



ACCREDITATION SCHEME FOR  
CERTIFICATION BODIES

# **CT 27**

## **SAC CRITERIA FOR PRODUCT CERTIFICATION BODIES (GROUND SUPPORT AND STABILISATION WORKS FOR ERSS)**

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## 1. INTRODUCTION

- 1.1 This document specifies the additional definitions and supplementary criteria for Certification Bodies (“CB”) that provide certification of Specialist Builders (“SB”) for ground support and stabilisation works for Earth Retaining and Stabilising Structures (“ERSS”) (Defined in part (b) of “Specialist building works” in Section 2 of the Building Control Act). The document shall be used in conjunction with ISO/IEC 17065 and applicable IAF mandatory documents.

## 2. DEFINITIONS

The following definitions apply:

### 2.1 Earth Retaining and Stabilising Structures (ERSS)

The field of specialist ground support and stabilisation works for ERSS covers various types of products as listed below: -

**Table 2.1: List of Products of Ground Support and Stabilisation Works for ERSS**

Item	Type
1	Ground Anchors
2	Soil Nails
3	Rock Bolts
4	Jet Grouting
5	Deep Soil Mixing (e.g., GMP wall)
6	TAM Grouting
7	Fissure Grouting
8	Reinforced Fill
9	Sprayed Concrete [SC] / Sprayed Fibre Reinforced Concrete [SFRC]

### 2.2 Minor nonconformity

Failure to meet a requirement of relevant standards for ground support and stabilisation works (refer to “SAC Criteria for SB (Ground Support and Stabilisation Works for ERSS)”) and its Singapore complementary standards or other reference documents, and which is considered not to constitute a risk to the quality of ground support and stabilisation works.

### 2.3 Major nonconformity

Failure to meet one or more requirements of relevant standards for ground support and stabilisation works (refer to “SAC Criteria for SBs (Ground Support and Stabilisation Works for ERSS)”) and its Singapore complementary standards or other reference documents, which would,

on the basis of available objective evidence raise significant doubt to constitute a significant risk to the quality of the product or conformity of ground support and stabilisation works SB.

#### 2.4 Specialist Builder

Person or body who provides ground support and stabilisation works for ERSS.

#### 2.5 Audit Team

A team comprising the minimum of an auditor and a technical expert that performs audit on the activities of the SB to verify conformity to the Scheme's requirements. The audit team shall declare free of conflict before each audit. In the event that a person is able to meet the qualification requirements of both auditor and technical expert, he can serve both roles during the audit.

#### 2.6 Technical Expert

A technical expert is the person with the relevant experience on ground support and stabilisation works, professional qualifications and technical knowledge. He supports the audit team in the technical aspects of the audit.

### 3. CERTIFICATION CRITERIA

#### 3.1 CB shall assess the SB's system in ensuring that ground support and stabilisation works are installed according to the respective standards:

- a) Ground Anchors – BS EN 1537 and BS EN ISO 22477-5
- b) Soil Nail – BS EN 14490
- c) Grouting – BS EN 12715
- d) Jet Grouting – BS EN 12716
- e) Deep Mixing – BS EN 14679
- f) Reinforced Fill – BS EN 14475
- g) Sprayed Concrete – BS EN 14487

#### 3.2 The CB shall perform the certification in accordance with the certification criteria specified in Annex 1. The certification of the SB shall cover the execution, supervision, testing, monitoring, special requirements and including those portions outsourced for all related processes of ground support and stabilisation works. The CB shall conduct audits at the project site for the product(s) that the SB wishes to include in the scope of certification.

- 3.3 If the SB has been certified to ISO 9001 by a CB accredited by SAC or its IAF MLA partner, the CB may use the accredited certificate in support of the certification of the SB.

#### **4. CERTIFICATION BODY PERSONNEL**

- 4.1 A CB shall appoint qualified auditors and technical experts to conduct the assessments of SBs for ground support and stabilisation works of ERSS. Auditors and technical experts shall meet the criteria specified in Annex 2.

