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INTUMESCENT COATING SYSTEMS FOR PROTECTING STRUCTURAL STEEL

1 SCOPE AND DEFINITIONS

1.1 Scope

1.1.1 This document sets out the general operating procedures for testing, appraisal, quality assurance and training requirements for the Certifire Australia Scheme for intumescent coatings protecting structural steel.

1.1.2 Reference should also be made to the following Certifire Schedules:

- a) Certifire Australia procedures & regulations CA001
- b) Certifire Australia Quality Assessment Schedule (QAS) for Manufacturers/Suppliers and Installers CA002

1.2 Definitions

Certifire Schedule - A document setting out requirements and procedures of the Certifire Australia Schemes.

Certifire Specification - A form of words for nominating the Certifire Schemes for building projects

Certifire Scheme - A third party certification scheme for the purpose of listing suppliers and contractors which comply with the relevant Certifire Schedules.

B.C.A. - The current edition of the Building Code of Australia

Appraisal - In the context of the Certifire Scheme an appraisal is an assessment of a system against the requirements of the appropriate Certifire Schedules.

Surface Area to Mass Ratio - Ratio of surface area exposed to fire to mass of steel. This is referred to as either E or k_{sm} and the units are m^2/kg . Note – This is not the thermal response factor (commonly known as H_p/A (m^{-1})).

Load Ratio - The ratio of element is defined as the ratio of the limit state load applied during the fire divided by the limits state at ambient temperature conditions. The limit state loads for each case are determined in accordance with AS1170.0.

Structurally Critical Temperature - The temperature at which the structural member would collapse due to the effects of fire

Intumescent Coating System – A fire protection system applied to structural steel elements consisting of a primer, intumescent coating and possibly a top sealer coat.

Intumescent Coating – An applied coating which reacts under the influence of heat by swelling in a controlled manner to many times its original thickness and typically producing a layer of carbonaceous char or foam which acts as an insulating layer for the structural steel element.

Primer – Interface coating(s) between the intumescent coating and the steel substrate.

Top Sealer Coat – Material applied to the surface of the intumescent coating as a decorative coating or as a protection (where necessary) against environmental degradation.

The Schedule is available from Certifire Pty. Ltd. and Warrington Fire Research (Aust.) Pty. Ltd. Certifire Australia Schedules may only be copied with the permission in writing of Certifire Pty. Ltd.

2 GENERAL OPERATING PROCEDURES

2.1 Introduction

- 2.1.1 The ability of fire protection systems to increase the Fire Resistance Level (FRL) of a load bearing steel member is dependent upon many factors. Typically these include variations in the components/materials of fire protection systems, in the surface area to mass ratio of the element, the load ratio and the method of application.
- 2.1.2 The effectiveness of a system can be reduced by many factors including for example inadequate steel preparation before application of a coating system, incompatibility of primer, intumescent coating and top seal, insufficient dry film thickness, or the use of a system in unsuitable applications (e.g. systems suitable for internal use only exposed to external conditions).
- 2.1.3 The objective of the Certifire Australia Scheme is to increase the likelihood that structural steel members protected by fire protection systems when installed in buildings would be capable of achieving nominated FRLs. This is to be achieved through:
- The independent appraisal of products in a consistent manner against clearly defined performance requirements
 - The appraisal of the competency and capability of fire protection contractors to install fire protection systems correctly against documented standards
 - The definition of minimum quality assurance requirements for product suppliers and fire protection contractors, and independent auditing of companies to monitor on-going compliance with these requirements
 - The preparation of certificates defining the performance of fire protection systems or the capabilities of fire protection contractors in a consistent manner
 - Clear unambiguous labelling requirements for systems supplied and installed in accordance with the scheme
- 2.1.4 It is recognised that the size and type of project and geographic location of a site can influence the selection of an appropriate Certifire specification.
- 2.1.5 For most major building projects in Australia the standard Certifire specification should be nominated which requires Certifire listed products to be installed and

maintained by Certifire listed contractors. This provides coverage by the Certifire Scheme in the supply and installation phases in a cost-effective manner and enables the installation to carry a Certifire label. An example of the Certifire label for structural steel systems is shown in Appendix 1.

2.1.6 Other options under the Certifire scheme are

- Product only certification, and
- Independent site inspection

It should be recognised that product only certification does not provide any control over site installations and therefore should only be specified when installation by a Certifire contractor is impractical. Independent site inspection, if used in conjunction with a Certifire contractor, can provide additional control.

2.1.7 The methods for appraisal of fire protection systems for intumescent fire protection coatings for structural steel systems are given in section 3, the quality assurance level requirements for the manufacturers and suppliers of the systems are given in section 4, the competency/ training levels required for key personnel of a fire protection contracting organisation installing and maintaining intumescent coating fire protection systems for structural steel are given in section 5, and the quality assessment requirements for these fire protection contractors are given in section 6.

