	88	W	NW
	2.0	Yariakle Windi	Circle 1 or more directions	19	NE	8	BW	N	NE	- 5	BW	14	NE	- 5	5W
		Direction	wind comes FROM	E	56	W	WW	E	55	W	NEV	E	SE	W	NUV

3.2 Steady or Variably blowing winds. If steady, circle letter for direction. If variable, circle all appropriate letters for directions.

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 Čloud Type: Check the appropriate box based on cloud description in the guide book
- | Comparison of Security | Comparison of Secur
- I.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.
- I.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

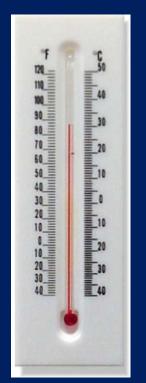


Umbrella; 1.5 m cord



All thermometers are not created equal

Common wall thermometers can be easily damaged in a disaster



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

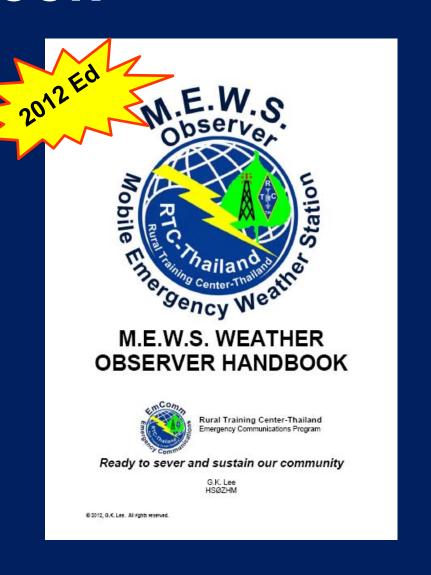
A thermometer enclosed in plastic is compact and may be more durable to survive a disaster



The MEWS Weather Observer Handbook

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

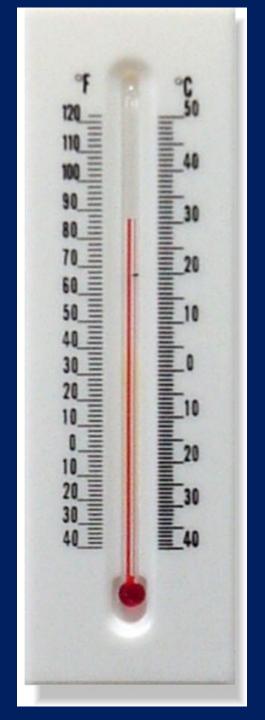




Temperature is a measure of the amount of heat present.



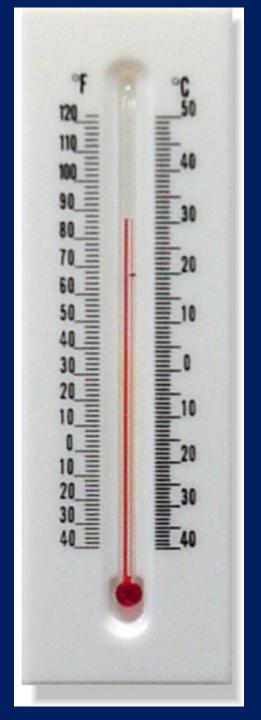




A thermometer is a tool to measure temperature.







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→													
al; see back)													
n sh de; 1.5	°C	4 °C	°C										
gro nd	°C	°C	°C										
fr <mark>.</mark> 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	
dity	2.2	Wet Bulb	m above ground	
Humidit	2.3	Difference	Subtract 2.2 from 2.1;	
Wel	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	
_				



