



PRODUCT CONFORMITY CERTIFICATION SCHEME

FOR

Falling Rock Barrier Systems

PCCS – FRBS

PARTS ONE & TWO

Administrative Regulations

Technical Regulations

Issue 1

February 2018

Hong Kong Institute of Steel Construction

The use of the documentation is subjected to the standard Terms and Conditions of Hong Kong Institute of Steel Construction (HKISC). A Certification Body who uses this Scheme for product certification shall be approved by and registered with HKISC.

Disclaimer

No responsibility is assumed for any injury and/or damage to persons or properties as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. HKISC and the members of the Joint Technical Committee of this document will not be responsible for its use or misuse in whatever form and the readers of this document should accept this condition before reading or making reference of this document.

Copyright 2018 © reserved by:

The Hong Kong Institute of Steel Construction (HKISC)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic mechanical, photocopying, recording or otherwise, without the prior written permission of the HKISC. Further information about the HKISC can be obtained at the official website: <http://www.hkisc.org>.

This document is controlled. In case of any discrepancy(ies) in interpretation of this document, the interpretation by Hong Kong Institute of Steel Construction shall be final. Enquiries about status and issue of amendments should be directed to HKISC and make attention to the Secretary of HKISC.

**HONG KONG INSTITUTE OF STEEL CONSTRUCTION
C/O DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING
THE HONG KONG POLYTECHNIC UNIVERSITY
KOWLOON, HONG KONG**

**PRODUCT CONFORMITY CERTIFICATION SCHEME
FOR FALLING ROCK BARRIER SYSTEMS**

PCCS-FRBS

FORWORDS

The objective of this Scheme is to provide a framework for the certification of the production of Falling Rock Barrier Systems. This Scheme can be generally adopted by all related falling rock barrier systems manufacturers/suppliers in order to show conformity with all necessary technical requirements in accordance with this Scheme.

**The following organization has been sought for opinions
in the course of drafting this document**

The Hong Kong Institution of Engineers (Structural Division)

The Scheme is the effort of the Task Group formed by the members of Hong Kong Institution of Steel Construction through the co-operation among representatives of local academics, engineers, manufacturers/suppliers, contractors, government bodies and users to develop a product conformity certification scheme for FRBS in accordance with the ISO/IEC 17067.

Contents

FORWARD	2
ADMINISTRATIVE REGULATIONS	4
1. INTRODUCTION	5
2. GENERAL DEFINITIONS	6
3. PREREQUISITES FOR PARTICIPATION	10
4. PROCEDURES FOR APPLICATION AND CERTIFICATION	10
5. OBLIGATIONS OF CERTIFIED PFPP MANUFACTURERS	13
6. SURVEILLANCE ASSESSMENT AND RECERTIFICATION ASSESSMENT	14
7. SUSPENSION AND WITHDRAWAL OF CERTIFICATION	17
8. INFORMATION ON CERTIFIED PFPP MANUFACTURERS	18
9. APPEALS AGAINST DECISIONS	18
10. COMPLAINTS	18
11. CONFIDENTIALITY	18
12. EXPERIENCE AND QUALIFICATION OF LEAD AUDITORS AND TECHNICAL AUDITORS	19
TECHNICAL REGULATIONS	21
1. INTRODUCTION	22
2. QUALITY SYSTEM	22
3. CERTIFIED PFPP MANUFACTURERS' QUALITY RESPONSIBILITIES	22
4. TECHNICAL DEFINITIONS	22
5. EVALUATION OF CONFORMITY	23
6. MARKING AND LABELLING	28
7. REQUIREMENTS OF FRBS AND PARTS	28

PRODUCT CONFORMITY CERTIFICATION SCHEME

FOR

FALLING ROCK BARRIER SYSTEMS

PCCS – FRBS

ISSUE 1

PART ONE

ADMINISTRATIVE REGULATIONS

Hong Kong Institute of Steel Construction

**PRODUCT CONFORMITY CERTIFICATION SCHEME
FOR FALLING ROCK BARRIER SYSTEMS**

PCCS-FRBS

ADMINISTRATIVE REGULATIONS

1. INTRODUCTION

- 1.1** The purpose of the Scheme is to ensure that all falling rock protection barrier systems (FRBS) produced by Certified FRBS Manufacturers/Suppliers meet Purchasers' specified requirements in accordance with the requirements under the Buildings Ordinance and relevant associated regulations. This is a product certification scheme that requires Certified FRBS Manufacturers/Suppliers to operate a quality system relevant to production and supply of FRBS, which is certified to ISO 9001 and complies with the Regulations of the Scheme.
- 1.2** The Administrative Regulations set out the rules for the operation of the Scheme and the rights and obligations of Certified FRBS Manufacturers/Supplies and certification body in relation to the Scheme.
- 1.3** The Technical Regulations set out the general technical requirements for the Scheme and the specific requirements for the specific FRBS.
- 1.4** This Scheme is a System 5 product certification scheme in accordance with ISO/IEC 17067 which includes initial assessment of quality and production systems, initial plant inspection and type testing, reassessment of Certified FRBS Manufacturers'/Supplies' quality and production systems, followed by periodic surveillance visits and regular audit testing that takes into account the Certified FRBS Manufacturers'/Suppliers' quality system and the testing of samples.
- 1.5** A Certification Body who uses this Scheme for certification of falling rock barrier systems manufacturing plants, shall be operated in accordance with this Scheme and ISO/IEC 17065.
- 1.6** In order to ensure an impartial operation of the Scheme for Certification, the parties involved in the certification scheme with potential conflict of interests shall be independent from each other. The manufacturers of the certified products (applicants), the notified bodies (testing laboratories and certification bodies), the purchasers / end-users and their representatives (such as the project Authorized Person, Registered Structural Engineer and Registered Contractor), involved in administration and management of the project using products of this scheme, shall be independent from each other.

2. GENERAL DEFINITIONS

For the purposes of this document, the following definitions are applied to the Regulations:

2.1 Administrative Regulations

The regulations that set out basic Administrative Requirement for the Scheme.

2.2 Applicant

A firm or company engaged in production and supply of falling rock barrier systems who has formally applied for certification to become a Certified FRBS Manufacturer/Supplier.

2.3 Areas for Improvement

Areas for improvement (AFIs) are not nonconformities and corrective actions are not mandatory. However, the assessment team judges by their experience that these are potential problem areas which may deserve attention.

