

Transport for London



2.2. Project stage gate decisions and digital assurance

2.2.1. The Employer's stage gate process, to manage the projects, is 'Pathway'. Table 2 - Alignment of Stages shows how the 'Pathway' stages align to the RIBA Plan of Work Stages' stages.

Pre-Pathway Stages	Pre-RIBA Stages
Benefits Planning & Value Management	N/A
Pathway Stages	RIBA Stages
Stage 1 - Outcome Definition	Stage 0 - Strategic Definition
Stage 2 - Feasibility	Stage 1 – Preparation and Brief
Stage 3 - Concept Design	Stage 2 – Concept Design
Stage 4 - Detailed Design	Stage 3 – Developed Design Stage 4 – Technical Design
Stage 5 - Delivery	Stage 5 - Construction
Stage 6 - Project Close	Stage 6 – Handover and Close out
Post-Pathway Stages	
Benefits Realisation	Stage 7 – In Use

Table 2 - Alignment of Stages

2.2.2. Production Information and / or Handover Information is to be delivered, using the Common Data Environment (CDE), at each Pathway Stage and as notified by the Employer, in order to:

- a) provide the requisite level of assurances as set out by the Employer
- b) inform stage gate decisions, to enable gateway sign-off (refer to):
 - o Stage Gate 2 – Are the outcomes and benefits achievable? Is there an option that delivers optimum value?
 - o Stage Gate 3 – Have the design principles been defined? Can the scope of the project be frozen?
- c) to facilitate the primary uses as set out in Table 1 – Primary Use
- d) deliver the required types of documentation as part of the Handover Information.

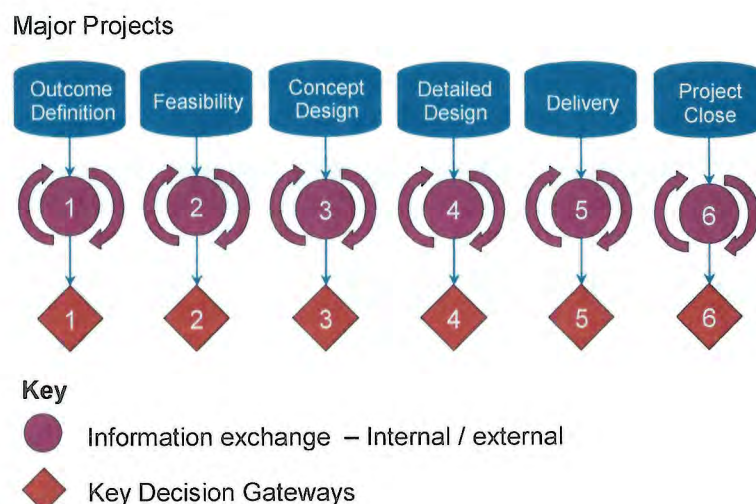


Figure 1- Key Decision Gateways

2.3. Technical / Design Reviews

- 2.3.1. Technical / design reviews will be carried out at various stages of the project. Table 3 - Design Review Meetings identifies the types of reviews and Appendix A provides the questions that the Production Information and / or Handover Information need to answer at each review.
- 2.3.2. The Consultant shall invite the relevant Employers discipline lead to all Technical / Design review meetings.
- 2.3.3. The Consultant shall provide a schedule of all planned Technical / Design review meetings in alignment with Table 3 - Design Review Meetings

Pathway Stages	Review
Stage 1 - Outcome Definition	Requirement Output Review
Stage 2 - Feasibility	Feasibility Output Review
Stage 3 - Concept Design	Concept Design Review
Stage 4 - Detailed Design	20%
	60%
	95%



Pathway Stages	Review
	Design Review
	Final Design Review
Stage 5 - Delivery	Validation Reviews

Table 3 - Design Review Meetings

2.3.4. The Consultant shall identify (and capture within the MIDP) the Production Information and / or Handover Information they will share in order to support and inform the technical / design review questions, as set out in Appendix A and as notified by the Employer.

2.4. Level of Definition

2.4.1. The Consultant shall provide details of the varying Levels of Definition to be used for all Production Information and Handover Information at each stage of the Rotherhithe to Canary Wharf Crossing Project.

