



Guidebook for Remote Site Supervision (RSS)

Jointly Published by **BCA, IES, ACES and SCAL**

Version 2.0
June 2026

History of Amendments

S/N	Brief Description of Changes	Revision Date
1	Version 1.0 – First Issue	Oct 2021
2	Version 2.0 – Revision including: - Expanded supervision matrix with technology replacement and evidence-based supervision categories - Enhanced phased implementation framework (30%-75%-100%) - Added innovation framework for new technologies - Comprehensive RSS plan template with detailed checklists (Annex A) - ISO 17020 compliance requirements - Expanded structural works coverage including PPVC, ERSS, and post-installed anchors - Enhanced quality assurance and documentation standards	Jun 2026

No part of this document may be reproduced or copied in any form or by any means without BCA's prior permission.

Disclaimer

This Guide is a summary of practices that may be adopted for the performance of remote supervision of structural works and does not purport to be exhaustive or applicable to all situations. This Guide does not constitute professional advice.

The Building and Construction Authority disclaims any liability (including any liability arising from negligence) arising in respect of any matter and the consequences of any act done or not done by any person in reliance on anything in or omitted from this Guide.

This Guide may be amended from time to time. Please refer to the website of the Building and Construction Authority: www.bca.gov.sg for the latest version of this Guide.

© Building and Construction Authority

Acknowledgements

The Building and Construction Authority (BCA), Institution of Engineers Singapore (IES), Association of Consulting Engineers Singapore (ACES), and Singapore Contractors Association Limited (SCAL) gratefully acknowledge the valuable contributions of the following parties in the development of this Remote Site Supervision Guidebook.

The HDB-BCA-Industry Workgroup, chaired by Er. Tan Chun Yong (BCA), Er. Teh Poh Suan (HDB) and Er. Edwin Ong Beng Koon (Surbana Jurong), which provided critical insights and practical expertise through the following pilot project implementations by its members:

- Er. Aaron Foong (KTP) and Ulu Pandan C1 Project Team
- Er. Edwin Ong (Surbana Jurong) and the Woodlands N1 C23/24 Project Team
- Er. Kam Mun Wai (Meinhardt) and the Bedok Kembangan C3 Project Team
- Er. Kenneth Wong (P&T) and the Woodlands N4C7 Project Team
- Er. Lauw Su Wee (LSW) and the Ang Mo Kio N7C30 Project Team
- Er. Ting Chiew Peng (BECA) and the Tanglin Halt C1 Project Team
- Er. Titus Tay (ECAS) and the Tengah C3 & C7 Project Team
- Er. Vincent Zhang (AECOM) and the Ang Mo Kio N8C38A Project Team

The Land Transport Authority, Mr. Chang Kin Boon and Ms. Ng Sock King, for supporting remote supervision implementation in infrastructure projects. In particular, Er. Romanch Mittal (CKMbT) and project teams who pioneered RSS methodologies in underground infrastructure at P105 and the Kim Chuan Depot Extension.

Additional Qualified Persons who contributed valuable expertise:

- Er. Lai Chi Kin (Surbana Jurong) and the J'den Project Team for their innovative approaches to high-rise residential RSS implementation
- Er. Ng Chun Keong (KTP) and the Luxus Hill Project Team for demonstrating multi-site RSS supervision capabilities across large-scale landed housing developments
- Er. Aaron Foong (KTP) and the Alibaba Tower Project Team for their contributions to commercial development RSS practices

The practical experience, technical feedback, and innovative solutions provided by these industry professionals have been instrumental in shaping the guidance and best practices contained within this publication.

Table of Contents

Acknowledgements.....	3
Quick Start Guide to Implementing Remote Site Supervision	8
1. Who this guide is for	8
2. What RSS is.....	8
3. What RSS is not	8
6 Practical Steps to Implement RSS	9
1. Transforming Site Supervision for Singapore’s Built Environment	12
2. Scope.....	14
3. Abbreviations.....	16
4. Guiding Principles of using the Remote Site Supervision Guidebook	17
4.1. Outcome-Based Supervision Principles	17
4.2. Guiding Principles for Remote Site Supervision.....	18
5. Assessment of the suitability of Remote Site Supervision of the site	19
5.1. BCA’s Industry trials and Supervision Framework	19
5.2. Framework for Assessing Supervision Approaches	19
5.2.1. Identify structural works that are suitable for Remote Site Supervision at each construction stage.....	19
5.2.2. Systematic assessment of structural works	19
5.2.3. The Supervision Matrix	20
6. Preparing for Remote Site Supervision (RSS).....	24
6.1. RSS Plan.....	24
6.2. Phased Implementation Strategy.....	25
6.3. Timeline of Remote Site Supervision	26
6.4. Building Confidence Through Gradual Implementation	27
6.4.1. Progressive Phased Implementation	27
6.4.2. Parallel Supervision During Learning Phase.....	27
6.4.3. Continuous Improvement Process.....	27
6.4.4. Performance Monitoring and Adjustment.....	27
6.5. Manpower Organisation, Training and Competency Development	28
6.5.1. Manpower Organisation Chart	28

6.5.2.	Site Supervision Team Training	28
6.5.3.	Competency Verification for Remote Supervision Works.....	28
6.6.	Technology and Infrastructure Requirements	29
6.6.1.	Live Streaming Infrastructure	29
6.6.2.	Evidence-Based Supervision Tools	29
6.6.3.	Infrastructure Specifications	29
6.7.	Quality Assurance and Risk Management	29
6.7.1.	Contingency Planning.....	29
6.7.2.	Verification and Audit Requirements.....	30
6.7.3.	ISO 17020 Compliance Framework.....	30
6.7.4.	Documentation Standards and Record Keeping	30
6.7.5.	Documentation Control, Record Management and Quality Assurance	31
7.	Conducting RSS	33
7.1.	Reference Supervision Framework	33
7.2.	Application of Live Streaming and Evidence-Based Supervision	33
7.3.	Customisation and Enhancement of Supervision Requirements	34
7.4.	Quality and Compliance Requirements	34
7.5.	Implementation Considerations	35
8.	Framework for Innovation and New Technologies	36
8.1.	Innovation Framework for QP(S) Teams	36
8.2.	Evaluation Criteria for New Technologies	36
8.2.1.	Technical Suitability.....	36
8.2.2.	Economic Viability:.....	37
8.2.3.	Operational Effectiveness:	37
9.	Limitations of Remote Site Supervision	38
Annex A – Remote Site Supervision Plan Template		1
Annex B – Remote Site Supervision Examples from Industry Trials		1
B1. High-Rise Residential Development with Cast-in-Place System - J'den		2
B1.1.	Concrete Slump Testing and Cube Sampling (Evidence-Based Supervision)	2
B1.2.	Concrete Casting Supervision (Live Remote Supervision)	3

B1.3.	Reinforcement Inspection (Live Remote Supervision).....	4
B2.	Underground Infrastructure Development - Punggol MRT Station Project (P105).....	5
B2.1.	Diaphragm Wall and Piling Works (Live Remote Supervision).....	5
B2.2.	Bentonite Properties Testing (Evidence-Based Supervision)	6
B2.3.	Structural Steel Works Inspection (Live Remote Supervision).....	7
B3.	Large-Scale Landed Housing Development - Luxus Hill Project.....	8
B3.1.	Three-Stage Phased Implementation Process	8
B3.2.	Jack-in Piling Works Supervision (Continuous Remote Supervision).....	9
B3.3.	Concrete Works Supervision (Continuous Remote Supervision).....	10
B3.4.	Multi-Site Supervision Innovation.....	11
B4.	Findings from BCA-HDB-Industry Workgroup.....	12
B4.1.	Pilot Project Implementation Matrix	12
B4.2.	Supervision Activity Classification Framework	12
B4.3.	Key Benefits Identified Across All Pilots.....	13
B4.4.	Common Challenges and Industry Solutions	13
B4.5.	Implementation Best Practices Framework.....	14
Annex C –	Organisation Chart Samples.....	1
Annex D –	Reference Activities List for RSS.....	1
D1.	Scope of Supervision: Concreting Works.....	1
D2.	Scope of Supervision: Post-Tensioning Works.....	7
D3.	Scope of Supervision: Safety Barriers	9
D4.	Scope of Supervision: Foundation Works (Bored Pile).....	11
D5.	Scope of Supervision: Foundation Works (Displacement Pile)	14
D6.	Scope of Supervision: Foundation Works (Shallow Foundation)	18
D7.	Scope of Supervision: Structural Steelworks.....	20
D8.	Scope of Supervision: Demolition	25
D9.	Scope of Supervision: Precast Concrete Components	28
D10.	Scope of Supervision: Curtainwall & Cladding	33
D11.	Scope of Supervision: ERSS Works	35



Quick Start Guide to Implementing Remote Site Supervision

1. Who this guide is for

The quick start guide is intended for Supervision Qualified Persons (“QP(S)s”), Site Supervision Firms (“SSFs”), and project teams who are planning to adopt Remote Site Supervision (“RSS”) as part of their site supervision approach, using technology to maintain visibility and control over site works.

The guide provides a practical overview of **how to begin this process, what decisions to make and what arrangements will be required**. Detailed guidance, requirements, and templates are provided in the later sections of this Guidebook.

2. What RSS is

RSS is an outcome-based supervision approach that allows parts of supervision to be carried out using:

- live video,
- photos and recordings, and
- documentation with digital records.

This enables the supervision team to optimise in-person attendance for low-risk, repeatable works, access expertise remotely while still being able to provide the oversight to intervene quickly when issues arise.

RSS complements on-site supervision.

3. What RSS is not

RSS is not

- a blanket replacement for on-site presence, or
- a lowering of supervision standards, or
- suitable for all projects and activities.

RSS does not remove professional judgement or responsibility. Supervision arrangements should be adjusted accordingly when risks or site conditions change. RSS is intended to apply to building works where full-time site supervision is required under the prevailing statutory site supervision framework. It is not intended to replace immediate supervision arrangements.

6 Practical Steps to Implement RSS

Step 1: Identify the structural activity

Start small.

List specific structural activities, e.g.:

- Post-concreting inspections
- Precast installation checks
- Routine material verification
- Monitoring-based ERSS activities



Step 2: Use the supervision matrix

Ask 2 questions:

1. Is this inspection simple or complex?
2. Does quality need continuous checking or staged verification?

This helps decide whether the activity is suitable for (1) technology replacement, (2) evidence-based supervision, (3) live remote supervision, or (4) still needs in-person supervision.

		→ Increasing Complexity of supervision →	
		Simple Inspection	Complex Inspection
→ Increasing Time taken →	Periodic Inspection	Technology Replacement (easiest to implement)	Evidence-based Supervision
	Continuous Inspection	Live Remote Supervision (verification process, easy to implement with high returns)	In-person Attendance suggested



Step 3: Choose the supervision approach for each activity

Based on the matrix assessment of the activities in your project, select one of the four supervision approaches for each activity (You may use different approaches on the same project):

- Technology Replacement – automated or digital systems replace physical presence
- Evidence-Based Supervision – compliance shown through records, photos, videos, test results
- Live Remote Supervision – real-time video, communication, and immediate intervention
- In-Person Attendance – physical presence required throughout



Step 4: Prepare a simple RSS plan (Refer to **Section 6.1) with supervision checklists (Refer to **Annex D**)**

The RSS plan should answer:

- which activities will implement RSS
- the supervision approach for each activity
- the extent and phasing of RSS implementation
- roles and reporting lines within the supervision team
- escalation triggers and stop-work procedures
- technology and equipment to be used
- documentation and record-keeping arrangements
- contingency actions if RSS cannot be carried out as planned

A structured Remote Site Supervision Plan template is provided in Annex A – Remote Site Supervision Plan Template.



Step 5: Confirm readiness of people and technology

Before starting, check **People**:

- Supervision team trained in RSS procedures and tools
- Understanding of communication and escalation protocols

Guidance on manpower organisation and competency is provided in Section 6.5: Manpower Organisation, Training and Competency Development.

Check **Technology**:

- Suitable cameras and image-capturing devices
- Reliable 2-way communication
- Adequate internet connectivity with backup options
- Recording and secure storage of evidence

Technology and infrastructure requirements are detailed in section 6.6: Technology and Infrastructure Requirements



Step 6: Implement gradually and improve

Phased Implementation	Typical Extent of RSS
Initial phase	Small percentage of suitable works; parallel in-person + remote supervision
Intermediate phase	Expanded use after review
Mature phase	Broader use for simple, standardised works

Key Reminders

- RSS is a tool to improve supervision, not a shortcut.
- Different activities require different supervision approaches.
- Start small, learn, and scale responsibly.
- When in doubt, go to site.

- End of Quick Start Guide -

1. Transforming Site Supervision for Singapore's Built Environment

As building works become increasingly complex, individual professionals alone cannot reasonably possess the full suite of specialised competencies required to supervise compliance for complex building works. Construction projects in Singapore now involve specialist works such as complex facades, deep excavations, long-span composite structures, and sophisticated construction methods like Design for Manufacturing and Assembly ("DfMA") and Advanced Precast Concrete System ("APCS").