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

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

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	2.1	Air (Dry b	ulb)	Thermome	der in shade: 1.5		°C		°C		°C		
lity	2.2	Wet Bu	lb	m ab	ove ground		°C		°C		°C		
Ě	2.3 Difference		ce	Subtrac	t 2.2 from 2.1;		°C		°C		°C		
토	2.4	Rel. Hum	idity		2.3; R H Table		%RH		%RH		%RH		
Temperature / Relative Humidity	2.5	Dew Po			.3; Dew Pt Table		70T/II		70IXII		**C		
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ture	2.6	Heat Str	ess		*	Heat Stre □Cautn	ss °C □Danger	Heat Stress □Cautn	□Danger	Heat Stress □Cautn	□Danger		
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emi				Use 2.1, 3	.1; Wind Chl Tbl	Wind Chil	. °C	Wind Chill.	°C	Wind Chill.	°C		
	2.7	Wind Cl	hill	Danger L	evel (if any from	□Trvl Dngr		□Trvl Dngr	□Frstbte10	□Trvl Dngr	□Frstbte10		
2					Chill chart)	□TShltr Dg □Frostbite	r prstite30	□TShltr Dgr □Frostbite	□Frstite30 □Frstbte5	□TShltr Dgr □Frostbite	□Frstite30 □Frstbte5		
_	\equiv			Rep	ort wind spee						HEISTORES		
•	°C	Augus											
		Averag	je	Get 3 read	dings & average	km/t	knts knts	km/h	knts	km/h	knts		
•	°C Gusts			Record	l highest gust	km/f	n knts	km/h	knts	km/h	knts		
				Wind 9	Speed Guid	elines fo	or Helicop	ter Flight	t Operati	ons			
•	°C	10) kn	ots / 18.5 k	m/h ideal; OK	to fly	А	bove 45 kr	nots / 83 ki	m/h; No flig	jhts.		
0/ 5				ove 20 knd	ots/ 37 km/h; N	lo flights	Max	k tailwind 5	knots/ 6 k	m/hr; No ta	ake off		
%F	(H	Steady W			tion steady Wind	N NE	S SW	N NE	S SW	N NE	S SW		
(~)	3.2	Direction Variable V			nes FROM more directions	E SE	W NW	E SE	W NW	E SE	W NW S SW		
		Direction			omes FROM	E SE	W NW	E SE	W NW	E SE	W NW		
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		Cloud Bas			e to local Mtn		above mtn	□ Clouds at		□ Clouds ab			
	4.2	(Loc Re	el)			□ Clouds				□ Clouds at			
	7.6		-	Dan 5-47	m AMSL	□ Clouds		□ Clouds be	□ Clouds at mtn top □ Clouds at mtn □ Clouds below mtn □ Clouds below mtn				
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	4.5	(Visibilit		Name o	f 3.2 km mark	□ more	🗆 less than	□ more	less than	□ more □	less than		
						□ Rain	□ Fog		Fog		Fog		
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		770	J.Co.		derstorms	□ Yes	□ No	□ Yes	□ No	□ Yes	□ No		
	4.6	Seven		Lightning	Flash, count secs to boom / 3	N NE E S	E S SW W NW	N NE E SE	5 SW W NW	N NE E SE S	5 SW W NW		
		Weath	er	,		□ Yes m air cneu	km rs of any sevi	□ Yes	in ware ane:	□ Yes	km		
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Important Note

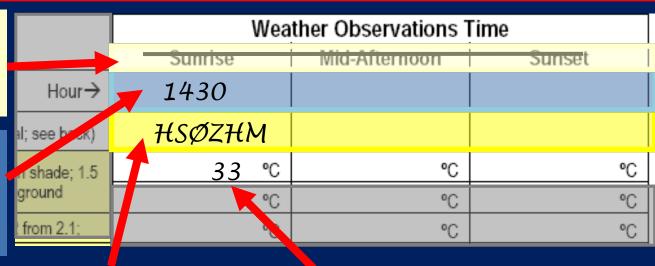
Normally MEWS observations are made 3 times a day. However, if flight operations are in progress, try to provide flight crews with weather updated prior to landings and take-offs for flight safety.



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...



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...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



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MEWS / EmComm situations will probably be less than ideal.



Thermometer Placement

Standard practice is to house weather instruments in shaded,



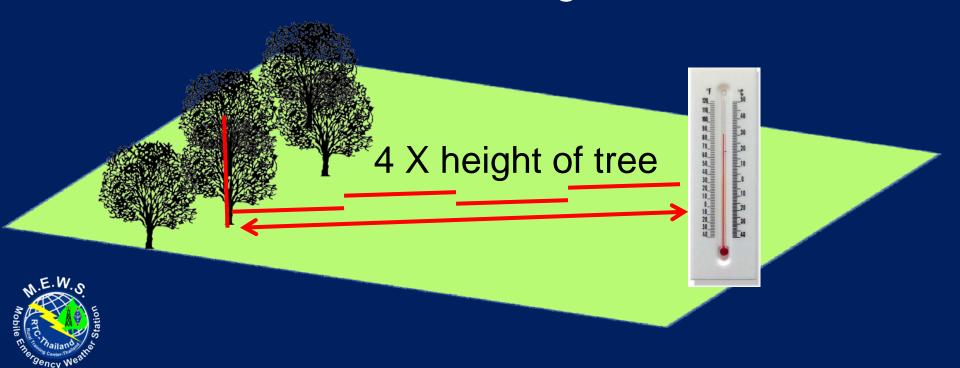
ventilated enclosures
1.5 m above the ground.



