Dynamo for Preconstruction: Data Management for Estimating Workflows

Alvaro Colato

Sr. Preconstruction Technology Specialist

Jesse Nelson

Preconstruction Engineer

- **INDUSTRY TALK**

AUTODESK. UNIVERSITY

About the speakers

Alvaro Colato

Currently works as Sr. Preconstruction Technology Specialist at Skanska USA Building in the greater DC Metro area, developing content, training and solutions at a local and national level. This process includes data management, 3D modeling, AR/VR and tools building. Prior to joining Skanska, Alvaro worked in IT, Architecture and the Service Industry. Alvaro graduated from the Catholic University of America with a Bachelors degree in Architectural Science and has professional certificates from the University of Washington in BIM and from Darden Business School at University of Virginia in Design Thinking.

Jesse Nelson

Jesse is a Civil Engineer working for Skanska USA Building as a preconstruction Engineer as well as a Cost Engineer on jobsites. In preconstruction, Jesse is tasked with cost estimating, quantity takeoffs and data management to deliver estimates to Skanska's clients. Prior to joining Skanska Jesse worked abroad in the Oil and Gas sector, building the largest laboratory in South America and infrastructure for the 2016 Olympic Games in Rio de Janeiro. Jesse graduated from Virginia Tech in 2009 and recently earned his executive MBA with a focus in finance from IBMEC (Brazil)

AGENDA

Objectives:

Virginia Hospital MOB Case #1
Skanska's Preconstruction Process

Scotts Run Residential Case #2
Skanska's Approach to Structural Concrete Estimating

Q&A

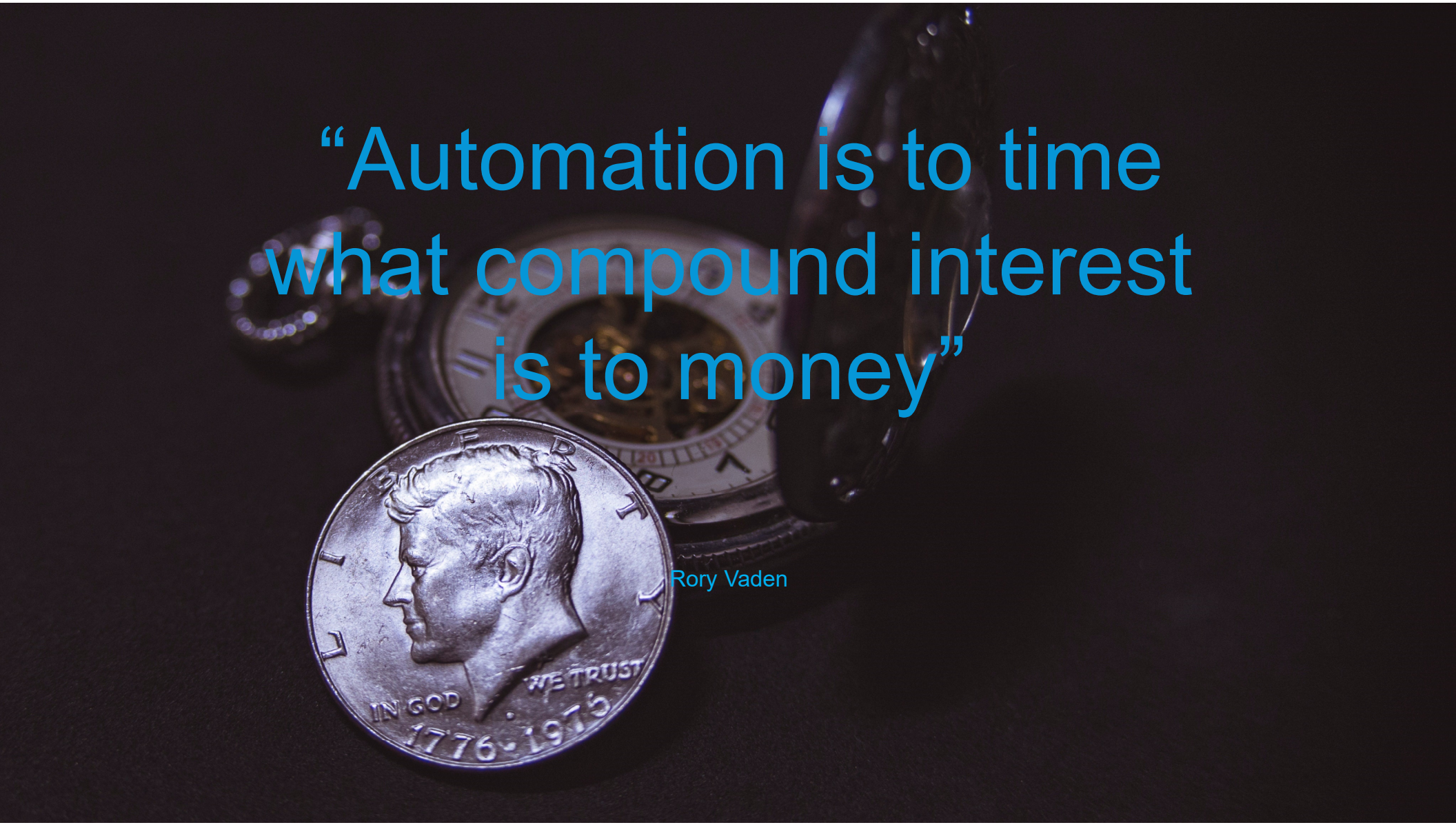
OBJECTIVES

1. LEARN THE IMPORTANCE OF MODEL-BASED ESTIMATING WORKFLOW

2. DISCOVER KEY DRIVERS TO SUCCESS IN MODEL-BASED ESTIMATING WORKFLOWS

3. DISCOVER ADVANTAGES OFFERED FROM ROBUST MODEL-BASED ESTIMATING WORKFLOW

4. LEARN HOW TO CAPITALIZE ON EXISTING DATA IN 3D MODELS


“Automation is to time what compound interest is to money”
Rory Vaden
LIBERTY
IN GOD WE TRUST
1776 1976

Virginia Hospital Medical Office Building

Responsibility Matrix

V.H.C (Internal Kick-off Meeting)

Assign bid packages to the estimating team

Establish Goals
Room Finish Schedule
1400 + Rooms

Data Gathering

Narrative

Drawings

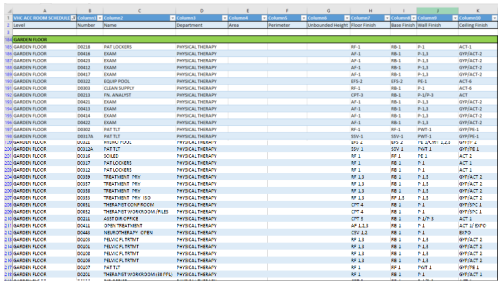
3D Model

Room Finish Schedule must contain:

- Flooring
- Wall Finish
- Base
- Ceiling

Room Schedule generated from Door Schedule Data

Room Finish Schedule



Benchmark

Benchmark Study
Virginia Hospital Center - Ambulatory Care Center

SKANSKA

Industry study for peer institutions having built similar programs within the past 3 years. An asteric denotes a Skanska built project.