2.4 Assessment

An in-depth appraisal of an Applicant's or a Certified FRBS Manufacturer's quality and technical system at a Plant to assess compliance with the Regulations. It is classified as Certification, Surveillance and Recertification assessments.

2.5 Audit Testing

Sampling, inspection and testing of FRBS, which are ordered by an assessment team during Certification, Surveillance and Recertification or based on the production volume whichever applicable or requested by Certification Body after critical nonconformity, has been raised. In Certification, Surveillance and Recertification Assessments, products shall be sampled and tested for audit testing. The testing and compliance standards shall be confirmed by the assessment team in considering the performance of the products and the Regulations of this Scheme. The tests shall be conducted by an independent HOKLAS, or its MRA partners, accredited laboratory and the results shall be produced in an HOKLAS or its MRA partners endorsed test reports.

2.6 Auditor

A nominee of the Certification Body appointed to carry out assessments. Auditors are classified as Lead and Technical Auditors.

2.7 Certificate of Conformity

The certificate issued by the Certification Body to confirm certification of an Applicant or a Certified FRBS Manufacturer/Supplier has been assessed and complied with Scheme Requirements in respect of a particular falling rock barrier systems manufacturing plant.

2.8 Certification

Acceptance by the Certification Body, on the basis of assessments, that the Applicant or the Certified FRBS Manufacturer complies with the Regulations for a particular falling rock barrier systems.

2.9 Certification Board

A decision making board of a Certification Body to deliberate and grant a Certification or otherwise to an Applicant or a Recertification to a Certified FRBS Manufacturer/Supplier.

2.10 Certification Body (CB)

An organization which is operated in accordance with ISO/IEC 17065 to process applications from the Applicant and to grant certification or otherwise to the Applicant.

2.11 Certification Mark

The Certification Body logo issued by Certification Body which Certified FRBS Manufacturers/Supplies are licensed to use. The use of this logo should be in accordance with the Regulations of the Certification Body.

2.12 Certified FRBS Manufacturer/Supplier

An Applicant who has achieved the Certification.

2.13 Critical Non-conformity

Significant deviations of products from specified requirements in the Regulations, or the absence of, or failure to implement and maintain a series of required quality management system elements, or a situation which would, on the basis of available objective evidence raise highest degree of doubts to the conformity of the product that the Certified FRBS Manufacturer produces.

2.14 Falling Rock Barrier Systems

Systems that are designed to effectively stop a falling rock. The components of a falling rock barrier system include interception structure, support structure and the connection components. The foundation is not considered part of the falling rock barrier system. The design of the foundation is in the responsibility of the designer, taking account of national provisions.

- **Interception Structure**

It has the function of bearing the direct impact of the mass, deforming elastically, and/or plastically, and transmitting the stresses to the connection components, the support structure and the foundations (e.g ring nets, etc.).

- **Support Structure**

It has a function of maintaining the interception structure unbent, which is by nature not rigid. It can be directly connected to the interception structure or through a connection structure (e.g. foundation, steel posts, etc.).

- **Connection Components**

Components that have the function of transmitting the stresses to the foundation. In order to allow the deformation, devices can be installed onto the structure, which permit a controlled lengthening (e.g. ropes, shackles, clips/u-bolts, breaking element, etc.).

2.15 Initial Type Testing

A method under which a sample of the product is selected in the certification audit and tested according to a prescribed test method in order to verify full compliance with the relevant Technical Requirements.

- 2.16 Major Non-conformity**
Deviation of products from specified requirements in the Regulations, or the absence of, or failure to implement and maintain one or more required quality management system elements, or a situation which would, on the basis of available objective evidence raise serious doubts to the conformity of the product that the Certified FRBS Manufacturer/supplier produces.
- 2.17 Minor Non-conformity**
Failure to meet one requirement of a clause of ISO 9001 QMS and/or this Scheme or other necessary reference documents, and which is considered NOT to constitute a risk to the quality of fall rock barrier systems that the Certified FRBS Manufacturer/Supplier produces.
- 2.18 Plant**
A Plant for the production of certified falling rock barrier systems or its components.
- 2.19 Plant Production Control (PPC)**
The manufacturer shall establish, document and maintain a PPC system to ensure that the products placed on the market comply with the declared performance of the essential characteristics. The PPC system may be included in the ISO 9001 QMS.
- 2.20 Plant Register**
The register of certified Plant maintained by the Certification Body of all Plants which have attained Certification and are currently certified.
- 2.21 Purchaser**
An individual, firm or company who entered into a contract with a Certified FRBS Manufacturer/Supplier to purchase certified FRBS.
- 2.22 Quality Assurance**
All the activities and functions concerned with the attainment of the quality of falling rock barrier systems.
- 2.23 Quality Control**
The operational techniques and activities that sustain the quality of falling rock barrier systems as set out in a specification agreed between the Purchaser and the Certified FRBS Manufacturer/Supplier and in accordance with the Regulations.
- 2.24 Quality Manual**
The document describing the Applicant's or Certified FRBS Manufacturer's/Supplier's structures, resources, procedures and methods which together ensure that the Applicant or Certified FRBS Manufacturer/supplier can meet the requirements of the Scheme.
- 2.25 Quality Records**
The records required by the Certified FRBS Manufacturer's/Supplier's Quality Manual to be kept by the Certified FRBS Manufacturer/Supplier to meet the requirements of the Regulations.
- 2.26 Quality System Management Office**
A location at which a Certified FRBS Manufacturer's/Supplier's quality and production records are maintained.

- 2.27 Regulations**
The combined Administrative Regulations and Technical Regulations.
- 2.28 Scope of Certification**
A range of products that an Applicant applies for the product conformity certification under this Scheme.
- 2.29 Scheme**
The product conformity certification scheme for the certification of the production of FRBS. The Scheme is owned by Hong Kong Institute of Steel Construction (HKISC)
- 2.30 Technical Regulations**
The regulations which set out the technical requirements of the Scheme.