Find an open, level area.

Keep away from tall obstructions.

Stand off distance = 4X height of the obstacle.

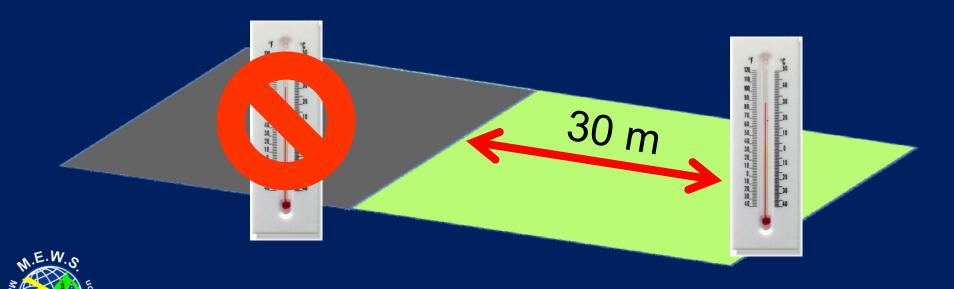


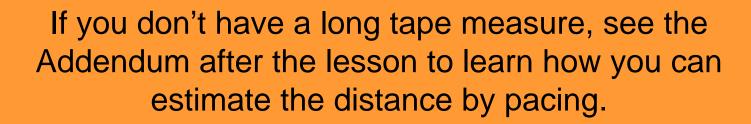
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See the Addendum after the lesson to learn how to use a sight ruler to estimate the height of tall objects.

Avoid Large Paved Areas

Stay 30 m away from any large paved area

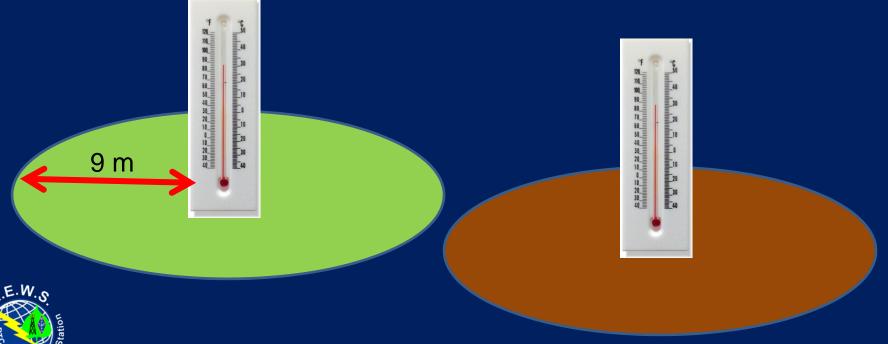


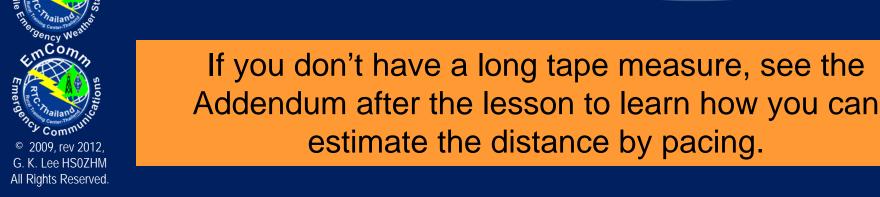


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The Optimum Surface Type

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





- 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.

- 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



Step1. Open umbrella



Step 2. Attach instrument bridle chord to top ring





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



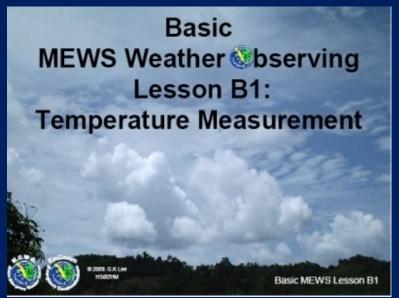


Step 5. Record date/ time; take 3 measurements; and record on log form





You have completed the Basic MEWS Temperature Lesson B1









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

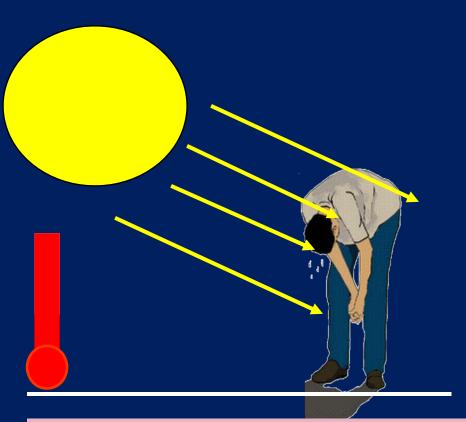
Basic MEWS Temperature data is used for these Advanced MEWS calculations...