#### **5. RECOMMENDATIONS AFTER AN INITIAL CERTIFICATION AUDIT**

There are four possible recommendations after an initial audit:

- 5.1 Certification will be recommended. No nonconformity was found during the certification audit. A sample of the certificate issued to a SB of ground support and stabilisation works for ERSS is given in Annex 3.
- 5.2 Certification will be conditional subject to the successful implementation of corrective actions for the minor nonconformities. These minor nonconformities do not cumulatively indicate a major failure of the quality of the product or conformity of ground support and stabilisation works. Certification will be recommended after receipt of a letter which gives satisfactory details of correction and corrective action which will be implemented to remove the nonconformities from the system. The time limit for the receipt of the letter will be two weeks from date of audit. Correction and corrective action shall be implemented within one month and verified to be satisfactory by the auditor.
- 5.3 Certification will be conditional subject to the successful implementation of corrective actions for the major nonconformity or a number of systematic minor nonconformities. These nonconformities accumulate to indicate a major failure of the quality of the product or conformity of ground support and stabilisation works. The applicant will be required to submit a letter which gives satisfactory details of correction and corrective action which will be implemented to remove the nonconformities from the system. The time limit for the receipt of the letter will be two weeks from date of audit. Correction and corrective action shall be implemented within 2 months from date of audit.

Certification will not be recommended until the nonconformities have been removed from the system and a satisfactory partial re-audit has been carried out.

If the applicant is not ready for the partial re-audit within six months from the date of initial audit, the application will lapse. A new application may then be made.

- 5.4 Certification will not be recommended. A major nonconformity or a number of systematic minor nonconformities which accumulate to indicate a major failure of the production control system or product quality. The extent of the systems failure, based on objective evidence, is considered by the auditor to require more than six months for correction and corrective action. The applicant will be required to re-apply after a period of at least six months from the date of audit.

## **6. RECOMMENDATIONS AFTER A RECERTIFICATION AUDIT**

There are four possible recommendations after a recertification audit:

- 6.1 Certification will be confirmed or renewed. The SB complies with the certification criteria with no nonconformity.
- 6.2 Certification will be conditionally confirmed or renewed. A number of minor nonconformities exist which do not cumulatively indicate a major failure of the production control system or product quality. Certification will be confirmed or renewed after receiving a letter from the SB stating details of the proposed correction and corrective action which to the judgment of the auditor, will remove the nonconformities from the system after successful implementation. The time limit from the receipt of the letter will be two weeks from date of audit. Correction and corrective action shall be implemented within one month and verified to be satisfactory.

If the correction and corrective action are not implemented by the stipulated date, actions will be initiated to suspend certification.

- 6.3 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 production control system or product quality. The SB will be required to submit a letter stating details of the proposed correction and corrective action which to the judgment of the auditor, will remove the nonconformities from the system after successful implementation. The time limit for the receipt of the letter will be two weeks from the date of audit. Auditor shall assess the correction and corrective action to ensure proposed action(s) are effectively implemented before certification is resumed or renewed.

A partial or full re-audit, as directed by the auditor, will be required within three months before reinstatement or renewal of certification can be recommended.

- 6.4 Withdrawal of certification is recommended. A major nonconformity or a number of systematic minor nonconformities have not been removed from the system after the expiry of suspension of certification.

## **7. PRECERTIFICATION**

- 7.1 A letter of precertification may be granted to a SB that had fulfilled all certification criteria but has yet to demonstrate compliance through on-site audit by the CB due to the lack of suitable on-going projects at the time of application or during recertification.

The SB undertakes to inform the CB as soon as a suitable contract is awarded and to arrange for the CB to carry out the on-site audit within 3 months of work commencement.

The precertification letter shall be valid for a period of one year but may be reissued for another year.

- 7.2 Certification will be awarded upon satisfactory on-site audit, and all nonconformities raised are addressed to the satisfaction of CB.

## **8. DURATION OF AUDITS**

- 8.1 The auditor days for initial and recertification audits for ground support and stabilisation works SBs are:

### Initial Certification Audit

- 2 man-days (if the SB is certified to ISO 9001 by SAC accredited QMS CB or its IAF MLA partner) for the first scope of certification
- 3 man-days (if the SB is NOT certified to ISO 9001 by SAC accredited QMS CB or its IAF MLA partner) for the first scope of certification
- additional auditor days will be required for the subsequent scope of certification

### Recertification Audit

- 1 man-day (if the SB is certified to ISO 9001 by SAC accredited QMS CB or its IAF MLA partner)
- 2 man-days (if the SB is NOT certified to ISO 9001 by SAC accredited QMS CB or its IAF MLA partner)
- additional auditor days will be required for the subsequent scope of certification

For subsequent scope(s) utilising same machineries or similar processes proposed by the SB to be audited at the same time or within a reasonably short period as determined by the CB, savings of auditing

time is envisaged. It is CB's responsibility to ensure that adequate time is allocated for audit of multiple scopes.

