# Guidebook for
# SITE
# MANAGEMENT
# PLATFORMS

**Pre-release**

**Part A – For Solution Providers**

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# ACKNOWLEDGEMENTS

# Disclaimer

This Guide is a summary of practices and recommendations that may be adopted for the application of Site Management Platform (SMP) and does not purport to be exhaustive or applicable to all situations.

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# 1     INTRODUCTION

## Definition of Site Management Platforms

The construction process, from start to finish, entails complex procedures that result in the constant production, collection and management of data at the construction site. Site Management Platforms (SMPs) serve as a centralised digital hub to collect and consolidate such construction works information and data. Through SMPs, project parties can efficiently communicate and share information, facilitating seamless flow of data across the construction project.

## Examples of data that can be stored on Site Management Platforms



Site Progress and Milestone Data

Material Procurement Data

Workforce and Productivity Data

Quality Control and Inspection Data

Design and Engineering Data

Environmental Impact and Sustainability Data

Worker Safety Data

AND MORE...

**Site Management Platforms** consolidate data from the site for effective internal reporting and analysis.
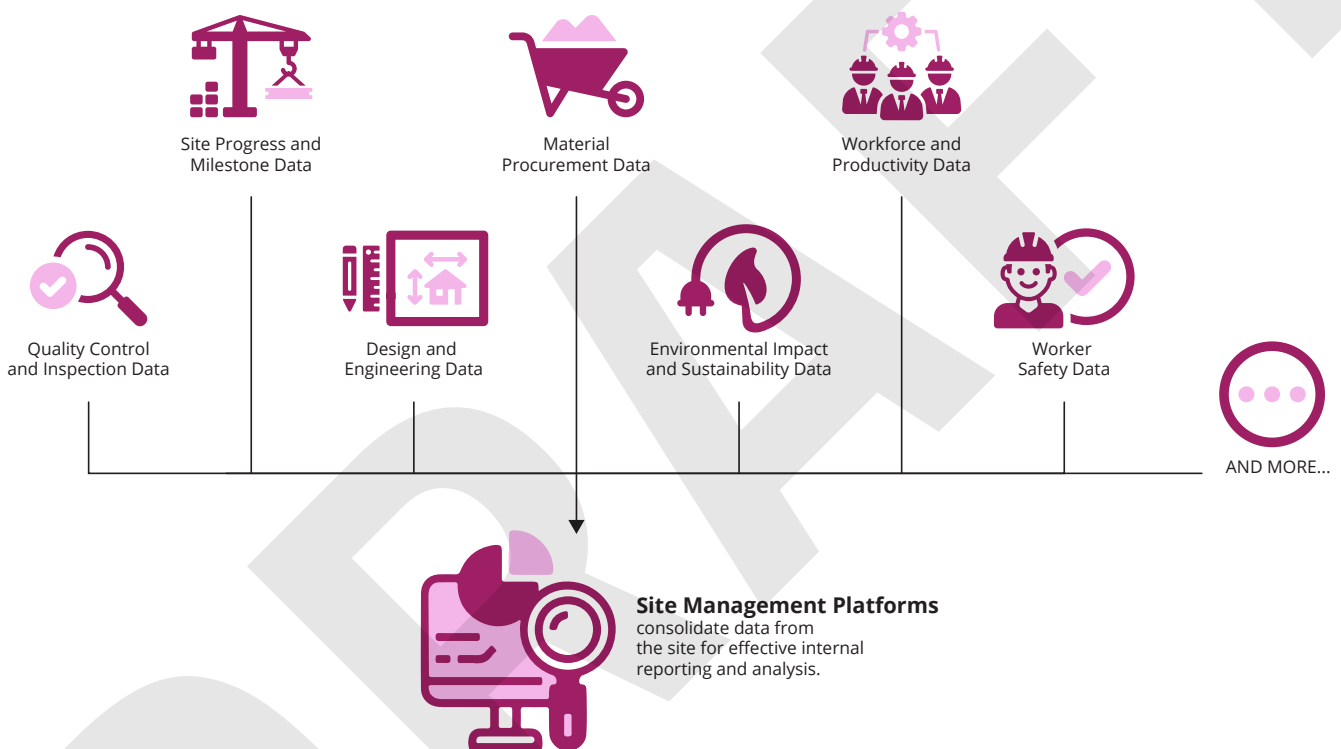
This Guide is intended to help solution providers set up SMPs for BCA regulatory use cases, and includes basic functional requirements and recommended workflows for digital management of essential site and test records. Other project parties including Developers, Builders, Site Supervisors, Supervising Qualified Persons (as defined in the Building Control Act 1989) ("Supervising QPs") may also refer to this guide to work with solution providers for SMP adoption.

