香 港 特 別 行 政 區 政 府
The Government of the Hong Kong Special Administrative Region

政府總部
發展局
工務科

香港添馬添美道 2 號
政府總部西翼 18 樓

Works Branch
Development Bureau
Government Secretariat

18/F, West Wing,
Central Government Offices,
2 Tim Mei Avenue, Tamar,
Hong Kong

Ref : DEVB(PSGO)38/2
Group : 5

17 February 2023

Development Bureau
Technical Circular (Works) No. 2/2023

Digital Works Supervision System

Scope

This Circular sets out the policy and requirements on the adoption of the Digital Works Supervision System (DWSS) in capital works contracts under the Capital Works Programme, with pre-tender estimate exceeding $30 million and to be tendered on or after 1 April 2023. Capital works contracts tendered prior to 1 April 2023 shall implement the enhancements to the DWSS stipulated in this Circular as far as practicable.

Effective Date

2. This Circular takes immediate effect.

Effect on Existing Circulars and Circular Memoranda

3. This Circular supersedes DEVB TC(W) No. 3/2020.

Background

4. The Government is leading the construction industry to make change by implementing "Construction 2.0" advocating "Innovation", "Professionalisation" and "Revitalisation" to uplift the capacity and sustainability of the industry, increase productivity, enhance regulation and quality assurance, improve site safety and reduce environmental impact.

5. As promulgated under DEVB TC(W) No. 3/2020, all capital works contracts, with pre-tender estimate exceeding $300 million and tendered on or after 1 April 2020, are required to adopt the DWSS to enhance the standard and efficiency of works supervision as well as the quality and safety of works.

6. With an aim to further uplifting the performance of capital works contracts, the Works Policies Coordination Committee endorsed at its meeting in October 2022 the policy to further enhance the DWSS through the promulgation of this Circular. The DWSS shall be enhanced with the followings –

(a) wider adoption of the DWSS by lowering the adoption threshold of pre-tender estimate from $300 million to $30 million;

(b) enhancement to workflow modules by adding a new Contract Management Module, and incorporating Inspection and Test Plan in the RISC Form Module;

(c) inclusion of Smart Site Application Module to collect and consolidate data from different smart site applications; and

(d) other enhancements such as issue of Data Standardization Report for DWSS.

Policy

7. Capital works contracts, including capital subventions contracts under Head 708, with pre-tender estimate exceeding $30 million, shall adopt the DWSS. Bureaux/Departments should adopt as far as practicable the DWSS in other works

contracts, such as maintenance and term contracts, with a view to strengthening works supervision.

Adoption of the DWSS

8. The DWSS is essentially a web-based centralised portal of collecting construction works information and managing the workflows of site activities and contract management to enhance efficiency, safety and quality performance. The DWSS is also the centralized platform for all different smart site applications deployed on site. The DWSS shall be accessible through secure network and operated on desktop and laptop computers and mobile devices.

9. The captured data shall be synchronised automatically across all devices and servers to support efficient flow of information including site records among contractor, site supervisory staff and employer/client, and enable timely reporting and alert of works progress and performance.

Design Stage

10. The DWSS shall form part of the proposal for contract computer facilities under the Project Administration Handbook. In preparing the contract specification, the employer/client and/or the consultants shall refer to the reference specification at **Annex A** which sets out the basic requirements of the DWSS. Apart from the mandatory modules as stipulated in Section 1 of the reference specification, additional provisions or modification to the reference specification may be imposed to address specific requirements of individual works contract if justified. The employer/client and/or the Consultants shall take into account the nature and scope of works contract, establishment of site supervisory staff, availability of mobile network and Wi-Fi provision in construction site, etc. Approval of the DWSS specification shall be sought from an Approval Officer as required under the Project Administration Handbook.

11. The estimated cost of the DWSS shall not exceed $1.5 million or 1% of pre-tender estimate whichever is higher, with a cap of $10 million. If the aforementioned limit is to be exceeded, approval from an officer at D2 rank or above shall be obtained. For the avoidance of doubt, the estimated cost of the

DWSS[1] shall not form part of the estimated cost of contract computer facilities under the Project Administration Handbook.

Construction Stage

12. The employer/client's representative[2] shall review Contractor's DWSS proposal against the contract specification and seek employer/client's endorsement before accepting the DWSS proposal.

Completion of Contract

13. Upon completion of the contract, the DWSS shall be handed over to the employer/client for record and facilitating future operation and maintenance works.

Technical Audit

14. As the DWSS is of high importance to the contract management and site supervision of capital works contracts, a standard item on the proper adoption and use of the DWSS will be added to the technical audits of capital works contracts.