2.4.2. The Level of Definition of the Production Information and Handover Information must:

- a) continually inform and support decision making (refer to Appendix A) throughout the Project lifecycle
- b) enable acceptance criteria and requisite levels of assurance to be achieved.

2.4.3. Levels of Definition comprise the following:

- a) **Level of Model Detail (LOD) (graphical)** – the detail to which the physical characteristics, of the asset(s), are represented (as graphical data) within model files, at each stage of the project; and
- b) **Level of Model Information (LOI) (non-graphical)** – the type and amount of information (about the assets functional characteristics) which may be included as attributes within model files, at each stage of the project.

2.4.4. Table 4 - Level of Definition provides an overview of the minimum Levels of Definition of the graphical data and information of non-graphical data, at each Level of Definition. Please refer to the Model Production Delivery Table (MPDT) for the Project Requirements.

Graphical Data	Non-Graphical Data	Level Of Definition
Overall massing of construction	Project requirements (form,	1



entities; indicative of area, height, volume, location and orientation.	function, cost and schedule).	
Discipline specific model files. Discipline task team allocated volumes. Architectural form and layout (including that reserved for MEP). Outline structural / civil spatial arrangements. Generic systems, assets or assemblies with approx. size, shape, location and orientation.	General performance criteria (based on assumed asset). System types. Forecast cost data +/- 15%. Note: associated to the applicable modelled elements.	2
Discipline team specific models files. Primary structural / civil elements developed and frozen. Specific systems, assets or assemblies in terms of quantity, form, size, location and orientation.	Specific performance criteria. Forecast cost data +/- 10%. Note: associated to the applicable modelled elements.	3
Discipline team specific models files Graphically represented as a specific system, asset or assembly in terms of quantity, size, shape, location and orientation.	Actual performance criteria. Actual cost data. Note: associated to the applicable modelled elements.	4
Discipline team specific model files. Graphically represented as actual built / constructed / installed system, asset or assembly in terms of quantity, size, shape, location and orientation.		5

Table 4 - Level of Definition

2.5. BIM Execution Plan (BEP)

- 2.5.1. The Consultant will create a BEP. The BEP will capture how the Consultant intends to meet the requirements set out in the EIR.
- 2.5.2. The Consultant will submit the BEP for acceptance to TfL within 8 weeks of Contract award.
- 2.5.3. The Consultant will keep their BEP current and up-to-date.
- 2.5.4. The Consultant will resubmit the BEP to the employer for acceptance if:



- a) Changes are made to the BEP.
 - b) Instructed by the employer.
- 2.5.5. While not exhaustive, potential reasons the employer would not accept the BEP include:
- a) It does not meet the requirements set out in the EIR
 - b) It does not meet the requirements set out in standards listed in section 3 Standards, Methods and Procedures.
- 2.5.6. The Consultant will implement the accepted BEP.
- 2.5.7. The Consultant will ensure the BEP aligns with the the accepted project programme.
- 2.6. Model Production and Delivery Table (MPDT)**
- 2.6.1. The Model Production and Delivery Table specifies the subject matter of each Model, the person who is to produce and deliver each Model (described in the table as "Model Originator") at each Stage and the Level of Definition for each Model at each Stage of the project.
- 2.6.2. The MPDT is not an exhaustive list as it contains only the known model deliverable requirements at the point of creation.
- 2.6.3. The Consultant shall work with the employer to define any further models which need to be created at each of the Pahway Project Stage.
- 2.7. Master Information Deliver Plan (MIDP)**
- 2.7.1. In response to the MPDT, the Consultant shall ensure that each Task Team provides (and maintains) a Task Information Delivery Plan (TIDP).
- 2.7.2. The Consultant will submit the MIDP for acceptance to TfL within 8No. weeks of Contract award.
- 2.7.3. The Consultant shall compile the TIDPs within a MIDP.
- 2.7.4. The MIDP shall capture all data and information deliverables (as set out in the TIDPs) and be aligned to the Programme.
- 2.7.5. The Consultant will resubmit the MIDP to the employer for acceptance if:
- c) Changes are made to the MIDP.
 - d) Instructed by the employer.



