

# The Alaska Avalanche Fieldbook

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PHONE \_\_\_\_\_

DATES:

FROM \_\_\_\_\_

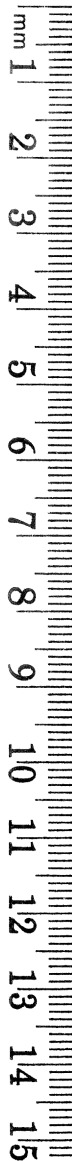
TO \_\_\_\_\_



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907-523-8900

This book follows the format we use in our avalanche courses. Updates, ordering information, and detailed handouts on snow stability evaluation and how to use this book are on our website - <http://www.akavalanches.com>

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## DECISION-MAKING CHECKLIST (TALLY + 0 - FACTORS)

- **TERRAIN** (+ 0 - USING TERRAIN CLASSIFICATION)
- **SNOWPACK** (+ 0 - USING ROADMAP & STABILITY WHEEL)
- **WEATHER** (+ 0 - WITH RESPECT TO STABILITY)
- **HUMAN** (+ 0 - WILL CHANGE WITH TIME AND SITUATION)

## STABILITY EVALUATION ROADMAP

### 1. STABILITY 1 - OBSERVATIONS

#### • SIGNS OF INSTABILITY

- AVALANCHE ACTIVITY
- WHOOMPING, COLLAPSE
- HOLLOW SOUNDS
- SHOOTING CRACKS
- RECENT HEAVY SNOW
- RAIN OR THAW
- WIND LOADING

#### • TALLY # OUT OF 7 SIGNS.

#### • WEIGHT MAGNITUDE & SIGNIFICANCE.

### 2. STABILITY 2 - SLOPE & TRAVELING TESTS

#### • EVALUATE SITES, 5 FACTORS

1. ANGLE
2. ASPECT
3. ELEVATION
4. LOADING
5. RISK

#### • TESTS, SAMPLE QUICKLY & WIDELY

- SLOPE CUT (SC)
- DRIFT, CORNICE
- SWITCHBACK
- PARALLEL TRACKS
- PROBING
- POTATO CHIP TEST (PCT)
- HAND SHEAR
- NO EXCUSE BLOCK (NE)

### 3. STABILITY 3 - SNOWPITS

#### • QUICK PIT CHANT:

1. PICK SITE (5 FACTORS).
2. LAY OUT BLOCK TESTS.
3. DIG IT.
4. SMOOTH IT.
5. BRUSH IT.
6. POKE IT:
  - \* PICK OUT LAYERS
  - \* HARDNESS
  - \* GRAIN TYPE
  - \* MOISTURE

- \* GRAIN SIZE
- \* TEMPERATURE
- 7. PREDICT IT (5 LEMONS):
  - \* WEAK LAYER THICKNESS  $\leq$  10cm
  - \* WEAK LAYER GRAINS PERSISTENT
  - \* INTERFACE GRAIN SIZE DIFF  $\geq$  1mm
  - \* INTERFACE HARDNESS DIFF.  $\geq$  1 STEP
  - \* INTERFACE  $\leq$  1m DEEP
- 8. PREDICT IT (6 YELLOW FLAGS):
  - \* WEAK LAYER GRAIN SIZE  $>$ 1 mm
  - \* WEAK LAYER HARDNESS  $<$  1F
  - \* WEAK LAYER GRAINS PERSISTENT
  - \* INTERFACE GRAIN SIZE DIFF.  $>$  0.5 mm
  - \* INTERFACE HARDNESS DIFF.  $>$ 1 STEP
  - \* INTERFACE 20-85cm DEEP
- 9. SHEAR IT (KEY TESTS):
  - \* AK BLOCK, contact length x table value (AK)
  - \* RUTSCHBLOCK (RB), 2.0 x 1.5 m
  - \* JUMP, rough size to testers
  - \* COMPRESSION (CT), STUFFBLOCK (SB), 30 x 30 cm
  - \* EXTENDED COLUMN (ECT), 90 x 30 cm
  - \* PROPAGATION SAW (PST), 30 x 100 cm, WL depth if  $>$ 10
  - \* SHOVEL (ST), 30 x 30 cm
  - \* SHEAR QUALITY (OPTIONAL - FRACTURE CHARACTER):
    - Q1 - FAST, USUALLY CLEAN SHEAR
    - Q2 - AVERAGE SHEAR
    - Q3 - IRREGULAR, INCOMPLETE, SLOW
    - SP/SC - SUDDEN PLANAR/COLLAPSE
    - PC - PROGRESSIVE COMPRESSION,
    - RP - RESISTANT PLANAR or BRK - BREAK
  - \* POTATO CHIP TEST (PCT), undermine ski pole, arm length
- 10. MOVE ON, sample widely, continue to evaluate & re-evaluate.