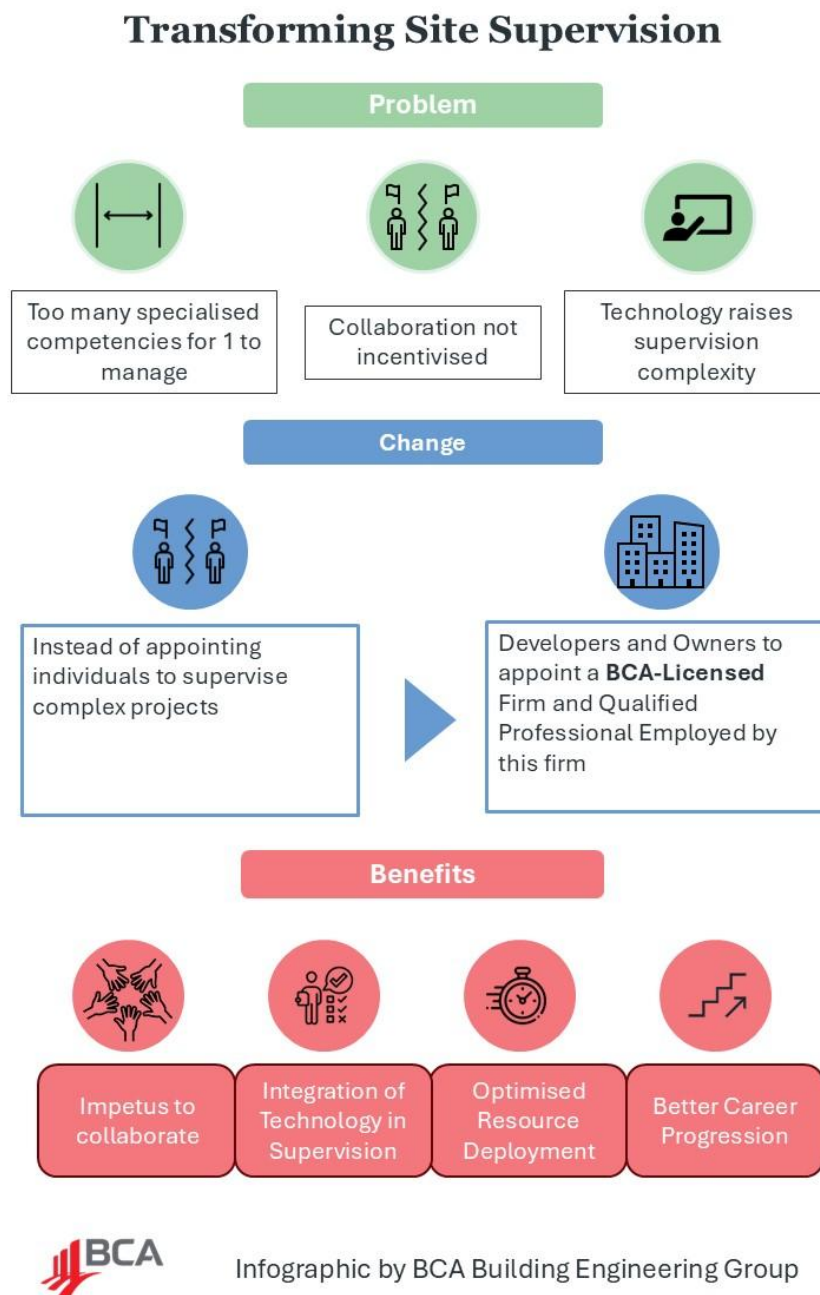


Figure 1: Transforming Site Supervision with the Firm-Based Supervision Regime

To address these challenges, the Building and Construction Authority (“BCA”) is implementing a firm-based site supervision regime requiring the appointment of BCA-licensed Site Supervision Firms (“SSFs”) for projects exceeding \$75 million. This shift aligns with international practices and recognises that professional firms, with their collective expertise and institutional resources, are better positioned to uphold the safety standards in our Built Environment.

The firm-based regime delivers significant advantages over the current regime where only individuals are accountable for supervision. Firms allow access to broad specialised knowledge and experience, supported by proper governance structures that enable effective collaboration across disciplines. Firms can also invest in sophisticated monitoring systems, digital platforms, and automated quality control processes that individual practitioners cannot reasonably afford or maintain. Through structured training programmes and knowledge retention systems, firms ensure continuity of engineering expertise whilst developing the next generation of construction professionals. Most importantly, comprehensive quality assurance processes drive improvements in productivity, safety, and service consistency across all project phases.

Central to this transformation is the paradigm shift from manpower-based to outcome-based supervision. Rather than simply deploying personnel to sites, the new regime prioritises effective results achieved through optimal integration of traditional supervision methods with cutting-edge technology solutions. Remote Site Supervision (“RSS”) emerges as a critical enabler of this transformation, and SSFs will need to demonstrate robust capabilities in personnel, equipment, and processes to be registered. This technological evolution empowers firms to harness centralised expertise, implement systematic oversight processes, and deploy advanced monitoring technologies whilst maintaining rigorous governance frameworks and standardised operating procedures. The result is consistent, efficient supervision that can be scaled across multiple projects and locations without compromising quality or safety standards.

The RSS Guide serves as the essential catalyst for this transition, providing firms with the framework, methodologies, and best practices necessary to embrace the new site supervision regime and deliver superior outcomes for Singapore's construction industry.

2. Scope

- 2.1. This Guidebook provides guidance for Qualified Persons for Supervision (“QP(S)”) and SSFs in developing RSS approaches as part of comprehensive, **outcome-based** site supervision strategies that leverage technology and centralised resources to address evolving industry needs.
- 2.2. RSS is a complementary method that enhances traditional site supervision practices as established in the **Guidebook for Site Supervision Plan (Version 1.0, September 2019)**. This guide works alongside the existing Site Supervision Plan Guidebook, Building Control Act 1989 (“BC Act”), Building Control Regulations 2003 (“BC Regulations”), and Code of Practice for Supervision of Structural Works (SS 515:2021) to provide SSFs with innovative tools and methodologies for achieving the intended supervision outcomes. When RSS approaches propose improvements that differ from current BC Act or Regulations requirements, such as optimising the number of site supervisors through technology or introducing new supervision methods, early discussion with BCA can help clarify expectations and acceptance pathways, including possible waiver applications of the proposal to the Commissioner of Building Control (“CBC”). This collaborative pathway enables the adoption of enhanced processes that demonstrate superior outcomes, supporting the transition towards outcome-based supervision while maintaining rigorous safety standards.
- 2.3. The guide sets out the principles, requirements and operations of a Remote Site Supervision Plan, covering the following: -
- a. The principles for preparation of RSS Plans.
 - b. The form and content of an RSS Plan
 - c. The supervision approach of various structural activities; and
 - d. The requirements for material and construction tests.
 - e. Documentation requirements of RSS.
- 2.4. **For structural works where RSS is not applicable or suitable, QP(S) is expected to follow the supervision requirements and checklists as specified in the Guidebook for Site Supervision Plan.** The RSS approach supplements, but does not replace, the provisions of the BC Act and building regulations, enabling QP(S) and SS to supervise structural works and geotechnical works with technology assistance while maintaining compliance with statutory duties.
- 2.5. RSS is intended to apply to building works where full-time site supervision is required under the prevailing statutory site supervision framework. It is not intended to replace immediate supervision arrangements.



- 2.6. The provisions of the BC Act and building regulations will take precedence over the Remote Site Supervision Plan prepared by QP(S) where any difference exists.
- 2.7. For other requirements and guidance on Site Supervision, refer to the Code of Practice, the Execution Standards, the Guidebook for Site Supervision Plan, and other relevant circulars issued by BCA.

3. Abbreviations

The following abbreviations are used throughout this guidebook:

BC Act	Building Control Act 1989
BC Regulations	Building Control Regulations 2003
BCA	Building and Construction Authority
CBC	Commissioner of Building Control
PE	Professional Engineer, under the Professional Engineers Act 1991 and has in force a practising certificate issued under the Act
QP	Qualified Person, under the Building Control Act 1989
QP(S)	Qualified Person appointed by the Developer/Builder to supervise the building works.
RE	Resident Engineer, certified under the Joint Accreditation Council
RSS	Remote Site Supervision
RTO	Resident Technical Officer, certified under the Joint Accreditation Council
SOP	Standard Operating Procedures
SS	Site Supervisors as defined the Building Control Act. They include both RE and RTOs.
SSF	Site Supervision Firms

4. Guiding Principles of using the Remote Site Supervision Guidebook

RSS is an outcome-based supervision approach that uses technology, documentation, and structured processes to support effective supervision of structural works. It complements in-person site supervision and allows supervision intensity and methods to be matched to the complexity, risk, and timing of the works being carried out.

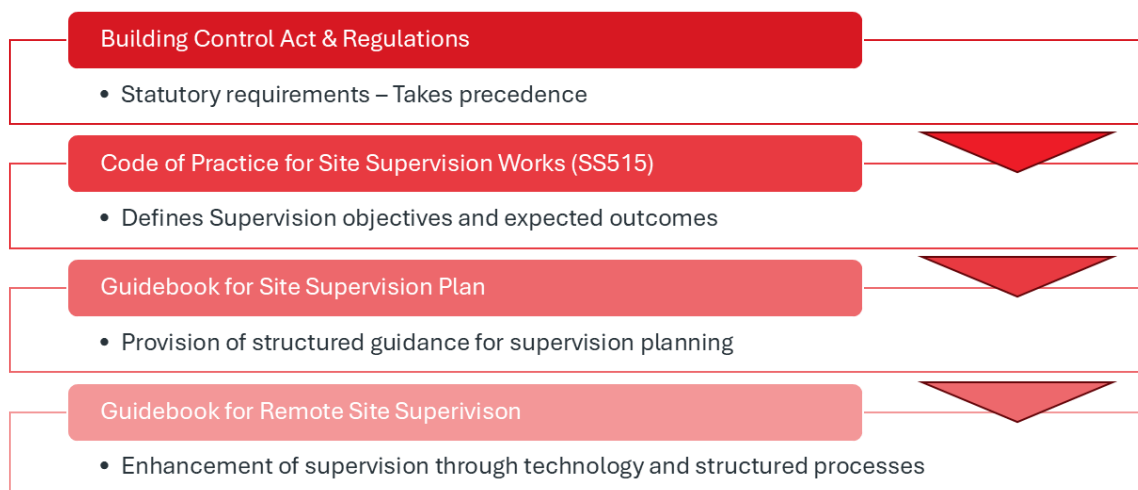


Figure 2: How RSS Fits Within Existing Supervision Requirements

4.1. Outcome-Based Supervision Principles

- 4.1.1.** RSS adopts an outcome-based approach that prioritises achieving effective supervision results through the most appropriate combination of traditional and technology-enhanced methods. This approach recognises that supervision effectiveness is measured by the quality of structural works compliance rather than solely by in-person attendance on site.
- 4.1.2.** The outcome-based framework enables SSF and QP(S) to leverage their centralised expertise, advanced technologies, and systematic processes to deliver consistent supervision quality across multiple projects while optimising resource deployment and enhancing collaboration among multi-disciplinary teams.
- 4.1.3.** Regardless of the QP(S)'s chosen supervision approach, whether traditional, remote, or hybrid, the QP(S) is required to ensure that the supervision objectives established in the Guide Book for Site Supervision Plan can be effectively achieved, maintaining or enhancing safety standards and compliance verification while achieving productivity gains.

What This Means in Practice

A QP may rely on evidence-based checks e.g. video recording for inspection of concreting, with an audit process in place. For example, the QP can specify for site supervisors to spot check the concreting in-person at random intervals, or review sampling of the recordings of the concreting afterwards.

4.2. Guiding Principles for Remote Site Supervision



- 4.2.1. Principle 1 Risk-Proportionate Supervision:** Supervision intensity and methods should align with the complexity and risk profile of structural works, as established in the risk-based inspection framework. Higher-risk activities require more stringent supervision approaches, while routine activities may benefit from technology-enhanced efficiency.
- 4.2.2. Principle 2 Assurance with Technology:** Remote supervision technologies should support the QP(S)'s ability to verify compliance with approved plans and identify deviations, through appropriate combinations of real-time observation, recorded evidence, and review mechanisms, so correction actions can be implemented when necessary.
- 4.2.3. Principle 3 Professional Accountability:** QP(S) retains professional liability, while RSS provides the additional tools, records, and visibility to support effective supervision decisions e.g. clear protocols for decision-making, intervention capabilities, and documentation standards.
- 4.2.4. Principle 4 Improvement through Continuous Feedback:** SSFs/QP(S) should establish feedback mechanisms to continuously refine their remote supervision approaches based on project outcomes, technology performance, and regulatory compliance.
- 4.2.5. Principle 5 Documentation with Purpose:** Documentation for RSS should be purposeful and focused on supporting effective supervision, rather than serving pure

administrative purpose. Records should be sufficient to explain supervisory decisions and outcomes, without imposing unnecessary burden to site teams.

5. Assessment of the suitability of Remote Site Supervision of the site

5.1. BCA's Industry trials and Supervision Framework

Through comprehensive trials, BCA, along with our industry partners, have developed a systematic approach to categorise supervision requirements based on two key factors: complexity and frequency of supervision. This framework helps QP(S) and his teams determine the appropriate supervision approaches for various structural works.

5.2. Framework for Assessing Supervision Approaches

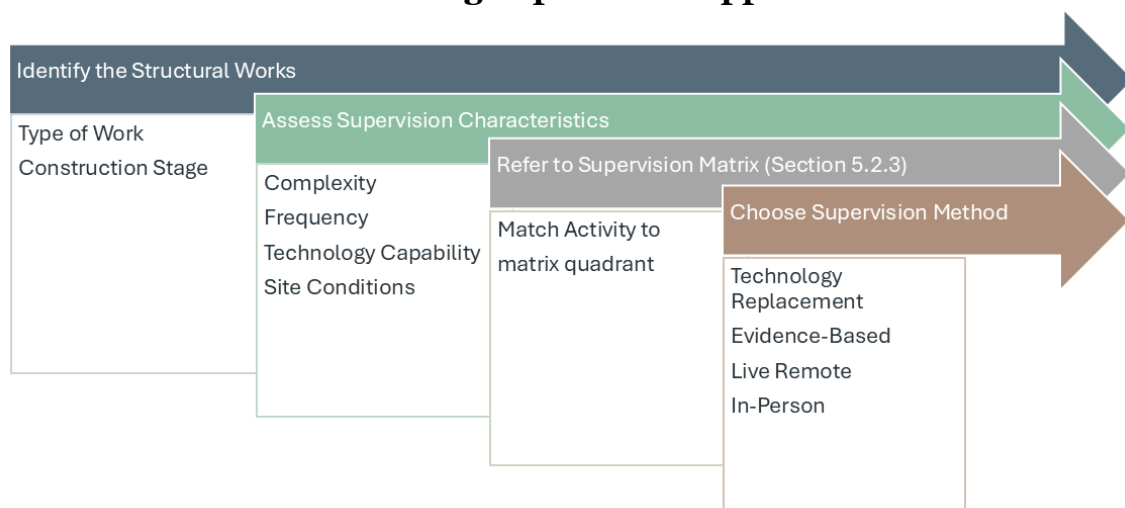


Figure 3: How to assess Supervision Approach

5.2.1. Identify structural works that are suitable for Remote Site Supervision at each construction stage

It is suggested that the QP(S) team works through the structural works in each construction stage with the builder to identify suitable activities where Remote Site Supervision is applicable, given site constraints and project specifics.

