Morning Mountain Leaders' Meeting

Date:_____ Time:_____ Loc:_____

Instructors Present:_____

1) Weather Station Observations: Time:_____ Loc:_____

Sky: PresT: Storm: Wind:

Prec type/rate: MaxT: T10: HS:

BloSnow: MinT: FtPen: Bpres:

Bpres trend:

2) Weather forecast: Winds & Temps

Elev: Elev: Elev:

Wind: Wind Wind:

Temp: Temp Temp:

Precip: Today: Tonight: Tomorrow:

Other:

Avalanche Hazard Analysis Matrix Loc & Elev:

	N	S	E	W	COMMENTS
Low(green)					
Moderate (yellow)					
Considerable (orange)					
High (red)					
Extreme (red/black)					

Other Hazards: (Cold Wx injuries, rock fall, obstacles, etc.)

3) Discuss Training Schedule:

a. Where do we want to go:
b. What terrain features should we avoid?
c. What alternatives / options do we have?
d. What additional or new data do we need for the evening meeting?
(assigned by group or name)

Evening Mountain Leaders' Meeting
Goals: Field Observations and Hazard Analysis

1) Weather Station Observations: Time:_____ Loc:_____

Sky:	PresT:	Storm:	Wind:
Prec type/rate:	MaxT:	T10:	HS:
BloSnow:	MinT:	FtPen:	Bpres:
Bpres trend:			

2) Current Avalanche Hazard Analysis Matrix Loc & Elev:

	N	S	E	W	COMMENTS
Low(green)					
Moderate (yellow)					
Considerable (orange)					
High (red)					
Extreme (red/black)					

3) Debrief the Day:

a: Debrief the training for the day.

b: When were we at the greatest risk (overall)?

c. Any injuries

Data Class

Data Class	Information Category	Observations Made	Red Flag Values	Your Observation
Weather	Precipitation	Type	Rain/Heavy wet snow	
		Intensity	>3cm (1in)/hour	
		Accumulation	>30cm (12in)/12 hours	
	Wind	Speed	Strong enough to move snow	
		Direction	Moving snow onto/across terrain where you will travel	
		Duration	Long	
	Temperature	Current	≥0°C/32°F	
		Max/Min	≥0°C/32°F	
		Trends	≥5°C/9°F in 3 hours (especially from cold to warm, & through the freezing level)	
	Solar Radiation	Cloud cover	Allowing a lot of radiation to enter or intensifying radiation.	
		Intensity	Strong	
		Duration	Long	
Snow Pack	Snow Cover	Height	<1.5m/5ft	
		Strength	Weak	
		Variability	High	
	Layers	Strength	Strong over Weak	
		Temp	Near/=0°C/32°F	
		Grain Character	Lg, loosely packed, angular	
	Bonding	Strength	Compression test ≤20 Rutschblock ≤4	
		Plane Character	Smooth, Clean	
		Failure Layer	Lg, loosely packed, angular	
	Whumphing	Initiation	Natural/Human trigger	
		Propagation	Far >3m/10ft	
		Extent	Widespread	
Avalanche Activity	When	Current	Observed	
		Recent	<24 hrs (Maritime) <48 hrs (Continental)	
		Past	If condition still exists	
	Where	Area	Widespread	
		Slope Angle	Over 30°	
		Slope Aspect	Facing sun, Leeward	
		Slope Shape	Concave	
		Terrain Traps	Exist where Avg. are running	
	What	Natural Triggers	All natural	
		Human Triggers	All human	
		Other Triggers	Remote, arty, demo etc.	
	How	Destructive	≥ Class 2	
		Propagation	Wide fracture lines running far	
		Failure Layer	Lg loosely packed angular grains	

