

2 Exchange Requirements for Design to Quantity Take-Off

Name	Exchange of Design to Quantity Take-Off
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Identifier	ER_Design_to_QTO
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Change Log		
5-Jan-09	Initial creation of version 0.01, draft for internal review	Tom Wiggins
4-Feb-09	Edits creating version 0.02	Tom Wiggins
11-Feb-09	Edits creating version 0.03	Tom Wiggins
18-Feb-09	Edits for version 0.5 - adding 'ER QTO to Design' to the process diagram, expanding table for 'ER Design to QTO'	Richard See
23-Feb-09	Edits for version 0.6 -- expanded ER tables significantly	Richard See
19-Aug-09	Final changes for version 1.0	Richard See

Project Stage	0	Portfolio requirements	
	1	Conception of need	
	2	Outline feasibility	
	3	Substantive feasibility	
	4	Outline conceptual design	✓
	5	Full conceptual design	✓
	6	Coordinated design and procurement	
	7	Production information	
	8	Construction	
	9	Operation and maintenance	
	10	Disposal	

2.1 Overview

The scope of this exchange requirement is the exchange of information about building, space, elemental quantities and element descriptions intended for use in preparation of a cost estimate. The purpose of the exchange requirement is to support the **coordination** of model quantities with the **needs** of the cost estimator preparing the cost estimate.

The exchange requirement assumes that a building model is available from which relevant geometric information required for a conceptual cost estimate can be derived. It is anticipated that the building model will provide context information about the project including units to be used, coordinate systems to be adopted and the direction of true north.

The building model will provide specific information about:

- the building, its location, composition, overall shape and orientation
- the shape and location of adjacent buildings
- building stories within the building
- spatial configuration

The building model will provide conceptual information about:

- the building services
- the building structure
- the site design

Information that is provided by this exchange requirement to enhance the initial set of building model information includes:

- space type and function identification with type data being obtained from a project space type library (which is in turn derived from an industry space type library).
- building elements construction type data with type data being obtained from a project construction type library (which is in turn derived from an industry construction type library).

2.2 Exchange Requirements - Design to QTO (Concept)

Type of Information	Information Needed	Required	Optional	Data Type	Units
<i>Project</i>	The following properties should be included:				
	o Identification	X		String	n/a
	o Owner/Client information (name, address, phone, email address)		X	String	n/a

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Model Author (name, address, phone, email address)		X	String	n/a
Site	The following properties should be included:				
	o Address (including number, street, city, state, ZIP, and country)		X	String	n/a
	o Global Coordinates (Longitude & Latitude)	X		(2) triples	deg/min/sec
	o Site Elevation (datum)(relative to sea level)	X		Real	m
Building	The following properties should be included (if not known then probable values should be used):				
	o Identification	X		String	n/a
	o Description		X	String	n/a
	o Functional Classification (OmniClass Table 11, but IBC for Testbed to match BEPA)		X	String	n/a
	o Location (relative to Site origin - defined by longitude & Latitude)	X		(2) triples	deg/min/sec
	o Orientation (deviation of building grid from true north, clockwise)	X	X	Real	Angular Degrees
	o Elevation (relative to the site datum)	X		Real	m
	o Building Height	X		Real	m
Building Story	The following properties should be included (if not known then probable values should be used):				
	o Identification	X		String	n/a
	o Description		X	String	n/a
	o Elevation (relative to building datum)	X		Real	m
	o Building Story Height	X		Real	m
	o Building Story Perimeter	X		Real	m
	o Building Story Gross Area	X		Real	m
Space	The following properties should be included (if not known then probable values should be used):				
	o Identification	X		String	n/a
	o Description		X	String	n/a
	o Functional Classification – OmniClass Table 13		X	Relationship	n/a
	o Functional Classification – Client Space Type	X		Relationship	n/a
	o Form Classification – OmniClass Table 14		X	Relationship	n/a
	o Inside or Outside space	X		Boolean	
	o Space Height	X		Real	m