#### 4. USE STABILITY WHEEL TO EVALUATE:

- **STRENGTH - STRESS (+, 0, -)**
  - BLOCK TESTS (STRENGTH & STRESS)
  - OBSERVATIONS
    - \* WEAKEST LAYER?
    - \* HOW WEAK?
    - \* DEPTH & DISTRIBUTION?
  - LOADING RATE & AMOUNT (STRESS)
- **ENERGY (+, 0, -)**
  - Q SCORES
  - SHOOTING CRACKS
- **STRUCTURE (+, 0, -)**
  - POTATO CHIP TEST
  - LEMONS & YELLOW FLAGS (SLAB, WEAK LAYER, BED)

#### WEATHER OBSERVATIONS

- SKY (○ CLR, ☁ FEW, ☁ SCT, ☁ BKN, ☁ OVC, ☁ X, OBSCURED, FOG)
- PRECIPITATION TYPE, RATE, & AMOUNT
- TEMPERATURE & SNOW LEVEL
- WIND DIRECTION & SPEED
- TREND

#### PIT PROFILE

- HARDNESS impenetrable I, knife K, pencil P, 1 finger 1F, 4 finger 4F, & fist F
- LEMONS, FLAGS, & TESTS: arrow to layer, note bottom of test block
- DATES & WEATHER EVENTS for marker layers (if known)
- GRAIN TYPE, key classes & subclasses first, others optional, size, moisture, temperature, density if measured, other features as needed

#### MOISTURE CONTENT $\theta_w$

- DRY (no one-handed snowball)
- MOIST (makes snowball)
- WET (makes wet snowball, FROZEN if refrozen)
- VERY WET (makes your gloves wet, FROZEN if refrozen)
- SLUSH (saturated, FROZEN if refrozen)

#### BASIC GRAIN SYMBOLS (F - Key classes & subclasses.)

- ✦ new snow (precipitation particles)
- ⚡ graupel (subclass)
- ∇ rime (subclass)
- ⚡ early rounds (partly decomposed pp's, subclass)
- ⚡ broken grains (precipitation particles, subclass)
- rounded grains (intermediate or advanced)
- ⚡ wind packed (subclass)
- ⊖ faceting rounded grains (subclass)
- ⊖ faceted grains (solid)
- ⊖ near surface faceted grains (subclass)
- ⊖ rounding faceted grains (subclass)
- ∧ faceted grains (depth hoar)
- ∇ surface hoar
- melt forms
- ⊖ melt-freeze crust
- ⊖ faceted melt forms (graphic notation)
- ⊖ faceted melt forms (tabular notation)
- ⊖ faceted melt-freeze crust
- ▬ ice formations

## COMPRESSION (TAP) TEST SCALE

- **CT**, 30 x 30 cm.
- VERY EASY fractures when cut, CTV. EASY taps from wrist, CTE 1 to 10.
- MODERATE taps from elbow, CTM 11 to 20.
- HARD taps from shoulder, CTH 21 to 30; or no fracture, CTN.
- Note angle, layer, shear quality.
- Example: CTM 18 Q2 39°; add on + 2.0 mm ↓ 28 cm if not in pit notes.

## LARGE BLOCK TEST SCALE

- **RB** 2 m across x 1.5 m on slope, **AK** contact length across x table value on slope.
  - 1 Fractures during setup.
  - 2 On approach, first gentle load, or shear push.
  - 3 On knee flex.
  - 4 On first gentle jump.
  - 5 On second hard jump.
  - 6 AK On three vertical jumps at top, RB step down to mid-block.
  - 6.5 AK Three hard “shear kick” jumps.
  - 7 No fracture.
- AK - note angle, layer, shear quality, propagation as % of block released,
- RB - add tester weight, note release type as WB whole block, MB most of block, or EB edge of block.
- Example: AK3 Q2 34° 100%; add on ▣ ↓ 48 cm if not in pit notes.