Current Danger Rating	Low (Green)	Moderate (Yellow)	Considerable (Orange)	High/Extreme (Red/Black)
Danger Trend/Forecast	Improving/Steady	Rising Slowly	Rising Rapidly	
Continue? If yes, proceed to avalanche activity data:				
When	Past	Recent	Current	Current+ Widespread+ Same as you+ Human/Natural+ Large
Number	None/Far	Many	Widespread	
Where	Far away	In Area	Same as you	
Triggers	Large	Human	Human/Natural	
Characteristics	Small	Med/Slabs	Large	
Continue? If yes, proceed to snowpack data:				
Avg Depth	>2.0m	1.5 - 2.0m	<1.5m	
Avg Strength	Strong	Moderate	Weak	
Variability from Avg Depth/Str	Uniform	Somewhat variable	Highly variable	
Strong over Weak layering	Little/None	Some	Pronounced	
Compress Test Rutschblock	CT 30+ RB 7	CT 20-30 RB 5-6	CT 10-20 RB 3-4	CT 0-10 RB 1-2
Danger Sign (cracking/whumphing)	Few/None Heavy trigger Localized Prop	Isolated Mod trig Mod prop	Widespread Light trigger Wide Prop	
Continue? If yes, proceed to weather data:				
Storm	None	Snow 1-2 cm/hr Winds move little snow in start zone. Cool and steady temps	Snow 2-3 cm/hr. Winds move some snow in start zone. Warm temps &/or rapid tem rise.	Snow 3+ cm/hr+. Winds move much snow in start zone+ vary warm temps &or rapid tem rise
Last NG Storm Ended	>48 hours ago	36-48 hours ago	<36 hours ago	
New Snow (12hrs)	< 15 cm	15-30 cm	> 30 cm	
Blowing Snow	None	Some recently	Much recently or currently	
Temps/Radiation	Cold – Cool None – Little	Cold – Warm Some	≥ 0 &or rapid rise Strong	
Continue? If yes, proceed to terrain data:				
Incline	<25	25-35	>35	
Aspect (wind Exposure)	Windward	Some cross/lee	Much cross/lee	
Trigger Points	None – Few	Some	Many	
Size of Traps	Small/None – Few	Moderate/Some	Large/Many	
Other Pertinent Data:				
	Go with normal caution	Consider Safer Options Go with increased caution	Consider Safest Options Travel not recommended on specific terrain or certain snowpacks	Travel not recommended
Discussion of go/no go (terrain/snowpack to avoid, human factors, etc.):				

Sky Condition

Class	Field Symbol	Data Code	Definition
Clear		CLR	No Clouds
Scattered		SCT	Partially Cloudy; half or less of the sky is covered with clouds (1/8 to ½)
Broken		BKN	Cloudy; more than half but not all of the sky is covered with clouds (>1/2, <1)
Overcast		OVC	The sky is completely covered (1)
Obscured		X	A surface based layer (e.g. fog) or a non-cloud layer (e.g. snowfall) prevents observer from seeing the sky
Valley Fog	VF	VF	Fog in valleys

Precipitation, Type & Intensity

Symbol & Data Code	Description
NIL	No Precipitation
R	Rain
S	Snow
RS	Mixed Rain and Snow
G	Graupel and Hail
ZR	Freezing Rain
Snowfall intensity (this system is open ended, any appropriate rate may be specified)	
S-1	Snow accumulates at a rate of < 1 cm per hour
S1	Snow accumulates at a rate of about 1 cm per hour
S2	Snow accumulates at a rate of about 2 cm per hour
S3	Snow accumulates at a rate of about 3 cm per hour
S10	Snow accumulates at a rate of about 10 cm per hour
RV	Very Light rain; would not wet or cover the surface regardless of duration.
RL	Light rain; accumulation of up to 2.5 mm of water per hour.
RM	Moderate rain; accumulation of 2.6 to 7.5 mm of water per hour.
RH	Heavy rain; accumulation of > 7.5 mm of water per hour.

Air Temperature

Symbol	Data Code	Description
	RR	Temperature rising rapidly >5º in last 3 hours.
	R	Temperature rising slowly 1 to 5º in last 3 hours.
	S	Temperature steady < 1º in last 3 hours.
	F	Temperature falling slowly 1 to 5º in last 3 hours.
	FR	Temperature falling rapidly >5º in last 3 hours.

Wind Direction (from)

N	NE	E	SE	S	SW	W	NW

Or use compass heading, in degrees magnetic.

Wind Speed

		Equivalent Measured Wind Speed		
Class	Data Code	Km/h	m/s	Typical indicator
Calm	C	0	0	No air motion. Smoke rises vertically
Light	L	1-25	1-7	Light to gentle breeze, flags and twigs in motion
Moderate	M	26-40	8-11	Fresh breeze; small trees sway. Flags stretched. Snow begins to drift.
Strong	S	41-60	12-17	Strong breeze; whole trees in motion; snow drifting.
Extreme	E	>60	>17	Gale force or higher.