2.2 Compliance with Building Regulations

2.2.1 It is the intention that the Certifire scheme will complement relevant building regulations by ensuring systems are in place to demonstrate compliance with relevant regulations.

2.2.2 The Building Code of Australia 1996 (BCA 96) allows building solutions which comply with the deemed-to-satisfy provisions, are equivalent to the deemed-to-satisfy provisions, or comply with the nominated performance requirements.

The deemed-to-satisfy provisions prescribe, among other things, fire resistance levels (FRLs) and smoke resistance properties required by certain construction elements in buildings. Certifire certificates can be used to check compliance with those provisions. However, when a building solution is to be assessed for either equivalence to the deemed-to-satisfy provisions, or for compliance with the performance requirements, data from Certifire certificates will need to be considered on a case-by-case basis.

2.2.3 If the building regulations and Certifire scheme documents conflict, the building regulations must take priority but the manufacturer or fire protection contractor must notify Certifire in writing of any variations from the scope of their certification required by the regulations.

2.2.4 In some instances the regulatory authority having jurisdiction may permit the installation of systems which lie outside the scope of the current Certifire listing. Under these circumstances the contractor must:

- a) Not attach a Certifire label, or
- b) If a Certifire label is to be applied, supply written proof to Certifire from the relevant regulatory authorities that the installation is 'approved' together with an appropriate fee to Certifire. Certifire will then maintain a file on the project so that any queries in the future can be answered.

2.3 Labelling and Log Books

2.3.1 The use of Certifire labels is strictly controlled to enable the status of an installation to be clearly identified.

- 2.3.2 The packaging of component parts and materials that form part of a Certifire listed system can incorporate the Certifire logo as indicated in Appendix 2 providing the scope of the appropriate Certifire certificates is clearly defined in the instructions supplied. The components of a system cannot be labelled prior to installation.
- 2.3.3 An installation can be labelled with a Certifire label if the installation complies with a current Certifire certificate and it has been installed by a Certifire listed fire protection contractor within the scope of the contractor's certification.
- 2.3.4 The Certifire labels are available from Certifire Pty. Ltd. in numbered batches. The Fire Protection Contractor shall keep a register of the location of all Certifire labels that have been attached to installations.
- 2.3.5 A log book listing all protected structural steel members must be supplied by the fire protection contractor to the building owner or representative. A copy must be retained by the fire protection contractor for a minimum of ten years. The log book shall include the following details for each protected member:
- Steel Member reference (e.g. B1)
 - Steel Member designation (e.g. 200 UB 30)
 - Steel preparation
 - Surface area to mass ratio
 - Minimum required protection thickness
 - Material used (primer, intumescent coating and sealer)
 - Critical temperature adopted
 - FRL or PSA for the element
- 2.3.6 Copies of the Certifire Schedules and certificates relevant to the installation shall be attached to the log book. Members of the Certifire Scheme are granted permission to copy Certifire schedules specifically for this purpose.

3 CERTIFIRE REQUIREMENTS FOR INTUMESCENT COATING FIRE PROTECTION SYSTEMS FOR STRUCTURAL STEEL

3.1 Building Regulations and Standards

- 3.1.1 Systems are to be appraised against the requirements of the current Australian Building Regulations as defined in the Building Code of Australia.
- 3.1.2 The BCA 2007 under specification A2.3 (d) permits structural steel elements to be designed to achieve an FRL in accordance with AS1250, AS4100, AS2327 and AISC Guidelines for assessment of the Fire Resistance of Structural Steel Members.

3.2 Fire testing

- 3.2.1 Appraisals will be based on information derived from tests carried out in accordance with the heating conditions of AS1530.4.
- 3.2.2 The appraisals will be based on test data from a testing authority registered by the National Association of Testing Authorities (NATA) to test in the relevant field,
or
by an organisation outside Australia recognised by NATA through a mutual recognition agreement, or by any other organisations defined as Registered Testing Authorities in the BCA.

- 3.2.3 Fire tests carried out to standards other than the current edition of AS1530.4 will only be used if confirmatory data (an opinion from a registered testing authority) is available to demonstrate the continued applicability of the data and if the test methodology is sufficiently similar to that specified in the current edition of AS1530.4.

Note: It is not the intention that all tests are required to be repeated as new editions of AS1530.4 are released. In many cases it may be acceptable for evidence from tests used to extend the range of application to evaluate formulation changes, or other reasons, to also provide confirmatory data. It is important that Certifire is notified during the planning stages of such a test to ensure the test data will be acceptable. Where significant changes to a test methodology occur which necessitate further testing of existing Certifire systems a 'grace period' of 12 months will be permitted which will only be extended if further delays are justifiable. The 'grace period' does not apply to systems that have been demonstrated not to comply with the current Certifire specifications.