## Common Data Environment

The adoption of a Common Data Environment (CDE) is pivotal in streamlining collaboration and information management for a construction project. The CDE serves as a unified platform for storing, sharing, and accessing project data, promoting transparency and efficiency across the construction life cycle. The SMPs can form part of the CDE, when connected through Application Programming Interface (API). This will then enable seamless sharing of construction site data among project stakeholders, thereby enhancing overall project coordination and delivery.

# PART **1**

# OBJECTIVES OF SITE MANAGEMENT PLATFORMS

**Digitalisation and technology have brought about numerous benefits to the entire lifecycle of construction projects. For instance, it can save time in the field by enabling one-time data collection for use within the team, and faciltate the monitoring of daily site work progress at the project office as well as global operations performance at the headquarters.**

Adopting SMPs as the digital platform for collecting construction site data offers benefits for various parties :

- Stakeholders
- General and specialist contractors
- Architects
- Engineers

- Facility and property managers
- Consultants
- And more.



SMPs can be applied in various ways within the construction industry as the digital platform to collect construction site data and manage the workflows of site activities. Users can utilise the captured data to monitor and report work progress. Such timely reporting and alerts of work progress can enhance work productivity, workplace safety, and quality performance. Examples of the diverse applications of SMP, including but not limited to the following, are listed below.

## Work Productivity

SMPs can assist in managing equipment and resources efficiently. By using an SMP to monitor daily site records, deployment of resources such as site workers, materials, transportation etc. can be improved and arranged in advance. SMPs help to provide visibility of resource availability and optimise resource allocation to reduce wastage and increase productivity.

In addition, proper planning for site activities can help to reduce operational costs. SMPs can be used to better manage project schedules, task assignments and track progress to ensure timely completion of tasks, reducing downtime.
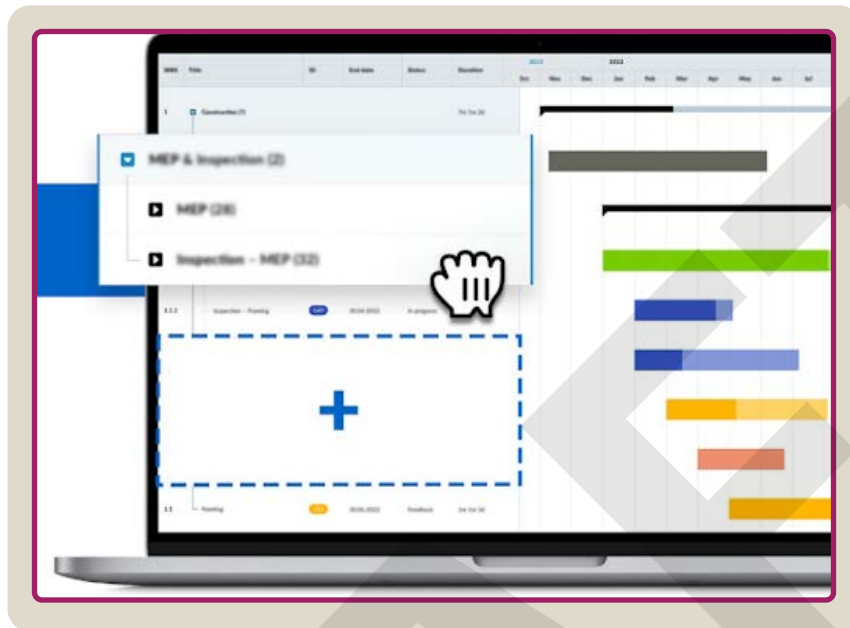


