香港
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Hong Kong Institute of
Steel Construction

Façade Group

PRODUCT CONFORMITY CERTIFICATION SCHEME

FOR

HEAT SOAKED TEMPERED GLASS

TECHNICAL REQUIREMENTS

FaG-TG 002

JANUARY 2006

FOREWORD

The Facade Group of The Hong Kong Institute of Steel Construction was established in 2002. It aims to provide a technical platform for various professionals in the construction industry, including architects, building surveyors, engineers, contractors and facade suppliers, to promote advanced and cost-effective façade applications in structures. The Committee of the Façade Group consists of:

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Dr A. K. W. So	*Vice Chairman*
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Mr. Joe Yu	

This document "Product Conformity Certification Scheme for Heat Soaked Tempered Glass Technical Requirements, FaG-TG 002" is the first publication on heat soaked tempered glass compiled by the Facade Group. It serves as a reference document for the local construction industry to establish effective administrative procedures of the Product Conformity Certification Scheme for general heat soaked tempered glass. This document was compiled between July and November 2005 by a Task Group consisting of the following Committee Members:

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Amendment Record

SYNOPSIS

This Product Conformity Certification Scheme for Heat Soaked Tempered Glass aims to promote the quality of manufacture and supply of heat soaked tempered glass. The Scheme requires that all the certified products are controlled by a quality management system at various critical stages of manufacture and supply, from auditing of quality management system of production plants, initial prototype testing of products, technical inspection of manufacturing process, and subsequent surveillance visits and continual audit testing of products. It should be noted that in many advanced countries, most government departments, local regulators and authorities as well as national agencies require mandatory certifications of heat soaked tempered glass for reasons of safety, health, environmental protection, fraud prevention and market fairness. Such requirements are often stipulated in their project specifications and procurement contracts. The Scheme adopts ISO 9001 for quality management system, ISO 17020 for inspection and ISO 17025 for testing schemes into one coordinated audit, ensuring conformity of the products at various critical stages of manufacture and supply. All the certified products are entitled to bear a certification mark together with relevant technical product description.

This Scheme carries the following advantages:

- An independent assurance on heat soaked tempered glass is achieved that the products are manufactured and supplied under an effective system of testing, inspection, conformity control and regular monitoring by an independent accredited certification body.

- The purchasers of the products are assured that each individual product is certified to be in compliance with both the stringent administrative procedures and the relevant technical requirements of the Scheme.

- The Scheme is able to identify certified products with a certification mark which enhances the reputation of the products as well as the manufacturers, and hence, their competitiveness in the market.

- All certified products enjoy the benefits of protection against competition from sub-standard products and misrepresentation.

- The Scheme is highly effective in improving production efficiency with reduced wastage and rejects.

It should be noted that a complementary document, namely, Administrative Procedures FaG-TG 001 is compiled for the product conformity certification process.

Moreover, as the ISO/IEC Guide 65: 1996 "General requirements for bodies operating product certification systems" specifies that the scope of certification system shall be coupled with production surveillance / assessment and surveillance of the Applicant's quality management system, the framework of this Scheme is established against the following international guidance:

i) IAF Guidance on the Application of ISO/IEC Guide 65, and
ii) IAF Guidance on the Application of ISO/IEC Guide 62.

In view of the local practice and the normative reference in heat soaked tempered glass in Hong Kong, the HKCAS Supplementary Criteria No. 2, in particular, Clause 4 about product certification procedures is adopted. Thus forms a base for building up both the administrative procedures and the technical requirements of this scheme.

The workflow of the Scheme and all relevant procedures of certification audit, surveillance visits and renewal audits are outlined in Appendix A for easy reference.

Content

1. Introduction

1.1 This Scheme aims to promote the quality of manufacture and supply of heat soaked tempered glass panels. The Applicants / Participants participating in this Scheme shall meet all the specified requirements stipulated in this document.

1.2 This Scheme requires all the Applicants/ Participants to operate a Quality Management System complied with ISO 9001: 2000. Alternatively, while the Quality Management System is not required to comply fully with ISO 9001: 2000, all the essential quality elements relevant to the manufacture and supply of the products shall be followed (HKCAS Supplementary Criteria No. 2, Issue No. 1 dated August 2003).