Interface with Integrated Capital Works Platform

15. The Development Bureau is developing in phases the Integrated Capital Works Platform (iCWP) to collect and consolidate data from the DWSS and other digital systems for continuous monitoring and data analysis such that the overall management and performance of capital works projects could be further enhanced. Selected data from the DWSS shall be standardised and transferred to the iCWP according to the Data Standardisation Report for the

[1] Whilst the DWSS provides a centralized platform to collect and consolidate data from different smart site applications, the provision of these smart site applications does not form part of DWSS.

[2] Employer/client's representative means the Architect, the Engineer, the Supervising Officer, the Project Manager or the like as defined under the contract.

DWSS[3], which is a living document with future updates by the Development Bureau as appropriate.

Exemption

16. As a transitional arrangement for smaller capital works contract (pre-tender estimate between $30 million and $300 million) tendered on or before 31 December 2024, an officer at D2 rank may exempt the adoption of the DWSS as required under this Circular.

17. Apart from paragraph 16, on exceptional grounds, such as substantial impact on project delivery or projects of little works content, the Head of the department concerned may exempt the adoption of the DWSS as required under this Circular.

Enquiries

18. Enquiries on this Circular shall be addressed to Chief Assistant Secretary (Works) 1.

(Ricky C K LAU)
Permanent Secretary for Development (Works)

[3] The Report is accessible at the DEVB website

Annex A

Reference Specifications for DWSS

Contents

System Requirements for DWSS

1. General

1.1 System Description

1.1.1 The Digital Works Supervision System (DWSS) is a centralized construction management platform for efficient contract management, supervision and monitoring of construction sites. It should be incorporated with workflow-enabled application system which consists of the following six mandatory modules to facilitate the digital processing of the required forms and records with one centralised database system:

i. Request for Inspection/Survey Check (RISC) Form;
ii. Site Diary/Site Record Book;
iii. Site Safety Inspection Records;
iv. Cleansing Inspection Checklists;
v. Labour Return Record; and
vi. Contract Management.

The functional requirements of the abovementioned mandatory modules are detailed in Section 7.

1.1.2 Apart from the workflow-enabled application modules, the DWSS shall also include Smart Site Application Module as the centralized platform to collect and consolidate data from all different smart site applications deployed on site such as internet of things (IoT), remote sensors, artificial intelligence (AI) applications, and smart carry-on devices, etc.

1.1.3 The employer/client's representative[1] shall appoint and assign duties of system administrator(s) for the employer/client, the employer/client's representatives, contractors or other parties as approved by the employer/client's representative to manage and assign functional modules, access right and authorities, etc. to different staff in their organisations.

1.1.4 The DWSS shall be fully accessible via a web-browser by a desktop

[1] Employer/client's representative means the Architect, the Engineer, the Supervising Officer, the Project Manager or the like as defined under the contract.

computer/laptop computer with secured internet connection (HTTPS) without physical or geographical limitation. No other desktop software or licenses shall be required to access the DWSS.

1.1.5 The DWSS shall be fully accessible by a Mobile App on iOS and Android operating systems through internet connection. The Mobile App installed on mobile devices shall support the input, storage and retrieval of data, photographs and/or attachments into/from a centralised database storage for designated workflow processes and smart site applications.

1.1.6 The DWSS shall support English display and input. If requested by the employer/client's representative, the DWSS shall support multi-language display, including Traditional Chinese, automatically according to the language settings of users' internet browser and mobile devices.

1.1.7 The DWSS shall be designed to manage the workflows of submission and approval processes during the administration and supervision of the construction activities. The data collected shall be stored as its original format (including but not limited to textural and numerical) in database fields, which could be made available to third-party applications, including but not limited to Integrated Capital Works Platform (iCWP), through an Application Programming Interfaces (API) or Web Services (e.g. Restful) within 24 hours. Dataset transferred from DWSS to iCWP shall be standardised according to the Data Standardisation Report as referred in paragraph 15 of the Technical Circular.

1.2 Mobile App Requirements

1.2.1 The Mobile App shall be a native application which includes the ability to implement/trigger the native library on mobile devices such as camera, GPS, messaging, alert and notification directly.

1.2.2 The users shall be able to execute the required actions, including but not limited to submission, approval and operations, directly on the Mobile App. The captured data shall be automatically synchronised with the backend servers of the DWSS application systems (either physical server or cloud platform) whenever internet connection is available.

1.2.3 The DWSS shall be able to temporarily cache/store information and data on

mobile devices at the time of inspection or completing the records when internet connection is not available. All the records in the temporary cache/storage shall be automatically synchronised to the backend servers of the DWSS application systems once internet connection is available.

1.2.4 Notifications shall be issued to the users from the Mobile App for assigned action items.

1.2.5 The Contractor shall maintain the Mobile App to support the latest iOS or Android operating system.

1.3 System Availability

1.3.1 The DWSS servers shall always be accessible when internet connection is available. The users shall be able to access the system with internet browsers or Mobile APP to undertake daily operation without physically and geographical limitation.

