11/28/2012

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# "BIM Object Libraries and their implications in the preparation of BQ and estimating"

Eugene Seah Deputy Chairman Langdon & Seah Singapore Assistant Professor (Adjunct), National University of Singapore eugeneseah@sg.langdonseah.com

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	DAY 1 - 26 November	2012	
	9.00-9.15am	Welcoming address by Royal Institution of	Sr. Eddie Wong, QS
		Surveyors Malaysia QS Division Chairman	Division Chairman
	9.15-9.35am	Paper 1	Sr. Quek Jin Keat, Chair
		"BIM reality check and what's ahead"	of BIM Technical
			Committee
	9.35am-9.40am	Quinton Paper 1	
	0. dam-10.20am	Paper 2	Eugene Seah, Deputy
		"BIM Object Libraries and their implications in the	Chairman,
1		preparation of BQ and estimating"	Langdon Seah (S'pore)
(	10.20am-10.30am	Q&A on Paper 2	
·	10.30am-11.10am	Paper 3	Eugene Seah, Deputy
		"Green BIM opportunities - some pointers from	Chairman,
		Singapore"	Langdon Seah (S'pore)
	11.10cm-11.20am	Q&A on Paper 3	
	11.20am-11.50am	Break	
	11.50am-12.30pm	Paper 4	Dr. Kherun Nita bt. Ali
		"Legal Implications and Challenges in BIM	& Dr. Nur Emma bt.
		Adoption"	Mustaffa, Researchers,
			Universiti Teknologi
			Malaysia
	12.30pm-12.40pm	Q&A on Paper 4	
	12.40pm	Presentation of certificates & Close of Day 1	
	DAY 2 – 27 November	r 2012	
	9.15am-9.50am	Paper 5	Ir. Dr. Zuhairi Abd.
		"BIM Road Map for the Malaysian Construction	Hamid, Exec. Director,
		Industry"	Construction Research
			Institute of Malaysia
	9.50am-10.00am	Q&A on Paper 5	
	10.00am-10.35am	Paper 6	Ben Thum, Innovation
		"Above All, The Cloud – Knowledge Management	Director,
		Beyond Computers"	SIACAD Pte. Ltd.
			(S'pore)
	10.35am-10.45am	Q&A on Paper 6	
	10.45am-11.00am	Break	
	11.00am-11.40am	Paper 7	Sr. Chin Keh Liang &
		"CAD Measure software vs. Autocad + Excel and	Chin Wei Min,
		Beyond"	Perunding PCT Sdn.
			Bhd.
	11.40am-11.50am	Q&A on Paper 7	
Global Co	11.50am-12.30pm	Paper 8	Ronan Collins,
CIPODA CO		"BIM for Civil Engineering Contracts"	Intelibuild Technyx Asia
			Ltd. (Hongkong),
			representing Chartered
			Institute of Civil
			Engineering Surveyors

















# Neutral database structure: Industry Foundation Classes (IFC) LangdonSe

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Model Element	Information Needed for Cost Planning	Data Type	Units
Wall			
	Identification	String	n/a
	Construction type (i.e. wall type)	String	n/a
	Classification - UniFormat	String	n/a
- Country Based	Classification – SS CP80	String	n/a
Country Dased	Classification – SS CP97	String	n/a
	Exterior or Interior Element (i.e. Is Exterior)	Boolean	n/a
	Fire Rating	String	n/a
	3D Geometry	IFC	varies
		Geometry	
	Wall Length	Real	m
	Wall Height	Real	m
	Wall Thickness	Real	m
	Wall Gross Side Area	Real	m2
	Wall Net Side Area	Real	m2
	Wall Gross Volume	Real	m3
	Wall Net Volume	Real	m3

IDM for country based QTO Lanadan Caab

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15

# Attributes needed in stages

	IICCUG		ages		LangdonSi	
Table & - Model Eleme	LOD100	LOD200	LOD300	LOD400	LOD500	1
	Schematic	Design Development	Tender Documentation	Construction	Completion	-4
TYPES OF OBJECT ELEME	INT					
Site Feature	Site Inventory					
Site Layout & Surround	Site Model			1		
Building Mass	Massing	Country	Based			
Room/ Spaces	Mass to Room					
Building Elements		Object in CP80 Elemental	Extended to CP97 CEMS			
Building Services		Object in CP80 Elemental	Extended to CP97 CEMS			
Finishes			Rendering to CP97 CEMS			
OBJECT ATTRIBUTE / RESOURCE PARAMETERS	;					
Function	Need, Requirement					
Geometry Accation		Nominal Dimension	Accurate Dimension			
Physical properties		LCA, Green mark	More Attributes			
Production process		Preliminary Animation sequence		Construction Animation sequence		
Product data		Country Based	Procurement CP93 CRCS, NPQS	More Attributes	FM /CP93 CRCS	
Phase Code				Animation Timing		
Cost Code	Preliminary Estimate	Elemental Estimate	Contract Pricing	Variation	Final Account	
Contract details			Contract informati indemnities, warra	on including insur- anties, etc.	ances,	
Operation & Maintenance			Document Control	SS527	SS517	

