Topic / Subject  ROPE

Time frame = ______ mins

Contact statement (gain student attention and create a readiness to learn)

Overview (key points)

• Definition / Purpose
  Means a line composed of a core of braided, twisted or parallel continuous synthetic filaments encased in a smooth woven synthetic sheath manufactured to comply with UIAA/CEN/AS standards.

  Ropes provide security to climbers in the event of a fall – they are designed to absorb the impact of the fall without causing injury.

• Historical perspective
  Pre 1941 – vegetable fibre ropes widely used (typically Italian hemp)
  1941 – First nylon rope used in WW2 (hawser laid)
  1953 – First ‘Kernmantel’ (core + sheath) rope developed by Edelrid in Germany
  1964 – Introduction of international test certificate for mountaineering ropes (UIAA)
  Present day – ropes are getting thinner, lighter and stronger (give some examples)

• Types
  -low stretch (previously known as static)
  -dynamic
  -twisted, hawser laid
  -yachting rope (‘sheets’, known as double braid and similar to climbing ropes)

  Note: Important to distinguish between ropes that are designed for human life support in contrast to lifting non-living loads; eg, Yachting rope is not intended for abseiling.

• Construction
  Modern synthetic fibre ropes utilise a ‘kernmantel’ construction which consists of two parts: the core (or ‘kern’) and the sheath (or ‘mantel’). The non-climbing public usually refer to this type of rope as a ‘double braid’. The kernmantel construction will be manufactured to be either dynamic or low stretch (‘static’). The distinction between the two is determined by the method of weaving the fibres. Discuss the following diagrams:

  Dynamic rope construction – EN 892 (woven or braided core)
  Low stretch (Static) rope construction – AS 4142.3 (parallel core – minimal braiding)

  Hawser laid construction – not used by climbers or abseilers (generally consists of 3 strands in a right hand lay)
• **Applications / Selecting a rope**

For climbing applications, choose a rope that matches your needs. Are you abseiling, climbing (rock, ice, leading, top roping)? Discuss ‘dry’ treated ropes. The best rope isn’t necessarily the rope with the highest fall-rating. Abrasion resistance and handling characteristics may be equally or more important.

Low stretch rope = abseiling, caving, rescue, or where low stretch is important
Dynamic rope = climbing or where a fall or sudden shock loading is likely (eg lead climbing, tower climbing)

• **Specifications**

-a range of information is provided with a new rope. This information includes:
  - fall rating
  - impact force (KN)
  - diameter (mm)
  - weight per meter (g/m)
  - type of rope (eg single, half or twin)
  - elongation (%)
  - static breaking strength
  - mantle (sheath) slippage
  - EN (or AS) number – dynamic = EN 892; Low stretch = EN 1891

-Symbols for dynamic ropes:

  1 = single rope

  ½ = half rope

  = twin rope

Briefly discuss the 3 sub-categories of dynamic ropes… “We’ll cover this in more detail in our next lesson…”

• **Care and maintenance**

-washing (provide information on water temp, cleaning substances, washing machines etc)
-keep your ropes clean – don’t stand on your rope (it forces particles into the rope)
-expected lifespan (how long will my rope last?)
-discuss effects of water on ropes (ie in terms of abrasion resistance, strength and weight increase)
-Criteria for retirement:
Topic / Subject  FALL-FACTORS

Time frame = ______ mins

Contact statement (gain student attention and create a readiness to learn)

Overview (key points)

• Definition
  Fall-factor is a mathematical ratio expressing the severity of a fall.

• Formula
  -Length of fall ÷ length of active rope out
  -Explain the meanings of ‘length of fall’ and ‘active rope out’

• Sample calculations
  (Use a white board)
  Make point that with more active rope out, the more rope fibre available to absorb the energy
Topic / Subject  
EN 892 TEST PROCEDURE FOR DYNAMIC ROPES

Time frame = ______ mins

Contact statement (gain student attention and create a readiness to learn)
Try discussing the first mass paratroop drop in WW2... in the early days of parachute development the force of opening shock was not considered. As a result, many German paratroops died before they hit the ground during an assault on Crete... the opening shock of their parachutes created very high forces which caused severe internal injuries. We now know from the errors of others and through medical research that the human body can only withstand up to 12 KN impact force. This limit is reflected in the EN 892 test standards which specifies that the impact force must not exceed 12 KN on the first test fall of a rope.

Overview (key points)

- Purpose

- Outline of EN 892 test method
   Ideally, show students a diagram or picture of a test rig
   - The test tower
   - Random sample of rope subjected to test (tested as either a single strand or as a double strand)
   - Drop mass (mass varies according to test category)
   - Deflection ring (simulates a carabiner)
   - Force measuring instrument attached to drop mass

- Forces generated by test
   - Fall factor generated by test
   - Severity of test – comparison to real world falls taken by climbers
   - Impact force – why is 12KN the maximum force permitted in the test?
   - Heat – during the test falls, heat energy is generated which goes where?

- Test procedures for different categories of dynamic rope
   Emphasise that there are 3 categories of dynamic rope and each category is subjected to different test conditions.
   - Single rope 1
   - Drop mass ____ kg  Falls ____
   - Half rope 1/2
   - Drop mass ____ kg  Falls ____
   - Twin rope 0
   - Drop mass ____ kg  Falls ____