1.3.2 The Contractor shall guarantee 99.9% system uptime during working hours of the Contract. The Contractor shall provide redundant infrastructure, including hardware, software and network connection, as a measure of system failover to ensure the system stability and accessibility.

1.3.3 Planned maintenance shall be undertaken outside working hours or as agreed with employer/client's representative. Full backup of system data shall be undertaken before conducting major system maintenance.

1.3.4 The Contractor shall propose a disaster recovery plan and provide the required infrastructure guaranteeing full system accessibility within 12 hours of major disaster in hosting site. Backup scheme is required to protect the data loss of less than 24 hours.

1.4 System Delivery

1.4.1 Within 1 month from the commencement of the contract, the Contractor shall propose the DWSS and arrange a live demonstration for employer/client's representative's approval.

1.4.2 The Contractor shall submit the DWSS proposal within eight weeks after the commencement of the contract or within a period as agreed with the employer/client's representative. The DWSS proposal shall include but not limited to the design of the forms, records, report and dashboard, workflow processes and the allowable time for completing each action in the workflow, interfacing protocols with the smart site data systems, architecture of the centralized platform, network configuration, hosting environment, schedule of system delivery, user acceptance criteria, backup and disaster recovery plan, and security assurance plan, etc.

1.4.3 The DWSS shall be commissioned within three months from the commencement of the works contract or within a period as agreed with the employer/client's representative.

2. System Security

2.1 General

2.1.1 The DWSS servers shall be hosted at site office or externally in data centre or cloud-based environment.

2.1.2 For the DWSS servers hosted at site office, it shall be protected and separated from other systems by firewall (e.g. trusted zone, DM zone, etc.) and/or Virtual Private Network (VPN). The Contractor shall ensure the hosting environment meets the requirements of data confidentially, system integrity, system availability/accessibility, and data privacy aspect as agreed with the employer/client's representative.

2.1.3 For the DWSS servers hosted in data centre or cloud-based environment, the Contractor shall ensure that the selected hosting solution is configured, deployed and managed to meet the data confidentially, integrity, availability and privacy aspects in compliance with globally recognised industrial security standards, e.g. TIA-942 certified Tier 3 data centre and, ISO/IEC 27001. The Contractor shall provide an up-to-date independent auditor report for achieving internationally recognised certification, e.g. ISO/IEC 20000 or ISO/IEC 27017 to demonstrate the cloud service provider has the required capability in security and risk management.

2.1.4 Secure connection of at least 256-bit SSL shall be used for any network communication, transaction and data feed. The data stored on the DWSS are encrypted in transit and at rest. The Contractor shall also implement appropriate arrangements for preventing unauthorised access to the DWSS and its data.

2.2 Electronic Authentication

2.2.1 Each user shall be assigned with a unique login ID in the system with a strong password with a mix of at least eight mixed-case alphabetic characters, numerals and special characters. The system shall allow the system administrator to assign different access rights to each application and dashboard.

2.2.2 Two-factor authentication shall be adopted for users to log on to the DWSS. For example, authentication using login ID with strong password plus biometric authentication (i.e. facial or fingerprint recognition) and/or other authentication during offline mode as agreed with employer/client's representative.

2.2.3 Single-factor authentication shall be adopted for users to perform the functions of the DWSS i.e. submission, acknowledgement, approval and completion of assigned workflow, etc. For example, authentication using strong password, biometric authentication (i.e. facial or fingerprint) or other authentications as agreed with employer/client's representative.

2.3 Mobile Device Management (MDM)

2.3.1 Mobile Device Management (MDM) software or similar tool is required to distribute, upgrade, manage and wipe the DWSS applications, data and configuration settings for all type of registered mobile devices used in the contract over-the-air.

2.3.2 The Contractor shall propose an MDM software or similar tool and the MDM policy and agree with the employer/client's representative within one month after acceptance of the proposed DWSS.

2.3.3 The Contractor shall set up and maintain an MDM software or similar tool to ensure the system security and integrity of the registered mobile devices across multiple mobile operating systems. The DWSS shall prevent all access from non-registered mobile devices.

2.4 System Backup

2.4.1 The DWSS shall perform scheduled incremental backup on a daily, weekly and monthly interval automatically. An off-site backup of full system data, including audit trails and system logs, shall be undertaken every month or at a frequency as agreed with the employer/client's representative to minimise the impact of system failure and any possible virus or ransomware attacks.

2.4.2 The Contractor shall keep at least three versions of backup of the DWSS for at least 12 months. For site hosted system, the backup copies shall be stored on at least two different media types. At least one of those copies shall be kept offsite, or locations as agreed with the employer/client's representative.

2.4.3 The Contractor shall provide necessary infrastructure, including hardware, software, backup media etc., to support the backup exercise.

2.4.4 The Contractor shall carry out the system backup restoration test during acceptance test of the DWSS and every 12 months thereafter.