		•	5		
	Employer	Architect	Consulting Engineers	Contractor / Quantity Surveyor	LangdonSeah
Concept Design	ual Provide requirements related to form, function, cost and schedule	Begin design intent model with massing concepts and site considerations	Provide feedback on initial building performance goals and requirements	Provide feedback on initial building cost, schedule, and constructability*	← Functional Needs
Schemat Prelimin Design	ic / Provide design review and to further refine design requirements LOD200	Refine Design Model with new input from Employer, Consulting Engineers, and Construction Manager.	Provide schematic modelling, analysis and system iterations as Design Model continues to develop	Provide design review and continued feedback on cost, schedule, and constructability *	→ 5D Budget Mgt Users → Green Analysis
Detailed Design	Design reviews. Final approval of project design and metrics	Continue to refine Design Model. Introduce consultants models and perform model coordination	Create Discipline specific Design Models and Analyses	Create Construction Model for simulation, coordination, estimates, and schedule *	→ Buidability
	LOD300	Finalize Design Model, Tender Documents and Specifications, Regulatory Code Compliance	Finalize Discipline specific Design Models, Tender Documents and Specifications, Code Compliance	Enhance Construction Model and perform final estimate & construction schedule, Manage bid process,	→ 5D Cost Mgt Users
Construc	Monitor construction and give input to construction changes and issue	Respond to construction RFI's, Perform contract administration, update Design Model with changes	Respond to construction RFI's and update Discipline specific Design Models, field conditions, and	Manage construction with subcontractors and suppliers, inform changes to Design Model	→ 4D Constructability
	LOD400		commissioning		$\rightarrow$ 4D Time Mgt Users
As-Built	LOD500	Verify As-built model	Verify As-built model	Prepare As-built model	→ Change Mgt
Facility Managen	Engage Architect and Facilities Group for handing over	Coordinate information exchange through model to Facilities Group	Prepare handover documentation		17 → 6D FM User

## Attributes-Responsibility Matrix to Integrate BIM

### Associate Classification to Singapore Standard CP97 CEMS ID

		MEASUF Informati	EMENT ITEMS	3 Quality /Genera	I Conditio	ns	MEASUREMENT RULES (IFC)	DEFINITION RULES	COVERAGE RULES	SUPPLEMENT RULES
05100	ID	CLASSF	CATION TABL	E						
CEMS cross refe	rence ID:	Col.1	Col. 2	Col.3	Col.4	Unit /Description for Unit Measurement	IFC measurement resource layers for e- measurement	Define sizes are nominal or effective	Items deemed included	Items linked to NPQS & other electronic info exchange
e.g. 04000000: 0: 2. 2. 1. 1							Classification (CRCS /description)			Quality of material to Singapore Standards (SS)
21000000 1 1 4 1 2			Document Layer	Document Layer			Cost			Treatments & Testing
				1	1		Measure (m2, m3)			Jointing & Fixing
				1	1		Material			Limits
										Link to web based NPQS
Work Section	Sub Heading	Nur	nber from	n	Number from		Number from		Number from	
	number	C	2		column 2 colu		1 1 1		<u>umn 4</u>	
Excavation Works	-	Excava works	ation /Fi	lling F e	ounda xcava	ation tion	Pits for column stanchion and the lik	pile-caps, or bases te	Comme stated	ncing leve
e.g. 20000000:	1:		1.			4.	1			2
Ventilation,	Ventilation /Fume extract	Ventila	ition		)ampe	ers	Type and stated	nd size	Fire dampers	

# Develop plug-in Drivers: IDMs



19

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#### **Detailed Wall Types QTO**

These are generic wall types that have had the correct Uniformat information applied to them.

You can certainly use other wall types, but these will give you guidance about what information is key to this process.