3. PREREQUISITES FOR PARTICIPATION

- 3.1** The Applicant will be required to demonstrate the ability to comply with the Regulations and shall confirm agreement to comply with the Regulations.
- 3.2** The Applicant shall nominate a quality manager to be responsible for the overall management of the falling rock barrier systems production and supply activities of the Plant of the Applicant.
- 3.3** The Applicant shall establish and maintain a documented quality system (ISO 9001) in accordance with the requirements of the Administrative Regulations. The same quality system shall apply to the production of rock falling barrier systems or its components in a Plant of the Applicant within the Scheme.
- 3.4** The Applicant shall obtain relevant permits for the operation of the Plant to fulfill relevant statutory and regulatory requirements and establish a quality system management office to maintain quality records for at least three months before the Certification Assessment.

4. PROCEDURES FOR APPLICATION AND CERTIFICATION

4.1 Application

- 4.1.1** For consideration to become a Certified FRBS Manufacturer/Supplier, an Applicant shall:
 - 1. complete and submit the application form prescribed by Certification Body;
 - 2. pay fee including an application fee, a certification audit fee, a product testing fee and all the subsequent fees for the certification etc.;
 - 3. provide the Certification for the ISO 9001 system for the business office and production plant, Quality Manual and related documentations e.g. scope of certification, quality manual, drawings and technical information including specifications related to the products, certificates of origin for purchased raw materials, etc. for assessment;
 - 4. nominate a person to be the management representative and the Applicant's formal contact point with the Certification Body.

4.2 Certification Assessment

- 4.2.1** On receipt of an application, an assessment team consisting of a Lead Auditor and Technical Auditor will assess the quality and technical documentations for compliance with the Regulations and carry out document review and arrange to perform on site assessment of the Quality Management System and Manufacturing Plant.
- 4.2.2** Certification Assessment shall comprise the following:
 - 1. Overall assessment of the quality management and PPC systems.
 - 2. Quality management system office. The assessment team will assess the quality system relating to the Plant by an assessment of quality and production control.

3. Manufacturing Plant. The assessment team will assess the plant and equipment including the calibration of such plant, equipment, PPC processes and the operation of the relevant sections of the Certified FRBS Manufacturer's/Supplier's quality and technical systems conforming to the Regulations.
4. Evaluation of the results of production testing. The assessment team will assess the quality control system by carrying out an evaluation of quality control (QC) testing results covering a minimum of three months. The assessment team will also examine relevant quality and production records to confirm the output of quality control systems and hence authenticate the conformity of the FRBS to the specified criteria in the Regulations.
5. Initial Type Testing. The samples of the products/key components shall be selected by the Certification Body for the purpose of initial type testing. The tests shall be carried out by an independent HOKLAS, or its MRA partners, accredited laboratory and the results produced in a HOKLAS or its MRA partners endorsed test report. Details for initial type testing refer to the Technical Regulation.

The results included in the Test Reports shall be evaluated by the assessment team of the Certification Body for generating the approved scope of product.

4.2.3 On completion of the Certification Assessment, the assessment team will notify the Applicant the type of nonconformities found and obtain the Applicant's acknowledgement of these. The assessment team will indicate orally the recommendations for Certification or otherwise.

4.2.4 There are four possible recommendations:

1. **No nonconformity.** Certification will be recommended to the decision making Certification Board or equivalent function of the Certification Body. Some AFIs may be given for the improvement of the quality and technical systems.
2. **A number of minor nonconformities** which do not cumulatively indicate a major failure of the quality management system and product quality. Certification will be recommended after receipt of a letter giving satisfactory details of corrections and corrective actions taken which will eliminate the nonconformities from the system after successful implementation. The time limit for the receipt of the letter will be two weeks.

Note that corrections and corrective actions do not have to be implemented before the receipt of the letter by the Certification Body. Corrections and corrective actions shall be implemented within an agreed timeframe which will be a maximum of four weeks or such lesser time as the assessment team may decide. Minor nonconformities will be audited on the first subsequent Surveillance Assessment.

3. **A major nonconformity or a number of systematic minor nonconformities** which accumulate to indicate a major failure of the quality management system and product quality. The Applicant will be required to respond giving satisfactory details of corrections and corrective actions to be taken which will rectify the nonconformities in the system after successful implementation. The time limit for the written response will be two weeks.

Corrections and corrective actions shall be implemented within an agreed time frame which will usually be between one to three months.

Certification will not be recommended until the nonconformities have been rectified from the system and a satisfactory follow up assessment has been carried out.

If the Applicant is not ready for the follow up assessment within six months, the application will be considered unsuccessful. A new application will be required.

4. **A critical nonconformity** indicating that the extent of the system failure is considered by the assessment team to require more than six months for corrections. The Applicant will be required to re-apply for Certification after a period of at least six months following the date of Certification Assessment.

4.3 Certification

- 4.3.1 On receipt of the assessment team's written recommendation, the Certification Body will decide to grant Certification or otherwise based on the decision made by the Certification Board or equivalent function.
- 4.3.2 The Applicant shall sign an agreement to be abided by the Regulations and the regulations of the Certification Body. A Certificate of Conformity will be issued by Certification Body to the Applicant for that Plant.
- 4.3.3 Details of the Certified FRBS Manufacturer/Supplier together with its locations and details of the certified Plant will be included on the Plant Register of Certification Body's website or equivalent means.
- 4.3.4 Where an application for participation in this Scheme is rejected or Certification is refused, the Applicant shall have the right of representation to an appeal committee in accordance with the Certification Body regulations.
- 4.3.5 For traceability of records, the Certification Body is responsible to keep the following documents of not less than 3 years.
 1. Application documents;
 2. Certification assessment records;
 3. Certification documents;
 4. Surveillance assessment records;
 5. Re-certification assessment records and documents;
 6. Suspension and withdrawal of certification records; and
 7. Complaint and investigation records.
- 4.3.6 Documents from one Certification Body shall not be transferrable to another Certification Body for products conformity certification.

4.4 Certificate of Conformity and Certification Mark

4.4.1 Upon Certification, conformity of falling rock barrier systems to the PCCS- FRBS Scheme shall be indicated by a Certificate of Conformity issued by the Certification Body. The Certified FRBS Manufacturer/Supplier shall be entitled to use the Certification Body logo as a Certification Mark in accordance with the Certification Body regulations.