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Space Gross Perimeter	X		Real	m
	o Space Net Perimeter		X	Real	m
	o Space Finished Ceiling Height		X	Real	m
	o Space Finished Floor Height		X	Real	m
	o Space Gross Floor Area	X		Real	m ²
	o Space Net Floor Area	X		Real	m ²
	o Space Net Volume		X	Real	m ³
Beam	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. beam type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Beam Length	X		Real	m
	o Beam Height	X		Real	m
	o Beam Width	X		Real	m
	o Beam Net Surface Area - extruded sides	X		Real	m ²
	o Beam Gross Volume		X	Real	m ³
	o Beam Net Volume	X		Real	m ³
Column	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. column type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Column Length	X		Real	m
	o Column Height	X		Real	m
	o Column Width	X		Real	m
	o Column Net Surface Area - extruded sides	X		Real	m ²
	o Column Gross Volume		X	Real	m ³
	o Column Net Volume	X		Real	m ³

Type of Information	Information Needed	Required	Optional	Data Type	Units
Curtain Wall	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. curtain wall type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Fire Rating		X	String	n/a
	o Curtain Wall Width		X	Real	m
	o Curtain Wall Height		X	Real	m
	o Curtain Wall Count - Outside Corners	X		Count	n/a
	o Curtain Wall Count - Inside Corners	X		Count	n/a
	o Curtain Wall Frame Depth	X		Real	m
	o Curtain Wall Frame Thickness	X		Real	m
	o Curtain Wall Gross Area	X		Real	m2
Door	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. door type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Fire Rating		X	String	n/a
	o Door Width	X		Real	m
	o Door Height	X		Real	m
	o Door Frame Depth		X	Real	m
	o Door Frame Thickness		X	Real	m
	o Door Leaf Thickness		X	Real	m
	o Door Perimeter		X	Real	m
	o Door Gross Area	X		Real	m2
Equipment	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. equipment type)	X		String	n/a

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Classification - UniFormat		X	String	n/a
Opening	The following properties should be included:				
	o Identification		X	String	n/a
	o Opening Width	X		Real	m
	o Opening Height	X		Real	m
	o Opening Depth		X	Real	m
	o Opening Gross Area		X	Real	m ²
	o Opening Gross Area		X	Real	m ³
Plumbing Fixture	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. plumbing fixture type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
Ramp Flight	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. ramp flight type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Ramp Flight Length	X		Real	m
	o Ramp Flight Width	X		Real	m
	o Ramp Flight Rise	X		Real	m
	o Ramp Flight Gross Area - Tread Faces	X		Real	m ²
	o Ramp Flight Gross Area - Riser Faces		X	Real	m ²
Slab (Floor, Roof, Landing)	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. slab type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Slab Thickness	X		Real	m
	o Slab Perimeter	X		Real	m
	o Slab Gross Area	X		Real	m ²
	o Slab Net Area	X		Real	m ²

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Slab Gross Volume	X		Real	m3
	o Slab Net Volume	X		Real	m3
Stair Flight	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. stair flight type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Stair Flight Length	X		Real	m
	o Stair Flight Width	X		Real	m
	o Stair Flight Rise	X		Real	m
	o Stair Flight Gross Area - Tread Faces	X		Real	m2
	o Stair Flight Gross Area - Riser Faces		X	Real	m2
Wall	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. wall type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Fire Rating		X	String	n/a
	o 3D Geometry	X		IFC Geometry	varies
	o Wall Length	X		Real	m
	o Wall Height	X		Real	m
	o Wall Thickness	X		Real	m
	o Wall Gross Side Area	X		Real	m2
	o Wall Net Side Area	X		Real	m2
	o Wall Gross Volume	X		Real	m3
	o Wall Net Volume	X		Real	m3
Window	The following properties should be included:				
	o Identification		X	String	n/a
	o Construction type (i.e. window type)	X		String	n/a
	o Classification - UniFormat		X	String	n/a