QTO-1 Conceptual Exterior Wall Schedule

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e	Superstru	cture	<u>Co</u>	nstruct	on of R	esider	ntial	Developmen	f at HKIL 328		Concrete (N	4)	1
	Ref. No.	Description	Qt	y UoN	Rate	Tota	1	Remove	Reference	Seq. No.	Description	Gty	UoM
		REINFORCED IN-SITU CONCRETE WORK						83	B6.1/2/A	1	Walls 100mm thick (PROVISIONAL)	300	CUBE
		Concrete designed mix 20D				1		83	B6.1/2/B	2	Walls 125mm thick (PROVISIONAL)	30	CUBE
-		Walts		1	-			- 23	B6.1/2/C	3	Walls 150mm thick (PROVISIONAL)	150	CUBE
4	B6.1/2/A	100mm thick (PROVISIONAL) [Concrete (L)] [Concrete (M)] 03000	30	0 CUB	1 (	<b>†</b>	1	<u> </u>	B6.1/2/D	4	Walls 180mm thick (PROVISIONAL)	225	CUBE
P	B6.1/2/B	125em thick (PROVISIONAL) [Concrete (L)] [Concrete (M)] 03000	3	0 CUB	2 6	2	0	De	oka	10	Assamblar		
N	B6.1/2/C	150mm thick (PROVISIONAL) [Concrete (L)] [Concrete (M)] 03000	15	0 CUB			0	12	ickaş	ge i	Assembler		
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		Suspended slabs and roofs											
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	B6.1/2/H	175mm thick [Concrete (L.)]	61	7 CUB		2	0		the	e-	BQ, repackag	ed,	,
	B6.1/2/	180mm thick [Concrete (L)]		9 CUB	- 0	2	0	<u>8</u>	0.00		ant dimatly to	4h	~
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### Conceptual Quantity Takeoff with BIM- HOK/ LS Study

Currently, construction project facing following challenges –

- •Advance groundbreaking
- •Compressed construction schedule
- Raw materials escalation
- Accurate forecast of construction cost

HOK generates conceptual quantity takeoff information from the BIM model that can be used to formulate a conceptual cost estimate.

The techniques and methods have been developed in junction with the HOK Construction Services Group.







#### What is included in a conceptual estimate

To begin to construct a conceptual estimate you must have a firm understanding of how it is produced.

Because in this phase of a project the variables are so great a small amount of information is used to generate a large variety of cost information.

•Functional Floor Area

•Building Skin Area

#### •Interior Wall Length (if applicable)

•Ratio of Solid vs Glass

•Ratio of External Wall to Construction Floor area

•Construction Floor Area showing PES, NFA and even efficiencies

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27

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#### **BIM building masses**

Revit masses are very useful when a design is in its very first stage of development. It allows you to quickly create the building form, and then easily count the quantity information that has been generated from the form.

This process also works with a mass imported into a family from Rhino or other applications that produce solid geometry.

Designer can balance between form seeking & technical requirement, i.e. floor area.











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#### B2010 - Surface Area

This value is calculated by the mass floors for each level of the building. It is essentially the surface area from one Mass Floor to the one above.

This information is very useful regarding conceptual QTO. However, this critical data can be difficult to quantify with today's creative architecture. BIM made these available to both designer and cost estimator with constant update as building mass evolves.



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Mass it, Test it, & Evaluate it





### Mass it, Test it, & Evaluate it



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![](_page_37_Picture_1.jpeg)

![](_page_37_Picture_2.jpeg)

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CSFDR	10068 OOX O (1	.18"x83") Marvin Sliding French Doors (4 Panel)	\$580	INNER FRAME GLASS HANDLES OUTER FRAME	
CSFDR	10068 OOX O (1	18"x83") Marvin Sliding French Doors (4 Panel)	\$250	INNER FRAME GLASS HANDLES OUTER FRAME	Glass Shade M
CGL30	40 (36" <b>x</b> 48")	Marvin 2 Panel (12 Pane) Glider Window	\$154	INNER FRAME GLASS OUTER FRAME	2 Track Spotlig
CGL30	40 (36"x48")	Marvin 2 Panel (12 Pane) Glider Window	\$564	INNER FRAME GLASS OUTER FRAME	4' × 2' Fluoresc
CGL30	40 (36"x48")	Marvin	\$542		Abalone
Shopping Li	st contains all objects and	d materials In a plan, use this information for purchasin	a furnishinas. 🔀	= -11' . v = 10' 4" [1:1	CAP NUM

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Vendor: Action Furni Phone:1-800-700-1233 Address:	ture by Lane		×					
Item Name	Item Description	Parts	Materials					
02006	Action Premiere Glider Recliner	BODY	6522-30					
02006	Action Premiere Glider Recliner	BODY	6522-30					
02006	Action Premiere Glider Recliner	BODY	6522-30					
Vendor: Century Furn Phone:1-800-852-5552 Address:	iture							
Item Name	Item Description	Parts	Materials					
104400	Coddington Square Pine Slat Back Side Chair	MAIN SEAT CUSHION	401 Coddingtc 5863C23					
Vendor: Marvin Windows and Doors Phone:800-346-5128 Address: www.marvin.com								
•			<u> </u>					
Shopping List contains all objects and	d materials In a plan, use this information for purchasing furnishings. $\qquad imes$ =	= -6' 4", y = 24' 5"	1:1 CAP NUM					