1.3 This scheme requires the performance of a tempered glass panel undergoing a heat soak process to comply with BS EN 14179-1: 2005 Clause 5.3, 6 and 10 or PNAP 239 Clause 8 or other international / national standards. The heat soaked tempered glass shall not lose its mechanical or thermal characteristics.

1.4 This scheme requires calibration of the heat soak chamber / furnace shall meet the requirements as stipulated in Clause 8.2.

2. Definitions

For the purposes of this scheme, the following terms and definitions apply:

Auditor

A person who possesses the competence as required by ISO 19011:2002 to conduct an audit.

CB

A certification body accredited by the Hong Kong Accreditation Services (HKAS) to execute this Scheme.

Heat Soak Process

The condition that all panels of one consignment be kept at a mean oven temperature of (290 +/- 10) ^{o}C for two hours in accordance with BS EN 14179-1:2005 or those required by other international / national standards.

Heat Soaked Tempered Glass

Glass within which a permanent surface compressive stress has been induced in order to give it greatly increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics and which has a known level of residual risk of spontaneous breakage due to the presence of critical nickel sulphide (NiS) inclusions.

Horizontal Toughening

Toughening process in which the glass is supported on horizontal rollers.

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.

Lead Auditor

An auditor having additional knowledge and skills in audit leadership, as required by ISO 19011: 2002, to facilitate efficient and effective execution of the audit.

Level of Residual Risk

Risk of spontaneous breakage of heat soaked tempered glass, on a statistical basis, due to the presence of critical nickel sulphide inclusions, is no more than one breakage per 400 tonnes of heat soaked tempered glass.

Major Nonconformity

A deviation from the Scheme Requirements, or absence of, or failure to implement and maintain one or more required quality management system elements, or a situation which will, on the basis of available objective evidence, raise significant doubt to the conformity of the products (IAF Guidance on the Application of ISO/IEC Guide 65: 1996, Issue 1 dated 27 March 1999).

Minor Nonconformity

A failure to comply with the Scheme Requirements which is considered not to affect seriously the quality management system of the Applicant / Registrant or the compliance with the Scheme Requirements.

Purchaser

An individual or a company that purchases the product.

Quality Management System

The organizational structure, responsibilities, procedures, processes and resources for implementing quality management regarding the manufacture and supply of the products.

Scope of Certification

A range of products that an Applicant applies for the product conformity certification under this Scheme.

Vertical Toughening

Toughening process in which the glass is suspended by tongs.

3. Overview of Technical Requirements

3.1 The Participant shall demonstrate full compliance with all the technical requirements listed in Clause 3 to Clause 12 in each certification audit, surveillance visit and renewal audit.

3.2 A quality management system shall be established, documented and maintained in accordance with relevant requirements of ISO 9001: 2000 related to the certified product, and be certified by an accredited certification body. In addition, the quality management system shall cover the following aspects:

a. Quality responsibilities of the Participant;
b. Quality requirement planning;
c. Identification of heat soaked tempered glass panels;
d. Quality control of purchased glass panels;
e. Production control;
f. Conformity control of heat soaked tempered glass panels;
g. Training of staff;
h. Quality management system review;
i. Quality records.

3.3 Technical procedures different from the Technical Requirements may be accepted but subjected to the approval of the CB on the same degree of quality assurance of the product can be achieved. However, the alternative technical procedures shall be fully documented and be made available to the CB for consideration.

4. Quality Responsibilities of the Participant

4.1 The Participant shall delegate authorities and responsibilities to appointed staff as its representative for implementing and ensuring that the requirements of ISO 9001: 2000. Alternatively, while the quality management system is not required to comply fully with ISO 9001:2000, all the essential quality elements relevant to the product production shall be followed, as well as all the technical requirements listed in Clause 3.2 are met. He must have:
- witnessed at least one heat soak process of the tempered glass; and
- fully understand the technical requirements of the Scheme.

4.2 The Participant's staff shall be technically competent for their duties and functions in their organization. Moreover, they shall fully aware of the effects of their duties and functions in the Quality Management System (refer to Clause 10 for details).

5. Quality Requirement Planning

5.1 The Participant shall produce heat soaked tempered glass meeting the purchaser's quality requirements, the quality requirements of a specified standard (e.g. BS EN 14179-1: 2005, PNAP 239 or other international / national standards) as well as the quantity as ordered by the Purchaser.

