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| Template for Site Supervision Plan |
| Version 1.0 |

Site Supervision Plan

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| Project Reference No.: *A1234-11001-2019* |
| Project Description: *PROPOSED CONDOMINIUM HOUSING DEVELOPMENT COMPRISING OF 10 BLOCKS OF 18 STOREY AND 4 BLOCKS OF 25 STOREY APARTMENTS (TOTAL: 1401 UNITS INCLUDING 100 DUEL KEY UNITS) WITH LANDSCAPE DECK, BASEMENT CAR PARK AND COMMUNAL FACILITIES AT JALAN BUKIT PUTEH* |

Prepared by:

|  |  |
| --- | --- |
| Qualified Person (Supervision) for Structural/Geotechnical Building Works | Er *XX XX XX*(PE NO.: *1234*) |
| Name of Company | *XXX* Pte. Ltd. |

**DECLARATION BY QUALIFIED PERSON (SUPERVISION) FOR STRUCTURAL AND GEOTECHNICAL BUILDING WORKS ON “SITE SUPERVISION PLAN”**

A). PREPARATION OF SUPERVISION PLAN

i. Qualified Person (Supervision) for Structural Works

1a. I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Qualified Person (Supervision) for Structural Works appointed under Section 8(1)(b) of the Building Control Act) hereby submit the comprehensive supervision plan prepared by me and certify that it has been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings construction for the time being in force.

1b. I further certify that the schedule of material tests is prepared and checked by me to be in compliance with approved drawings, design requirements and updated/latest material standards for the test frequency and acceptance criteria for use in structural works.

ii. Qualified Person (Supervision) for Geotechnical Building Works

2a. I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Qualified Person (Supervision) for Geotechnical Building Works appointed under Section 8(1)(b) of the Building Control Act) hereby submit the comprehensive supervision plan prepared by me and certify that it has been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings construction for the time being in force.

2b. I further certify that the schedule of material tests is prepared and checked by me to be in compliance with approved drawings, design requirements and updated/latest material standards for the test frequency and acceptance criteria for use in structural works.

B). ISSUANCE OF SITE SUPERVISION PLAN AND BRIEFING

3. I hereby declare that a copy of Site Supervision Plan has been issued to the following site supervisors (see **Table 1**). I have briefed the site supervisors on the site supervision requirements and material test requirements. I shall brief the new or incoming site supervisors should there be any change of site supervisor(s) throughout the construction period. It is my duty to ensure that all appointed site supervisor(s) understand the site supervision requirements as stated in this site supervision plan prepared by me.

Table 1: Briefing to Site Supervisor(s)

|  |  |  |  |
| --- | --- | --- | --- |
| Name of Site Supervisor | RE/RTO | Date | Signature |
| Tan xx xxxx | RTO | 2 April  |  |
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**DECLARATION BY QUALIFIED PERSON (SUPERVISION) FOR STRUCTURAL AND GEOTECHNICAL BUILDING WORKS ON “SITE SUPERVISION PLAN”**

C). QP’S INSPECTION ON CRITICAL STRUCTURAL AND GEOTECHNICAL BUILDING WORKS

4. I have reviewed and studied the BCA approved plans for the project thoroughly and hereby confirm that the following works (see **Table 2**) are critical which require QP’s inspection before or during the execution of works.

Table 2: List of Critical Works Requires QP’s Inspection

|  |  |  |
| --- | --- | --- |
| Description of Critical Works#1 | QP’s Inspection(before or during the execution of works?)  | Tentative Execution Date#2 |
| 1. (e.g launching of 40m span steel girder) | (e.g Inspect and witness the launching of steel girder) | xx Dec 2019 |
| 2. |  |  |
| 3. |  |  |

#1 – QP shall determine the critical works in the project and this shall also include the complex structures as defined in circular dated 2nd June 2014 *- “Early Pre-consultation of Structural Concept For Complex Buildings”*

#2 – Enclose construction program as record, if available

5. I understand that it is QP’s duty to notify Commissioner of Building Control (CBC) at least 2 weeks before the actual execution of critical works listed below in **Table 2** (refer to **Annex 4-1: Form BE-NCSW** in the Guide Book for Site Supervision Plan– Notification to CBC on Critical Works to Be Carried Out).

|  |  |
| --- | --- |
| Qualified Person (Supervision) for Structural WorksQualified Person (Supervision) for Geotechnical Building Works |  Digitally signedDigitally signed |
| Date  |  |

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**PROJECT BACKGROUND**

|  |
| --- |
| Instructions: |
| To include project description, site location, foundation & structural system |

|  |  |  |
| --- | --- | --- |
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| --- |
| Notes: |
| To show site plan |

 |
| Figure 1: Overall Site Plan |

**CONSTRUCTION AND SUPERVISION CHALLENGES**

|  |
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| Instructions: |
| * Discuss the construction challenges
* Key supervision messages or reminders to the supervision team.
 |

**SUPERVISION TEAM**

|  |
| --- |
| Notes: |
| * Organization Chart
* Roles and responsibilities of each supervisor
 |

**QP’S SITE VISIT**

|  |
| --- |
| Notes: |
| * Requirement for QP to prepare the QP’s Inspection Report for each visit and file them systematically in “Annex A” as part of site supervision plan for future audit purpose
* QP’s Inspection Report (to use the form Annex 3: Form: BE-INSREP)
* Frequency of site visit in Table 3
* To add on additional pages of record as required.
 |

Table 3: Frequency of QP’s Site Visit

|  |  |
| --- | --- |
| **Site**  |  **Frequency** |
| **Construction site** |  |
| Piling works |  ( ) visit(s) per month |
| Substructure works (e.g basement) |  ( ) visit(s) per month |
| Superstructures works |  ( ) visit(s) per month |
|  |  |
| **Off-site** |  |
| Precast Yard |  Once in every ( ) month |
|  |  |
| Structural Steelworks Yard |  Once in every ( ) month |
|  |  |

Annex A

Record of Site Visits

**A1. QP’s Site Visit – Attendance Summary (QP(S) for Structural Works)**

**Name of QP(S):** *Er XX XX XX*

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| s/n | Date of Site Visit | Time-in | Time-out | Signature | remarks |
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Notes: QP shall sign after completion of inspection for each site visit.

**A2. QP’s Site Visit – Attendance Summary (QP(S) for Geotechnical Building Works)**

**Name of QP(S):** *Er XX XX XX*

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| s/n | Date of Site Visit | Time-in | Time-out | Signature | remarks |
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Notes: QP shall sign after completion of inspection for each site visit.

**A3. Site Supervisor’s Site Visit – Attendance Summary**

**Name of Supervisor 1 (RE/RTO):**  *XX XX XX*

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**A4. Site Supervisor’s Site Visit – Attendance Summary**

**Name of Supervisor 1 (RE/RTO):**  *XX XX XX*

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**A5. Site Supervisor’s Site Visit – Attendance Summary**

**Name of Supervisor 1 (RE/RTO):**  *XX XX XX*

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| s/n | Date | Time-in | Time-out | Signature | remarks |
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Annex B

QP’s Inspection Report

Annex 3: Form: BE-INSREP

|  |
| --- |
| ***QP’s Inspection Report***  |
| **Project Reference No.:****Project Description:** |
| **Inspection Reference No.:** **Date of Inspection:**  |
| **Outcome of Inspection** 1. Area of Inspection (gridline/storey/element marking):* QP’s Comments:
* Follow up action by RE/RTO:

 2. Area of Inspection (gridline/storey/element marking):* QP’s Comments:
* Follow up action by RE/RTO:

  |
| **Assessment of Site Inspection forms**1. Improvement on format of site inspection form:2. Comments on inspection forms filled by RE/RTO: |
| **Assessment on Material Test Reports**1. Failure of material test failure:2. Follow up action (e.g design check by QP(D) or further structural assessment):**Assessment of Site Non-Conformity Report** * + 1. 1. Outstanding non-conformity/structural defects on critical elements:
		2. 2. Follow up action:
 |
| QP’s Declaration:  I hereby certify that I have checked the building works on site and confirmed that all building works are carried out in accordance with the approved plan. |
|

|  |  |
| --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Name & Signature of QP(Supervision)  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date |

 |

Annex C

Status of Structural Plan Approval

**Summary of Structural Plan Approval**

**Project Ref Number:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| s/n | ST number | Amendment submission (Y/N) – to which ST? | Description of works | Approval Dates | Permit Application No: |
| *1* | *ST01* | *N* | *Piling* | *10 April 2019* | *2019-1234* |
| *2* | *ST02* | *Y (ST01)* | *Amendment of pile type A (Block 1)* | *25 May 2019* | *As above* |
| *3* | *ST03* | *N* | *Superstructure (L1 to Roof) – Block 1* | *28 June 2019* | *As above* |
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Notes: The ST plan approval records to be updated by site supervisor.