5.2.2. Systematic assessment of structural works

QP(S) should systematically assess each structural work activity to determine the most effective supervision approach by evaluating:

- Complexity of supervision requirements** based on technical difficulty, quality parameters, and potential consequences of defects
- Frequency and timing of supervision** considering work duration, critical checkpoints, and intervention requirements
- Technology capability** to provide adequate oversight, documentation, and quality verification
- Site conditions and constraints** that may affect supervision effectiveness

5.2.3. The Supervision Matrix

When assessing supervision works' suitability for RSS, QP(S) may find it useful to refer to the following Supervision Matrix in Table 1 below. The matrix is based on two fundamental assessment criteria:

Complexity of Supervision

- **Simple Inspection:** For activities with standardised procedures, predictable outcomes, and established quality control measures. These typically involve routine construction methods where:
 - Defects are easily detectable through visual inspection
 - Quality parameters can be measured objectively
 - Rectification is straightforward if issues are identified
 - Industry best practices are well-established
- **Complex Inspection:** For activities requiring specialised expertise, involving critical structural elements, or having multiple interdependent components. These often include works where:
 - Multiple quality parameters must be assessed simultaneously
 - Professional judgement is required for acceptance decisions
 - Defects could lead to significant structural implications
 - Rectification is costly or technically challenging once completed

Frequency of Supervision

- **Periodic Inspection:** Suitable for works with longer execution timeframes where:
 - Quality can be verified at discrete checkpoints
 - Interim checks are sufficient to verify compliance
 - Work progress allows for scheduled inspection intervals
 - Quality outcomes are primarily result-based rather than process-dependent
- **Continuous Inspection:** Required for activities where:
 - Real-time verification throughout the work process is essential
 - Time-critical processes cannot be paused for inspection
 - Quality must be maintained throughout the entire execution period
 - Immediate intervention may be necessary to prevent defects

		→ Increasing Complexity of supervision →	
		Simple Inspection	Complex Inspection
→ Increasing Time taken →	Periodic Inspection	May be replaced by technology (Validation process, simplest to implement) • Verification of Earth Retaining and Stabilising Structure (ERSS) • Vibration and ground movement monitoring • Inspection for any grout leakage after completion of concreting • Checking of “honeycomb” for cast structures (Formwork removal) • Verify dimension of completed structures after removal of formwork • Concrete Strength Tests	Evidence-based Supervision • Concrete Slump Test • Concreting works • Precast Façade Installation. • Precast Walls Installation. • Precast Corridor/Service Yard Parapet Installation • Precast Columns & Gable End Walls Installation • Installation of Prefabricated Prefinished Volumetric Construction (PPVC) components and other 3D precast components with splice connections (e.g. HS or PBU)
	Continuous Inspection	Live Remote Supervision (verification process, easy to implement with high returns) • Pile Load Tests • Curing after casting and temperature monitoring for massive casting of concrete (e.g., raft footing foundations) • Welding Checks • Witnessing of Pull-Out Test (Post Installed Mechanical or chemical Anchors). • Witnessing Field Density Tests for Road Works) • Rebar inspection • Material checks for steel structures at Fabrication yard • Fit-up works for structural steel members	In-person Attendance suggested • Bored Pile • Driven Pile • Prestressing/post-tensioning works • Grouting of Vertical Connectors (e.g. Splice Sleeve & Spiral Connector) • Witnessing of post installation of (Mechanical or chemical) Anchors

Table 1. Supervision matrix for assessing suitability of remote supervision for supervision works with examples subjected to QP(S) assessment



Note: The supervision matrix for assessing suitability of remote supervision is not exhaustive and serves as a starting framework. Process redesign and technological innovation are essential for the success of remote supervision. As new technologies emerge and construction processes evolve, activities may shift between categories in the matrix. BCA encourages QP(S) to propose innovative process re-designs and technological solutions that can reduce the complexity and time frames originally requiring in-person attendance. BCA will review these proposals on a case-by-case basis, recognising that technological advancement and process innovation can continuously expand the scope of effective remote supervision.

What This Means in Practice

A simple activity does not automatically mean remote supervision is suitable. If workmanship on site is inconsistent, the supervision approach should be upgraded regardless of matrix classification. Conversely, the QP(S) may propose complex inspection activities for evidence-based supervision with advanced documentation systems or address continuous inspections using live remote supervision with enhanced monitoring capabilities.

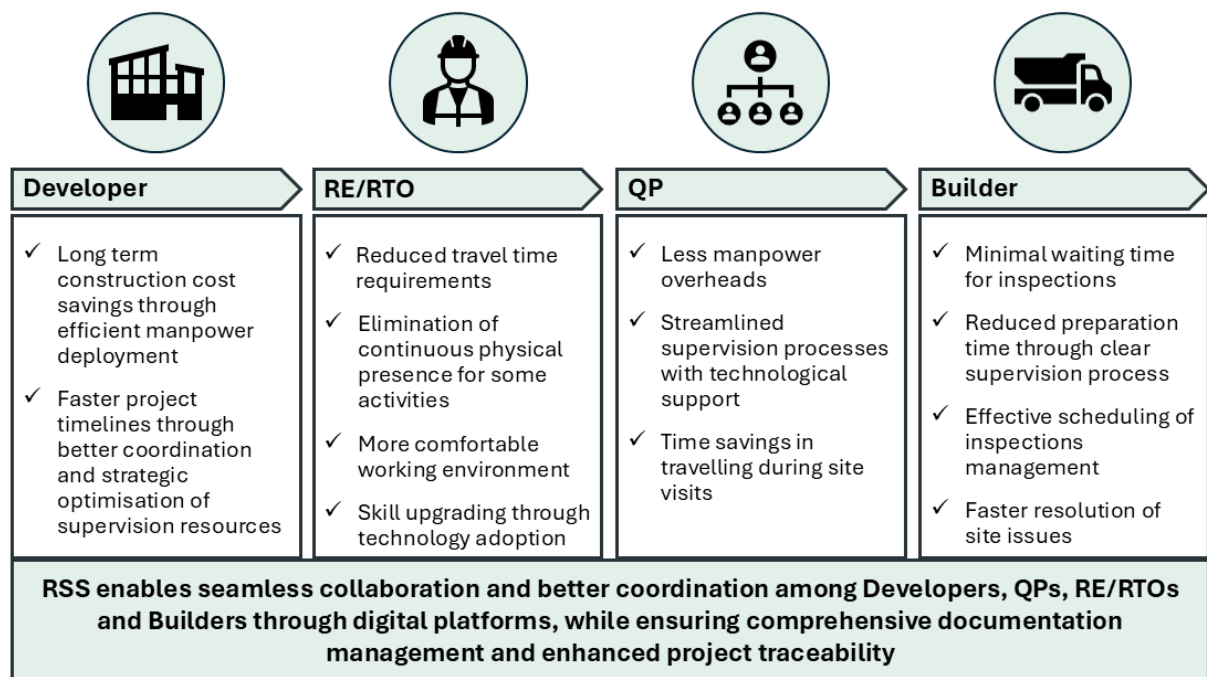
5.2.4. Approach Selection: Based on this assessment, QP(S) can determine the appropriate supervision approach from four primary categories:

- a. **Technology Replacement:** For simple, periodic activities with standardised procedures and predictable outcomes where automated monitoring systems, digital documentation, and sensor-based quality control can effectively replace in-person attendance.
- b. **Evidence-Based Supervision:** For complex but periodic activities where comprehensive documentation, material certificates, test results, photographic evidence, and post-installation verification can demonstrate compliance without continuous oversight.
- c. **Live Remote Supervision:** For simple but continuous activities where real-time communication, high-quality video streaming, and immediate intervention capability can provide effective oversight throughout the work process.
- d. **In-Person Attendance:** For complex, continuous, or irreversible activities where physical presence remains essential for immediate decision-making, professional judgement, and quality assurance.

6. Preparing for Remote Site Supervision (RSS)

A successful implementation of RSS will require cooperation among the Developers, Builders and QP(S) team. It is suggested that the RSS is jointly developed between Builder and QP(S) team, with the support of the Developer.

When implemented within a structured supervision framework, RSS supports coordination, communication and documentation across the project team.



Infographic by BCA Building Engineering Group

Figure 4: How Remote Site Supervision Supports Coordination Across Project Stakeholders

The QP(S) must prepare a comprehensive RSS plan before implementing any remote supervision activities. This plan serves as the foundational document that outlines the technical, procedural, and safety requirements for remote supervision implementation.

6.1. RSS Plan

When submitting RSS plans, applicants must address the following key elements:

- Project Background and Scope Definition:** Clear description of project location, structural and foundation systems, site challenges, and identification of specific structural works suitable for remote supervision with appropriate phasing strategies.
- Manpower Organisation and Competency Framework:** Documentation of supervision team hierarchy including QP(S), site supervisors, and RSS operators, along

with comprehensive training programmes, competency verification requirements, and backup personnel arrangements to ensure continuous supervision capability.

c. Technology and Infrastructure Specifications: Evidence that proposed remote supervision technologies can provide effective oversight through live streaming infrastructure for real-time activities and evidence-based supervision tools for periodic verification, supported by robust connectivity and backup systems.

d. Progressive Implementation Strategy: Clear demonstration of phased implementation approach with acceptance criteria for phase progression, parallel supervision during learning phases, and continuous improvement processes to build confidence and validate technology performance.

e. Structural Activity Classification and Supervision Matrix: Detailed specification of structural activities categorised by supervision approach (live streaming or evidence-based), evidence requirements, equipment needs, and location of activity framework for each structural activity.

f. Process Workflows and Procedures: Comprehensive step-by-step procedures for conducting remote supervision, including pre-RSS inspection requirements, equipment setup protocols, communication procedures, and post-supervision documentation processes.

g. Quality Assurance and Risk Management: Comprehensive framework addressing contingency planning, verification and audit requirements, ISO 17020 compliance, documentation standards, data security management, and records traceability to maintain supervision effectiveness and regulatory compliance.

Elements (a), (e), and (f) are primarily addressed through the structured template format provided in [Annex A](#), while elements (b), (c), (d), and (g) require detailed consideration as outlined in the following subsections. For examples of supervision matrix applications based on work complexity and timescale, refer to section 5.2.3. For RSS implementation examples across various structural works, refer to [Annex B](#).

6.2. Phased Implementation Strategy

The plan must incorporate a phased approach that gradually increases the scope of remote supervision. The following phased approach is recommended, but QP(S) teams should propose a plan based on their comfort level and familiarity with the processes/technologies being deployed:

Phase	Scope
Phase 1 (First 30% of works)	Maximum 15% of the first 30% of works can be remotely supervised to serve as learning stage
Phase 2 (30-75% of works)	Maximum 30% remote supervision after demonstrating competency
Phase 3 (75-100% of works)	Maximum 50% remote supervision for experienced teams
Beyond Phase 3	QP(S) teams may propose to go beyond 50% remote supervision once the process is proven and the personnel involved are familiar, and the works done are simple enough for this to be feasible (e.g. 100% steel component fabrication in overseas steel yard).

Table 2. Guidelines on phased RSS implementation

The QP(S) team is to propose the specific acceptance criteria before progression. Common performance criteria evaluation requirements include the following but not limited to:

- 95% system uptime
- zero critical safety incidents
- Satisfactory performance evaluation

6.3. Timeline of Remote Site Supervision

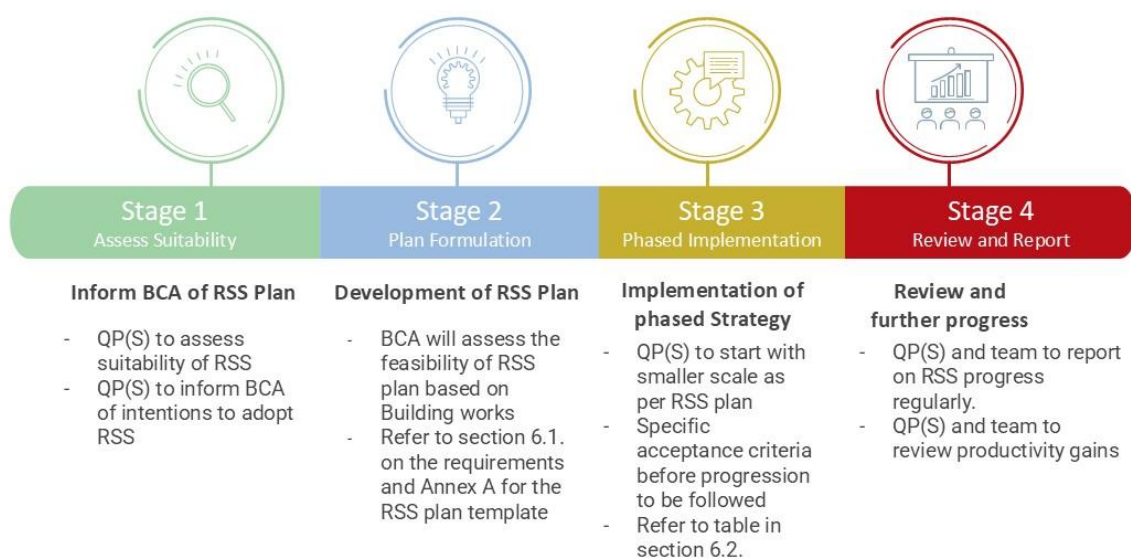


Figure 5: Pictorial Timeline of Remote Site Supervision

6.4. Building Confidence Through Gradual Implementation

6.4.1. Progressive Phased Implementation



QP(S) should begin with a limited scope of remote supervision to allow the team to gain familiarity and confidence with the technology and processes. This approach enables:

- Learning curve management for site supervisors
- Technology performance validation under actual site conditions
- Process refinement based on practical experience
- Risk mitigation through controlled implementation

6.4.2. Parallel Supervision During Learning Phase

During the first 30% of building works, it is recommended to conduct both in-person supervision and remote supervision simultaneously. This dual approach:

- Provides verification of remote supervision effectiveness
- Builds confidence in technology reliability
- Allows for real-time comparison and calibration
- Enables immediate intervention if remote supervision fails

6.4.3. Continuous Improvement Process

The Remote Site Supervision Plan should be treated as a "living document" that evolves based on:

- Lessons learned from initial implementation phases
- Technology performance data and user feedback
- Changing project requirements and site conditions
- Regulatory updates and industry best practices

6.4.4. Performance Monitoring and Adjustment

It is recommended that QP(S) teams establish metrics to evaluate remote supervision effectiveness:

- System uptime and reliability statistics
- Defect detection rate comparison with in-person supervision
- Time efficiency and cost-benefit analysis

- User satisfaction and compliance monitoring
- Safety incident tracking and analysis

What This Means in Practice

The QP(S) should work with the Site Supervisors and Builders on a progressive implementation of RSS, considering the experience of the Site Supervisors and Builder, so that confidence and rapport is built between all parties. This will ensure familiarity and ensure that maximum savings are derived from the process.