- 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...



make it dangerous to work outside.



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

Measuring Relative Humidity and Heat Stress...

Advanced MEWS
Weather bserving Lesson A1:
Measuring Relative Humidity and
Heat Stress

92009, GKLEE
HSG0ZHM
MEWS Lesson A1





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

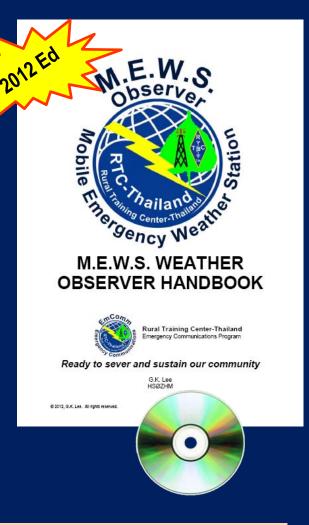
Free Self-Study Materials by Internet

RTC-TH Weather Observer manual

Illustrated PDF topical lessons

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.

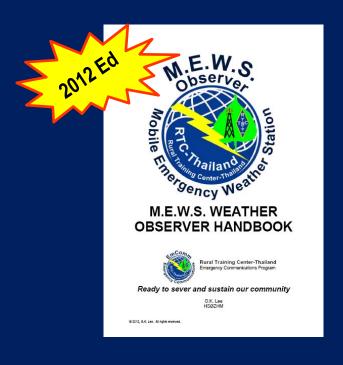




These materials are in English. Volunteer assistance for Thai translation to is welcome and will be acknowledged and cited.

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 <u>www.neighborhoodlink.com/RTC-TH_Tech/pages</u> for the latest updated editions of MEWS lessons

Basic MEWS PDF Lessons

A Brief Introduction to

2012 Ed

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rientation

MEWS Weather ®bserver

Handbook @rientation



3 Orientation and 8 Basic lessons.

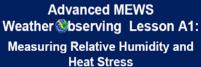
Some show how to build your own weather equipment.

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



Advanced MEWS PDF Lessons











Advanced MEWS
Weather Observing Lesson A4:
Measuring Rainfall





Advanced MEWS
Weather bserving Lesson A6:
Weather Forecasting





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



When you're at the end of your rope, it's too late to start EmComm planning!

Start today and prepare before it is too late.

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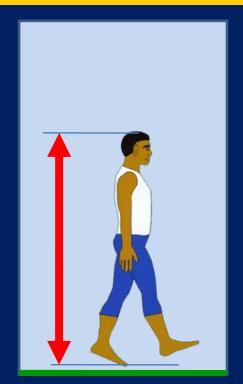
Continue to see the Addenda on how you can estimate heights using a sight ruler and estimate distances by pacing.

Or you may go on to MEWS Lesson B2 Estimating Wind Speed

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

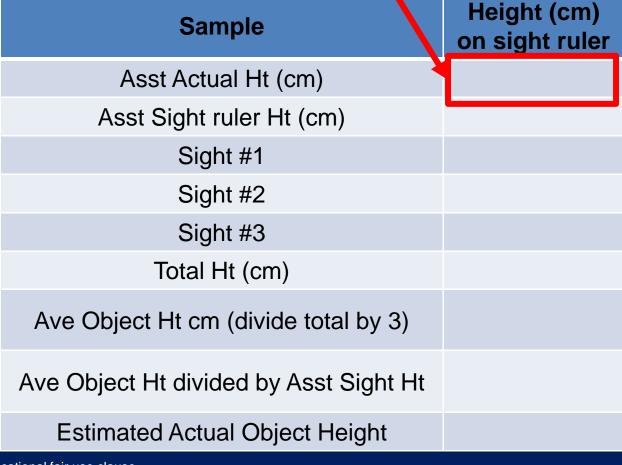
	Sample	Height (cm) on sight ruler
	Assistant Actual Ht (cm)	
	Assistant Sight ruler Ht (cm)	
	Object Sight ruler Ht (cm) #1	
	Object Sight ruler Ht (cm) #2	
	Object Sight ruler Ht (cm) #3	
M.E.W.o	Total of all Object Sightings (cm)	
Oble Challed New West of the Control	Average Object Ht cm (divide total by 3)	
Suoji Emer	Ave Object Ht divided by Asst Sight Ht	
© 2009 rev 2012	Estimated Actual Object Height	
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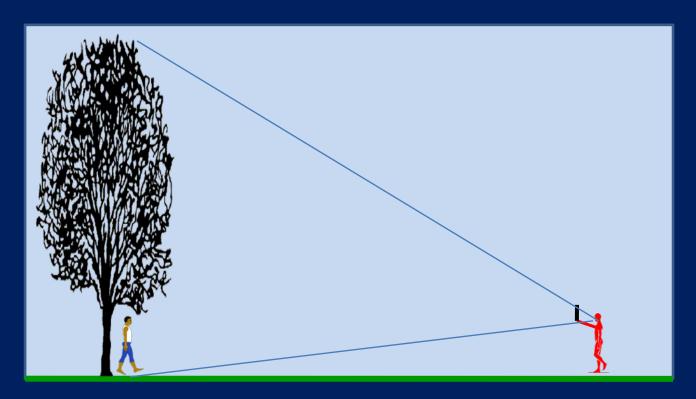