2.4.5 The DWSS shall download and replicate a local copy of the application data automatically to the site office server on a daily basis if the DWSS is a cloud-based Software as a Service (SaaS) application. The Contractor shall set up failover server if the DWSS server is hosted on-site.

2.5 Logging and Monitoring

2.5.1 The DWSS shall maintain and keep the audit trails and system logs for a minimum period of six month to record add, edit and/or delete process undertaken by users.

2.5.2 The Contractor's system administrator shall submit the log records every three months for employer/client's representative's review to ensure system security and integrity.

2.6 IT Security

2.6.1 The Contractor shall implement measures and conduct IT security audits to ensure the security of the DWSS in accordance with Chapter IX of the Security

Regulations, Core Security Principles of the Baseline IT Security Policy promulgated by the OGCIO and the relevant parts of the derived employer/client's IT Security Policy that complies with the Security Regulations and the Baseline IT Security Policy.

3. Basic Functional Requirements

3.1 Workflow Management

3.1.1 The DWSS shall be able to capture different types of module-specific data, including but not limited to text, numbers, date and time, locations, identification of users, checkbox, URLs, files and images, in workflow-enabled forms.

3.1.2 All captured data shall be kept in a database management system in the form of textural, numerical, date & time, locations format, to support direct indexing, searching, filtering, reporting and exporting purposes. The textural data stored in the database fields of the forms or records shall be in English.

3.1.3 The forms shall be set up with selection lists and checkboxes as far as practicable and minimise the use of non-standardized "free-text" fields to support the filtering and statistical analysis.

3.1.4 The system shall be able to display and capture English characters in UNICODE standard on the system forms and database fields.

3.1.5 All the captured data and workflow process in the DWSS shall be extractable by an Application Programming Interface or Web Services.

3.1.6 The DWSS shall manage predefined forms for users to undertake daily operations on-site and in office.

3.1.7 Workflows are triggered by assigning the forms to next approval or reviewing party. Users cannot edit the form after submission. User re-authentication is required prior to submission, acknowledgement, approval and completion of assigned workflow activities.

3.1.8 A unique identifier shall be stamped to all forms and records as an attribute in the DWSS database. The unique identifier shall be 6-digit serial number with

one character for the revision/resubmission number, which shall be automatically generated by the DWSS. The filing system for the DWSS forms and records shall make reference to the example as shown below:

Module/Type of Form/Serial NumberRevision

For example: RISC/SUR/000001A, where

Field 1: Up to 4 characters for Application type

- RISC: Site Inspection/Survey Request Form
- SD: Site Diary
- SRB: Site Record Book
- SSR : Site Safety Record
- CIC: Daily and Weekly Cleansing Inspection Checklist
- LRR: Labour Return Record
- CM: Contract Management

Field 2: Up to 4 characters for Application form sub-type

- SUR: Survey
- SI: Site Inspection
- PW: Pre work Safety Check
- WSI: Weekly Safety Walk Inspection
- MSI: Monthly Safety Walk Inspection
- EI: Environmental Inspection
- PTW: Permit to work
- NCR: Non-conformity Reports
- SPP: Safety Performance Report
- SCR: Safety Score Card
- DCI: Daily Cleansing Inspection
- WCI: Weekly Cleansing Inspection
- PMI: Project Manager's Instruction
- CE: Compensation Event
- EW: Early Warning
- IP: Interim Payment
- XX: Not Applicable

Field 3: 6-digit serial number, which shall be automatically generated by the DWSS (e.g. 000000 - 999999)

Field 4: 1 character for the revision/resubmission character, i.e. A-Z

3.1.9 The DWSS shall assign a unique identifier automatically and sequentially for each form and record at the time when it is generated. The DWSS shall allow the authorised system administrator to correct mistakenly assigned numbers and file reference numbers. A function shall be provided to backward the status in the creation of folio number operation.

3.1.10 The DWSS shall allow the user to create draftsusing Mobile App or web-browsers and store as temporary records in the backend servers of the DWSS. The system shall allow users to edit the temporary records before submission, review or approval.

3.1.11 The submitted, reviewed or approved forms or records shall be stored and locked permanently. Change to these records is not allowed by unauthorised users. Changes can only be made through rejection and resubmission of workflows which supersede the previous records.

3.1.12 Each submission and approval shall be time-stamped with the associated issuers or approvers.

3.2 Smart Site Data Management

3.2.1 The project team is encouraged to deploy smart site applications for site monitoring on progress, safety, deformation, material, machinery, as well as environment, with utilization of technologies such as AI applications, IoT remote sensors, smart carry-on devices, and drones. The DWSS shall incorporate a Smart Site Application Module as the centralised platform to collect and consolidate data from the smart site applications deployed on site and provide real time alerts and warnings to the responsible officers for follow up actions through Application Programming Interfaces (API) and/or real-time communication protocols. Key matrices associated with the smart site applications shall be presented in the form of dashboards to facilitate continuous site monitoring and formulation of enhancement/preventive measures.