## Construction Structural and Workplace safety

SMPs can play a crucial role in improving structural safety at construction sites through the proper documentation of site records. They achieve this by enabling the effective tracking of structural elements, adherence to the approved plan and the implementation of proactive measures to maintain quality of works and structural integrity. SMPs can also be used for work accident reporting ensuring prompt attention and investigation. Using SMPs to track safety incidents and near-misses can help to identify trends, implement corrective actions and prevent similar incidents in the future. This then allows supervisors to better conduct safety inspections and audits, thereby promoting a culture of proactive safety management and compliance with regulations.
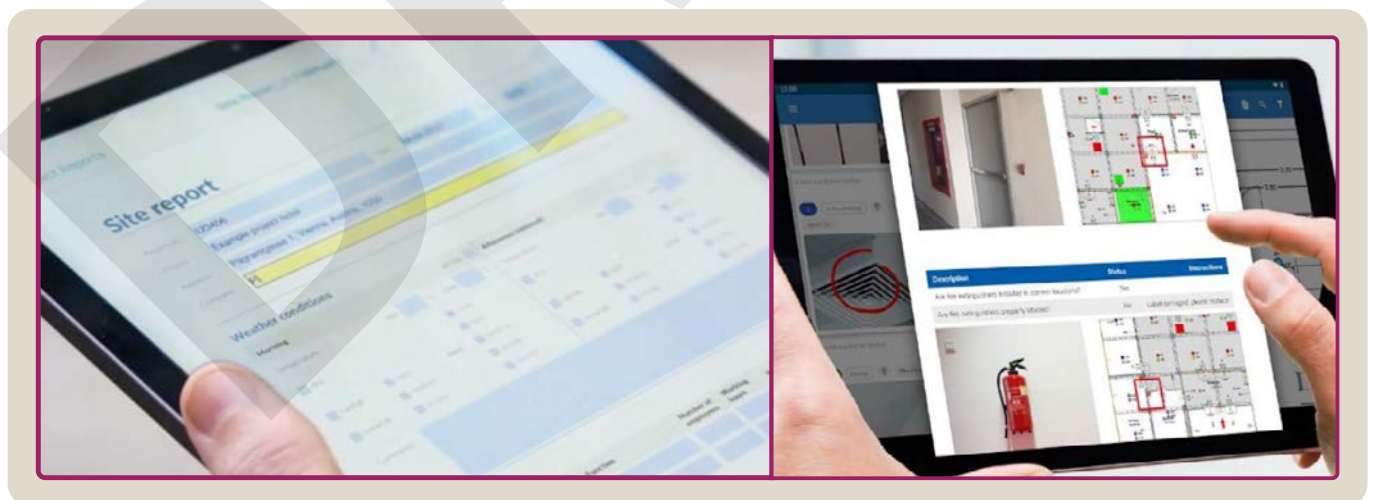
## Site Supervision

SMPs can also greatly improve site supervision for Qualified Persons (QPs) by enhancing their oversight, and enabling them to remotely monitor construction activities, assign tasks, communicate with the team, manage documents, and generate reports for informed decision-making.

## Improved Data Accuracy and Document Management

SMPs provide a standardised template for data entry, ensuring consistency and accuracy across different records. Using SMPs as a centralised repository for storing and managing project documents will also reduce the chances of referencing incorrect or outdated information.

