



ACCREDITATION SCHEME FOR
CERTIFICATION BODIES

CT 32
SAC CRITERIA FOR SPECIALIST
BUILDERS (PILING WORKS)

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1. INTRODUCTION

- 1.1 The purpose of certification of Specialist Builders for Piling Works is to ensure the installation process of specialist piling works conforms to standards or other normative documents and/or general requirements.
- 1.2 The field of specialist piling works covers installation of various types of piled foundations and retaining wall comprising of piles. This piling specialists' certification is to ensure the piling specialists have acquired the competency and resources (manpower and machinery), and for them to follow the appropriate procedures or methods to install piles with good quality and durability.
- 1.3 This Criteria Document should be read in conjunction with documents listed in the Appendixes and other reference sections and government regulations wherever applicable.
- 1.4 Supplementary information for specific areas of installation and associated testing may be published as other Criteria Document.
- 1.5 The piling certification is divided into three categories of piling specialists, namely.
 - Category: Cat.L.- land
 - Category: Cat.N - near shore (waterways and coastal water)
 - Category: Cat.M - marine (with special piling vessel/purpose-built barge)
- 1.6 Each category may have up to 3 grades: G1, G2 & G3 as shown in Table 1.1 below:

Table 1.1: Category and Grade of Specialist Builders (Piling Works)

Category Grade	Cat.L- Land	Cat.N - Near Shore	Cat.M - Marine
G1	L-G1	N-G1	M-G1
G2	L-G2	N-G2	M-G2
G3	L-G3	N-G3	M-G3

1.6.1 Additional Requirements for Cat. L, Cat. N and Cat. M:

- (a) Cat. N will have to satisfy all requirements of Cat. L and additionally, past record of at least one project done housing the piling equipment on a pontoon or barge (positioned using mooring anchors or spuds) in the past 3 years.
- (b) Cat. L may apply for provisional certificate for Cat N. for a limited time – under the grace period up to one year granted by the Certification Body.
- (c) Cat. M will be allowed to do Cat. N work but only for the type of piles for which the company possess Cat. M certification. Cat. M companies are still required to apply for the relevant Cat. N certification.

1.7 The detailed classification, requirements and tendering limits allowed, for the purpose of registration and piling certification, can be found in Appendix 2

2. PILING BASE MACHINERIES

2.1 Piling Base Machineries: Types and minimum set

2.1.1 For certification of a Specialist Builder for the respective piling works, the required relevant primary piling base machineries and minimum number of such piling base machine are to be owned by the Specialist Builder (Piling Works). Below is the table for the requirement for the partial fulfilment to meet the certification criteria for the respective piling works:

Table 2.1: Type of Primary Piling Base Machineries and minimum set to be owned by Specialist Builder (Piling Works): Land & Near Shore – Cat.L & Cat. N

Type of Product	Type of Primary Piling Base Machineries	Minimum Number		
		G1	G2	G3
1) Bored piles (diameter 0.5m to 3m)	Boring Rig (Mechanical, hydraulic, <u>reverse circulation</u> , oscillator, or rotator with grab) with accessories	2	5	10
2a) Driven piles (steel, precast, spun, timber)	Pile driving machine with accessories	2	5	10
2b) Jacked piles (steel, concrete)	Pile jacking machine with accessories	2	5	10
3a) Bored Micropiles	Boring rig with accessories	2	5	10
3b) Driven Micropiles	Pile driving machine with accessories	2	5	10
3c) Jacked Micropiles	Pile jacking machine with accessories	2	5	10
4) Diaphragm wall and Barrette with thickness t = 0.6m -1.5m	Grabber or Cutter with accessories	2	5	10
5) Sheet pile	Pile driving machine / vibro hammer system / jacking machines	2	5	10

2.1.2 For Cat. N (near shore), piling is done with conventional piling machines placed on a barge the movement of which is restricted either by mooring anchors or spuds.

2.1.3 Track record for Cat. N shall have at least one piling project described under Cat. N done within the past 3 years in addition to all requirements of Cat. L. Without prior Cat. N piling project experience, Cat. L piling specialist may apply for Cat. N provisional certification under the condition that he would perform Cat. N piling project operations within the 12 months grace period.

