Welcome!

The Business Model of Custom Tools

Tuesday, February 16, 2016 2:00 PM - 3:00 PM ET Earn 1.0 AIA LU



Moderator



Cory Brugger

Cory Brugger's diverse background and education supports the collaborative and multidisciplinary approach towards design that distinguishes Morphosis as an industry leader in technological innovation and integration in architecture. Since joining Morphosis in 2010, Mr. Brugger has managed the development and implementation of advanced design technology in the office. He provides day-to-day oversight of BIM integration and CAD production for Morphosis and its multidisciplinary project teams. For over ten years he has successfully managed the integration of CAD and BIM technologies on projects ranging from residential design-build to highrise office towers. At Morphosis, Mr. Brugger's primary focus has been the integration of virtual building models into design and delivery processes.





Zigmund Rubel, AIA

Zigmund Rubel, AIA is a licensed architect advocating Integrated Project Delivery in healthy, healing and sustainable environments. He is a founder of Aditazz, a technology startup in Northern California whose mission is to revolutionize current methods of designing, constructing and operating healthcare facilities by leveraging proven design and manufacturing techniques from other industries. Aditazz also aims to automate repetitive tasks in building design flow and enable the use of advanced manufacturing techniques in the construction process. Their key goal is to provide faster realization of health care facilities with improved construction quality and reduced operational costs.





Corey Johnson

Corey Johnson is the Director of Product Management, Visual Solutions, InEight. In his current role, Corey is responsible for delivering maximum value from InfinyD across Web, Mobile and Workstation based platforms. Previously, as a Manager of Virtual Construction for Kiewit Corporation, providing construction services in markets including transportation, water/wastewater, heavy civil, power, oil, gas and chemical, building and mining. Prior to that he spent five plus years with Bentley Systems as a Solutions Engineer serving the Transportation and Local Infrastructure Market with a focus on DOT's and Large Engineering firms. Corey has spent the past 20 years working in the design engineering, software and construction industries.





Stewart Carroll

Stewart Carroll is the Chief Operating Officer of Beck Technology, developers of DESTINI Profiler and DESTINI Estimator, based in Dallas. For over two decades, he has been a lead A/E/C technologist and continually speaks on the integration of cost and scoping technologies to owners and developers.





Jeff Ratcliff, CHC

Jeff Ratcliff, CHC is Director of Preconstruction with The Beck Group in Dallas. With nearly 15 years of project management experience, he is skilled at managing construction in critical care facilities while building valuable relationships with owners and team members. Jeff received his Bachelor of Science in construction science from the University of Louisiana at Monroe.





Questions?

Submit a question to the moderator via the chat box.

Content-related questions will be answered during the Q&A portion at the end as time allows.

Tech support questions will be answered by AIA staff promptly.





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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



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- in the Chat box at the conclusion of the live presentation;
- in the follow-up email you will receive one hour after the webinar.





Course Description

This seminar will explore how AECO firms are developing custom-built tools to improve the design, construction and management of buildings. The expansion of bespoke technology solutions has created new business markets where offices can sell and support proprietary tools and processes to the broader design and construction industry. Examples drawn from practice will illustrate how the development of these tools has provided new business opportunities through innovation in architectural practice.



Learning Objectives

- 1. Describe how custom tools are influencing the range of services a business can provide.
- 2. Relate the development of new tools and processes to the practice of architecture.
- 3. Identify opportunities within their own practice to leverage new or custom tools.
- 4. Assess the benefit of developing new tools as a model for business growth.



BUILDING THE RIGHT BUILDING

From Silica to buildings

The Business Model of Custom Tools February 16, 2016

Zigmund Rubel, AIA Co-founder, **\DIT\ZZ**

DON'T JUST CONSUME TECHNOLOGY

Make It

What's the business model?

Building the right building | From Silica to Buildings Zigmund Rubel, AIA | February 16, 2016

Agenda

- Aditazz
- Why and what is our different
- business model
- Case Studies
- Final Thoughts

Aaditas आदितस् From the beginning

Integrated, Multi-Disciplinary Team The Unique Aditazz Culture







































Building the right building | From Silica to Buildings Zigmund Rubel, AIA | February 16, 2016

Silicon Valley meets the AEC



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Business Model

The current business model Construction ✦Fees COST ✦No. of hours Х ✦Standardized Percentage Services Х Providing Net Fees predictable

value



COMPLEXITY IN HEALTHCARE: DAILY ADMITS



Ranges Surgery: 32 – 62 Emergency: 27 – 72 Totals: 59 – 134

- New England Journal of Medicine: Smoothing the Way to High Quality, Safety, and Economy
- Eugene Litvak, Ph.D., and Harvey
 V. Fineberg, M.D., Ph.D.

Daily Fluctuations in One Hospital's Admissions for Emergency and Elective Surgery.

Zigmund Rubel, AIA | February 16, 2016



The future business model

Value of +Savings services +Efficiency +Differentiation

I'm not paying for your

experiment

reseate

Population driven design

Se	lect	year	

Select	baseline	po	pulation

-

-

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90	

All assessed

2020

Select population unit

1	nou	san	a	

Select market access

20			

Select optimum utilization	
percentage (all services)	

60 85 100 60 65 70 75 80 85 90 95 100

Annual days of operation

250							365
-	1.					11	-
250	265	280	295	310	325	340	355365

Scenarios	
> ~300 beds > ~500 beds	
Exploration	
Scenario summary Socio-Economic Status	Service Lines Key-drivers
Caseloads Workflows Simulation	
Show 100 \$ entries	Search:
keyDriver	keyDriverUnits \$\u00e9
Patient_Beds	103
ICU	29
Emergency_Department_beds	17
Postnatal_room	5
Antenatal_room	4
Outpatient_clinic	2
OR	2
Delivery_room	2
CT	1
Xray	1
MRI	1
Ultrasound	1
Echocardiogram	1
Endoscopy	1
PET	1
Cath_Lab	1
Procedure_outpatient	1

Ischemic heart disease	459
COPD	450
Other non-communicable	388
Diarrheal diseases	386
Lower respiratory infections	370
Child birth	363
Preterm birth complications	355
Tuberculosis	254
Stroke	214
Iron-deficiency anemia	211
Other communicable	207
Neonatal sepsis	206
Low back pain	199
Neonatal encephalopathy	159
Major depressive disorder	153
Other neurological disorders	146
HIV/AIDS	143
Diabetes	137
Hemorrhagic stroke	136
HIV (other)	113
Protein-energy malnutrition	107
Other neonatal disorders	105
Asthma	83
Migraine	83

EMR data driving no. of MD's



Check-in time to plan generation time

2012

2013

2014

UNDERSTANDING TIME TO DOCTOR FOR ALL PATIENTS



Building the right body for Silver in Keing longest time waiting to shortest)