- 3.2.4 The potential fissuring cracking or detachment of a fire protection material may only become apparent during full scale fire resistance tests. The full scale tests are therefore designed to provide information regarding the physical/ mechanical performance of fire protection under the following conditions:
- Vertical and horizontal orientations.
 - Maximum and where appropriate minimum protection thickness.
 - Maximum and where appropriate minimum fire resistance period under consideration
- 3.2.5 To demonstrate the retention of the fire protection material, loaded beam tests should generally be continued until structural failure imminent.
- 3.2.6 To demonstrate the retention of the fire protection material, full scale column tests should be continued until the maximum desired critical temperature is reached for the section. It is permitted for unloaded full scale columns in lieu of loaded columns to be tested provided they are 2.8m to 3.2m in height in accordance with AS1530.4-2005.
- 3.2.7 Supplementary temperature data may be provided by non-loaded specimens and shall have a length of at least 1m.
- 3.2.8 The average steel temperature shall be measured and determined in accordance with AS 1530.4:2005. If the thermocouple distribution varies from the requirements of AS 1530.4 data may be used provided appropriately conservative approaches are adopted.
- 3.2.9 There is no fixed programme of tests specified, as each fire protection material will have a different performance and target market however the scope of the appraisal will depend on the nature of tests carried out and the performance of the material in those tests.
- 3.2.10 If reinforcement is used over part of the thickness range additional loaded / full scale tests will be required.
- 3.2.11 The materials and standards of workmanship of the test specimens shall be representative of good site practice.
- 3.2.12 Test specimens shall be conditioned in such a manner that they correspond as closely as possible, in temperature, solvent content and state of cure to the expected state of a similar element in service.

3.2.13 Any variations from the above must be authorised by Certifire and the reasons for and details of the variation included in the appraisal report.

3.3 Assessment of Test Results

3.3.1 Assessments of variation shall be performed by registered testing authorities using the standards/documents referenced in Sections 3.1 and 3.2.

3.3.2 The assessment will define the field of application for the system based on one or more fire tests and justification for any variations from the procedure detailed in this document.

3.3.3 All test data used in the preparation of the appraisal shall be fully referenced by test number and type of test (beam/column, loaded /unloaded, full scale/small scale, etc.)

3.3.4 The procedures given in the standards/documents referenced in Section 3.1 and 3.2 shall be used to evaluate the effects of the following parameters:

- Fire resistance period for structural adequacy
- Thickness of fire protection material
- Exposed surface area to mass ratio
- Load ratio
- Structurally critical temperature
- Shape of section
- Orientation of section
- Surface preparation of steel
- Reinforcement (if any)
- Primer compatibility
- Manner of application (bush/spray)
- Top coat compatibility
- Effects of over coating
- Number of coats

3.3.5 An opinion/assessment from a registered testing authority is required for variations to parameters other than those listed above.

3.3.6 Multiple linear regression methods of AS4100/AISC guidelines shall be the preferred method of evaluation for intumescent coating fire protection systems and the calculated and adopted regression coefficients shall be specified in the appropriate assessment or appraisal together with the coefficient of correlation. (Note: experience has shown that linear regression techniques can be successfully applied to intumescent coatings)

3.3.7 If a coefficient of correlation less than 0.9 is obtained safety factors shall be applied to the predicted relationships and/or further testing performed so that the coefficient of correlation is more than 0.9.

3.3.8 If it is proven that the regression analysis is not applicable to a particular intumescent coating or over part of the field of application the time (t) at which the limiting temperature is attained shall be determined from the results of individual test results in accordance with Clause 12.6.3 of AS 4100.

3.3.9 As a minimum, tables of required thicknesses versus ESA/m (and optionally Hp/A) shall be submitted based on a critical temperature of 550°C which equates

to a load ratio of 0.51. Additional critical temperatures and associated thicknesses can also be included to cater for more involved fire safety engineering analyses. A suitable ESA/m versus thickness table layout is shown in Appendix 2.

- 3.3.10 For other cases if the design live load is equal or greater than the design dead load the load ratio of 0.51 may be conservatively applied.
- 3.3.11 Assessment will only be made regarding the performance of horizontal elements if:
- A full scale loaded beam test in accordance with AS1530.4-2005 or equivalent has been completed.
 - In that test the element reached its predicted load capacity predicted by the proposed regression analysis
 - And stickability of the coating system was satisfactorily demonstrated for a minimum of 90% the required maximum proposed FRL for the coating system.
- 3.3.12 Assessment will only be made regarding the performance of vertical elements if:
- A full scale loaded or full scale unloaded column test in accordance with AS1530.4-2005 or equivalent has been completed.
 - In that test the element reached its load capacity predicted by the regression analysis of all of the temperature data
 - And stickability of the coating system was satisfactorily demonstrated for a minimum of 90% the required maximum proposed FRL for the coating system
- 3.3.13 The average dry film thickness of the tested specimens shall be used in the preparation of an appraisal but the predicted thicknesses should be treated as the minimum required thicknesses providing conservative estimates of required thicknesses.
- 3.3.14 The total average dry film thickness (dft) will be used as a basis for appraisals. The assessment should take account of the individual dft's of primer, intumescent and top coats.
- 3.3.15 For appraisal purposes steel section shapes will be divided into the following groups:
- I sections (or other section shape providing a re-entrant profile)
- Horizontal
 - Vertical
- Square/rectangular section
- Horizontal
 - Vertical
- Circular hollow sections
- Horizontal
 - Vertical
- 3.3.16 Each of the shape groups above shall be treated separately for the purpose of assessments. Assessments for circular sections may normally be based on tests on square sections. Alternatively tests on circular sections may be evaluated separately.

