Automating Plumbing Design in Revit

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Class summary

Autodesk Revit MEP is a powerful design tool in the BIM world. While we can't automate the entire design of plumbing systems in Revit, there are various workflows that we can automate for a quicker, more efficient way of design. Utilizing Revit, this class will show how we can use Revit's piping systems, families with more useful information and manipulation of some parameters to automate various workflows in our plumbing designs. These workflows include automating the flow of roof areas in sq. ft. or GPM in roof drainage piping, required CFH in gas piping, and GPM in hot water return piping. The information in the families used will also allow us to create schedules for our drawings or calculation sheets.

Key learning objectives

At the end of this class, you will be able to:

- Automate flow calculation in storm piping
- Automate flow calculation in gas piping
- Automate flow calculation in hot water return & other piping systems
- Produce automated schedules and calculation sheets

About the speaker

- Joined CannonDesign in 2007, Buffalo NY.
- Plumbing & Fire Protection Engineer,
  BIM Development Leader
- B.S. in Mechanical Engineering Technology,
  A.A.S. in CADD
- Co-Authored “Advanced Building Information Modeling” in Plumbing Engineer, July 2014
- Autodesk Revit MEP Mechanical Certified Professional

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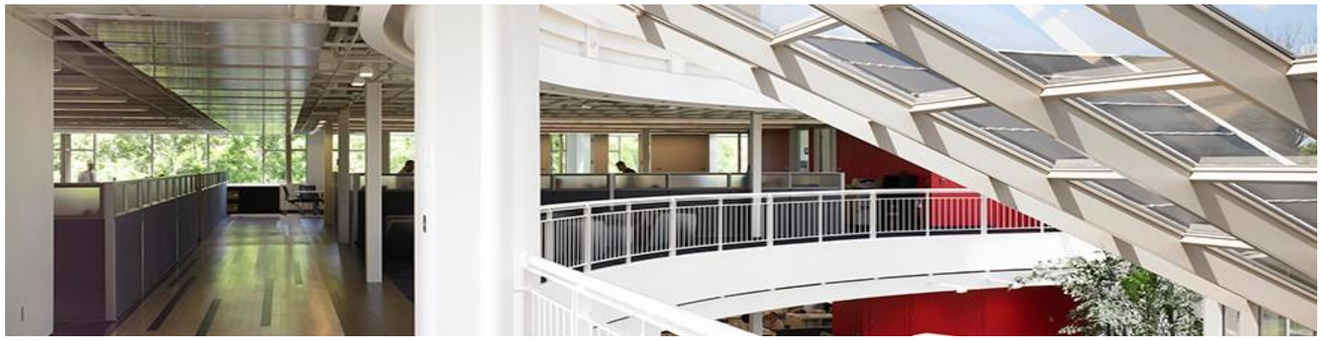

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Wegmans

Introduction

- 11 Piping system classifications, not all calculate flow
  - Domestic cold and hot calculate fixture units and flow
  - Sanitary calculates fixture units
  - Hydronic supply and return calculate flow
- Flow transfers via one path
  - Can only have one open end, such as the point of site connection; all other open ends must be capped
- Connector settings in families must be set correctly
  - Flow direction must be consistent
  - Flow configuration, system classification and parameter association also need to be set correctly
- Use shared parameters
  - Information in shared parameters can be scheduled and tagged