2.7.6. While not exhaustive, potential reasons the employer would not accept the MIDP include:

- a) It does not meet the requirements set out in the MPDT
- b) It does not meet milestones stated in the accepted Project Programme

2.7.7. The Consultant shall identify and capture within the MIDP the Production Information and / or Handover Information they will deliver to support and inform the stage gate decisions and assurances, as set out in Appendix A (and as notified by the Employer).

2.8. Value Engineering

2.8.1. The Consultant shall provide details of how they will utilise the Production Information to show the effectiveness (and provide assurance and evidence) of value engineering.

2.8.2. Value engineering must be integrated into the design review process. A representative from the Employer Operations must have access to all relevant Production Information and attend all value engineering reviews.

2.8.3. The Consultant shall provide details of how the Production Information will be presented and approved during the review process.

2.9. HSE & CDM

2.9.1. The Consultant shall provide details of how the BIM will be utilised to support their health and safety and CDM obligations; identifying, eliminating and reducing hazards and risks and providing better safety management.

2.10. Asset Information

2.10.1. The Consultant shall provide details of how the required data / information will be extracted from the Production Information and / or Handover Information into the appropriate delivery vehicle and provide assurance that it is complete and current.

2.11. Training Arrangements

2.11.1. The Consultant is responsible for ensuring their staff (and that of their Sub-Consultants of any tier) is sufficiently trained to undertake the Building Information Modelling aspects of the project.

2.11.2. The Consultant shall provide details of how they will ensure (and manage and maintain) their staff (and that of their Sub-consultants) have the



capability and competency to provide verified and coordinated Production Information and Handover Information in accordance with the EIR.

- 2.11.3. The Employer shall train a nominated champion within the Consultants organisation, in the use of (and associated processes and requirements of) the employers CDE if deployed. It is the responsibility of the nominated champion to subsequently train the Consultant and their Sub-Consultants of any tier.



3. Standards, Methods and Procedures

3.1. Standards

- 3.1.1. All Production Information and Handover Information, as specified in the MPDT and defined in the MIDP, shall be produced and managed in accordance with the specified standards, including those set out in Table 5 Standards:

Standard Ref	Title	Revision
Surface Standards		
ST_PJ585C-AMD-XXX-XX-LST-IM-00001	File Naming Convention (FNC)	C01
ST_PJ585C-PMO-XXX-XX-PRO-IM-00001	Rotherhithe to Canary Wharf Crossing - Document Control Procedure	C01
	Asset Data Dictionary Definition Documents – AD4's	
Industry Standards (include but not limited to), can be used as guidance		
BS 1192:2007 + A2:2016	Collaborative production of architectural, engineering and construction information. Code of practice	N/A
BIP2207	Standard Framework and Guide to BS1192:2007	N/A
PAS 1192-2:2013	Specification for Information Management for the capital/delivery phase of construction projects using building information modelling	N/A
PAS 1192-3:2014	Specification for Information Management for the operational phase of assets using building information modelling	N/A
BS 1192-4:2014	Collaborative production of information – Part 4: Fulfilling employers information exchange requirements using COBie – Code of practice	N/A
PAS 1192-5:2015	Specification for security-minded building information modelling, digital built environments and smart asset management	N/A



BS 8541-1:2012	Identification and classification – Code of practice	N/A
BS 8541-2:2011	Library objects for AEC.	N/A
BS 8541-3:2012	Shape and measurement – Code of practice	N/A
BS 8541-4:2012	Attributes for specification and assessment – Code of practice	N/A
BS 8541-5:2015	Assemblies – Code of practice	N/A
BS7000-4:2013	Design management systems. Guide to managing design in construction	N/A
BSRIA BG 6/2014	A Design Framework for Buildnig Services	4
BS 8536-1:2015	Code of practice for facilities management (Buildings infrastructure)	N/A
BS 8536-2:2016	Code of practice for asset management (Linear and geographical infrastructure)	N/A

Table 5 – Standards

3.1.2. The Consultant shall submit to the Employer for acceptance their CAD/BIM Modelling standards.

3.2. Security

3.2.1. The Consultant will assist the employer in defining the correct security classification for the project in alignment with PAS1192-5.

3.2.2. If identified as required the Consultant will assist the employer in the creation of a Built Asset Security Management Plan, a Built Asset Security Strategy, a Security Breach/Incident Management Plan and the Built Asset Security Information Requirements.