## EXTENDED COLUMN TEST

- **ECT**, 90 cm across x 30 on slope.
- Load at one end with taps on shovel as for compression test.
- n = number of taps on which fracture initiates.
- ECTP # = to end on one or two taps, # is tap initiating fracture.
- ECTN # = little or no propagation on #th or #th +1 tap.
- ECTPV = fracture during setup; ECTX = no initiation or propagation.
- Note angle & layer if not in pit profile, note shear quality.
- Propagation likely if fracture to end on any tap or that tap plus 1.
- Example: ECTP 8 Q1; add 42° on ▣ ↓ 51 cm if not in pit notes.

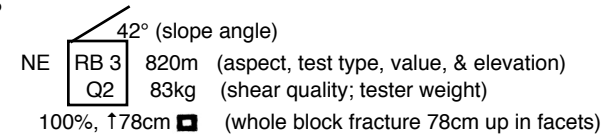
## PROPAGATION SAW TEST

- **PST**, 30 cm across x 100 cm (WL depth if >100 cm) on slope.
- Identify weak layer using other tests. Dig well beyond WL.
- Clear side and bottom. Cut other two sides with saw, cord, or shovel.
- Blunt edge of saw follows weak layer upslope.
- Note as: PST x/y (arr, sf, end) on YYMMDD date of weak layer if known.
- x = cut length where fracture initiates.
- y = block length (100 cm or WL depth if WL depth >100 cm).
- Arr = fracture arrested before end of column.
- SF = slab fracture, fracture broke out as slab before end of block.
- End = fracture propagated to end of block.
- Note x/y (Arr, SF, End), layer depth, date; grain type, angle.
- Propagation likely if <50% of block is cut when fracture propagates to end.
- Example: PST 35/100 (End) down 43 cm on 090203; optional on ♥ 40°.

## STUFFBLOCK TEST SCALE

- **SB**, 30 x 30 cm, 4.5 kg snow in stuffsack.
- SBV fractures during isolation/cutting.
- SB0 fractures on static load (no drop).
- EASY, drop snow bag onto shovel, +10 cm, SB10 to 20.
- MODERATE, SB 30 to 40.
- HARD, SB 50 to 70, or no fracture SBN.
- Note angle, layer, shear quality.
- Example: SB30 Q2 36°; add on ▣ ↑ 60 cm if not in pit notes.

## SHEAR NOTES



## AVALANCHE CLASSIFICATION, BASIC CATEGORIES, U unknown, O if other

- TYPE: L loose (point release), WL wet loose, SS soft slab, HS hard slab, WS wet slab, I ice avalanche, SF slush flow, C cornice, R roof, U unknown
- TRIGGER:
  - N - NATURAL (C cornice, E earthquake, I ice, L loose, S slab, R rock, O other, U unknown)
  - A - ARTIFICIAL, HUMAN OR VEHICLE - (add c if intentional, u if unintentional, r if remote, y if sympathetic) S skier, R boarder, I snowshoer, F foot, C human-triggered cornice; M snowmachine, K snowcat, V other vehicle, U unknown
  - A - ARTIFICIAL, EXPLOSIVES, & MISC. - A artillery, E hand charge, L avalauncher, B airblast, C cornice, X gas exploder, H helicopter, P preplaced remote detonation, W wildlife, U unknown, O other
- RELATIVE SIZE: R1 (small) to R5 (large), based on path capability
- DESTRUCTIVE SIZE:
  - D1 - relatively harmless to people; <10 tons; ~10 m long
  - D2 - could bury, injure, or kill a person; ~10<sup>2</sup> tons; ~100 m long
  - D3 - could bury and destroy a car, damage a truck, destroy a wood frame house, or break a few trees; ~10<sup>3</sup> tons; ~1,000 m long
  - D4 - could destroy a railway car, large truck, several buildings, or a substantial amount of forest; ~10<sup>4</sup> tons; ~2,000 m long
  - D5 - could gouge the landscape, largest snow avalanches known; ~10<sup>5</sup> tons; ~3,000 m long
- BED SURFACE: S within storm snow, I at new/old snow interface, O in old snow, G ground, glacier, or firn, U unknown
- ALSO NOTE: date and time, elevation range, slab thickness, width and length, aspects and angles, slab, weak layer, and bed surface