3.2.2 The smart site information shall include but not be limited to photographs, short videos, date and time, locations, type and frequency, relevant parties, as well as the description of events to support the generation of the site information dashboard.

3.2.3 The smart site information shall be kept in a database management system in the form of textual, numerical, date & time, and locations format, to support direct indexing, searching, filtering, reporting and exporting purposes.

3.2.4 Multimedia data (such as short videos and photographs) shall be stored in a filestore system and linked to the database management system with its storage path and metadata (such as the location, date & time, and description) to support direct indexing, searching, filtering, reporting and exporting purposes.

3.2.5 The textural data stored in the database fields of the forms or records shall be in English, unless under further instruction by the employer/client's representative.

3.3 Photograph Management

3.3.1 The Mobile App shall be able to capture images directly from the cameras of the mobile devices and the photos shall be appended to forms or records directly. Only the photos captured by the same device can be used for inserting into the DWSS forms and records.

3.3.2 The resolutions of the photographs shall be optimised, compressed and resized automatically before uploading to the DWSS backend server. The maximum file size of each uploaded photograph shall be less than 1MB or as agreed with the employer/client's representative.

3.3.3 The date, time and GPS location of the photographs shall be captured/extracted from the mobile devices and stored as the metadata of the photographs or attribute fields of the associated forms or records. The GPS locations shall be exportable to HK80 coordinates system.

3.4 User Management

3.4.1 The DWSS shall manage user access right for the authorised users or user groups from the employer/client, Consultants, Contractors and/or any other parties, including but not limited to sub-contractors and suppliers as approved by the employer/client's representative.

3.4.2 The DWSS shall allow the authorised system administrators to assign users to different user groups, manage and assign different access right to different users or user groups, etc.

3.4.3 The DWSS shall provide a user management portal to facilitate system administrators to grant, change and/or revoke user access rights and assign functional modules to users.

3.4.4 The DWSS shall issue login and password to users by email once their accounts have been set up. Users are required to change the default password at first login. The DWSS shall require the users to change the password every three months or at a frequency as agreed with employer/client's representative.

3.4.5 The users can reset their own password with their registered email and multiple factors authentications.

3.4.6 The DWSS shall temporarily suspend a user account after five invalid login attempts and keep all logs. The DWSS shall only allow authorised system administrator to unlock and configure user accounts.

4. Workflow and Report Management

4.1 Workflow

4.1.1 Workflows are sequential electronic processes to circulate forms or records automatically to designated users or groups of users.

4.1.2 The DWSS shall be able to digitise site operation and contract management workflows and capture approval history, inspection records and site records as required under the contract.

4.1.3 The DWSS shall be able to issue notifications to designated users according to the workflow assignment.

4.1.4 The DWSS shall provide the interfaces for the system administrator to edit the workflow when necessary.

4.1.5 The DWSS shall be able to maintain all records and their relationships created in previous workflow process when changes to the workflow are made afterwards. The users shall be able to retrieve all records in the DWSS according to the hierarchy and relationships created from workflow processes.

4.1.6 The Contractor shall agree with the employer/client's representative on the criteria and workflow in generating alert notifications by means of emails or push notifications to designated users for overdue actions and poor performance, etc.

4.2 Dashboard

4.2.1 Dashboard provides a near real-time status of the workflow process, daily summary and periodic statistics of the collected data in the checkpoints of workflow processes. Dashboard shall also include real-time status of the key data and alerts from the smart site applications.

4.2.2 The dashboard shall only be accessible by authorised users.

4.2.3 The DWSS shall provide dashboard page(s) for all input data, usage statistics of all mandatory modules, including but not limited to submission and approvals, defects summary, register summary of RISC forms, site resources statistics, late submission analysis, and process summary in the form of charts, graphical and/or tabular format. The detailed requirements of the dashboard for each module shall be referred to Section 7. The Contractor shall agree with the employer/client's representative on the content and presentation of the dashboard page(s) within three months after the contract commencement.

4.2.4 The DWSS shall be able to generate near real-time status reports, alert and warning of the information captured in desktop computers, laptop computers, and mobile devices.

4.2.5 The periodic statistics dashboard shall support search, filter, sort, re-arrange in descending/ascending order functions of all displayed fields. By selecting the fields, users can extract detailed information of the selected fields.

4.2.6 The status dashboard shall be shown on both the Mobile App and web-browser without any additional software. By selecting the fields, users can retrieve inspection information of the selected fields.

4.2.7 All the reports shall be shown on the web browser and printable directly by the webbrowser.

4.2.8 The dashboard results shall be downloadable in form of PDF, tabular (e.g. XLS,

CSV) or other format as agreed with the employer/client's representative without any additional software.

4.3 Reports and Alerts

4.3.1 Reports and alerts of site activities shall only be accessible by authorised users or user groups with designated authorities.