3.2.3. The Consultant shall assign the appropriate security classification in accordance with the Employer's Information Security Classification Standard, to all Production Information and Handover Information within the CDE.

3.2.4. The Consultant shall provide details within the BEP of how compliance with the Employer's Information Security Classification Standard will be monitored and managed.

3.3. Roles and Responsibilities



- 3.3.1. The role of Project Information Manager shall be appointed by the Consultant.
- 3.3.2. The responsibilities which fall under the role "Project Information Manager" may be fulfilled by more than one person.
- 3.3.3. The responsibilities of the Project Information Manager include:
- a) ensuring the BEP have been completed, have been agreed with the Employer and are briefed to the Consultant, Sub-Consultants or supplier of the Consultant, the Project Manager, the Supervisor and Others (as applicable) and are updated during the works through the project change control procedures
 - b) ensuring processes and collaborative behaviours are fully complied with across the project
 - c) providing the focal point for all Production Information and Handover Information management issues on the project
 - d) ensuring that all Production Information and Handover Information is compliant with the requirements of the contract and all applicable standards
 - e) ensuring that all Production Information and Handover Information is managed through the CDE including that all mandatory meta-data has been captured
 - f) ensuring the Consultant, Sub-consultants or supplier of the Consultant, the Project Manager, the Supervisor and Others (as applicable) have continued and appropriate access to the Common Data Environment
 - g) providing clear instructions including on the following areas:
 - what Production Information and Handover Information is required, by whom and for what purpose;
 - who will generate the Production Information and Handover Information and maintain it;
 - how it will be sorted and distributed;
 - how frequently it is shared; and
 - what actions should be taken on receipt of the Production Information and Handover Information.
- 3.3.4. The Consultant shall ensure all responsibilities have been allocated and maintain a list of contact information of those assigned, providing their Curriculum Vitae (CV) as notified by the Employer.



3.4. Naming Conventions

- 3.4.1. A single Unique File Identification (File ID) convention shall be used for all graphical and non-graphical data uploaded onto the CDE. File ID details are found in the FNC Standard referenced in Table 5 – Standards.

3.5. Classification

- 3.5.1. The Consultant shall structure all Production Information and Handover Information; categorising the functional and physical characteristics of the assets such that they can be efficiently identified, grouped and utilised for different purposes.
- 3.5.2. All Production Information and Handover Information must be assigned with the appropriate classification(s), in accordance with Table 5 – Standards.
- 3.5.3. The Consultant shall comply with the layering/container convention detailed in section 5.4.4 and table 3 of the BS1192:2007 +A2:2016.
- 3.5.4. The Consultant shall utilise Uniclass 2015 as the classification system in their design production.



4. Information Management

4.1. System Performance and Constraints

- 4.1.1. The Consultant shall provide details of any limitations / restrictions of all parties IT systems; this should as a minimum determine limitations on files size and restrictions on use of versions of software.
- 4.1.2. The Consultant is responsible for procuring, testing and implementing any required IT infrastructure, hardware and software during the mobilisation period as notified by the Project Manager.

4.2. Massing Strategy

- 4.2.1. The Consultant shall provide a massing strategy, within the BIM Execution Plan.
- 4.2.2. The Massing Strategy will as a minimum establish the extents of the proposed design, including:
 - a) shape
 - b) general size
 - c) location
 - d) orientation.

4.3. Modelling Strategy

- 4.3.1. The Consultant shall provide a modelling strategy within the BIM Execution Plan.
- 4.3.2. The Modelling Strategy will as a minimum establish the requirements for how Production Information and Handover Information will be developed to allow;
 - a) parallel working within discipline / task teams
 - b) coordination within (and across) discipline / task teams
 - c) efficient exchange through the CDE
 - d) delivery of graphical data in accordance with Table 4.

4.4. Volume Strategy



- 4.4.1. The Consultant shall provide a volume strategy within the BIM Execution Plan.
- 4.4.2. The Volume Strategy must establish as a minimum how the extents of the massing strategy are sub-divided into spaces for discipline / task teams to coordinate their designs within (i.e. rooms, horizontal and vertical circulation, structures, service routes).
- 4.4.3. The Consultant shall provide details of their processes for utilising the volume strategy, in accordance with PAS 1192-2:2013, to:
 - a) federate models
 - b) provide assurances and evidence of coordination of discipline / task teams design within each volume
 - c) provide assurances and evidence of the coordination and integration between the volumes.