## Quality Performance and Data Analytics

Consistent use of SMPs to collect data over time will allow for data analytics. This will enable  users to identify trends, take immediate actions to solve issues and improve the quality of performance.



## Audit Trail

SMPs often offer version control and an audit trail feature, allowing users to track changes made to records over time. This helps in identifying who made the changes and when, ensuring accountability and transparency.

### Note: This guidebook focuses on data collection related to structural safety

While SMPs can be used in many ways, the primary focus for this guidebook is outlining necessary modules for collecting data related to structural safety to serve the needs for BCA as regulators. This guidebook will not detail specific requirements for use-cases beyond structural safety. Solution providers should consult with their clients on their additional needs or provide additional modules/fields to value-add and meet their client's specific requirements.



*Focus of this guidebook*
**Structural Safety**

**Productivity**

**Workplace Safety**

**Quality**

**Others**

**Client's Needs**

**Project Data**

**Regulator's Needs**
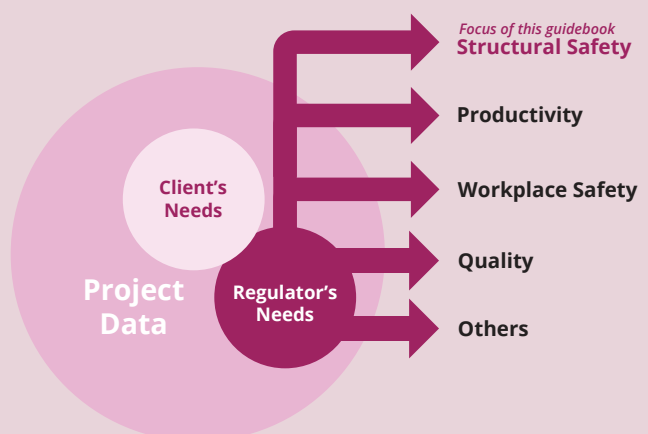
# PART **2**

# FUNCTIONAL REQUIREMENT OF SMPs

## Form and Data Requirements

This section covers the required structured and unstructured data as well as optional data to be collected in SMPs.

*Structured data* refers to organised and formatted information that is readily identifiable and searchable. It is typically presented in a well-defined and predictable format, often using rows and columns, making it easy for machines to interpret and process. This structured format allows for efficient storage, retrieval, and analysis of the data, enabling automated processing and analysis. Examples of structured data include data in relational databases, spreadsheets, and standardised file formats such as CSV (Comma-Separated Values) and JSON (JavaScript Object Notation)

*Unstructured data* refers to information that does not have a predefined data model or is not organised in a pre-defined manner. This type of data does not fit neatly into traditional databases or spreadsheets and lacks a specific structure, making it more challenging to analyse using conventional methods. Unstructured data can include text documents, images, audio files, video files, social media posts, and other forms of content that do not have a fixed format.

| **Required** (Compulsory datasets for projects adopting SMPs) | | | | |
|---|---|---|---|---|
| **(A) Structured Data** | | **(B) Unstructured Data** | | |
| A1 | QP/SS Attendance Record | B1 | Pre-con Survey Report | |
| A2 | Site Investigation Report | B2 | Temporary Building Design (COS, PE Design & Layout plans) | |
| A3 | Pile Load Test | B3 | Steel Mill Cert & FPC | |
| A4 | Piling Installation Record | B4 | Welding Test Report | |
| A5 | Instrumentation & Monitoring | B5 | QP(D) Approval for Proprietary Product | |
| A6 | ERSS Annex C-1: Site inspection & Approval Records | B6 | 360 Captures | |
| A7 | Annex D: Certification of Monitoring Building Settlement | B7 | Original Reports for structured datasets (if necessary) | |
| A8 | Concrete Cube Test Results | B8 | BCA Permit to carry out structural work* | |
| A9 | Steel Strength Test Results | B9 | BCA Approved drawings/ Amendment plans* | |
| A10 | Generic Notification Module | | | |
| A11 | Site Progress | | | |
| A12 | MET test results (finger joint, delamination, bending and shear test) | | | |