2.1.4 If a piling is done from a backfilled ground or a fixed platform, it falls under Cat. L (land piling)

2.1.5 As for the piling machineries for Cat. N, please refer to Table 2.1

Table 2.2: Type of Primary Piling Base Machineries and minimum set to be **owned** by Specialist Builder (Piling Works): Marine – Cat. M

Type of Product	Type of Primary Piling Base Machineries	Minimum Number		
		M-G1	M-G2	M-G3
1) Driven pile	Piling Vessel (with specially built driven piling machine integrated with the vessel) or purpose-built barge for piling works.	1	2	3
	Crane barge (Supporting activities)	0	0	1
2) Sheet pile	a) Purpose-built barge for piling works. b) Pile driving machine / vibro hammer system / jacking machines	1	2	3
	Crane barge (Supporting activities)	0	0	1
3) Bored pile	a) Purpose-built barge for piling works b) Boring Rig (Mechanical, hydraulic, <u>reverse circulation</u> , oscillator, or rotator with grab) with accessories	1	2	3
	Crane barge (Supporting activities)	0	0	1

2.1.6 If M-G1, M-G2 or M-G3 specialist builder wants to be certified as Cat. N specialist builder, he must satisfy all the requirement as in Table 2.1 used for the respective pile types as Cat. L specialist builder and Table 5.1 for key personnel.

2.1.7 Age of piling base machines owned shall not be more than the stipulated years as shown in the table below, from the year of manufacturing. That is the maximum age of piling machines allowed corresponding to the requirement on the numbers of the piling base machines for the various Grade under Tables 2.1 and 2.2

Table 2.3: Age and Capacity of Piling Base Machineries:

Type of Primary Piling Base Machineries	Age of piling base machines	Remarks
Boring rigs	15 years	For G2 and G3 category of piling specialist, min. 1 and 3 numbers respectively of boring rigs are required to have min. 30 ton-m torque.
Micropile rigs	15 years	For G2 and G3 category of piling specialist, min. 1 and 3 numbers respectively of micropile rigs are required to have min. 3 ton-m torque.

Type of Primary Piling Base Machineries	Age of piling base machines	Remarks
Barrette, D/Wall rigs	15 years	-
Jacked rigs	15 years	For G2 and G3 category of piling specialist, min. 3 numbers of jacked rigs are required to have min. 200-ton and min. 400-ton counterweight respectively.
Pile Drivers	25 years	For G2 and G3 category of piling specialist, min. 2 and 5 numbers of Pile Drivers are required to have min. 7- ton. and min. 9-ton hammers respectively.

2.2 Piling machines are to be subject to a regular maintenance regime by a dedicated maintenance team. Specialist Builders are to produce such maintenance records and maintain such regular maintenance team to ensure piling machines are always in good conditions for use. Maintenance Checklists (For daily site use, monthly, quarterly, yearly whenever applicable) are needed for maintaining piling machineries in good conditions from time to time.

3.0 MATERIAL & PRODUCTS REQUIREMENTS

3.1 All material and products shall meet the requirements set in the respective EN standards, the provisions valid in the place of use and provisions given in the project specifications.

3.2 The sources of supply of all constituents shall be documented and shall not be changed without prior notification/documentation. Specialist Builders shall ensure all materials and products comply with the relevant codes and project specifications.

4. PILE INTEGRITY TESTS AND WORKING LOAD TESTS

4.1 As one way to demonstrate that the piles as products have achieved good quality and durability, the necessary integrity tests are to be carried out on the piles produced by the Specialist Builders to demonstrate to the auditors that their piles as products have passed tests and met the relevant requirements of the execution codes and standards.

4.2 In addition to piles integrity tests, the Specialist Builders are to declare to the Certification Body's Auditors on all the Working Load Tests carried out in the past 2 years. They are to declare which working load tests have failed from among all the working load tests carried out. Working Load Test Reports are to be shown to the auditors accordingly during the audit.

4.3 The Specialist Builder shall provide records on the details of the number of project sites, no of piles to be installed and have been installed and the percentage of

passing rate for working pile load tests during application of certification and re-certification.

