Part 20 – Quality Management

20.1 Not Used

20.2 General Requirements

The *Contractor* shall have a Quality Management System in place which meets the requirements of ISO 9001 and demonstrates compliance with the Works Information and takes full account of the Site Information. Third party registration of assessed capability (i.e. approval to ISO 9001) is not considered to be demonstration that the specified Quality Management System requirements of the contract have been met.

The Quality Management System is to be capable of demonstrating by *Contractor* self certification that all the requirements of the contract and all relevant standards, regulations etc are being met. Self certification is the process whereby the *Contractor* can demonstrate that all the requirements of the contract have been fulfilled.

The *Contractor* shall ensure that subcontractors and suppliers of any tier also supply a quality presence with adequate resources and appropriate authority to ensure the quality of work on this Contract.

The *Contractor* shall not commence design, procurement, construction, installation, commissioning or maintenance activity until a suitable and relevant Contract Quality Plan has been accepted by the *Project Manager*.

The *Employer*, the *Project Manager*, the *Supervisor* and any third parties authorised by the *Project Manager*, including LUL, NR, DLR, TfL, statutory authorities and statutory undertakers, shall have the right to conduct audits, inspections and tests of any part of the *works* that are being executed in connection with their assets by the *Contractor* and to observe the execution of these activities.

The *Contractor* shall manage the inspection and testing necessary to demonstrate that all specified requirements in the Works Information have been met by the dates shown on the Accepted Programme. All Defects are to be resolved before issue of the Defects Certificate and final acceptance of the *works* or any *section* of the *works* by the *Project Manager*.

In addition to the verification activities identified on ITPs, the *Contractor* shall perform quality-related site surveillance activities including in-process monitoring against method statements in accordance with a planned schedule. The observations made shall be recorded, followed up, and tracked to closure; this may include the raising of improvement initiatives, lessons learned, and NCRs.

The *Contractor* shall attend regular quality focus meetings with the *Project Manager,* the *Supervisor* and the *Employer,* at which a site visit will be followed by a review of quality performance and issues, including the bullet list below.

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The *Contractor* shall contribute to and participate in the identification, discussion and implementation of lessons learned initiatives agreed with the *Project Manager*.

The *Contractor* shall make available for audit all records necessary to demonstrate that the *works* have been executed in accordance with the contract. They also provide the *Project Manager* with documents that demonstrate that the *works* are progressing in accordance with specified requirements. These documents are to be provided in a timely manner as the work progresses.

The *Contractor* shall provide periodic progress reporting of quality management activities in accordance with Part 14 Management and Administration of the Works in Volume 2B of the Works Information including the following:

- management system status;
- audit progress results, CARs, and outstanding issues;
- status of RFI's and non-conformities and summary of actions taken to close out;
- progress on certification and records;
- quality issues identified and / or anticipated;
- improvement activities; and
- performance against the agreed key performance indicators.

Quality issues shall also be identified in the *Contractor's* weekly reports which are provided to the *Project Manager*.

The *Contractor*'s Quality Management System shall provide procedures for witnessing the manufacturing, construction, installation, testing and commissioning of the works.

The *Contractor* shall develop, with the *Project Manager*, quality improvement initiatives.

20.3 Not Used

20.4 Contract Quality Plan

Within 4 weeks of the *starting date*, the *Contractor* shall produce a Contract Quality Plan (CQP) and submit it to the *Project Manager* for acceptance. In the case of the first submission of the Contract Quality Plan the *Project Manager* replies within 4 weeks of the date of submission. The *Contractor* shall agree with the *Project Manager* the submittal timings of the CQP to interface with the requirements of the Accepted Programme. Any further revisions, submissions and responses shall be made within the *period for reply*.

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The *Contractor* shall not start any activity on any part of the *works* for which the Contract Quality Plan, applicable QSPs or ITPs, are not accepted by the *Project Manager.* Where these documents together adequately address ongoing and imminent works but not the entire scope of the *works*, the *Project Manager* may give limited acceptance to the *Contractor*'s submission in order to allow limited activities to proceed.