Annex D

Site Supervision Checklist

**Supervision for Structural Works**

|  |
| --- |
| Instructions: |
| * To prepare the supervision checklist based on project requirement/ complexity.
* To edit, remove or add on to the list of structural works in this template which was extracted from guide book for supervision plan.
 |

List of Structural works

|  |
| --- |
| * Concreting works
 |
| * Post-tensioning works
 |
| * Safety Barriers
 |
| * Foundation works (Bored Piles)
 |
| * Foundation works (Displacement Piles)
* Foundation works (Shallow Foundation)
 |
| * Structural Steelworks
 |
| * Mass Engineered Timber
 |
| * Reinforcement
 |
| * Demolition
 |
| * Precast Concrete Components
 |
| * Curtainwall & Cladding (Stick System)
 |
| * Curtainwall & Cladding (Unitised System)
 |
| * PPVC (Steel)
 |
| * PPVC (Concrete)
 |
| * Post-Installed Anchors/Rebars
* ERSS Works

**Supervision for Geotechnical Building Works**List of Geotechnical Building Works* Bored Tunnelling Works
 |

**Concreting Works**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Material check* verify the reinforcing steel reinforcement specification/requirement delivered to site with approved drawings, e.g type of reinforcement, ductility class
* verify that the couplers or any other cast-in products are the type approved by QP and comply with material standards.
 | - | √ |
| 2 | Preparation for concreting* understand the curtailment requirement at supports (e.g pinned, fixed, cantilever) from approved drawings or verify with QP if in doubt for the following:
* beam connecting to wall/beam/column
* slab connecting to beam/CBP/SBP/Dwall
* cantilever beam from column/wall
* cantilever slab – to check the required back span for top reinforcement at supports

 * check the lapping requirement with general notes in approved drawings and EC2.
* check the cleanliness of formwork and application of debonding agent.
* concrete cover, formwork and support
* reinforcement shall be adequately supported by approved spacers and bar chairs to maintain the specified concrete cover
* bar chair to support reinforcement for deep transfer plate or similar structures, shall be designed by PE and the calculation to be kept at site.
* ensure formworks are designed by PE and Certificate of Supervision (COS) is issued and kept at site.
* cast-in bolts, bars and anchors
* verify if they have been approved by QP or as shown in approved plans
* check the embedment length with the approved plans. Check with QP if the information on the embedment length is not found in the approved plans.
 | - | √ |
| 3 | Concrete Test* slump test and sampling of fresh concrete for cube specimens
 | √ | - |
| * testing at accredited laboratory

(SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory) | - | √ |
| 4 | Installation of couplers* check to confirm that the cast-in couplers are the approved type and installed as per the specification and approved drawings.
* required number of couplers shall be verified.
 | √ | - |
| 5 | Concrete placement and compaction* check design mix, ensure delivery orders of concrete are endorsed and filed
* check that the concrete is from approved batching plants and verify the concrete travelling time to be within allowable duration as specified in the design mix.
* ensure no addition of water to improve the workability without QP’s written approval
* reinforcement shall not be displaced during concreting. Reinforcement projecting from works being concreted or already concreted shall not be bent without approval from QP and shall be protected from accidental deformation and damage
* ensure concrete is compacted using approved immersion type mechanical vibrators. Concrete shall be thoroughly worked into all parts of the formworks and between and around the steel reinforcement
* check the maximum height for the concrete pour to prevent segregation. Check on the approved method statement or verify with QP.
* check the surface treatment at construction joint before concreting. Provision of approved construction joint by QP e.g roughening, checker plate finish
 | √ | - |
| 6 | Reinforcement lapping with starter bars* Check to ensure that the rebars are lapped with the cast-in/post-installed “starter bar” or the “starter bar” installed/ connected to the cast-in couplers from the support, in accordance with approved plans.
* check for every starter bar connected to the coupler to ensure that they are properly screwed or “locked” to the couplers in accordance with the approved method statement by QP and manufacture’s recommendation.
 | - | √ |
| 7 | Curing after casting and temperature monitoring* refer to temperature monitoring regime or method statement approved by QP or concrete specialist
* check for any special requirement on curing of completed concrete structures
* check the appropriate times (days) to dismantle the formworks.
 | - | √ |
| 8 | Post-concreting inspection * in-situ test
* inspection for any grout leakage after completion of concreting
* check for any “honeycomb” and verify dimension of completed structures after removal of formwork
 | - | √ |

**Post-Tensioning Works**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Preparation for concreting* check the placement of reinforcement, shear links and bursting reinforcement
* check the placement of post-tensioning tendons
* check the installation of anchor block/head with approved type.
* check that the tendons are free from loose or thick rust, oil, grease, tar, paint, mud or any other deleterious substances. A thin film of rust is permitted subject to QP’s written approval.
 | - | √ |
| 2 | Material preparation (site mixing) and test* sampling of strand and grout
* supervise and ensure that the grout mixing and grouting works are carried out by trained worker or specialist e.g monitor the mixing duration and consider special requirement to maintain the workability and strength of the grout
 | √ | - |
| * testing at accredited laboratory

(SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory) | - | √ |
| 3 | Check the stressing equipment/ calibration certificates* calibration shall be carried out by an accredited laboratory
* check the validity of the calibration certificate
 | - | √ |
| 4 | Stressing and record of elongation measurement* ensure the elongation is within specified allowable limits as indicated in the approved method statements.
 | √ |  |
| 5 | Curing after casting and temperature monitoring* refer to temperature monitoring regime or method statement approved by QP or concrete specialist
* any special requirement on curing of completed concrete structures
 | - | √ |
| 6 | Review stressing records and strand elongation calculations | - | √ |

**Safety Barriers**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Compliance with approved drawings* check for material properties
* verify member size
* verify weld size
* check embedment of glass into supporting channel, if applicable
* check connection between barrier panels with handrails
* check end connection of handrail to support
* verify glass type and thickness
* check the base structure supporting the barrier i.e. channel, reinforcement details for kerb
 | - | √ |
| 2 | Post-installed anchor bolts* check that correct bolts are used. To check with QP if the builder proposed alternative or the bolt types are not indicated in the approved plans.
* check the embedment requirement with the approved plans. To check with QP if embedment requirement is not indicated in the approved plans.
* ensure that the works are carried out by a trained installer as per BS 8539:2012 Code of Practice for the selection and installation of post-installed anchors in concrete and masonry.
 | √ | - |
| 3 | Material test/connection test* refer to schedule of material tests prepared by QP e.g NDT carried out for welding.
 | √ | - |
| * testing at accredited laboratory
* (SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory)
 | - | √ |

**Foundation Works (Bored Pile)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|  | **Bored piles** |  |  |
| 1 | Ensure piling contractor holds valid builder license (SB) | - | √ |
| 2 | Checking before concreting of piles* concrete cover and reinforcement cage
* length of steel casing
* concrete mix
* pile diameter (diameter of steel cage and pre-bored hole)
 | - | √ |
| 3 | Concrete Test* slump test and sampling of fresh concrete including cube specimen
 | √ | - |
| * testing at accredited laboratory

(SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory) | - | √ |
| 4 | Boring works* verify soil type against the soil report
* refer to appropriate SI borelog
* ensure the use of appropriate equipment for rock coring
* check for pile verticality
* Tremie method –stabilizing liquid for wet piles shall be approved by QP
* check pile toe to ensure sound and clean base
* check the accuracy of measuring tape (not tampered) provided by main contractor/piling contractor. Supervisor shall use their own measurement tape.
 | √ | - |
| 5 | Concreting of piles* supervise concrete placement carried out in accordance with approved method statements.
* If applicable, check the alignment or verticality of plunge-in steel section (Kingpost)
 | √ | - |
| 6 | Check equipment, test load and witness pile load test Static Load Test* setting up, loading & unloading, dismantling of kentledge. Ensure that the test set up is endorsed by PE
* monitor the loading increment during pile load test

Dynamic Load Test * supervise and witness the process of every test
* endorse and file the test results
 | √ | - |
| 7 | Check the vibration and ground movement monitoring during piling work* witness the recording of instrumentation readings by the instrumentation specialist
* ensure instrumentation readings are taken in accordance with the frequency as stated in the approved plans.

Impact to adjacent properties* to carry out visual inspection on surrounding properties. Report to QP for any potential impact caused by the piling works
 | - | √ |

**Foundation Works (Displacement Pile)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|  | **Displacement piles** |  |  |
| 1 | Ensure piling contractor holds valid builder license (SB) | - | √ |
| 2 | Before piling works* check source and details of pile (e.g dimension, concrete grade, reinforcement, splice plate details)
* ensure that the ground is prepared to carry the loads/pressures induced by jacking operation without compromising the safety during operation
* check validity of calibration cert for jacking machine.
 | - | √ |
| 3 | During piling works* check appropriate machines used
* supervise welding between two piles and check weld quality
* check for pile verticality. Ensure jointed sections of piles are straight, free from dents and corrosion pits.

Jack-in: * check the hydraulic jack pressure and holding time for pile set
* refer to approved plan or check with QP

Driven type: * check for height of hammer drop, weight of hammer
* check for pile set requirement
* refer to approved plan or check with QP.
 | √ | - |
| 4 | Check equipment, test load and witness pile load test Static Load Test* setting up, loading & unloading, dismantling of kentledge. Ensure that the test set up is endorsed by PE
* monitor the loading increment during pile load test

Dynamic Load Test * supervise and witness the process of every test

Endorse and file the test results | √ | - |
| 5 | Check the vibration and ground movement monitoring instrumentations during piling work* witness the recording of instrumentation readings by the instrumentation specialist
* ensure instrumentation readings are taken in accordance with the frequency as stated in the approved plans.