*Table 1: List of required data*
*\*Documents are issued by BCA and will be required to be kept on SMP for project's own reference*

Optional data refers to information that is not mandated by BCA for storage in SMPs. However, it represents a valuable filing practice that facilitates efficient data processing, analysis, and reporting, ultimately leading to time and resource savings.

| | **Optional**<br>(Good to have and implement in SMPs) |
|---|---|
| C1 | RFI Forms |
| C2 | Inspection Checklists (as stated in site supervision guidebook) |
| C3 | Schedule of Works |
| C4 | Information of piling machines (including calibration records) |
| C5 | Images of soil condition/rocks |
| C6 | Records of point load test for rocks |
| C7 | Shop drawings & approval from Qualified Person |
| C8 | Construction drawings (issued by Qualified Person) |
| C9 | Method of statements / construction sequence |
| C10 | Post-tensioning records (elongation calculated and measured) |
| C11 | Grouting records |
| C12 | Appointment of Specialist Builder/ Professional Engineer |
| C13 | Purchase order (concrete, structural steel, rebars, MET, fixings) including products certification e.g. Conformité Européene (CE) marks for MET |
| C14 | Information on other construction materials and products (post-installed anchor, acrylic, fixings, aluminium) |

*Table 2: List of optional data*

## Form and Data Management

Data standardisation plays an important role in ensuring that the data collected is correct and consistent in terms of formats, structures and conventions. The objective of data standardisation is to maintain data accuracy, ensure the data is usable for analysis, and encourage interoperability across the industry.

This section serves as a guide on the data standards for structured data and documentation storage plan with a list of standard file naming and the directory for filing systems for unstructured data. Users are advised to refer to Site Management Data Standards for the data standardisation requirements of structured data.

For both unstructured and optional data, vendors should provide customised solutions to store the documents and information in SMP based on the requirements of different system owners.

For unstructured data, the system owner should determine a standardised documentation storage plan to serve as a directory for users to find and store documents. This information may be documented as PDF, images, drawings or MS Word document files. The recommended documentation storage plan for required unstructured data is tabled below. Any source documents to generate the required structured data (e.g. original concrete cube test reports) should also be kept in the SMP neatly for audit purposes.

| SN | Document | Description | Example Folder Name | Directory |
|---|---|---|---|---|
| 1 | **Pre-construction Survey Report** | Pre-construction Survey and relevant documents/photos | BCA >> Pre-con Survey >> [Project Name] | BCA >> Pre-con Survey >> [Project Name] |
| 2 | **Temporary Building** | Temporary Building COS, PE Design, Room Layout Plan etc. | BCA >> Temporary Building >> [Building name] | BCA >> Temporary Building >> Site Office Block A |
| 3 | **Steel Mill Cert & FPC** | All material certificates | BCA >> Certification >> [Cert Name] | BCA >> Certification >> Steel Mill Cert |
| 4 | **RFI** | All RFI forms | BCA >> RFI >> Workstream >> Serial no. Ex: BCA >> RFI_ ARCH_001 | BCA >> RFI >> ARCH |