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Exterior or Interior Element (i.e. Is Exterior)	X		Boolean	n/a
	o Fire Rating		X	String	n/a
	o 3D Geometry	X		IFC Geometry	varies
	o Door Width	X		Real	m
	o Door Height	X		Real	m
	o Door Frame Depth		X	Real	m
	o Door Frame Thickness		X	Real	m
	o Door Leaf Thickness		X	Real	m
	o Door Perimeter		X	Real	m
	o Door Gross Area	X		Real	m2
HVAC System	The following properties should be included:				
	o Identification		X	String	n/a
	o Description		X	String	n/a
	o Classification - UniFormat (reference to a classification = system type)		X	String	n/a
Electrical System	The following properties should be included:				
	o Identification		X	String	n/a
	o Description		X	String	n/a
	o Classification - UniFormat (reference to a classification = system type)		X	String	n/a
Hot Water System	The following properties should be included:				
	o Identification		X	String	n/a
	o Description		X	String	n/a
	o Classification - UniFormat (reference to a classification = system type)		X	String	n/a
Cold Water System	The following properties should be included:				
	o Identification		X	String	n/a
	o Description		X	String	n/a
	o Classification - UniFormat (reference to a classification = system type)		X	String	n/a
Vertical Circulation System	The following properties should be included:				
	o Identification		X	String	n/a

Type of Information	Information Needed	Required	Optional	Data Type	Units
	o Description		X	String	n/a
	o Classification - UniFormat (reference to a classification = system type)		X	String	n/a
	o				

3 Exchange Requirements for Quantity Take-Off Results to Design

Name	Exchange of Quantity Take-Off Results to Design
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Identifier	ER_QTO_to_Design
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Change Log		
5-Jan-09	Initial creation of version 0.01, draft for internal review	Tom Wiggins
4-Feb-09	Edits creating version 0.02	Tom Wiggins
11-Feb-09	Edits creating version 0.03	Tom Wiggins
12-FEB-2009	Adding CPD elements for mapping communications (social networking analysis) model interactions across processes [associative link analysis both internal to QTO decisions and cross-disciplinary adding interaction effects with BPEA]	Phillip Cousins
18-Feb-09	Edits for version 0.5 - adding 'ER QTO to Design' to the process diagram, expanding table for 'ER Design to QTO'	Richard See
20 FEB 2009	Edits for version 0.6 to extract and map CPD elements from QTO IDM	Phillip Cousins Diane Downs
19-Aug-09	Final changes for version 1.0	Richard See

Project Stage	0	Portfolio requirements	
	1	Conception of need	
	2	Outline feasibility	
	3	Substantive feasibility	
	4	Outline conceptual design	✓
	5	Full conceptual design	✓
	6	Coordinated design and procurement	

	7	Production information	
	8	Construction	
	9	Operation and maintenance	
	10	Disposal	

3.1 Overview

The scope of this exchange requirement is the exchange of information about quantity and/or cost reports. The purpose of the exchange requirement is to enable coordination of quantity information with other design roles and to make these reports available to other applications (particularly the design application). The coordination of roles is based on the application of the NBIMS BIM Capability Maturity Model to candidate standard Enterprise Stakeholder Activity Model developed in prototype form for this testbed. The exchange requirement assumes that the information provisions outlined in the exchange requirement **ER Design to QTO Inputs** (concept) have been satisfied. The Enterprise Model will map the changes, gain input from user groups, and return a result to the process.

Information that is provided by this exchange requirement to includes:

- Links to reports generated by the QTO/Estimating application

3.2 Exchange Requirements - QTO to Design

Type of Information	Information Needed	Required	Optional	Data Type	Units
<i>Project</i>	The following properties should be included:				
	o Identification	X		String	n/a
	o Owner/Client information (name, address, phone, email address)		X	String	n/a
	o Model Author (name, address, phone, email address)		X	String	n/a
	o URL for quantity report		X	URL	n/a
	o URL for cost estimate report		X	URL	n/a
	o URL for cost comparison report		X	URL	n/a