BUILDING THE RIGHT BUILDING

Space Program Generator			D Gen/Fast Pod Hi-Acuity Pod DGSF/dr	NSF: DGSF: Qty: Qty: river:	14,973 23,209 2 1 703	treatment min bays per max bays per Distribution n Scenario Selec Hospital	bays: pod: pod: node: ction: Beds:	33 12 15 2 4 225	SP v:	G 1	F	Physio Chara	cal Ro acteris	om stcs			
Section Control	Section Name	Room Code	Function Name	Room Functional Description	Allocation Rule	NSF	Placment over-ride	Zone assignment	BM Qty	Alloc ation Rule			Room NSF	QNTY	Prog Area	x	у
On	Admin	OSHAR	Office, Shared	Template Shared Office with two workstations <u>for case</u> <u>managers</u> . <u>social workers</u> , etc., who primarily	1 per 2 FTE allocated per Regional Standards for provision of shared or private office, round	110	Yes	5. Dept Support_Admin	6	10%	2		110	3	330	10.00	11.00
net: 2290	Areas	OSHAR	Office, Shared, Assistant Managers/Supervisors	Template Shared Office white workstations for case managers, social workers, etc. who primarily consult	1 per 2 FTE allocated per Regional Standards for provision of shared or private office, round	110	Yes	5. Dept Support_Admin	2	5%	- 1901 #1919		110	1	110	10.00	11.00
dgsf: 3550	[next to the chiefs and workstations],	OPROV	Office, Provider, Chief	Template designated Provider Office.	1per designated Chief FTE	100	Yes	5. Dept Support_Admin	2	5%			100	2	200	10.00	10.00
single loaded dblock seed	chiels deconices, ai	APREX	Alcove, Printer/Fax/Copier	Locate central to Nurse Station area. Multi-function Printer/Fax/Copier, additional space for receptacles, paper storage and a stient education materials	1per ED in Staff Office Area	15	Yes	5. Dept Support_Admin	1				15	1	15	6.00	2.50
		OPROV	Office, Provider, Assistant Chief	Template designated Provider Office .	1 per forecast FTE allocated per Regional Standards for private Provider Office	100	Yes	5. Dept Support_Admin	2	5%			100	2	200	10.00	10.00
		WAPRO	Work Area, Provider [rls: Private area for physicians]	Template modular workstation, additional area to access workstations from department gross. <u>Private area for</u>	1 per forecast FTE allocated per Regional Standards for workstation	55	Yes	5. Dept Support_Admin	5	15%			275	1	275	9.00	6.11
		OGENL	Office, General, Manager	Template Office appropriate for a Manager that meets the Regional requirement for private office space.	1perFTE	100	Yes	5. Dept Support_Admin	3		- 1981 #1010.00		100	3	300	10.00	10.00
		WACLR	Work Area, Clerical	Template workstation may be assigned to clerical staff or specialty support staff as defined by the department.	1perFTE	55	Yes	5. Dept Support_Admin	12	20%	gant at		660	1	660	10.00	5.50
		OGENL	Office, General	Template Office for case managers, social workers, etc. who primarily consult with patients in their	1 per FTE meeting regional guidelines for private office, use OSHAR when more than 1 ETE in the closer	100	Yes	5. Dept Support_Admin	2	5%	- 1,001 01:01:01:01		100	2	200	10.00	10.00
On	Ambulance	ASTRE	Alcove, Stretcher	Alcove near ambulance entry for spare gurney holding. Include wall protective bumpers and material.	1 per 12 rooms, round, minimum 1	25	Yes	3. Treatment Pods_edge	3				75	1	75	6.25	4.00
net: 375	Area	WATEC-EMS	Work Area, EMS and Storage	Locate near ambulance entrance.	1 per 24 total rooms, round, minimum 1[separate from comm station][can be in the	35	No	3. Treatment Pods_edge	1				0	1	0	8.75	4.00

Case Studies



900-bed Cancer Center Hospital Guangzhou Province, China

Integrated Business Planning, Space Planning, Architecture and Engineering

Case Study 1: 900 Bed Cancer Center Hospital (China)

Impact of operational efficiency improvements on key driver quantities and building layout – Surgery and Radiation Oncology Departments on overall Building Scheme



Department Block Sizing Surgery & Radiation Oncology





Case Study 1: 900 Bed Cancer Center Hospital (China)

Improvements to both Surgical and Radiation Oncology departments

Space Savings: 29,934 NSM down to 17,824 NSM **CAPEX Savings:** RMB 181.4M down to 110.4M



Department Block Sizing Surgery & Radiation Oncology







Emergency Department Optimization Large US Health Care Network Client

Virtual Simulation and Optimization, Integrated Space Planning

Case Study 2: US Health Care Network Client Emergency Department Optimization



Department Block Generation Department Layout



Before:

Traditional sizing methods suggested 45 treatment bays





Emergency Department Operational Scenarios	UCH Urgent Care High Decontation	UCM Urgent Care Medium Decontation	IB Immediate Bedding	FT Fast Track	SW Sub-Walt Choirs	TCU Transitional Care Unit	Treatment Bays	Sub-Wait Chairs	Nurse FTE	NPV of Differential Life Cycle Cost
Select Options							45	0	96	\$325M
Option 3			~		7		36	8	72.96	\$291M
Option 12	J		J		1	~	33	4	65.28	\$273M
Option 17		~	J		J		35	8	72.96	\$290M
Option 19		<i>√</i>	<i>.</i>		<i>√</i>	~	35	8	72.96	\$290M

Space Program Generation Live

NSF: DGSF: Gen/Fast Pod Qty: Hi-Acuity Pod Qty: DGSF/driver:		19,308 29,928 2 1 665	treatment I min bays per max bays per Distribution n Scenario Sele Hospital	eatment bays: in bays per pod: ax bays per pod: tribution mode: enario Selection: Hospital Beds:			SPC v1	5	P GE	SPACE PROGRAM GENERATOR				
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1 per ED or that Office Area	15	Yes	5 Dept Support_Adress	9				t	15	•	. 6	1.00	21	

Case Study 2: US Health Care Network Client Emergency Department Optimization

Resource Optimization Results: Lowest Cost of Ownership

After:

ARP simulation and optimization reduced treatment bays to 33.

Customer projections of savings using ARP: \$22M



Department Block Generation Department Layout





Emergency Department Operational Scenarios	UCH Urgent Care High Decantation	UCM Urgent Care Medium Decantation	IB Immediate Bedding	FT Fast Track	SW Sub-Walt Choirs	TCU Transitional Care Unit	Treatment Bays	Sub-Wait Chairs	Nurse FTE	NPV of Differential Life Cycle Cost
Select Options	~		1	~	~		33	4	65.28	\$273M
Option 3			~		1		36	8	72.96	\$291M
Option 12	J		7		V	~	33	4	65.28	\$273M
Option 17		~	1		~		35	8	72.96	\$290M
Option 19		~	~		V	<i>√</i>	35	8	72.96	\$290M



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Allocation Rule	NSF	Placment over-ride	Zone assignment	BM Cty	Alloc ation Rule				Room NSF	QNTY	Prog Area	×	y
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er 2 FTE allocated per Regional Standards. provision of ehaviert or private office, round	950	Yes	1. Dept Support, Admin	- ž	5%	-			110	÷.	116	10.00	11.00
er designated Chief FTE	100	Yes	1. Dept Support_Admin	2	5%				100	2	290	10.00	10.00
er ED in Staff Office Aree	15	Yes	6 Dept Support_Admin	÷.			-		н	ĩ	15	6.00	2.58

SPACE

PROGRAM

ENERATO

SPG


Health System San Leandro, CA

Remodel of Existing Acute Care Hospital for SB 90 compliance

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Case Study 3: Health System



Case Study 3: Health System San Leandro

Alameda Health System: San Leandro Hospital Acute Rehab Unit

05: Room Definition Sheets







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Case Study 3: Health System San Leandro



NOTES:

- 1. THE NON-BEARING PARTITION WALL FRAMING SYSTEM ILLUSTRATED ABOVE CONSISTS OF PRE-FABRICATED UPPER AND LOWER WALL PANELS THAT SPIAN HORIZONTALLY BETWEEN FULL HEIGHT
- KING POSTS. THE WALL FRAMING COMPONENTS ARE INTENDED TO BE INSTALLED IN THE FOLLOWING ORDER: 2.
 - A. KING POST BASE CONNECTIONS B. KING POST TOP CONNECTIONS
 - C. DEFLECTION TRACKS AT CELING D. UPPER WALL PANELS
- E. LOWER WALL PANELS 3. FOR USE AT INTERIOR, NON-LOAD BEARING PARTITION WALLS ONLY 4. WALL STUD BRIDGINGBLOCKING REQUIRED PER 3/85.