6.5. Manpower Organisation, Training and Competency Development

6.5.1. Manpower Organisation Chart

The manpower organisation chart should consider the hierarchy of the whole team including the QP(S), site supervisors and RSS operators (workers from builder side). Please refer to [Annex C](#) for an example of the manpower organisation chart.

6.5.2. Site Supervision Team Training

The site supervision team must be adequately trained in all technologies and procedures outlined in the Remote Site Supervision Plan. Training requirements include but are not restricted to:

- Proficiency in digital tools and streaming platforms
- Understanding of remote supervision protocols and safety procedures
- Competency in operating assigned RSS equipment
- Familiarity with documentation and evidence collection requirements

6.5.3. Competency Verification for Remote Supervision Works

For Resident Engineers/Resident Technical Officers conducting remote supervision:

- Completion of technology provider training programmes for the relevant technology solutions used for remote supervision in the project
- Demonstrated proficiency in digital tools and platforms during the trials
- Continual training for any software and/or hardware upgrade for the relevant technology solutions

6.6. Technology and Infrastructure Requirements

6.6.1. Live Streaming Infrastructure

Continuous supervision activities requiring real-time observation should have the following equipment:

- High-definition video streaming capabilities with multiple camera angles
- Two-way audio communication systems
- Reliable internet connectivity with backup systems
- Real-time recording and storage capabilities
- Equipment redundancy to prevent supervision interruption

6.6.2. Evidence-Based Supervision Tools

For periodic supervision activities that can be verified through documentation:

- High-resolution photography and video recording equipment
- Digital measurement tools (e.g., digital callipers, laser measuring devices)
- 3D scanning technology (LiDAR) for dimensional verification
- Digital documentation platforms with timestamp and location verification
- Automated monitoring systems for continuous parameter tracking

6.6.3. Infrastructure Specifications

The Remote Site Supervision Plan must specify:

- Internet connectivity requirements and backup systems
- Data storage methods (cloud-based or server systems)
- Video resolution and quality standards for streaming and recording
- Equipment specifications including backup devices
- Power supply arrangements and battery backup systems

6.7. Quality Assurance and Risk Management

6.7.1. Contingency Planning

The Remote Site Supervision Plan must include comprehensive contingency procedures for:

- Technology failure and equipment malfunction
- Poor connectivity or communication breakdown
- Safety incidents during remote supervision
- Non-conformity detection and escalation procedures

6.7.2. Verification and Audit Requirements

To ensure remote supervision effectiveness:

- Conduct parallel in-person inspections for 10% sample verification
- Implement quarterly independent third-party audits
- Establish peer review processes and stakeholder feedback mechanisms
- Maintain regulatory compliance through regular checks

6.7.3. ISO 17020 Compliance Framework

The inspection body shall establish and maintain a management system capable of achieving consistent fulfilment of ISO 17020 requirements through either:

- Option A: Meeting the requirements specified in clauses 8.2 to 8.8 of ISO 17020
- Option B: Having an established ISO 9001 management system that supports ISO 17020 requirements

6.7.4. Documentation Standards and Record Keeping

All RSS sessions shall be documented in accordance with **ISO/IEC 17020:2012, Clauses 7.3 and 7.4**, to ensure traceability, accountability, and auditability of supervision outcomes. All RSS relevant documents and records shall be retained and readily accessed by QP(S) and his site supervision team.

a. Evidence based Documentation:

For RSS, *evidence-based* refers to the use of **objective, verifiable evidence to replace or supplement specified in-person on-site supervision activities**, while maintaining equivalent assurance of compliance and safety outcomes.

RSS activities shall be recorded in a **structured Evidence-Based Logbook**, which will serve as the **primary record of remote supervision conducted**.

Each logbook entry shall, at a minimum, capture the following:

- **Unique session reference** (S. No.)
- **Date of installation / supervision**
- **Block / structural part supervised**
- **Nature and quantity of works** (e.g. number of precast panels installed)
- **Unique identification of inspected elements** (e.g. panel numbers / component IDs)
- **Start and end time** of each remote supervision session
- **Identity of supervising personnel** (RE / RTO / authorised staff)
- **Supporting Images of the works done**

What This Means in Practice

Evidence e.g. photos should clearly show scale, orientation and identification. Photos without reference markers or context are unlikely to be useful for verification.

b. Remote Session Documentation:

- Unique identification and date of issue
- Date and time of inspection
- Identification of inspected items/areas
- Results of inspection activities
- Digital evidence (recordings, photographs, measurements)
- Statement of conformity where applicable
- Signature or approval by authorized personnel

6.7.5. Documentation Control, Record Management and Quality Assurance

The RSS documentation system shall be subject to systematic control and governance to ensure record integrity, confidentiality, traceability, and audit readiness.

a. Documentation Control and Data Security

The documentation system shall establish procedures for the identification, storage, protection, retrieval, retention, and disposal of all RSS records. The system shall:

- Adopt standardised data formats to support interoperability, regulatory submission and machine-readable audit. RSS data should follow the requirements of structured data under [Site Management Data Standards](#) published on BCA Website.
- Maintain confidentiality through role-based access permissions
- Control access through formal authorisation protocols with periodic access reviews
- Protect records against unauthorised alteration, loss, or misuse
- Include regular backup procedures with audit trail maintenance

b. Record Retention Requirement

Records shall be retained for periods consistent with prevailing regulatory, contractual, and legal obligations. At a minimum, the following shall apply:

- RSS reports and checklists (including signed logbooks):
Minimum 5 years after Temporary Occupation Permit (TOP)

- Video recordings and other supporting digital evidence:
Minimum 2 years after TOP
QP(S) shall evaluate the need to extend the retention period based on project risk and supervision needs
- Equipment calibration and maintenance records:
Minimum 3 years
- Training and competency records:
Duration of employment plus 2 years
- Incident, non-conformity, and escalation records:
Minimum 5 years

c. Quality Management and Audit

The RSS documentation and record management system shall form part of the inspection body's Quality Management System, established in accordance with Clause 6.8.3 (ISO 17020 Compliance Framework). This shall include, at a minimum:

- Management reviews conducted at planned intervals (minimum annually)
- Internal audits covering RSS procedures, documentation, and records
- Corrective and preventive actions supported by root cause analysis
Control of documents and records with version management and approval workflows
- Handling of complaints and appeals with systematic resolution tracking

d. Records Management and Traceability

RSS records shall be managed to ensure full internal traceability and regulatory defensibility. Records shall at the minimum:

- Be traceable to the inspector(s) or supervising personnel involved
- Contain sufficient information to evaluate supervision adequacy and compliance
- Be readily retrievable through systematic filing, indexing, or digital search
- Be protected against unauthorised alterations through access controls and audit trails
- Be retained in accordance with the defined retention requirements

Note: The detailed Remote Site Supervision Plan template is provided in **Annex A** to guide QP(S) in preparing comprehensive plans that meet the documentation, quality assurance, and record-keeping requirements for remote supervision implementation.

What This Means in Practice

Smaller projects may use simple shared folders and naming conventions, while larger projects may integrate RSS into formal quality management systems.

7. Conducting RSS

7.1. Reference Supervision Framework

The supervision scope, supervision approach, and minimum documentation requirements for Remote Site Supervision (RSS) are prescribed in [Annex D – Reference Activities List for RSS](#).

Annex D establishes the baseline supervision framework for RSS implementation and sets out, for each structural activity:

- The **scope of supervision** to be carried out.
- The applicable **supervision approach**, namely:
 - Live Streaming Supervision; and/or
 - Evidence-Based Supervision supported by objective records.
- The **minimum documentation requirements**, including photo and video evidence; and
- Any **activity-specific conditions or limitations** on the use of remote supervision.

QP(S) teams shall refer to **Annex D** when planning, implementing, and documenting RSS activities. Annex D shall be read as the minimum acceptable standard for RSS and does not preclude the application of more stringent supervision measures where warranted.

7.2. Application of Live Streaming and Evidence-Based Supervision

Annex D clearly distinguishes between activities that require:

- **Live Streaming Supervision**, where real-time observation is necessary to ensure compliance with approved plans, specifications, and method statements; and
- **Evidence-Based Supervision**, where compliance may be verified through objective, verifiable records such as photographs, videos, monitoring data, and test results.

Where Annex D specifies minimum quantities of screenshots, photographs, or recordings, these shall be treated as **mandatory baseline requirements**.

For activities identified in Annex D as potentially suitable for replacing in-person inspection with remote supervision, the **appropriateness of RSS shall be assessed by the QP(S)**, considering:

- Structural criticality and load path significance.
- Span length, transfer behaviour, or cantilever action.

- Construction sequencing and tolerance sensitivity.
- Site conditions and workmanship risk.

Where such activities are deemed unsuitable for RSS, in-person site supervision shall be retained.

What This Means in Practice

QP(S) and Site Supervisors should assess suitability of RSS for the structural works proposed, and where they are found to be unsuitable, revert back to in-person site supervision.

7.3. Customisation and Enhancement of Supervision Requirements

While Annex D provides a standardised reference framework, QP(S) teams are expected to exercise professional judgement to tailor supervision arrangements to the specific project context.

In doing so, QP(S) teams should:

- Review the applicable supervision scope and requirements in Annex D for each work activity
- Identify project-specific risks that may warrant **enhanced supervision intensity**, increased documentation, or higher audit frequency
- Propose alternative or supplementary supervision methods where innovative technologies, automated monitoring systems, or established site controls can deliver **equivalent or higher assurance** of safety and quality outcomes
- Clearly document any enhancements or deviations from Annex D within the project's RSS implementation plan.

Any proposed alternative approaches shall demonstrate that the **intent and outcomes of the Annex D requirements are met or exceeded**.

What This Means in Practice

QP can feel free to propose more stringent RSS Requirements than stated in Annex D.

7.4. Quality and Compliance Requirements

All works supervised under RSS shall comply with the quality requirements stipulated in **SS 515:2021**, as well as all applicable approved plans, specifications, and method statements.

The documentation generated through RSS shall:

- Be objective, verifiable, and traceable to the specific work activity,
- Clearly identify the element, location, and date of supervision, and
- Be retained as part of the project's supervision records for audit and compliance purposes.

Annex D provides the **minimum supervision and documentation** framework to support compliance with SS 515:2021 when RSS is adopted.

7.5. Implementation Considerations

When implementing RSS in accordance with Annex D, QP(S) teams should consider the following:

- **Technology Readiness**
Ensure that devices, platforms, and monitoring systems used can produce clear, time-stamped, and tamper-resistant records consistent with Annex D requirements.
- **Site Constraints**
Adjust supervision arrangements to account for access limitations, environmental conditions, and construction sequencing while maintaining compliance with baseline requirements.
- **Resource Planning**
Allocate supervisory resources in line with the supervision intensity prescribed in Annex D, particularly for activities requiring continuous or repeated live streaming.
- **Internal Verification**
Implement internal checks to ensure that supervision records meet the prescribed quantity, clarity, and coverage before acceptance as evidence of supervision.

8. Framework for Innovation and New Technologies

The standards and procedures outlined in this guidebook are non-exhaustive. The construction industry is rapidly evolving with new technologies and methodologies. QP(S) teams are encouraged to explore innovative solutions that may enhance supervision effectiveness while maintaining safety and quality standards.

8.1. Innovation Framework for QP(S) Teams

Step 1: Technology Assessment

- Capability Analysis: Define specific supervision challenges the technology addresses
- Technical Specifications: Evaluate resolution, connectivity, reliability, and integration capabilities
- Regulatory Compliance: Ensure alignment with Building Control Act requirements and BCA guidelines
- Safety Considerations: Assess any safety implications or enhancements

Step 2: Pilot Planning

- Scope Definition: Start with limited, non-critical applications for initial trials
- Success Metrics: Define measurable outcomes (time savings, accuracy improvements, cost reductions)
- Risk Assessment: Identify potential failure modes and mitigation strategies
- Backup Procedures: Maintain conventional supervision as fallback during trials

Step 3: Stakeholder Engagement

- Developer Presentation: Prepare business case highlighting productivity gains, cost savings, quality improvements
- BCA Consultation: Early engagement with BCA officers to discuss innovative approaches and compliance pathways
- Team Training: Ensure adequate competency development for new technologies

8.2. Evaluation Criteria for New Technologies

8.2.1. Technical Suitability

- Image/video quality sufficient for detailed inspection requirements
- Real-time communication capability with minimal latency
- Data storage and retrieval functionality
- Integration with existing project management systems

- Scalability across different project phases and locations

8.2.2. Economic Viability:

- Total cost of ownership including equipment, software, training, maintenance
- Productivity improvements quantified in time and labour savings
- Quality enhancement benefits (reduced rework, faster approvals)
- Return on investment timeline and break-even analysis

8.2.3. Operational Effectiveness:

- User-friendliness and learning curve for supervision teams
- Reliability under site conditions (weather, dust, vibration)
- Battery life and power management for extended operations
- Maintenance requirements and technical support availability

What This Means in Practice

BCA welcomes QPs to propose new technologies and processes for Supervision as long as intent of supervision can be met. You may use Section 8.1.2. to help evaluate the proposed technology/process and follow the innovation framework BCA has set out to help Teams with implementing them.

9. Limitations of Remote Site Supervision

Remote Site Supervision serves as a complementary tool to enhance traditional site supervision practices. While it offers significant advantages in certain scenarios, it shall not fully replace in-person site inspections for structural works. Supervision Qualified Persons (QP(S)) shall note that:

- a) In-person site inspections remain essential for critical structural works.
- b) Remote supervision technologies shall be deployed only when they can effectively achieve the intended supervision outcomes.
- c) Where remote supervision capabilities are inadequate or unable to provide clear verification of works, QP(S) shall conduct in-person site supervision

The decision to implement remote supervision shall be based on the QP(S)'s professional assessment of the technology's capability to achieve the required level of supervision for the specific work scope.

What This Means in Practice

The success of RSS implementation depends on whether the outcome of supervision can be achieved. If the video feed is unclear or site conditions change unexpectedly, the appropriate response is to attend site and supervise physically. QPs should not “make do” with poor evidence.

Guidebook for Remote Site Supervision v.2

Annex A – Remote Site Supervision Plan Template

Remote Site Supervision Plan

Project Reference No.:
Project Description:
Fabrication yard or Construction site:
Address:

Prepared by:

Name of Qualified Person (Supervision) & PE Registration No.	
Company	
Date	

Guidebook for Remote Site Supervision v.2

TABLE OF CONTENTS

S/N	Description	Page
1	Project Background	
2	Phased Implementation Plan for Remote Supervision	
3	Personnel & Organisational Structure	
4	Structural activities classification, supervision approach and recording / evidence requirements	
5	Devices for Remote Supervision	
6	Infrastructure Requirements	
7	Process (step by step) of conducting remote supervision	
8	Quality assurance & contingency procedures	
9	Documentation & records management	
10	Supervision checklist	
11		
12		
13		

Guidebook for Remote Site Supervision v.2

1. PROJECT BACKGROUND

Brief description of project

- site location
- structural and foundation system
- site-specific challenges, if any.
- challenges to carry out remote supervision, if any.

