

# The Alaska Avalanche Fieldbook

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PHONE \_\_\_\_\_

DATES:

FROM \_\_\_\_\_

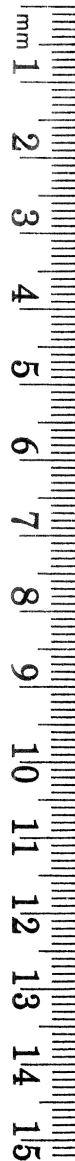
TO \_\_\_\_\_



PO Box 22316  
Juneau, Alaska 99802  
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
- GRAIN SIZE

- MOISTURE
- 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 (AK), contact length x table value for weight
  - COMPRESSION (CT), STUFFBLOCK (SB), 30 x 30 cm
  - SHOVEL TILT, top layers on shovel; tilt & tap
  - EXTENDED COLUMN (ECT), 90 x 30 cm
  - SHEAR QUALITY (FRACTURE CHARACTER; OPTIONAL):
    - Q1 - FAST, CLEAN SHEAR (SP/SC - SUDDEN PLANAR/ COLLAPSE)
    - Q2 - AVERAGE SHEAR (RP - RESISTANT PLANAR)
    - Q3 - IRREGULAR, INCOMPLETE, SLOW (PC - PROGRESSIVE COMPRESSION; BRK - BREAK)
    - PROPAGATION SAW (PST), 30 x 100cm, WL depth if  $>$ 100
  - RUTSCHBLOCK (RB), 2.0 x 1.5 m
  - JUMP, rough size block to testers
- 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
  - PROPAGATION IN TESTS
- **STRUCTURE (+, 0, -)**
  - POTATO CHIP TEST
  - LEMONS & YELLOW FLAGS (SLAB, WEAK LAYER, BED)
  - PROPAGATION IN TESTS

#### 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 key identifiable layers
- GRAIN TYPE & SIZE, key classes & subclasses, others optional; moisture, temperature, density & other factors 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

## 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, moderate jump.
  - 5 On second, hard jump.
  - 6 AK on three hard 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  $\blacksquare$  ↓ 48 cm if not in pit notes.

## 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.

## EXTENDED COLUMN TEST

- **ECT**, 90 cm across x 30 on slope.
- Load at one end with taps on shovel as for compression test.
- 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  $\blacksquare$  ↓ 51 cm if not in pit notes.

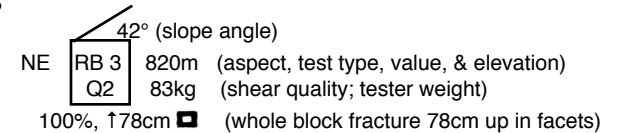
## PROPAGATION SAW TEST

- **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 YYYYMMDD 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  $\blacktriangledown$  40°.

## STUFFBLOCK TEST SCALE

- **SB**, 30 x 30 cm, 4.5 kg snow in stuffsack.
- SBV fractures during isolation/cutting.
- SBO 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  $\blacksquare$  ↑ 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.**

**Avalanche Terrain Classification**

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

Terrain Complexity Factors	Class 1 +	Class 2 0	Class 3 -
<b>Route Options or Alternatives</b>	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>
<b>Slope Angle</b>	Angles generally < 30°.	<i>Mostly low angle, isolated slopes &gt; 35°.</i>	<i>Variable, with many &gt; 35°.</i>
<b>Terrain Traps &amp; Consequences</b>	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>
<b>Avalanche Frequency</b>	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>
<b>Interaction with Paths</b>	Runout zones only.	Single path or paths with separation.	<i>Numerous and overlapping paths.</i>
<b>Exposure Time</b>	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>
<b>Glaciation</b>	None or smooth.	<i>Generally smooth with isolated bands of crevasses.</i>	<i>Broken or steep sections of crevasses, icefalls or serac exposure.</i>
<b>Start Zone Density</b>	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.
<b>Runout Zone Characteristics</b>	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.
<b>Slope Shape</b>	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.

## 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		
<b>AK Block Width in meters, same as contact length.</b> Move decimal 2 places right for cm. <b>AK Block height in m, choose from closest weight column. Weight is without gear or clothing.</b> 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	1.0
		1.20	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	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	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5
		1.70	1.9	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	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	1.1	1.0	0.9	0.8	0.7	0.6
		1.80	1.8	1.8	1.7	1.6	1.5	1.5	1.4	1.3	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	1.0	0.9	0.8	0.8	0.7	0.6	0.5	0.4
		2.00	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.5	0.4
		2.05	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.1	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.5	0.4
2.10	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.6	0.5	0.4		

## EMERGENCY MEDICAL QUICK REFERENCE NOTES

- PYRAMID**
- LEVEL 1 - SCENE SIZE-UP
  - LEVEL 2 - LIFE THREATS, **ABCDEE**
  - LEVEL 3 - **F** FOCUSED EXAM (HEAD TO TOE), **G** GET VITALS, **H** HISTORY.
  - LEVELS 4 & 5 - PROBLEM LIST & PLAN; MONITOR
- **SCENE SIZE UP/HAZARDS**
    - YOU, PARTNER, BYSTANDERS, PATIENT
    - MOI /HPI (MECHANISM OF INJURY/HISTORY OF PRESENT ILLNESS)
    - BSI (BODY SUBSTANCE ISOLATION)
    - # OF VICTIMS
    - GENERAL IMPRESSION
  - **INITIAL ASSESSMENT**
    - ID SELF & OBTAIN CONSENT
    - ESTABLISH RESPONSIVENESS & SPINAL CONTROL
    - **A** - AIRWAY
    - **B** - BREATHING
    - **C** - CIRCULATION
    - **D** - DISABILITY DECISION
    - **EE** - ENVIRONMENT/EXPOSE
  - **F Focused Exam**
    - HEAD TO TOE
    - ARMS
    - BACK
  - **G Get Vitals**
    - LOR:
      - **A** - A & O, PERSON, PLACE, TIME, EVENTS
      - **V** - VERBAL
      - **P** - PAIN
      - **U** - UNRESPONSIVE
    - HR - HEART RATE, RHYTHM & QUALITY
    - RR - RESPIRATORY RATE, RHYTHM & QUALITY
    - SCTM - SKIN COLOR, TEMPERATURE, & MOISTURE
    - BP - PEDAL > RADIAL > OK > CAROTID LAST
    - P - PERRL: PUPILS EQUAL, ROUND, REACTIVE TO LIGHT
    - T - TEMPERATURE
  - **H - History**
    - AGE
    - SEX
    - CC (CHIEF COMPLAINT)
    - MOI/HPI
    - S SIGNS/SYMPOMS: (MED: ONSET, PALLIATIVE, QUALITY, RADIATING, SEVERITY, TIME)
    - A - ALLERGIES
    - M - MEDICATIONS
    - P - PERTINENT HISTORY (INCLUDE **OPQRST** IF MEDICAL)
    - L - LAST INTAKE/OUTPUT
    - E - EVENTS
  - **SOAP Note**
    - S - SUBJECTIVE (AGE, SEX, CC CHIEF COMPLAINT, MOI/HPI)
    - O - OBJECTIVE
      - HEAD TO TOE EXAM
      - VITALS:
        - TIME
        - LOR
        - HR
        - RR
        - SCTM
        - BP
        - PUPILS
        - T°
      - HISTORY - **SAMPLE** (INCLUDE **OPQRST** IF MEDICAL)
    - A - ASSESSMENT
    - P - PLAN
    - A - ANTICIPATED PROBLEMS