4.4.2 Certificate of Conformity shall include, in particular:

1. The name and address of the Certification Body;
2. The name and address of the Certified FRBS Manufacturer/Supplier and of the Plant;
3. The name of the certified FRBS;
4. Statement that the falling rock barrier systems conforms to the requirements of the relevant product specification standard and the conformity is established according to the PCCS-FRBS Scheme;
5. List of important components and materials from other suppliers and sub-contractors associated with the certified falling rock barrier systems, e.g. steel posts, rope, clips/u-bolts, shackles, ring net and brake element etc. The list shall provide specific name and model of the important components and the name of supplier / sub-contractor; and
6. The certificate number assigned by the Certification Body.

The Certificate of Conformity shall entitle the manufacturer to use the Certification Mark on packaging materials and any documentation used for the certified falling rock barrier systems.

4.4.3 A Certified FRBS Manufacturer/Supplier may also use the Certification Mark on quotations and delivery notes for Plants which have achieved Certification and may use the Certification Mark on stationery, brochures and other advertising media.

4.4.4 The conformity marking shall consist of the Certification Mark and shall be followed by:

1. The identification number of the Certified FRBS Manufacturer/Supplier,
2. The standard designation of the Falling Rock Barrier Systems to the PCCS-FRBS Scheme.

5. OBLIGATIONS OF CERTIFIED PFPP MANUFACTURERS

5.1 The Certified FRBS Manufacturer/Supplier shall operate a quality management system in accordance with ISO 9001. The Certified FRBS Manufacturer/Supplier shall also comply with the Regulations.

5.2 The Certified FRBS Manufacturer's/Supplier's quality and technical documentations shall be applied to its PPC and supplying FRBS within the Scheme.

5.3 The Certified FRBS Manufacturer/Supplier shall pay an annual fee to Certification Body for each Certification. The Certified FRBS Manufacturer/Supplier shall also pay an initial assessment fee and all subsequent fees to Certification Body for assessment, surveillance and re-assessment. The amount of all fees will be

determined by the Certification Body. The Certified FRBS Manufacturer/Supplier shall bear the cost of any Audit Testing which may be directed.

- 5.4** The Certified FRBS Manufacturer/Supplier shall afford an assessment team full assistance and cooperation during any assessments, producing documentation and Quality Records when requested, allowing an assessment team to have free access to a Plant and Quality Records Centre and assisting with Audit Testing as necessary.
- 5.5** The Certified FRBS Manufacturer/Supplier shall not sub-contract the production and supply of falling rock barrier systems unless specific prior approval has been obtained from the Certification Body. Such approval will only be given if the proposed sub-contractor is also a Certified FRBS Manufacturer/Supplier and the Purchaser has been informed of and agreed with the sub-contract arrangement.
- 5.6** The Certified FRBS Manufacturer/Supplier may use the Certification Mark as described before but shall not use it in a manner that may bring the Scheme or the Certification Body into disrepute.
- 5.7** The Certified FRBS Manufacturer/Supplier shall keep the Certification Body informed in writing of any changes in his circumstances which may affect Certification. Such changes include:
1. Changes in ownership or name.
 2. Changes of its management representative or company directors.
 3. Changes of Certification for the ISO 9001 system for the plant and Quality System in its Plant.
 4. Significant changes of activities related to FRBS, e.g. changes of suppliers for sources of the raw materials
 5. Changes of scope of certification
 6. Changes of the location of the Plant and/or Quality System Management Office.
 7. Closure of a manufacturing Plant.
- 5.8** The Certified FRBS Manufacturer/Supplier shall inform the Certification Body any significant changes to the product, manufacturing process or quality system, which may affect the conformity of the product. In such case, the Certification Body shall evaluate the degree of such changes to the product quality and may demand an assessment for such changes and the Certified FRBS Manufacturer/Supplier may be asked not to release the product before the performance of on site assessment
- 5.9** The Certified FRBS Manufacturer/Supplier shall keep a list of its purchasers who purchased the certified Falling Rock Barrier Systems for the purpose of recall when necessary. An identification system should be in place to ensure that any products to be recalled, where necessary, could be located easily.

6. SURVEILLANCE ASSESSMENT AND RECERTIFICATION ASSESSMENT

6.1 Continual Periodical Assessments

- 6.1.1** After Certification, the assessment team will conduct periodic Surveillance Assessments to the Plant and associated Quality System Management Office, for assessment of the Certified FRBS Manufacturer/Supplier.

6.2 Frequency and Purpose of Surveillance Assessment

6.2.1 The frequency of routine Surveillance Assessments for the first three-year Certification and subsequent Certification cycles shall be at least once for every twelve months.

Surveillance Assessments shall comprise the followings:

1. Manufacturing Plant. The surveillance assessment team will assess plant and equipment including the calibration of such plant and equipment and the operation of the relevant sections of the Certified FRBS Manufacturer's/Supplier's quality and technical documentations conforming to the Regulations. Audit on each manufacturing line for each product will be conducted.
2. Quality System Management Office. The surveillance assessment team will assess the quality system relating to the Plant by an assessment of the quality and production records.
3. Evaluation of the results of production testing. The surveillance assessment team will assess and evaluate the results of all quality control tests since the previous assessment. The surveillance team will also examine relevant quality records to confirm the output of control systems and hence authenticate the conformity of the FRBS to the specified criteria in the Regulations and relevant requirements.
4. Audit Testing (Surveillance). The surveillance assessment team will select samples randomly at the Plant for destructive and non-destructive testing to check the compliance of the physical properties and the assembly of the FRBS against the product specifications.

The results shall be evaluated by the assessment team of the Certification Body and a report shall be produced.

6.2.2 Other Surveillance Assessments will be made for follow up assessment purposes following a report of major or critical nonconformities. Such assessments may require either:

1. A partial assessment to confirm that nonconformities have been corrected; or
2. A full assessment to confirm compliance with the Regulations.

6.3 Conclusions from Surveillance Assessment

6.3.1 On completion of each Surveillance Assessment, the surveillance assessment team will report the type of nonconformities found and obtain the Certified FRBS Manufacturer's/Supplier's acknowledgement of these. The surveillance assessment team will indicate orally with a written recommendation for continued Certification or otherwise.

6.3.2 There are four possible recommendations:

1. Certification should be confirmed. The Plant and its associated Quality System Management Office comply with the Regulations with no

nonconformity. Some AFIs may be given for the improvement of the quality and technical systems.