## Workflow and Report Management

Examples of recommended workflow and processes for the dataset are shown below. These recommendations serve as a reference to develop SMPs. Solution providers should work with clients to customise the workflow and processes for each dataset and ensure necessary endorsements are met.
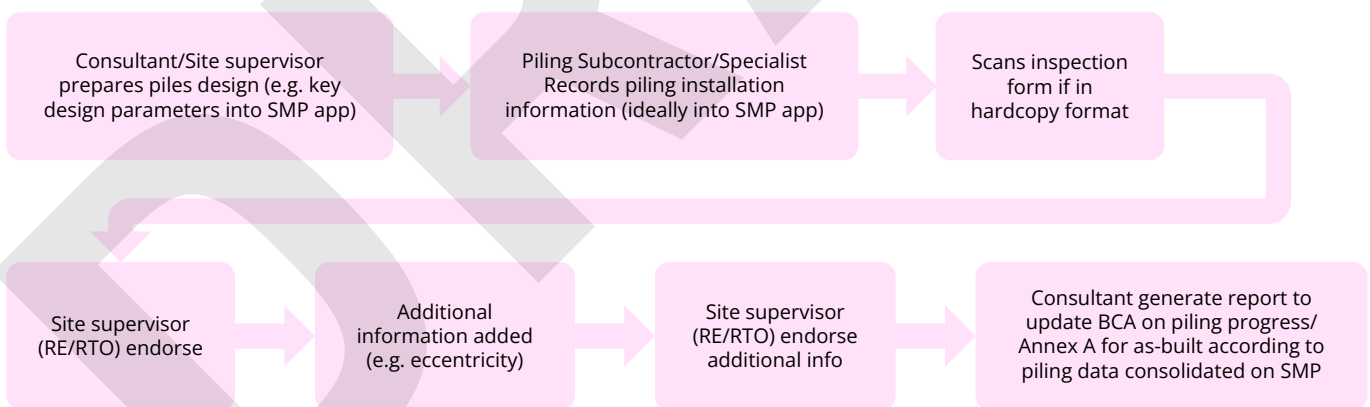


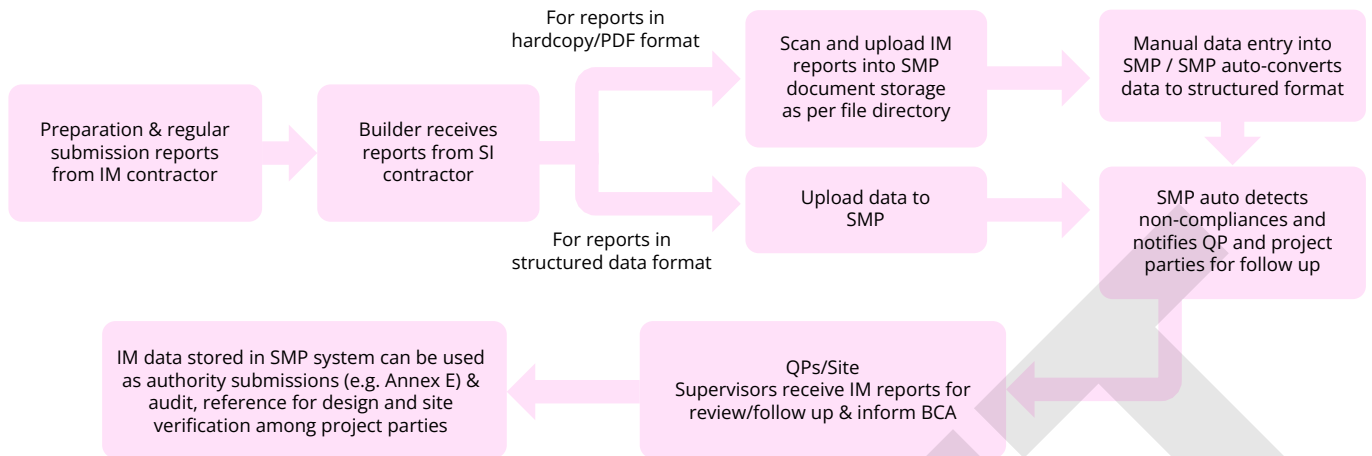*Figure 1: Recommended workflow of piling installation record*

*Figure 2: Recommended workflow of Instrumentation and Monitoring record*

## Essential Functions

The basic functions below are recommended to be included in SMPs. Solution providers should be able to provide these functions when developing the SMP:

a.    Time-based electronic processes to circulate forms and records automatically to designated users

b.    Issue notifications to designated users according to workflow assignment

c.    Auto-trigger data and alert authorised users for action on critical issues e.g. material test failure, instrument reading exceeds alert level

d.    Generate reminders by means of emails/ push notifications for events such as overdue/ outstanding actions, incomplete workflow processes, data or poor performance etc.