Ridge Top Blowing Snow

Nil	No snow transport observed
Prev.	Snow transport has occurred since last observation but there is no blowing snow activity at the time of observation
M	Moderate snow transport
I	Intense snow transport
U	Unknown (dark, cloud or fog)

Forms of Snow Grains (F)

Symbol	Basic Classification	Data Code
+	Precipitation Particles (new snow “stellar”)	PP
/	Decomposing and Fragmented Particles	DF
●	Rounded Grains (monocrystaline)	RG
□	Solid Faceted Crystals	FC
∧	Cup Shaped Crystals (Depth Hoar, etc.)	DH
O	Wet Grains	WG
v	Feathery Crystals (Surface Hoar, etc.)	SH
■	Ice Masses	IM
	Surface Deposits and Crusts	CR
	Rime	rm
=	Rain crust	rc
-	Sun crust, firnspiegel	sc
∅	Wind crust	wc
∞	Melt Freeze crust	mfc

Snow Hardness (R)

Symbol	Hand Test	Term	Graphic Symbol
F	Fist in glove	Very low	
4F	Four fingers in glove	Low	/
1F	One finger in glove	Medium	X
P	Blunt end of pencil	High	//
K	Knife blade	Very high	
I	Too hard to insert knife	Ice	■

Liquid Water Content (θ)

Class	Definition	Water Content (by volume)	Graphical Symbol	Code
Dry	Usually the snow temp (T) is below 0^o C but dry snow can occur at any temp up to 0^o C. Disaggregated snow grains have little tendency to adhere to each other when pressed together, as in making a snowball.	0%		D
Moist	T=0^o C. The water is not visible even at 10 x mag. When lightly crushed, the snow has a distinct tendency to stick together.	<3%	|	M
Wet	T=0^o C. The water can be recognized at 10 x mag by its meniscus between adjacent snow grains, but water cannot be pressed out by moderately squeezing the snow in the hands (Pendular regime)	3-8%	||	W
Very Wet	T=0^o C. The water can be pressed out by moderately squeezing the snow in hands, but there is an appreciable amount of air confined within the pores (Funicular regime).	8-15%	|||	V
Slush	T=0^o C. The snow is flooded with water and contains relatively small amount of air.	>15%	||||	S

Density (ρ)

$\rho = \frac{\text{Weight (g)}}{\text{Volume (cm}^3\text{)}} \times 1{,}000$	Weight of snow in full sampling tube, divided by volume of tube times 1,000

Weather Observations

Date	011214			
Time	0730			
Location	Base			
Elev(m)	2100			
Aspect	S			
Precip	S1			
Wind	Nil			
BloSnow	M S			
Sky	⊗			
Bpres(inHg)	23.00			
Temp(°C)	3			
Tsurf(°C)	-1			
T10(°C)	0			
Surf	+			
Density	U			
HS(cm)	120			
HN(cm)	12			
Hst(cm)	37			
FootPen(cm)	30			
Comments ~ no observ o no measur	Still storming			

Snow Profile

Snow Profile	Observer: Culp CA	Type: Test	
Date: 011213	Time: 1430	Sky: ⊕	Wind: M S
Loc: Leavitt Creek	Ele: 2640	Precip: NIL	AirT: 4
Aspect: 0	Incline: 0	FootPen: 25	Surface: -2

H (cm)	θ	F	E (mm)	R	ρ Kg/m³	Comments/Shears	H (cm)	T (°C)
122	D	+\	2				122	-2.0
	M	•	1	F	10		112	-3.0
104			1+	1F			110	-3.0
				4F	22		100	-4.0
87				1F			90	-3.5
				P@78	32		80	-3.0
52				P			70	-3.5
				P	26		60	-3.0
33				P-			50	-2.5
				P	32		40	-1.5
17				P			30	|
		•		P+			20	|
12		⋀		P+			10	-1.5
				P+			0	.5
3				K				
		□•		K				
0				K				
						Solid Snow Pack no Shears		

Stability Tests

Incline:
Aspect:
Elevation:

Terrain:
Snow Pack:
Slab Hardness:

Failure Depth:
Displacement:
Score(s):