4.5. Compliance Plan

- 4.5.1. The Consultant shall provide a Compliance Plan
- 4.5.2. The Compliance Plan will detail how they will ensure and provide evidence that all Production Information and Handover Information, delivered through the CDE at each Pathway Stage and as notified by the Employer, is:
 - a) verified against Project Requirements (including the EIR)
 - b) compliant with the standards set out in Table 5 – Standards,
 - c) progressed to the agreed Level of Definition as set out in the MIDPs and BEP
 - d) spatially coordinated in relation to asset's physical space, operational space and maintenance space
 - e) useable by the software platforms identified in Table 6 - Software Platforms
 - f) in the formats identified in Table 7 - Employer's Data Exchange Formats
 - g) checked and approved for technical content

4.6. Common Data Environment (CDE)

- 4.6.1. All Production Information and Handover Information are to be issued to the employer through the employers CDE.



- 4.6.2. Details relating to the CDE and associated processes are found in the CDE Standard listed in Table 5 – Standards.

4.7. Collaboration Process

- 4.7.1. All Production Information and Handover Information shall be checked, approved and verified as it passes through the CDE.
- 4.7.2. The level and types of checks and approvals shall be determined by the purpose for which the Production Information and Handover Information is being shared.
- 4.7.3. The Consultant shall provide the following details:
- a) processes for checking, approving and verifying Production Information and Handover Information within the CDE
 - b) triggers for sharing / exchanging Production Information and Handover Information
 - c) purposes of sharing / exchanging Production Information and Handover Information
 - d) required exchange formats
 - e) frequency and purpose for each design review / coordination workshops.

4.8. Asset Information Handover

- 4.8.1. The Consultant shall ensure accurate and complete asset data produced during the design and construction of the Rotherhithe to Canary Wharf Crossing are input into TfL's Asset Management Systems.

5. Digital Engineering

5.1. Software Platforms

- 5.1.1. The Employer will utilise, for a number of activities, the software platforms identified in Table 6.

Use		Platform	Version
Data authoring	Non-Graphical Data	Excel	2010
	Graphical Data	AutoCAD	2015



		AutoCAD Civil 3D	2015
		Revit	2015
		Esri (GIS)	2015
Data capture	Laser Surveys	Recap Pointools	2015 SS2
Data visualisation	Documentation	Adobe PDF	11
	Graphical Data	Navisworks	2015
Data coordination	Graphical Data	Navisworks	2015
Data simulation	Graphical Data Non-Graphical Data	Navisworks	2015

Table 6 - Software Platforms

5.1.2. The Consultant shall provide details of software platforms they and their Sub-Consultants will use and for what purpose.

5.2. Data Exchange Formats

5.2.1. Graphical Data, Non-Graphical Data and Documentation, to be provided by the Employer, will be exchanged (through the CDE) in the file format(s) as set out in Table 7.

Data / Information	Exchange Format	Version
NAMS, SFM, BridgeStation, Confirm Ellipse, Maximo Asset data (Non- Graphical Data)	XLS SHP PDF DWG	
Native models (Graphical Data)	Native Format	
Federated models (Graphical Data)	NWD	2015



4D Simulation (Graphical Data and Non-Graphical Data)	NWD	2015
Cost Data (Non-Graphical Data)	XLS	2010
Programmes	XER	P6
	PLF	P6
	PDF	11
	MPP	2010
Documentation	PDF	11

Table 7 - Employer's Data Exchange Formats

5.2.2. The Consultant shall deliver Production Information and Handover Information (through the CDE), with the Employer on the dates contained within the accepted MIDP, in the formats identified in Table 7.

5.2.3. The Consultant shall provide details of how they will address interoperability issues.

5.3. Cost Estimation

5.3.1. The Consultant shall utilise their 3D design models to derive quantities to assist in cost estimation activities and the production of Bills of Quantities (BoQ).

5.3.2. The Consultant shall include within the BEP the method by which they intend to produce their cost estimates and BoQ's derived from the 3D Design Models.