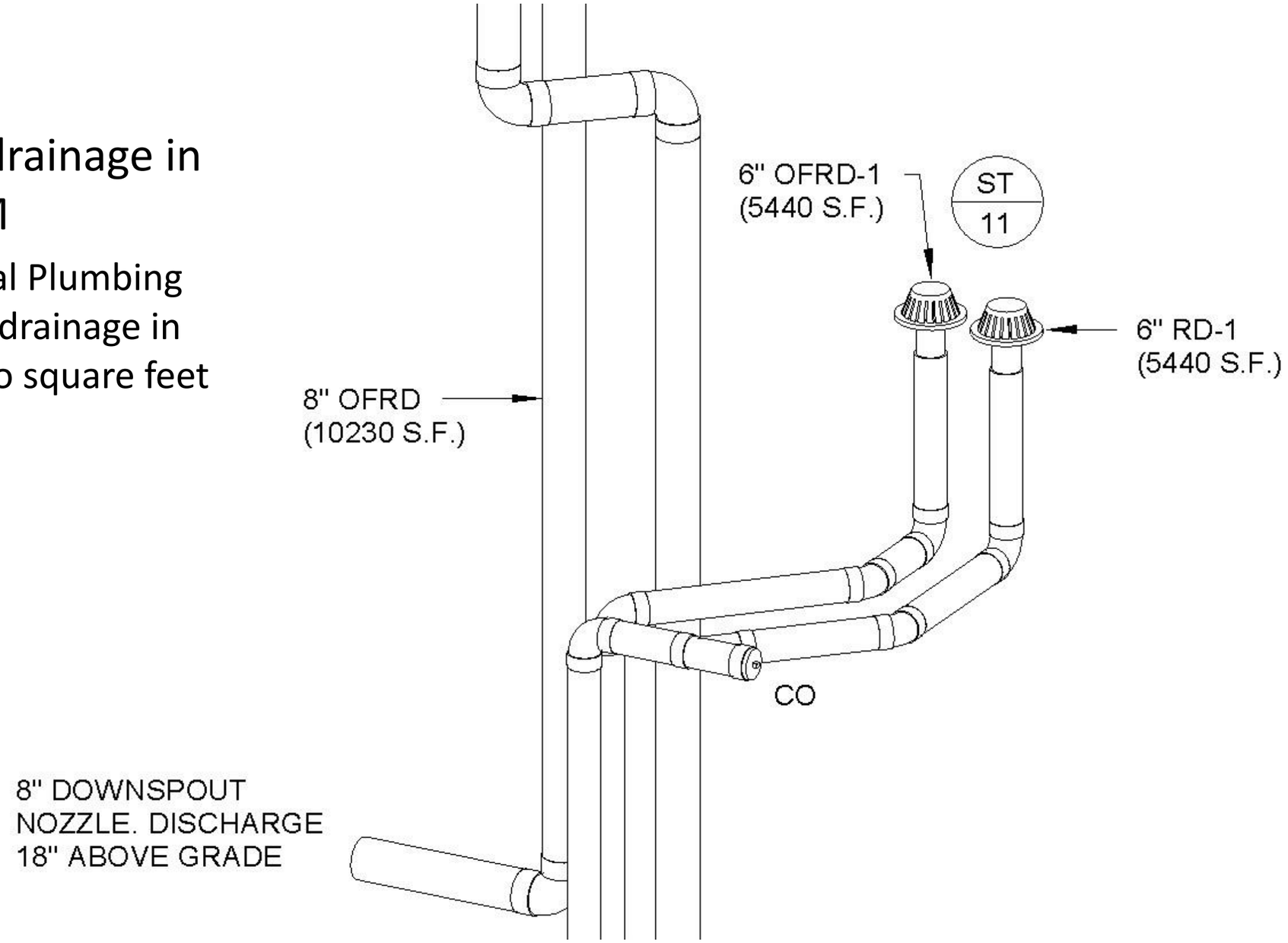
Introduction

- Additional courses that may be beneficial to view:
  - (AU2014) MP6879 – Get Connected Autodesk Revit MEP Connectors Demystified; S. Zirbes
  - (AU2014) MP7059 – Revit MEP Parameters: Much More Than Flexible Families; J. Baumann, J. Londenberg, D. Bokmiller