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NPQS NO.	IFC RESOURCES		GLASS CRCS NO A OUTER FRAME	0 🖻 🤫
ICA 2559 3W (73"x60"	) Marvin 3 Pane Casement Window	\$350	 INNER FRAME GLASS OUTER FRAME	Recessed Ligh
CSFDR 10068 OOX O (1	18"x83") Marvın Sliding French Doors (4 Panel)	\$580	INNER FRAME GLASS HANDLES OUTER FRAME	Glass Shade M
CSFDR 10068 OOX O (1:	18"x83") Marvin Sliding French Doors (4 Panel)	\$250	INNER FRAME GLASS HANDLES OUTER FRAME	Track Spotlin
CGL3040 (36"x48")	Marvin 2 Panel (12 Pane) Glider Window	\$154	INNER FRAME GLASS OUTER FRAME	
CGL3040 (36"x48")	Marvin 2 Panel (12 Pane) Glider Window	\$564	INNER FRAME GLASS OUTER FRAME	4' x 2' Fluoresc
CGL3040 (36"x48") ◀	Marvin	\$542	• •	Abalone
Shopping List contains all objects and	materials In a plan, use this information for purchasing	g furnishings. 🛛 🖂	= -11' , y = 10' 4"	CAP NUM

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P.O. Box 100			-
Warroad, MN 56763	3		
Item Name	Item Description	Parts	Materials
ICH 2337 3w (73 2	3 Pane Casement Window	INNER FRAME GLASS OUTER FRAME	Rich Maple Wc Glass Rich Maple Wc
ICA 2559 3W (73"2	x60") Marvin 3 Pane Casement Window	INNER FRAME GLASS OUTER FRAME	Rich Maple Wc Glass Rich Maple Wc
ICA 2559 3W (73"2	x60") Marvin 3 Pane Casement Window	INNER FRAME GLASS OUTER FRAME	Rich Maple Wc Glass Rich Maple Wc
CSFDR 10068 OOX (	) (118"x83") Marvin Sliding French Doors (4 Panel)	INNER FRAME GLASS HANDLES OUTER FRAME	Rich Maple Wc Glass Brass Rich Maple Wc
CSFDR 10068 OOX (	) (118°x83°) Marvin Sliding French Doors (4 Panel)	INNER FRAME GLASS HANDLES	Rich Maple Wc Glass Brass 💌
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Shopping List contains all object	ts and materials In a plan, use this information for purchasing furnishings.	x = -6' 4", y = 24' 5"	1:1 CAP NUM

