

# Plumbing Code Calculations

With Spreadsheet Link and Schedule XL



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SUITE

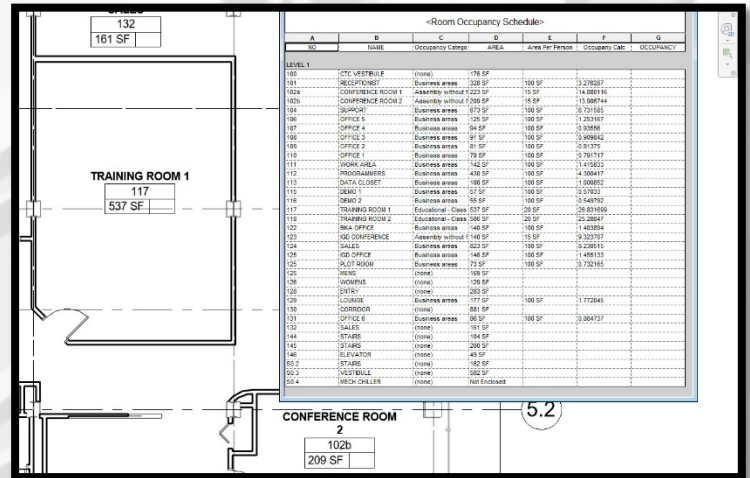
*Speed up manual IBC code calculations with the ease of repeatability.  
Spreadsheet Link and Schedule XL can save you hours!*

# The Issue

Revit® has trouble with complex calculations and the ability to run cross-category math. This can be frustrating when design calculations need to be run. In the case of plumbing code calculations, we need to take the occupancy of a defined area (floor, smoke compartment, etc.) and use these totals to derive the number of different plumbing fixtures that are required by code to be designed into these areas. Many firms run these calculations manually, but this can be done far more efficiently. This white paper will describe how a re-usable workflow can generate occupancy, calculate plumbing fixture counts and generate graphics for use in Revit to present this information in a live model.

## Typical Workflow

In manual workflows, some Architectural firms will use either fake calculated values in a Revit schedule, then sometimes copy those values across to a real parameter for display in a tag, a schedule, and on the actual room object. Some firms may also use a calculated value in a tag to reduce some of the manual data transfer. Other firms will export schedules to Excel®, and run calculations there, but then must manually copy the values back into Revit. In all cases, the process is very manual and extremely error prone.



ROOM	USAGE	Occupancy Category	Area	Area Per Person	Occupancy Calc	OCCUPANCY
LEVEL 1						
100	CTC VESTIBULE	(none)	176 SF			
101	RECEPTIONIST	Business areas	208 SF	100 SF	2.08000	
102a	CONFERENCE ROOM 1	Assembly without	422 SF	15 SF	14.06667	
102b	CONFERENCE ROOM 2	Assembly without	758 SF	15 SF	11.36667	
103	RECEPTION	Business areas	672 SF	100 SF	6.72000	
104	OFFICE 1	Business areas	125 SF	100 SF	1.25000	
105	OFFICE 2	Business areas	84 SF	100 SF	0.84000	
106	OFFICE 3	Business areas	91 SF	100 SF	0.91000	
107	OFFICE 4	Business areas	81 SF	100 SF	0.81000	
108	OFFICE 5	Business areas	79 SF	100 SF	0.79000	
109	OFFICE 6	Business areas	142 SF	100 SF	1.42000	
110	DATA CLOSET	Business areas	430 SF	100 SF	4.30000	
111	DATA CLOSET	Business areas	198 SF	100 SF	1.98000	
112	DATA CLOSET	Business areas	57 SF	100 SF	0.57000	
113	DEMO 1	Business areas	55 SF	100 SF	0.55000	
114	DEMO 2	Business areas	55 SF	100 SF	0.55000	
115	TRAINING ROOM 1	Educational - Class	577 SF	20 SF	28.85000	
116	TRAINING ROOM 2	Educational - Class	590 SF	20 SF	29.50000	
117	TRAINING ROOM 3	Educational - Class	590 SF	20 SF	29.50000	
118	TRAINING ROOM 4	Educational - Class	590 SF	20 SF	29.50000	
119	TRAINING ROOM 5	Educational - Class	590 SF	20 SF	29.50000	
120	TRAINING ROOM 6	Educational - Class	590 SF	20 SF	29.50000	
121	TRAINING ROOM 7	Educational - Class	590 SF	20 SF	29.50000	
122	TRAINING ROOM 8	Educational - Class	590 SF	20 SF	29.50000	
123	TRAINING ROOM 9	Educational - Class	590 SF	20 SF	29.50000	
124	TRAINING ROOM 10	Educational - Class	590 SF	20 SF	29.50000	
125	TRAINING ROOM 11	Educational - Class	590 SF	20 SF	29.50000	
126	TRAINING ROOM 12	Educational - Class	590 SF	20 SF	29.50000	
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133	TRAINING ROOM 19	Educational - Class	590 SF	20 SF	29.50000	
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202	TRAINING ROOM 88	Educational - Class	590 SF	20 SF	29.50000	
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207	TRAINING ROOM 93	Educational - Class	590 SF	20 SF	29.50000	
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210	TRAINING ROOM 96	Educational - Class	590 SF	20 SF	29.50000	
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213	TRAINING ROOM 99	Educational - Class	590 SF	20 SF	29.50000	
214	TRAINING ROOM 100	Educational - Class	590 SF	20 SF	29.50000	

This is also rather time consuming, reducing potential production time. Regardless of how we get the room occupancy, we always must manually transfer the occupancy to a spreadsheet for our code checks, present the information in a meaningful way and return this information back to Revit. This is also entirely manual and error prone. Nothing keeps this information up to date with the Revit project model. There needs to be a better, more efficient way to do these types of calculations, and return the result of our efforts to the Revit project model and include the information on the construction document set.