FAST INER PATTERN 2

NERPATT

ACTUART DATITION A

ASTENER PATTERN 5

FASTENER PATTER

4 KING PASTENER PATTE









CONNECTION PLATE B NO MEN



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Final Thoughts

Impacts of Automation to Jobs

McKinsey analyzed the detailed work activities for 750+ occupations in the US to estimate the percentage of time that could be automated by adapting currently demonstrated technology.

Click on a data point or occupation family to learn more - a pop-up will show the work activities for each occupation considered. Click again to toggle off.



Impacts in AEC

McKinsey analyzed the detailed work activities for 750+ occupations in the US to estimate the percentage of time that could be automated by adapting currently demonstrated technology.

Click on a data point or occupation family to learn more - a pop-up will show the work activities for each occupation considered. Click again to toggle off.



Why Has This Not Happened Yet?



Think Hybrid



Think different Business Model

Thank you!

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Conceptual + Model Based Estimating

Collaborating + Profiler

Stewart Carroll, Beck Technology Jeff Ratcliff, Beck Group

AIA TAP



Budgeting Process - Traditional



@aia_tap

Budgeting Process – Target Value Design

What are we trying to do differently?

- Make early decisions prior to utilizing valuable design hours
- Aligning design intent with the budget
- Communicate design options to allow the owners to make informed decisions
- Align design and preconstruction to ensure we are rowing

our boat in the same direction.

About Beck Technology



@aia_tap

Technology Tool – DProfiler



Budgeting Process – Target Value Design

The Program / Idea



AIA TAP

Budgeting Process – Target Value Design

Engagement / Communicate





AIA TAP

Model the Program





Model the Program





<mark>ΔΙΑ ΤΑΡ</mark>

Model the Program





Data Within the Model

ayers • a x	Line Items View Spatial View Tabular V	/ew Estimate View				4 b x	Project Summary	• •	×
Laver Name *	Ewand Crouned Bems						Project Information		
Projectinformation	Colore accelerations						Project Nami My Project		
Location Marker	Transmission in the local data						Clash		
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	0 Excavate Pier Caps		68	1.51 bey	\$6.00	\$411.07	Country		
	0 Excavate Pit		35	1.56 bcv	\$6.00	\$213.33	Web Page:		
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	0 Backfill Wall w/Select Fill		2124	.44 cy	\$20.00	\$42,488.89	pononid type		
	0 Baddill Pit Wall w/Select Fill		12	1.80 CY	\$20.00	\$256.00			
	0 30" Dia Drilled Pier Turnkey		663	1.00 ¥	\$54.90	\$36,398.70	Building Summary Data		
	0 Mud Slab		22552	.25 sf	\$2.00	\$45,104.50	Item.	Value	
	0 Elevator Pit - Passenger		2	69 00.	\$10,000.00	\$20,000.00	Gross Building Area	64 501 SF	
	0 Sealed Concrete Floor, Acrylic Sealer or	Similar, No Mechanical Polishing	178	1.50 sf	\$0.40	\$71.40	Rentable Building Area	63,295 SF	
		1997 - 19				\$145.621.44	Number of Stories	4	
						2142/021144	Solid Cladding Area	47 242 SF	
	Uniformat 2: A20 - Basement Construction (T)	otal Aggregate Cost: \$199,296.44, Total Aggre	gate Per Unit: \$3.09)		0412.0		Glazina Claddina Area	17.818.SF	Ξ
	0 Crawl Space Excavation		5011	.61 bcy	\$4.00	\$20,046.44	Percent of Glazing	27 39 %	
	0 Crawl Space Wall		7170	1.00 sf	\$25.00	\$179,250.00	Door Cladding Area	0.SF	
						\$199,296.44	Blandari Cladding Araa	0.SF	
	🔲 😅 Uniformat 2: 810 - Superstructure (Total Agg	regate Cost: \$2,265,784.48, Total Aggregate P	er Unit: \$35.13)				Other Clarking Area	D SF	
	0 Slab on Metal Deck		64500	.91 sf	\$3.50	\$225,753.17	Total (Tadding Area (Extimated)	AC AND SE	
	0 Structural Steel Floor Structure (9.5 lbs	(sf)	306	i.38 tn	\$3,950.00	\$1,210,198.27	Linclad Area (Ectimated)	0.9F	Ŧ
	0 Floor Metal Deck	NO # 11	64500	.91 sf	\$2.10	\$135,451,90	Parking Summary Data		
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	0 Roof Metal Deck	-1	28967	.75 st	\$2.05	\$59,383,89	Rem	Value	4
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	0 Thru Wall Flashing Stainless Steel		2514	67 F	\$15.00	\$17 719 71	Available Spaces (Estimated)	457	
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	0 Clean Exterior Brick		10058	1.46 sf	\$0.45	\$4,516.25	liem	Value	
						SUM=\$9,320	Site Size	5.7 Acre	
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	C - SDI		1.20 % Total		\$134,167	.86 \$2.08			
	0 - CCIP		2.25 % Total		\$251,564	.75 \$3.90			
	E - Escalation		1.00 % Direct		\$93,209	103 \$1.45			
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Estimate Supporting Data