Overall site plan or location of construction site or fabrication yard.

Figure 1: Overall Site Plan or Location of Fabrication Yard

Guidebook for Remote Site Supervision v.2

2. PHASED IMPLEMENTATION PLAN FOR REMOTE SUPERVISION

2.1. Phased Implementation

Examples:

A) Construction Site

Example 1

Location of building works – Superstructure, Tower “A” (10-storey)

Type of building works – reinforced concrete beam (included the associated slab (cast together), applicable for beam-slab structural system)

Phase of Building Works	Permitted Extent of Building Works for Remote Supervision
First 30% (up to 3 rd storey)	up to a max. of 15% of beams
Subsequent 30% to 75% (4 th to 7 th storey)	up to a max. of 30% of beams
Subsequent 75% to 100% (8 th to roof)	up to a max. of 50% of beams

(measurement of beams: by volume of concrete or length of beams)

Example 2

Location of building works – Superstructure, Tower “A” (10-storey)

Type of building works – reinforced concrete slab (applicable for flat slab system)

Phase of Building Works	Permitted Extent of Building Works for Remote Supervision
First 30% (up to 3 rd storey)	up to a max. of 15% of slabs
Subsequent 30% to 75% (4 th to 7 th storey)	up to a max. of 30% of slabs
Subsequent 75% to 100% (8 th to roof)	up to a max. of 50% of slabs

(measurement of slabs: by surface area on plan)

Guidebook for Remote Site Supervision v.2

B) Fabrication Yard

Example 3

Location of building works – Precast yard, for structural works of Tower “A” (10-storey)

Type of building works – precast beam

Phase of Building Works	Permitted Extent of Building Works for Remote Supervision
First 30% (up to 3 rd storey)	up to a max. of 15% of beams
Subsequent 30% to 75% (4 th to 7 th storey)	up to a max. of 30% of beams
Subsequent 75% to 100% (8 th to roof)	up to a max. of 50% of beams

(measurement of beams: by volume of concrete or length of beams)

Example 4

Location of building works – PPVC precast yard, for structural works of Tower “A” (10-storey)

Type of building works – PPVC module

Phase of Building Works	Permitted Extent of Building Works for Remote Supervision
First 30% (up to 3 rd storey)	up to a max. of 15% of PPVC modules
Subsequent 30% to 75% (4 th to 7 th storey)	up to a max. of 30% of PPVC modules
Subsequent 75% to 100% (8 th to roof)	up to a max. of 50% of PPVC modules

(measurement of PPVC modules: by volume of concrete for PPVC modules)

Note:

1. The permitted extent (%) of building works can be measured by the volume of concrete (e.g. RC beams), length of structural members (e.g. RC beams or structural steel beams) or surface area on plan (e.g. slab).
2. First 30% of building works (first phase) should be considered as learning stage, the supervision of structural works is encouraged to be carried out in both methods, in-

Guidebook for Remote Site Supervision v.2

person at site and remotely. This serves as a learning curve for the site supervisors to familiarise with the use of digital tools for carrying out remote supervision.

2.2. Acceptance Criteria for RSS Implementation

The following criteria must be met before proceeding to the next phase:

- Successful completion of trial period with 95% system uptime
- Zero critical safety incidents during RSS activities
- Compliance with all documentation requirements
- Satisfactory performance evaluation by QP(S)
- Approval from relevant authorities where required

Guidebook for Remote Site Supervision v.2

3. Personnel and Organisational Structure

3.1. RSS Team Structure

Organisational Chart

E.g. QP(S) - Overall Responsibility

└─ Site Supervision Team (RE/RTO) -

└─ Operators from Builders Side for the RSS equipment/infrastructure –

└─

3.2. Roles and Responsibilities

Qualified Person (Supervision):

- Overall responsibility for RSS implementation and effectiveness
- Approval of RSS plans and procedures
- Final sign-off on RSS reports
- Liaison with authorities

Site Supervisor (RE/RTO):

-

Operators from Builders Side for the RSS equipment/infrastructure:

-

3.3. Competency Requirements

For RE/RTO conducting RSS:

- Training by tech providers
- Demonstrated proficiency in digital tools and platforms
- Valid professional registration

For Site Staff supporting RSS:

- Basic training in RSS procedures and equipment
- Understanding of safety protocols during RSS
- Competency in operating assigned RSS equipment

Guidebook for Remote Site Supervision v.2

4. STRUCTURAL ACTIVITY CLASSIFICATION, SUPERVISION APPROACH AND RECORDING / EVIDENCE REQUIREMENTS FOR REMOTE SUPERVISION

Please indicate the type of structural works, supervision (continuous or periodic) and recording requirements.

Notes:

Live Streaming involves the use of streaming tools to provide site supervisors with a live feed of the construction works, allowing the SS to be able to observe the structural works clearly, intervene and instruct the contractor at site instantaneously.

Evidence-Based Supervision involves the use of digital tools to provide site supervisors with sufficient evidence to show that the works have been constructed in accordance with approved plans.

S/N	Structural Activity (e.g. concreting works, reinforcement)	Supervision approach and minimum evidence (Refer to Annex D) <u>Live Streaming</u> Minimum duration of video recordings to be saved for each remote supervision live streaming session (e.g. xx% of total duration of RSS)	List of equipment/software required	Location of structural activity	Step by step supervision procedure including detailed method of statement and deployed personnel roles <u>(Please attach as annex for each structural activity, refer to Annex A section 7 for the requirements)</u>

Guidebook for Remote Site Supervision v.2

		Minimum number of photos to be taken for each live streaming remote supervision session <u>Evidence-Based</u> Type and quantity of evidence to save for each activity % of activities that are audited				
e.g.	Concreting of beam/slab	<u>Evidence-Based</u> Video recording for 100% of activity 5 photos (1 photo every 15 mins) 50% audit	Smart Photo with camera function CCTV Digital platform	1 st storey	1. Builder Operator sets up fixed camera and records the entire concreting process. 2. Builder Operator saves the video recording and photos per documentation requirements and notifies RE/RTO when ready for review. 3. RE/RTO review the photos and/or	

Guidebook for Remote Site Supervision v.2

					video recording at critical stages, checks against acceptance criteria, and complete the remote supervision report/checklist 4. RE/RTO informs QP of any non-compliance observed during video/photo review. 5. QP audits photos and/or video recording as necessary.
•					

Guidebook for Remote Site Supervision v.2

5. DEVICES FOR REMOTE SUPERVISION

Examples of the items to be specified in this section (not exhaustive):

- Name the devices used for image capturing, video recording, live streaming, scanning
- Number of device(s) to be used
- Indicate whether a back-up device will be provided (this is recommended in case of device malfunction during continuous supervision e.g. concreting)
- Indicate all the relevant devices to be used for remote supervision such as digital Vernier calliper for rebar size measurement
- Indicate whether torch light is required
- Indicate whether back-up battery is required

Guidebook for Remote Site Supervision v.2

6. INFRASTRUCTURE REQUIREMENTS

Examples of the items to be specified in this section (not exhaustive):

- To specify the internet connection, requirement, specifications which will be used to ensure effective remote supervision
- To state the method or infrastructures used for storage of photos/videos – cloud base/server space
- To provide the details of remote supervision platform/software
- To specify the requirement or specification of video during live streaming and recording – resolution

Guidebook for Remote Site Supervision v.2

7. PROCESS (STEP BY STEP) OF CONDUCTING REMOTE SUPERVISION

Important Note: each structural activity shall have a separate step-by-step procedure of conducting remote supervision, attaching as annex in the RSS plan.

Before Remote Supervision (Preparation Works)

Site Preparation Checklist:

- Label all structural elements clearly with identification tags
- Ensure adequate lighting in supervision areas
- Test all RSS equipment functionality
- Verify internet connectivity and backup systems
- Brief all site personnel on RSS procedures
- Confirm safety measures are in place
- Prepare inspection checklists and documentation templates

Equipment Setup:

- Position cameras for optimal viewing angles
- Test audio communication systems
- Calibrate measurement devices
- Verify data storage connectivity
- Prepare backup equipment
- Document equipment serial numbers and settings

During Remote Supervision

- To provide detailed method statements for carrying out remote supervision.
- To include the good practices such as self-introduction before the commencement of remote supervision.

- **Supervision Execution:**

- Systematic inspection following approved checklist
- Clear verbal communication of observations
- Real-time documentation of findings
- Immediate flagging of non-conformities
- Continuous monitoring of equipment performance
- Regular confirmation of audio-visual quality

- **Communication Protocol:**

- Use standardised terminology and codes
- Confirm understanding of instructions
- Document all verbal communications
- Maintain professional conduct throughout
- Ensure all parties remain visible on camera

Guidebook for Remote Site Supervision v.2

- Record any technical difficulties encountered

After Remote Supervision

- **Immediate Actions:**

- Confirm completion of inspection scope
- Summarise key findings and decisions
- Save all recordings and documentation
- Update project tracking systems
- Communicate outcomes to relevant parties
- Schedule follow-up actions if required

- **Documentation Requirements:**

- Upload all evidence to project database
- Update inspection tracking spreadsheet
- File hard copies where required
- Distribute reports to stakeholders
- Archive data according to retention policy

Guidebook for Remote Site Supervision v.2

8. QUALITY ASSURANCE & CONTINGENCY PROCEDURES

8.1 System Performance Monitoring

Performance metrics:

- System uptime tracking (target: minimum 95%)
- Defect detection rate compared with
- in-person supervision
- Time efficiency and cost-benefit analysis
- User satisfaction and compliance rate monitoring

Verification methods (per RSS Guidebook Clause 6.7.2):

- Parallel in-person inspections – 10% sample for verification
- Independent third-party audits – quarterly
- Peer review processes and stakeholder feedback
- Regulatory compliance checks

8.2 Contingency Plans and Escalation

The Plan addresses the four contingency areas required under RSS Guidebook Clause 6.7.1:

- Technology failure and equipment malfunction
- Poor connectivity or communication breakdown
- Safety incidents during remote supervision
- Non-conformity detection and escalation procedures

System failure protocol:

- Immediate switch to backup equipment
- Revert to in-person supervision if safety is compromised
- Document failure cause, duration, and corrective measures
- Report to QP(S) within 2 hours

Escalation levels:

Level 1 – Site Supervisor addresses the issue immediately and documents resolution

Level 2 – Vendor support engaged; QP(S) notified within 4 hours

Level 3 – Immediate QP(S) involvement; possible RSS suspension; authority notification if required

Poor connectivity management:

- Automatic quality adjustment for streaming
- Switch to evidence-based supervision mode when necessary
- Use compressed formats and prioritise critical elements
- Document connectivity issues and reschedule if quality is compromised

Safety incidents during RSS:

Guidebook for Remote Site Supervision v.2

Suspend RSS activity immediately and notify the QP(S) and site safety officer
Where safety cannot be assured remotely, revert to in-person supervision
Record the incident in the Incident, Non-Conformity and Escalation Register (Section 9.4)

8.3 ISO 17020 Compliance Framework

In line with RSS Guidebook Clause 6.7.3, the inspection body shall establish and maintain a management system capable of achieving consistent fulfilment of ISO 17020 requirements through either:

Option A – Meeting the requirements specified in clauses 8.2 to 8.8 of ISO 17020; or

Option B – Having an established ISO 9001 management system that supports ISO 17020 requirements.

State below the option adopted for this project and reference the corresponding management system documentation:

Option adopted (A / B): _____

Reference / accreditation no.: _____

Date of last management review: _____

Guidebook for Remote Site Supervision v.2

9. DOCUMENTATION & RECORDS MANAGEMENT

All RSS sessions shall be documented in accordance with ISO/IEC 17020:2012, Clauses 7.3 and 7.4, to ensure traceability, accountability and auditability of supervision outcomes. All RSS-relevant documents and records shall be retained and readily accessible to the QP(S) and his site supervision team.

9.1 Evidence-Based Documentation

For RSS, evidence-based documentation refers to the use of objective, verifiable evidence to replace or supplement specified physical on-site supervision activities, while maintaining equivalent assurance of compliance and safety outcomes.

9.2 Evidence-Based Logbook

RSS activities shall be recorded in a structured Evidence-Based Logbook, which serves as the primary record of remote supervision conducted. Each logbook entry shall, at a minimum, capture:

- A unique session reference (S. No.)
- Date of installation / supervision
- Block or structural part supervised
- Nature and quantity of works (e.g. number of precast panels installed)
- Unique identification of inspected elements (e.g. panel numbers / component IDs)
- Start and end time of each remote supervision session
- Identity of supervising personnel (RE / RTO / authorised staff)
- Supporting images of the works done

Note: The Evidence-Based Logbook may be maintained in digital form provided that access controls, version control and audit trails are in place (see Section 9.5).

9.3 Remote Session Documentation

Each remote supervision session shall produce a session record that, at a minimum, captures:

- A unique identification and date of issue
- Date and time of inspection
- Identification of inspected items / areas
- Results of inspection activities
- Digital evidence (recordings, photographs, measurements)
- A statement of conformity, where applicable
- Signature or approval by authorised personnel

9.4 Record Retention Requirements

This shall be done in accordance with section 6.7.5(b) above.