2. Certification should be conditionally confirmed. **A number of minor nonconformities** exist which do not cumulatively indicate a major failure of the quality management system and product quality. Certification will be recommended to be confirmed after receiving a written response from the Certified FRBS Manufacturer/Supplier stating details of the proposed corrections and corrective actions, to which the judgment of the surveillance assessment team will rectify the nonconformities in the system after successful implementation. The time limit for the receipt of the written reply will be two weeks. Corrections and corrective actions shall be implemented within an acceptable time limit which will be a maximum of four weeks or such lesser time as the surveillance assessment team may decide.
3. Suspension of Certification is recommended. A **major nonconformity** or **a number of systematic minor nonconformities** exist which accumulate to indicate a major failure of the quality management system and product quality. The Certified FRBS Manufacturer/Supplier will be required to submit a written reply stating details of the proposed corrections and corrective actions, to which the judgment of the surveillance assessment team will rectify the nonconformities in the system after successful implementation. The time limit for the receipt of the written response will be two weeks. Surveillance assessment team shall assess the corrections and corrective actions to ensure proposed actions are effectively implemented before the reinstatement of the Certification.

A partial or full re-assessment, as directed by the surveillance assessment team, will be required within three months before reinstatement of Certification can be recommended.

4. Withdrawal of Certification is recommended. A critical nonconformity, major nonconformity or a number of systematic minor nonconformities have not been rectified in the system in accordance with the relevant procedures stated in the Regulations or if the Certified FRBS Manufacturer/Supplier is persistently failing to comply with his obligation under this Scheme.

6.4 Recertification Assessment

- 6.4.1 The duration of a Certification is three years. Recertification Assessment will be carried out at every third year of each three-year Certification cycle. The Recertification Assessment will be carried out as if it is an initial Certification Assessment except that the initial type testing for the required performance will be substituted by an Audit testing (Recertification).
- 6.4.2 During the recertification assessment, audit testing as stated in the technical requirement is required to provide a monitoring on the certified product to reveal possible invisible deficiency of the manufacturing line. The Certification Body shall randomly take one sample, which is the most representative from the family of products as determined by the CB, at the point of release of key

components of falling rock barrier systems by the plants. The sample will then be sent for tests carried out by a HOKLAS, or its MRA partners, accredited laboratory and the results shall be produced in a HOKLAS or its MRA partners endorsed test reports.

7. SUSPENSION AND WITHDRAWAL OF CERTIFICATION

- 7.1** On receipt of an adverse assessment report and recommendation from the assessment team on any Plants or associated Quality Management System, the Certification Board or equivalent will agree or otherwise that the Certification for the Plant will be suspended or withdrawn.
- 7.2** If the Certified FRBS Manufacturer/Supplier is, at any time in the opinion of the Certification Board, failing systematically to comply with the Scheme either by reason of suspension of Certification for the majority of its Plant or by reason of its failure to comply with his obligations under the Scheme, then the Certification Body will suspend the Certification for all certified Plants of the Certified FRBS Manufacturer/Supplier.
- 7.3** If the Certification is suspended in accordance with Clause 7.2, a full Certification Assessment of the Certified FRBS Manufacturer's/Supplier's Plant under the Scheme will be required within three months after the suspension of Certification is made before reinstatement of Certification can be recommended.
- 7.4** If, upon an assessment following suspension in accordance with Clause 7.3, a major nonconformity or a number of systematic minor nonconformities have not been rectified in the system or if the Certified FRBS Manufacturer/Supplier is persistently failing to comply with his obligations under the Scheme, then the Certification Body may, in its absolute discretion, withdraw all the Certificates of Conformity of the Certified FRBS/Supplier Manufacturer.
- 7.5** In the event that the Certification Body suspends or withdraws the Certification of any Plants of a Certified FRBS Manufacturer/Supplier, the Certification Body may publish such decisions in appropriate newspapers or similar media. If the Certification Body has exercised its right to publish such decisions, then the Certification Body will, at the request of the Certified FRBS Manufacturer/Supplier, publish any decisions reinstating a Certification.
- 7.6** Upon suspension or withdrawal of the Certification of Conformity, the FRBS Manufacturer/Supplier shall notify his customers and shall call back all products which fail systematically to comply with the Scheme.
- 7.7** If the Certification for a Plant is suspended or withdrawn, the Certified FRBS Manufacturer/Supplier shall cease to use the Certification Mark in relation to that Plant.

8. INFORMATION ON CERTIFIED FRBS MANUFACTURERS

- 8.1** Upon the request of any purchasers, end users or any concerned parties of the certified Falling Rock Barrier Systems. The Certification Body will provide verbal and, if requested, written confirmation of the status of any Certified FRBS Manufacturers/Suppliers or Plant under its register.

- 8.2 Any announcement or confirmation of the suspension or withdrawal of Certification will state the reasons for such suspension or withdrawal.

9. APPEALS AGAINST DECISIONS

- 9.1 The Applicant or Certified FRBS Manufacturer/Supplier shall have the right of appeal against any decisions of the Certification Body. Details of the appeal procedure shall refer to the Certification Body regulations.

10. COMPLAINTS

- 10.1 Certified FRBS Manufacturers/Suppliers shall keep a record of all written complaints received from any concerned parties. These records shall be made available to the assessment team at the time of Assessments.
- 10.2 The Certification Body will keep a record of all written complaints, in relation to a Certified FRBS Manufacturer/Supplier received from any concerned parties. Such complaints will be investigated and reported to the Certification Board or equivalent in accordance with the Certification Body regulations.
- 10.3 The Certification Body will respond to complainants with a report which is confined to a statement upon the Certification status of the Certified FRBS Manufacturer/Supplier and its Plants.
- 10.4 The Certified FRBS Manufacturers/Suppliers shall take appropriate actions with respect to the Certification Body's decision on the complaints and make good any deficiencies found in the products or the services to comply with the requirements of this Scheme.