5 SPECIALIST BUILDERS (PILING WORKS) PERSONNEL

5.1 GENERAL REQUIREMENTS

5.1.1 The Specialist Builders' personnel shall be suitably qualified and have sufficient relevant experience in their scope of piling works.

5.1.2 Specialist Builders' personnel must be familiar with the relevant standards or codes used in the piling works. The Technical Managers, Piling Engineers and Piling Supervisors are required to attend the relevant training courses and pass the test to be Certified Piling Personnel (CPP) prior to the application for certification to CB by their Specialist Builders (Piling Works).

5.1.3 Specialist Builders shall maintain records of key personnel's qualifications, training, and experience.

5.2 QUALIFICATION CATEGORIES FOR CERTIFIED SPECIALIST BUILDERS (PILING WORKS) PERSONNEL

Table 5.1: Table for designation, roles, the required experience, and qualification of key piling personnel for all categories of Specialist Builders (Cat. L, N and M) of Piling Works.

Designation	Roles	Required Experience and Qualifications	Minimum number of staff		
			G1	G2	G3
Qualified Piling Professionals (QPP)	See note 5.2.1 below	In-house PE(Civil) or external PE(Civil) engaged by SB(PW)	1 See note 5.2.1 to 5.2.4	1 See note 5.2.1 to 5.2.4	2 See note 5.2.1 to 5.2.4
Technical Manager (TM)	Provide technical guidance on: <ul style="list-style-type: none"> - Soil and rock identification on-site - Site bored pile length computation to achieve design working load - Drivability studies for driven pile 	<ul style="list-style-type: none"> - Degree in Civil Engineering with at least 3 years in piling works for degrees that are recognised by the Professional Engineer Board of Singapore. - Attended and passed the Certification Course for Piling Personnel and registered with IES/GeoSS 	1 See note 5.2.7	1 See note 5.2.7	2 See note 5.2.7

Designation	Roles	Required Experience and Qualifications	Minimum number of staff		
			G1	G2	G3
	<ul style="list-style-type: none"> - Appropriate measures for piling in geologically complex ground e.g., boulderly or cavities in ground conditions 				
Piling Engineer ^{Note 1}	<p>Bored Pile / Diaphragm Wall/ Bored Micro pile</p> <ul style="list-style-type: none"> - Perform site pile length computation - Perform quality control test on stabilising fluid <p>Driven Pile / Jacked Pile / Driven Micro pile / Jacked Micropile</p> <ul style="list-style-type: none"> - Pile set determination on-site <p>Sheet pile</p> <ul style="list-style-type: none"> - Length and/or set check 	<ul style="list-style-type: none"> - Degree in Civil Engineering recognised by Professional Engineer Board of Singapore or equivalent - or any other Degree in Civil Engineering with 5 years of relevant piling experience - Attended and passed the Certification Course for Piling Personnel and registered with IES/GeoSS <p>Note 1: For certification requirement, at least one of the piling engineers should fulfil minimum two years of design experience on piled foundation design, wherever applicable.</p>	1	2	4
Geologist (Required for Bored piling works/Barrette/D Walls)	<ul style="list-style-type: none"> - Soil and rock identification 	<ul style="list-style-type: none"> - Geology degree with at least two years engineering geology related works experience or Civil Engineering degree with at least 2 years geology related works experience 	1	1	2

Designation	Roles	Required Experience and Qualifications	Minimum number of staff		
			G1	G2	G3
		<p>OR,</p> <ul style="list-style-type: none"> - Civil Engineering degree who obtained additional engineering geology training by the recognised institutions (BCAA, NUS/NTU) - Must have minimum 1 (one) year of experience in soil/rock classification in local context. 			
Piling Site Supervisor	Day to day supervision of pile installation works	<ul style="list-style-type: none"> - Min Diploma in Civil Engineering, Geology, Built Environment, and related discipline, with at least two years' experience in piling works and passed the Certification Course for Piling Personnel and registered with IES/GeoSS <p>OR</p> <ul style="list-style-type: none"> - Five years working experience as specialist piling works site supervisor; AND - Attended and passed the Certification Course for Piling Personnel and registered with IES/GeoSS <p>Maximum number of rigs supervised by any one site</p>	1	3	5