The Contract Quality Plan shall include the controls to be applied by the *Contractor* and subcontractors and suppliers of any tier, both directly and by identifying the Quality Management System documentation that subcontractors and suppliers of any tier are required to produce. The *Contractor* shall ensure that subcontractors and suppliers of any tier agree to and implement the applicable controls specified in the Contract Quality Plan and the identified Quality Management System documentation.

The Contract Quality Plan shall be developed in accordance with the guidelines set out in ISO 10005:2005 and as appropriate:

- cover the relevant phases of the contract (correlation and condition survey, design, procurement, manufacture, construction, installation, testing, commissioning and maintenance);
- comply with BS EN ISO 9001;
- contain a policy confirming a commitment to the management of quality and identify quality objectives;
- describe how performance against quality policies and objectives will be measured and reported;
- incorporate or reference the full list of applicable QSPs;
- include or reference roles and responsibilities within the organisation, including those for all quality personnel;
- identify responsibility for implementation of arrangements for inspection & testing, as well as who is responsible for certifying that compliance with requirements has been achieved;
- describe the interrelationship between partners' quality systems where the *Contractor* is a joint venture or consortium and identify the partner responsible for assembling and retaining all *Contractor* records for the contract;
- describe the relationships and activities of the *Contractor* and his subcontractors and suppliers including organograms;
- specify the requirements of the Quality Management System to be operated by the *Contractor*'s subcontractors and suppliers;

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- indicate the inter-relationship of the Contract Quality Plan with other associated documentation of the *Contractor*;
- include criteria and methods to monitor and measure the effectiveness and efficiency of processes required for managing quality and the competent resource needed to undertake these activities;
- incorporate a monitoring system for procurement, maintenance and condition of Equipment, Plant and Materials to ensure that contract objectives can be fulfilled;
- include a Package Breakdown Structure identifying the proposed number and structure of certification packages, programme for submission of these packages, and the dedicated resource to be assigned to this activity;
- identify quality-related key performance indicators, including those related to the measurement against quality objectives and others based on inspection attendances and the results of surveillances;
- identify continual improvement activities;
- allow for external second and third party audits to be carried out as required by the *Project Manager* and Others as described in 20.2;
- incorporate comprehensive quality system audit procedures including a quality audit schedule and the process for the preparation of audit reports;
- incorporate reference to the use of PTR, the Snagging and Outstanding Works (Punchworks) database (described in 20.8)
- describe the statistical process techniques to prevent the occurrence of Non-conformities;
- provide for regular management reviews of the contract Quality Management System and subsequent updating as necessary;
- identify those Subcontractor and supplier documents that are to be submitted for acceptance to the *Project Manager*;
- include *Contractor*'s and Subcontractors' design control systems/procedures; and
- include contract Completion procedures which shall provide for review and verification of records by the *Contractor*'s Quality Manager.

The Contract Quality Plan shall be supported by comprehensive QSPs. The *Project Manager* shall agree with the *Contractor* which QSPs require the *Project Manager*'s acceptance. The primary activities addressed by QSPs and to be implemented by the *Contractor* are to include:

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- skills and required competency levels for all personnel performing quality related activities;
- preparation of QSPs for design (including temporary works), procurement, manufacture, construction, installation and testing along with all management system processes;
- design control including verification, validation, certification, approval and acceptance by Others (see Section 7 of Works Information);
- preparation of material requisitions including manufacturer certification requirements;
- approval of purchase orders in accordance with accepted specifications;
- preparation, review, approval and monitoring of ITPs;
- control of documents & data;
- control and calibration of measuring and test equipment;
- scheduling of necessary testing;
- interim inspection of work including temporary works;
- monitoring against method statements;
- monitoring the activities of subcontractors and suppliers of any tier to ensure their compliance with the contract;
- review of Subcontractors' and material suppliers' quality verification documentation;
- administration of Non-conformities and reporting to the *Project Manager*, including use of the PTR system;
- certification control and co-ordination;
- quality verification and surveillance inspection of the partially completed and completed works and collation of quality verification records;
- verification of Equipment, Plant and Materials and system compliance through conducting inspection, testing and commissioning;
- administration of design, procurement, manufacture, construction, installation, test and functional non-conformities and concessions and reporting of them to the *Project Manager*; and
- production of four-weekly reports of quality data as indicated in 20.2 above.