4.3.2 The DWSS shall allow authorised users to generate printable reports for inspection forms, reports and dashboard, etc. in PDF format and enable grouping and filtering by selected period, location, trade, creation/submission/inspection date/time, users and/or user groups without installing any additional software.

4.3.3 The DWSS shall allow authorised users to generate printable reports of the workflow progress, such as process time, dead-locked process, assignation track, etc. grouped and filtered by selected period, location, trade, creation/submission/inspection date/time, users and/or user groups without installing any additional software.

4.3.4 The DWSS shall support export of the records into PDF, tabular (e.g. XLS or CSV) or other formats as agreed with the employer/client's representative. The output format shall be configurable in accordance with the requirements of the contract or other standard forms commonly used for construction works (e.g. G.F. 527 for Labour Return).

4.3.5 The DWSS shall generate alerts and reminders by means of emails and/or push notifications for events including but not limited to overdue/outstanding actions, missing forms, incomplete inspection tasks, incomplete forms, incomplete workflow process, poor performance and/or other events as agreed with the employer/client's representative. The DWSS shall send alerts and reminders to designated users by email and/or SMS as agreed with employer/client's representative.

4.4 Search Function

4.4.1 The DWSS shall provide search functions for records with file or form numbers, keywords, issuance and inspection date, tags, versions, drawing numbers, locations, area, trades, users, and other relevant data, etc.

4.4.2 The DWSS shall support the searching of relevant records in the workflow.

5. Other Requirements

5.1 System Time

5.1.1 The system time of the DWSS shall be synchronised among the DWSS backend servers and all mobile devices to a trusted local time source (e.g. the Hong Kong Observatory).

5.2 BIM Compatibility

5.2.1 The forms or records in the DWSS shall be designed to include fields to store the interfacing IDs (such as, Object ID/BIM ID/Location ID), for the purpose of interfacing with BIM models with Application Programming Interface (API).

5.2.2 Upon the request of the employer/client's representative, the DWSS shall provide API for the Common Data Environment or BIM software applications to retrieve the forms or records in the DWSS through the interfacing IDs.

5.3 Interfacing Requirements

5.3.1 The DWSS shall provide API libraries for authorised parties to access the required data of the DWSS. The Contractor shall maintain all APIs during system upgrade or maintenance and keep copy of the API library documents after launching of the DWSS and major system upgrades.

5.3.2 The Contractor is responsible for coordinating with the government departments or government agents for the exchange of the DWSS information with third-party application upon the request of the employer/client's representative.

5.3.3 The Contractor is responsible to arrange uploading of the required data automatically to the dedicated server/location such as iCWP at a daily interval. The detailed requirements of the data for each module shall refer to the Data Standardisation Report for DWSS, which is a living document to be updated regularly. The latest report shall be made available on the DEVB website.

5.4 Handover Requirements

5.4.1 Upon the completion of the contract, the DWSS shall be handed over to the employer/client in the form of an offline and password-protected copy not later than one month after issuance of the maintenance certificate.

5.4.2 The DWSS databases (including the interfacing IDs) should be exported into open-source database formats (such as SQLite). It should be handed over with the database catalogue document to describe the definition of the database fields.

5.4.3 In addition to the database, the contractor shall export each inspection/record as a single organised, tabular, and searchable PDF format, and named with its unique identifier number. The associated supporting records (such as photographs, reports, etc.) should be organised in folders named with the unique identifier number. These records shall be handed over with a document register spreadsheet that lists the unique identifier, workflow modules/type of record, project number, works/tasks description, association keywords, as well as creation and completion date.

5.4.4 The handover copy shall be self-contained and in the form of a password-protected extractable package which can be accessed without the need of handover the physical hardware provided in the operation stage.

5.5 Licensing and Data Ownership

5.5.1 The DWSS shall be licensed under "HKSAR Government". The Contractor shall secure, obtain and maintain throughout the contract period all approvals, permits or licences, which may be required or necessary in connection with the use of the DWSS and to bear all costs, charges and expenses that may be incurred in obtaining and maintaining the permits and licences. All data in the DWSS shall become the property of the HKSAR Government.

5.5.2 The ownership and all intellectual property rights, including without limitation any patent, copyright, registered design or trademark, in all reports, plans, models or other particulars or things prepared by the Contractor or received by the Contractor in the course of the Contract shall be vested in and belong to the employer/client and the Contractor shall not use any such documents, particulars or things or disclose the contents thereof to any third person, in any manner

outside the course of the Contract without the prior approval in writing of the employer/client.

5.5.3 The Contractor shall not infringe any of the said intellectual property right of any publications and shall in any event indemnify and keep indemnified the employer/client against all actions, claims, losses, damages and costs which may be sustained by the employer/client consequent upon any such infringement.

6. Training and Documentation

6.1 User Training

6.1.1 The Contractor shall deploy qualified trainers to provide system administrator training and user training for assigned personnel of the employer/client, the Consultants and the Contractor.

