

ICOP Additional Guidance Note 0002

Additional guidance on Y angles when an anchor device has a rated strength of less than 15 kN

This ICOP Additional Guidance Note (ICOP AGN 0002) is in response to concerns expressed by IRATA members. The wording will be incorporated into the ICOP at the next amendment or revision.

Overview

This AGN essentially concerns anchor devices with a rated static strength of 10 kN, in particular anchors in accordance with European Standard EN 795:1996 (since superseded by EN 795:2012). There are many thousands of such anchors installed in various base materials.

Except for references to static strengths in EN 795, reference to static strength in this AGN means the static strength of anchors when **installed** in the base material, e.g. eyebolts fixed to concrete or a steel beam or when **placed** on such base material, e.g. anchor slings around a steel beam. See Annex F for more information on installed and placed anchors.

This AGN first clarifies the advice given within ICOP 2.11.2 on static strengths and directions of loading by adding text to 2.11.2.5 and to 2.11.2.6 as follows. The original text is shown in black. New text is shown in blue and deletions are shown with a strikethrough and yellow highlighting.

2.11.2.5 The foreseeable directions of loading and anticipated potential loads should be established and taken into account when setting up the anchor system. **The reliability of an anchor device can depend on the direction of loading in use, which can vary almost infinitely from tension to shear, so anchors need to have the required strength in all the intended directions of use. It should be ensured that anchors are suitable for use in the particular base material(s) into which they are installed or are to be installed, e.g. that they are strong enough and fixed securely enough for use in both shear and tension. Trial testing and/or proof testing may be required.**

2.11.2.6 To determine the minimum anchor strength recommendation, this code of practice uses a safety factor of 2.5. The maximum impact load on the user in the event of a fall should not exceed 6 kN; therefore, as a general rule, the static strength of anchors, with the exception of some deviation anchors, should be at least 15 kN. **Unless otherwise stated, static strength means the static strength of anchors when installed in the base material, e.g. eyebolts fixed to concrete or a steel beam or when placed on the base material, e.g. anchor slings around a steel beam. See Annex F for more information on installed and placed anchors.**

NOTE The anchor may **yield** deform but should not fail at this load.

This AGN also addresses the largely theoretical situation where there is a load of 15 kN (the recommended minimum static strength for anchors in the ICOP) on a pair of anchors, with the load shared equally in a Y hang by two anchor devices rated at 10 kN (e.g. EN 795:1996) and where the Y angle is the ICOP preferred maximum of 90°. In this situation, the load at each anchor is just over 70% of the total (15 kN), i.e. 10.5 kN. This is more than the rated strength of each anchor.

Tests indicate that Y hangs arranged with the best intentions of equal loading may not achieve this goal, so the loading at one of the anchors in the above example is likely to be higher than 10.5 kN.

For information, the 2012 version of EN 795 requires a static strength of 12 kN for anchor devices. However, even this does not meet the IRATA recommendation that anchors for the working line and for the safety line should each have a minimum static strength of 15 kN when installed or placed. There are several good reasons for the 15 kN recommendation, which, in the interest of brevity are not discussed in this AGN.

The simple answer to the problem is to recommend that the preferred maximum Y angle should be less than 90° (see ICOP 2.11.2). For example, assuming a load of 15 kN on the anchor line and equal loading of each anchor, if the Y angle is reduced to 80°, the loading at each anchor is 9.8 kN. If the Y angle is reduced to 70°, the loading at each anchor is 9.2 kN. At 60°, the loading is 8.7 kN.

It is unlikely that a rope access technician will put a load of 15 kN on an anchor. However, taking into consideration potential misuse or mistakes, it is possible in the arrest of a fall in certain circumstances to achieve loads of over 10 kN on an anchor and the 15 kN requirement provides a safety factor. This problem has been addressed by amending Figure 2.4b, 2.11.2.10 and 2.11.2.11.

Amendments to Figure 2.4b, 2.11.2.10 and 2.11.2.11

NOTE Original text is shown in black. New text is shown in blue and deletions are shown with a strikethrough and yellow highlighting.

1. Add text to the title of Figure 2.4b

Add the capital letter Y before *angle* and add *prior to loading* (but see 2.11.2.10 and 2.11.2.11) to the title so it reads: *b) Preferred maximum Y angle prior to loading* (but see 2.11.2.10 and 2.11.2.11).

Figure 2.4b is included in this AGN to help the reader.

2. Modify 2.11.2.10 and 2.11.2.11

Modify the text as shown.

2.11.2.10 Where the minimum recommended static strength of 15 kN for a single anchor is not achievable *via testing, assessment or calculation*, it is acceptable to link together a number of anchors of a lower static strength *and use them in a combined rigging arrangement*, e.g. by the use of a *Y hang*, to act effectively as a single independent anchor for either the working line or the safety line. *as long as* The load on each group of anchors *in the combined rigging arrangement is should be such that it is intended to be* equally shared and the combined static strength *is should be* a minimum of 15 kN, see **Figure 2.6b**. *(Usually, the combined rigging arrangement uses a pair of anchors but it may be more.)* To allow for foreseeable misuse, e.g. unequal loading, it is recommended that the minimum static strength of each *individual* anchor in this combination is 10 kN.

2.11.2.11 The contained angle formed by the ropes linking the anchors in a Y hang (*known as* the Y angle) should be as low as possible and should *generally preferably be less than not exceed* 90°. *The greater the Y angle, the greater the load applied to each of the anchors. This 90° is the preferred maximum Y angle prior to loading, e.g. loading by the mass of the user, see Figure 2.4b. When individual anchors have a static strength rating of less than 15 kN (with a minimum of 10 kN), the Y angle should not exceed 70° prior to loading. This should ensure the load on each anchor is kept to less than 10 kN when a load of 15 kN is applied to the anchor line, as long as the Y hang is rigged with the intention that the load on each anchor is to be shared equally. The greater the angle beyond this, the weaker the connection will be.* If loadings are known to be unequal, each anchor should have a *minimum strength of 15 kN*. If circumstances dictate the need for an angle greater than 90°, account should be taken of the increased loads at the anchors, at the anchor line terminations and on other components in the system. The angle should not exceed 120° because at angles greater than 120° the loads increase very significantly. There is an exception to this advice on preferred-maximum and maximum Y angles, which concerns flexible horizontal anchor line systems. These systems require special expertise to set up and use safely. Also see **2.11.2.21**. Further information is provided in **Part 3, Annex L**.

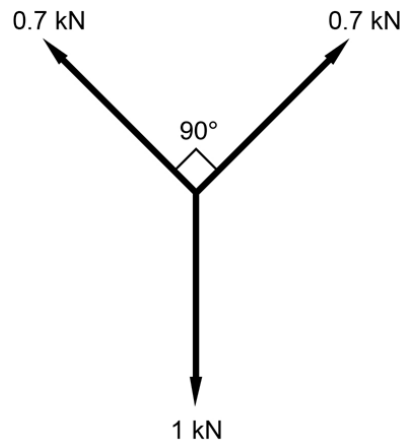


Figure 2.4b) Preferred maximum Y angle prior to loading (but see 2.11.2.10 and 2.11.2.11)