Guidebook for Remote Site Supervision v.2

9.5 Documentation Control and Data Security

The documentation system shall establish procedures for the identification, storage, protection, retrieval, retention and disposal of all RSS records. The system shall:

- Maintain confidentiality through role-based access permissions
- Control access through formal authorisation protocols with periodic access reviews
- Protect records against unauthorised alteration, loss or misuse
- Include regular backup procedures with audit-trail maintenance
- Apply unique document identification with version numbering and date tracking
- Maintain a change log with an approval workflow
- Ensure secure transmission of records (e.g. encryption in transit)

9.6 Quality Management and Audit

The RSS documentation and record management system shall form part of the inspection body's Quality Management System established under Section 8.3 (ISO 17020 Compliance Framework). At a minimum, the system shall include:

- Management reviews conducted at planned intervals (minimum annually)
- Internal audits covering RSS procedures, documentation and records (monthly process audits, quarterly system reviews, annual comprehensive assessment)
- Corrective and preventive actions supported by root cause analysis
- Control of documents and records with version management and approval workflows
- Handling of complaints and appeals with systematic resolution tracking
- External regulatory compliance audits and third-party verification
- Training-effectiveness evaluation

9.7 Records Management and Traceability

RSS records shall be managed to ensure full internal traceability and regulatory defensibility. Records shall, at a minimum:

- Be traceable to the inspector(s) or supervising personnel involved
- Contain sufficient information to evaluate supervision adequacy and compliance
- Be readily retrievable through systematic filing, indexing or digital search
- Be protected against unauthorised alterations through access controls and audit trails
- Be retained in accordance with the retention requirements set out in Section 6.7.5

9.8 Systematic Tracking Systems

Non-Conformity Management:

- Unique identification numbering with category classification
- Root cause analysis documentation and corrective action tracking
- Verification of closure with trend analysis reporting

Instrumentation and Material Compliance:

Guidebook for Remote Site Supervision v.2

- Real-time alert system for breaches with automatic notifications
- Test result database with non-compliance flagging
- Supplier performance tracking with batch traceability
- Quality trend analysis and corrective action monitoring

Remote Supervision Report by Site Supervisor (Template)

(This form shall be prepared by Site Supervisor who conducted the remote supervision)

This section can be detached for each activity/group of activities carried out

Project Ref No. (" Project ")	
Location of Remote Supervision (Fabrication yard or construction site)	Insert address
ST No.	
Type of structural works	Beam 2HB2 at level 2 (block A)
Scope of supervision	Reinforcement inspection
Type of supervision	Live Stream or Evidence Based
Date of remote supervision	
Duration of remote supervision	30 mins (from 1400H to 1430H)
Outcome of remote supervision (approved, rejected, approved with minor comments)	approved
Parties involved in the remote supervision	Example
Screenshot of parties involved (with name, company and designation) in remote supervision Note: The operator must turn on his video camera throughout each remote supervision session. All other involved parties (especially the site supervisor) should turn on their video cameras throughout each remote supervision session.	

Guidebook for Remote Site Supervision v.2

Photos of structural works (to capture/screenshot from site supervisor's device)	Example 
File name and duration of video recording	
Storage of video (cloud/server):	
Attachment of Inspection Checklist (yes/no)	
Builder's Signature Name: Designation: Date:	



Guidebook for Remote Site Supervision v.2

I confirm that I have conducted remote supervision for the structural works recorded in this report in accordance with the remote supervision plan prepared in respect of the Project. I am satisfied with the process of remote supervision and confirm that the structural works were carried out in accordance with the plans approved by the Commissioner of Building Control under Section 5 of the Building Control Act, the Building Control Act and the Building Control Regulations 2003.

Yours faithfully

Site Supervisor

Name:

Designation (RE/RTO):

Date:



Guidebook for Remote Site Supervision v.2

Annex B – Remote Site Supervision Examples from Industry Trials

The following examples are based on successful RSS implementations from four distinct project types, demonstrating the versatility and adaptability of remote supervision methodologies across different construction environments, structural systems, and project scales. All projects implemented phased supervision approaches and achieved significant manpower optimization through RSS adoption.

Guidebook for Remote Site Supervision v.2

B1. High-Rise Residential Development with Cast-in-Place System - J'den

40-storey residential tower with 3-basement levels and podium facilities using cast-in-place reinforced concrete with precast elements. RSS focus on superstructure works including concrete casting, reinforcement inspection, and precast installation. Obtained waiver approval to reduce site supervision team by 2 Resident Technical Officers through demonstrated RSS effectiveness with progressive adoption and parallel supervision during learning phase.

B1.1. Concrete Slump Testing and Cube Sampling (Evidence-Based Supervision)

Technology Adopted: Mobile phone cameras with Digital Build Inspection Platform

Process Implementation:

- Site team captures photographic evidence of concrete delivery orders upon arrival
- Slump test conducted with dimensional measurement clearly visible (target: 160-210mm for Consistency Class 4)
- Concrete cube samples photographed with clear sample reference numbering and timestamps
- All evidence uploaded to digital platform for remote supervisor review and approval

Phased Supervision Approach:

- Initial trials conducted with parallel in-person and remote supervision for validation
- Gradual increase in RSS coverage as team confidence and system reliability improved
- Systematic documentation of lessons learned for process refinement

Acceptance Criteria:

- Slump within approved concrete mix range
- Sample reference numbers clearly visible and properly labelled
- Delivery order details legible and timestamped
- Photos taken in adequate lighting conditions

Documentation Requirements:

- Delivery order photographs
- Slump test results with dimensional verification
- Cube sample identification with batch traceability

Guidebook for Remote Site Supervision v.2

- Digital platform records with timestamp verification

B1.2. Concrete Casting Supervision (Live Remote Supervision)

Technology Adopted:

- Network cameras (Hikvision DS-2DE2A204IW-DES(S6)) with infrared capability up to 20m
- 4x optical zoom/16x digital zoom with 5G connectivity
- Tower crane-mounted CCTV for bird's eye view
- Secondary CCTV positioned for detailed area coverage

Process Implementation:

- CCTV positioned on Level 1 overlooking casting zone with remote supervisor tablet access
- Real-time communication via phone/walkie-talkie between supervisor and site team
- Continuous monitoring of concrete placement sequence and vibration procedures
- Live verification of construction joint preparation and treatment
- Immediate intervention capability for quality deviations

Phased Supervision Approach:

- Started with limited scope casting operations for technology validation
- Parallel supervision maintained during initial phases for comparison and confidence building
- Progressive expansion to cover larger casting areas as system performance was validated

Acceptance Criteria:

- Casting zone clearly marked and verified before commencement
- Good quality video and audio streaming maintained throughout
- Proper concreting sequence followed as per approved method
- Technical issues immediately highlighted and addressed

Documentation Requirements:

- Before and after casting photographs
- Video recordings of critical casting phases
- Real-time communication logs
- Equipment setup verification records

Guidebook for Remote Site Supervision v.2

B1.3. Reinforcement Inspection (Live Remote Supervision)

Technology Adopted: Mobile phone video calling to site supervisor tablet with measuring tools

Process Implementation:

- Site supervisor directs site team through video call for random inspection
- Verification of reinforcement bar sizes using digital measuring tools
- Spacing measurement at minimum 1 location per element or every 2m for walls
- Minimum 1 location every 200m² for slab reinforcement
- In-person backup inspection conducted as safeguard during trial phase

Phased Supervision Approach:

- Initial implementation with 100% parallel in-person verification for accuracy validation
- Gradual reduction in in-person backup inspections as remote supervision reliability was established
- Systematic sampling approach developed for ongoing quality assurance

Acceptance Criteria:

- Reinforcement size compliance with approved drawings
- Spacing verification within tolerance
- Clear visual verification of cover requirements
- Random sampling at supervisor's discretion

Documentation Requirements:

- Measurement verification photographs
- Reinforcement size and spacing records
- Location identification with grid references
- Digital platform evidence storage

Guidebook for Remote Site Supervision v.2

B2. Underground Infrastructure Development - Punggol MRT Station Project (P105)

Project Overview: 2-level underground MRT station with civil defence shelter using diaphragm wall, piling, and temporary support systems. RSS focus on underground works including diaphragm walls, structural steel, and deep foundation elements with challenges including limited visibility in underground environments and complex temporary works supervision. Achieved 36.9% project coverage with systematic monthly camera relocations and progressive RSS adoption across different construction phases.

B2.1. Diaphragm Wall and Piling Works (Live Remote Supervision)

Technology Adopted:

- Network topology using 60 GHz wireless infrastructure with gigabyte bandwidth
- Solar-powered CCTV boxes for above-ground supervision
- Non-solar fuel cell boxes for underground works supervision
- QPBUDDY digital platform for inspection management

Process Implementation:

- CCTV cameras positioned with 30-50m range coverage depending on obstructions
- Monthly relocation schedule (27 relocations over 27-month project duration)
- Real-time monitoring of panel dimensions and cut-off levels
- Live supervision of rebar cage installation and tremie pipe installation
- Continuous verification of guide wall tolerances and pile verticality

Phased Supervision Approach:

- **Phase 1:** D-Wall North and South (4 relocations each) with initial RSS implementation
- **Phase 2:** Piling works (5 relocations) with expanded RSS coverage
- **Phase 3:** Temporary structures across 4 levels (12 relocations) with comprehensive RSS deployment
- **Phase 4:** Cooling tower works (2 relocations) with refined RSS procedures

Acceptance Criteria:

- Panel dimensions within specified tolerances
- Proper excavation volume and existing ground level verification
- Reinforcement cover compliance with approved drawings
- Verticality of piles within acceptable limits

Guidebook for Remote Site Supervision v.2

Documentation Requirements:

- Minimum 3 photos per inspection session
- Real-time video recordings of critical installation phases
- Digital platform records with timestamp verification
- Equipment relocation and setup documentation

B2.2. Bentonite Properties Testing (Evidence-Based Supervision)

Technology Adopted: Wearable cameras with two-way communication and QPBUDDY platform

Process Implementation:

- Site engineer raises Request for Inspection (RFI) on QPBUDDY platform
- Site supervisors approve RFI if documentation is in order
- Site supervisor carries mobile camera to testing location
- Remote verification of bentonite density, pH value, sand content, and viscosity
- Digital documentation of test results with photographic evidence

Phased Supervision Approach:

- Systematic implementation across different diaphragm wall panels
- Progressive refinement of testing procedures based on initial trial results
- Continuous improvement of documentation standards throughout project phases

Acceptance Criteria:

- Bentonite properties within specification limits
- Proper testing procedures followed
- Clear photographic evidence of test results
- Compliance with approved mix design parameters

Documentation Requirements:

- Test result photographs with clear readings
- Digital platform inspection records
- Automated video saving on cloud storage
- Site supervisor team digital signatures for approval

Guidebook for Remote Site Supervision v.2

B2.3. Structural Steel Works Inspection (Live Remote Supervision)

Technology Adopted:

- Fixed CCTV cameras for general overview
- Wearable cameras for detailed inspection
- Digital measurement tools for dimensional verification

Process Implementation:

- Real-time monitoring of steel structure erection including alignment, level, and plumb
- Live supervision of erection sequence compliance
- Remote verification of proper access provision
- Continuous checking for galvanisation or coating damage
- Two-way communication for complex locations with limited CCTV visibility

Phased Supervision Approach:

- Sequential implementation across different king post installations
- Progressive expansion from simple to complex steel structure supervision
- Continuous refinement of inspection procedures based on field experience

Acceptance Criteria:

- Steel grade and bolt grade compliance verification
- Factory Production Control (FPC) certificates validation
- Material Test Certificates (MTC) verification
- Proper bolt tightening and welding procedures

Documentation Requirements:

- Minimum 5 photos per inspection session
- Material certificates and test documentation
- Dimensional verification records
- Heat number and material traceability documentation

Guidebook for Remote Site Supervision v.2

B3. Large-Scale Landed Housing Development - Luxus Hill Project

Project Overview: 3-storey landed housing development comprising Phase 11 (161 units) and Phase 12 (159 units) with detached, semi-detached, and terrace dwelling houses with attic using cast-in-place reinforced concrete with precast staircase and household shelter. RSS focus on jack-in piling works, substructure and superstructure concrete works. Obtained waiver approval to use 1 team of site supervisors shared between 2 adjacent sites covering very large land area, demonstrating RSS effectiveness for multi-site supervision with three-stage progressive implementation including comprehensive training and trial phases.

B3.1. Three-Stage Phased Implementation Process

Stage 1: Remote Supervision Personnel Appointment & Training

- **Site Supervisors (SS):** Computer literacy and software proficiency requirements, clear communication skills for guiding "shadow RTO" during remote supervision
- **"Shadow RTO":** Personnel responsible for operating remote supervision devices, maintaining constant communication with SS, nominal construction knowledge requirements
- **Remote Supervision Specialist:** Advanced device and software proficiency, internal SOP development, training delivery for new team members

Stage 2: Remote Supervision Setup/Trial Stage

- Initial in-person supervision as per usual practice to establish supervision standards
- Agreement between "shadow RTO" and SS on supervision regime and acceptance criteria
- KTP supervisory forms shared for checklist understanding and acceptance criteria
- Trust and confidence building between all parties
- Implementation starting with simpler, less critical works for learning

Stage 3: Remote Supervision Implementation Stage

- Full deployment across foundation, substructure, and superstructure works
- Systematic coverage of jack-in precast pile, pile cap, reinforced column stump, and superstructure elements
- Integration with precast staircase flight and household shelter supervision

Guidebook for Remote Site Supervision v.2

B3.2. Jack-in Piling Works Supervision (Continuous Remote Supervision)

Technology Adopted:

- 2 mobile devices for image capturing, video recording, live streaming
- Body cameras (HIK VISION) as alternative for video recording and live streaming
- PC desktop equipped with webcams and headsets for video conferencing
- Measuring tools including torch lights, measuring tapes, and spotlights

Process Implementation:

- 100% video recording duration with photographic documentation at each testing stage
- Real-time monitoring of pile dimension, quality, setting out, and verticality
- Live supervision of hydraulic jack-in pressure monitoring
- Continuous observation of pile splicing and welding procedures
- Immediate intervention capability for installation monitoring

Phased Supervision Approach:

- **Maximum 50% RSS Coverage:** Progressive implementation across all pile installation activities
- **Systematic Coverage:** Pile dimension checking, setting out verification, installation monitoring, splice welding, verticality checking, hydraulic pressure monitoring, pile set verification, penetration length measurement
- **Quality Assurance Integration:** Pile integrity testing and pile load testing with continuous supervision

Acceptance Criteria:

- Pile dimensions within specified tolerances
- Proper setting out accuracy and verticality compliance
- Hydraulic jack-in pressure within approved parameters
- Splice welding quality and penetration length verification

Documentation Requirements:

- 100% duration video recordings of installation process
- Photographic documentation at each stage of testing
- Real-time pressure monitoring records
- Installation sequence compliance verification

Guidebook for Remote Site Supervision v.2

B3.3. Concrete Works Supervision (Continuous Remote Supervision)

Technology Adopted:

- Mobile devices with live streaming capabilities
- Statically mounted IP cameras for fixed monitoring positions
- Virtual meeting software (Zoom or Microsoft Teams) integration
- QPBUDY remote supervision software with cloud storage

Process Implementation:

- 100% video recording for concrete slump testing and cube making
- Live monitoring of steel reinforcement inspection and formwork checking
- Continuous supervision of concrete casting and discharging
- Real-time verification of post-concreting works and formwork removal
- Immediate quality control intervention capabilities

Phased Supervision Approach:

- **Ready-Mix Concrete Plant:** 100% RSS coverage for slump testing and cube making
- **Construction Site:** Maximum 50% RSS coverage for reinforcement, formwork, and casting activities
- **Multi-Location Supervision:** Concurrent monitoring across Phase 11 and Phase 12 sites using shared supervision team

Acceptance Criteria:

- Concrete slump within approved mix design parameters
- Reinforcement size, spacing, and cover compliance
- Formwork dimensional accuracy and stability
- Concrete placement sequence and quality standards

Documentation Requirements:

- 100% video recording for plant-based activities
- Minimum five photographs per supervision session (1 photo every 20-minute interval for casting)
- Real-time slump test results with dimensional verification
- Formwork and reinforcement compliance records

Guidebook for Remote Site Supervision v.2

B3.4. Multi-Site Supervision Innovation

Shared Supervision Team Structure:

- **Piling Works:** 2 REs + 3 RTOs covering both Phase 11 and Phase 12
- **Superstructure Works:** 2 REs + 5 RTOs with RSS enabling efficient coverage across large land area
- **Technology Integration:** Virtual meeting platforms and cloud-based supervision software enabling seamless multi-site coordination

Site Coverage Strategy:

- Adjacent site locations enabling shared in-person presence when required
- RSS technology allowing concurrent supervision of multiple activities across both phases
- Efficient resource allocation through technology-enabled supervision capabilities

Guidebook for Remote Site Supervision v.2

B4. Findings from BCA-HDB-Industry Workgroup

Project Overview: Comprehensive industry collaboration involving HDB-Surbana Jurong co-chaired initiative with regular HDB C&S Consultants across seven pilot BTO projects implementing Remote Site Supervision (RSS) methodologies. RSS focus on encouraging remote supervision adoption, re-designing supervision practices, improving Site Supervisor productivity, reviewing available A.I. tools, and enhancing Builder supervisory capability and competency across diverse project types and construction methodologies.