Impact to adjacent properties* to carry out visual inspection on surrounding properties. Report to QP for any potential impact caused by the piling works
 | - | √ |
| 6 | Precautionary of ground heave* check SI borelog for presence of soft clay strata
* ensure that all measures are in-placed to mitigate possible damages to neighbouring’s structure, e.g relief well, settlement markers, inclinometer.
* check for requirement of pre-boring before the installation of displacement pile.
 | - | √ |

**Foundation Works (Shallow Foundation)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|  | **Pad, raft footing** |  |  |
| 1 | Checking before concreting of footing/raft footing* concrete cover
* concrete mix
* footing dimension
 | - | √ |
| 2 | Site tests* plate load test (to follow approved method statement by QP)

Concrete Test* slump test and sampling of fresh concrete including cube specimen
 | √ | - |
| * testing at accredited laboratory

(SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory) | - | √ |
| 3 | Excavation and preparation prior to footing construction* ensure that excavation is in accordance with the approved drawings (if applicable) or PE/QP(D)’s design
* check that the base preparation/compaction requirement is in accordance with approved drawings.
 | √ | - |
| 4 | Concreting of footing/raft* Supervise the concrete placement carried out in accordance with approved method statements.
 | √ | - |

**Structural Steelworks**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Steelworks fabricated overseas* Suitably trained and experienced SS shall be appointed (e.g StS qualification issued by Singapore Structural Steel Society); and a full-time Independent Testing Agency (ITA) accredited under Singapore Accreditation Council (SAC) Inspection Bodies Scheme should also be appointed to assist the QP in supervising and inspecting the works.

[Note: Foreign IB accredited to this Scheme by its local accreditation body that has the relevant Mutual Recognition Arrangement (MRA) with SAC is technically acceptable.]* All elements or materials sampled for testing shall be carried out by laboratories accredited under the Singapore Accreditation Council Laboratory Accreditation Scheme (SAC-SINGLAS), or foreign laboratories accredited by their local accreditation body that has the relevant MRA with SAC.
* ensure the fabricator has the appropriate welding facilities, qualified welders and a shelter fabrication yard

Steelworks fabricated in Singapore* to confirm that the fabricator is a licensed specialist builder (structural steelwork)
* ensure the fabricator has the appropriate welding facilities, qualified welders and a shelter fabrication yard

(refer to circular issued on 2nd November 2015 : *Guidelines on Supervision of Structural Steelworks Fabricated Off-site Locally or Overseas*) | - | √ |
| 2 | Material verificationCheck structural members or materials are in compliance with approved drawings and accordance to specified standards* source of material, grade
* hot rolled / cold-formed
* dimension / thickness/ weight
* check for steel markings
* check that CNC profiling machine is used for pipe connections
* check that the members are free from defects e.g warping, twisting, distortion, damaged section, pitting
* check that sample material test as specified by QP are carried out

(SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory) | - | √ |
| 3 | Class of structural steelCheck that the class of structural steel is in accordance with BC1: 2012 (Design Guide on Use of Alternative Structural Steel to BS 5950 and Eurocode 3). a) For Class 1, check the following - Factory Production Control (FPC) Certificate;- Manufacturer Test Certification (MTC)b) For Class 2, check the following - Manufacturer Test Certification (MTC)- Relevant material tests carried out as per BC1 Appendix B | - | √ |
| 4 | Bolted Connection* check bolting type: HSFG bolts / Black bolts
* bolt grade & type conforming to BC1
* bolts dimension (diameter x length)
* washer grade & type
* connection joints/splice joints to be constructed as per drawings
* bolts tightened to the correct torque
* ensure that the bolt extends beyond the nut by minimum 1½ thread
* check for defects e.g tilted bolts, holes enlarged by torch cutting; and the respective remedy action.
* check embedment length and arrangement of holding down bolts
 | √ | - |
| 5 | Welded Connection* check for welding defects, edge preparation, under-cutting, pits, lack of fusion. Check with QP for the remedy action
* welding procedure, size & length of weld to be according to approved plan & specifications
* welding electrode strength to comply with BC1
* weld surface to be clean & free from dust, rust & scales
* check the certificate of qualified welder
* check presence of cracks
* Welding test (%) :
* Ultrasonic testing
* Magnetic Particle testing
* Radiographic testing
* Penetration testing

(Note: All welding tests shall be witnessed by SS, ITA, where applicable.)* For failure of welding test, check with QP for the remedial action to be taken
 | √ | - |
| 6 | Holding down bolts/Anchor bolts* check the embedment requirement with the approved plans. To check with QP if embedment requirement is not indicated in the approved plans
* for post-installed anchor bolts, check that correct bolts are used. To check with QP if the builder proposes alternative, or the bolt types are not indicated in the approved plans
* ensure that the post-installed anchor bolt works are carried out by a trained installer as per BS 8539:2012 Code of Practice for the selection and installation of post-installed anchors in concrete and masonry
 |  |  |
| 7 | Erection works* check the approved method statement for erection details
* Stability and verticality
* Alignment of 2 adjoining pieces
* PE design & Certificate of Supervision for temporary structure, supporting bracings, tie backs are to be submitted and reviewed by QP
* check alignment, level, plumb & correctness of structure
* erection sequence is in accordance to QP’s design
* safe work platform & access to be provided
 | √ | - |
| 8 | Painting and Surface Preparation* check that galvanised steel / steel surface is prepared and painted/coated to approved plans and specifications
 | √ | - |
| 9 | Corrosion and Fire Protection* details and thickness of materials are in accordance with approved plans and specifications
* protection such as coatings and fire protection is to be evenly applied with no damage to the integrity of the coating.
 | √ | - |

**Mass Engineered Timber**

|  |  |  |
| --- | --- | --- |
|  **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|   | **MET (Glued Laminated Timber works/ Cross Laminated Timber)** |  |  |
| 1 | Pre-erection* check material free from defects ie. bowing, springing, twisting, cupping, end splits
* check that CE marking is affixed to material
* check for ID of certification Body
* check for Factory Production Control (FPC) Certificate, list the certificate no.
* list the harmonised product standards
* check the adhesive type and verify with approved drawings or check with QP check for species of MET and verify with approved drawings
* check for fire performance and verify with the fire performance requirement in the approved drawings. If in doubt, to check with QP.
* dimension check and verify with approved drawings
* check steel plates/ connections/ screw/ bolt holes pre-installed in accordance with approved plans
* check for moisture content
* check calibration certificate of equipment for measuring moisture content
* check for approved technical specification for glue/ resins
* check for proper storage of material
* check moisture content prior to erection
* check technical specifications/ ETA for wood screws & bolts
* check on wood screws & bolts e.g type/ size/ strength grade
* check for steel plates, angles and brackets e.g type/ size/ strength grade
* check technical specifications/ ETA for steel plates, angles and brackets
* check welder's qualification
 | - | √ |
| 2 | During/post erection* install deflection indicator according to QP's instruction
 | √ | - |
| 3 | Laboratory Tests* check the test report on finger joint, bending test, delamination tests
 | - | √ |
|  | **Cross Laminated Timber** |  |  |
| 4 | Check the nails e.g type/size/strength grade | - | √ |
| 5 | Check technical specifications, or European Technical Approval (ETA) for wood screws & bolts | - | √ |
| 6 | Check all end grains are protected  | - | √ |

**Reinforcement**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Material verificationTo check the materials are in compliance with approved drawings and accordance to specified standards* source of reinforcement
* verify reinforcement with the mill certificate
* verify and keep the factory production control (FPC) certificate from an accredited certification body.
 | - | √ |
| 2 | Material testing (chemical test, tensile test, shear test, bend & rebend test) at accredited laboratory* select the sample for testing
* witness the test - SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory
* check the results of test
 | - | √ |
| 3 | Review test results. Check with QP for acceptance of test results. | - | √ |

**Demolition**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Prior to commencement of demolition* verify that the existing structure to be demolished is as shown in the approved plans. Discrepancies must be reported to QP for review
* check that approved demolition works plan and method statements are available at site
* check that the protective hoarding, safety screen/netting, covered walkway, catch platform and catch fan are provided
* check the installation of sound barrier and dust screen/netting, whose height shall be at least 1 storey higher than the floor where the demolition takes place
* check instrumentation monitoring works are in placed
* check the requirement of adopting controlled demolition e.g partial demolition, especially at area near to the common party wall to prevent damage to the common party wall
* where machine is used, check to ensure it tallies with what is specified in the approved plan, in particular the weight of the machine.
 | - | √ |
| 2 | During demolition* check that demolition debris are not accumulated on suspended floor
* check that the provision of shoring and propping requirements are adhered for the support of the suspended floor
* check and monitor the sequence of demolition to prevent uncontrolled collapse
* check to ensure that demolition debris is not piled up to be used as temporary ramp to facilitate movement of machinery between suspended slab.
* where machinery is used, check for the allowable or safety zone for movement of machinery on building floor during demolition and in accordance to the approved demolition plan
* check on the safe working spaces and exclusion zones for demolition/partial demolition over basement, adequate containment should be provided in the approved plan
 | √ | - |
| 3 | After demolition* ensure precautionary measures are enforced on site in accordance with approved method statements and/or approved plans e.g water proofing plaster for exposed common party wall to prevent water seepage to adjacent premises
* check on the anchorage details of the existing beam rebar where continuity of the beam from the adjacent structure is loss as a result of the demolition works
 | - | √ |
| 4 | Demolition involving post-tensioned structures * check the demolition sequence for post-tensioned structures
* precautionary measures for detensioning of prestressed strands to prevent hazard due to possible fly-out of the strands
 | √ | - |
| 5 | Demolition involving Highrise (more than 10 storey) * check the requirement of CCTV supervision for high-rise demolition
* ensure the demolition sequence is in accordance with approved plan
 | √ | - |