Program Description

200,000 SF **200,000 SF ACC in Virginia**
$ 305 /SF **Adjusted PV Cost/SF per below averages**
$ 382 /SF **Adjusted PV Cost/SF WITH location adjustment per below averages**
$ 76,300,531 **Anticipated construction cost range (SF provided x Adj. PV cost with location adjustment)** 2.0% Annual Inflation Rate

Peer *Ambulatory Care Center* Projects






Project	PROJECT A	PROJECT B	PROJECT C	PROJECT D	PROJECT E	PROJECT F	Averages
Location	Sylvania, OH	Philadelphia, PA	Jacksonville, FL	Oaklawn, IL	King of Prussia, PA	Richmond, VA	
Designer							
Year Completed	2015	2014	2015	2014	2015	2016	
SF	230,000	357,251	210,000	330,000	145,000	640,000	254,450
Construction Cost	$50,000,000	$62,500,000	$60,000,000	$108,000,000	$65,000,000	$ 200,000,000	$ 69,100,000
Cost / SF	$ 217	$ 175	$ 286	$ 327	$ 448	$ 313	$ 291
PV (to 2017) Construction Cost	$ 52,020,000	$ 66,325,500	$ 62,424,000	$ 114,610,464	$ 67,626,000	$ 204,000,000	$ 72,601,193
PV (to 2017) Cost / SF	$ 226	$ 186	$ 297	$ 347	$ 466	$ 338	$ 305
Location Factor (Adjustment)	1.39	1.15	1.54	1.11	1.15	1.00	1.27
Adjusted PV Cost	$ 72,307,800	$ 76,274,325	$ 96,132,960	$ 127,217,615	$ 77,769,900	$ 204,000,000	$ 89,940,520
Adjusted PV Cost / SF	$ 314	$ 214	$ 458	$ 386	$ 536	$ 338	$ 382
Notes	4-story facility enhances new care models for the outpatient setting. Interconnecting 23 clinic modules around a spacious central atrium. Design results include; connectivity, expansive use of light and flexibility.	13-story multi-specialty center. Building houses; clinical, research and office space. Multi-story glass atrium. Use of "super- graphics" to assist with way finding.	6-story multispecialty ACC designed to provide "value" to both clinicians and patients. Full service D&T facility with offices. Flexibility with "boundaryless" departments. Incorporates new technology.	9-story LEED Gold facility enhances new care models for the outpatient setting. Collaboration and efficiency based project. Building sets new direction and model of care for campus.	3-story facility enhances new care models for the outpatient setting. Design based on operational efficiency, enhanced value and a healing environment.	Multi-story ACC dedicated to multidisciplinary care model. Exam, surgery, procedure and radiology space in program (full D&T). Includes space for future retail, connectivity to nature and abundent use of natural light.	**Project costs could be expected to be in the mid to high $300/SF range** - pending program scope, SF efficiencies and level of selected finishes.

Virginia Hospital MOB

Design team input

Narrative

Room Name: **Departmental Waiting and Reception**

Floors: Carpet tile at seating areas equal to Shaw Contract Group, "Park Collection".

Walls: Low VOC latex eggshell paint, with up to two accent colors. Thermoset rubber cove base equal to Johnsonite, "Baseworks". Low VOC latex paint, eggshell finish equal to Sherwin Williams, "Harmony". Natural stone tile accents equal to Crossville, "Yin+Yang".

Ceilings: Dropped gypsum soffit/bulkheads with square lay-in acoustical ceiling tile with NRC of .95 equal to Armstrong, "Optima Open Plan 3252PB".

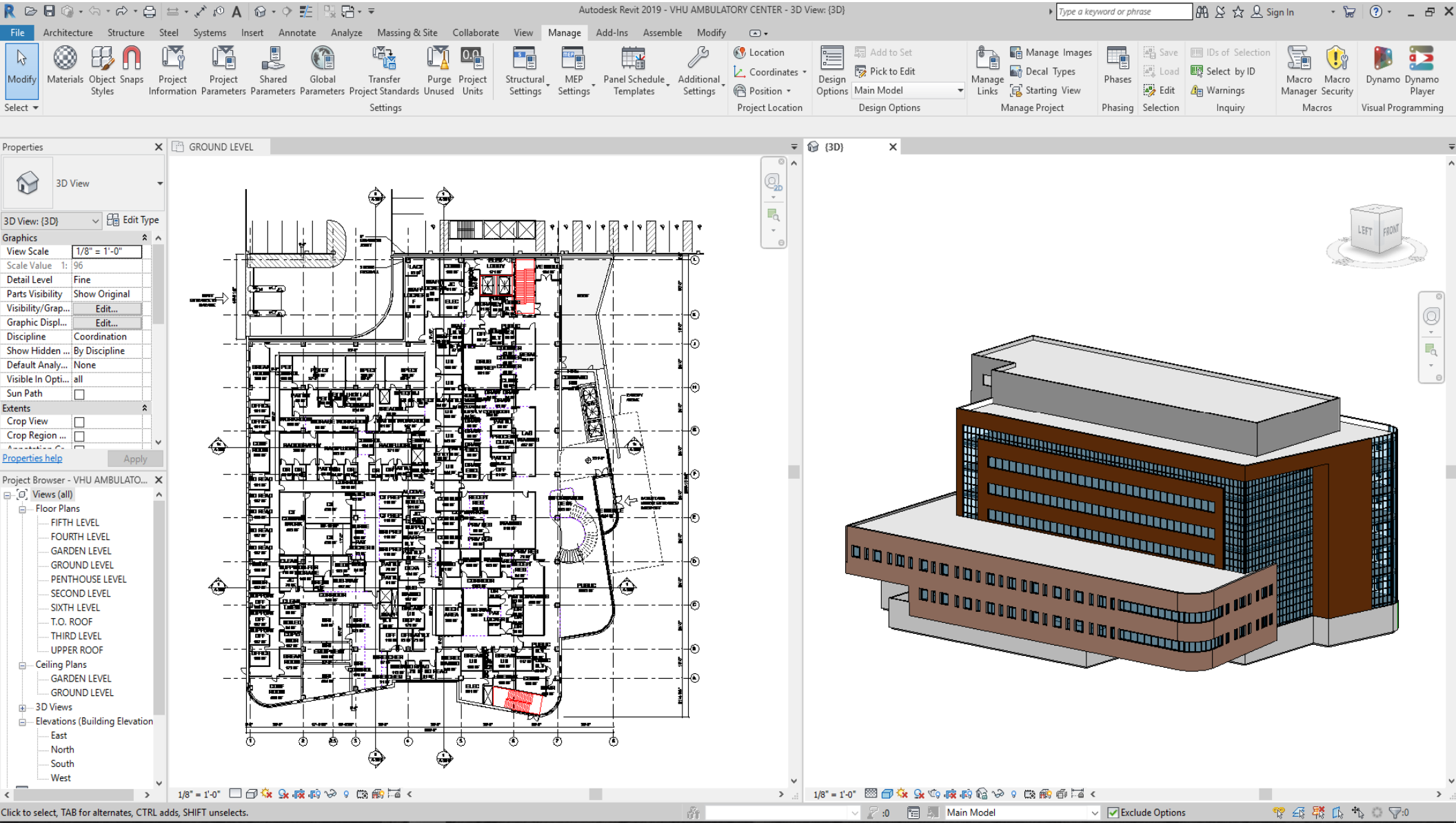
Casework: Wood laminate vertical surface and solid surface. Decorative resin accent. Stainless steel toe kicks. Worksurface and transaction counter to be solid surface.

Lighting: Semi-recessed LED circular diffuse lensed downlight with 0-10V dimming above reception desk, recessed linear LED 1'x4' fixture with 0-10V dimming for area lighting behind reception desk, and reception desk integrated LED task lighting at counter and casework.

Specialty Items or Features:

- Etched glass and gypsum board divider walls.
- Specialty lighting as required to support the interior architectural design.