		ED Room Pricing Schedu	/e			
		- -				
		Ambulance				
Classification	Item Number	Name	Qty. Formula	Quantity	Cost Unit	Aggregat
82030	0001	Overhead Doors	5	5.00	\$20,000.00 Ea.	\$100,0001
C1010	811	Interior Partition Allowance	Perimeter*Height	4243.91	\$5.50 S.F.	\$23,341
C1010	0001	Fire / Smoke Stopping	Area	3828.39	\$1.10 S.F.	\$4,211.3
C1020	906	Int Door/Frame/Hardware - 4/0x7/0 - Hollow Metal, Painted	(Area * .05)* Height/500	5.52	\$1,800.00 Ea.	\$9,934.6
C1510	1024	Fire Extinguishers	Area / 250	15.31	\$75.00 Ea.	\$1,148.5
C1510	0001	Decontam Separation Curtain	1	1.00	\$3,500.00 Ea.	\$3,500.0
C3010	0001	Caulk Interior Joint Allowance	Perimeter	294.38	\$1.10 L.F.	\$323.8
C3010	1219	Paint Drywall Partitions, Interior	Perimeter*Height	4243.91	\$0.45 S.F.	\$1,909.7
C3010	927	Tape & Bed	Perimeter*Height	4243.91	\$0.45 S.F.	\$1,909.7
C3010	0002	Paint MEP Piping Allowance	1	1.00	\$5,500.00 L.S.	\$5,500.0
C3020	1321	4* Rubber Base	Perimeter	294.38	\$1.25 L.F.	\$367.9
C3020	1329	Sealed Concrete. Floor	Area	3828.39	\$1.50 S.F.	\$5,742.5
C3030	1408	Paint Exposed Joists & Decking	Area	3828.39	\$1.25 S.F.	\$4,785.4
		Ante Room				
Classification	Item Number	Name	Qty. Formula	Quantity	Cost Unit	Aggregat
C1010	811	Interior Partition - Full Height	Perimeter * Height	836.17	\$5.50 S.F.	\$4,598.
C1010	0002	Furr Down	8*3	24.00	\$15.00 S.F.	\$360.0
C1010	802	In-Wall Blocking - Miscellaneous	Area	154.00	\$1.50 L.F.	\$231.0
C1010	801	In-Wall Blocking - Upper Cabinets	6	6.00	\$3.00 L.F.	\$18.0
C1010	804	In-Wall Blocking - Base Cabinets	6	6.00	\$3.00 L.F.	\$18.0
C1010	0001	Fire / Smoke Stopping	Area	154.00	\$1.10 S.F.	\$169.4
C1020	0001	Caulk Door Frame	(4+8+8)*2	40.00	\$1.10 L.F.	\$44.0
C1020	903	Int Door/Frame/Handware - 3/0x7/0 - Hollow Metal, P-lam Veneer	2	2.00	\$1,950.00 Ea	\$3,900.0
C1020	0002	Madical Usear Cohinat	6	6.00	\$175.00 I.E	\$750.0
C1030	0001	Medical Opport Cabinet	4	6.00	6165.00 L.F.	6000.0
C1030	0001	Internal base cauties	0	0.00	5103.00 L.F.	3330.0
C1030	1003	Solid Surface Countertop	6°2 Derivator 160	12.00	\$33.00 S.F.	5660.0
C1510	1004	Wall Protection, Corner Guards	Perimeter / 50	1.16	\$50.00 E8.	558.0
C3010	1219	Paint Drywall Partitions, Interior	Perimeter * Height	836.17	\$0.50 S.F.	5418.0
C3010	0001	Tape and Bed Partition	Perimeter * Height	836.17	\$0.50 S.F.	\$418.0
C3010	0001	Caulk Interior Joint Allowance	Perimeter * 1.5	87.00	\$1.10 L.F.	\$95.7
C3010	927	Tape & Bed Furr Down	8*3	24.00	\$8.00 S.F.	\$192.0
C3010	1224	Paint Furr Downs	8*3	24.00	\$1.75 L.F.	\$42.0
C3010	1207	Ceramic Tile, Wall at Clinical Sink	4*9	36.00	\$12.50 S.F.	\$450.0
C3020	1319	Sheet Vinyl, Integral Cove Base	Perimeter	58.00	\$5.75 L.F.	\$333.5
C3020	1318	Welded Sheet Vinyl Flooring	Area	154.00	\$6.00 S.F.	\$924.0
C3020	0001	Floor Prep	Area	154.00	\$0.30 S.F.	\$46.2
C3030	1401	Acoustical Ceiling Allowance / SF (tile and grid installed)	Area	154.00	\$3.25 S.F.	\$500.5
		Bull Pen				
Classification	Item Number	Bull Pen Name	Qty. Formula	Quantity	Cost Unit	Aggregate
Classification C1010	Item Number 811	Bull Pen Name Interior Partition - Full Height	Qty. Formula Perimeter * Height	Quantity 1314.29	Cost Unit \$5.50 S.F.	Aggregate \$7,228.5
Classification C1010 C1010	Item Number 811 0002	Bull Pen Name Interior Partition - Full Height Furr Down	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5	Quantity 1314.29 683.73	Cost Unit \$5.50 S.F. \$15.00 S.F.	Aggregate \$7,228.5 \$10,256.0
Classification C1010 C1010 C1010	Item Number 811 0002 802	Bull Pen Name Interior Partition - Full Height Furr Down In-Wall Blocking - Miscelluneous	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area	Quantity 1314.29 683.73 501.01	Cost Unit \$5.50 S.F. \$15.00 S.F. \$1.50 L.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5
Classification C1010 C1010 C1010 C1010 C1010	Item Number 811 0002 802 0001	Bull Pen Name Interior Partition - Full Height Furn Down In Wall Blocking - Miscellaneous Free / Smoke Stopping	Qty. Formula Perimeter * Height (Perimeter * 3]*2.5 Anea Anea	Quantity 1314.29 683.73 501.01 501.01	Cost Unit \$5.50 S.F. \$15.00 S.F. \$1.50 L.F. \$1.10 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1
Classification C1010 C1010 C1010 C1010 C1010 C1010	Item Number 811 0002 802 0001 0003	Name Name Interiar Purtflon - Full Heigh Furr Down In Yull Bicking - Miscelluneous Frey Smake Roging Interiar Storefront - Standard	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter/2) * 5	Quantity 1314.29 683.73 501.01 501.01 227.91	Cost Unit \$5.50 \$.F. \$15.00 \$.F. \$1.50 L.F. \$1.10 \$.F. \$35.00 \$.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9
Classification C1010 C1010 C1010 C1010 C1010 C1030	Item Number 811 0002 802 0001 0003 0003	Buil Pen Name Interior Partition - Full Heigh Furr Down In Wall Bickling Wardelmensos Fire / Smake Stopping Interior ScoreFinant - Standard Solid Sufface Council Standard Solid Standard	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter/2) * 5 Perimeter*.8*2.5	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 L.F. \$1.10 S.F. \$35.00 S.F. \$35.00 S.F. \$55.00 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030	Item Number 811 0002 802 0001 0003 0003 0004	Bull Pen Interior Partition - Full Height Farr Board Farr Board Farr Jonan Congeneration Farr Jonate Stopping Farr Jonate Stopping Sold Scifface Causterbop Numer Staten Sold Scifface Causterbop Numer Staten	Qty, Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter/2) * 5 Perimeter*.8*2.5 Perimeter*.8	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 S.F. \$11.00 S.F. \$35.00 S.F. \$35.00 S.F. \$35.00 S.F. \$425.00 L.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1510	Item Number 811 0002 802 0001 0003 0003 0004 1004	Bull Pen Name Interior Partition - full Heght (nr Your Bonn) In Youl Bookne, Muscellunetous (nr Your Stogging Interior StorePart - Standard Sold Softrate Counterty Name Station Ward Poterton, Course Guards	Qty, Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter/2) * 5 Perimeter * 8*2.5 Perimeter * 8 Perimeter / 50	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.01 L.F. \$1.10 S.F. \$35.00 S.F. \$35.00 S.F. \$425.00 L.F. \$425.00 L.F. \$50.00 E.