## User Management

This section covers the role and responsibilities of authorised users and user access rights.

Solution providers should provide the service requirements listed below.

a.    Allow system owners to assign users based on different user groups, as well as manage and assign different access rights to different users or user groups.

b.    Allow system owners to issue login usernames and passwords to users by email notification.

c.    Allow users to reset passwords with their registered email and  various factor authentications. Given that the data is owned by the project team, solution providers should enhance user authentication and security protocols to align with Personal Data Protection Act (PDPA) guidelines.

## Smart Site Sensors Management

Smart site sensors refer to sensors equipped with advanced technologies that allow users to monitor and collect data from various aspects of physical sites or locations. These sensors can be deployed in areas such as buildings or industrial facilities to gather information such as structural and environmental conditions, safety and energy usage.

Solution providers are encouraged to provide seamless integration with different smart site sensors available in the market to incorporate with SMPs. For example, smart site sensors that can be integrated with SMPs include 360 captures and CCTVs with AI capabilities. 360 captures can enable comprehensive inspections and defect tracking on construction sites by providing immersive views for remote assessment, progress tracking, and collaboration. On the other hand, CCTV with AI can be used to automatically detect safety violations, potential hazards, track construction progress, and optimise resource allocation through real-time monitoring and analysis of site activities. These serve as valuable documentation and analysis tools that can enhance efficiency and accuracy in site management.

### Accessibility of Other Devices

SMPs are recommended to be accessible by mobile devices to enable workers to refer to plans and record observations on the go, fostering real-time communication and data access. Contractors should ensure the readiness of infrastructure, such as reliable internet connectivity and mobile device support, to facilitate seamless access to the platform, thereby enhancing productivity and collaboration among on-site personnel.

# PART **3**

# OTHER OPERATIONAL REQUIREMENTS

## IT security requirements

Companies are responsible for the cyber and data security of the SMPs they adopt, as well as for access given to users. It is essential that companies understand potential risks and take appropriate measures to protect their data and systems from cyber threats. If needed, companies can consider engaging a specialist or consulting firm with expertise in cybersecurity to assess risks, provide recommendations, and assist in implementing robust security measures.

Companies may refer to the Infocomm Media Development Authority (IMDA) and Cyber Security Agency of Singapore (CSA) websites for more information.

Companies should also consider adopting SMPs that have the capability to interface seamlessly with other systems if necessary. This allows for future collaborations, data sharing with partners or stakeholders, and the ability to leverage emerging technologies. SMPs that possess inherent interoperability and the potential for smooth integration can enable companies to adapt to evolving needs and future-proof their systems.

## System Maintenance

Regular system maintenance is crucial to prevent downtime and disruptions to site operations. By conducting routine maintenance activities, companies can ensure that their SMPs and associated systems are functioning optimally. This includes tasks such as software updates, hardware checks, data backups, and performance monitoring. Proactive maintenance helps identify and address potential issues before they escalate, minimising the risk of unexpected system failures or downtime. By prioritising system maintenance, companies can maintain the reliability, availability, and performance of their SMPs, ensuring smooth operations and minimising any negative impact on site activities.

## Archiving of Data After Project Completion

Data stored on the SMP should be archived and handed over to stakeholders, such as the developer, to preserve project information. This is to ensure that stakeholders have access to valuable resources for future references, maintenance and potential legal or regulatory requirements.

## Feedback

This Guide will be updated progressively from the First Edition published on April 2024. We welcome your comments about this Guide to help us continue to develop and improve it. Please provide your inputs at https://go.gov.sg/smpguidefeedback or scan the QR code on the right.