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The *Contractor* shall complete the *works* in accordance with the applicable Contract Quality Plan and QSPs.

Contract Quality Plans are supported by applicable procedures (including QSPs), Inspection & Test Plans, Method Statements and Crossrail Standards. The *Contractor* is to minimise the duplication of information in the various quality system documents.

20.5 Quality Audits

The *Contractor* shall submit with his Contract Quality Plan a quality audit schedule of internal and Subcontractor and supplier audits that are conducted by his personnel. This schedule shall be planned using a risk based approach and ensure that all key activities are audited at a time and frequency appropriate to the significance of the activity under review. The schedule shall be a twelve-month rolling schedule and shall be reviewed every four weeks with the *Project Manager* to reflect all relevant aspects of the contract. Following any amendments the revised quality audit schedule shall be submitted for acceptance by the *Project Manager*.

The *Contractor* shall allow the *Employer*, the *Project Manager*, and third parties authorised by the *Project Manager* to observe/participate in these audits and to conduct additional independent audits, as they consider appropriate to provide assurance that the *works* are being conducted in accordance with contractual requirements. The *Contractor* provides the facilities and access necessary for these audits to be carried out effectively.

The *Contractor* shall place similar requirements on his subcontractors and suppliers and use his reasonable endeavours to ensure that access is provided to audits carried out by subcontractors and suppliers of any tier.

All audits performed by the *Contractor* shall be carried out in accordance with the guidelines of BS EN ISO19011 and all audit reports are, unless otherwise agreed, to be submitted to the *Project Manager* for acceptance.

The *Contractor* shall record, track and manage the timely close out of any Non-conformities found by the audit, by implementing the necessary corrective action to eliminate the detected non-conformity and its cause. Audit findings shall be analysed and communicated to the interested parties to enable system and process improvements and where appropriate, management actions.

The quality audit schedule shall be supplemented by *Contractor* surveillance activities which verify compliance with the Works Information as described in 20.2 above.

20.6 Quality Management Resources

20.6.1 General

The *Contractor* shall provide its own and its subcontractors' and suppliers' organisation charts. The charts show the reporting structure of the management and

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supervisory personnel on the contract and the reporting lines for both quality assurance and quality control/inspection personnel. The charts shall identify personnel responsible for key inspection activities.

The *Contractor* shall demonstrate that adequate resources are provided to fulfil the requirements for quality management, inspection & testing and self certification.

The *Contractor* shall provide appropriate training to all personnel in the operation of the Quality Management System and maintain training records.

20.6.2 Quality Manager

The *Contractor* shall appoint a Quality Manager..

The Quality Manager shall be independent of the design and construction functions, and have an independent link to senior director level. The Quality Manager shall be full-time for the duration of the contract, dedicated to quality matters on this contract, and shall be provided with adequate resources and authority to enable the quality of work on the contract to be managed effectively.

The Quality Manager shall:

- develop and implement a Contract Quality Plan as detailed in 20.4 above;
- develop and provide quality training for all personnel to include induction and training for staff with specific quality responsibilities;
- manage all quality personnel;
- approve the quality elements of the *Contractor's* method statements;
- ensure compliance with legal and contractual requirements;
- provide advice and instruction to construction teams to deal rapidly and effectively with quality Non-conformities and complaints;
- analyse individual Non-conformities and complaints to identify trends, root causes and the corrective and preventive actions needed;
- ensure the provision and review of ITPs;
- undertake audits of the *Contractor* and Subcontractors including compliance with legal and contractual requirements;
- produce information for management review with top management and attend the management review meeting to ensure that the quality management system remains suitable, adequate and effective; and

The Quality Manager shall have the following key competencies:

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- appropriate experience of quality management and the delivery functions of the contractor/supplier under self certification contracts;
- good knowledge and practical experience of developing, implementing and improving quality management systems;
- be a member of the Chartered Quality Institute (or an equivalent recognised quality body) or an appropriate engineering institute; and
- be a competent auditor or have access to competent auditors