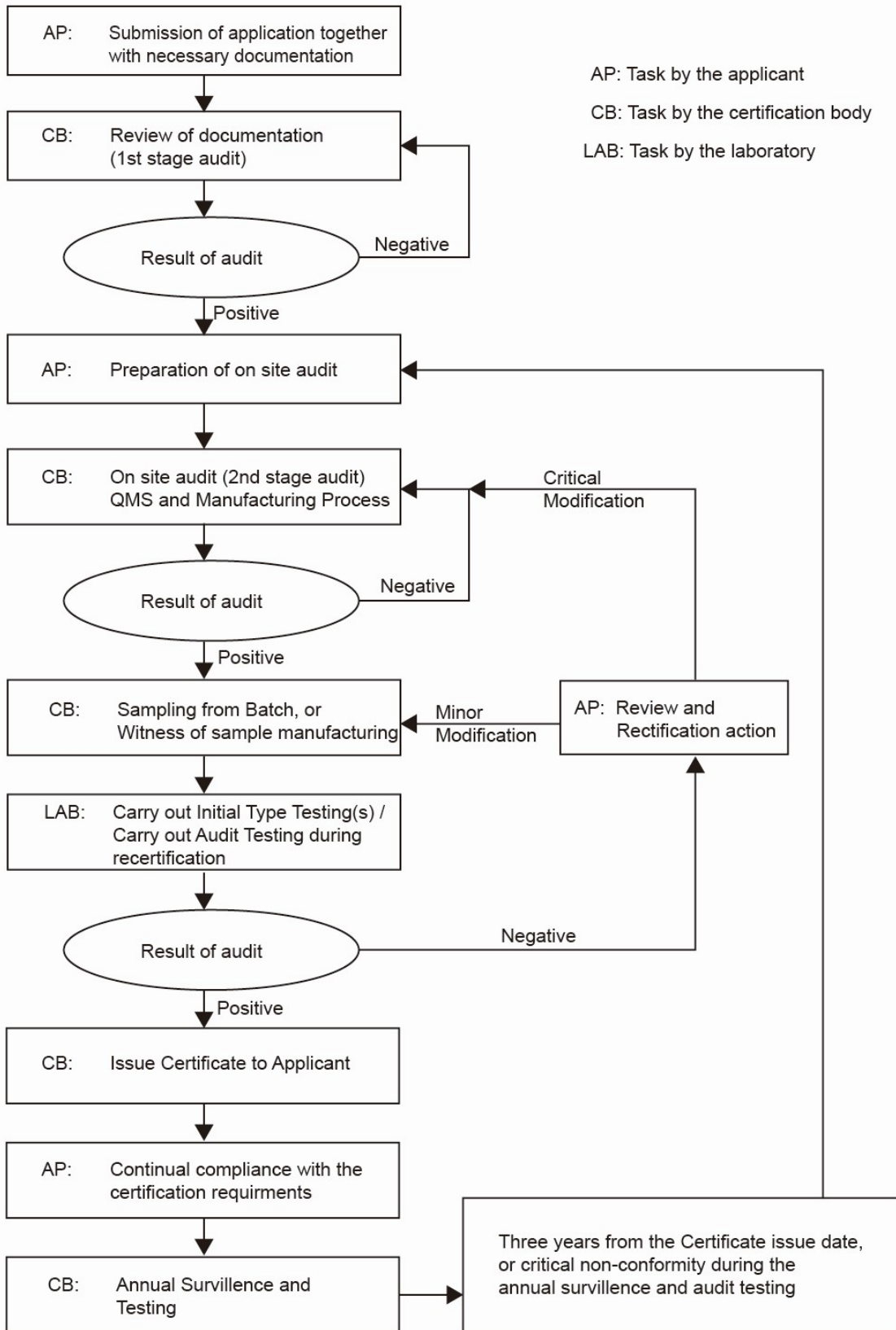
11. CONFIDENTIALITY

- 11.1 Certified FRBS Manufacturers/Suppliers shall disclose to the assessment team for the purposes of Assessments all information or records obtained from or pertaining to Purchasers and connected with the Scheme.
- 11.2 The assessment team and the Certification Body shall not disclose information or records obtained from Certified FRBS Manufacturers/Suppliers except as may be permitted by the Certification Body regulations.

12. EXPERIENCE AND QUALIFICATION OF LEAD AUDITORS AND TECHNICAL AUDITORS

- 12.1** Lead Auditors who are eligible for auditing PCCS-FRBS quality management system shall have the following registration:
- With minimum of two years quality management system auditing experience and with Quality Management System (QMS) and Product Certification. The CB may develop a system to train and authorize lead auditors and auditors with reference to Section 7 of ISO 19011.
- 12.2** Technical Auditors who are eligible for auditing PCCS-FRBS technical management system shall have the following training, experience and qualifications:
1. A recognized Degree in Civil Engineering, Materials Science, Production Engineering, Structural Engineering, Mechanical Engineering or equivalent and;
 2. With QMS and Product Certification training acceptable to Certification Body for this purpose, and
 - a) a minimum of two years post-degree experience in relevant industry; or
 - b) a minimum of two years quality management system audit experience for relevant manufacturing industry.

FLOW CHART TO OBTAIN AND MAINTAIN THE PCCS – FRBS



PRODUCT CONFORMITY CERTIFICATION SCHEME

FOR

FALLING ROCK BARRIER SYSTEMS

PCCS – FRBS

ISSUE 1

PART TWO

TECHNICAL REGULATIONS

HONG KONG INSTITUTE OF STEEL CONSTRUCTION

**PRODUCT CONFORMITY CERTIFICATION SCHEME
FOR FALLING ROCK BARRIER SYSTEMS**

PCCS – FRBS

TECHNICAL REGULATIONS

1. INTRODUCTION

- 1.1 This Technical Regulations set out the technical requirements of the Scheme.
- 1.2 This Technical Regulations shall be read in conjunction with the Administrative Regulations.
- 1.3 This Technical Regulations cover the technical requirements for the certification of falling rock barrier systems.

2. QUALITY SYSTEM

- 2.1 An effective quality system shall be established, documented and maintained in accordance with the prevailing ISO 9001 requirements to ensure and demonstrate that the falling rock barrier systems produced and supplied under the Scheme conforms to the relevant requirements and the Regulations.

3. CERTIFIED FRBS MANUFACTURERS'/SUPPLIERS' QUALITY RESPONSIBILITIES

- 3.1 The Certified FRBS Manufacturer shall nominate a Quality Management Representative who shall have defined authority and responsibility for ensuring that the requirements of ISO 9001 and the Technical Regulations are met.
- 3.2 All staff shall be technically competent for the functions that they perform and are aware of the effects of these functions on the product quality. A proper training procedure shall be set up and maintained for the training of technical staff.

4. TECHNICAL DEFINITIONS

4.1 Falling Rock Barrier Systems

A system that designed to effectively stop a falling rock. The component of a falling rock barrier systems including interception structure, support structure and the connection components.