6.1.2 The system administrator training shall cover user management, workflow management, MDM (or similar tools) and system backup.

6.1.3 The training courses shall cover all levels or grades available, and training schedule must be submitted for the approval by the employer/client's representative.

6.2 Documentations

6.2.1 The Contractor shall provide user manuals and training manuals for the system administrators and users.

6.2.2 The Contractor shall provide system manual and documentation on API, Web Services, Entity-Relation Diagrams and Data Dictionary-/Database Catalogue.

7. Functional Requirement of Mandatory Modules

7.1 Mandatory Forms and Records

7.1.1 *Request for Inspection/Survey Check Form (RISC Form)* refers to Appendix 7.9 of PAH/"Request for Inspection of Works" Form No. D/COW.006 for COW and Form No. D/BSI.006 for BSI in ArchSD PAH or other relevant form for the same

purpose. The submission and approval of the RISC Form shall also follow the approved Inspection and Test Plan of the relevant works activities.

7.1.2 *Site Diary* refers to G.F. 536 and *Site Record Book* refers to ArchSD Site Record Book.

7.1.3 *Site Safety Records* shall include:

i. safety inspection checklists to record inspection results and the associated photographs of the weekly and monthly safety walk inspection and environmental inspection with reference to Chapter 8 of Construction Site Safety Manual; and
ii. safety performance records to record accident rate statistic, LD/MD improvement and suspension notice, conviction record, and other relevant information with reference to the proforma for Contractor's Monthly Report on Safety Performance in Chapter 12 of Construction Safety Manual.

7.1.4 *Site Cleanliness Records* shall include:

i. Daily Cleansing Inspection Checklist;
ii. Weekly Cleansing Inspection Checklist; and
iii. Cleanliness Performance Record

to record the works undertaken to maintain the site cleanliness and tidiness and contractor's performance with reference to ETWB TC(W) No. 22/2003 & 22/2003A. Daily and weekly inspection checklists and photographs taken at various work locations shall be recorded for the monitoring of site cleanliness condition.

7.1.5 *Labour Return Records* refers to G.F. 527 under DEVB Technical Circular (Works) No. 3/2003A - Monthly Return of Site Labour Deployment and Wage Rates for Construction Works.

7.1.6 Contract Management shall include workflow processes such as Compensation Event, Project Manager's Instruction, Early Warning, programme and payment, etc. as stipulated in the respective contract documents and the corresponding contract forms such as New Engineering Contract (NEC). For payment, the workflow stipulated in the corresponding Payment Certificate shall be

incorporated in the DWSS.

7.1.7 The Contractor shall agree with the employer/client's representative on the workflow, format and data field of all required forms within six weeks after contract commencement and set up all of the workflow-enabled inspection forms or records with reference to CEDD PAH, ArchSD PAH, ArchSD SAH and the contract documents within three months after the contract commencement.

7.1.8 The DWSS shall enable the creation of forms and subsequent submission, reception, approval, rejection and response to the request to be done in the Mobile App and web-browser. The DWSS shall record the user assignation track and time stamp along the inspection workflow must be recorded to support the process time analysis for each type of inspection.

7.1.9 The forms created for the *RISC Forms* workflows shall enable the requesting officer to submit and re-submit inspection requests until the inspection is certified completed. The workflow-enabled forms shall ensure the linkage of inspection history and re-submissions are recorded for searching and retrieval. The DWSS shall enable checking the submission and approval process of the RISC Forms against the Inspection and Test Plan. Photo records shall be included in the forms.

7.1.10 The forms created for the *Site Diary/Site Record Book* shall include workflow process for recording, review and endorsement of the *Site Diary/Site Record Book.* It shall be set up to record progress of work, plant and labour employed on site, weather and site condition, site photos, any occurrence which affect the progress and/or quality of works and the extent to which they are affected. Photo records shall be included in the forms.

7.1.11 The forms created for the *Site Safety Records* shall include workflow process for submission, review, confirmation and completion of safety inspections. It shall be set up to record the date, time, name of reporting officers and responsible persons, work location, descriptions of works, site photos before and after the inspection, logging of non-compliance and remedial works, as well as maintaining the relationships of entire inspection and non-compliance report cycle.

7.1.12 The forms created for the *Site Cleanliness Record*s shall include workflow process for submission, review, confirmation and completion of cleansing inspections. It shall be set up to record the date, time, name of reporting officers and responsible persons, work location, descriptions of works, record photos before and after the inspection, logging of non-compliance and remedial works, as well as maintaining the relationships of entire inspection and non-compliance report cycle.

7.1.13 The forms created for the *Labour Return Records* shall record the site labour deployment and wage rates of manual workers and automatically generate/calculate project-specific fields and dates and avoid repeated entry of similar fields. It shall be set up to allow automatic retrieval of labour resources information from Site Diary/Site Record Book, and the workflows process for manual input, submission, acknowledgement and responding to enquiry on the Labour Return Record.