20.7 Materials and Construction

The *Contractor* shall develop a Materials Proposal Schedule (MPS) listing all proposed permanent works materials and products and indicating any variances from the specified materials. The MPS shall identify:

- architectural & non-architectural items;
- samples/ mock-ups/ prototypes/ test panels/benchmarks required;
- PTR-RFI reference numbers;
- material approvers (*Contractor* /sub contractor organisations/persons, including applicable BREAM specialists); and
- target dates (approval, delivery, over dues)

The *Contractor* shall regularly submit the Material Proposal Schedule and a matrix of approvers for all materials and products, commencing within 6 weeks of the *starting date.*

The *Contractor* shall ensure that the Project's quality certification requirements are established in the preparation of material requisitions and orders for manufactured goods and materials.

Unless otherwise accepted by the *Project Manager,* Plant and Materials forming part of the works or temporary works incorporated into the *works* shall be procured from sources that hold appropriate certification from a United Kingdom Accreditation Service (UKAS) accredited certification body (or one that has mutual recognition with UKAS). The existence of UKAS or similar acceptable accreditation does not relieve the *Contractor* from ensuring the quality of the products.

The *Contractor* shall make available certification to demonstrate that Plant and Materials used comply with the relevant legal requirements and standards. Material quality and traceability requirements for *Employer* designed parts of the *works* are described on the drawings and in the materials and workmanship specifications in Part 2 of Volume 2C of the Works Information. For *Contractor* designed parts of the *works* the material quality and traceability requirements shall be indicated on

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applicable drawings or materials and workmanship specifications or by reference to appropriate codes of practice.

Verification of the quality and material traceability of each element of the *works* shall be the responsibility of the *Contractor* and shall be achieved through checks, tests, inspections, audits and reviews, planned and implemented in accordance with the Contract Quality Plan and ITPs developed by the *Contractor*.

Unless otherwise accepted by the *Project Manager*, the *Contractor* and his Subcontractors and suppliers shall use the Project proforma for inspection & test records and construction certificates (see Part 13 Assurance, Records and Certification to be Provided by the *Contractor* of Volume 2B of the Works Information).

The *Contractor* shall provide representative samples of proposed manufactured items, mock-ups/ prototypes/benchmarks of proposed fabricated or constructed items, and test panels of standard finishes, including concrete, to be achieved during construction as required by the drawings and materials and workmanship specifications in Part 2 of Volume 2C of the Works Information and applicable drawings or materials and workmanship specifications produced by the *Contractor* as part of his design obligations. Each sample shall be offered for inspection and acceptance by the *Supervisor* prior to construction of the parts of the *works* represented. The sample shall subsequently be protected and retained by the *Contractor* and made available as an inspection reference until Completion.

The *Contractor* shall maintain for *Project Manager's* acceptance*,* a schedule of all samples, mock-ups, prototypes, test panels and benchmarks within the Material Proposal Schedule which identifies for each:

- the planned date at which each sample will be made available for inspection by the *Supervisor*;
- the planned date at which the *Supervisor's* acceptance will be needed;
- the part of the Works Information that requested it;
- the part(s) of the *works* that it represents;
- a unique reference number;
- the secure location (accepted by the *Project Manager*) where the item is stored or located; and
- the acceptance status of the sample by the *Contractor* and by the *Supervisor.*

The preliminary schedule shall be submitted for the *Project Manager's* acceptance within 6 weeks of the *starting date*, and shall subsequently be regularly updated and resubmitted to incorporate changes and updates.

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20.8 Inspection and Testing

The *Contractor* and his subcontractors and suppliers of any tier engaged in supplying, manufacturing, construction, installation, commissioning and testing or any other service connected with the *works*, shall maintain ITPs appropriate for the services they provide that are accepted by the *Supervisor*. These accepted ITPs shall stipulate the necessary level and frequency of tests and inspections for each aspect of the works and also stipulate:

- item(s) being inspected and tested;
- the inspection and test activity;
- acceptance criteria;
- involvement of various parties including hold and witness points;
- controlling specifications; and
- certification/documentation/records to be generated in support of the inspection and test activities.