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1510 C3010	Item Number 811 0002 802 0001 0003 0003 0004 1004 1219	Bull Pen Interior Portition - full Height for Data Black (Pen for Data) for Data Black (Pen for State) for Jonate Stapping for Jonate Stapping Sold Sofrace Constructop Naves Station Wal Potetorics, Carener Guards Pen for Daynal Parliame, Interior	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter/2) * 5 Perimeter* 8*2.5 Perimeter* 8*2.5 Perimeter* 50 Perimeter * Height	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82 1314.29	Cost Unit \$5.50 S.F. \$15.00 S.F. \$1.50 U.F. \$1.10 S.F. \$35.00 S.F. \$35.00 S.F. \$425.00 S.F. \$50.00 S.F. \$425.00 U.F. \$50.00 E. \$0.50 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1510 C3010 C3010	Item Number 811 0002 802 0001 0003 0003 0004 1004 1219 0001	Ind Pen Name Interior Partition - Full Height (are Down - In Yuli Blooke, - Muschlanetou In Yuli Blooke, - Muschlanetou (are f yonks Stepping Interior Storefort - Standard Sold Software Careford Wants Nation Ward Parteton, Caref Guard Part Dayna Parktion, Interior Taxe and Ball Parktion	Qty, Formula Perimeter * Height (Perimeter * 3)*2.5 Area	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82 1314.29 1314.29	Cost Unit \$55.50 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$35.00 S.F. \$455.00 S.F. \$425.00 LF. \$50.00 Ea. \$0.00 S.F. \$0.00 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1
Classification C1010 C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1510 C3010 C3010 C3010	Item Number 811 0002 802 0001 0003 0004 1004 1219 0001 927	Bull Pen Name Interior Partition - Full Heght (are Down) In Wall Bloody - Mancellaneous Interior Strenders - Standard Sold Andrae Canterlaneous Name Station Sold Andrae Canterlaneous Name Station - Conter Guided, Dance Downal Particular, Interior Tage and Ber Artikina	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area (Perimeter * 3)*2.5 Perimeter * 8*2.5 Perimeter * 8*2.5 Perimeter * 16ight Perimeter * 14ight (Perimeter * 3)*2.5	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82 1314.29 1314.29 683.73	Cest Unit \$55.00 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$35.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$50.00 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$657.1
Classification C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C1510 C3010 C3010 C3010 C3010	Item Number 811 0002 802 0001 0003 0004 1004 1219 0001 927 1224	Ind Pen Name Interior Partition - full Regift (are Down) (in You Blooks, - Muschlaneous (in You Blooks, - Muschlaneous (in You Blooks, - Muschlaneous (interior Storefort - Standard Solid Sorkan Counterban Nama Station Wan Destrono, Career Guard Part Down All Partitions, Interior Taree als der Farturan Taree Station	Qty, Formula Perimeter * Height (Perimeter * 3)? 2.5 Area Area (Perimeter /2) * 5 Perimeter * 8? 2.5 Perimeter * 8? 2.5 Perimeter * Height (Perimeter * Height (Perimeter * 3)? 2.5 (Perimeter * 3)? 3.5 Charlies * 3)	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82 1314.29 1314.29 683.73 683.73	Cest Unit \$5.50 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$35.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$50.00 E. \$0.50 S.F. \$0.50 S.F. \$8.050 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$10,028.1 \$30,995.9 \$11,9557.1 \$657.1 \$657.1 \$55,669.8 \$1,195.5
Classification C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C1030 C1510 C3010 C3010 C3010 C3010	Item Number 811 0002 802 0001 0003 0004 1004 1219 0001 927 1224 0001	Bull Pen Name Unterior Partition – Full Heght (in YouT Boons) In YouT Boons, Minorettereop Universitation of the Standard Sold Solariza Carateriza Sold Solariza Carateriza Value Standard Solariza Carateriza Value Standard Tape & Med Partition, Interfor Tape & Med Partition, Interfor Tape & Med Partition, Interfor Tape & Med Partition, Interform Tape & Med Partition, Interform Tape & Med Partition, Interform	Qty. Formula Perimeter * Height (Perimeter * 3)*2.5 Area Area Area Perimeter ? * 5 Perimeter * 8*2.5 Perimeter * 8*2.5 Perimeter * 16:9 Perimeter * 16:9 (Perimeter * 3)*2.5 (Perimeter * 3)*2.5 Derimeter * 15.7 Derimeter * 15.7 Deri	Quantity 1314.29 683.73 501.01 2227.91 182.33 72.93 1.82 1314.29 1314.29 1314.29 683.73 683.73 185.75	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 K.F. \$15.00 K.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 E.R. \$0.50 S.F. \$50.50 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$55,469.8 \$1,1965.5
Classification C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3010	Item Number 811 0002 802 0001 0003 0004 1004 12219 927 1224 0001 927 1224	Ind Pen Name Interior Partition - Full Regift (arr Down) (in Your Bookey, Mucellaneous) (in Your Bookey, Mucellaneous) (in Your Bookey, Mucellaneous) (interior Storeberth - Skadard (Skadard) (Skad	City, Formula Perimeter * Height (Perimeter * 3]*2.5 Area Area (Perimeter/2) * 5 Perimeter/2) * 5 Perimeter * 18:25.5 Perimeter * Height Perimeter * Height (Perimeter * 3]*2.5 Perimeter * 1:50 Benerer	Quantity 1314 29 663.73 501.01 501.01 227.91 182.33 72.93 182. 1314 29 663.73 663.73 1663.73 1663.73 1665.75 1665.75 1665.75 1665.75 1665.75 1665.75 1675.75 1775.	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$35.00 S.F. \$35.00 S.F. \$425.00 LF. \$425.00 LF. \$50.00 S.F. \$51.75 LF. \$51.75 LF.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$55,469.8 \$1,196.5 \$1,196.5 \$1,196.5
Classification C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3020	Item Number 811 0002 802 0001 0003 0004 1004 12219 0001 2219 0001 1224 0001 1319	Bull Pen Name Interior Partition – Full Regist (in Youl Biodyn, Minstellnetous) (in Youl Biodyn, Minstellnetous) (interior Storetons - Standard Sold Sofrata Carenet Name Station Wave Station Wave Neterion, Carene Guards (Part Dyna) Parktion, Interior Type & Med Parktion, Interior Type & Med Parktion, Interior Type & Med Parktion, Interior Care Brance Care Station (Care Brance Care Station) (Care Brance Care Station)	Qy, Formula Perimeter * Height (Perimeter * 3)*2-5 Area (Perimeter * 3)*2-5 Perimeter * 3*2-5 Perimeter * 4*2-5 Perimeter * 50 Perimeter * Height (Perimeter * 1150) Perimeter * 150 Perimeter * 150	Quantity 1314.29 683.73 501.01 501.01 182.791 182.33 72.93 182 1314.29 1314.29 1618.73 683.73 196.75 91.16	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$35.00 S.F. \$55.00 S.F. \$425.00 LF. \$50.00 Ea. \$0.50 S.F. \$50.50 S.F. \$50.50 S.F. \$50.50 S.F. \$50.50 S.F. \$51.75 LF. \$1.10 LF. \$51.75 LF. \$55.75 LF. \$55.75 LF.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$5,460.8 \$1,196.5 \$150.4 \$31,045.5 \$150.4 \$24.2 \$24.2 \$150.4 \$24.2 \$24.2 \$25.2