Shovel Sheer Test Table (30x40cm)			
Term	**Description**	**Equivalent Shear Strength (N/M3)**	**Data Code**
Very Easy	Fails during cutting or insertion of shovel	<100	STV
Easy	Fails with minimum pressure	100-1000	STE
Moderate	Fails with moderate pressure	1001-2500	STM
Hard	Fails with firms sustained pressure	2501-4000	STH
Collapse	Block settles when cut		STC
No Shear	No shear failure observed		STN

Shovel Compression Test Table (30x30cm)		
Term	**Description**	**Data Code**
Very Easy	Fails during cutting.	CTV – CT 0
Easy	Fails with 5 to 10 light taps using the finger tips	CTE – CT #
Moderate	Fails with 5 to 10 moderate taps from elbow using palm	CTM
Hard	Fails with 5 to 10 taps from whole arm using fist	CTH
No Failure	Does not fail	CTN

Rutschblock Test Table (190/200x150x150cm)		
Field Score	**Loading step producing a clean shear failure occurs.**	**Data Code**
1	The block slides while cutting the back.	RB1
1	The block slides while skier approaches from above.	RB1
2	The skier gently steps down onto the upper part of the block (within 35cm of the upper wall).	RB2
3	W/O lifting the heels, the skier drops from straight leg to bent knee position, pushing downwards and compacting surface layers.	RB3
4	The skier jumps up and lands in the same compacted spot.	RB4
5	The skier jumps again onto the same compacted spot.	RB5
6	For hard or deep slabs, remove skies and jump on the same spot.	RB6
6	For soft or shallow slabs, where jumping w/o skies might penetrate through the slab, keep the skis on, step down another 35cm, almost to mid-block, push once then jump three times.	RB6
7	None of the loading steps produced a smooth slope-parallel failure.	RB7

RB 1-3 or CT 0-10 = significant avalanche danger on similar slopes, skier triggering likely
RB 4-5 or CT 11-20 = some avalanche danger on similar slopes, skier triggering possible
RB 6-7 or CT 21-30 = lesser avalanche danger on similar slopes, skier triggering unlikely but still possible

Avalanche Observations

Observer				
Location				
Occurrence				
Date				
Time				
Path/Loc				
Aspect				
Start Zone Elevation				
Size				
Type Moisture				
Comments				

Size		**Trigger**		**Liquid Water Content**	
0	No Avalanche	N	Natural	D	Dry
1	Sluff	X	Explosives	M	Moist
2	Could injure a person	S	Skier	W	Wet
3	Could destroy cars/trees	M	Snowmobiles	U	Unknown
4	Could destroy buildings/forest	V	Over the snow vehicles		
5	Could destroy village/large forest	U	Unknown	**Type**	
		O	Other	L	Loose
Terminus				S	Slab
SZ	Start zone	**Bed surface**		U	Unknown
TK	Track	S	Storm Snow		
TR	Top run out	O	Old Snow	**Start Location**	
MR	Middle run out	G	Ground	T	Top of start zone
BR	Bottom run out	U	Unknown	M	Middle of start zone
U	Unknown			B	Bottom of start zone
TP	Top path			U	Unknown
MP	Middle path				
BP	Bottom path				

Danger Scale

Rating	Trigger	Size	Action
Low (Green)	Naturally triggered slab avalanches highly unlikely. Human triggered avalanches are unlikely.	Very small avalanches. Unlikely to bury or injure people except in significant terrain traps.	Travel is generally safe. Use normal caution.
Moderate (Yellow)	Naturally triggered slab avalanches unlikely. Human triggered slab avalanches are possible.	Small avalanches. Could bury or injure people, especially in terrain traps.	Exercise caution on steeper terrain or hazardous aspects.
Considerable (Orange)	Naturally triggered slab or loose snow avalanches are possible. Human triggered slab avalanches are probable.	Medium size avalanches. Will bury or injury people in terrain traps.	Exercise increasing caution. Avoid steeper terrain or hazardous aspects.
High (Red)	Naturally triggered avalanches are likely. Human triggered slab or loose snow avalanches are certain.	Large avalanches. Will bury or injure people.	Travel in avalanche terrain is not recommended. Stay on windward ridges or low angle slopes without steeper terrain above.
Extreme (Black)	Widespread naturally and human triggered avalanches are certain.	Very large avalanches. Burial, serious injury, or death are certain.	Travel in and near avalanche terrain should be avoided. Stay on flat ground well away from avalanche paths.