? BRMRG

BASIC VERTICAL SKILLS
Classroom Training

I. PURPOSE

A. Basic Vertical Equipment

1. Software

a. rope

b. webbing

2. Hardware

a. carabiners

b. descenders

c. ascenders

B. Minimal Personal Skills

1. Basic knots

2. Harnesses

C. Special Considerations in Rescue

1. Loads

2. Weather conditions

3. Constraints

a. experience

b. fatigue

c. quality of rock, anchors, etc.

4. Extra caution

II. SAFETY

A. Proper Equipment

B. Proper Training

C. Equipment Check

D. Backups

E. Double Checking

III. EQUIPMENT

A. Software

1. Materials

a. nylon/Perlon

b. tenstron

c. everything else

2. Construction

a. laid

b. kernmantel

c. braided

d. woven

3. Design requirements

a. static vs dynamic loads

b. linear vs non-linear stretch

c. strength

d. abrasion resistance

e. handling (friction, flexibility, weight)

f. water absorption

g. chemical resistance

h. heat resistance (storage, use)

i. radiation resistance

4. Strength factors

   a. material

   b. construction

   c. size/number of yarns

   d. age

   e. wear (50% rule)

   f. damage

   g. knots/bends (50% rule)

   h. sunlight

   i. temperature

   j. water

5. Care & feeding

   a. storage (dry, cool, dark)

   b. inspection (after use, during use)

   c. use (chemicals, light, mechanical damage)

   d. washing/drying

   e. retiring

B. Hardware

1. Materials

   a. steel

   b. aluminum alloy

2. Construction

   a. casting

   b. machining

3. Design requirements

   a. strength

   b. weight

4. Strength factors

a. material

b. construction

c. flaws

d. wear

e. damage

f. temperature

5. Care & feeding

a. storage

b. inspection

c. handling

d. don't oil

IV. ROPES (w/examples)

A. Laid vs. Kernmantle

1. Goldline

a. high linear stretch (climbing)

2.Mammut

a. non-linear stretch (climbing)

B. Climbing vs. Caving

1. Bluewater II

a. low linear stretch (caving)

2. PMI

a. high abrasion resistance, low stretch (caving)

V. WEBBING (w/examples)

A. "Tubular"

1. Helical woven

2. Edge stitched

B. Flat

1. Climbing

2. Straps

C. Uses

1. Harnesses

2. Protection (climbing)

3. Anchors (cllimbing)

VI. KNOTS (w/demonstration & practice)

A. Nomenclature

1. Knot

2. Bend

3. Standing line (line, rope)

4. Running end (bitter end, end)

5. Bight

6. Loop

B. Backups

1. Overhand knot (minimum)

2. Barrel/double fishermans knot (recommended)

C. Basic Knots

1. Square/reef knot (seat harnesses)

a. joining ends

b. not for load-bearing

c. granny knot

2. Figure 8

a. rope end loops (harness tie-in)

b. stopper knots

3. Ring/overhand bend/water knot

a. webbing loops

4. Simple bowline

a. secure loops

b. good for variable strain

5. Bowline-on-a-coil

a. direct rope tie-in

VII. HARNESSES (w/examples)

A. Purpose

1. Comfort

2. Safety

a. chest compression

3. Efficiency

4. Ascender/descender connection

B. Seat harnesses (should also have chest harness)

1. Direct tie-in

2. Swami belt

3. Belt + leg loops

4. Commercial

5. Home made

a. sewn

b. tied (w/demonstration & practice)

C. Chest harnesses (not used w/o seat harness)

1. Commercial

2. Home made

a. sewn

b. tied (w/demonstration & practice)

3. Special purpose

   a. chest box

   b. Simmons roller

REFERENCES

1. William Halliday; American Caves and Caving; Harper & Row

2. Harvey Manning (Ed.); Mountaineering The Freedom of the Hills; Seattle Mountaineers

3. Neil Montgomery; Single Rope Techniques; Sydney Speleological Society

4. Tim Setnicka; Wilderness Search and Rescue; Appalachian Mountain Club

5. Walt Wheelock; Ropes, Knots and Slings for Climbers; La Siesta Press

6. Toni Williams (Ed.); Manual of U.S. Cave Rescue Techniques; National Speleological Society

7. Equipment catalogs:

   Recreational Equipment, Inc.

   PO Box C-88125, Seattle, WA 98188

   The Gendarme

   PO Box 53 Seneca Rocks, WV 26844

J.E. Weinel, Inc.

PO Box 213 Valencia, PA 16059

California Mountain Company, Ltd.