Designation	Roles	Required Experience and Qualifications	Minimum number of staff		
			G1	G2	G3
		supervisor at any one time: <ul style="list-style-type: none"> - for bored pile: 3 rigs - for micropile: 5 rigs - other pile types: To be decided by QP (Supervision) 			
Piling Rig Operator	<ul style="list-style-type: none"> - Day to day operation of piling rigs 	<ul style="list-style-type: none"> - For certification requirement, at least one must have minimum 3 years of working experience as piling rig operator. - Operator should possess experience relevant to the piling types - Every operator shall possess Skills Evaluation Certificate (Knowledge) [SEC(K)] for operation and use of piling machinery, and the relevant certificates for piling operations issued by the Building and Construction Authority under BCA Approved Training and Testing Centres (ATTC) in Singapore 	1	3	5

Qualified Piling Professionals (QPP):

- 5.2.1 Full time in-house and part-time external PE shall register themselves as Qualified Piling Professionals (QPP) for providing professional services to enhance the piling professionalism & quality of piling works of Specialist Builders (Piling Works). Part-time external PE as QPP, are to work closely with the SB(PW) to ensure that there are adequate resources and capabilities to do piling works with good quality. This is in addition to solving piling technical issues of the SB(PW) they are serving. The QPP registry list shall be kept with IES/GeoSS for regular maintenance and reference purposes. Part-time external PE as QPP shall not serve/support more than two Special Builders (Piling Works) at the same time.
- 5.2.2 Those PE (Civil) who is to be certified as QPP, they need to:
- i. attend and pass the Certification Course for Piling Personnel conducted by IES Academy or BCAA and
 - ii. register with IES/GeoSS as QPP
- 5.2.3 PE (Geo) needs not attend the Certification Course for Piling Personnel; however, he is required to register with IES/GeoSS as QPP.
- 5.2.4 QPP need to obtain adequate and suitable Professional Development Units (PDU) from courses related to piling works every year.

Certified Piling Personnel (CPP):

- 5.2.5 Piling Specialist's personnel (Technical Managers, Piling Engineers, and Piling Supervisors) are required to attend and pass the Certification Course for Piling Personnel. They are to be registered as Certified Piling Personnel (CPP) for the purpose of SAC Piling Certification for their piling companies. The CPP registry list shall be kept with IES/GeoSS for regular maintenance and reference purposes.
- 5.2.6 CPP need to obtain adequate and suitable Professional Development Units (PDU) (for Technical Managers and Piling Engineers) / Supervisor Development Units (SDU) for Piling Site Supervisors from courses related to piling works every year.

Technical Manager:

- 5.2.7 Technical Manager and the professional engineering works
- 5.2.7.1 In view of the critical roles and technical expertise required for piling works, Specialist Builder (Piling Works)'s technical manager is required to be a registered Professional Engineer (Civil) with the Professional Engineers Board, Singapore.

5.2.7.2 However, if the technical manager has no such PE(Civil) qualification in piling company, the company is required to engage external part-time PE(Civil) who is a QPP to support the technical manager.

5.2.7.3 In the case of G3, if anyone of the two technical managers in the piling company has no such PE(Civil) qualification, the company is required to engage one external part-time PE(Civil) who is a QPP; if the two technical managers in G3 piling company have no such PE(Civil) qualification, two QPP are required to be engaged by G3 piling company to support the said two technical managers.

5.2.8 Project Manager may be serving as Technical Manager / Piling Engineer / Site Supervisor, if he fulfils the experience and qualification requirements as stated in the above Table 5.1

6. FORMAT OF RECORDS / DOCUMENTATION FOR PILING WORKS INSTALLATION

6.1 The Specialist Builder (Piling Works) shall keep proper and timely records for all the piling works.

6.2 QPP shall review and endorse the items as listed in the Table 6.1.

6.3 The review and endorsement are for the documentation of QPP’s active and timely roles in ensuring quality pile products.