B4.1. Pilot Project Implementation Matrix

Technology Adoption Across Projects:

- **Woodlands N4 C7 (P&T Consultants, Er. Kenneth Ng):** QPBUDDY software with camera and tripod for precast installation, grouting works, and concrete casting supervision
- **Ulu Pandan C1 (KTP Consultants, Er. Aaron Foong):** High-resolution PTZ cameras with tower crane mounting, Hik-Connect platform, 1Gbps fibre connectivity for beam and slab concreting
- **Tanglin Halt C1 (Beca Carter, Er. Ting Chiew Ping):** QPBUDDY software + headset with phone camera for concrete slump inspection and precast component delivery inspection
- **Ang Mo Kio N7 C30 (LSW Consulting, Er. Lauw Su Wee):** Normal HD Camera, 360 Camera, Robot/Drone technology for post-concreting works inspection
- **Ang Mo Kio N8 C38A (AECOM):** Multi-platform approach with photo, remote, video, cloud, and software integration
- **Woodlands N1 C23 & C24 (Surbana Jurong, Er. Edwin Ong Beng Koon):** WhatsApp and Autodesk Construction Cloud (ACC) for evidence-based precast supervision
- **Tengah Garden C3 & C7 (ECAS Consultants, Er. Titus Tay):** QPBUDDY platform with dedicated mobile phones and customised inspection forms

B4.2. Supervision Activity Classification Framework

Matrix Development: Activities distributed into quadrants based on inspection complexity and supervision continuity requirements.

- **Simple Inspection + Continuous Supervision:** 'Live Remote' Supervision for verification processes including concrete slump/cube sampling, precast inspection/installation, column base/splice grouting

Guidebook for Remote Site Supervision v.2

- **Complex Inspection + Continuous Supervision:** In-person attendance for irreversible processes requiring immediate intervention
- **Simple Inspection + Periodic Supervision:** Technology-based validation processes suitable for evidence-based supervision
- **Complex Inspection + Periodic Supervision:** Evidence-based supervision for reversible processes including precast installation documentation

B4.3. Key Benefits Identified Across All Pilots

Productivity Improvements:

- Significant reduction in travel time for RTOs with up to 13.33% productivity gain demonstrated in Woodlands N1 project
- Concurrent supervision capabilities enabling multiple activity monitoring
- Enhanced safety for elderly RTOs through reduced exposure to unsafe site access
- Digital record-keeping improving accountability and eliminating risk of conflicts between supervision staff and contractors

Quality Enhancement:

- Recorded supervision providing material for future training and staff improvement
- Non-compliance documentation on record eliminating foul-play risks
- Enhanced audit trail through digital platform integration
- Improved transparency in supervision processes

B4.4. Common Challenges and Industry Solutions

Technical Infrastructure Challenges:

- Internet connectivity instability causing video lag during supervision sessions
- Limited camera coverage requiring multiple viewing points for concurrent activities
- System breakdown disruptions with insufficient contingency equipment
- Inadequate zoom capability for detailed inspection requirements

Operational Implementation Challenges:

- Additional manpower requirements for camera handling and positioning
- High contractor engineer turnover affecting software utilisation
- Lighting conditions significantly affecting video footage quality
- Movement speed and steadiness of recording personnel influencing clarity

Guidebook for Remote Site Supervision v.2

- Difficulty in marking areas requiring rectification using video footage

Industry-Wide Solutions Developed:

- Reliable 1Gbps business broadband on fibre connection implementation
- Multiple camera/tripod setup for static workstations
- Technical support availability at all times for RE/RTO assistance
- Comprehensive training programmes and contingency equipment provision
- Cloud-based storage platforms with real-time supervision capabilities

B4.5. Implementation Best Practices Framework

Preparation Requirements:

- Minimum 2-week advance notification to BCA with Remote Supervision Plan submission
- Hands-free or stabilised cameras with strong internet connectivity and backup devices
- Proper site labelling, lighting provision, and safety measures implementation
- Operator readiness with same language capability and measurement tools availability

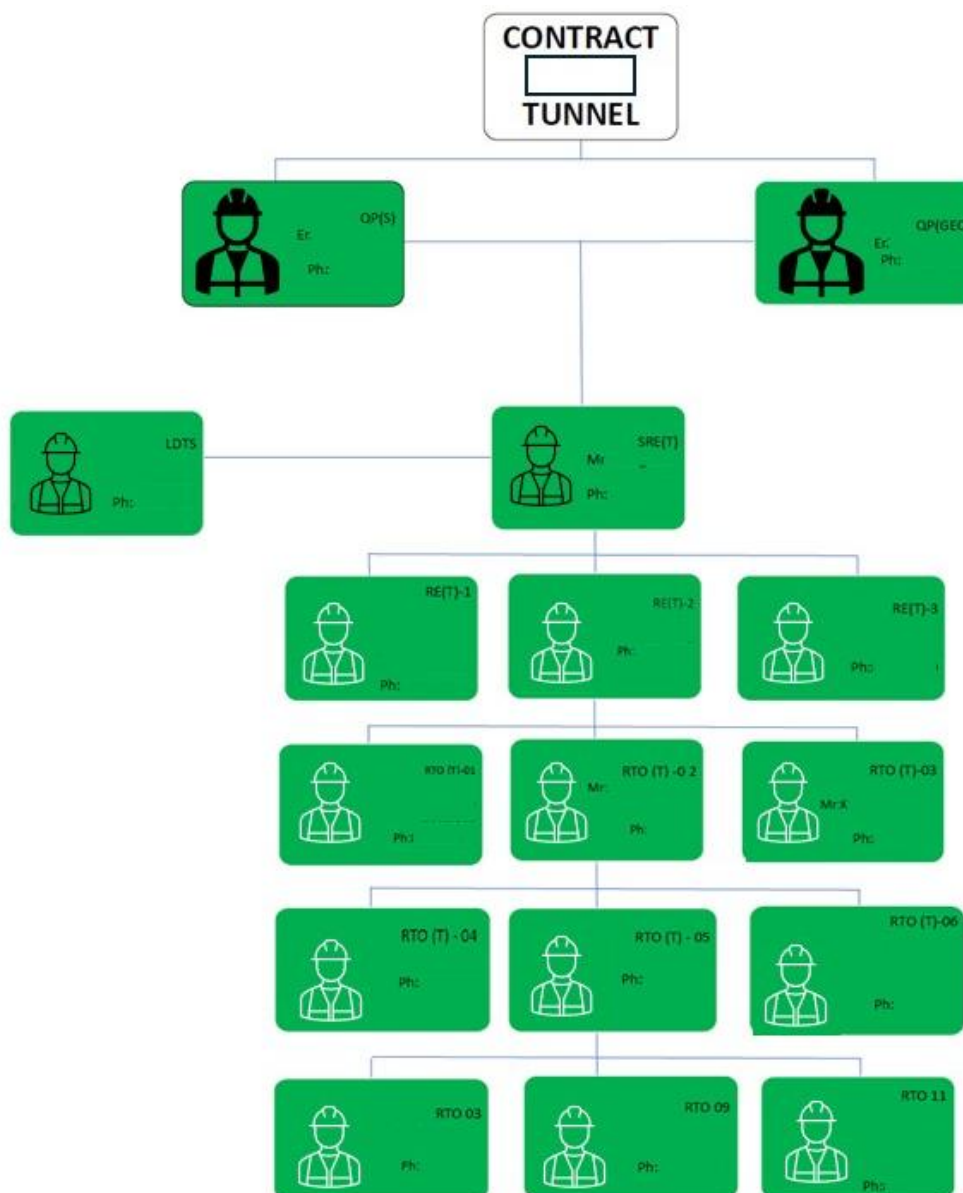
Quality Assurance Protocol:

- Briefing involving QP, Site Supervisors, Contractor, and Sub-contractor with emphasis on practical implementation
- Minimum two remote supervision sessions attended by Supervising QP for each SS validation
- Trial runs under supervision prior to full implementation
- Systematic logbook maintenance for RSS activities with clear documentation standards

Guidebook for Remote Site Supervision v.2

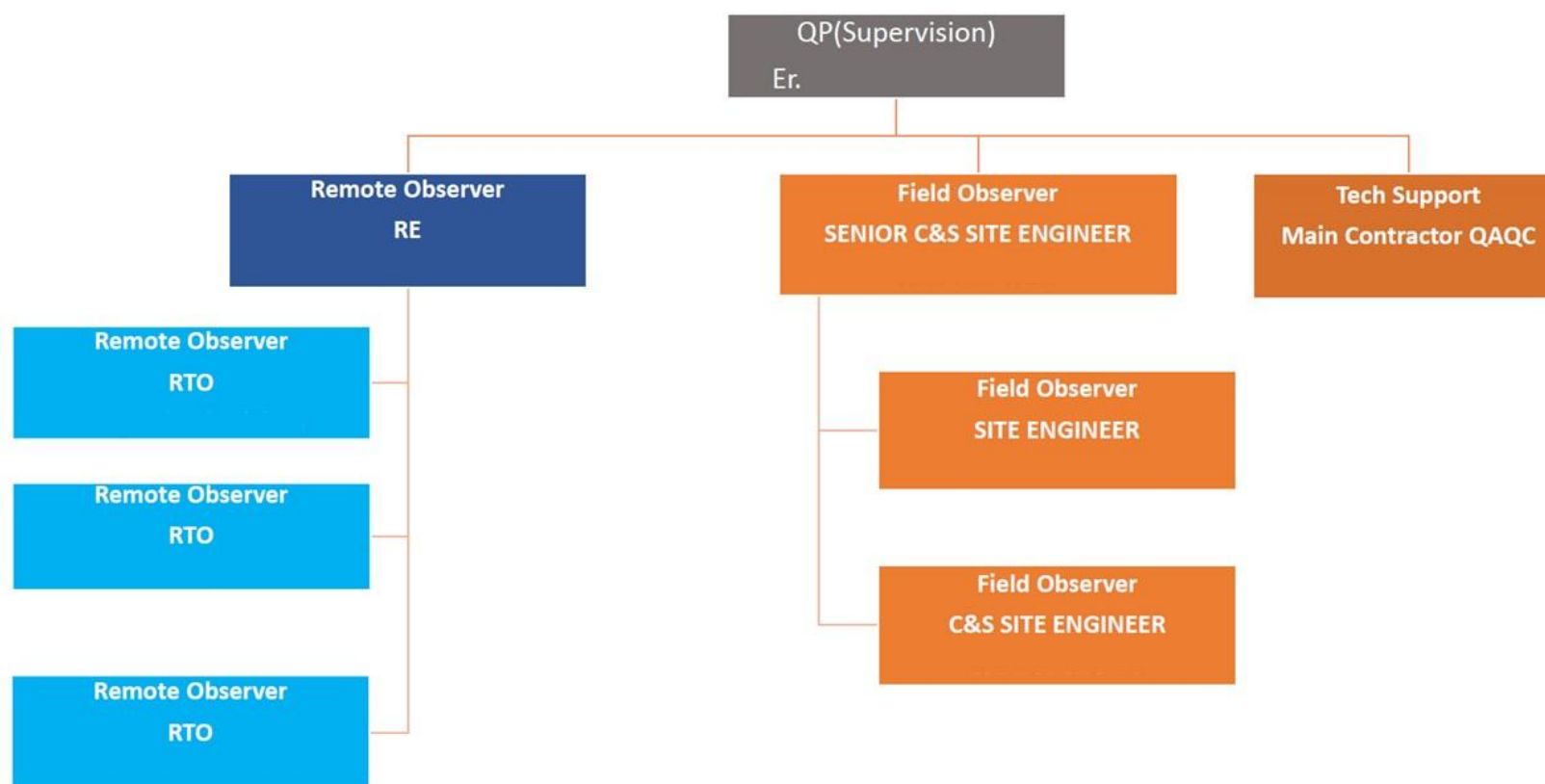
Annex C – Organisation Chart Samples

Manpower Organisation Chart Sample 1 (Tunnelling Project)



Guidebook for Remote Site Supervision v.2

Manpower Organisation Chart Sample 2 (Private Non-Landed Project)



Guidebook for Remote Site Supervision v.2

Annex D – Reference Activities List for RSS

The reference list provides the minimum supervision requirements and documentation thresholds to support RSS implementation under Section 7 of this Guidebook. It defines the scope of supervision for each activity, the applicable supervision approach (Live Streaming and/or Evidence-Based), and the minimum evidence required to demonstrate compliance. QP(S) teams shall adopt Annex D as the baseline when developing project-specific RSS arrangements. Where additional supervision measures are necessary due to risk, complexity, or site constraints, these should be implemented and documented, without reducing the minimum requirements stated in Annex D.