PO Box 6602 Santa Barbara CA 93160

BASIC VERTICAL SKILLS
Field Training

I. PURPOSE

A. Minimal Personal Skills

1. Basic rigging
2. Belaying
3. rappeling
4. ascending
5. self-rescue

II. SAFETY

A. Proper Equipment

1. rope
2. rope pads
3. harness
4. helmet
5. gloves
6. boots
7. carabiners
8. descending gear
   a. carabiners
   b. figure-8
   c. rack
9. ascending gear
   a. knots
   b. semi-mechanical
   c mechanical

B. Backups

1. load line/belay line

2. knots

C. Double Check

D. Signals

1. Rock

2. Rope

3. On rope/off rope

4. On belay/off belay

5. Belay on/belay off

6. Up rope

7. Tension

8. Slack

9. On rapell/off rapell

10 Falling

E. Suggestions

1. When in doubt, ask

2. When uncertain, don't

III. BASIC RIGGING

A. Purpose

1. Individual descending/ascending (SRT)

2. Lowering/hauling systems

3. Load minimization

4. redundancy

B. Anchors

1. Natural

a. rocks

b. trees

2. Artificial

a. nuts

b. pitons

c. bolts

3. Multiple

a. simple backup

b. self-equalizing

4. Webbing

a. uses

b. limits

5. Know your limits!

a. rigging specialists for litter hauls

C. Rope Protection

1. Padding

2. Re-direction

3. Rock fall

a. damage to rope

b. caused by rope

D. Stress Management

1. Geometry

2. Knots

a. stress concentration

b. "tensionless" rigging

c. re-rigging under load

3. Wear points

E. Carabiners

1. Locking

2. Reverse gates

3. Loading

a. major vs minor axis

b. gate loading

c torque

4. Variable loading (rotation)

5. Use in rigging

F. Precautions

1. Short rope (end loop)

IV. BELAYING

A. Belayer Protection

1. Secure stance

2. Objective hazards

B. Belayer Tie-in

1. "Aiming" belay

1. Anchor direction

C. Belay Technique

1. Rope position

a. over/under tie-in

b. use of carabiner

2. Guide hand

3. Braking hand

a. never leaves the rope

4. Braking

5. Feeding out rope

6. Taking in rope

D. Limitations

1. Mechanical aids

a. sticht plate

b. figure 8

c. rack

E. Belay Practice

V. RAPPELING

A. Arm Rappel

1. Limitations

a. slope

b. run-out

2. Technique

a. number of wraps

b. braking action

3. Practice

B. Body (Dulfersitz) Rappel

1. Limitations

a. slope

b. run-out

2. Technique

a. rope position

b. braking action

c. leg position

d. body protection

3. Practice

C. Problems of Mechanical Rappels

1. Harness/descender required

2. Single point failures

3. Hot-dogging

D. Bottom Belay

1. Technique

2. Demonstration (practice as part of rappeling)

E. Carabiner Wrap

1. Limitations

a. distance, speed, weight

b. fixed friction

2. Technique

a. carabiner orientation

b. rope position

3. Practice

F. Figure-8

1. Limitations

a. distance, speed, weight

b. fixed friction

b. accidental lock-up (ears)

2. Technique

a. attachment to rope

b. figure 8 orientation

c. harness attachment

d. carabiner orientation

3. Practice

G. Rack

1. Limitations

a. distance, speed, weight

2. Technique

a. rack orientation

b. gross control (number of bars)

c. fine control (bar spacing)

3. Practice

H. Tie-offs

1. Demonstration

a. carabiner wrap

b. figure 8

c. rack

2. Practice

VI. ASCENDING

A. Points of attachment

1. 2-point rigs

2. 3-point rigs

3. Failures

4. Rest position

B. Knots

1. Advantages

a. simplicity

2. Disadvantages

a. jammed knots

b. slipping knots

3. Practice (prussik)

C. Bachmann "Knot"

1. Advantages

a. non-jamming

2. Disadvantages

a. more complex

b. slippage

3. Practice

D. Mechanical Systems (w/ examples)

1. Jumar-type

2. Gibbs

3. Advantages/disadvantages

a. speed

b. ease of use

c. security

d. rope damage

E. Descending on Ascenders (Knots)

1. Demonstration

2. Practice

VII SELF-RESCUE

A. Rappel-to-Ascend

1. Preparation

2. Tie-off rappel

3. Attach ascenders

4. Remove descender

B. Ascend-to-Rappel

1. Preparation

2. Rest position

3. Attach descender & tie-off

4. Remove ascender

5. Remove tie-off

VIII THE PROOF IS LEFT TO THE READER

A. Person Stuck on Rope (2 rope extrication)

B. Pinned Belayer