- 8.2 Certification is valid for 24 months. Recertification is subject to continuing satisfactory performance and conformance to the Scheme's requirements. Recertification audit shall be conducted and Non-conformities raised shall be successfully closed before the expiry of the Certificate of Conformity ("CoC").
- 8.3 Each scope or type of ground support and stabilisation works that are included in the certification shall be audited.
- 8.4 All scopes shall be audited during initial audit and recertification.

## **9. EXTENSION OF SCOPE**

- 9.1 A minimum audit duration of 1 man-day is to be used for assessing any extension of scope to an existing certification.

## **10. TRANSFER OF CERTIFICATE OF CONFORMITY**

- 10.1 The transfer of certificates shall be based on IAF MD2 – IAF Mandatory Document for the Transfer of Accreditation of Management Systems.
  - a) Transfer of certificates between CBs is only allowed for certificates that are still valid. Valid certificates are those that are not expired, withdrawn, terminated, or suspended. For other cases, a new application is required.
  - b) The new CB shall ensure the product, installation site and test standards is the same as that of the previous CoC; the implementation of corrections and corrective actions in respect of all outstanding nonconformities have been verified.
  - c) The validity of the transferred CoC shall be limited to the remaining timespan of the recently valid CoC.

## **11. WITHDRAWAL OF CERTIFICATE OF CONFORMITY**

- 11.1 The decision to withdraw a certificate of conformity (CoC) is made by the CB. After the decision, the SB in question has the right to appeal to the Appeals Panel.
- 11.2 Examples of the reasons for withdrawal of the CoC are:
  - a) Frequent non-compliance with any of the specified properties or other criteria specified in the relevant Standard



- b) Uncorrected deficiencies noted during a rectification audit
- c) Misuse of CoC and/or CB's and/or SAC's mark
- d) Refusal or hindrance to allow CB to verify inspection or testing records
- e) Circumstances which may affect the confidence of the public or authorities on the reliability

## Annex 1

### Certification Criteria for SBs (Ground Support and Stabilisation Works)

#### Index of Certification Criteria for SBs (Ground Support and Stabilisation Works)

S/N	Certification Criteria	Reference from SB Document	Checklist
1A	Machineries	Section 2.1	Table 1A
1B	Machines Maintenance	Section 2.2	Table 1B
2	Material and Products Requirements	Section 3.1	
3	Quality Tests	Section 4.1 and 4.2	
4	Personnel Requirements	Section 5.1 and 5.2	Table 4
5	Execution Records	Section 6.1	Table 5
6	Installation Procedures	a) Section 7.1, 7.2 and 7.3 b) BS EN Execution Standards c) Project Specifications	
7	Safety and Environmental Requirements	Section 10.1, 10.2 and 10.3	

**Table 1A: Machineries Checklist**

Type of Product	Primary Machines Owned (With Accessories)	Number	Criteria Met	Remarks
(1). Ground Anchor				
(2). Soil Nail				
(3). Rock Bolt				
(4). Jet Grouting				
(5). Deep Soil Mixing (e.g., GMP wall)				
(6). TAM Grouting				
(7). Fissure Grouting				
(8). Reinforced Fill	N.A.	N.A.	N.A.	N.A.
(9). Sprayed Concrete [SC] / Sprayed Fibre Reinforced Concrete Lining [SFRC]				