Schematic Design


Autodesk Revit 2019 - VHU AMBULATORY CENTER - 3D View: {3D}
File
Architecture
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Collaborate
View
Manage
Add-Ins
Assemble
Modify
Modify
Materials
Object Styles
Snaps
Project Information
Project Parameters
Shared Parameters
Global Parameters
Transfer Project Standards
Purge Unused
Project Units
Structural Settings
MEP Settings
Panel Schedule Templates
Additional Settings
Settings
Location
Coordinates
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Main Model
Design Options
Manage Links
Manage Images
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Manage Project
Phases
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Macro Security
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Dynamo Player
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Crop View
Crop Region ...
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Views (all)
Floor Plans
FIFTH LEVEL
FOURTH LEVEL
GARDEN LEVEL
GROUND LEVEL
PENTHOUSE LEVEL
SECOND LEVEL
SIXTH LEVEL
T.O. ROOF
THIRD LEVEL
UPPER ROOF
Ceiling Plans
GARDEN LEVEL
GROUND LEVEL
3D Views
Elevations (Building Elevation
East
North
South
West
GROUND LEVEL
1/8" = 1'-0"
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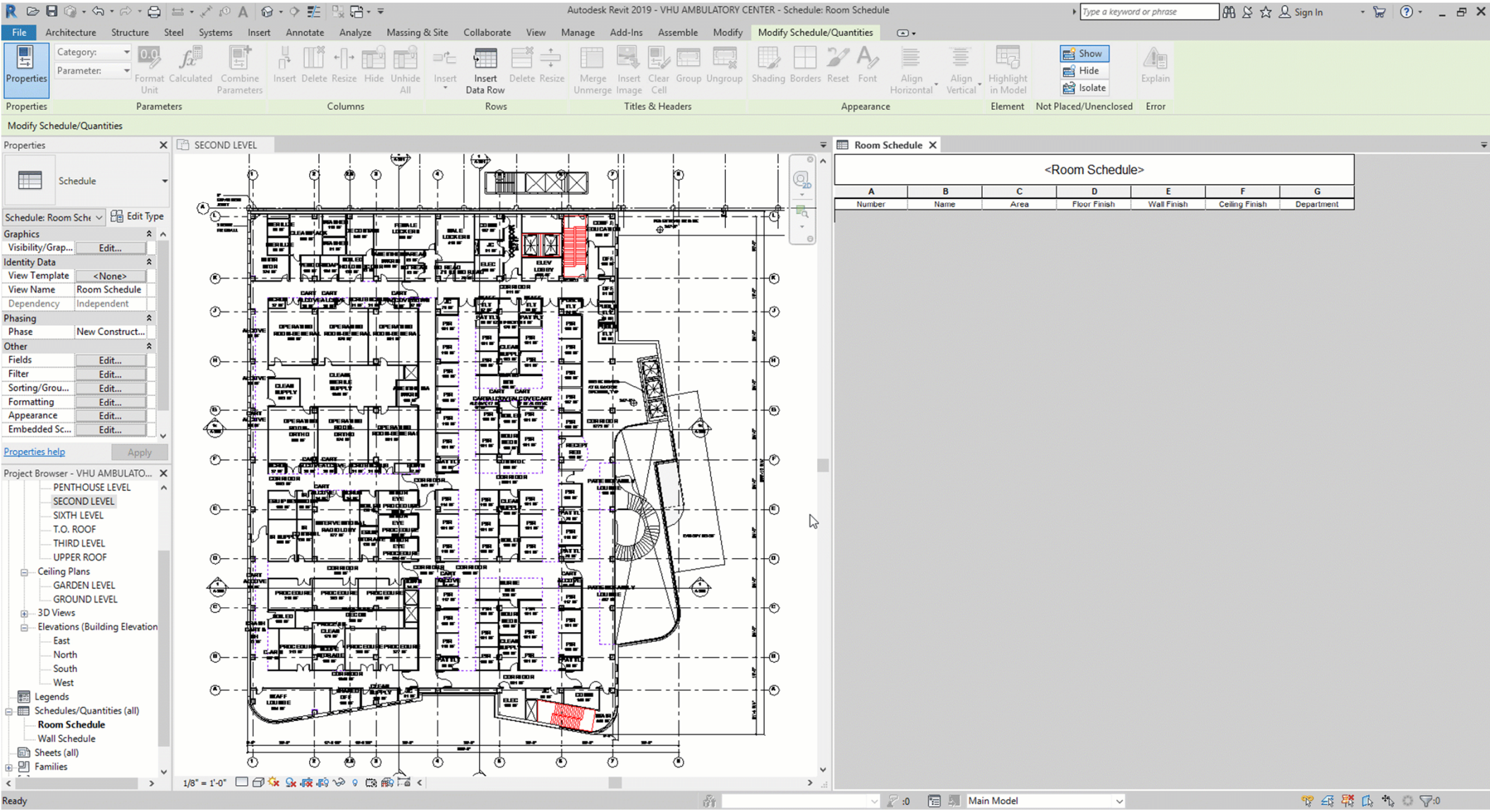
FRONT
1/8" = 1'-0"
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
Main Model
Exclude Options

Creating Room Schedule

Door Schedule was used as base to create the Room Schedule

IDENTIFICATION				DIMENSIONS							PANEL
				WIDTH							
LEVEL	ROOM NO.	ROOM NAME	DOOR NO.	W1	W2	TOTAL WIDTH	H	T	TYPE	MATERIAL	FINISH
GARDEN FLOOR	D0006	ELEV LOBBY	D0006	4' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0405	CORRIDOR	D0405	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0311	STAFF CHANGE	D0311	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0316	SOILED	D0316	3' - 1"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0333	TREATMENT- PRV -ISO	D0333	3' - 6"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0332	PAT TLT	D0332	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0339	TREATMENT- PRV	D0339	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0335	CORRIDOR	D0335	3' - 6"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0331	SPINAL BLACKOUT	D0331	3' - 6"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0202	BREAKRM (CANTEEN)	D0202	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0203	COPY/WRKRM	D0203	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0215	CORRIDOR	D0215	3' - 0"							
GARDEN FLOOR	D0218	PAT LOCKERS	D0218	3' - 0"							
GARDEN FLOOR	D0215	CORRIDOR	D0215	3' - 0"							
GARDEN FLOOR	D0215	CORRIDOR	D0215	3' - 0"							
GARDEN FLOOR	D0111	PELVIC FL TRTMT	D0111	3' - 0"							
GARDEN FLOOR	D0115	CORRIDOR	D0115	3' - 0"							
GARDEN FLOOR	D0115	CORRIDOR	D0115	3' - 0"							
GARDEN FLOOR	D0118	PELVIC FL TRTMT	D0118	3' - 6"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0105	CORRIDOR	D0105	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0101	PELVIC FL TRTMT	D0101	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0108	PELVIC FL TRTMT	D0108	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0105	CORRIDOR	D0105	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0446	SPEECH	D0446	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0449	ADL BATHROOM	D0449	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0448	HSKG	D0448	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0338	TREATMENT- PRV	D0338	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0321	HYDRO POOL	D0321	3' - 0"			7' - 0"	0' - 2"	F	WD	ST
GARDEN FLOOR	D0005	CORRIDOR	D0005	3' - 6"	3' - 6"	7' - 0"	7' - 0"	0' - 2"		HM	PNT