**Precast Concrete Components**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Pre-installation check* take note the delivery order and check for any concrete chipped off, cracks, honeycombs or broken parts.
* check to ensure compliance with approved drawings
* check soffit of columns/ wall (no patching around splice sleeves/ connectors)
* check the verticality of multi-tier precast column is within acceptable range
* check splice sleeves bottles are clean (no blockage)
* check the length of dowel bars
* check the position and reinforcement size of lifting points
* check storage of precast elements
 | - | √ |
| 2 | Installation * check for shim plates/ washers e.g with spring
* check props secured and braced the columns/ walls
* ensure verticality of erected columns / walls
* check for correct orientation and correct precast component, according to approved drawings
 | √ | - |
| 3 | Splice sleeve / connectors* supervise for grout mixed (SS mortar\* for splice sleeve)
* witness flow test of grout (SS mortar\* for splice sleeve)
* supervise grouting process - pumped from lower inlet tube
* grout flow continuously at outlet before stopper is inserted
* supervise and ensure that the grout mixing and grouting works are carried out by specialist e.g mixing duration and special requirement to maintain the workability and strength.
* no excessive blackflow observed

(\* SS mortar – type of mortar used for splice sleeve) | √ | - |
| 4 | Horizontal joint* supervise for grout mixed (grout process for horizontal joint)
* ensure pressure pump with pressure gauge is used
* grout flow continuously at outlet before stopper is inserted
* supervise and time grout to maintained at \_\_\_\_psi for \_\_\_ min after all outlets are sealed (pressure according to QP’s design)
* no excessive blackflow observed
 | √ | - |
| 5 | Pre-bedding process for horizontal joint* supervise for grout mixed
* supervise and ensure that the grout mixing and grouting works are carried out by specialist e.g mixing duration and special requirement to maintain the workability and strength.
* ensure shim plates are secured using mortar one (1) day in advance
* check for sufficient grout pour
* removed all excessive grout
 | √ | - |
|  | **Fabrication yard** |  |  |
| 6 | Pre-concreting checks* check that the shopdrawings are approved and endorsed by QP
* check the mould condition, dimensions, openings
* check for reinforcement e.g No. / size and spacing
* check concrete cover
* check for splice sleeve position/ type
* check the embedment length of dowel bar, protrusion length of continuity bar (size, number and spacing)
* check strand position and elongation
* check the dimension & position of block out
* check grouting tubes/ pipes & the position
* ensure viewing holes are provided at height 255mm from base & in-line with rebars (spiral connectors)
 | - | √ |
| 7 | Concreting* supervise the pouring concrete/ concreting
* supervise making of test cube
* supervise slump test
* verify design mix and ensure the delivery orders of concrete are endorsed and filed
 | √ | - |
| 8 | Post concreting check* check for curing
* check for honeycomb & note any repairs
 | - | √ |

**Curtainwall & Cladding (Stick System)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|  | **Stick system curtain wall / Cladding** |  |  |
| 1 | **Before commencement of works*** check shopdrawings against BCA approved drawing. Shopdrawings shall be endorsed by QP.
* highlight discrepancies to QP, if any (shopdrawings and approved drawings)
* witness compatibility test
 | - | √ |
| 2 | **Test requirements*** torque wrench test
* functionality test i.e. water tight/ air tight
* adhesion test
* non-staining test/ other lab testing
* deglazing test
 | √ | - |
| **Material tests*** SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory
 | - | √ |
| 3 | **Site Fixing*** check materials against BCA approved drawing
* check type and alignment of steel bracket & runner
* check anchor type and size
* check drilled holes/ depth and setting out
 | √ | - |
| 4 | **Installation*** Installation of transoms and mullions
	1. check control point and alignment
	2. check in position screws, washer and bolts
	3. check cleanliness
* Installation of panels
	1. check alignment of panels
	2. check fin/capping/gasket engagement
	3. check bolt/nut properly tighten
	4. check for setting block, self-weight supports
	5. check for structural sealant
* Installation of retaining devices and fixings
	1. test for retaining devices (where applicable)
 | √ | - |
| 5 | Review of test results. Check with QP for acceptance of test results.  | - | √ |

**Curtainwall & Cladding (Unitised System)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
|  | **Unitised system** |  |  |
| 1 | **Before commencement of works*** check shopdrawings against BCA approved drawing. Shopdrawings shall be endorsed by QP
* highlight discrepancies to QP, if any (shopdrawings and approved drawings)
 | - | √ |
| 2 | **Factory fabrication*** supervise the fabrication works at factory
* check alignment of bracket and runner
* deglazing test
* compatibility test
* adhesion test
* non staining test/ other lab testing
* check anchor type and size
* check drilled holes/ depth and setting out
* check control point and alignment
* check the setting-out of screws and bolts
* where structural sealant glazing is used -
* check for setting block, self-weight supports and retaining devices
* check sealant type and bite size
* to witness test for retaining devices and fixing
 | - | √ |
| 3 | **Erection at site*** supervise the installation of transoms and mullions module.
* supervise installation of anchor bolts (including tests) and channels
* check alignment of bracket and runner
* check fixing of module to main structure
* ensure all fixings of claddings to be corrosion-resistant stainless steel fasteners
 | √ | - |

**PPVC (Steel)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | During installation of modules on site* check the verticality for every installation of PPVC module
* Verticality tolerances or requirements for every corner and overall height of erected PPVC module should refer to Site Supervision Plan prepared by QP. If it is not specified, please check with QP.
* Horizontal gap at every column should be monitored/checked to ensure that the floor to floor height of the next module is not exceeded. Tolerance should refer to Site Supervision Plan prepared by QP. If it is not specified, please check with QP
* check that the connection or bolt installation between module is in accordance to approved plans
 | √ | - |
| 2 | Supervise the fabrication of PPVC module* pre-welding checking
* post welding inspection and non-destructive testing
* Mill Certificates/ FPC of steel materials, bolts
* Vertical alignment of every PPVC column after assembly
* Height of every PPVC column after assembly
* the squareness tolerance of the top and bottom frames is to be checked for distortion after assembly

(refer to circular issued on 2nd November 2015 : Guidelines on Supervision of Structural Steelworks Fabricated Off-site Locally or Overseas) | √ | - |
| 3 | Laboratory test* check and ensure that all required tests specified in the approved plans are carried out
	+ SS shall perform intermittent or spot checks for the material test carried out by an accredited laboratory
 | - | √ |

**PPVC (Concrete)**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous** | **Periodic** |
| **(mandatory)** |
| 1 | During installation of modules on site* check the verticality for every installation of PPVC module
* check qualification of surveyor
* check the connection details between modules (according to approved plans)
* check details and requirements for key bars, wire loops, slimbox, slab cable ties etc.
* Supervise and ensure that the grout mixing and grouting works are carried out by specialist e.g mixing duration and special requirement to maintain the workability and strength.
* Supervising the installation of couplers, shear key bars, wire loops, “slim box”, cable wires and connecting reinforcement
 | √ | - |
| 2 | Supervise the fabrication of PPVC module. * concreting
* reinforcement (including couplers, wire loops)
* acceptance and quality of surface treatment for walls and columns (for composite action). Refer to requirements
 | √ | - |
| 3 | Laborator test* check and ensure that all required tests specified in the approved plans are carried out e.g wire loops, cable wire, “slim box” etc.
	+ SS shall perform intermittent or spot checks for the material test carried out by an accredited laboratory
 | - |   √ |

**Post-Installed Anchors/Rebars**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Installation of anchor bolts and rebars.* SS shall ensure that the anchor bolts and rebars are installed in accordance with the approved plans
* SS shall ensure that the installation of anchors/rebars is in accordance with manufacturer’s instructions
* installation shall be carried out by trained/competent installer as per BS 8539 Code of Practice for the selection and installation of post-installed anchors in concrete and masonry.
 | √ | - |
| 2 | Test of anchor bolts/rebars.* SS shall ensure that testing of anchors are carried out as prescribed by the QP (number or frequency of test)
* SS shall ensure that the tests are carried out in accordance with CFA Guidance Note Procedure for site testing construction fixings as specified in BS 8539
* SS shall witness the test
 | √ | - |

**ERSS Works**

|  |  |  |
| --- | --- | --- |
| **Supervision Requirements** | **Continuous****(mandatory)** | **Periodic** |
| 1 | Daily inspection of ERSS WorksNo fewer than one inspection is to be carried out per day to ensure the works and activities associated with the construction of the ERSS (including excavation) are being carried out in accordance with the approved plans, including the sequence of any excavation. |
| 2a | Excavations/earth filling (when the instrumentation readings (lateral movements, support loads or settlement) **are within** the alert level)* ensure the excavation profile and sequence is in accordance with approved plan.
 | - | √(At least once daily) |
| 2b | Excavations/earth filling (when the instrumentation readings (lateral movements, support loads or settlement) have **exceeded** the alert level)Excavations for cantilever retaining structures | √ | - |
| 3 | Installation or removal of earth retaining wall including capping beam* ensure the earth retaining wall including capping beams are in accordance with approved plans
 | √ | - |
| 4 | Installation or removal of lateral support elements to support the ERSS; including struts and walers, king posts, soil nails, ground anchors and walers, ring beams, temporary and permanent slabs, or any other type of lateral support element* ensure the lateral support element and connection details are in accordance with approved plans
* follow sequence of ERSS in approved drawings
 | √ | - |
| 5 | Installation of ground improvement or ground strengthening works* ensure works are carried out in full compliance with the specifications shown in the approved drawings
 | - | √(At least once daily) |
| 6 | Protection measures associated with ERSS works* ensure protection measures are installed in accordance with the details specified in the approved drawings.
 | - | √(At least once daily) |
| 7 | Instrumentation and monitoring * witness the recording of instrumentation readings by the instrumentation specialist
* ensure instrumentation readings are taken in accordance with the frequency as stated in the approved plans.