**Table 1B: Machines Maintenance Checklist**

S/No.	Maintenance Items	Frequency				Criteria Met	Remarks
		Daily (Visual)	Monthly *	Quarterly *	Yearly *		
1	Leaks on Engine and Hydraulic Components, Hoses and Fittings	X	-	-	-		
2	Fuel, Radiator Water, Coolant, Battery Water and Oil Level	X	-	-	-		
3	Mechanical Structure Integrity	X	-	-	-		
4	Electrical Switches, Warning Lamps and Buzzers	X	-	-	-		
5	Abnormal Sound from Engine or Electric Motor	X	-	-	-		
6	Unusual Pressure, Temperature, Ampere, Voltage	-	X	-	-		
7	Check Engine Oil, Fuel, Hydraulic Oil and Filters Elements for Contamination	-	X	-	-		
8	Tension all Bolts, Mountings, Transmission/Fan Belts, Crawler Tracks, Leader Mast Steel Wire Ropes	-	X	-	-		
9	Mechanical and Electrical Control Functionality	X	-	-	-		
10	Wire Ropes, Sheaves and Shafts	X	-	-	-		
11	Brake and Clutch Adjustments	-	X	-	-		
12	Battery and Charging System	-	X	-	-		
13	Safety Devices	X	-	-	-		
14	Lubricate All Grease Points (Hydraulic Cylinder, Leader Mast, Track Link Idler, Swivel Head)	X	-	-	-		
15	Replace Engine Oil and Filters	-	-	X	-		
16	Replace Hydraulic Oil, Gear Oil and Its Filters	-	-	-	X		
17	Replace Engine Coolant	-	-	-	X		

\* Note: These checks should be carried out by qualified mechanics

**Table 4: Personnel Requirements Checklist**

Personnel	Relevant Experience and Qualifications	Number	Criteria Met	Remarks
(1). Technical Manager (TM)				
(2). Engineer				
(3). Geologist *				
(4). Site Supervisor				
(5). Rig Operator				
(6). Safety Manager/ Officer				

\* Note: Required for rock bolt works only

**Table 5: Execution Records**

S/No.	Description	Type of ground support and stabilisation works							Criteria Met
		Ground Anchor	Soil Nail	Rock Bolt	Jet / TAM / DSM	Fissure Grouting	Reinforced Fill	SC / SFRC	
1	Project Reference	x*	x*	x*	x*	x*	x*	x*	
2	Element Reference	x*	x*	x*	x*	x*	x*	x*	
3	Element Type	x*	x*	x*	x*	x*	x*	x*	
4	Equipment Type	x*	x*	x*	x*	x*	x*	x*	
5	Equipment Reference	x	x	x	x	x	x	x	
6	Nominal Cross-Sectional Dimensions	x*	x*	x*	x*	x*	x*	x*	
7	Designed Pullout Resistance Element	x*	x*	x*	-	-	x	-	
8	Design Strength of Concrete/ Grout	x*	x*/-	x*/-	x*	(x)	-	x*	
9	Design Strength of Reinforcement/ Rod/ Strand	x*	x*	x*	-	-	x*	-	
10	Designed Stiffness and Permeability of Grout	-	-	-	x*	x*	-	-	
11	Required Depth/ Length/ Thickness of Element	x*	x*	x*	x*	x*	x*	x*	
12	Date and Time of Installation Commencement	x*	x*	x*	x*	x*	x*	x*	
13	Date and Time of Installation Completion	x*	x*	x*	x*	x*	x*	x*	
14	Details of Grout/ Concrete Samples Taken for Cube Test	x*	x*	x*	x*	(x)	-	x*	
15	Top/ Bottom Level of Grouting	-	-	-	x*	x*	-	-	
16	Length of Temporary Casing	(x)	(x)	-	-	-	-	-	
17	Size/ Type/ Length of Reinforcement/ Rod/ Strand	x*	x*	x*	-	-	x*	x*	
18	Details of Locking System (e.g. Wedge/ Locking Nut)	x*	x*	x*	-	-	-	-	
19	Theoretical Volume of Grout Required	x*	(x)	(x)	x*	x*	-	-	
20	Actual Volume of Grout Used	x*	(x)	(x)	x*	x*	-	-	
21	Graph of Grout Dispensed vs Grouting Height	-	-	-	x*	x*	-	-	
22	Records of Obstruction	x*	x*	x*	x*	x*	-	-	
23	Records of Interruption to Installation	x*	x*	x*	x*	x*	x*	-	
24	Soil Samples to be Taken During Excavation	x*	x*	x*	-	-	-	-	

Legend: x\* : Required    x : Recommended    (x) : Required for Specific Site Condition    - : Not Applicable