	A	B	C	D	E	F	G	H	I	J	K
1	VHC ACC ROOM SCHEDULE	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10
2	Level	Number	Name	Department	Area	Perimeter	Unbounded Height	Floor Finish	Base Finish	Wall Finish	Ceiling Finish
3											
184	GARDEN FLOOR										
185	GARDEN FLOOR	D0218	PAT LOCKERS	PHYSICAL THERAPY				RF-1	RB-1	P-1	ACT-1
186	GARDEN FLOOR	D0416	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
187	GARDEN FLOOR	D0423	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
188	GARDEN FLOOR	D0412	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
189	GARDEN FLOOR	D0417	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
190	GARDEN FLOOR	D0322	EQUIP POOL	PHYSICAL THERAPY				EFS-2	EFS-2	PE-1	ACT-6
191	GARDEN FLOOR	D0303	CLEAN SUPPLY	PHYSICAL THERAPY				RF-1	RB-1	P-1	ACT-6
192	GARDEN FLOOR	D0213	FN. ANALYST	PHYSICAL THERAPY				CPT-3	RB-1	P-1/P-3	ACT
193	GARDEN FLOOR	D0421	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
194	GARDEN FLOOR	D0413	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
195	GARDEN FLOOR	D0414	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
196	GARDEN FLOOR	D0422	EXAM	PHYSICAL THERAPY				AF-1	RB-1	P-1,3	GYP/ACT-2
197	GARDEN FLOOR	D0302	PAT TLT	PHYSICAL THERAPY				RF-1	RF-1	PWT-1	GYP/PE-1
198	GARDEN FLOOR	D0317A	PAT TLT	PHYSICAL THERAPY				SSV-1	SSV-1	PWT-1	GYP/PE-1
199	GARDEN FLOOR	D0321	HYDRO POOL	PHYSICAL THERAPY				EFS-2	EFS-2	PE-1/CWT-1,2,3	GYP/PE-2
200	GARDEN FLOOR	D0312A	PAT TLT	PHYSICAL THERAPY				SSV-1	SSV-1	PWT-1	GYP/PE-1
201	GARDEN FLOOR	D0316	SOILED	PHYSICAL THERAPY				RF-1	RF-1	PE-1	ACT-2
202	GARDEN FLOOR	D0317	PAT LOCKERS	PHYSICAL THERAPY				RF-1	RB-1	P-1	ACT-1
203	GARDEN FLOOR	D0312	PAT LOCKERS	PHYSICAL THERAPY				RF-1	RB-1	P-1	ACT-1
204	GARDEN FLOOR	D0339	TREATMENT- PRV	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
205	GARDEN FLOOR	D0337	TREATMENT- PRV	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
206	GARDEN FLOOR	D0338	TREATMENT- PRV	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
207	GARDEN FLOOR	D0333	TREATMENT- PRV -ISO	PHYSICAL THERAPY				RF-1,3	RF-1,3	P-1,3	GYP/ACT-2
208	GARDEN FLOOR	D0031	THERAPIST CONF ROOM	PHYSICAL THERAPY				CPT-4	RB-1	P-1	GYP/SPC-1
209	GARDEN FLOOR	D0032	THERAPIST WORKROOM /FILES	PHYSICAL THERAPY				CPT-4	RB-1	P-1	GYP/SPC-1
210	GARDEN FLOOR	D0211	ASST DIR OFFICE	PHYSICAL THERAPY				CPT-3	RB-1	P-1/P-3	ACT-1
211	GARDEN FLOOR	D0411	OPEN TREATMENT	PHYSICAL THERAPY				AF-1,2,3	RB-1	P-1	ACT-1/ EXPO
212	GARDEN FLOOR	D0443	NEUROTHERAPY- OPEN	PHYSICAL THERAPY				CSV-1,2	RB-1	P-1	EXPO
213	GARDEN FLOOR	D0103	PELVIC FL TRTMT	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
214	GARDEN FLOOR	D0101	PELVIC FL TRTMT	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
215	GARDEN FLOOR	D0108	PELVIC FL TRTMT	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
216	GARDEN FLOOR	D0106	PELVIC FL TRTMT	PHYSICAL THERAPY				RF-1,3	RB-1	P-1,3	GYP/ACT-2
217	GARDEN FLOOR	D0107	PAT TLT	PHYSICAL THERAPY				RF-1	RF-1	PWT-1	GYP/PE-1
218	GARDEN FLOOR	D0201	THERAPIST WORKROOM (30 PPL)	PHYSICAL THERAPY				RF-1	RB-1	P-1	GYP/ACT-1


Autodesk Revit 2019 - VHU AMBULATORY CENTER - Schedule: Room Schedule
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Sign In
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Architecture
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Add-Ins
Assemble
Modify
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Combine Parameters
Insert
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Resize
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Unhide All
Insert Data Row
Merge Unmerge
Insert Image
Clear Cell
Group
Ungroup
Shading
Borders
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Font
Align Horizontal
Align Vertical
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PENTHOUSE LEVEL
SECOND LEVEL
SIXTH LEVEL
T.O. ROOF
THIRD LEVEL
UPPER ROOF
Ceiling Plans
GARDEN LEVEL
GROUND LEVEL
3D Views
Elevations (Building Elevation
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South
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Schedules/Quantities (all)
Room Schedule
Wall Schedule
Sheets (all)
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1/8" = 1'-0"
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A
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Number
Name
Area
Floor Finish
Wall Finish
Ceiling Finish
Department
Ready
Main Model

Room Data

Rooms Schedule Gets Moved back to a Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L
1	VHC ACC ROOM SCHEDULE	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11
2	Level	Number	Name	Department	Area	Perimeter	Unbounded Height	Floor Finish	Base Finish	Wall Finish	Ceiling Finish	Comments
3												
184	GARDEN FLOOR											
185	GARDEN FLOOR	D0218	PAT LOCKERS	PHYSICAL THERAPY	111	43	8	RF-1	RB-1	P-1	ACT-1	Not in program
186	GARDEN FLOOR	D0416	EXAM	PHYSICAL THERAPY	141	48	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
187	GARDEN FLOOR	D0423	EXAM	PHYSICAL THERAPY	145	49	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
188	GARDEN FLOOR	D0412	EXAM	PHYSICAL THERAPY	145	49	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
189	GARDEN FLOOR	D0417	EXAM	PHYSICAL THERAPY	139	49	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
190	GARDEN FLOOR	D0322	EQUIP POOL	PHYSICAL THERAPY	129	49	8	EFS-2	EFS-2	PE-1	ACT-6	
191	GARDEN FLOOR	D0303	CLEAN SUPPLY	PHYSICAL THERAPY	117	50	8	RF-1	RB-1	P-1	ACT-6	
192	GARDEN FLOOR	D0213	FN. ANALYST	PHYSICAL THERAPY	96	40	8	CPT-3	RB-1	P-1/P-3	ACT	
193	GARDEN FLOOR	D0421	EXAM	PHYSICAL THERAPY	142	53	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
194	GARDEN FLOOR	D0413	EXAM	PHYSICAL THERAPY	141	48	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
195	GARDEN FLOOR	D0414	EXAM	PHYSICAL THERAPY	143	49	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
196	GARDEN FLOOR	D0422	EXAM	PHYSICAL THERAPY	140	48	8	AF-1	RB-1	P-1,3	GYP/ACT-2	
197	GARDEN FLOOR	D0302	PAT TLT	PHYSICAL THERAPY	49	29	8	RF-1	RF-1	PWT-1	GYP/PE-1	
198	GARDEN FLOOR	D0317A	PAT TLT	PHYSICAL THERAPY	66	39	8	SSV-1	SSV-1	PWT-1	GYP/PE-1	
199	GARDEN FLOOR	D0321	HYDRO POOL	PHYSICAL THERAPY	663	106	8	EFS-2	EFS-2	PE-1/CWT-1,2,3	GYP/P-2	
200	GARDEN FLOOR	D0312A	PAT TLT	PHYSICAL THERAPY	72	40	8	SSV-1	SSV-1	PWT-1	GYP/PE-1	
201	GARDEN FLOOR	D0316	SOILED	PHYSICAL THERAPY	61	34	8	RF-1	RF-1	PE-1	ACT-2	
202	GARDEN FLOOR	D0317	PAT LOCKERS	PHYSICAL THERAPY	197	73	8	RF-1	RB-1	P-1	ACT-1	
203	GARDEN FLOOR	D0312	PAT LOCKERS	PHYSICAL THERAPY	200	77	8	RF-1	RB-1	P-1	ACT-1	
204	GARDEN FLOOR	D0339	TREATMENT- PRV	PHYSICAL THERAPY	143	48	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
205	GARDEN FLOOR	D0337	TREATMENT- PRV	PHYSICAL THERAPY	143	48	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
206	GARDEN FLOOR	D0338	TREATMENT- PRV	PHYSICAL THERAPY	143	48	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
207	GARDEN FLOOR	D0333	TREATMENT- PRV -ISO	PHYSICAL THERAPY	189	60	8	RF-1,3	RF-1,3	P-1,3	GYP/ACT-2	
208	GARDEN FLOOR	D0031	THERAPIST CONF ROOM	PHYSICAL THERAPY	217	61	8	CPT-4	RB-1	P-1	GYP/SPC-1	
209	GARDEN FLOOR	D0032	THERAPIST WORKROOM /FILES	PHYSICAL THERAPY	251	70	8	CPT-4	RB-1	P-1	GYP/SPC-1	
210	GARDEN FLOOR	D0211	ASST DIR OFFICE	PHYSICAL THERAPY	97	40	8	CPT-3	RB-1	P-1/P-3	ACT-1	
211	GARDEN FLOOR	D0411	OPEN TREATMENT	PHYSICAL THERAPY	2,522	211	8	AF-1,2,3	RB-1	P-1	ACT-1/ EXPO	
212	GARDEN FLOOR	D0443	NEUROTHERAPY- OPEN	PHYSICAL THERAPY	1,062	152	8	CSV-1,2	RB-1	P-1	EXPO	
213	GARDEN FLOOR	D0103	PELVIC FL TRTMT	PHYSICAL THERAPY	142	49	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
214	GARDEN FLOOR	D0101	PELVIC FL TRTMT	PHYSICAL THERAPY	141	53	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
215	GARDEN FLOOR	D0108	PELVIC FL TRTMT	PHYSICAL THERAPY	146	49	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
216	GARDEN FLOOR	D0106	PELVIC FL TRTMT	PHYSICAL THERAPY	145	50	8	RF-1,3	RB-1	P-1,3	GYP/ACT-2	
217	GARDEN FLOOR	D0107	PAT TLT	PHYSICAL THERAPY	68	36	8	RF-1	RF-1	PWT-1	GYP/PE-1	
218	GARDEN FLOOR	D0201	THERAPIST WORKROOM (30 PPL)	PHYSICAL THERAPY	1,063	150	8	RF-1	RB-1	P-1	GYP/ACT-1	