D1. Scope of Supervision: Concreting Works

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Material check verify the specification/requirement of steel reinforcements, couplers or any other cast-in products delivered to site with approved drawings	At least 1 screenshot photo per element shall be taken as evidence in inspection report.	Not less than 3 photos per element type shall be taken as evidence.
2	Preparation for concreting confirmation of reinforcement placement and cover with approved drawings	For non-transfer beams (<8m), cantilever beams (<2m) and columns:	For non-transfer slabs: Not less than 2 photos shall be taken as evidence for every 100m ² plan

Guidebook for Remote Site Supervision v.2

	- check the lapping, anchorage and bending requirement with general notes of approved drawings - check the cleanliness of formwork and application of debonding agent. - check concrete cover, formwork and support - check cast-in bolts, bars and anchors	Not less than 2 screenshot photos per element shall be taken as evidence in inspection report. For non-transfer slabs: At least 1 screenshot photos shall be taken as evidence for every 100m² plan area of concreting or not less than 2 screenshot photos per floor, whichever is greater	area of concreting or 5 photos per floor, whichever is greater
		QP(S) to review suitability for remote supervision to replace in-person inspection for long-span beams, long cantilever beams, transfer beams, columns and transfer slabs.	
3	Concrete Test slump test and sampling of fresh concrete for cube specimens	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo per concrete batch shall be taken as evidence
	testing at accredited laboratory		At least 1 photo per test shall be taken as evidence

Guidebook for Remote Site Supervision v.2

	(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.		At least 1 photo per concrete element shall be taken as evidence
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	Can be carried out without the need of providing screenshot photos as evidence in inspection report	Not less than 2 photos shall be taken as evidence for every 100m ² plan area of concreting or 5 photos per floor, whichever is greater

Guidebook for Remote Site Supervision v.2

	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.	For non-transfer beams (<8m), cantilever beams (<2m) and columns: Not less than 2 screenshot photos per element shall be taken as evidence in inspection report. For non-transfer slabs:	For non-transfer slabs: Not less than 2 photos shall be taken as evidence for every 100m² plan area of concreting or 5 photos per floor, whichever is greater

Guidebook for Remote Site Supervision v.2

	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.	At least 1 screenshot photos shall be taken as evidence for every 100m ² plan area of concreting or not less than 2 screenshot photos per floor, whichever is greater	
		QP(S) to review suitability for remote supervision to replace in-person inspection for long-span beams, long cantilever beams, transfer beams, columns and transfer slabs.	
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.	Can be carried out without the need of providing screenshot photos as evidence in inspection report	Not less than 2 photos shall be taken as evidence for every 100m ² plan area of concreting or 3 photos per floor, whichever is greater
8	Post-concreting inspection - in-situ test - inspection for any grout leakage after completion of concreting	Can be carried out without the need of providing screenshot photos as evidence in inspection report	Not less than 2 photos shall be taken as evidence for every 100m ² plan area of concreting or 5 photos per floor, whichever is greater

Guidebook for Remote Site Supervision v.2

	• check for any “honeycomb” and verify dimension of completed structures after removal of formwork		
--	--	--	--

Guidebook for Remote Site Supervision v.2

D2. Scope of Supervision: Post-Tensioning Works

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Preparation for concreting - check the placement of reinforcement, shear links and bursting reinforcement with approved drawings - check the placement of post-tensioning tendons with approved drawings - 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.	For non-transfer beams (<10m), cantilever beams (<3m): Not less than 3 screenshot photos per element shall be taken as evidence in inspection report. For non-transfer slabs: Not less than 2 screenshot photos shall be taken as evidence for every 100m² plan area of concreting or 3 screenshot photos per floor, whichever is greater	For non-transfer slabs: Not less than 3 photos shall be taken as evidence for every 100m² plan area of concreting or 6 photos per floor, whichever is greater
		QP(S) to review suitability for remote supervision to replace in-person inspection for long-span beams, long cantilever beams, transfer beams and transfer slabs.	

Guidebook for Remote Site Supervision v.2

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 correctly	Not less than 3 screenshot photos per element shall be taken as evidence in inspection report.	Not less than 3 photos shall be taken as evidence for every 100m ² plan area of concreting or 6 photos per floor, whichever is greater
	testing at accredited laboratory	Can be carried out without the need of providing screenshot photos as evidence in inspection report	Not less than 2 photos shall be taken as evidence for every 100m ² plan area of prestressing
3	Check the stressing equipment/ calibration certificates - calibration carried out by an accredited lab - 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		

Guidebook for Remote Site Supervision v.2

D3. Scope of Supervision: Safety Barriers

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
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	Not less than 2 screenshot photos per barrier type for every 3 floors where the barriers are to be installed shall be taken as evidence in inspection report.	Not less than 2 photos per barrier type for every floor where the barriers are to be installed shall be taken as evidence in inspection report.
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		

Guidebook for Remote Site Supervision v.2

	requirement is not indicated in the approved plans. ensure that the works are carried out by a trained installer for the selection and installation of post-installed anchors in concrete and masonry.		
3	Material test/connection tests	Can be carried out without the need of providing screenshot photos as evidence in inspection report	Not less than 2 photos shall be taken as evidence for every 3 floors where the barriers are to be installed

Guidebook for Remote Site Supervision v.2

D4. Scope of Supervision: Foundation Works (Bored Pile)

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	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)	Not less than 3 screenshot photos per pile shall be taken as evidence in inspection report.	
2	Concrete Test slump test and sampling of fresh concrete including cube specimen	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo per concrete batch shall be taken as evidence
	testing at accredited laboratory		At least 1 photo per test shall be taken as evidence
3	Boring works - verify soil type against the soil report - refer to appropriate SI bore log - ensure the use of appropriate equipment for rock coring	QP(S) to review suitability for remote supervision to replace in-person inspection	

Guidebook for Remote Site Supervision v.2

	• 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 • keep record of pile penetration/boring for each pile for as-built submission at later stage		
4	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)	Not less than 3 screenshot photos per pile shall be taken as evidence in inspection report.	
5	Check equipment, test load and witness pile load test <u>Static Load Test</u> • 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		

Guidebook for Remote Site Supervision v.2

	<u>Dynamic Load Test</u> • supervise and witness the process of every test • endorse and file the test results		
6	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 on adjacent properties • to carry out visual inspection on surrounding properties. Report to QP for any potential impact caused by the piling works	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo per monitoring instrument shall be taken as evidence

Guidebook for Remote Site Supervision v.2

D5. Scope of Supervision: Foundation Works (Displacement Pile)

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	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.	Not less than 2 screenshot photos per pile shall be taken as evidence in inspection report.	
2	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.	At least 1 screenshot photo per pile during progress and at pile set respectively shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

	- keep record of pile penetration for each pile for as-built submission at later stage. 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		
3	Check equipment, test load and witness pile load test <u>Static Load Test</u> - 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 <u>Dynamic Load Test</u> - supervise and witness the process of every test	Not less than 2 screenshot photos per pile shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

	Endorse and file the test results		
4	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	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo per monitoring instrument shall be taken as evidence
5	Precautionary of ground heave - check SI bore log for presence of soft clay strata - ensure that all measures are in-place to mitigate possible damage to neighbouring structure, e.g. relief well, settlement markers, inclinometer.	Can be carried out without the need of providing screenshot photos as evidence in inspection report	

Guidebook for Remote Site Supervision v.2

	• check for requirement of pre-boring before the installation of displacement pile.		
--	---	--	--

Guidebook for Remote Site Supervision v.2

D6. Scope of Supervision: Foundation Works (Shallow Foundation)

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Checking before concreting of footing/raft footing - concrete cover - concrete mix - footing dimension - steel reinforcements	At least 1 screenshot photo per element shall be taken as evidence in inspection report.	Not less than 3 photos per element or every 20m ² plan area of concreting, whichever is greater, shall be taken as evidence
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		At least 1 photo per activity shall be taken as evidence
	testing at accredited laboratory		
3	Excavation and preparation prior to footing construction	At least 1 screenshot photo per element after completion of	At least 1 photo showing the condition of excavated area shall be taken as evidence

Guidebook for Remote Site Supervision v.2

	- 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.	excavation shall be taken as evidence in inspection report.	
4	Concreting of footing/raft Supervise the concrete placement carried out in accordance with approved method statements.	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo per element or every 20m ² plan area of concreting, whichever is greater, shall be taken as evidence

Guidebook for Remote Site Supervision v.2

D7. Scope of Supervision: Structural Steelworks

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Material verification Check 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	Not less than 5 screenshot photos per steel section type per manufacturing batch shall be taken as evidence in inspection report.	Other than detailed photographic documentation of dimensions check, at least 1 photo per activity per steel section type and per manufacturing batch shall be taken as evidence
2	Class of structural steel		

Guidebook for Remote Site Supervision v.2

	Check 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).		
3	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	At least 1 screenshot photo per bolt type and per connection joints/splice joints shall be taken as evidence in inspection report.	At least 1 photo per check activity per bolt type and per connection joints/splice joints shall be taken as evidence
4	Welded Connection	At least 1 screenshot photo per each type of weld connection after	

Guidebook for Remote Site Supervision v.2

	• 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	completion shall be taken as evidence in inspection report.	
5	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	Not less than 1 screenshot photo per each type of bolt connection after completion shall be taken as evidence in inspection report.	At least 1 photo per check activity per bolt connection type shall be taken as evidence

Guidebook for Remote Site Supervision v.2

	proposes alternative, or the bolt types are not indicated in the approved plans		
6	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 with QP's design • safe work platform & access to be provided	Can be carried out without the need of providing screenshot photos as evidence in inspection report	
7	Painting and Surface Preparation • check that galvanised steel / steel surface is prepared and painted/coated to approved plans and specifications		At least 1 photo shall be taken as evidence for every 400m ² plan area of steelworks or 2 photos per floor, whichever is greater

Guidebook for Remote Site Supervision v.2

8	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.		
---	--	--	--

Guidebook for Remote Site Supervision v.2

D8. Scope of Supervision: Demolition

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
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	Not less than 5 screenshot photo document each day of demolition in progress shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

	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 slabs. - where machinery is used, check for the allowable or safety zone for movement of machinery on building floor during demolition and in accordance with the approved demolition plan - check on the safe working spaces and exclusion zones for demolition/partial demolition over		

Guidebook for Remote Site Supervision v.2

	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	Not less than 3 screenshot photos shall be taken as evidence in inspection report.	
4	Demolition involving post-tensioned structures - check the demolition sequence for post-tensioned structures - precautionary measures for de-tensioning of prestressed strands to prevent hazard due to possible fly-out of the strands	Not less than 5 screenshot photos document each day of demolition in progress shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

D9. Scope of Supervision: Precast Concrete Components

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
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	At least 1 photo shall be taken as evidence for each type of precast element per batch delivered to site in inspection report.	At least 1 photo for each check activity for each type of precast element per batch delivered to site shall be taken as evidence
2	Installation check for shim plates/ washers e.g. with spring	At least 1 photo shall be taken as evidence for each type of precast	

Guidebook for Remote Site Supervision v.2

	• 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	element before and after installation in inspection report.	
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 backflow observed		
4	Horizontal joint		

Guidebook for Remote Site Supervision v.2

	• 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 backflow observed	At least 1 photo shall be taken as evidence for each type of joint grouting after installation in inspection report.	At least 1 photo for each joint location before and after completion shall be taken as evidence
5	Pre-bedding process for horizontal joint • supervise for grout mixed • supervise and ensure that the grout mixing and grouting works are carried out 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		

Guidebook for Remote Site Supervision v.2

6	Pre-concreting checks • check that the shop drawings 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)	Not less than 2 screenshot photos per element for every check cycle shall be taken as evidence in inspection report.	
7	Concreting • supervise the pouring concrete/ concreting • supervise making of test cube • supervise slump test	Not less than 2 screenshot photos per element for every concreting cycle shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

	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	At least 1 screenshot photos per element after removal of formwork shall be taken as evidence in inspection report.	Not less than 2 photos per element after removal of formwork shall be taken as evidence

Guidebook for Remote Site Supervision v.2

D10. Scope of Supervision: Curtainwall & Cladding

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Test requirements torque wrench test, functionality test, adhesion test, non-staining test and deglazing test	Can be carried out without the need of providing screenshot photos as evidence in inspection report	
	Material tests SS shall perform intermittent or spot checks for the material test carried out at accredited laboratory		
2	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	Not less than 2 screenshot photos for every similar cladding frame shall be taken as evidence in inspection report.	Not less than 3 photos for every similar cladding frame for every 3-metre run shall be taken as evidence
3	Installation - Installation of transoms and mullions a. check control point and alignment		

Guidebook for Remote Site Supervision v.2

	b. check in position screws, washer and bolts • Installation of panels a. check alignment of panels b. check fin/capping/gasket engagement c. check bolt/nut properly tighten d. check for setting block, self-weight supports e. check for structural sealant • Installation of retaining devices and fixings a. test for retaining devices		
--	--	--	--

Guidebook for Remote Site Supervision v.2

D11. Scope of Supervision: ERSS Works

Supervision Requirements		Live Streaming Supervision	Evidence-Based Supervision
1	Ensure the excavation profile and sequence is in accordance with approved plan.	At least 1 screenshot photo for every similar excavation profile shall be taken as evidence in inspection report.	Not less than 2 photos for every similar excavation profile for every 10-metre run shall be taken as evidence
2			
3	Installation of earth retaining wall including capping beam ensure the earth retaining wall including capping beams are in accordance with approved plans	Not less than 3 screenshot photos for every similar retaining wall type shall be taken as evidence in inspection report.	Not less than 2 photos for every similar retaining wall type for every 5-metre horizontal run shall be taken as evidence
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	Not less than 1 screenshot photo for every installation or removal after completion for every 5-metre horizontal run shall be taken as evidence in inspection report.	

Guidebook for Remote Site Supervision v.2

	- 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	Not less than 1 screenshot photos for every 10-metre horizontal run or 3 photos for every 100m ² plan area of such works shall be taken as evidence in inspection report, whichever is greater	
6	Protection measures associated with ERSS works ensure protection measures are installed in accordance with the details specified in the approved drawings.	Can be carried out without the need of providing screenshot photos as evidence in inspection report	At least 1 photo for every similar excavation profile for every 10-metre horizontal run shall be taken as evidence
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.	Can be carried out without the need of providing screenshot photos as evidence in inspection report	

Guidebook for Remote Site Supervision v.2

	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		
--	---	--	--