Impact to adjacent properties* to carry out visual inspection on surrounding properties. Report to QP any potential impact caused by the excavation works
* ensure surplus excavated materials are not stockpiled on site
 | - | √ |

**Supervision for Bored Tunnelling Works**

| **No** | **Components of Bored Tunnelling works** | **Duty/Inspection regime** | **Remarks** |
| --- | --- | --- | --- |
| **1** | **General** |  |  |
| a. | Bored Tunnelling works | All permanent and temporary works associated with Bored Tunnelling must be supervised by the QP(S). | QP(S) refers to QP(S)(ST) and QP(S)(Geo)  |
| b. | Bored Tunnelling, instrumentation and monitoring approved plans | QP(S) and his appointed site supervisors (SS) to take all reasonable steps and exercise due diligence in supervising and inspecting the building works or geotechnical building works, to ensure those building works are being carried out in full compliance with details and specifications shown in approved plans.QP(S) to perform duties as stipulated in Building Control Act and Regulations. | Tunnels fall under the category “building works” and “geotechnical building works” in the regulation  |
| c. | Specific conditions of permit | The project parties must comply with the Specific Conditions of Permit for Bored Tunnelling Works. |  |
| d. | Preconstruction and Post-construction survey | It will be prudent for QP(S) to verify that the Builder has carried out the preconstruction surveys prior to the start of the tunnelling works and post-construction surveys after the completion of tunnelling works and when the instrumentation monitoring results have stabilised. The extent of the surveys shall cover the structures within the zone of influence of tunnelling works as assessed by QP(D).  |  |
| e. | QP(S) to provide regular guidance and direction to site supervision (SS) team | QP(S) must provide guidance, advice and technical inputs as well as make decisions at critical stages. QP(S) is advised to conduct routine technical briefings to the SS team on site supervision matters.  The frequency of the technical briefing should be weekly at least for the 1st month of tunnelling works or as and when new staff join the SS team.The frequency can be reduced to monthly when SS team has achieved full familiarity with the tunnelling works at the site.  |  |
| f. | Effective communication between QP(S) and SS team | QP(S) is advised to establish and maintain an effective communication plan with the SS team covering incident reporting, breaching of critical limits and deviations from approved plans. |  |
| g. | Prepare and implement supervision plans on Quality Assurance and Control (QAC). | QP(S) should prepare and implement a supervision plan in relation to QAC plans that should include trials and construction tests to be performed in accordance with the approved plan. QP(S) to review the test reports to ensure compliance with approved plans and BC Regulations. QP(S) must report to Commissioner of Building Control (CBC) on failure of test as soon as practicable. Failure to report to the CBC as soon as practicable is an offence. QP(S) should work with QP(D) such that QP(D) can develop and recommend appropriate steps, measures or remedial works to be carried out. |  |
| h. | Maintain Attendance Logbooks | QP(S) to keep and maintain an Attendance Logbook for recording the daily attendance of the QP(S) and SS Team and the day-to-day activities carried out by the SS at site.  |  |
| l. | QP(S) to attend weekly I&M/site meeting | QP(S) should attend Weekly Instrumentation Meeting / Weekly Site Meeting / 100 Ring Look-ahead Meeting / Risk Review Meeting / Safety and Quality Control Meeting to resolve site and technical matters that require his decision. | Builder’s Geotechnical Engineer should also attend IM meeting. |
| j. | Review of drawings | QP(S) in the course of their supervision, must highlight to the QP(D) on any discrepancies and/or missing details in a timely manner. |  |
| k. | Review of Builder’s submissions and method statements | QP(S)/SS to review and evaluate Builder’s submissions, shop drawings and method statements to ensure works carried out are in accordance to BC Act and Regulations, and approved plans. |  |
| L. | Review and verification of as-built plans | QP(S) to maintain the as-built plans including any deviations that are to be passed to the QP(D) on a regular basis. |  |
| m. | Watchman and emergency safety barricades | When tunnelling or TBM is in close proximity to building/structure/road, QP(S) should ensure that watchman is stationed 24/7 at the ground surface of TBM location with adequate stand-by safety barricades near the TBM location. |  |
| n. | Prolonged stoppage | QP(S)/SS to ensure KPI (Key Performance Indicator) are being maintained at all timesQP(S) shall implement **Tunnel Annex C-2** for each location of prolonged stoppages. |  |
| 2 | **Tunnel Segments** |  |  |
| a. | At Factory | QP(S)^ to apply for a separate permit for casting of tunnel segments at the casting yard.Full-time supervision at the casting yard is to be carried out by SS.The QP(S) is to visit and supervise the work at the casting yard not less than once a month during casting period.SS to:-1. inspect and keep Quality Control (QC) records
2. witness tests
3. examine for compliance materials, goods and work procedure
4. Carry out final inspection before delivery
5. Check on the delivery and transportation process to ensure quality of segment is maintained

in connection with segment production. | ^ - if QP(S) for precast tunnel segments are different from the QP(S) for bored tunnelling works |
| b. | At Site | QP(S)/SS should inspect each tunnel segment and to prepare and maintain a Segment Inspection Report.Any segment not meeting QP(D)’s requirements must be rejected.Repairs and/or making good of segmental lining shall be supervised by QP(S)/SS in accordance to the approved repair plan. |  |
| c. | During installation | QP(S)/SS to perform supervision during each ring built and verify measurements of Ring Build tolerances.If Ring Build tolerances exceed the specified limits during the ring build operation, the QP(S) shall instruct the Builder to rebuild the ring.If cracks occur in segment during installation, QP(S) shall instruct the Builder to replace the particular segment.QP(S)/SS to prepare and maintain Ring Build Report. |  |
| d. | Post installation | QP(S)/SS to perform inspection of each tunnel ring, record and bring to the notice of QP(D) any defects such as out of tolerances, cracks and leakages. QP(S)/SS to ensure repair is carried out in accordance to approved method with consideration given to the design life and long term durability. No repair shall be carried out without the supervision of SS. |  |
| 3 | **Protective measures and Inspection of Surrounding Structures** |  |  |
| a. | Protective measures on surrounding buildings/structures | QP(S) to ensure protective measures, if specified, are installed on buildings in accordance to the details specified in the approved plans before TBM enters the influence zone of the affected buildings/structures. |  |
| b. | Regular inspection of surrounding structures | QP(S) to carry out inspection on surrounding structures regularly to ensure stability and structural integrity. When a damage is observed or a feedback is received about a damage on an adjacent structure, QP(S) shall: - 1. conduct immediate inspection of the affected structure for any damage
2. inform QP(D) and assess the structural safety of the building together with QP(D), if serious damage is observed.
3. determine and make decision on whether tunnelling work can proceed.
4. assist QP(D) in developing the appropriate remedial measures
5. instruct Builder to implement immediate measures to remove danger and make the building safe
6. notify the Commissioner of Building Control
 | QP(D) shall submit his assessment report to BCA within 3 working days, on his findings and where applicable, with recommendations on the remedial measures. QP to work with BCA officer if there are building access issues.  |
| 4 | **Instrumentation and Monitoring** |  |  |
| a. | Installation of instrumentation, taking of instrument readings, protective measures, and timely replacement of faulty instrument | 1. QP(S)/SS should give input with respect to the appropriate location of instruments, witness the installation of instrumentation and verify the installation records are in accordance to the details stated in the approved plan.

 1. QP(S) to verify that the instrumentation readings are taken in accordance to the frequency stated in the approved plan.