Scotts Run Residential Project

Responsibility Matrix

Scotts Run Residential (Internal Kick-off Meeting)

Assign Bid Packages to estimating Team

Desired Output **Structure Cost Analysis**

Data Gathering

Narrative

Drawings

3D Model

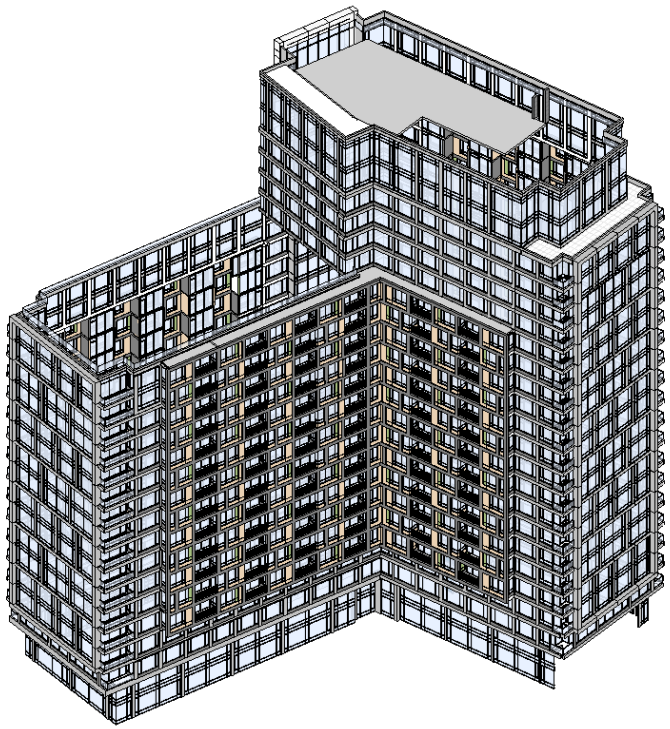
Structural Concrete Frame:
- Slab
- Drop caps
- Columns
- Post Tension

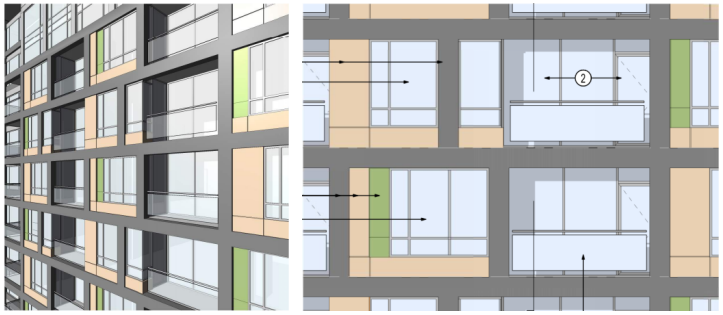
Create concrete frame models

Cost Analysis

		Floors	SQFT	Price	Unit	Cost
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.18	/sqft	$515,240
	0	1	17,657	$29.30	/sqft	$517,387
	0	1	17,657	$29.30	/sqft	$517,387
	0	1	17,657	$29.30	/sqft	$517,387
	0	1	17,657	$29.30	/sqft	$517,387
Foundation Walls						
Retaining Wall						
Structural Cost			211,884	$31.74	/sqft	$6,724,296
Concrete			35,314	$190.41	$/cuyds	
Black Rebar			227,051	tons		

Scotts Run Cost Analysis Exercise





Cost Analysis Study Exercise

Cost Saving Options:

1. Eliminate balconies and eliminate building envelope articulation (Considering GSF Impact).
2. Reduce floor to floor height to reduce concrete structure and building envelope area.

Benchmarking: Look at previous/similar projects for structural systems, materials and schedule

CSI Div	PROJECT A		PROJECT B		PROJECT C		PROJECT D	
	400,716	GSF	256,341	GSF	243,335	GSF	458,290	GSF
02 Site Construction & Garage (Not Included)	$0	$0.00	$0	$0.00	$0	$0.00	$0	$0.00
03 Concrete and Precast	$14,413,515	$35.97	$9,592,376	$37.42	$9,065,044	$ 37.25	$14,173,304	$30.93
04 Masonry	$75,000	$0.19	$622,413	$2.43	$121,344	$ 0.50	$308,871	$0.67
05 Metals	$2,879,180	$7.19	$1,196,809	$4.67	$546,241	$ 2.24	$1,307,881	$2.85
06 Wood & Plastics	$1,871,184	$4.67	$471,396	$1.84	$375,281	$ 1.54	$1,594,407	$3.48
07 Thermal & Moisture Protection	$3,126,306	$7.80	$1,836,667	$7.16	$1,771,297	$ 7.28	$1,735,218	$3.79
08 Doors & Windows	$23,513,370	$58.68	$7,232,415	$28.21	$5,966,411	$ 24.52	$17,361,405	$37.88
09 Finishes	$4,826,086	$12.04	$2,402,988	$9.37	$2,027,306	$ 8.33	$5,562,650	$12.14
10 Specialties	$400,716	$1.00	$282,261	$1.10	$192,997	$ 0.79	$434,092	$0.95
11 Equipment	$10,000	$0.02	$175,889	$0.69	$43,384	$ 0.18	$902,423	$1.97
12 Furnishings	$825,023	$2.06	$397,631	$1.55	$202,094	$ 0.83	$362,981	$0.79
13 Special Construction	$0	$0.00	$473,550	$1.85	$1,159,443	$ 4.76	$1,224,385	$2.67
14 Conveyance	$3,375,000	$8.42	$2,018,618	$7.87	$2,105,162	$ 8.65	$3,965,400	$8.65
15 Mechanical	$12,056,480	$30.09	$7,449,930	$29.06	$7,122,791	$ 29.27	$12,987,369	$28.34
16 Electrical	$6,411,456	$16.00	$5,270,400	$20.56	$3,470,014	$ 14.26	$7,665,992	$16.73
Total Direct Construction Cost	$73,783,316	$184.13	$39,423,343	$153.79	$34,168,807	$140.42	$69,586,378	$151.84
12.95% ENR Inflation From 06/2014 to 12/2017								
9.80% ENR Inflation From 09/2015 to 12/2017								
4.39% ENR Inflation From 09/2016 to 12/2017								
Total Indirect Construction Cost	$12,651,611	$31.57	$7,196,834	$28.08	$6,024,413	$24.76	$10,561,687	$23.05
ENR Inflation on Indirect Cost								
Grand Total Cost	*$86,434,927*	*$215.70*	*$46,620,177*	*$181.87*	*$40,193,220*	*$165.18*	*$80,148,066*	*$174.88*
Floor Plate Area	25,044	SF/floor	23,304	SF/floor	22,121	SF/floor	24,121	SF/floor

NOTE: Below grade garage and site have too many variations, garage and site were not included on this comparison

