

CONFORMITY ASSESSMENT DEVELOPMENTS

Post-installed mechanical and chemical anchors



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Introduction

The aim of this paper is to provide a brief description of current developments in conformity assessment within the Australian anchoring industry. The focus is on post-installed (mechanical and chemical bonded) anchors used to connect structural steel to other elements. The reasons for developing conformity assessment for anchors include:

- (i) there are no generic Australian Standards or industry codes of practice available to engineers for testing or design of such anchors;
- (ii) anchors are often used to connect dissimilar materials (e.g., steel to concrete or steel to masonry) and hence do not naturally fall under a material specific standard;
- (iii) there have been significant changes in technology in recent times, with many new products sourced from around the globe now available locally.



Typical failure modes for anchors

Overview of conformity assessment system

To ensure that a building product is suitable for the intended use, four key requirements need to be satisfied:

- (a) The specified requirements must be appropriate for the intended use. This is related to identifying the technical demands of the application and determining the appropriate specifications of the product to be used. As an example, if a chemical anchor is to be subjected to sustained loading, the specifications of the anchor must cover long term creep.
- (b) The product must conform to the specified requirements. This is the main subject of conformity assessment. For example, in Europe for safety critical applications, the anchors must have an ETA (European Technical Approval) which states the capabilities of the product under standard conditions as well as optional conditions (e.g., sustained loading or freeze-thaw conditions).
- (c) The product must be of consistent quality. This may or may not be partly covered under conformity assessment depending on the scheme and could also be addressed by quality assurance.
- (d) The product must be installed correctly. This is related to the supplier's installation procedures, the skill of the installer and associated supervision and inspection processes. For connections in general and anchors in particular this is of paramount importance. Poor installation is often the cause of unsatisfactory performance and is currently the area with the least regulation and consistency in approach. A recent development to address this issue is the introduction of a US national scheme by the American Concrete Institute (ACI) known as the ACI-CRSI Adhesive Anchor Installation Certification Program.

Thus, conformity assessment is a responsibility for all participants in the industry.

To facilitate world trade of products, a number of ISO documents have been developed to standardise the terms and provide guidance to certifiers and end users. These include ISO/IEC 17000:2004 which covers conformity assessment vocabulary and general principles, ISO/IEC 17011:2004 which addresses conformity assessment requirements for accreditation bodies, ISO/IEC Guide 65: 1996 which provides general requirements for bodies operating product certification schemes and ISO/IEC Guide 28: 2004 which provides guidance on third party certification systems.

Australian context

i. Role of the Building Surveyor

In the Australian building regulatory system, the task of ensuring the construction is in accordance with the requirements of the National Construction Codes (NCC) is given to the building surveyor (also called building certifier) who can either operate within the private or public domain.

In carrying out this task, the building surveyor is guided by the NCC Vol.1 Part A2 or NCC Vol.2 Part 1.2 'Acceptance of design and construction'. The building surveyor has considerable flexibility in the application of this Clause.

In addition to the regulations set out in the NCC, there are also regulations related to work, health and safety (Work Health and Safety Act 2011) which take precedence and have significant implications for all stakeholders in relation to supply and installation of compliant products. A body of work being undertaken by the Australian Steel Institute in conjunction with the relevant State work health and safety authorities is helping to clarify the link between compliance and the duty of care obligations in the Act and may be accessed from <http://steel.org.au/key-issues/compliance/whs>

ii. Options for conformity assessment

Conformity assessment is currently **not** mandatory in the trading of building products. Non-conforming products however may fall foul of consumer protection legislation which prohibits misleading and deceptive conduct, false representations and unfair practices. Consumer protection legislation covers quality (including durability) and workmanship issues which are **not** universally covered under building regulation.

Various types of documents are used in *conformity assessment*. These include those listed under **Evidence of suitability** as well as other related documents such as NCC referenced documents and appraisal reports. The types of documents are not mutually exclusive. One type of document may rely on other types of documents for support. A flow chart outlining the options for *conformity assessment* is provided in Fig. 1.

It is useful to distinguish products that are listed under *Deemed-to-Satisfy* (DTS) provisions of the NCC and products that are used in *Alternative Solution*. The latter usually do not have a corresponding standard and need some form of evaluation. The level of stringency in conformity assessment should vary with the level of risk associated with failure of the product.

Application to anchors

The options that are available to anchors are shown in Figure 1 in **bold** line.

In Australia, most engineers rely on technical data provided by the manufacturers or suppliers for the selection and detailing of anchors. For major projects, engineers often require from the suppliers a form of certification of their products. Due to lack of local DTS provisions, suppliers generally provide an American ICC (International Code Council) Evaluation Report which provides compliance with relevant codes or an equivalent European ETA. For infrastructure projects, the Australian Technical Infrastructure Committee (ATIC) recommends anchors to have an ETA.

In general, an ETA for a construction product is a technical assessment of its fitness for an intended use. An ETA can be granted when no relevant harmonised standards (European

Standard) for the product exist. In most cases, an ETA for a product will be granted to a manufacturer based on the assessment principles set out in an ETA Guideline (ETAG) for the relevant product sector. The European Organisation for Technical Approvals (EOTA) monitors the drafting of ETA Guidelines and coordinates all activities relating to the issuing of ETAs.

It should be noted that ICC or ETA design data on a given anchor are used with an associated design model. Hence, ICC data are used with American codes while ETA data are used with ETAG design guides. As the design values contained in ICC and ETA documents are not the same for a given product, and indeed the terminology used is not the same, confusion can arise in comparing or substituting products.