### Criteria for Auditor and Technical Expert of Ground Support and Stabilisation Works

Criteria	Auditor
Personal Attributes	Demonstrate personal attributes for effective and efficient performance of audits
Formal Education	Minimum Diploma in Architecture, Building, Structural or Civil Engineering, or other related construction industry
Other Qualifications	Have knowledge of current regulatory requirements and applicable Codes of Practice
Work Experience	Minimum <b>5 years</b> full time working experience which includes minimum <b>3 years</b> full time working experience in construction-related industry in a technical, professional or supervision position OR minimum <b>3 years</b> quality management system audit experience in construction-related industry
Training on Management system and audit	<ul style="list-style-type: none"> <li>• Attended training on ISO 9001</li> <li>• Successfully completed a course on Quality Management Systems Auditor / Lead Auditor (ISO 9001)</li> </ul>
Audit Experience	<u>Auditor</u> Minimum of <b>3 product certification audit</b> for construction-related industry within last 3 years  The audit team should have at least one person with audit experience in product certification (ISO/IEC 17065)
Maintenance of qualification <b>(Every 3 years)</b>	<u>Auditor</u> Perform minimum of <b>2 product certification audits</b> for construction-related industry within last 3 years  In addition, the competence of auditors in Clause 6.1.2 of ISO/IEC 17065 shall be demonstrated.

Criteria	Technical Expert
Formal Education	Minimum Degree in Civil Engineering
Work Experience	<p>Minimum <b>10 years</b> of working experience in the construction-related industry which includes:</p> <ul style="list-style-type: none"> <li>• Minimum <b>5 years</b> working experience in ground support and stabilisation works industry, design, consultancy or related products in a technical, professional or supervision position and;</li> <li>• Assessed by working committee of this Scheme to have the experience and recognition in the ground support and stabilisation industry to competently carry out the duties of a technical expert.</li> </ul>
Other Qualifications	<p>The technical expert must demonstrate competency in the various execution codes on special geotechnical works:</p> <ul style="list-style-type: none"> <li>a) Ground Anchors – BS EN 1537 and BS EN ISO 22477-5</li> <li>b) Soil Nail – BS EN 14490</li> <li>c) Grouting – BS EN 12715</li> <li>d) Jet Grouting – BS EN 12716</li> <li>e) Deep Mixing – BS EN 14679</li> <li>f) Reinforced Fill – BS EN 14475</li> <li>g) Sprayed Concrete – BS EN 14487</li> </ul>



# CERTIFICATE OF CONFORMITY

## Specialist Builder – Ground Support and Stabilisation Works

This Certificate is issued to

**Specialist Builder:**

Name of Specialist Builder  
Address

### FOR

Execution of Special Geotechnical Works – Ground Anchors  
Execution of Special Geotechnical Works – Soil Nails  
Execution of Special Geotechnical Works – Rock Bolts  
Execution of Special Geotechnical Works – Jet Grouting  
Execution of Special Geotechnical Works – Deep Soil Mixing (e.g., GMP wall)  
Execution of Special Geotechnical Works – TAM Grouting  
Execution of Special Geotechnical Works – Fissure Grouting  
Execution of Special Geotechnical Works – Reinforced Fill  
Execution of Special Geotechnical Works – Sprayed Concrete / Sprayed Fibre  
Reinforced Concrete

*(To delete above product(s) not included in the audit as appropriate)*

***which has complied with the requirements of the scheme and based on the following:***

### Standards

BS EN XXX : YYYY

SAC CT XX: YYYY

This product conformity certificate is awarded on the basis of an assessment of process control system covering, execution, supervision, monitoring and testing, and the supporting quality management system.

**THIS CERTIFICATE IS VALID for 2 YEARS FROM (day/month/year) to (day/month/year)**

Designation  
<name of CB>

Certificate No  
SBP 01

Date of Original Issue  
dd/mm/yyyy

Date of Last Revision  
---

Date of Expiry  
dd/mm/yyyy

This Certificate is part of a full report and should be read in conjunction with it. This Certificate remains the property of <name of CB> and shall be returned upon request. The use of this Certificate is subjected to the terms and conditions of the Ground Support and Stabilisation Works Scheme. Persons relying on this Certificate should verify its validity by checking <name of CB>'s website at <CB>