Activities listed in the ITP shall include pre-construction activities such as material approvals and completion activities such as close out of any NCRs arising. The *Contractor* shall complete the details to be stipulated in the ITPs including acceptance criteria. As a minimum the acceptance criteria shall comply with the requirements specified in the Works Information, this shall include the provision of samples/mock-up/prototypes (including test panels and benchmarking of standard finishes for agreement with the *Supervisor* where identified). Where not specified the *Contractor* shall propose acceptance criteria for the *Supervisor*'s acceptance, including the method and frequency of inspection and testing.

The *Contractor* shall submit the ITP to the *Supervisor* 4 weeks prior to the start of the relevant works using the proforma included as Appendix 20C unless agreed otherwise by the *Project Manager*. The *Contractor* shall not start the relevant works until the *Supervisor* has accepted the ITP. The *Contractor* shall maintain a schedule of ITP submissions with a record of the status of review and acceptance. Any further revisions, submissions and responses shall be made within the *period for reply.*

ITPs refer to those procedures, method statements and other documents such as national standards, codes of practice and legislation, which are to be used to control in-process and completed works.

Records and other deliverables generated as part of the inspection and test process shall be identified within the ITPs. The ITPs shall also make clear who is responsible for implementing the planned arrangements, as well as who is responsible for certifying that compliance with requirements has been achieved in practice.

Whilst 'self certification' represents a fundamental principle that shall be used, the *Supervisor* shall identify upon receipt and acceptance of the *Contractor*'s ITPs those activities, which are required to be checked and/or witnessed by the *Supervisor,*

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Employer and/or third parties. Mandatory interventions shall be defined as 'Hold Points', other interventions may include activities such as 'Witness Points' and 'Review Points'. The *Contractor* shall ensure a minimum of 7 days notice is provided for Hold Points in the United Kingdom and 14 days notice for those outside the United Kingdom.

The *Contractor* shall implement QSPs to verify conformance with the Works Information. The *Contractor*'s verification is accomplished by examinations, tests, measurement and inspection and by verifying records including those of his Subcontractors and suppliers. The *Contractor's* verification procedures shall be developed using applicable testing and inspection methods along with acceptance criteria stipulated by the drawings and materials and workmanship specifications in in Part 2 of Volume 2C of the Works Information and applicable drawings or materials and workmanship specifications produced by the *Contractor* as part of his design obligations.

The *Contractor* shall ensure that staff nominated for undertaking sampling, inspection and testing activities are appropriately trained and competent to carry out the particular activities to which they have been assigned. The *Contractor* shall maintain records of training and competence and make such records available to the *Supervisor* for inspection upon request.

The *Contractor* shall conduct inspections and tests in accordance with his detailed quality plans and ITPs. Key inspection activities shall be agreed with the *Supervisor* prior to construction, which shall include activities of structural or operational, significance, and inspections which are of a subjective nature or release work that is to be covered up. The *Contractor* shall record the completion of inspections and tests and identify records of the results.

Where a Defect in a works item is noted that cannot be put back in compliance within the same shift the *Contractor* shall raise a NCR. Where a specified work activity has not been carried out in accordance with agreed procedural requirements, a NCR is raised. Unless otherwise accepted by the *Supervisor,* the *Contractor* shall enter each NCR, including sub-contractor NCRs, in the PTR system. Appendix 20A of this Works Information describes the application details for NCRs.

Nominated *Contractor* personnel, accepted by the *Supervisor*, shall produce a schedule of inspections to identify Defects and shall raise snagging lists or outstanding works lists at appropriate inspection and acceptance stages to record work that has not been completed correctly or which is outstanding. Defects identified during the inspection and included in these lists shall also require NCRs to be raised. Where testing and commissioning activities are to follow construction, access shall be provided to testing and commissioning personnel and their snagging/outstanding works items shall be included in these lists. Any items remaining open at Completion and any new Defects identified after Completion shall be transferred to a list of Defects for clearance. All snagging, and outstanding works items shall be entered by the *Contractor* into Punchworks or an alternative database provided by the *Project Manager,* and tracked to closure. Appendix 20A of this Works Information describes the application details for such items.