Australian Engineered Fasteners and Anchors Council

Given the increasing use of anchors in the construction industry, the increasing diversity of supply and potential confusion that may arise in interpretation of design data, the local industry has launched a new initiative to streamline the conformity assessment of anchors. This initiative is the formation of the Australian Engineered Fasteners and Anchors Council (AEFAC), founded by Ancon Building Products, Hobson Engineering Co, Hilti (Aust), ITW Construction Systems, Powers Fasteners Australasia, Würth Australia and Swinburne University of Technology, where it is based (www.AEFAC.org.au).

Currently, AEFAC is developing Australian guidelines for testing and design of anchors which are based on the ETA guidelines. This initiative aims to simplify and streamline the conformity assessment of anchors in construction within the available Australia regulatory framework and also develop a certification program for installers to ensure that products are installed in the intended manner. Technical notes are due for release in 2013 and guidelines to be published soon after.

References:

- American Concrete Institute (ACI),
http://www.concrete.org/certification/Cert_pgminfo.asp?pgm=Adhesive+Anchor+Installer
- Australian Buildings Codes Board, 2013, National Construction Code
- Australian Steel Institute (ASI) compliance program: XXXXXXXXX
- Australian Technical Infrastructure Council (ATIC):
<http://www.apcc.gov.au/SitePages/ATIC%20HomePage.aspx>
- ISO/IEC 17000:2004 'Conformity assessment – Vocabulary and general principles'
- ISO/IEC 17011:2004 'Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies'
- ISO/IEC Guide 65: 1996 'General requirements for bodies operating product certification schemes'
- ISO/IEC Guide 28: 2004 'Conformity assessment – Guidance on third party certification systems'

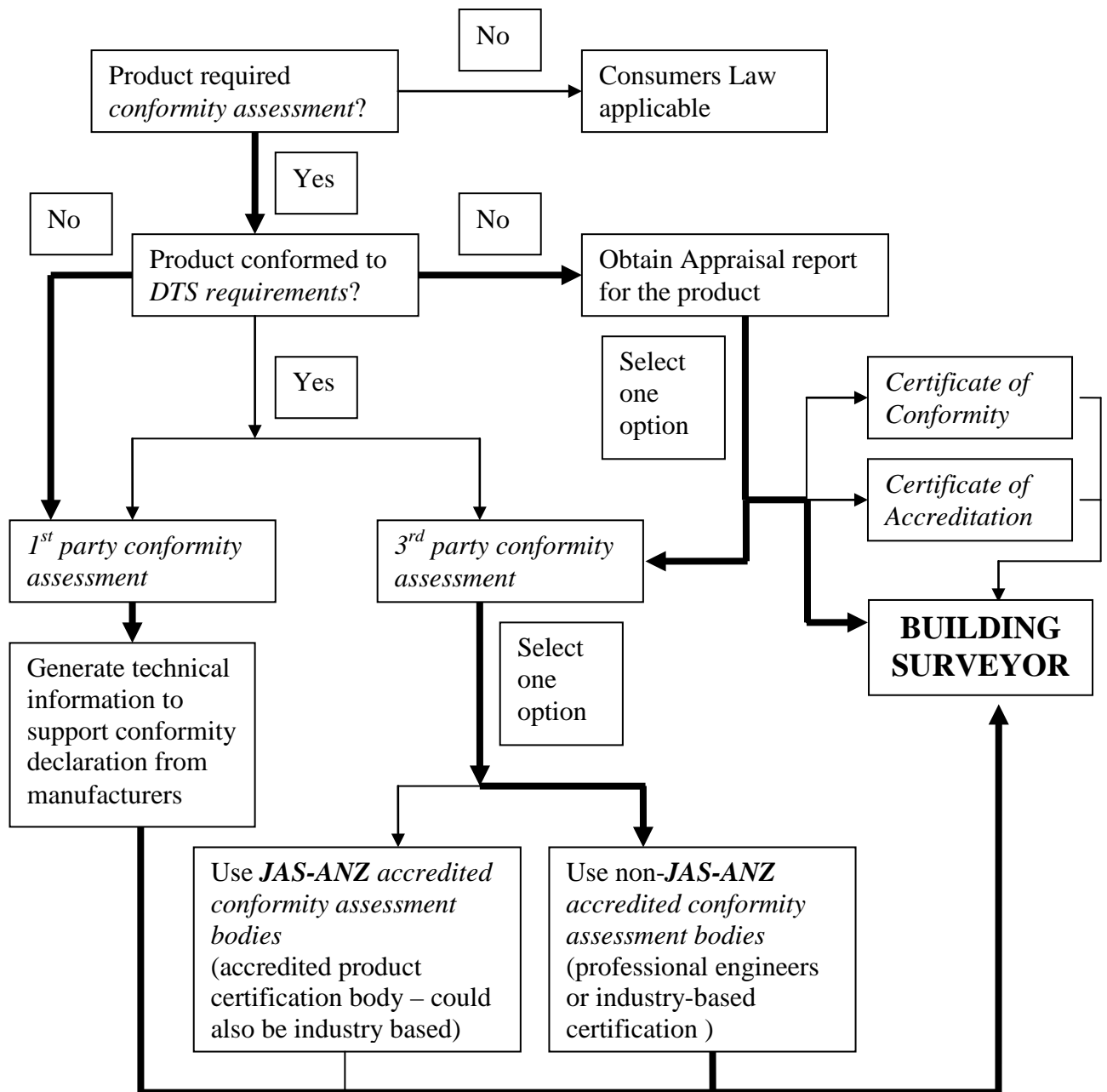


Figure 1: Options for conformity assessment in Australia.
(Bold lines indicate pathways available for anchors)