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C3020	tem Number 811 0002 802 0003 0003 0004 1004 1204 1204 1204 1217 1224 0001 927 1224 0001 1319 1318	Ind Pen Name Interior Partition - Full Regist (arr Down) (arr Down) (br Ault Blocky - Micelleneous (br Ault All Ander) (br Ault All A	City, Formula Perimeter * Tielght (Verimeter * 19)t2, Neva Area Perimeter /1 *5 Perimeter *3 Perimeter *3 Perimeter * Tielght Perimeter * Tielght (Perimeter *3)t2;5 Perimeter *3 Perimeter	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 1.82 1314.29 1314.29 1314.29 1314.29 1314.29 1314.29 1314.57 91.16 501.01	Cost Unit \$5.50 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$15.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$50.00 I.F. \$50.00 I.F. \$50.00 S.F. \$50.00 S.F. \$50.00 S.F. \$51.75 I.F. \$51.10 I.F. \$51.10 I.F. \$55.75 I.F. \$56.00 S.F. \$56.00 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,095.9 \$91.1 \$657.1
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C3020 C3020	Item Number 811 0002 802 0001 0003 0004 1004 1219 0004 1209 007 1224 0001 1319 1318 0001 0001	Bull Pen Kenne Interior Partition – Full Regist Instruction – Full Regist Instruction Constructions In Wall Biologies, Mitstelleneous Instruction Storegene, Instruction Storegene, Store Storegene, Instruction Wanne Station Wanne Station Parte Dava Partitions, Interior Tapes & Bef Partitions, Interior Tapes & Store Furthermon Tapes & Store Furthermon Tapes & Store Furthermon Cardin Instruction Cardin Instruction Cardin Instruction Cardin Instruction Webde Store Uting/Instruction Webde Store Uting/Instruction	City, Formula Perimeter * Tredge (Perimeter * 1972, Area Area Perimeter 20 Perimeter * 27,5 Perimeter * 150 Perimeter * 1620, Perimeter * 112,5 (Perimeter * 112,5) Perimeter * 15,0 Perimeter *	Quantity 1314.29 683.73 501.01 501.01 182.33 72.93 1.82 1314.29 683.73 663.73 156.75 91.16 501.01	Cost Unit \$55.00 S.F. \$55.00 S.F. \$15.00 S.F. \$15.00 S.F. \$11.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$55.00 S.F. \$50.50 S.F. \$50.50 S.F. \$50.50 S.F. \$50.50 S.F. \$50.50 S.F. \$51.75 LF. \$51.10 LF. \$56.00 S.F. \$56.00 S.F. \$51.75 LF. \$51.70 LF. \$56.00 S.F. \$50.30 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$657.1 \$55,469.8 \$1,196.5 \$150.4 \$524.2 \$3,006.0 \$150.3
Classification C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C3020 C3020 C3020 C3020 C3020	Item Number 811 0002 802 0001 0003 0004 1004 1219 0001 927 1224 0001 1318 0001 1318	Ind Pen Name Interior Partition - Full Regist (Terr Down) In You Blook, - Munothereous In You Blook, - Munothereous In You Blook, - Munothereous Interior Storebert-: Standard Sold Software Counterburg Names Station Water Develop, Course Guarde Part Down Part Develop, Course Guarde Part Down Part Develop, Course Guarde Cash Interior Course Cash Interior Course Cash Interior Course Cash Interior Course Weddel Develop, Course Guarde Weddel Develop, Course Munot Resource (Cash Interior Teor Part	City, Formula Perimeter * Tielgh (Reiningter * 1972) Area Area Perimeter * 1972 Perimeter * 3 Perimeter * 5 Perimeter * Tielgh Perimeter * 1162 (Perimeter * 1162) Perimeter * 1172 Perimeter * 1972 Perimeter * 1972 Area Area Area	Quantity 1314.29 683.73 501.01 501.01 182.33 72.93 1.82 1314.29 683.73 663.73 156.75 91.16 501.01 501.01	Cent Unit \$55:00 \$F. \$55:00 \$F. \$51:50 \$F. \$51:50 \$F. \$55:00 \$F. \$55:00 \$F. \$425:00 \$F. \$50:00 \$F. \$50:00 \$F. \$50:00 \$F. \$50:00 \$F. \$50:00 \$F. \$50:00 \$F. \$51:10 \$F. \$50:30 \$F. \$50:30 \$F. \$50:30 \$F. \$50:30 \$F. \$50:30 \$F. \$50:30 \$F. \$51:25 \$F. \$50:30 \$F. \$50:30 \$F. \$50:30 \$F. \$51:25 \$F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$657.1 \$54.698.8 \$1,1965 \$150.4 \$524.2 \$3,006.0 \$150.3 \$1,628.2
Classification C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C1010 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C3020 C3020 C3020 C3020	Item Number 811 0002 802 0001 0003 0004 1004 1219 0001 927 1224 0001 1319 1319 1319 1319 1340	bull Pen Name Unterior Partition - Full Regist (in You Biology, Minotellinesson, In You Biology, Minotellinesson, Interior Storehenst - Standard Gold Sorietan Carateritop Name Station Waren Station Waren Station Waren Berlann, Betelar Type at Bod Partition, Betelar State Unit, Honggal Care Base Walded Shaet Unit Thorong Fisco Fage Accustical Caling Alassance / 55 Dills and grid Installed)	City, Formda Perrineter * Treligh (Perineter * 1972) Area Area Area Perineter * 37:5 Perineter * 37:5 Perineter * 18 Perineter * 19:25 (Perineter * 130 Perineter * 130 Perine	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 182.33 182.33 182.33 182.33 184.29 1314.29 1314.29 683.73 136.75 91.16 501.01 501.01	Cost Unit \$5500 S.F. \$51500 S.F. \$51500 S.F. \$51500 S.F. \$51500 S.F. \$5500 S.F. \$5500 S.F. \$5000 S.F. \$5000 S.F. \$5175 L.F. \$5577 L.F. \$5303 S.F. \$3203 S.F. \$3203 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$5,469.8 \$1,196.5 \$150.4 \$5,469.8 \$1,196.5 \$150.3 \$1,628.2
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3020	Item Number 811 0002 802 0003 0003 0004 1004 1219 0001 927 1224 0001 1318 0001 1461 Item Number	bull Pen Name Viteriar Partition - full Regist Viteriar Partition - full Regist Viter Down In Vall Biogram, Muscellanetous In Vall Biogram, Muscellanetous In Vall Biogram, Muscellanetous Viteriar Standard Sold Software Counterburs Viteriar Standard Viteriar Standard Viteriar Viteri	Oty formula Permeter * Height (Permeter * 1912.5 Area Area Area Area Permeter * 312.5 Permeter * 32.5 Permeter * 100 Permeter * 100	Quantity 1314.29 668.73 501.01 227.91 182.33 142.93 1344.29 1314.29 668.373 668.373 168.373 168.373 168.375 191.16 501.01 501.01 501.01	Cost Unit \$5500 S.F. \$51500 S.F. \$51500 S.F. \$51500 S.F. \$55500 S.F. \$5500 S.F. \$5500 S.F. \$5500 S.F. \$5500 S.F. \$5000 S.F.	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$91.1 \$657.1 \$657.1 \$657.1 \$657.1 \$657.1 \$657.1 \$55,469.8 \$1,196.5 \$150.4 \$554.2 \$3,006.0 \$150.3 \$1,628.2