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Warroad, MN 56763         Item Name       Item Description         ICA 2559 3W (73"x60") Marvin         3 Pane Casement Window       \$30         ICA 2559 3W (73"x60") Marvin         3 Pane Casement Window         \$50         INNER FRAME         Rich Maple Wc         GLASS         GLASS     <	Courier 💌 🛛 💌 🖪 🗾 🛄 🔊									
Warroad, MN 56763       Item Name ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       Parts       Materials         ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$30       INNER FRAME GLASS OUTER FRAME SUTER FRAME INNER FRAME CLASS       INNER FRAME Rich Maple Wc GLASS OUTER FRAME Rich Maple Wc GLASS GLASS OUTER FRAME Rich Maple Wc GLASS GLASS OUTER FRAME Rich Maple Wc GLASS GLASS OUTER FRAME Rich Maple Wc GLASS G		5 -		7						
Item Name       Item Description       Parts       Materials         ICA 2559 3W (73"x60") Marvin       3 Pane Casement Window       \$30       INNER FRAME       Rich Maple Wc         ICA 2559 3W (73"x60") Marvin       3 Pane Casement Window       \$50       INNER FRAME       Rich Maple Wc         ICA 2559 3W (73"x60") Marvin       3 Pane Casement Window       \$50       INNER FRAME       Rich Maple Wc         ICA 2559 3W (73"x60") Marvin       3 Pane Casement Window       \$50       INNER FRAME       Rich Maple Wc         ICA 2559 3W (73"x60") Marvin       3 Pane Casement Window       \$100       INNER FRAME       Rich Maple Wc         ICA 2559 3W (73"x60") Marvin       Sliding French Doors (4 Panel)       INNER FRAME       Rich Maple Wc         CSFDR 10068 00X 0 (118"x83") Marvin       Sliding French Doors (4 Panel)       INNER FRAME       Rich Maple Wc         CSFDR 10068 00X 0 (118"x83") Marvin       Sliding French Doors (4 Panel)       INNER FRAME       Rich Maple Wc         CSFDR 10068 00X 0 (118"x83") Marvin       Sliding French Doors (4 Panel)       INNER FRAME       Rich Maple Wc	Warroad, MN 56763			<b>_</b>						
ICA 2557 3W (73 %60 ) Harvin 3 Pane Casement Window       \$30       INNER FRAME Rich Maple Wc OUTER FRAME Rich Maple Wc         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$50       INNER FRAME Rich Maple Wc GLASS OUTER FRAME Rich Maple Wc         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73 %60 ) Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73 %60 ) Marvin Sliding French Doors (4 Panel)       INNER FRAME Rich Maple Wc GLASS 0UTER FRAME Rich Maple Wc         CSFDR 10068 00X 0 (118 %83 ) Marvin Sliding French Doors (4 Panel)       INNER FRAME Rich Maple Wc         CSFDR 10068 00X 0 (118 %83 ) Marvin Sliding French Doors (4 Panel)       INNER FRAME Rich Maple Wc	Item Name Item Description		Parts	Materials						
ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$50       INNER FRAME GLASS OUTER FRAME Rich Maple Wc         ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window       \$100         ICA 2559 3W (73"x60") Marvin 3 Fane Casement Window       \$100         ICA 2559 3W (73"x60") Marvin Sliding French Doors (4 Panel)       INNER FRAME INNER FRAME AMDLES       Rich Maple Wc         CSFDR 10068 00X 0 (118"x83") Marvin Sliding French Doors (4 Panel)       INNER FRAME INNER FRAME       Rich Maple Wc	3 Pane Casement Window	\$30	GLASS OUTER FRAME	INNER FRAME Ri Glass Rich Maple Wc						
ICA 2559 3W (73"x60") Marvin 3 Fane Casement Window CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) INNER FRAME Rich Maple Wc GLASS Glass HANDLES Brass OUTER FRAME Rich Maple Wc GLASS Glass HANDLES Brass OUTER FRAME Rich Maple Wc CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) INNER FRAME Rich Maple Wc	ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window	\$50	INNER FRAME GLASS OUTER FRAME	Rich Maple Wc Glass Rich Maple Wc						
CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) CSFDR 10068 OOX O (118"x83") Marvin CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Fanel) INNER FRAME Rich Maple Wc	ICA 2559 3W (73"x60") Marvin 3 Pane Casement Window	\$100	INNER FRAME GLASS OUTER FRAME	Rich Maple Wc Glass Rich Maple Wc						
CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Panel) INNER FRAME Rich Maple Wc	CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Panel	)	INNER FRAME GLASS HANDLES OUTER FRAME	Rich Maple Wc Glass Brass Rich Maple Wc						
GLASS Glass HANDLES Brass OUTER FRAME Rich Maple Wc	CSFDR 10068 OOX O (118"x83") Marvin Sliding French Doors (4 Panel	)	INNER FRAME GLASS HANDLES OUTER FRAME	Rich Maple Wc Glass Brass Rich Maple Wc ▼						
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CGL3040 (36"x48	") Marvin 2 Panel (12	Pane) Glider	Window	\$340 GI OU	INNER FRAME ASS JTER FRAME	Rich Glass Rich Map	Mapl
CGL3040 (36"x48	") Marvin 2 Panel (12	Pane) Glider	Vindow	\$550 GI OU	INNER FRAME ASS JTER FRAME	Rich Glass Rich Map	ıMapl ole Wc
Vendor: Carpet Phone: (314) 29 Address: 2458 0	One 1-0000 Nd Dorsett Road S	uite #102					
Maryland Height	s, Missouri 63043						
Phone: (314) 29	1-0000						
FAX: (314) 291-	-6674						
www.carpetone.c	:om						
Material Name Enticing Rivier	Material Des a Bigelow Standard Pi	cription le - Light Sla	ate Blue	Fl	.oor		
		тот	AL COST	\$360,87	79.00		_
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Shopping List contains all ob	jects and materials In a plan,	use this information f	or purchasing furnishing	gs. x = -6'	4", y = 24' 5"	1:1 CAP	NUM

# Conclusions

LangdonSeah

- Establish IDM and Standards
- Agree on an open architecture
- Agree on function and use of the model
- Agree on information and attributes Agree on a shared Database
- Complimented by agreed BIM processes

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83

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# Thank You

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