7.1.14 The forms created for the Contract Management shall enable workflow processes for contract management such as Compensation Event, Project Manager's Instruction, Early Warning, programme and payment, etc. Details of such workflows shall comply with the relevant contract requirements, but should at least capture the following information as appropriate:-

Compensation Event / Project Manager's Instruction / Early Warning -

i. Title and reference number;
ii. Description;
iii. Justification;
iv. Dates (e.g. submission / response / implementation /closing dates);
v. Details of cost and time implication;
vi. Relevant supporting documents;

Payment -

i. Financial data contained in Payment Certificates;
ii. Interim assessment of the Contractor's share (NEC Option C and D);
iii. Relevant supporting documents;

Programme -

i. Contract Key Dates and Completion Dates;

ii. Planned Key Dates and Completion Dates; and

iii. Relevant supporting documents;

7.1.15 The *Contract Management* module shall contain at least the following key contract information, which shall be updated automatically as appropriate through the workflow processes of this module:-

Key Contract Information

i. Contract Number, Title and Scope;

ii. Key Financial Data (such as Approved Contract Sum, current and estimated final Price for Work Done to Date, Total of the Prices, Fee Percentage, etc.); and

iii. Key Contract Dates (such as Commencement Dates, contract and planned Key Dates and Completion Dates).

7.2 Smart Site Data

7.2.1 The DWSS shall be the centralized platform to capture and consolidate the data available from all different smart site applications deployed on site to facilitate continuous monitoring and analysis aiming to enhance the performance in safety, sustainability, progress and quality of the site works. Some examples of smart site applications are shown below for reference:

i. Progress monitoring such as land-based and drone-based photogrammetry;

ii. Safety monitoring such as detection by AI cameras and wearable devices on (i) intrusion of dangerous/restricted zones and (ii) misbehaviours of workers on-site, and other smart site safety devices as required under Smart Site Safety System (SSSS);

iii. Deformation monitoring by remote sensors to monitor the settlement, tilting, movement, vibration, etc. of concerned features;

iv. Material monitoring such as sensors for measuring early-age concrete strength by maturity method;

v. Machinery monitoring using technologies such as AI cameras and IoT sensors to monitor utilization rates, unauthorised uses and malfunctions of machineries; and

vi. Environmental monitoring by remote sensors to measure the environmental data such as air quality, noise level, water quality, etc.

7.2.2 The DWSS may store the key information (such as date, time, location, number and descriptions or alert messages) during the occurrence of an event and present them in the dashboards. The dashboards may also enable the users to visualise charts, and retrieve photographs and/or video streams of historical events of the smart site applications.

7.3 Dashboard

7.3.1 The dashboards shall enable grouping and filtering by types of forms, smart site applications, selected period, trade, location, area, users or user groups, etc.

7.3.2 The dashboard shall only be accessible by authorised users or user groups with designated authority. Different access rights should be assigned to each dashboard, area or zones.

7.3.3 The dashboard shall be designed to suit the need of respective contracts and include near real-time status and periodic statistics of site activities and contract management, including but not limited to:

i. summary of RISC form status;
ii. site activities statistics;
iii. site safety performance;
iv. site cleanliness performance;
v. labour return statistic;
vi. contract management statistic;
vii. smart site application statistic; and
viii. alert and reminder statistics, etc.

7.3.4 The summary of RISC form status shall include analytical summary and status of overdue actions, completed/incomplete/outstanding inspections, passing/ failing rate and process time analytics, etc.

7.3.5 The site diary statistics shall include analytical summary and status of overdue actions, completed/incomplete/outstanding Site Diary/Site Record Book, labour and plant deployment, weather conditions and instruction issued to Contractor, etc.

7.3.6 The site safety statistics shall include analytical summary and status of overdue actions, completed/incomplete/outstanding site safety inspections, non-compliance reports, observation reports, near-miss reports, accident rate, incident reports, safety convictions, number of unsafe acts and unsafe conditions identified at each inspection, etc.

7.3.7 The site cleanliness statistics shall include the analytical summary and status of completed/incomplete/outstanding site cleanliness inspections, non-compliance reports number of offences, non-compliance and remedial works, etc.

7.3.8 The labour return statistic shall include the analytical summary and status of number of labour deployed and wage rates of workers, etc.

7.3.9 The contract management statistic shall include summaries of Compensation Events, Project Manager's Instructions, Early Warnings, updated financial status and Completion Dates, etc.

7.3.10 The smart site application statistic shall include key metrics of smart site applications such as numbers and key details of unauthorized entries of restricted zones and exceedance of Alert-Alarm-Action levels of deformation monitoring points deployed on sites, etc.

7.3.11 The alert and reminder statistics shall include summary of alerts and reminders issued.