- 3.3.17 When considering the performance of elements in accordance with AS4100 the following criteria shall apply. The assessment shall be carried out separately for beams and columns.
- 3.3.18 The temperature used for the assessment shall be measured generally in accordance with AS1530.4-2005.
- 3.3.19 Situations may arise where certain of the above principles are not appropriate to a particular appraisal. In such circumstances the reason for the variation and the justification for alternative approach must be clearly detailed in the appraisal report.
- 3.3.20 The format of the report will provide the following details:
- Coating System - Brief description of materials used in the components of the system.
 - Test Specimens - No. of specimens and sizes used in the analyses.
 - Limits of Acceptability - Details of any constraints.
 - Predictive Analyses - Summary of test results.
 - Summary of analysed data.
 - Predicted thickness for various section factors.
 - The test reports used for the appraisal should be appended to the assessment report

3.4 Preparation of Certifire Appraisals

- 3.4.1 Three alternative methods are available for the preparation of an appraisal for each system. These are given below.

Method 1

- 3.4.2 The simplest appraisal will be that based on a prototype test. The test data, and a specification of the test assembly, manufacturer's installation instructions, and physical test data if appropriate is submitted to Certifire for appraisal and preparation of a certificate.

Method 2

- 3.4.3 A manufacturer may submit a range of tests and opinions/assessments for variations from the tested prototype from registered testing authorities meeting the requirements of this schedule. The assessments/opinions must comply with the requirements of this document.
- 3.4.4 In addition, specifications of the prototypes and variations together with manufacturer's installation instructions must be submitted with supplementary test data if appropriate (e.g. weathering tests).
- 3.4.5 Certifire will then prepare an appraisal and certificate for each system.

Method 3

- 3.4.6 A manufacturer may engage Certifire to obtain an assessment against the relevant standards/documents (as defined in clause 3.2 and 3.3) and appropriate Certifire schedules by a registered testing authority. The assessment, together with all supporting data, must be submitted for review by Certifire and a certificate for each system will be issued that the assessment complies with the appropriate Certifire Schedules.
- 3.4.7 Changes to primer and top seals can critically affect the performance of the intumescent coating system and must be supported by test evidence and an assessment from a registered testing authority.

3.4.8 The Certifire Certificate will include a list of approved primer and top seals that can be used as part of the intumescent coating system based on the test evidence and assessments provide to Certifire.

3.5 Installation

3.5.1 Intumescent Coating Fire Protection Systems for Structural Steel shall be installed in accordance with manufacturer's written instruction and should also take into consideration the following:

- Choice of product – ensure correct product is being used for the application in question e.g. Internal / external use
- Structural steel members have correct surface preparation
- Compatible primers are used
- Intumescent coating is applied no thicker than recommended wet film coating thickness – multiple coats should be used. Careful attention must be paid to drying times in between successive coats of intumescent coating.
- Correct top sealer is used when applicable
- Shelf life and /or expiry dates of products should be checked before application
- Environmental condition should be monitored to ensure the system is applied under conditions in accordance with the manufacturer's instructions
- Wet film and dry film thickness gauges should be used to check thicknesses on all exposed areas of the section at least at 500mm maximum length intervals and a minimum of three measurements should be taken on each face.
- The standard deviation of dry film thickness should not be more than 0.15 of required thickness unless otherwise allowed in the Certifire Schedule.
- Care should be taken to avoid over spray on adjacent surfaces

3.5.2 It is recommended that a specification be developed for each project that includes the above items, and also a steel schedule with dry and/or wet thickness required.

3.6 Serviceability

3.6.1 The certificate shall include data on the durability/serviceability of a system if available. As a minimum this shall include a statement of resistance to water/weather. The certificate shall describe the test methods used and report results obtained.

3.6.2 If no data is available or no data has been submitted the certificate shall state, for example, "No data has been provided under the category of resistance to water/weather".

3.6.3 A statement will be included on each certificate that the system should be selected to suit the particular environment or application.

4 CERTIFIRE QUALITY ASSURANCE REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF INTUMESCENT COATING FIRE PROTECTION SYSTEMS FOR STRUCTURAL STEEL

4.1 General Requirements

4.1.1 In addition to the requirements of this schedule, the Manufacturer must operate a quality system which complies with either:

- a) AS3902 (ISO9002), or
- b) Certifire - Quality Assessment Schedule CA002

Note: It will eventually become a requirement for all manufacturers to comply with AS3902 and the Certifire Quality Assessment schedule will be phased out. The time of the phase out will be determined by the relevant sub-committee and Certifire Advisory Panel.