 1. For effective monitoring, QP(S)/SS should ensure that the Builder puts in place adequate protective measures to prevent damage to the instrumentation and monitoring system.
2. QP(S)/SS to instruct the Builder to replace any instrument that is damaged or malfunctioning in a timely manner.
3. QP(S) to instruct Builder to install vibration meter to verify the vibration readings do not exceed the DIN 4150-3 limits whenever a public feedback on vibration is received within the tunnel’s influence zone
 | *(In addition to BT Circular - Annex 3 ID 26)**“BT Circular” refers to the Circular – Requirements on Bored Tunnelling Works* |
| b. | Regular review and analysis of instrumentation readings / Regular inspection of the tunnelling works | QP(S)/SS shall assess, analyse and interpret all instrumentation readings, factual reports submitted by the I&M Specialist Builder, so that safe execution of the tunnelling works is carried out at all time. This shall include review of data analysis processes and methods.QP(S) to establish a plan for SS to perform periodical instrumentation audit which should include site inspections and documentations.At the end of each tunnel shift, SS to submit a Shift Review Report containing a summary review of I&M and KPIs (face pressure, excavation muck etc.) before handing over.Senior RE shall conduct daily I&M meeting with at least the instrumentation specialist engineer and builder’s geotechnical engineer to review the instrumentation data, check readings that exceed review levels, and if so, report to QP(S) accordingly, and identify any trends of concern. | Daily meeting should be conducted by Senior RE/RE in the morning to cover previous day’s key tunnelling parameters, excavation data, instrumentation readings. |
| c. | Critical Instruments breaching review levels / excessive ground movement | Where instrument readings for tunnelling works exceed the review level limits, the QP(S) shall investigate and instruct the Builder to implement appropriate action plans to mitigate any safety concern.Where readings of critical instruments (e.g. extensometer, building settlement markers, ground settlement marker, tilt meter, piezometer where applicable) exceed the WSL, the QP(S) shall ensure safety, suspend TBM excavation and advancement, and inform BCA, Builder and/or other relevant authorities/agencies immediately. Whenever excessive ground movement (e.g. depression, sinkhole etc.) is observed, QP(S) shall do the same as paragraph 2 above. |  |
| d. | When tunnelling within the control zone of a building/structure in close proximity *(Refer to BT Circular - Annex 3 ID 19 for the definition of control zone.)* | QP(S) to ensure the control zone is marked on the surface.QP(S) to ensure builder implement a transverse ground instrumentation monitoring array to validate TBM KPIs just before going underneath/near a building/structure.QP(S) to ensure the planned CHI is executed before entering the control zone to avoid stoppage within the control zone.During tunnelling within the control zone:-* QP(S) to review I&M results and Tunnelling Key Performance Indicators (KPI) as defined in QP(D)’s drawings
* QP(S) to perform assessment of the performance of the tunnelling work and decide whether building is safe for tunnelling to continue; submit summary of monitoring results and assessment reports to BCA.
* QP(S) to deploy full time SS and ensure Builder’s site staff are positioned full time at the building to observe for any signs of distress on the ground and/or structure.
* QP(S)/SS to inspect the building and witness instrumentation monitoring.
 | (*BT Circular -* Annex 3 ID 23)(*BT Circular -* Annex 3 ID 24)Refer to BT Circular - Annex 3 ID 27 for the frequency of reviewing I&M results.Refer to BT Circular - Annex 3 ID 27 for the frequency of submitting the assessment report to BCA.Refer to BT Circular - Annex 3 ID 19 for the frequency of inspecting the building. |
| e. | Emergency Plan  | QP(S) shall identify from the approved plans the building capacity limits of all buildings below which tunnel under crosses.QP(S) to verify that decanting and emergency communication plans have been prepared and put in place.QP(S) to refer to BT Circular – Annex 3 ID 31 for any breach of Building capacity limits | (*BT Circular -* Annex 3 ID 31) |
| f. | Submission of instrumentation and monitoring results | QP(S) to submit form Annex E (Instrumentation and Monitoring for Excavation Works) monthly to Commissioner of Building Control by the 7th of the following month. |  |
| 5 | **Testing and Verification** |  |  |
| a. | Ground improvement works | QP(S)/SS shall supervise the ground improvement works in accordance with the approved plans and the method statement.QP(S)/SS shall ensure all information related to ground improvement is recorded. This includes: -1. location of each ground improvement point
2. start and end depths
3. pressure, volume, withdrawal rate as applicable
4. quality control test results
 |  |
| b. | Tail void grouting  | QP(S)/SS to ensure that records of grout volume and pressure are recorded for each ring.QP(S) to discuss with QP(D) and Builder the need for secondary grouting based on the grouting record. |  |
| c. | QAC for soil conditioning (EPBM) | When EPBM is adopted, QP(S)/SS to ensure that testing of soil conditioning for each type of soil is carried out to ensure that it can provide an adequate plug in the screw conveyor and to control cutter head wear. |  |
| d. | QAC for bentonite slurry (Slurry TBM) | When slurry TBM is adopted, QP(S)/SS to ensure that relevant tests are conducted to verify the quality of the bentonite slurry for each ring built. Test results to be reviewed and discussed during daily tunnel meeting.QP(S) to audit the test for compliance with relevant standards and procedures. |  |
| 6 | **Key Performance Indicator (KPI)** |  |  |
| a. | General requirement(Additional requirement for tunnelling in mixed face condition) | QP(S)/SS to review compliance of KPI during tunnelling and before each ring built.QP(S)/SS to sign off the excavation volume for each ring built while tunnelling in close proximity and /or in mixed face condition. | Annex C-3 |
| b. | Exceedance of KPI | QP(S) to temporarily suspend tunnelling work when persistent exceedance of KPI is observed for more than 5 mins, for the implementation of corrective actions. |  |
| c. | Face pressure  | QP(S)/SS to ensure that face pressure is being maintained in accordance to approved plan. |  |
| d. | Excavation volume | QP(S)/SS to verify the excavation volume of each ring advanced. If excavation occurs beyond the limits as defined by QP(D), QP(S) to adopt the actions to be taken in BT Circular – Annex 4 | *(BT Circular - Annex 4)* |
| e. | Malfunction of key KPI equipment | QP(S) to suspend tunnelling work when equipment measuring KPI is malfunctioning. Tunnelling work shall resume only when all key KPI measuring equipment are functioning properly. |  |
| 7 | **Cutter Head Intervention (CHI) – planned and unplanned** |  |  |
| a. | Tunnel Annex C-2 and Annex C-1 | QP(S) to implement Tunnel Annex C-2 for each CHI, and Tunnel Annex C-1 on restart of TBM after the CHI |  |
| b. | CHI monitoring regime | QP(S)/SS to ensure that the necessary instruments are installed before the CHI.For unplanned CHI, as a minimum, ground settlement markers following the planned CHI monitoring regime or equivalent alternatives are to be installed. |  |
| c. | QP(D)s’ requirements during CHI | The QP(D)s’ requirements should include the following: -1. Compressed air recommendations
2. Air pressure step down procedure, if applicable
3. Water ingress limits (rate and total volume allowable)
4. Maximum CHI duration
5. Allowable settlement
6. Additional monitoring requirements if any
7. Monitoring frequency
8. Need for ground improvement if necessary
9. Need for recharge well\*

QP(S)/SS to monitor closely and to ensure that the above requirements are controlled within the limits specified by the QP(D) and following QP(D)’s recommendations QP(S) / QP(D) to assess and instruct Builder to carry out necessary mitigation measures if the specified limits are breached. | \* - if tunnelling in weathered rock with potential drawdown and in close proximity to existing structure etc.*Refer to BT Circular - Annex 3 ID 11 for the frequency of instrumentation monitoring.* |
| d. | Face stability | QP(S)/SS to verify the ground condition at the CHI location to be as assumed by QP(D) in the CHI calculation.QP(S) together with QP(D) shall reassess the face stability at intervals not exceeding the requirements in the Specific Conditions of Permit for Bored Tunnelling Works. |  |
| e. | Face inspection | When face inspection occurs, it should be carried out by competent qualified geologist (acceptable by QP(D) and QP(S)) and a face map and photos shall be produced. |  |
| f. | CHI under free air | See remarks. | Refer to item f) of “Specific Conditions of Permit for Bored Tunnelling Works”  |
| h. | Post CHI assessment | QP(S) to assess the performance of each CHI prior to allowing the TBM to proceed.QP(D) to assess the performance of each CHI whenever the critical limit (Alert/work suspension limit) is breached. |  |
| 8 | **Other Bored Tunnelling Associated Works** |  |  |
| a. | Tunnel break-in and break-out | QP(S)/SS to ensure that the Builder complies with the approved procedure for Tunnel break-in and break-out. |  |
| b. | Tunnel eye support | QP(S)/SS to conduct acceptance check by probe drilling prior to hacking of tunnel eye. |  |
| c. | Tunnel jacking frame | QP(S)/SS to verify the jacking frame member sizes are in accordance to approved plans. QP(S)/SS to inspect and ensure all welding to jacking frame meet the design and welding strength requirements with tests.The tunnel jacking frame shall be monitored by strain gauge. |  |
| d. | Cast in-situ lining | QP(S)/SS shall ensure the Builder provides a good quality cast in-situ lining. Close attention shall be given to construction joints, waterproofing, rebar support to ensure a watertight structure. |  |

Annex E

Site Inspection Forms

**SITE INSPECTION FORMS**

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| --- |
| Instructions: |
| * All the required inspection forms to be included in this section.
* The completed inspection forms by SS to be filed in separate folder.
 |

List of inspection forms

* *Reinforcement Inspection Form*
* *Concreting Inspection Form*
* *PT Stressing Inspection Form*
* *Xxx*
* *Xxx*
* *xxx*

Annex F

Schedule of Material Tests

|  |
| --- |
| Notes: |
| * Schedule of material tests in this template are taken from guide book for site supervision plan. QP shall remove/edit and update to comply with updated codes/standards and project requirement.
* The material test results and reports to be filed in separate folders.
 |