5.2 Information as supplied by the purchaser

The following essential information of the heat soaked tempered glass panels is required in a purchaser's order:

a. The classification of the heat soaked tempered glass panels;
b. The range of heights, widths and thickness of the glass panels;
c. Shapes, holes and notches on the glass panels
d. Edge work of the glass panels.

5.3 Review of the purchaser's specifications and orders

The Participant shall appoint a competent person to review systematically the Purchaser's specifications and orders, relate these requirements to the type of heat soaked tempered glass panels and incorporate these requirements in production. Such specifications, orders, and any subsequent agreed modifications shall be documented so that the plant can carry out the production accordingly.

5.4 Information from the Participant to the purchaser

The following information of the tempered glass panels shall be given by the Participant prior to delivery whenever appropriate:

a. The classification of the heat soaked tempered glass panels;
b. The overall size of the glass panels;
c. Shapes, holes and notches on the glass panels
d. Edge work of the glass panels.

6. Identification of Heat Soaked Tempered Glass Panels

Correct identification of approved heat soaked tempered glass panels are vital for the purchasers and regulatory authorities to know accurately the product status.

Note:
The product certification mark, using RFID - Radio Frequency Identification Device (optional) or other alternatives, shall be inserted towards the corner of the glass panel to identify that the heat soaked tempered glass panels are covered by this Scheme.

7. Quality Control of Purchased Glass Panels

7.1 All the purchased glass panels shall be inspected or verified on delivery by the Participant. Whenever a non-conformity of incoming glass panels is identified, such non-conformity records shall be documented.

7.2 Glass panels from an approved source shall be checked against the Supplier's certificates for material conformance against the prevailing National or International Standards.

8. Production Control

8.1 General

The production procedure contains details of the heat soak process involved in the production of heat soaked tempered glass panels and calibration of the heat soak chamber/ furnace under the Scheme. The Participant shall carry out routine inspection and monitoring of the equipment and machinery at least at weekly

intervals to ensure the production consistency. These quality records shall be maintained for three years.

8.2 Calibration of the heat soak chamber/ furnace

(a) The furnace shall be calibrated at least once a year.
(b) The thermocouples used for the temperature monitoring shall be calibrated at a minimum of every six months.
A minimum no. of 8 monitoring points on the glass surface are required, including the positions where the minimum and maximum surface temperatures for each side stillage during the calibration.
(c) The rate of heating shall be steadily increased. After an initial 15 minutes of heating, the rate of heating of all glass panels shall be less than 3 ^{o}C / min.

8.3 The Participant shall establish and implement systematic controls on the heat soak process at the plant in accordance with Clause 5.3, Clause 6 and Clause 10 of BS EN 14179-1: 2005 and this Scheme.

NOTE: The glass surface temperature shall not be allowed to exceed 300 ^{o}C during the heating phase.

8.4 All the heat soaked tempered glass panels shall be subject to production control under the responsibility of the Participant.

Production control shall comprise all necessary measures to maintain the property of heat soaked tempered glass panels in conformity with specified requirements in this Scheme. It includes:

a. Selection of glass panels;
b. Heat soak process in accordance with BS EN 14179-1: 2005 or PNAP 239;
c. Routine inspections and tests; and
d. Conformity control as given in Clause 9.

8.5 Hest soak performance assessment
All main heat soak inspection evidence shall be conducted against all requirements in accordance with BS EN 14179-1: 2005 clause 5.3 and 6 or PNAP 239 Clause 8.

As a minimum, each Participant shall be subject to heat soak performance assessment in every 12 months. The initial heat soak inspection shall be required during the certification audit. The CB will advise Participants whenever more frequent inspections are required.

9. Conformity Control of Heat Soaked Tempered Glass Panels

9.1 Sampling and testing

Samples shall be randomly selected in accordance with the prevailing Code of Practice and taken for fragmentation test and mechanical strength test according to Clause 10 and Clause 11.4 of BS EN 141789-1: 2005 or other standards.

9.2 Audit testing

9.2.1 If the Applicant has the resource and capability which includes an accredited in-house laboratory to relevant test standards, fragmentation tests can be performed in-house and shall be witnessed by the Lead Auditor / Auditor against all requirements in ISO/IEC 17025 and relevant testing documents. Otherwise, testing shall be carried out by a laboratory accredited by HOKLAS for the specified tests or an overseas laboratory under the HOKLAS's Mutual Recognition Agreements (MRA).