4.1.2 The quality system will be initially audited by Certifire. Annual audits are to be carried out by Certifire or by a JASANZ accredited independent organisation or equivalent that will exchange information with Certifire where an AS3902 quality system is in operation.

4.1.3 Additional audits required to investigate complaints against a manufacturer are to be carried out by Certifire.

4.2 Specific Requirements for Intumescent Coating Fire Protection Systems for Structural Steel

General

4.2.1 A quality system for a manufacturer or supplier of Intumescent Coating Fire Protection Systems for Structural Steel must specifically address the requirements given in the remainder of this section.

Specifications and instructions for manufacture

4.2.2 The quality system shall include documented specifications and manufacturing instructions for each type of component and assembly.

4.2.3 These specifications must be clearly referenced to:

- a) The tested prototype, and
- b) Where relevant any permissible variations supported by assessments from registered testing authorities, and
- c) The Certifire certificate

4.2.4 The specification must accurately describe:

- a) All materials used in the manufacture of a component material or assembly including tolerances, source and any performance requirements
- b) Ordering details
- c) Methods of storage
- d) Tests and inspections and procedures in case of non-compliance and to check repeatability of the performance

4.2.5 It is preferred that all materials and components are supplied and manufactured by companies under third party quality assurance schemes. However it is realised that in many instances this may be impractical. Under these circumstances greater emphasis shall be placed on sampling and testing materials.

Third Party Suppliers

- 4.2.6 Many systems are manufactured from minerals or components whose properties may vary considerably and significantly affect the fire resistance performance of a system. It is therefore important that the Quality system monitors the sources and critical parameters of all materials to ensure that raw materials/components when compounded or assembled will meet fully the requirements of the performance specification of each product.
- 4.2.7 In some instances components may be delivered direct to site. Documented procedures shall be provided for the inspection and if necessary testing of materials under these circumstances. This may be carried out by the installer.
- 4.2.8 The manufacturing instructions shall describe all processes in detail together with inspection procedures. Manufacturing tolerances must be specified together with corrective actions if appropriate and rejection criteria.

Record system

- 4.2.9 The quality system shall be such that each batch or unit is identified by a unique number. A record should be kept of the batch number of materials/ components supplied to third parties.
- 4.2.10 All material and components used in the manufacture of a batch and inspections and tests during manufacture shall be identified on a file relating to the batch. Where materials are manufactured by a third party to a specification, a certificate of conformance must be obtained and a sample of each batch should be checked and tested following documented procedures.
- 4.2.11 The file on each batch must be retained for a minimum of ten years and be readily identified from the batch numbers marked on the components.

Packaging and instruction

- 4.2.12 The product packaging must be clearly marked with the product designation, batch number and storage conditions. The Certifire mark may be included in accordance with section 2.3 of this document. Details of the packaging must be submitted to Certifire for approval.
- 4.2.13 Fully documented instructions for the correct installation and use of a product shall be included with each sale. These instructions must be submitted to Certifire and will be referenced in the Certifire certificate.
- 4.2.14 Certifire must be notified prior to any modifications of the packaging or installation instructions and details must be submitted to Certifire for verification prior to publication and that any modifications required by Certifire are incorporated.

Technical services

- 4.2.15 There shall be documented procedures for consulting with and providing advice to customers on the performance and appropriate use of products.
- 4.2.16 The documented procedures shall clearly define the minimum training/ competency level requirements for technical advisers and identify the staff members having satisfied these requirements.

Note: A technical adviser should be able to satisfy the competency levels nominated in Section 5 for an installation inspector.

5 COMPETENCY/TRAINING REQUIREMENTS FOR FIRE PROTECTION CONTRACTING ORGANISATION

5.1 General Requirements

5.1.1 This section defines the minimum training required by personnel involved in the installation and maintenance of Intumescent Fire Protection Coatings for Structural Steel

5.1.2 Competency based training methods are adopted with provision to recognise prior learning.

5.1.3 Methods for the assessment of the competencies are given together with training requirements where appropriate. It should be noted that a level of competency can be attained by:

- a) prior knowledge
- b) on-the-job training/in-house training
- c) formal training seminars
- d) a combination of any of the above

5.2 Key Personnel

5.2.1 The key personnel involved in the installation of intumescent coating systems are defined below:

The Project Reviewer/Estimator

5.2.2 The project reviewer/estimator may perform the following tasks:

- review the initial specifications/ drawings and where appropriate visit the site and identify required FRLs
- select appropriate system(s) from test reports / Certifire certificates identifying critical details, required thicknesses and any potential non compliances
- check the proposed systems against the requirements of the BCA, and the appropriate Certifire certificate taking appropriate actions if non compliances are identified
- order materials and prepare work instructions

Installer

5.2.3 The installer may perform the following tasks:

- check materials are undamaged, perform any required tests and comply with the requirements of work instructions
- install a system or carry out maintenance work recording batch numbers, carrying out tests/checks as appropriate and identify any variations from the work instructions

The Inspector

5.2.4 The inspector may perform the following tasks:

- supervise installation
- check the final installation/carry out maintenance inspections
- attach the Certifire label
- complete the log book

5.3 Competency Requirements and Assessment Criteria

5.3.1 The key personnel described in section 5.2 shall demonstrate to the satisfaction of Certifire their competency to perform the critical tasks listed below.