- **Interception Structure**
It has the function of bearing the direct impact of the mass, deforming elastically, and/or plastically, and transmitting the stresses to the connection components, the support structure and the foundations (e.g ring nets, etc.).
- **Support Structure**
It has a function of maintaining the interception structure unbent, which is by nature not rigid. It can be directly connected to the interception structure or through a connection structure (e.g. foundation, steel posts, etc.).

- **Connection Components**
Components that have the function of transmitting the stresses to the foundation. In order to allow the deformation, devices can be installed onto the structure, which permit a controlled lengthening (e.g. ropes, shackles, clips/u-bolts, breaking element, etc.).

4.2 Nets

Bearing element acting as a surface.

4.3 Posts

Part of the support structure supporting the bearing ropes and nets.

4.4 Ropes (bearing)

Bearing elements serving to transmit the forces into the posts, ground plates and upstream cable.

4.5 Brake Element

Device designed for dissipating energy during the impact of a falling rock.

4.6 Critical Components

These are the components that are vital to the performance of the FRBS, includes the ring net and the braking element.

5. EVALUATION OF CONFORMITY

5.1 General requirements

The Scheme for the evaluation of conformity for Falling Rock Barrier Systems relating to the technical aspect includes the following tasks:

1. Inspection of plant QMS and Plant Production Control (PPC)
2. Initial Type Tests (ITT)
3. Audit Testing (AT)

A Certified FRBS Manufacturer/Supplier having a quality management system comply with ISO 9001 and the Regulations in this Scheme are deemed to meet the requirements of Plant Production Control.

5.2 Plant Production Control (PPC)

A PPC plan and procedures relevant to the declared properties, as confirmed by the initial type tests, shall be established and implemented by the Certified FRBS Manufacturer/Supplier in accordance with the requirements in the Regulations.

Any change in raw materials, design of components, manufacturing procedures or control plan that can affect the properties of the FRBS shall be recorded.

The PPC procedures shall consist of a system for the production quality control to ensure that the product complies with the relevant requirements.

The production control shall consist of the following main phases:

1. inspection and/or testing of raw materials;
2. inspection and/or testing of production equipment and process;
3. inspection and/or testing on finished products.

5.2.1 Production

5.2.1.1 Raw materials

The manufacturer/supplier shall define the acceptance criteria and control procedures for incoming materials to ensure that these are not used until it has been verified that they comply with the required specifications.

5.2.1.2 Production process

The manufacturer shall identify and define the plant and production processes and ensure that the processes are carried out under controlled conditions clearly described in the procedures. The processes are verified by means of inspections and tests documented in a plan, as frequency and values or criteria are required both on equipment and on operations in the process. The actions to be taken when control values or criteria are not satisfactory shall be given.

5.2.2 Finished products

The number and sizes of the samples, the frequency of sampling, the tests performed and the results obtained shall be recorded. The test shall be conducted at least with the frequency specified in Table 5. For the purposes of PPC, alternative tests to those given in Table 5 may be used, provided that a correlation of the test results between both tests, for the product in question, is established.

5.2.3 Statistical techniques

Where and when possible and applicable, the results of inspections and testing shall be interpreted by means of statistical techniques, by attributes or by variables, to verify the product characteristics and to determine if the production complies with the compliance criteria and the product complies with the declared values.

5.2.4 Registration and traceability

The Certified FRBS Manufacturer/Supplier shall establish and maintain suitable procedures for the identification and traceability of materials from receipts of raw materials and during all stages of production and delivery.

5.3 Initial Type Tests (ITT)

- 5.3.1 The falling rock barrier systems are assemblies of various structural materials with specific design to perform the rock falling protection purpose. The FRBS shall be designed using a large deflection, large deformation numerical analyses, showing that the system is structurally adequate. A system can have different types of components (such as the braking elements, ropes and ring nets, with similar characteristics, which are required to be assessed by competent persons). A full-scale test can be used to verify the performance of the designed system.
- 5.3.2 Historical data of full-scale tests prior to the application of this PCCS-FRBS will be acceptable, provided that the construction details of the FRBS was adequately described in the test report and the CB is able to satisfactorily verify the details of construction of the FRBS during the PPC audit. National/international reputable laboratories are acceptable to carry these full scale impact resistance performance tests.
- 5.3.3 These historical data of full-scale tests can also be used for similar systems of lower capacity, as assessed by competent persons with adequate numerical analyses.
- 5.3.4 Even the applicant has historical data on full-scale tests, the ITT of the critical components, e.g. the ring nets and the brake elements, should still be carried out during the audit. The test method as mentioned in **Table 2** in Section 7 shall be carried out to confirm that the characteristics of the product meet the requirements of the Regulations in this Scheme and the relevant requirements.
- 5.3.5 The samples of the critical components of the FRBS for initial type testing shall be selected by the Certification Body. The assessment team shall take random representative samples at the point of release of FRBS from the Plant and/or depots supplied with the FRBS by the Plant. The selected samples will be marked and submitted for initial type testing.
- 5.3.6 The initial type tests for the critical components shall be conducted by independent HOKLAS, or its MRA partners, accredited laboratories that are accredited to conduct the required tests.
- 5.3.7 The acceptance criteria of the initial type tests are as given in Table 2.

5.4 Audit Testing (Surveillance)

- 5.4.1 Audit Testing (Surveillance) shall be called out by the CB during surveillance visit to ensure the compliance of quality control as specified in the PPC.

During the surveillance visit, the CB shall select samples for audit testing (surveillance) in accordance with Table 3.

5.5 Audit Testing (Recertification)

- 5.5.1 Audit testing (recertification) for critical components is needed to provide a monitoring on the certified product to reveal the invisible deficiency of the PPC procedure or the unaware change in raw materials. The frequency of audit testing (recertification) for critical components shall be every three years in the certification cycle. The CB shall randomly take samples of critical components, at the point of release of the components by the plants for audit testing (recertification) in accordance with Table 3. The tests for the components shall be carried out by a laboratory accredited by HOKLAS, or its MRA partners, for the concerned test and the results shall be produced in a HOKLAS or its MRA partners endorsed test reports. The test methods shall be as specified in Table 2.

The results from an audit test (recertification) may be as shown in Table 1.