## BASIC DECISIONMAKING - ALP TRUTH

AVALANCHES  
LOADING  
PATH  
TERRAIN TRAP  
RATING  
UNSTABLE SNOW  
THAW

## RISK MANAGEMENT

- TIMING
- COMPANION CHOICE.
- BEACON, PROBE, SHOVEL, HELMET, AID KIT.
- SLOPE ANGLES & RUNOUTS
- RIDGES & CORNICES.
- CONSEQUENCES, TERRAIN TRAPS.
- ISLANDS OF "SAFETY"
- SUBTLE CLUES.
- CLIMBING VERSUS DESCENDING.
- MODE OF TRAVEL, SPEED.
- ESCAPE ROUTES, ALTERNATIVES, SLUFFS.
- ONE AT A TIME, NOT ABOVE OR UNDER OTHERS.
- COMMUNICATION, TEAMWORK ARE KEY!

## RESCUE

1. "SCENE SAFETY", CALL FOR HELP IF
  - IT WILL NOT CAUSE DELAY.
  - SCENE IS "UNSAFE".
2. LEADER & PLAN
3. INITIAL SEARCH
  - VISUALS - CALL OUT.
  - CLUES- CALL OUT, DON'T MOVE.
  - SPOT PROBE LIKELY AREAS.
  - BEACONS - AT SAME TIME.
4. BEACON SEARCH
  - SIGNAL - ONE/TWO FISHING BOAT LENGTH WORKING RANGE
  - COARSE -FLUX LINES TO LAST FEW METERS
  - FINE - FINE FLUX LINE THEN BRACKET; MAKE A CROSS.
  - PINPOINT WITH PROBE, SPIRAL OUT.
5. DIG DOWNHILL OF PROBE, IF SOLO LENGTH 1.5 x DEPTH; IF TEAM USE WEDGE, SLOPE TO VICTIM, PADDLE SNOW, ROTATE.
6. PROBING - 3 HOLE, BACKCOUNTRY/ORGANIZED RESCUE
  - FINGERTIP TO FINGERTIP/ WRIST TO WRIST
  - HEELS 15 CM AHEAD OF HOLES/ EVEN WITH.
  - 50cm (20"), 75cm (30") x 70cm (28")/50cm (20") ALL
7. VEHICLE - FINGERTIPS, 3 STRIDES, ONE HOLE.

## EMERGENCY MEDICAL QUICK REFERENCE NOTES

**PYRAMID** SCENE "SAFETY"  
INITIAL ASSESSMENT; ABCDEE  
F FOCUSED EXAM, G GET VITALS, H HISTORY.

**SCENE SURVEY/SAFETY** YOU, PARTNER, OTHERS, PATIENT  
MOI (MECHANISM OF INJURY)  
#  
IMPRESSION

**INITIAL ASSESSMENT** RESPONSIVENESS  
ID  
CONSENT  
A - AIRWAY  
B - BREATHING  
C - CIRCULATION  
D - DISABILITY  
EE - EXPOSE & ENVIRONMENT

**F Focused Exam** HEAD TO TOE  
ARMS  
BACK

**G Get Vitals** LOC: A - A & O, PERSON, PLACE, TIME, EVENTS  
V - VERBAL  
P - PAIN  
U - UNRESPONSIVE  
HR - HEART RATE, QUALITY, & RHYTHM  
RR - RESPIRATORY RATE, QUALITY, & RHYTHM  
SCTM - SKIN COLOR, TEMPERATURE, & MOISTURE  
BP - PEDAL > RADIAL > OK > CAROTID LAST  
P - PERRL: PUPILS EQUAL, ROUND, REACTIVE TO LIGHT  
T - TEMPERATURE

**H - History** S SIGNS & SYMPTOMS: ONSET, PALLIATIVE, QUALITY, RADIATING, SEVERITY, TIME  
A - ALLERGIES  
M - MEDICATIONS  
P - PAST (HISTORY)  
L - LAST INTAKE/OUTPUT  
E - EVENTS

**SOAP Note** S - SUBJECTIVE  
AGE  
SEX  
CC CHIEF COMPLAINT  
MOI/HPI  
DENIES SPINAL PAIN/TENDERNESS OR LOSS OF CONSCIOUSNESS, IF SO.  
CURRENTLY A&Ox4 OR...