Classification C1010 C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3020	Item Number 811 0002 802 0003 0003 0004 1004 1219 0001 1318 0001 1319 1318 0001 1461	bull Pen Kenne Interior Partition – Full Regist Interior Partition – Full Regist Instrum Stockny – Minestleneous Instrum Minestleneous Ins	Opt formula Perimeter ** Height (Perimeter ** 1912.5 Acco Perimeter *1912.5 Perimeter *1912.5 Perimeter *1912.5 Perimeter * Height Perimeter *1500 Perimeter *15000 Perimeter *15000 Perimeter *15000 Perimeter *15000 Perimet	Quantity 1314.29 663.73 501.01 227.91 182.33 72.93 1.82 1314.29 1314.29 1314.29 663.73 663.73 663.73 136.75 91.16 501.01 501.01 501.01	Cost Unit \$S50 \$F. \$S1500 \$F. \$S000 \$F. \$S000 \$S. \$S1500 \$F. \$S000 \$S. \$S1500 \$F. \$S000 \$S. \$S100 \$F. \$S000 \$S. \$S110 \$F. \$S120 \$F. \$Cast Unit	Aggregate \$7,228.5 \$10,260 \$75,15 \$55,11 \$7,976.9 \$10,028.1 \$30,995.9 \$11,1965 \$15,469.8 \$1,1965 \$15,046 \$55,42 \$3,006.0 \$15,03 \$16,28.2 \$1,628.2\$1,628.2\$1
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C30	Item Number 811 0002 802 0003 0003 0004 1219 0004 927 1224 0001 1319 1318 1401 Item Number 801	Index Partition - Full Regist Transform Partition - Full Regist Terry Town - In Yuli Blooke - Muscilleneous In Yuli Blooke - Muscilleneous Terry from & Stepping Thiniris Stepping Thiniris Stepping Marine Standard Sold Solvers Councel Carelo Water Stepping The and Bed Partition, Intellier Tare & Bed Partition, Intellier Tare & Step Partition Tare & Step Partition Tare & Stepping Part Caro Anna Name Clean Stepping Clean Stepping Manage - Stepping Clean Stepping Marine - Full Regist Than Down Step Data Stepping Steppi	Oty formula Permeter * Height (Permeter * 1912.5 Area Area Area Area Area Permeter * 312.5 Permeter * 32.5 Permeter * 10 Permeter	Quantity 1314.29 683.73 501.01 227.91 182.33 1.82 1314.29 1314.29 1314.29 1314.29 1314.29 1314.29 1314.29 1314.57 91.16 501.01 5	Cost Unit \$550 \$F. \$5150 \$S. \$5500 \$S. \$5000 \$S. \$5000 <td>Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$657.10\$\$657.</td>	Aggregate \$7,228.5 \$10,256.0 \$751.5 \$551.1 \$7,976.9 \$10,028.1 \$657.10\$\$657.
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Perrometer * 10*2 Perrometer * 11*2 Perrometer * 11*2 Perrometer * 11*2 Perrometer * 15:0 Perrometer * 15:0 Perrometer * 15:0 Perrometer * 15:0 Perrometer * 15:0 Area Area Area Area Area Area Area 5:5	Quantity 1314.29 683.73 501.01 501.01 227.91 182.33 72.93 1.82 1314.29 1314.29 1314.29 1314.29 1314.57 91.16 501.01 50	Cent Unit \$5550 \$F. \$5550 \$F. \$5150 \$S. \$5150 \$S. \$5150 \$S. \$5150 \$S. \$5150 \$S. \$5150 \$S. \$5550 \$S. \$5550 \$S. \$5550 \$S. \$5550 \$S. \$5550 \$S. \$5000 \$E. \$5000 \$E. \$5000 \$S. \$5000 \$S. \$5000 \$S. \$5175 \$S. \$5175 \$S. \$5000 \$S. \$5175 \$S. \$5000 \$S. \$5100 </td <td>Aggregate \$7,228.5 \$10,256.0 \$751.5 \$5551.1 \$7,976.9 \$10,028.1 \$30,995.9 \$11,196.5 \$10,028.1 \$30,995.9 \$11,196.5 \$155,469.8 \$1,196.5 \$150.3 \$1,628.2 Aggregate \$5,563.9 \$765.0 \$355.8 \$1,628.2 Aggregate \$5,563.9 \$765.0 \$355.8 \$1,628.2 Aggregate \$5,563.9 \$765.0 \$355.8 \$1,628.2 Aggregate \$5,563.9 \$765.0 \$355.8 \$1,028.2 Aggregate \$5,563.9 \$765.0 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Classification C1010 C1010 C1010 C1010 C1030 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C1020 C3020 C1020	Item Number 811 0002 802 0003 0004 0004 1004 223 0001 927 1224 0001 1318 0001 1461 Rem Number 811 0002 801	Bull Pen Kenne Interier Partition – Full Regist Interier Partition – Full Regist Instrum Stockny - Minotelleneous In Vaul Biodow, - Minotelleneous Instrum Stocknet - Standard Sold Sofrace Counterburg Narus Station Wan Detection, Courre Guards Part Dy Part Dy Partitions, Interier Tage als del Partitions, Interier Tage als del Partitions (Tage of Soft Part Down Part Part Orons Counter Soft Wanger Counter Software (Software) Counterburg Narus Station Weidel Software, I-Software (Software) Narus Station Neurol Interier Counterburg Nature Counterburg Nature Nat	Oper formula Permoter * Height (Perimeter * 1912) Area (Perimeter * 1912) Area (Perimeter * 1912) Area (Perimeter * 1012) Perimeter * 10 Perimeter * 1012) Perimeter * Height (Perimeter * 112) Perimeter * 1120 Perimeter * 1120 Perimeter * Height Perimeter * 1120 Perimeter * Height 123 Perimeter * Height 123 Perimeter * Height 123 Perimeter * Height 135 St 15	Quantity 1314.39 683.73 501.01 501.01 501.01 182.33 72.93 132 134.29 1314.39 134.4.39 134.4.39 135.4.55 101.01 501.01	Cent Unit \$5550 \$F, \$5550 \$F, \$51500 \$F, \$51500 \$F, \$51500 \$F, \$51500 \$F, \$51500 \$F, \$51500 \$F, \$55500 \$F, \$55500 \$F, \$5000 \$F, \$5000 \$F, \$5000 \$F, \$5175 \$F, \$5175 \$F, \$5175 \$F, \$5000 \$F, \$5120 \$F, \$5120 \$F, \$5120 \$F, \$5120 \$F, \$5150 \$F, \$120 \$F, \$120 <td>Aggregate \$7,228,58 \$10,256,2551,1 \$10,278,15551,1 \$10,278,15 \$10,278,15 \$10,278,15 \$10,278,11 \$10,078,11</td>	Aggregate \$7,228,58 \$10,256,2551,1 \$10,278,15551,1 \$10,278,15 \$10,278,15 \$10,278,15 \$10,278,11 \$10,078,11
Classification C1010 C1010 C1010 C1010 C1010 C1030 C1030 C1030 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3010 C3020 C1020 C3020 C1020 C3020 C3020 C1020 C3020 C3020 C1020 C3020 C1020	Item Number 811 0002 802 0001 0003 0004 1004 1219 1219 927 1224 0001 1319 1318 0011 1401 Rem Number 801 802 804 0001	Bull Pen Name Unterior Partition - Full Regist (Furth Doam) In Wall Biologie, "Minosthemeson, In Wall Biologie, "Minosthemeson, Warnes Statel Geld Forters Catenter Warnes Statel Wall Interest Strene Guards Wall Interest Desting Theorem State (Catenter Catenter Dessing) (Catenter Catenter Dessing) (Catenter Catenter Dessing) (Catenter Participae) (Catenter Participae) (Cat	Oper Kormola Perrimeter * 140ph (breinner * 3)*2,5 Area Area Perrimeter * 140ph Perrimeter * 15 Perrimeter * 150ph Perrimeter * 150ph Perrimeter * 15,0 Perrimeter * 15,0	Quantity 1314.29 683.73 501.01 501.01 507.01 182.33 72.93 182.33 182.33 182.33 182.75 91.16 501.01 501.0	Cent Unit. 55:50 3.F. 55:50 3.F. 51:50 1.F. 51:50 1.F. 51:50 1.F. 51:50 1.F. 51:10 1.F. 55:50 1.F. 55:50 1.F. 55:50 1.F. 50:50 1.F. 50:50 1.F. 50:50 1.F. 50:50 1.F. 50:50 1.F. 51:10 1.F. </td <td>Aggregate \$7,228,355 \$10,256,05 \$551,11,256,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,008,05 \$10</td>	Aggregate \$7,228,355 \$10,256,05 \$551,11,256,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,028,05 \$10,008,05 \$10