Table 1 - Consequence of Audit Testing Results

Result	Corrective Action Required	Time schedule
Performance > or = required	None required	N/A
Performance < Required period	<p>(i) Performance in between the required Performance and 85% of the required performance</p> <p>The reasons for the reduced performance shall be identified. A re-test shall be conducted. As long as the result of the re-test achieve the required performance, the result is satisfactory to use for recertification.</p> <p>If the result of the re-test is again less than the required performance, The certification will be suspended until the reason for the performance had been determined. The probable number of defective products shall be determined and dialogue between the certificate holder and CB initiated in order to discuss notifying the market and to consider a product recall. The product shall be retested and the product specification</p>	<p>Providing the reasons are identified and is not the fault in manufacturing process, a re-test on the same/similar sample shall be conducted within 1 month;</p> <p>or</p> <p>Providing the reasons are identified and requires minor rectification of manufacturing process, a re-test on the rectified sample shall be conducted within 1 month. If the re-tested sample achieved the required performance, the result is satisfactory to use for recertification, however, the scope of certification shall be modified to reflect the rectification made.</p>
	<p>(ii) Performance < 85% of the required period</p> <p>The certification will be suspended until the reason for the performance had been determined. The probable number of defective products shall be determined and dialogue between the certificate holder and CB initiated in order to discuss notifying the market and to consider a product recall. The product shall be retested and the product specification and manufacturing procedures reviewed.</p>	<p>The scale of the problem and destination of products likely to be deficient shall be determined within three weeks. Re-test(s) must take place within 3 months otherwise certification will be limited or withdrawn. Steps to notify the market and/or to organize a product recall shall take place within two weeks of the retest. Procedure review shall be conducted within 3 months of the original test.</p>

Failure to comply with the required actions within the agreed time schedule shall result in the withdrawal of certification.

6. MARKING AND LABELLING

6.1 General Requirements

Products complying with the Regulations of the PCCS-FRBS Scheme shall be clearly marked with the following information:

- (a) Brand name of the product/system,
- (b) Manufacturer's mark and place of origin,
- (c) Date or code of production,
- (d) Products certified in accordance with PCCS-FRBS,
- (e) Type of product/system,
- (f) Model and serial numbers,
- (g) Details of construction,
- (h) Address of manufacturer.

The information shall be marked on the packaging and/or the product's technical data sheet.

7. REQUIREMENTS OF FALLING ROCK BARRIER SYSTEMS

- 7.1** This section gives the basic requirements for the FRBS and its components which are essential to show the performance. Other physical properties of the materials of the FRBS which were used for internal quality checking may be included in the certification scheme upon requested. However, the test methods for evaluating those physical properties will not be mentioned in this regulation.

7.2 The performance standards/requirements for falling rock barrier systems shall be in accordance with **Table 2**.

Table 2 – Performance Test Standards for FRBS

PERFORMANCE TO CONSIDER	TEST STANDARDS	RESULTS FOR CERTIFICATION
Full-Scale Impact Resistance Performance	<ol style="list-style-type: none"> 1. Annex A of ETAG 027 – Guideline for European technical approval of Falling Rock Protection Kids: Impact test Method, A.6 Services Energy Level (SEL) Test. 2. Annex A of ETAG 027 – Guideline for European technical approval of Falling Rock Protection Kids: Impact test Method, A.6 Maximum Energy Level (MEL) Test. 	Refer to the test specification
Braking property of the Brake Element	Annex C of ETAG 027- Guideline for European technical approval of Falling Rock Protection Kids: Identification tests, C.2 Test on energy dissipating devices.	Refer to the test specification
Tensile strength of ropes	BS EN 12385-4: 2002: + A1: 2008 – Steel wire ropes. Safety. Stranded rope for general lifting applications	Refer to the test specification
Breaking Limit of Shackles	BS EN 13889: 2003 + A1: 2008 – Forged steel shackles for general lifting purpose. Dee Shackles and bow shackles. Grade 6. Safety.	Refer to the test specification
Strength of Ring Net	Annex C of ETAG 027- Guideline for European technical approval of Falling Rock Protection Kids: Identification tests, C.3 Test on net elements	Refer to the test specification
Tensile Strength of Steel	<ol style="list-style-type: none"> 1. BS EN 10002-1: 2001 – Tensile testing of metallic materials: Method of test at ambient temperature 2. BS EN ISO 6892-1: 2009 – Metallic materials – tensile testing: Method of test at ambient temperature. 	Refer to the test specification

- 7.3 The frequency for the initial type test, tests for plant production control and auditing testing and the related properties that need to be checked are summarized in Table 3.

Table 3: Initial type test, production control test and audit testing frequency

Test / Inspection Elements	Test / Inspection Method	Initial Type Test (ITT)	Production Control Test	Audit Testing (AT)	
				(Surveillance)	(Recertification)
Full Scale Impact Resistance Performance	See Table 2	Y	--	--	-
Brake Properties of Braking Elements	See Table 2	Y	--	Y	Y
Strength of Ring Net	See Table 2	Y	--	Y	Y
Tensile strength of ropes	See Table 2	Y	A	Y	Y
Breaking Limit of Shackles	See Table 2	Y	A	Y	Y
Steel – tensile strength	BS EN 10002-1: 2001 or BS EN ISO 6892-1: 2009	Y	A	Y	Y
Dimensional check and structural inspection of overall configurations and internal components against certified product drawings	Destructive testing using a randomly selected sample	Y	A	Y	--

Note:

1. "Y" - tests are required for all components with HOKLAS or MRA endorsed test reports. National/international reputable laboratories are acceptable to carry these full scale impact resistance performance tests (see Section 5.3).
2. Production Control Test frequency:
"A" means 1 test / inspection for every 5000 finished products, with a minimum of 1 time per year / as defined in the factory's technical procedures.
3. Specimens of key components of falling rock barrier systems shall be sampled randomly for representation of the products.
4. In-house method should be the test method of the manufacturer which is specified in their quality control system under ISO 9001 certification.

* Test/Inspection Elements depend on the product design requirements.

© 2018 Hong Kong Institute of Steel Construction

Hong Kong Institute of Steel Construction administrates the copyright and other intellectual property rights of these Regulations. All rights of Hong Kong Institute of Steel Construction are hereby reserved. No part of this document may be reproduced or transmitted in any form or by any means, including photocopying and recording, without the written permission of Hong Kong Institute of Steel Construction. Such written permission must also be obtained before any part of this document is stored in a retrieval system of any nature.