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RFIs shall be used within the PTR system by the *Contractor* to formally request from the *Project Manager* information, clarification or agreement to a proposed action. Appendix 20A of this Works Information describes the application details for RFIs.

Each NCR requiring a concession or design change shall be referred to the *Project Manager* by the *Contractor* for appropriate resolution. Any agreed remedial action shall be completed prior to the commencement of any further activities that may render the non-conforming item inaccessible, difficult to repair or increase the cost of the repair.

All on-site and off-site testing shall be carried out by laboratories accredited by UKAS or similar, acceptable national body or by persons accredited to a similar standard. The samples shall be taken by staff appointed by the laboratory. The requirement for UKAS accreditation may be waived for the testing of systems and their components, subject to an alternative testing proposal by the *Contractor* and the acceptance of the proposal by the *Project Manager*.

Testing and sampling methodologies shall be in accordance with the standards contained in the Materials and Workmanship Specifications in Part 2 of Volume 2C of the Works Information, unless otherwise specified in Part 2A of the Works Information or written agreement from the Project Manager, to a change in testing and sampling methodologies is provided .

The *Contractor* shall maintain a schedule of all inspection, measuring and test Equipment used for the *works* that includes records of the calibration of such Equipment to nationally recognised standards.

Notification of Inspections and Tests

Inspections and tests during construction shall be notified by the *Contractor* to the *Supervisor* utilising the Inspection Request Form (IRF) identified in Appendix 20D.

Where the *Contractor* requires the following:

- Off-site inspections and the like
- The involvement of Others
- Specialist/functional involvement in
    - Planned surveillance
    - Benchmarking
    - “first – offs” and trial builds
    - Mock-ups
    - Samples

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The *Contractor* shall provide to the *Supervisor* a weekly schedule of inspections and tests to be undertaken (to include planned and achieved).

20.9 Self Certification

The *Contractor* shall be responsible for demonstrating that the *works* have been completed in accordance with the requirements of the Works Information and shall produce records that provide clear evidence of conformance. This includes the implementation of surveillance and other effective controls to ensure that the checking, review, inspection and testing of the *works* are completed and satisfactory.

The *Contractor* shall produce records of self certification activities including demonstration that the supporting documents and "as-built" details have been satisfactorily completed and that the *Project Manager* has accepted the *Contractor*'s plans to correct notified Defects Part 13 Assurance, Records and Certification to be Provided by the *Contractor* of Volume 2B of the Works Information details the records that the *Contractor* provides to the *Project Manager* as the *works* progress.

The *Project Manager* and *Supervisor* monitor the effectiveness of the *Contractor*'s self certification system through:

- surveillance;
- witnessing appropriate key activities;
- review of certification and records;
- monitoring and participation in the *Contractor*'s audit schedule; and
- independent auditing.

If the *Contractor* fails to demonstrate that specified requirements are being met, the *Project Manager* may notify the *Contractor* that its Quality Management System is defective. A defective Quality Management System is demonstrated by any of the following:

- Defects and/or Non-conformities not being identified by the *Contractor* in a timely manner;
- Defects and/or Non-conformities not being resolved in a timely manner, including failure to meet criteria for clearance identified in the Works Information;
- failure to prevent recurring Non-conformities;
- consistent failure to provide required certification and records as the *works* are executed;

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- audits by the *Contractor*, the *Project Manager* or any independent party identifying significant inadequacies in the Quality Management System; or

- Identified inadequacies in the Quality Management System not being resolved in a timely manner.

If following notification by the *Project Manager* of an ineffective Quality Management System, the *Contractor* fails to correct the Quality Management System within one week of receipt by the *Contractor* of the notification, the *Project Manager* may either implement his own quality management regime on the works to correct the quality system or instruct the *Contractor* to stop or not to start any further works until inadequacies are fully addressed. In such circumstances the *Employer* shall recover any abortive costs incurred from the *Contractor*.

20.10 Not Used

20.11 Appendices

Appendix 20A Application Matrix for Agreed Defects List, Snagging Lists, RFIs, NCR's and CAR's

Appendix 20B Tracking & Control of Deficiencies at the Time of Completion

Appendix 20C Inspection and Test Plan proforma

Appendix 20D Inspection Request Form

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