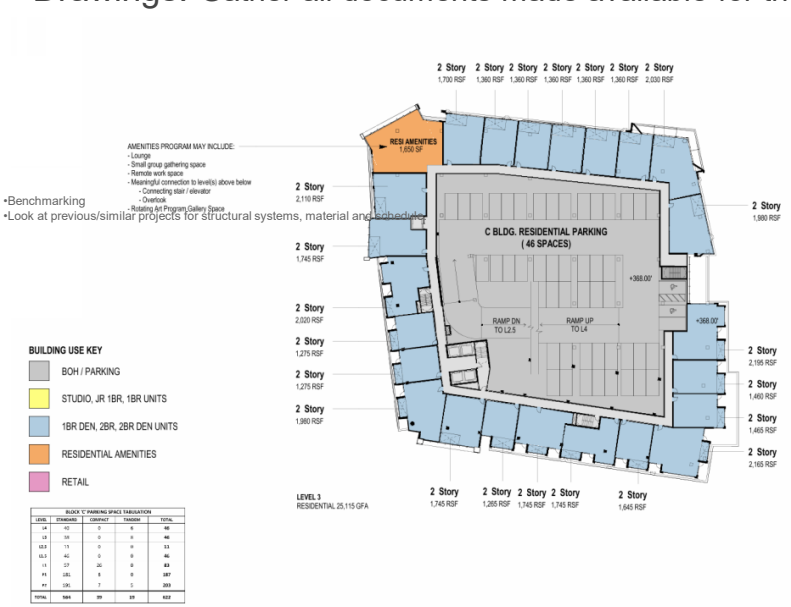
NARRATIVE AND DRAWING

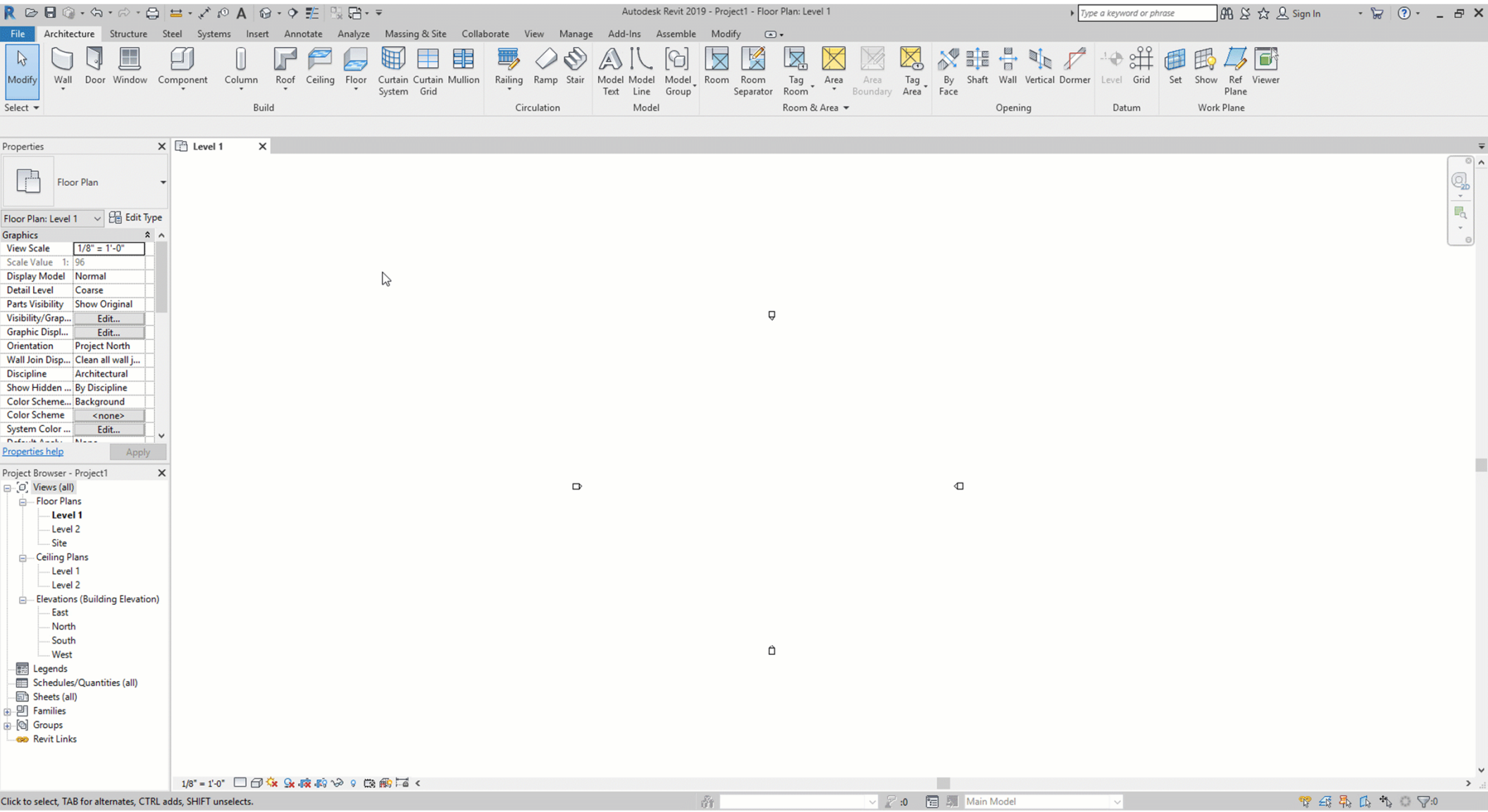
PLAN NOTES:

1. REFERENCE TOP OF SLAB ELEVATION IS 553.33'.
2. FLOOR AND ROOF SLAB SHALL BE 8" THICK REINFORCED AS FOLLOWS:
   PT = 1.3 PSF
   MILD STEEL = 0.8 PSF

Drawings: Gather all documents made available for the project.

- Benchmarking
- Look at previous/similar projects for structural systems, material and schedules




Autodesk Revit 2019 - Project1 - Floor Plan: Level 1
Type a keyword or phrase
Sign In
File
Architecture
Structure
Steel
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Assemble
Modify
Modify
Select
Wall
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Window
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Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
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Build
Railing
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Stair
Circulation
Model Text
Model Line
Model Group
Model
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
Room & Area
By Face
Shaft
Wall
Vertical
Dormer
Opening
Level
Grid
Datum
Set
Show
Ref Plane
Viewer
Work Plane
Properties
Floor Plan
Floor Plan: Level 1
Edit Type
Graphics
View Scale
1/8" = 1'-0"
Scale Value 1:
96
Display Model
Normal
Detail Level
Coarse
Parts Visibility
Show Original
Visibility/Grap...
Edit...
Graphic Displ...
Edit...
Orientation
Project North
Wall Join Disp...
Clean all wall j...
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Show Hidden ...
By Discipline
Color Scheme...
Background
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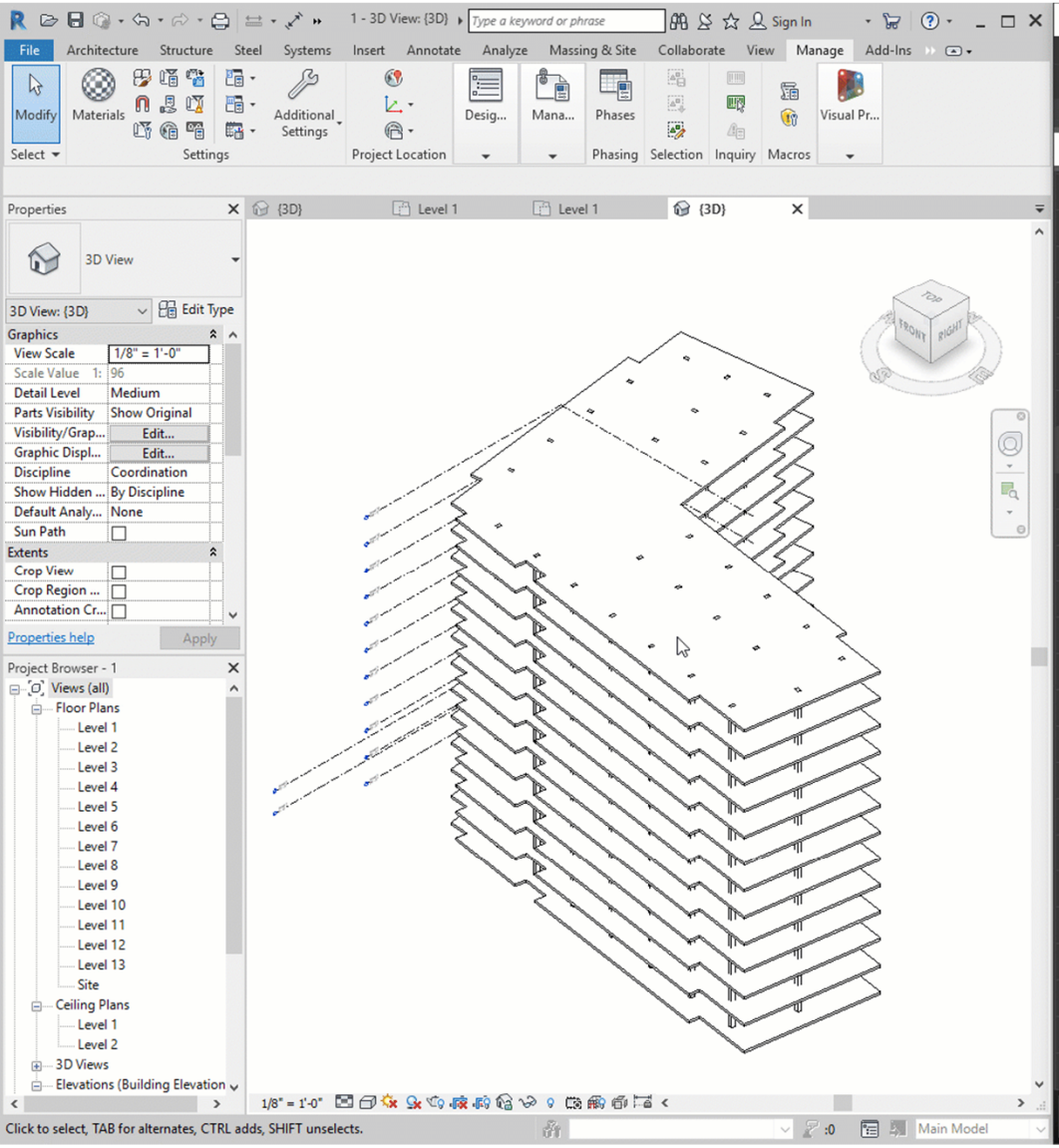
System Color ...
Edit...
Properties help
Apply
Project Browser - Project1
Views (all)
Floor Plans
Level 1
Level 2
Site
Ceiling Plans
Level 1
Level 2
Elevations (Building Elevation)
East
North
South
West
Legends
Schedules/Quantities (all)
Sheets (all)
Families
Groups
Revit Links
Level 1
1/8" = 1'-0"
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
Main Model