Table 6.1: Items required for the Documentation for Piling Works Installation

Items	Reviewed and/or endorsed by	Endorsement Before works commencement	During Piling Execution Period	Time of Endorsement (End of works)	Remarks
Project Description, Client & information	QPP	Yes	-	-	
Method Statement	QPP	Yes	-	-	
Risks Assessment of Piling Works	Safety Officer	Yes	-	-	
Piles Execution Records	Piling Engineers/ Piling Site Supervisors	-	-	Yes	
Piling Load Tests; Integrity Tests	QPP	Yes	Yes	Yes	
As-built drawings and records	QPP	-	-	Yes	
Incident Report & Remedial Works if any	QPP	-	Yes	-	

7. INSTALLATION PROCEDURES

7.1 The Specialist Builder (Piling Works) shall have detailed procedures, method statements and instructions for the application of the appropriate regulations, codes of practice, standards, specifications, guidance documents and customer requirements.

7.2 Various special piling works description shall follow the classification under BS EN standards wherever applicable, for which the Specialist Builder (Piling Works) apply in their respective category for certification based on the compliance with the relevant BS EN Standards:

BS EN: 791	Drill rigs – Safety
BS EN: 996	Piling equipment - Safety requirements
BS EN: 1536	Execution of special geotechnical work - Bored piles
BS EN: 1538	Execution of special geotechnical work - Diaphragm walls
BS EN: 12063	Execution of special geotechnical work - Sheet pile walls
BS EN: 12699	Execution of special geotechnical work - Displacement piles
BS EN: 14199	Execution of special geotechnical works - Micropiles
BS EN: 12794	Precast concrete products - Foundation piles
SS EN 1991-1	Eurocode 1- Basis of design and actions on structures - Part 1: Basis of design.
SS EN 1992-3	Eurocode 2: Design of concrete structures - Part 3: Concrete foundations
SS EN 1993-5	Eurocode 3: Design of steel structures - Part 5: Piling.
EN 16228 (all parts)	Drilling and foundation equipment — Safety

7.3 As the minimum, Specialist Builder (Piling Works) shall be competent and able to perform the type of specialist piling works where this is within their specialist works to which the BS EN execution standards are fully complied with.

8.0 TYPES OF TESTS REQUIRED

8.1 The Specialist Builder (Piling Works) shall make arrangement on the type of pile integrity tests required as per the table below during the on-site inspection for land piling works:

Table 8.1: Type of Integrity Test for the various pile types and its numbers for land piling works **(Cat. L)**

Type of test(s) required	Initial	Re-Certification	Remarks
1) Bored Pile			
Quality Test a. Sonic Logging Test (1 of 5) b. Sonic Coring at the pile toe c. Pile Integrity, Low Strain (PIT). High Strain (PDA) may be considered if PIT could not show convincing results d. Core Sample Test (top 3 metres from the cut-off level, 3 Samples)	1 for each test	1 for each test	
Profile Check (Verticality & Nominal Diameter)	Min. 1	Min. 1	
Records as per recommendation in Annex B & C of BS EN 1536			
2) Diaphragm Wall			
Quality Test a. Sonic Logging Test (1 of 5) b. Sonic Coring at the D/Wall toe c. Core Sample Test (top 3 metres from the cut-off level, 3 Samples)	1 for each test	1 for each test	
Profile Check (Width)	Min. 1	Min. 1	
Records as per recommendation in Annex B & C of BS EN 1538			
3) Micropiles (bored)			
Grout cube test (100mm, 3 samples)	Min. 3	Min. 3	
Low Strain integrity test (PIT)-(See 9.3.4) Pile Integrity, Low Strain (PIT). High Strain (PDA) may be considered if PIT could not show convincing results	1	1	
Records as per recommendation in Annex D of BS EN 14199			
4) Displacement piles (driven or jacked-in including micropile)			
Pile Integrity Testing a. Pile Integrity. High Strain (PDA) may be considered if PIT could not show convincing results	1 for each test	1 for each test	
Certificate of conformity of material e.g., cert (Precast Concrete)	Sampling according to standard		
Welding personnel qualification & Training			
Records as per recommendation in Annex D of BS EN 12699			
5) Sheet Pile			
Welding personnel qualification & Training For reused sheet pile – follow BC1			

- 8.2 Pile Integrity Test on piles installed on marine environment shall be like that on piles installed on land. The following tests are recommended:

Table 8.2: Type of Integrity Test for the various pile types and its numbers for marine piling works **(Cat. N & Cat. M)**