## Solution

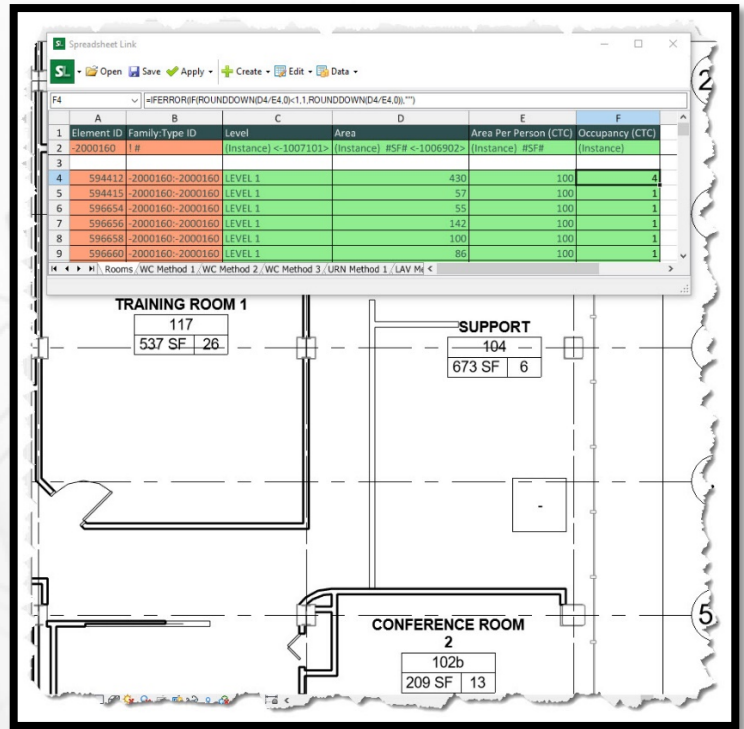
This entire workflow can be heavily automated using the Spreadsheet Link and Schedule XL tools from the CTC BIM Project Suite. Your current spreadsheet can be incorporated, and the values entered far more automatically. Even the room occupancy calculations can be tuned to your liking, entered directly into the room/area/space elements you are using in the Revit model. Further, the spreadsheet graphics can be directly linked into the model, avoiding any manual image or CAD file workflows.

- Establish predictable, repeatable workflows for all Revit users
- Leverage existing spreadsheet layouts so formatting in Revit aligns with company graphic standards
- Implement the power of spreadsheet formulas to drive calculations and graphics
- Import spreadsheet graphics directly into the Revit model for use on sheets

# Result

When the workflow is developed and implemented, the entire building occupancy can be calculated in a minute, and the code validation table can be filled out. With one more step, that same table can be linked back into the Revit model for use on sheets.

Any user, on any project, at any time can leverage this workflow to get updated numbers and update the tables on the sheets. Revit data-entry frustrations and quality control issues are gone, since you can leverage the power of computers to do what computers were designed for by automating the repetitive tasks that creative human minds are not great at completing.



# Savings/Benefits

Users do not need to know the formulas that are running automatically. They do not need to depend on Dynamo scripts that can be volatile after updates. They can simply walk through a simple workflow that is stable and repeatable.

The manual, error prone process can be eliminated, allowing users to focus more on design and

	Water Closets:		Urinals:		Lavatories:		Drinking Fountains:	
	Ratio 1 per 25 for first 50 and 1 per 50 for remaining exceeding 50		Ratio 1 per 65 (Males)		Ratio 1 per 40 for first 80 and 1 per 80 for remaining exceeding 80		Ratio 1 per 100	
BASEMENT LEVEL	Male	35	2	1			1	
Occ 70	Female	35	2	--			1	
LEVEL 1	Male	61	3	1			2	
Occ 122	Female	61	3	--			2	
LEVEL 2	Male	105	4	2			3	
Occ 209	Female	105	4	--			3	
LEVEL 3	Male	43	2	1			2	
Occ 85	Female	43	2	--			2	1
LEVEL 4	Male	39	2	1			1	
Occ 78	Female	39	2	--			1	1

documentation more than focusing on basic calculations and manual data entry. Time savings can be found every time that print day approaches. Design time can be extended since this time-consuming manual process is now automated.

# Conclusion

Spreadsheet Link and Schedule XL from the CTC BIM Project Suite can help automate calculations. This example of occupancy and plumbing code calculations can be automated nearly 100%. There are many other areas where this type of automation can save hours of time consistently throughout the design and documentation process. Whenever you or your team are pulling data from the Revit model, transferring to a spreadsheet environment, running some calculations then manually transferring data or graphics back into Revit, think about how this can be automated by the BIM Project Suite.

Manual, repetitive tasks are not enjoyable, often error-prone and should be eliminated where possible. Let the tools generated for you by CTC Software augment your workflow to allow you and your team to be more creative for longer periods.



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