1 - 3D View: {3D}
Type a keyword or phrase
Sign In
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1/8" = 1'-0"
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Detail Level
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Visibility/Grap...
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Properties help
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Project Browser - 1
Views (all)
Floor Plans
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Level 9
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Level 11
Level 12
Level 13
Site
Ceiling Plans
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3D Views
Elevations (Building Elevation
{3D}
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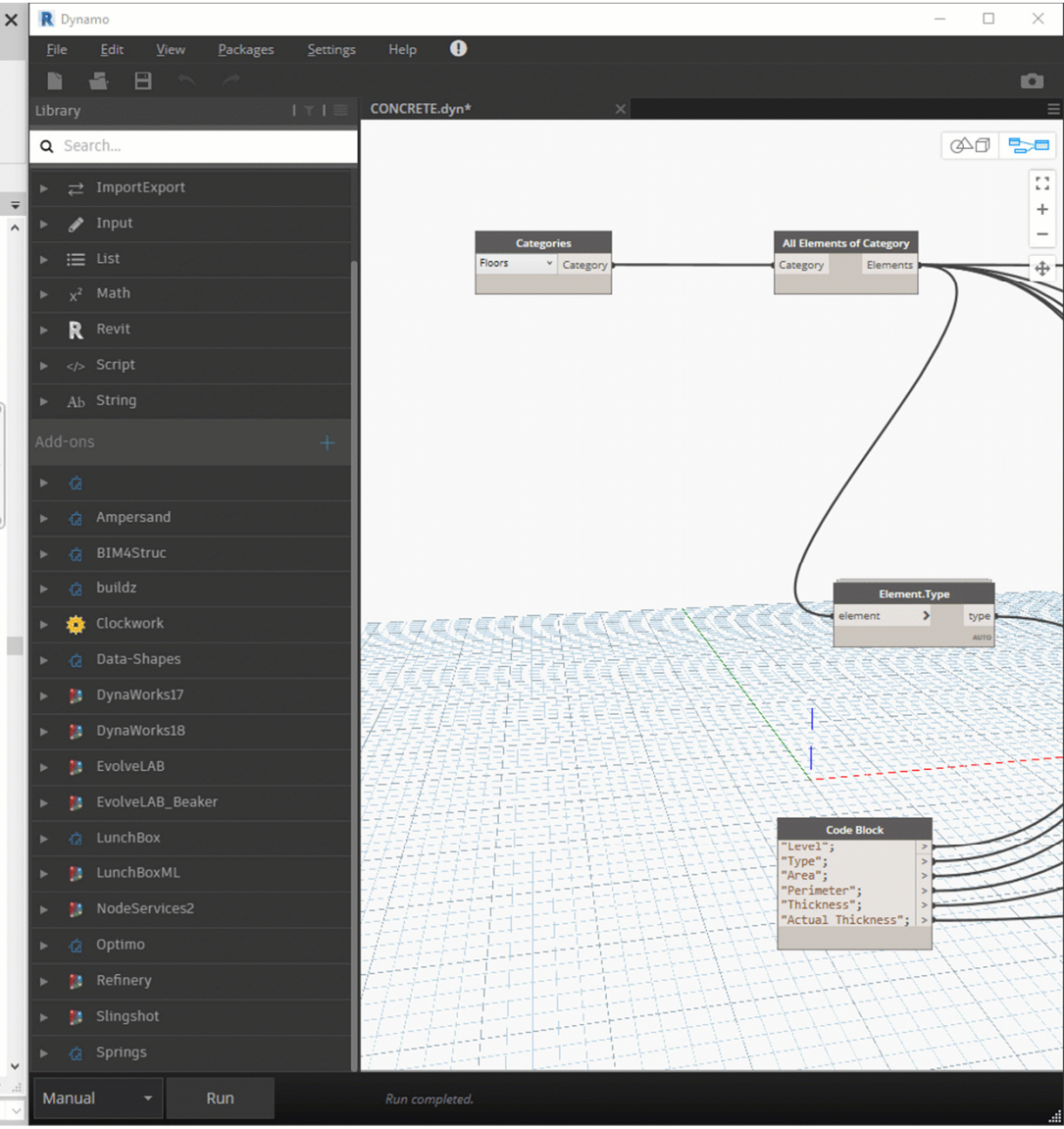
Level 1
{3D}
TOP
FRONT
RIGHT
1/8" = 1'-0"
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
Main Model