5.3.2 The methods of assessment to be adopted by Certifire are summarised below.

The Project Reviewer/Estimator

5.3.2.1 Outcome 1: Identify relevant requirements of the BCA, select the appropriate protection system and material thickness from test reports, assessments and Certifire certificates, describe design requirements and check the system is suitable for its application.

Assessment criterion:

- a) for a given application specify the FRLs required by the BCA
- b) identify relevant Certifire certificates and/or test data for suitable systems
- c) calculate required thicknesses and significant design requirements

5.3.2.2 Outcome 2: Compare a specification with the requirements of Certifire certificates and the appropriate AS3784.1, and identify non-compliances.

Assessment criterion:

for a specification and nominated Certifire certificate list any variations and non-compliances with the requirements of the BCA and Certifire certificate

5.3.2.3 Outcome 3: Propose a suitable course of action for a specification which does not comply with the requirements of a Certifire certificate.

Assessment criterion:

for a non-compliant system identify alternative courses of action.

5.3.2.4 Outcome 4: Produce work instructions for the installer and/or orders for materials.

Assessment criterion:

- a) for a given application prepare work instructions and/or orders. (Note: Proforma forms can be used)
- b) prepare labelled sketches of typical installations if necessary, or specify material thicknesses

5.3.2.5 Outcome 5: Interpret engineering drawings and specifications.

Assessment criterion:

from typical engineering drawings and specifications interpret the information available and identify a suitable system which complies with the requirements of the BCA and the Certifire scheme.

Inspector

- 5.3.2.6 Outcome 1: Identify relevant requirements of the BCA, AS3784.1 and Certifire certificates for an installation.

Assessment criterion:

for a given installation list the relevant requirements of the BCA, AS3784.1 and Certifire certificate applicable to the installation

- 5.3.2.7 Outcome 2: Inspect installations for compliance with the Certifire certificate, and evidence of deterioration.

Assessment criterion:

for a typical installation carry out an inspection and provide a written statement identifying any non-compliances, etc.

- 5.3.2.8 Outcome 3: Propose a suitable course of action for an installation which does not comply with the Certifire certificate and/or the BCA/AS3784.1.

Assessment criterion:

for a non-compliant system identify suitable rectification works and describe how to implement the courses of action

- 5.3.2.9 Outcome 4: Complete log book details.

Assessment criterion:

for a typical project prepare a log book incorporating as a minimum the information listed in clause 2.3 of this Schedule. The log book must also have provision for recording maintenance inspections. Pro-forma sheets may be used.

Installer

- 5.3.2.10 Outcome 1: Interpret installation instructions.

- 5.3.2.11 Outcome 2: Perform an installation in accordance with instructions.

Assessment criteria for Outcomes 1 and 2:

Based on written instructions, install a fire protection system following the instructions and the relevant Certifire certificate.

Note: some installers may install only a limited range of systems. Under these circumstances, compliance with the competency standards need only be demonstrated for the relevant systems.

- 5.3.2.12 Outcome 3: Identify variations from installation instructions, the requirements of AS3784.1 and the Certifire certificates, taking appropriate action.

Assessment criterion:

for a given installation identify any variations from installation instructions and/or the requirements of AS3784.1 and Certifire certificates and describe suitable actions.

5.4 Assessment of Training and Competency

- 5.4.1 Evidence of the training and competency of key personnel shall be provided prior to the initial audit. This can take the form of examples of work, or results from assessments from training programmes. The roles of all members of staff must be defined in a Quality Manual for the organisation together with training requirements.

- 5.4.2 The information will be reviewed by Certifire. The initial audit will assess the competency of key staff members, using the criteria given in section 3 of this schedule.

The audit will also assess the suitability of current training methods for the applicant company.

6 CERTIFIRE QUALITY ASSURANCE REQUIREMENTS FOR FIRE PROTECTION CONTRACTORS

6.1 General Requirements

- 6.1.1 The contractor must operate a quality system which complies with:

- a) AS3902 (ISO9002), or
- b) Certifire Quality Assessment schedule CA002

Note: It may become a requirement for all installers to comply with AS3902. The timing and decision to phase out the Certifire schedule CA002 will be determined by the relevant Certifire technical sub-committee and Certifire Advisory Panel.

- 6.1.2 The quality system will be initially audited by Certifire. Annual audits are to be carried out by Certifire or by a JASANZ accredited independent organisation that will exchange information with Certifire where an AS3902 quality system is in operation.

- 6.1.3 Additional audits required to investigate complaints against a manufacturer are to be carried out by Certifire.