5.4. Library of Objects

5.4.1. The Consultant shall provide a Library of Objects through the CDE for approval for use and inclusion within TfL's Library of Objects.

5.4.2. Objects provided by the Consultant shall be delivered through the CDE in their native format.

5.4.3. The Consultant shall ensure (and provide evidence that) all objects provided by the Consultant and their Sub-Consultants of any tier, are compliant with BS8541-1, BS8541-2, BS8541-3 and BS8541-4.

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5.4.4. The Consultant ensures that the minimum attribute data (non-graphical data), as set out in section 2.4, is attributed to the objects at each stage of the project.

5.5. Coordinates

5.5.1. The following must be exchanged, through the CDE, compliant with the Ordnance Survey's British National Grid :

- a) Survey information, including mapping
- b) Production Information and Handover Information representing the fixed geographical location of an asset or assets.

5.5.2. The Consultants model deliverables shall be coordinated with the files referenced in Table 8 - Existing Files

5.6. Existing data

5.6.1. TfL shall make available to the Consultant the following information:

File Ref No.	Bridge	Volume	Location	File Type

Table 8 - Existing Files



6. Definitions

Term	Definition
Asset Management Information System	Systems used to store and manage data about assets. The Employer uses a number of systems including • Bridge Station • NAMS • Site Fault Management (SFM) • Remedy • Pavement Information Management System (PIMS) • ProjectWise • Ellipse • Maximo • Livelink • Confirm
BEP (BIM Execution Plan)	A document which sets out the proposed approach, capability, capacity and competence of the prospective or chosen Supplier and supply chain to meet the EIR.
CDE (Common Data Environment)	The agreed solution for the production, use and management of Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s), as set out in the BEP and MIDP(s).
Composite Model	Computer Aided Design (CAD) file(s) displaying one or more Model Files (attached as references), for the purpose of performing coordination activities and / or compiling Document Definitions.
Data Authoring	Creation of Production Information and Handover Information.
Data Capture	Collecting, from various sources, Graphical Data and Non-Graphical Data relating to asset(s).



Term	Definition
Data Coordination	Use of Graphical Data and Non-Graphical Data, about the asset(s), to virtually assure and evidence coordination across all task teams, existing infrastructure and adjacent works.
Data Simulation	Use of Graphical Data and Non-Graphical Data to virtually test the design, construction, operation and maintenance of the asset(s).
Data Validation	Rule based tools used to validate and check all Production Information and Handover Information against the EIR and Standards.
Data Visualisation	Visually representing Graphical Data and Non-Graphical Data to support decision making.
Document Definition	Data file produced, containing a view of the Non-Graphical Data and / or Model File(s) and / or Composite Model(s), to derive meaning for a specific purpose.
Document Rendition	A data file in an immutable format, derived from a Document Definition.
Employer	The term Employer is interchangeable for Client and Purchaser dependant on the contractual arrangements
Handover Information	Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s) which have been agreed between the Parties to be produced, updated, maintained and delivered as set out in the Master Information Delivery Plan(s) until the Defects Certificate has been issued.
Model Production and Delivery Table (MPDT)	The table attached to the Protocol at Appendix 1.
Level of Definition (LOD)	The level of definition required for a Model as specified in Appendix 1 of the Protocol, which comprises the following two elements: the level of graphical detail and the level of information, as more particularly described in the EIR.



Term	Definition
MIDP (Master Information Delivery Plan)	A forward looking schedule of the Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s) which are to be produced, maintained and delivered as Production Information and Handover Information.
Model File	Computer Aided Design (CAD) file(s) containing shape(s) with defined origin, orientation and dimensions, communicating the physical characteristic of the assets. A Model File may also include Non-Graphical Data, associate to the CAD file(s) and / or shape(s), identifying the functional characteristics of the asset(s).
Non-Graphical Data	Data file containing alphanumeric characters, communicating the physical and functional characteristics of the asset(s).
Production Information	The Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s) which have been agreed between the Parties to be produced, updated and maintained in order to Provide the Works and be delivered, in accordance with S1-538, during the design and construction stages of the Project, as set out in the MIDP(s). Referred to as the Project Information Model (PIM) within PAS1192-2.

Table 9 - Definitions