9.2.2 Mechanical strength tests shall be carried out by an independent HOKLAS accredited laboratory or an overseas laboratory under the HOKLAS's Mutual Recognition Agreements (MRA) against relevant testing standards.

9.2.3 Initial fragmentation test and mechanical strength test of selected sampled shall be performed in the certification audit while subsequent audit testing shall be performed at every 12 months in the surveillance visits and renewal audits.

9.2.4 Impact test of heat soaked tempered glass (optional)
Impact test shall be conducted and reported in accordance with BS 6206 by a HOKLAS accredited laboratory. Each approved product must have at least one full scale, HOKLAS accredited, test report achieving the required performance.

As a minimum, each Participant shall carry out one impact test for each product type at every 12 months. As these impact tests shall normally be held during audits, the audit results serve the basis of verifying the conformity control of heat soaked tempered glass panels. The CB shall advise Participants where more frequent tests are required.

9.3 Audit test performance and actions in the event of inadequate performance

It is important that the cause of any reduced performance can be identified and eliminated. It is also recognized that fragmentation and mechanical strength test failure occasionally occurs as a result of factors beyond the control of the glass manufacturer. However, the cause of reduced strength performance shall be investigated and appropriate action shall be taken. The CB shall randomly select one more set of samples for repeat testing that is performed at the Applicant/ Participant's expense. If the strength performance in the repeat testing fails, it shall lead to suspension of the Certificate. Upon suspension of the Certificate, the Applicant/ Participant shall suspend the production of the certified product and publicly announce the suspension result and cease to use the Certification Mark on the concerned type of certified glass panels. Resumption of the certification status shall be verified in a renewal audit with additional audit testing to ensure the performance meet the required standard / specification.

10. Training of Staff

10.1 All personnel concerned with the production and quality management system shall have sufficient education background and suitable training to demonstrate competence in performing their duties. In particular, knowledge, training and experience of personnel involved in production and product conformity control shall be appropriate to the heat soaked tempered glass panels.

Records of training and experience of the personnel involved in the production shall be documented and maintained.

10.2 The performance of staff shall be controlled through routine monitoring / close supervision by their superiors.

10.3 Heat soaked tempered glass panels shall be produced by operatives who are sufficiently trained and possess adequate competence in such operation.

11. Quality management system review

11.1 The quality management system related to the product established in accordance with this Scheme shall be reviewed to ensure the continuity and consistency of on-going quality management practice.

11.2 Quality management system review shall be carried out at least once a year.

11.3 Records of review, including other relevant information, shall be maintained and documented.

12. Quality Records

Records shall be maintained to ensure the effective operation of the Quality Management System, as well as to confirm both the quality and quantity of the heat soaked tempered glass panels. The records shall be retained for a period of at least three years and shall cover the following minimum information:

a. Quality requirement planning
b. Order processing
c. Data to substantiate heat soaked tempered glass panels for quality and quantity
d. Production of heat soaked tempered glass panels
e. Identification of glass panels
f. Equipment calibration and plant maintenance
g. Purchase, usage and stock of glass panels
h. Test certificates for glass panels
i. Test results in production control
j. Calibration report of heat soak chamber/ furnace
k. Certification mark and associated serial number of each certified product, if appropriate

13. Reference

1. BS EN 14179-1:2005
Glass in building – Heat soaked thermally toughened soda lime silicate safety glass- Part 1: Definition and description

2. ISO/IEC Guide 65: 1996
General requirements for bodies operating product certification systems

3. ISO/IEC Guide 62: 1996
General requirements for bodies operating assessment and certification / registration of quality systems

4. ISO/IEC Guide 67: 2004
Conformity assessment – Fundamentals of product certifications

5. IAF Guidance on the Application of ISO/IEC Guide 65
General requirements for bodies operating product certification systems

6. ISO/IEC 17030:2003
Conformity assessment – General requirements for third-party marks of conformity

7. PNAP 239
Practice Note for Authorized Persons and Registered Structural Engineers No. 239 Window and Window Walls, published by the Buildings Department of Hong Kong SAR.

8. ISO/IEC 17020: 1998
General criteria for the operation of various types of bodies performing inspection

9. ISO/IEC 17025: 2005
General requirements for the competence of testing and calibration laboratories.