6.2 Specific Requirements for the Installation of Intumescent Coating Fire Protection Systems for Structural Steel

- 6.2.1 A quality system for an installation contractor must specifically address the requirements given in the remainder of this section.

Review of tender specifications, enquiries and orders

- 6.2.2 All tender documents and orders shall be reviewed by suitably trained and competent personnel for:

- a) Compliance with Certifire certificates relevant to the installation
- b) Compliance with the requirements of the BCA
- c) The ability of the installer to perform the work on time
- d) The suitability of a system for its particular application

- 6.2.3 The review should include but not necessarily be limited to checks on:

- a) Load ratio of members
- b) Steel member size
- c) Existing coatings & surface preparation
- d) Steel member profile
- e) FRL required
- f) Surface area to mass ratio
- g) Access
- h) Delivery date/availability of materials
- i) The serviceability of the system

- 6.2.4 Written procedures for actions required if a non-compliance is identified shall be provided.

Specifications and instructions

- 6.2.5 The quality system shall include documented specifications for ordering materials/components, checks for compliance with the specifications, recording batch numbers, storage of materials, etc.
- 6.2.6 The quality system shall require that no claims in relation to Certifire or Certifire membership are made for the installation of systems which do not comply with the requirements of a current Certifire certificate. Documented procedures shall be included defining the use of the Certifire logo and claims of Certifire membership.
- 6.2.7 It is preferred that all components are supplied and manufactured by companies under third party quality assurance schemes. However it is realised that in many instances this may be impractical.
- 6.2.8 Under these circumstances greater emphasis shall be placed on inspection. Examples could be fixings used in conjunction with a system. Variations in the materials used for the fixings could affect the performance.
- 6.2.9 Documented procedures shall be provided for the inspection of components when delivered to site.
- 6.2.10 Documented procedures shall be provided for the installation and final inspection of the system and labelling.
- 6.2.11 Documented procedures shall define appropriate actions if non-compliances are identified.

Record system

- 6.2.12 The quality system shall be such that each project is identified by a unique number from receipt of an order through to installation and inspection and subsequent maintenance.
- 6.2.13 All component batches used in the installation phase shall be identified on a file relating to the project.
- 6.2.14 Details of all systems installed and subsequent maintenance shall be recorded in a log book and on the project file together with the number/ID of the Certifire labels fixed to each installation.
- 6.2.15 The file must be retained for a minimum of ten years and be readily identified from the project reference.

Maintenance requirements

- 6.2.16 All fire protection systems require ongoing maintenance and inspection to maintain their performance at a level close to that of the original installation. The integrity of a barrier system can be impaired by disruption of seals or barriers by the installation of new services or relocation of existing services. The log book shall identify the frequency and scope of inspections required and specify procedures for the notification of building works and immediate reinstatement of penetration fire protection systems.
- 6.2.17 The requirements for inspection/ maintenance will vary with the building use, type of system and state regulations. Notwithstanding the above it is recommended that for all systems annual inspections shall be required as a minimum and records be kept of these inspections and any works undertaken.

APPENDIX 1: LABELLING AND USE OF THE CERTIFIRE LOGO

A1.1 General

In order for an installation to be labelled with a Certifire label, the system must comply with a Certifire certificate which was current at the time of installation and be installed by a Certifire listed contractor within the scope of the contractor's Certifire certificate.

A1.2 Labelling format

Certifire labels shall be obtained from Certifire Pty. Ltd.

Example of a Certifire label for Structural Fire Protection Systems



The label size will be 100mm x 50mm.

A1.3 Location

Where practicable the label shall be either:

- a) mounted in the foyer or other 'public' areas in the area protected by the system or
 - b) mounted adjacent to manual call points if the positions are known
- or
- c) adjacent to all fire exits from the area with structural steel protected under the Certifire Scheme

A1.4 Labelling methods

Certifire labels may be mechanically fixed or bonded in such a manner that accidental removal would be unlikely to occur.

A1.5 Packaging and Promotional literature

When a Certifire certificate has been issued to a company (manufacturer/supplier and installer) the company is entitled to use the Certifire mark shown below on packaging and/or promotional literature provided:

- a) the company may only use the mark or claim or imply certification in respect of products or services complying with the relevant performance, training and quality assessment schedules within the scope and limitations given in the certificate(s)
- b) copies of all material containing reference to certification and Certifire are submitted to Certifire for verification prior to publication and that any modifications required by Certifire are incorporated