	Initial	Re-certification
Driven Steel Pipe Pile	Min. 1 High Strain PDA	Min. 1 High Strain PDA
Driven Concrete Pile	Min. 1 High Strain PDA & Min. 1 Low Strain Pile Integrity Tester (checking for cracks and voids)	Min. 1 High Strain PDA & Min. 1 Low Strain Pile Integrity Tester (checking for cracks and voids)
Cast in-situ Bored Pile	Min. 1 High Strain PDA; min. 1 Cross Hole Sonic Logging; min 1 Bored pile toe coring; Min. 1 Low Strain Pile Integrity Tester (checking for cracks and voids)	Min. 1 High Strain PDA; min. 1 Cross Hole Sonic Logging; min. 1 Bored pile toe coring; Min. 1 Low Strain Pile Integrity Tester (checking for cracks and voids)

Note: Statnamic Testing can be used to check pile integrity.

9. SAFETY AND ENVIRONMENT REQUIREMENT

- 9.1 Staff on-site shall have the requisite Personal Protection Equipment. For example, safety helmet, safety shoes and any other safety equipment as deem necessary by the site safety officer.
- 9.2 The Specialist Builder (Piling Works) shall have procedures for safety and ensuring the safety of its staff and the public.
- 9.3 The Specialist Builder (Piling Works) shall ensure that they comply with relevant regulatory requirement regarding environmental issue.

10. FORMAT OF CERTIFICATION SCOPE

The scope of certification is granted only for specific piling works being audited. An example of the certification scope is attached in Appendix 1.

11. REFERENCE

- 1) SS EN 1997 Part 1 & 2:2010 – Eurocode 7: Geotechnical Design. Ground Investigation and Testing
- 2) BS EN 996: 1996 Piling equipment - Safety requirements
- 3) BS EN 1536: 2010+A1: 2015 Execution of special geotechnical work - Bored piles
- 4) BS EN 1538: 2010+A1: 2015 Execution of special geotechnical work - Diaphragm walls
- 5) BS EN 12063: 1999: Execution of special geotechnical work - Sheet pile walls

- 6) BS EN: 12699: 2001: Execution of special geotechnical work - Displacement piles
- 7) BS EN: 14199: 2015: Execution of special geotechnical works - Micropiles
- 8) BS EN: 12794: 2005: Precast concrete products - Foundation piles
- 9) BS EN: 791: 1995+A1:2009: Drill rigs – Safety
- 10) SS EN 1991-1, Eurocode 1- Basis of design and actions on structures - Part 1: Basis of design.
- 11) SS EN 1992-3, Eurocode 2: Design of concrete structures - Part 3: Concrete foundations
- 12) SS EN 1993-5, Eurocode 3: Design of steel structures - Part 5: Piling.
- 13) EN 16228 (all parts) Drilling and foundation equipment — Safety
- 14) Guides on Good Practices for Pile Load Test Using Kentledge Method in Singapore (1 Sept 2011 - GEOSS)
- 15) Foundation Supervision Guide (2012 - ACES/ IES)
- 16) Good Practice for Installation of Jacked Foundation Pile in Singapore (8 Oct 2015- GEOSS)
- 17)** Guidelines on Identification of Rock During Bored Piling Works (2 Sept 2019- GEOSS/ BCA)

APPENDIX 1 - SPECIALIST BUILDER (PILING WORKS): BASED ON TYPE OF PRODUCT AUDITED.