Step 1. Measure you assistant's height in cm.

Step 2. Record it on the form.

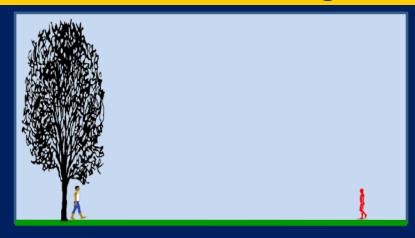




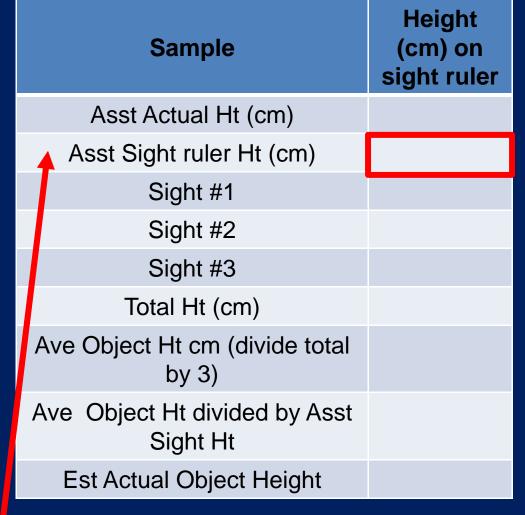




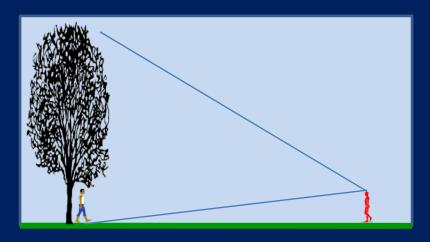
Step 3. Have your assistant stand by the tall object. Walk away from the object until it visually "fits" on the sight ruler.



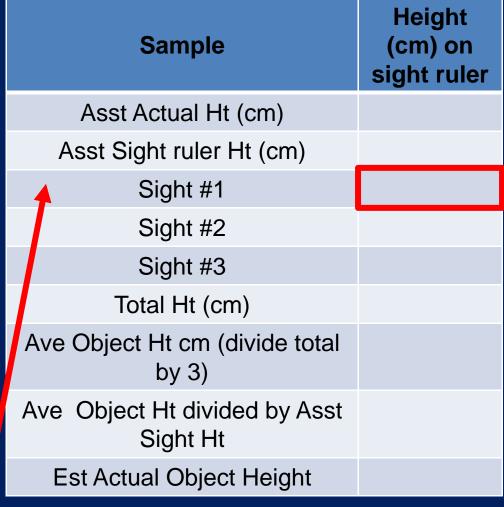
Step 4. With the bottom end of the ruler lined up to the base of the tall object, see where the top of your assistant's head is on the sight ruler. Record the "height" in cm.







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.



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



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.

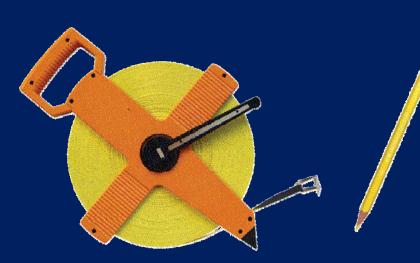
Sample	Height (cm) on sight ruler
Asst Actual Ht (cm)	
Asst Sight ruler Ht (cm)	
Sight #1	
Sight #2	
Sight #3	
Total Ht (cm)	
Ave Object Ht cm (divide total by 3)	
Ave Object Ht (cm) divided by Asst Sight Ht (cm)	
Est Actual Object Height	

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.





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

(calculator is optional)

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.



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