O - OBJECTIVE  
PT EXAM REVEALS...  
VITALS: TIME  
LOC  
HR  
RR  
SCTM  
BP  
P  
SAMPLE

A - ASSESSMENT  
P - PLAN  
A - ANTICIPATED PROBLEMS

## AK BLOCK SIZING TABLE

Dec 2010	WT lbs	264	253	242	231	220	209	198	187	176	165	154	143	132	121	110	99	
	WT kg	120	115	110	105	100	95	90	85	80	75	70	65	60	55	50	45	
Area m <sup>2</sup>		3.30	3.17	3.03	2.89	2.75	2.62	2.48	2.34	2.20	2.06	1.93	1.79	1.65	1.51	1.38	1.24	
AK Block Width in meters, same as contact length. Move decimal 2 places right for cm.	1.00	3.3	3.2	3.0	2.9	2.8	2.6	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.5	1.4	1.2	
	1.10	3.0	2.9	2.8	2.6	2.5	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.4	1.3	1.1	
	1.20	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.1	1.0
	1.25	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0
	1.30	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9
	1.35	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
	1.40	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
	1.45	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7
	1.50	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6
	1.55	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5
	1.60	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5
	1.65	2.0	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6
	1.70	1.9	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	0.9	0.8	0.7	0.6
	1.75	1.9	1.8	1.7	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5
	1.80	1.8	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	0.9	0.8	0.7	0.6	0.5
	1.85	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.6	0.5
1.90	1.7	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6	0.5	
1.95	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.5	
2.00	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.6	0.5	
2.05	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.6	0.5	
2.10	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.5	

AK Block height in m, choose from closest weight column. Weight is without gear or clothing.  
Move decimal 2 places right for cm.

## Avalanche Terrain Classification

20081212 Draft, Adapted by Alaska Avalanche Specialists from Parks Canada Model

Terrain Complexity Factors	Class 1 +	Class 2 0	Class 3 -
Route Options or Alternatives	Numerous, terrain allows multiple choices.	A selection of choices of varying exposure, options to avoid avalanche paths.	<i>Limited chances to reduce exposure, avoidance not possible.</i>
Slope Angle	Angles generally < 30°.	<i>Mostly low angle, isolated slopes &gt; 35°.</i>	<i>Variable, with many &gt; 35°.</i>
Terrain Traps & Consequences	Minimal, some creek slopes or cutbanks.	<i>Some depressions, gullies or hollows, and/or avalanche terrain above, trees, brush, cliffs, rocks, narrows creeks, or water with some good escape routes or "islands of safety".</i>	<i>Many depressions, gullies or hollows, cliffs, hidden slopes above gullies, cornices, trees, brush, cliffs, rocks, narrows, creeks, or water with few escape routes or "islands of safety".</i>
Avalanche Frequency	30 year return, ≥ D2 size.	Yearly for < D2 size. <i>3 year return for ≥ D2 size.</i>	Yearly for < D3 size. <i>Yearly for ≥ D3 size.</i>
Interaction with Paths	Runout zones only.	Single path or paths with separation.	<i>Numerous and overlapping paths.</i>
Exposure Time	None, or limited exposure crossing runouts only.	<i>Isolated exposure to start zones and tracks.</i>	<i>Frequent exposure to start zones and tracks.</i>
Glaciation	None or smooth.	<i>Generally smooth with isolated bands of crevasses.</i>	<i>Broken or steep sections of crevasses, icefalls or serac exposure.</i>
Start Zone Density	Limited starting zone terrain.	Some start zones; isolated avalanche paths leading to valley bottom.	Large expanses of start zones; multiple paths leading to valley bottom.
Runout Zone Characteristics	Solitary, well-defined areas, smooth transitions, spread deposits.	Abrupt transitions or depressions with deep deposits.	Multiple converging runout zones, confined depositions area, steep tracks overhead.
Slope Shape	Uniform.	Some convexities.	Convoluted.

**Notes:**

Terrain may fit into multiple classes. Consider all variables; note default properties indicated by *bold italics*. Those properties automatically default into that or higher class. Non-italicized descriptors carry less weight.