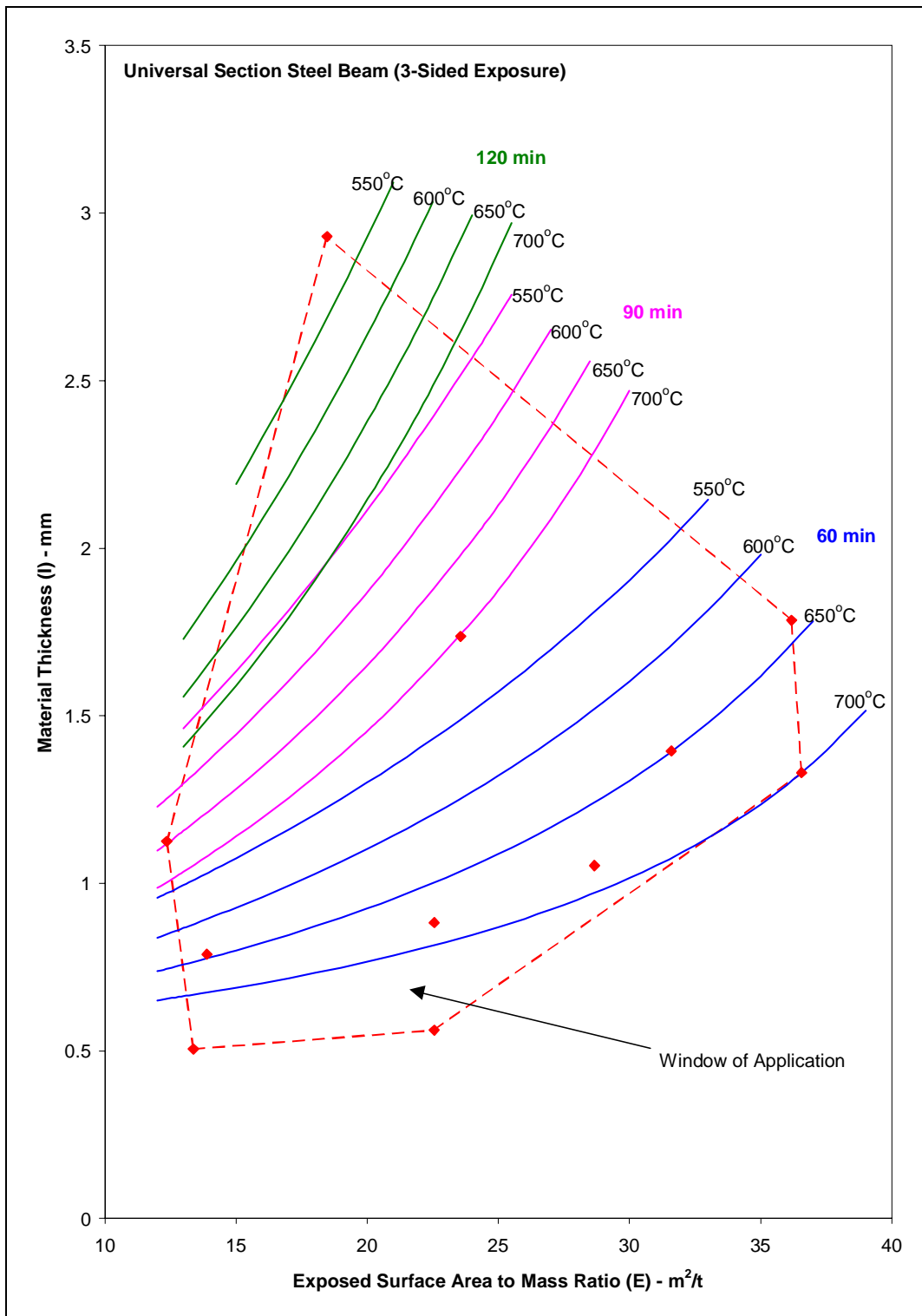
**APPENDIX 2:
 TYPICAL ESA/M VERSUS THICKNESS TABLE LAYOUT**

**Material Thickness (mm) required for universal section
 steel beams
 (3-sided exposure) to achieve FRL of 120 minutes.**

Exposed Surface Area to Mass Ratio (m ² /t)	For Critical Temperature			
	550°C (R = 0.514)	600°C (R = 0.442)	650°C (R = 0.370)	700°C (R = 0.297)
Up to 14	2.5	2.0	1.7	1.5
16	2.5	2.1	1.9	1.7
19	2.8	2.5	2.3	2.1
21	-	2.8	2.6	2.3
22	-	-	2.7	2.5
23	-	-	-	2.6

**Material Thickness (mm) required for universal section
 steel beams
 (3-sided exposure) to achieve FRL of 60 minutes.**

Exposed Surface Area to Mass Ratio (m ² /t)	For Critical Temperature			
	550°C (R = 0.514)	600°C (R = 0.442)	650°C (R = 0.370)	700°C (R = 0.297)
Up to 13	1.0	0.9	0.8	0.7
15	1.1	1.0	0.8	0.7
18	1.3	1.1	0.9	0.8
21	1.4	1.2	1.0	0.8
24	1.6	1.3	1.1	0.9
27	1.7	1.5	1.2	1.0
30	2.0	1.7	1.4	1.1
32	2.1	1.8	1.5	1.1
34	-	1.9	1.6	1.2
36	-	-	1.7	1.3



**Window of application and design chart for various critical temperatures
 for universal section steel beams (3-sided exposure)**