**SCHEDULE OF MATERIAL TESTS**

Schedule of Material Tests

* Concrete
* Reinforcement
* Xxx
* xxx

**Structural Works - Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 1 | **Initial test for concrete (normal)1**1 Data from previous tests or long-term experience may be considered as alternative to initial tests. | Compression | EN12390 | SS289:Pt4(SS EN 206-1, SS 544-1, SS 544-2) | 1 test per new concrete or concrete family | Refer to Annex A, SS EN 206-1 |  | Before concreting works |
| 2 | **Initial test for concrete (waterproofing) 2**2 Data from previous tests or long-term experience may be considered as alternative to initial tests. | Compression |  EN12390 | SS289:Pt4(SS EN 206-1, SS 544-1, SS 544-2) | 1 test per new concrete or concrete family  | Refer to Annex A, SS EN 206-1 |  | Before concreting works |
| Water Absorption | BS1881:Pt 122 | <3% (TR 31) | 3 cubes per test (at 28 days) |
| Permeability | Darcy’s Theory | <10-12 m/s (TR31) |
| Rapid Chloride Permeability | ASTM C1202 | ASTM C1202 |
| Water penetration | BS12390:Pt 8 | <50mm |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 3 | **Cement** | Consistency | BS EN 196 | SS26SS477 (PBFC)SS476 (HSBFC)(Current SS EN 197) | 1 test per brand/ type | 1 sample per test |  | Before concreting works or trial mix |
| Setting time |
| Fineness |
| Comp strength |
| Heat of hydration |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 4 | **Aggregate** | Particle Size Distribution | SS31SS73ASTM C289EN1744-1ASTM C227ASTM C295(Current SS EN 12620) | SS31SS73ASTM C33(Current SS EN 12620) | 1 test per size | 1 sample per test |  | Before concreting works or trial mix |
| Fines Content/Quality |
| Chloride Content |
| Acid Soluble Sulphate Content |
| Moisture Content |
| Potential Alkali-Silica Reactivity (ASR) |
| Shell Content |
| Petrographic Examination |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 5 | **Admixture** | pH value | BS EN 480  | SS EN 934  | 1 test per brand/ type | 1 sample per test |  | Before concreting works or initial test |
| Total chlorine |
| Water soluble chloride |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 6 | **Concrete** | Slump | BS EN 12350 | SS EN 206 | Every truck | 1 per truck | Every casting |  |
| Compressive strength | BS EN12350 | SS EN 206 | 1 test per 50m3 | One sample: 6 cubes per test (3 at 7 days and 3 at 28 days) |
| Permeability | Darcy’s Theory | <10-12 m/s (TR31) | 1 test per 50m3 | One sample: 3 cubes per test (at 28 days) | Every casting | Marine structure or structure in contact with chloride |
| Rapid Chloride Ion Penetration | ASTM C1202 | ASTM C1202 |
| Water penetration | BS EN 12390:Pt8 | SS EN 206 |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 7 | **Steel Reinforcement** | Tensile | BS EN ISO 15630-1 | SS 560 | 1 test unit at beginning of project and at every 40t | 3 pieces per size |  | Mil certificate and FPC certificates for each batch to be kept at site for each batch delivered |
| Bend & rebend | BS EN ISO 15630-1 | 1 piece per size |
| Chemical | BS EN ISO 15630-1 | 1 piece per size |
| 8 | **Couplers for Mechanical Splieces of Steel Reinforcement** | Tensile test, slip test, high-cycle fatigue test and low-cycle loading test | ISO 15835 | BS EN ISO 15835-1, BS EN ISO 15835-3 | 1 test unit at beginning of project and for each type/brand of coupler | 2 pieces per test |  | Coupler specification for each type/brand to be kept at site and endorsed by QP |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 9 | **Welded Steel Fabric Reinforcement** | Tensile test | BS EN ISO 15630-2 | SS 561 | 1 test unit at beginning of project and at every 25t | 15 pieces per fabric size (1 sheet 1mx1m per fabric size) |  | Mil certificate and FPC certificates for each batch to be kept at site for each batch delivered |
| Bend test | BS EN ISO 15630-2 |
| Strength of welded joints | BS EN ISO 15630-2 |

**Structural Works – Concrete**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 10 | **Wire Loop/****Slim box****(used in PPVC)** | Chemical Composition | SS475:Pt1BS5896BS4486(EN15630-3) | SS475:Pt2 (cold drawn)SS475:Pt3 (quenched & tempered)SS475:Pt4(strand)EN10138(ISO15630-3) | 1 test unit at beginning of project and at every 40T | 3 samples per test |  | Copies of manufacturer’s test certificate covering each coil shall be kept at site |
| Surface Condition |
| Maximum Force |
| Proof Force |
| % Elongation |
| Relaxation |
| Fatigue |

**Structural Works – Concrete (Post-Tensioning)**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 11 | **Steel for Prestressing Concrete** | Chemical Composition | SS475:Pt1BS5896BS4486(EN15630-3) | SS475:Pt2 (cold drawn)SS475:Pt3 (quenched & tempered)SS475:Pt4(strand)EN10138(ISO15630-3) | 1 test unit at beginning of project and at every 40T | 3 samples per test |  | Copies of manufacturer’s test certificate covering each coil shall be kept at site |
| Surface Condition |
| Maximum Force |
| Proof Force |
| % Elongation |
| Relaxation |
| Fatigue |

**Structural Works – Concrete (Post-Tensioning)**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 12 | **Grout for Prestressing Concrete** | Flowability * Flow Cone
* Grout Speed
 | BS EN 445BS EN 446BS EN 447BS EN 196 | BS EN 445BS EN 446BS EN 447BS EN 196 | Pre-bagged – 1 initial testOn-site mixing – 1 test for every batch of grout mixing | 3 samples per test |  |  |
| Volume Change * Wick Induced
 |
| Bleed* Wicked Induced
* Inclined Tube (for initial test only)
 |
| Strength at 7-day and 28-day |
| Homogeneity * Sieve Test
 |
| Density |
| DensitySetting time test (EN196-3) |

**Structural Works – Steelworks**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 13 | **Structural steel** | Yield | BS EN ISO 6892-1:2016 | BS EN 10025 or BS EN 10210 or BS EN 10219 | 1 test per source | 1 test per source |  |  |
| Tensile | BS EN ISO 6892-1:2016 |
| Notch Toughness | BS EN ISO 148-1: 2016 |
| Ductility | BS EN ISO 6892-1:2016 |
| Weldability | BS EN ISO 14284 |

**Structural Works – Steelworks**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 14 | **Structural steel welding (NDT)** | Visual Inspection (VI) | BS EN970BS EN17637 | FPBW – 100% RT or UT and 100% MP or PTFW – 50% MP or PTVI for all weldsShop welded connection – 1st 5 connections, thereafter 20%Other minor connections (purlin & side rail) – 10% |  |  |
| Magnetic Particle Testing (MP) | BS EN1290BS EN17638 |
| Penetrant Testing (PT) | BS EN571-1BS EN3452-1 |
| Ultrasonic Testing (UT) | BS EN1714BS EN17640 |
| Radiographic Testing (RT) | BS EN1435BS EN17636-1 |
| 15 | **Shear Studs (Weld)** | Hammer Blow To 15 Degree | No Fracture of Weld | Random per batch10% of Studs |  |  |

**Structural Works – Steelworks**

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| **S/N** | **Material Type** | **Type of Test** | **Test Method** | **Acceptance Criteria** | **Frequency of Test** | **No. of samples per Test** | **Actual Test Date** | **Remark** |
| 16 | **Bolts , Screws, studs (Carbon Steel & Alloy Steel)** | Tensile strength | BS EN ISO 898 | BS EN ISO 898 | Random per batch | 3 per size per batch |  | Recommended for critical structural elements. |
| 17 | **Bolts , Screws, studs (Stainless Steel)** | Tensile strength | BS EN ISO 898 | BS EN ISO 3506 | Random per batch | 3 per size per batch |  | Recommended for critical structural elements. |
| 18 | **High Friction Grip Bolts** | Tensile strength | BS 4395 | BS 4395 | Random per batch | 3 per size per batch |  | Recommended for critical structural elements. |

Annex G

Structural Non-Conformances (NCRs)

**List of Structural Non-Conformances** Annex 6: List of NCR

Note: All instruction from QP to be filed in this section.

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |
|  |  |
|  |  |

Qualified Person (Supervision):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Description of Structural Non-Conformance | Date | Notify QP? Yes/No(Date) | QP’s Instruction | Follow-up action / rectification | Date of Closure (Inspection and clearance by Supervisor) | Name & Signature of Supervisor |
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Annex H

Deviation from Approved Plans

**List of Deviation from Approved Plan** Annex 7: List of Deviation

Note: All instruction from QP to be filed in this section.

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |
|  |  |
|  |  |

Qualified Person (Supervision):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Description of Deviation from Approved Plan | Date | Notify QP? Yes/No(Date) | QP’s Instruction | Follow-up action / rectification | Date of Closure (Inspection and clearance by Supervisor) | Name & Signature of Supervisor |
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Annex I

Non-Conformances for Material Tests

**Summary of Non-Compliances for Material Tests** Annex 8: List of NC for Material Tests

Note: All instruction from QP to be filed in this section.