Dynamo
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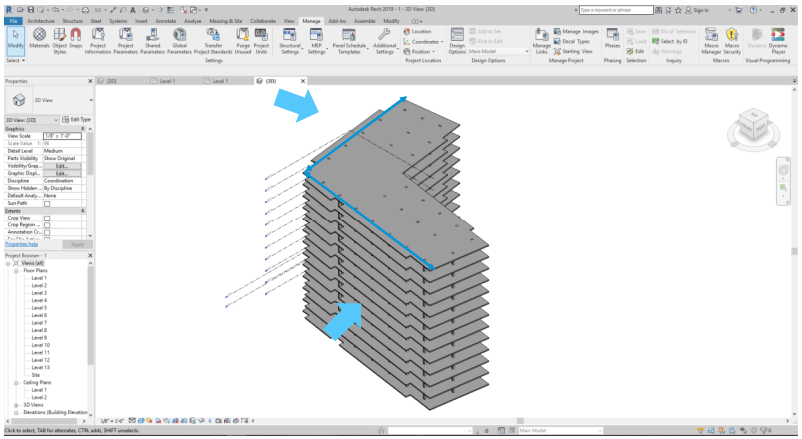
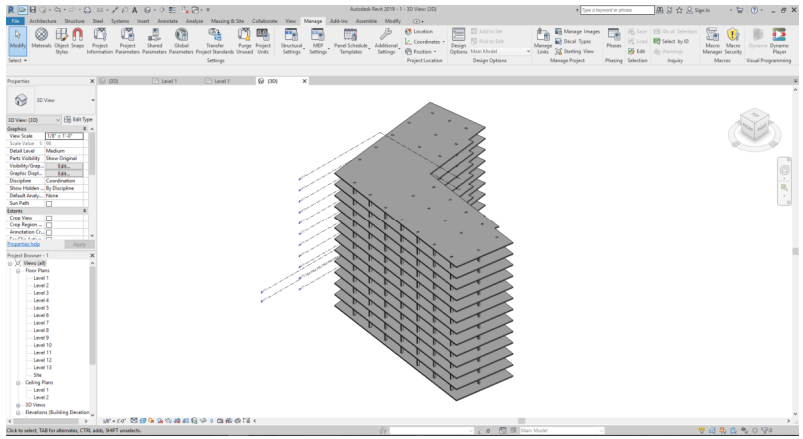
Add-ons
Ampersand
BIM4Struc
buildz
Clockwork
Data-Shapes
DynaWorks17
DynaWorks18
EvolveLAB
EvolveLAB_Beaker
LunchBox
LunchBoxML
NodeServices2
Optimo
Refinery
Slingshot
Springs
CONCRETE.dyn*
Categories
Floors
Category
All Elements of Category
Category
Elements
Element.Type
element
type
Code Block
"Level";
"Type";
"Area";
"Perimeter";
"Thickness";
"Actual Thickness";
Manual
Run
Run completed.

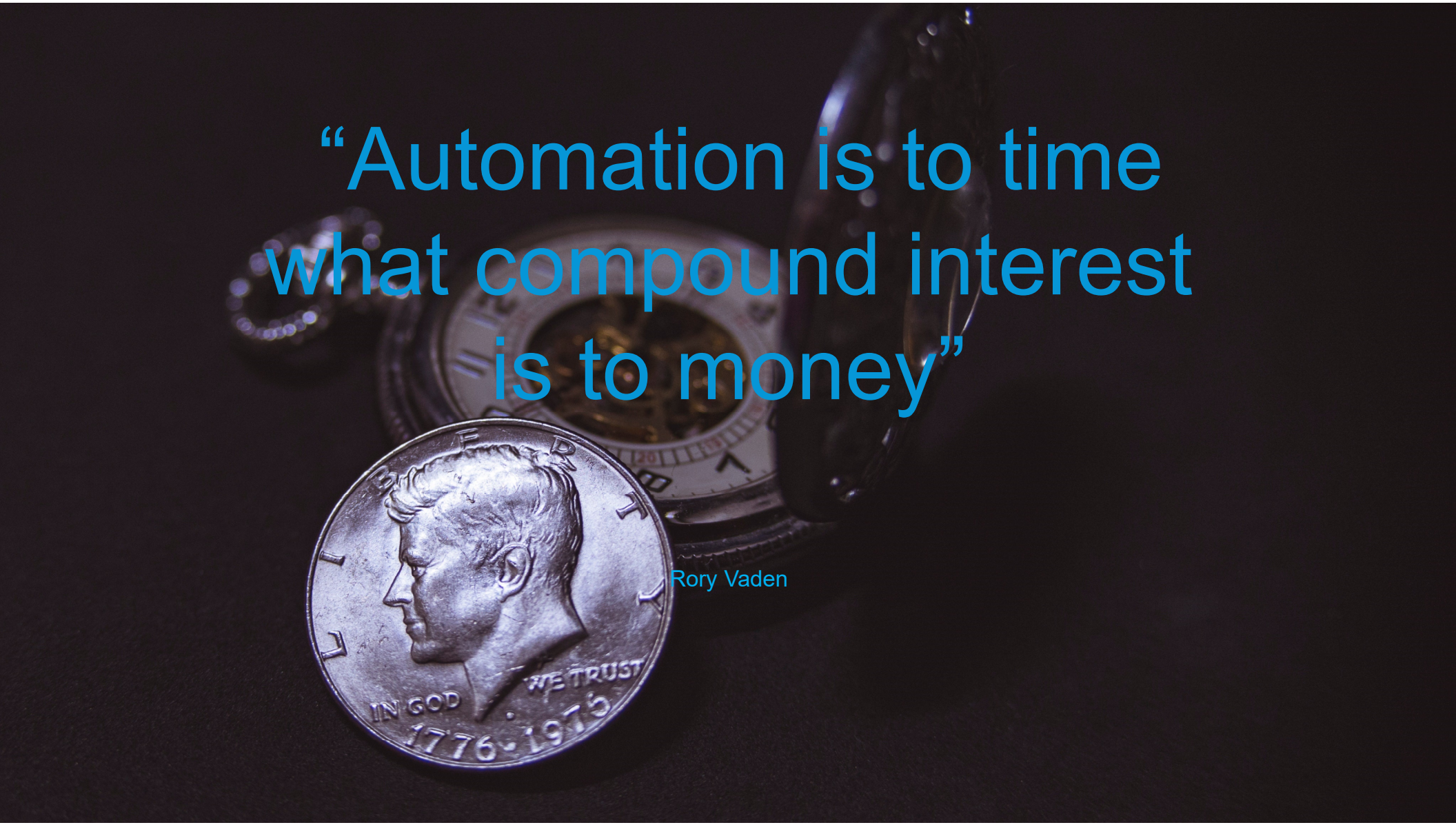
Scotts Run Concrete Cost Analysis

1	***Templete***							
2	***Washington DC***				***Estimate***			
3	***Structural Concrete Review/Pricing***							
4								
5								
6								
7								
8								
9			**Floors**	**SQFT**	**Price**	**Unit**	**Cost**	
10	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
11	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
12	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
13	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
14	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
15	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
16	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
17	**0**		**1**	**18,769**	**$29.11**	**/sqft**	**$546,329**	
18	**0**		**1**	**18,769**	**$29.23**	**/sqft**	**$548,538**	
19	**0**		**1**	**18,769**	**$29.23**	**/sqft**	**$548,538**	
20	**0**		**1**	**18,769**	**$29.23**	**/sqft**	**$548,538**	
21	**0**		**1**	**18,769**	**$29.23**	**/sqft**	**$548,538**	
22	**0**		**1**	**18,769**	**$29.23**	**/sqft**	**$548,538**	
30	**Foundation Walls**							
31	**Retaining Wall**							
32								
33	**Structural Cost**			**225,228**	**$31.65**	**/sqft**	**$7,128,762**	
34	**Concrete**			**37,538**	**$189.91**	**$/cuyds**		
35	**Black Rebar**			**240,395**	**tons**			
36								
53								



1	***Templete***							
2	***Washington DC***				***Estimate***			
3	***Structural Concrete Review/Pricing***							
4								
5								
6								
7								
8								
9			**Floors**	**SQFT**	**Price**	**Unit**	**Cost**	
10	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
11	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
12	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
13	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
14	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
15	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
16	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
17	**0**		**1**	**17,657**	**$29.18**	**/sqft**	**$515,240**	
18	**0**		**1**	**17,657**	**$29.30**	**/sqft**	**$517,387**	
19	**0**		**1**	**17,657**	**$29.30**	**/sqft**	**$517,387**	
20	**0**		**1**	**17,657**	**$29.30**	**/sqft**	**$517,387**	
21	**0**		**1**	**17,657**	**$29.30**	**/sqft**	**$517,387**	
22	**0**		**1**	**17,657**	**$29.30**	**/sqft**	**$517,387**	
30	**Foundation Walls**							
31	**Retaining Wall**							
32								
33	**Structural Cost**			**211,884**	**$31.74**	**/sqft**	**$6,724,296**	
34	**Concrete**			**35,314**	**$190.41**	**$/cuyds**		
35	**Black Rebar**			**227,051**	**tons**			
36								
53								




“Automation is to time what compound interest is to money”
Rory Vaden
LIBERTY
IN GOD WE TRUST
1776 1976


Q&A

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Make anything™