- Communicate Assumptions
 - This tool helps inform other team members that were not involved in the earlier stages.
- Data Separated by Rooms
 - In a format that communicates to field construction staff to what they are buying (bid tab format)



Corey Johnson Director of Product Management







One Model for Construction



Challenge then becomes...



Solution



Model Based Workflow

- Import Models
- Enhance Model for Missing Information
- Check Model for Errors
- Error Report
- FDE Report (Facility Data Exchange)



http://bim.psu.edu/Uses/

Model Based Workflow Issues

- Need Models from Multiple Sources
- Models may be Missing Data
- Data may need to be added for Owner Req.
- Errors need to be Documented and Communicated
- Data needs to be populated by many parties
- FDE Worksheet needs to be filled out

Gather

InfinyD import Options

- Industry Foundation Class (IFC)
- Navisworks Document (NWD)

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Models Conne	ections	Users	Reports	Unit Conversior	ns Dimensions						
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Generate

Custom Data Operations

- Emergency Lights
- Owner Asset Classification
- Owner System Designation

		Create a new pr	oroperty	by Express	ion										
Operation name	22 33 00 Asset (Classification Null													
Category	Model Prep - En	ror Prep		•										HARDDO	LLAR\Connor.Chr
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Generate

Owner Data Property Set

Base Information _USACE - Mechanical Equ	ipment IFC Constraints Dimensions	Identity Data Information
Mechanical Mechanical - Flow Other Pl	nasing Pset_DistributionFlowElementCor	nmon
Pset_ManufacturerTypeInformation USACE	Data USACE FDE Check	
Name	Value	
USACE - Asset Classification	Variable-Air-Volume Unit	
USACE - System Designation	Heating Ventilation and Air Condi	tioning
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Analyze

Custom Data Operations

• Check for Null Values

0						
Operation name	Asset Descriptio	n Null check				
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Property Set Name	USACE FDE Che	eck	•			
Property	Asset Descriptio	n - Null				
DataType	System.Int64		•			
Value	1					
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Property Se	et Name	Property Name	Data Type	Operator	Value	
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Update a property by Expression

Analyze

Owner FDE Check Property Set

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Communicate

Data Report and Export

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	Entity Na	me 🔻 Entity Type 🔻	Asset Classification - Null	 Asset Description 	-Null 🕆 Ir	nstallation Date - Null 🔻	Manufacturer - Null 🔻	Serial Number - Null	Spec Reference - Null T	System Classification - Null 🔻	System Designation - Null 🔻	Ta 🕇
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Communicate to Field

Field Data Entry

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M_Transformer Switchboard:MS1:8			1			
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		ModelName: Clinic		(
Communicate

Visual Report



Realize

Data Report and Export

		D	Drag a column here to group by this i	column.									
Family	T Keynote	USACE - Asset Classification	USACE - System Designation	Assembly Code	TagNumber	* Manufacturer *	T Model T	SerialNumber		v WarrantySta			
M_Water Heater: 380 L	22 33 00	Electric Domestic Water Heate.	Plumbing	D20	W.H.	Manufacturer		SerialNumber	InstallationDate	WarrantyStar			
M_Centrifugal Fan - Rooftop - Upblast: 991-190	5 LPS 23 34 00		Heating Ventilation and Air Con.	D30	RAF-1	Manufacturer		SerialNumber	InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 200 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	WWW	Manufacturer			InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 250 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	SSS	Manufacturer			InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 200 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	RRR	Manufacturer			InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 300 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	QQQ	Manufacturer			InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 400 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	XXXX	Manufacturer			InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 250 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	000	Manufacturer		DFG-654	InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 150 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	VVV	Manufacturer		FGH-987	InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 200 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	EEE	Manufacturer		UIO-789	InstallationDate	WarrantyStar			
M_VAV Unit - Single Duct: 150 mm	23 36 16	Variable-Air-Volume Unit	Heating Ventilation and Air Con.	D30	PPP	Manufacturer		SDF-321	InstallationDate	WarrantyStar			Contraction (1997)
M_VAV Unit - Single Duct: 200 mm		A		В	-	C			D		E	F	G _
M_VAV Unit - Single Duct: 300 mm	1	Family		Keynote	USA	CE - Asset Classif	fication	US	SACE - System Des	ignation	Assembly Code	TagNumber	Manufacture
M_VAV Unit - Single Duct 200 mm	2 M_Water Heater: 38/	DL		22 33 00	Electric Dom-	estic Water Heate	ers	Plumbing			D20	W.H.	Manufacturer
M VAV Unit - Single Duct 250 mm	3 M Centrifugal Fan	Rooftop - Upblast 991-1905 LPS	5	23 34 00				Heating Ve	entilation and Air Co	nditioning	D30	RAF-1	Manufacturer
M VAV Unit - Single Duct: 150 mm	n 3 M_Centrilogai Pan - Rootop - Opplast 591-190		5 · · · · · · · · · · · · · · · · · · ·	23 36 16	Variable Art Values 1 lait			Hasting Vantilation and Air Conditioning			030	WMM	Manufacturar
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M VAV Unit - Single Duct: 200 mm	200 mm 6 M_VAV Unit - Single Duct 200 mm			23 36 16	Variable-Air-Volume Unit			Heating Ventilation and Air Conditioning			D30	RRR	Manufacturer
M_VAV Unit - Single Duct: 200 mm	y M_VAV Unit - Single Duct 300 mm		9	23 36 16	Variable-Air-Volume Unit			Heating Ventilation and Air Conditioning			D30	QQQ	Manufacturer
M_VAV Unit - Single Duct: 200 mm	8 M_VAV Unit - Single	Duct 400 mm		23 36 16	Variable-Air-V	Volume Unit		Heating Ve	antilation and Air Co	nditioning	D30	XXXX	Manufacturer
M_VAV Unit - Single Duct: 250 mm	o M VAV Unit - Single	Duct 250 mm		23 36 16	Variable-Air-	Volume Unit		Heating Ve	entilation and Air Co	nditioning	030	UUU	Manufacturer
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M_VAV Unit - Single Duct: 150 mm	12 M_VAV Unit - Single	Duct 150 mm		23 36 16	Variable-Air-	Volume Unit		Heating Ve	entilation and Air Co	inditioning	D30	PPP	Manufacturer
M_VAV Unit - Single Duct: 300 mm	13 M_VAV Unit - Single	Duct 200 mm		23 36 16	Variable-Air-V	Volume Unit		Heating Ve	entilation and Air Co	nditioning	D30	GGG	Manufacturer
M_VAV Unit - Single Duct: 200 mm		Duct 300 mm		23 36 16	Variable-Air-Volume Unit			Heating Ventilation and Air Conditioning			D30	FFF	Manufacturer
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M VAVUalt Circle Duct 200 mm	18 M_VAV Unit - Single	Duct 150 mm		23 36 16	Variable-Air-	Volume Unit		Heating Ve	entilation and Air Co	nditioning	D30	0	Manufacturer
4.1	19 M_VAV Unit - Single	Duct 250 mm		23 36 16	Variable-Air-	Volume Unit		Heating Ve	entilation and Air Co	nditioning	D30	P	Manufacturer
	20 M_VAV Unit - Single	Duct 200 mm		23 36 16	Variable-Air-V	Volume Unit		Heating Ve	entilation and Air Co	nditioning	D30	Q	Manufacturer
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Q&A Time

If you have questions for today's presenters, please submit them to the moderator via the chat box.

Content-related questions will be answered during this Q&A portion as time allows.

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