Type of Product	Type and Range of Installation Method	Installation Method, Codes or Standards Used
<p>1) Bored piles</p> <p>a. Pile with diameter 0.5m up to 3m</p> <p>b. Barrette with width >0.4m</p>	<p>Execution of piling work</p> <p>A) Bored piles</p> <p>b) Barrettes</p> <p>c) Contiguous pile wall</p> <p>d) Secant pile wall</p>	<p>BS EN 1536:2010</p> <p>8. Execution</p> <p>9. Supervision, Testing, and monitoring</p> <p>10. Site Records</p> <p>Table 6 General information of the site</p> <p>Table 7 General information on the procedure</p> <p>Table 8 As-built information for bored pile</p> <p>11. Special Requirements</p>
<p>2) Displacement piles</p> <p>a. Driven piles</p> <p>b. Jacked piles</p>	<p>Execution of piling work</p>	<p>BS EN 12699: 2001</p> <p>8. Execution</p> <p>9. Supervision, testing and monitoring</p> <p>10. Site Records</p> <p>11. Special Requirements</p>
<p>3) Micropiles</p> <p>a. Drilled micropiles with shaft diameter < 300mm</p> <p>b. Driven micropile with shaft diameter < 150mm</p>	<p>Execution of piling work</p>	<p>BS 14199: 2015</p> <p>8. Execution</p> <p>9. Supervision, testing and monitoring</p> <p>10. Site Records</p> <p>11. Special Requirements</p>
<p>4) Diaphragm wall</p>	<p>Execution of piling work</p>	<p>BS EN 1538: 2010</p> <p>8. Execution</p> <p>9. Supervision of execution and monitoring</p> <p>10. Site Records</p> <p>11. Special Requirements</p>
<p>5) Sheet pile wall</p>	<p>Execution of piling work</p>	<p>BS EN 12603: 1999</p> <p>8. Execution of sheet pile wall</p> <p>9. Supervision, testing and monitoring</p> <p>10. Site Records</p> <p>11. Special Requirements</p>

Appendix 2 - REQUIREMENTS FOR THE CLASSIFICATION OF SPECIALIST BUILDER (PILING WORKS) (GRADES G1, G2 AND G3) COMPANIES FOR PILING WORKS:

It is intended to take reference to the prevailing classification of Contractors' Registration System (CRS) for the Construction Related (CR) Workhead - CR08 Piling Works. It is for the purpose of classification of Piling Specialists in this Criteria Document for the various Specialist Builder (Piling Works) as G1 (L1, L2 & L3), G2 (L4 & L5) and G3 (L6) for piling works.

APPENDIX 3 - APPLICATION SCENARIOS FOR CAT.L, N, M

(a) **Scenario 1:** Past record + live project

Assessment of track record
Assessment of live project
Result: Certificate of Conformity (validity is for 2 years)

(b) **Scenario 2:** Past record + no live project

Assessment of track record
No-Assessment of live project
Result: Provisional Certificate (validity is for 1 year with extension eligibility) + Upon award of contract, immediate notification to CB and apply for certification conversion

(c) **Scenario 3:** No Past record + no live project

No-Assessment of track record
No-Assessment of live project
Minimal Requirement: Adequate relevant piling machinery + manpower
Result: Provisional Certificate on grade G1 (validity is 1 year with no extension eligibility) + Upon award of contract, immediate notification to CB and apply for certification conversion on grade G1

(d) **Special scenario A: (Cat.L applying for Cat. N certification)**

Bonus: Piling machinery for Cat.L where appropriate can be used to satisfy the requirements in Table 2.1 for machineries required for Cat.N

BUT aware:

- a) Track record assessment shall be based on relevant Cat.N pile types.
- b) Grade shall be based upon on the relevant track record of Cat. N

(e) **Special scenario B: (Cat.M applying for Cat.N certification)**

Bonus: Piling machinery for Cat.M where appropriate can be used to satisfy the requirements in Table 2.1 for machineries required for Cat.N

BUT aware:

- a) Track record assessment shall be based on relevant Cat.N pile types.
- b) Grade shall be based upon on the relevant track record of Cat. N

APPENDIX 4: PROJECT RECORDS FORMAT OF WORKING LOAD TEST

The following information is to be included in the project records (including pile load testing, site piling records and as-built plans and reports)

1. The purpose and scope of the pile load testing/site piling records and as-built plans and reports)
2. Identification of the document, i.e., date of issue and unique identification.
3. Identification of the client, consultants, and subcontractors (if any).
4. Description of the work ordered, method adopted, and the type of pile tests conducted.
5. Date of pile load tests/piling works conducted.
6. Survey Coordinates and eccentricities of piling works installed.
7. Description of the equipment, methods and procedures used for pile load tests and piles installed.
8. The results of pile load tests, including field tests, laboratory tests, findings and issues encountered.
9. Name of the full staff members and supervisory team who performed pile load tests/special piling works.