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |

Qualified Person (Supervision):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Material | Material Test | Acceptance level or requirement | Test Results (failed) | Date | QP’s follow up action | Name & Signature of Supervisor  |
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Annex J

Precast Construction at Fabrication Yard

**Precast Construction at Fabrication Yard**  Annex 9: Form BE-SPCFY

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |

Particulars of Precaster

|  |  |
| --- | --- |
| Name of Precaster: | Specialist Builder for Precast Concrete Works\* (Yes/No):\*For overseas precast plants, please indicate ‘Yes’ if the precaster is a licensed Specialist Builder for Precast Concrete Work (SBPC) in Singapore |
| Address of Precast Yard:  | Number of Full-Time Site Supervisors appointed by QP (station at precast yard):Names (RE/RTO): 1. 2. |
| Ready-mixed concrete producer (certified by SAC-accredited Certification Body):Addresses of RMC Plants: | List of Accredited Laboratories for Material TestsReinforcement:Concrete:Cement/Sand/Coarse Aggregates: |
| QP’s visit to precast yard (dates of visit): |

1. I shall ensure the adequate number of full-time supervisors being appointed at precast fabrication yard and I have briefed the supervisors at precast fabrication yard on the requirements of site supervision plan. A copy of site supervision plan had been issued and kept at the precast fabrication yard for reference.

|  |  |
| --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Name & Signature of Qualified Person  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date |

Annex K

Structural Steelworks at Fabrication Yard

**Structural Steelworks at Fabrication Yard**  Annex 10: Form BE-SSSFY

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |

Particulars of Steel Fabricator:

|  |  |
| --- | --- |
| Name of Accredited Steel Fabricator:\*accredited by the Singapore Structural Steel Society under the Structural Steel Fabricators’ Accreditation Scheme | Number of Full-Time Qualified Site Supervisors (QSS) appointed by QP (station at steel fabrication yard):Names (RE/RTO): 1. 2. |
| Address of Fabrication Yard:  | List of Accredited Laboratories for Material Tests: |
| Full-time SAC Accredited Independent Testing Agency (ITA): | QP’s visit to Steel Fabrication Yard (dates of visit): |

1. I shall ensure the adequate number of full-time accredited supervisors being appointed at structural steelwork fabrication yard and I have briefed the supervisors at structural steel yard on the requirements of site supervision plan. A copy of site supervision plan had been issued and kept at the structural steelwork fabrication yard for supervisors’ reference.

|  |  |
| --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Name & Signature of Qualified Person  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date |

Annex L

Onsite Sampling Test for Precast Structural Components Fabricated Overseas

Annex 11: Onsite Sampling Test for Precast Structural Components Fabricated Overseas

Note: All instruction from QP to be filed in this section.

|  |  |
| --- | --- |
| Project Reference No : |  |
| Project Title :  |  |

Qualified Person (Supervision) to input following:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S/N | Type of Precast Structural Components | Test Method | Acceptance Criteria | Frequency of Test | No. of inspection points per PPVC module/precast structural component | Remarks |
|  | PPVC modules Or Precast Structural Components(QP to input) | Non-destruction test (QP to input, indicate method of test) | Total number or spacing of main reinforcement bars in the PPVC modules or precast structural components complies with approved plans (QP to input more details e.g inspection location for the PPVC modules/precast components) | Min. no of PPVC modules or precast structural components to be tested Or % of total PPVC modules/precast structural elements (QP to input) | (QP to input) |  |

Annex M

Checklist for BCA Site Audit

Annex 12: Checklist for BCA Site Audit

|  |
| --- |
| **Building Engineering Group** **SITE INSPECTION REPORT** |

**A. Project Particulars**

|  |  |
| --- | --- |
| Project Reference Number |  |
| Project Title |  |
| Name of QP(S) – Main works |  | PE No. |  |
| Name of QP(S) – ERSS |  | PE No. |  |
| Name of QP(S) – Geotechnical |  | PE No. |  |
| Name of RE/RTO |  | HP No. |  |
|  |  |
|  |  |
|  |  |
| Builder Firm |  |

**B. Type of On-Going Works (Please select works that are applicable)**

|  |
| --- |
| ☐ Barrier☐ Basement☐ Cladding/Curtain Wall☐ Demolition☐ Earth retaining structure/Excavation for cofferdam, trench etc☐ Ground Support & Stabilization Works |
| ☐ Pile Cap |
| ☐ Piling Works☐ Post-tensioning/Pre-stressing Works☐ Precast Concrete Works☐ Structural Steelworks☐ Super-structure |

**C. Inspection Report (Please cross out whichever that is not applicable)**

Hoarding

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 01 | Are there any protective hoarding erected at the site? | Yes / No / NA |  |
| 02 | Are the protective hoarding erected at the site adequate and in good and proper condition? | Yes / No / NA |  |

Signboard

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 03 | Is there a project signboard erected at the site and have all the particulars required as in the conditions of the permit issued? | Yes / No / NA |  |

Start works/Major deviations without plan approval/permit

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 04 | Are there plan approval and permit for the works that have commenced? | Yes / No / NA |  |
| 05 | Is there amendment plan approval for any major deviations detected on site? | Yes / No / NA |  |
| 06 | Are the approved drawings with watermark available on site? | Yes / No / NA |  |

Site records

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 07 | Are the attendance records of the Qualified Person and RE/RTO kept on site? | Yes / No / NA |  |
| 08 | Are the relevant test reports kept on site, i.e. Soil Investigation and testing report; Cube test reports; Load test reports; Steel test reports etc? | Yes / No / NA |  |
| 09 | Are there records of PE's inspection at each strut level and critical stage of the temporary works (Annex C-1)? | Yes / No / NA |  |
| 10 | Are there records of instrumentation and monitoring reports? | Yes / No / NA |  |

Failure of test

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 11 | Did the QP(S) notify BCA that the construction test has failed to meet the minimum requirements stipulated in the Regulations or any approved code of practice?*Note: RE/RTO to record the tests that have failed in “Remarks”.* | Yes / No / NA |  |
| 12 | Did the QP(S) or QP(D) recommend appropriate steps, measures or remedial works to be carried out for the construction test that has failed to meet the minimum requirements? | Yes / No / NA |  |

Instrument monitoring

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 13 | Have corrective actions been taken for the vibrations readings that has exceeded the limits proposed by the qualified person?*Note: RE/RTO to record the instruments that the readings are exceeded in “Remarks”.* | Yes / No / NA |  |
| 14 | Did the QP(S) notify BCA on the ground movements (lateral deflection/ground settlement) that has exceeded the allowable limits?*Note: RE/RTO to record the instruments that the readings are exceeded in “Remarks”.* | Yes / No / NA |  |
| 15 | Did the QP(S) notify BCA on the building settlement (for projects more than 10-sty) that has exceeded the limit proposed by the qualified person?*Note: RE/RTO to record the instruments that the readings are exceeded in “Remarks”.* | Yes / No / NA |  |

Temporary building

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 16 | Are the required plans, calculations, and certificate by PE for the temporary building/standalone worker’s quarters comprising 2 or more storeys kept on site? | Yes / No / NA |  |
| 17 | Is the certificate by PE to certify the floors above and on which the worker’s quarter is located in the building under construction have been constructed in accordance with approved plans, kept on site? | Yes / No / NA |  |
| 18 | Do the Standalone Workers' Quarters or Workers' Quarters in the building under construction comply with room requirements? | Yes / No / NA |  |

Demolition / Demolition for A&A

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 19 | No over-accumulation of demolition debris was observed on the floor slab? | Yes / No / NA |  |
| 20 | Is the building to be demolished properly isolated from the party wall? | Yes / No / NA |  |

ERSS

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 21 | Are there proper temporary shoring works for the excavations at the site? | Yes / No / NA |  |

Piling works

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 22 | Do the actual penetration depths comply with pile termination criteria in approved plans and are not considerably shorter?*Note: Check if RE/RTO use their own measuring tapes to measure the penetration depths of bored piles. If not, did RE/RTO check the measuring tapes used and how frequent is the check carried out? Please indicate the findings in “Remarks”.* | Yes / No / NA |  |
| 23 | Do the actual rock socketing depths tally with the design rock socketing depth and are not shorter? | Yes / No / NA |  |

Builder’s License

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 24 | Is the appointment of licensed specialist builder submitted to BCA?(Specialist Building Works: Piling works (PW) / Structural steelworks (SS) / Precast concrete works (PC) / In-situ post tensioning works (PT) / Ground support & stabilization works (GS) / Site investigation works (SI))*Note: RE/RTO to record the licensed specialist builder in the “Remarks”.* | Yes / No / NA |  |

Others

|  |  |  |  |
| --- | --- | --- | --- |
|  | ITEM INSPECTED  | FILL IN THIS COLUMN | REMARKS |
| 25 | Is any pre-construction survey of surrounding properties done and kept on site? | Yes / No / NA |  |
| 26 | Are the waterproofing or protection measures to prevent seepage into the exposed party wall provided? | Yes / No / NA |  |
| 27 | No visible damage in the surrounding area/structures due to the construction activities? | Yes / No / NA |  |

Other Observation

|  |
| --- |
| 28 Please note down any other observations not covered under items 1-27. |
|  |

Progress

|  |
| --- |
| 29 Progress of Works (Percentage of Works Completed)  |
| NATURE OF WORKS | Progress (%) |
| Demolition Works |  |
| Piling Works |  |
| Basement Works |  |
| Superstructure Works |  |

**D. Overview Photos (Please attach overview photos of on-going structural works)**

|  |
| --- |
|  |
|  |
|  |
|  |

**E. Non-Compliance Observed on Site (Please attach photos of the structural non-compliances)**

|  |  |  |
| --- | --- | --- |
| S/No. | Description & Details of Non-Compliance Observed On Site | Photographs |
|  |  |  |
|  |  |  |
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**D. Particulars of Inspection**

|  |  |
| --- | --- |
|  Date of this inspection |  |

|  |  |
| --- | --- |
| Name of Inspecting RE/RTO | Signature |
|  |  |
| Name of QP(S) | Signature |
|  |  |
| Name of QP(Geo) | Signature |
|  |  |