http://au.autodesk.com/au-online/overview

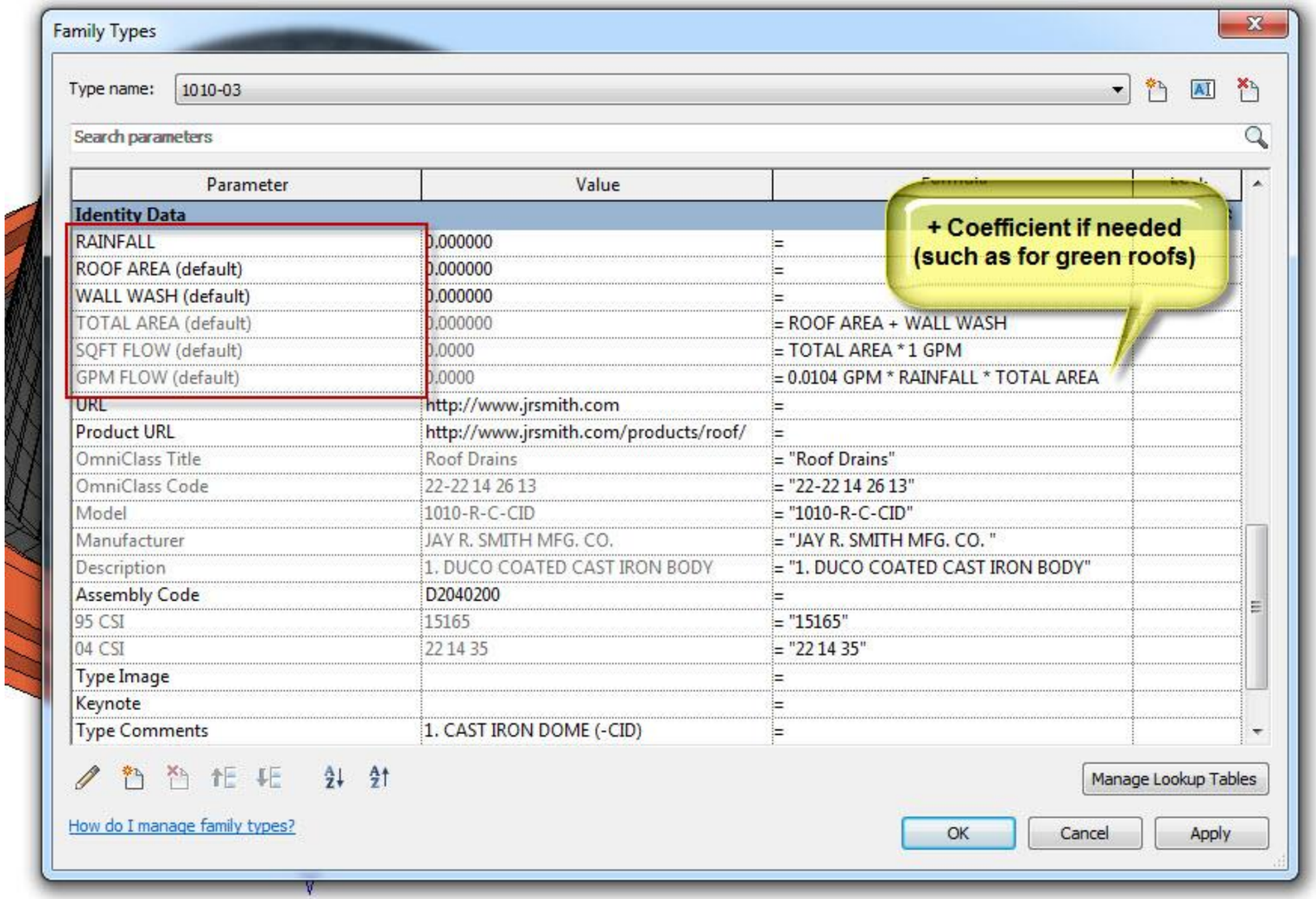
Storm Piping

- Automate flow of drainage in square feet or GPM
  - 2015 International Plumbing Code sizes storm drainage in GPM compared to square feet (2012 and older)



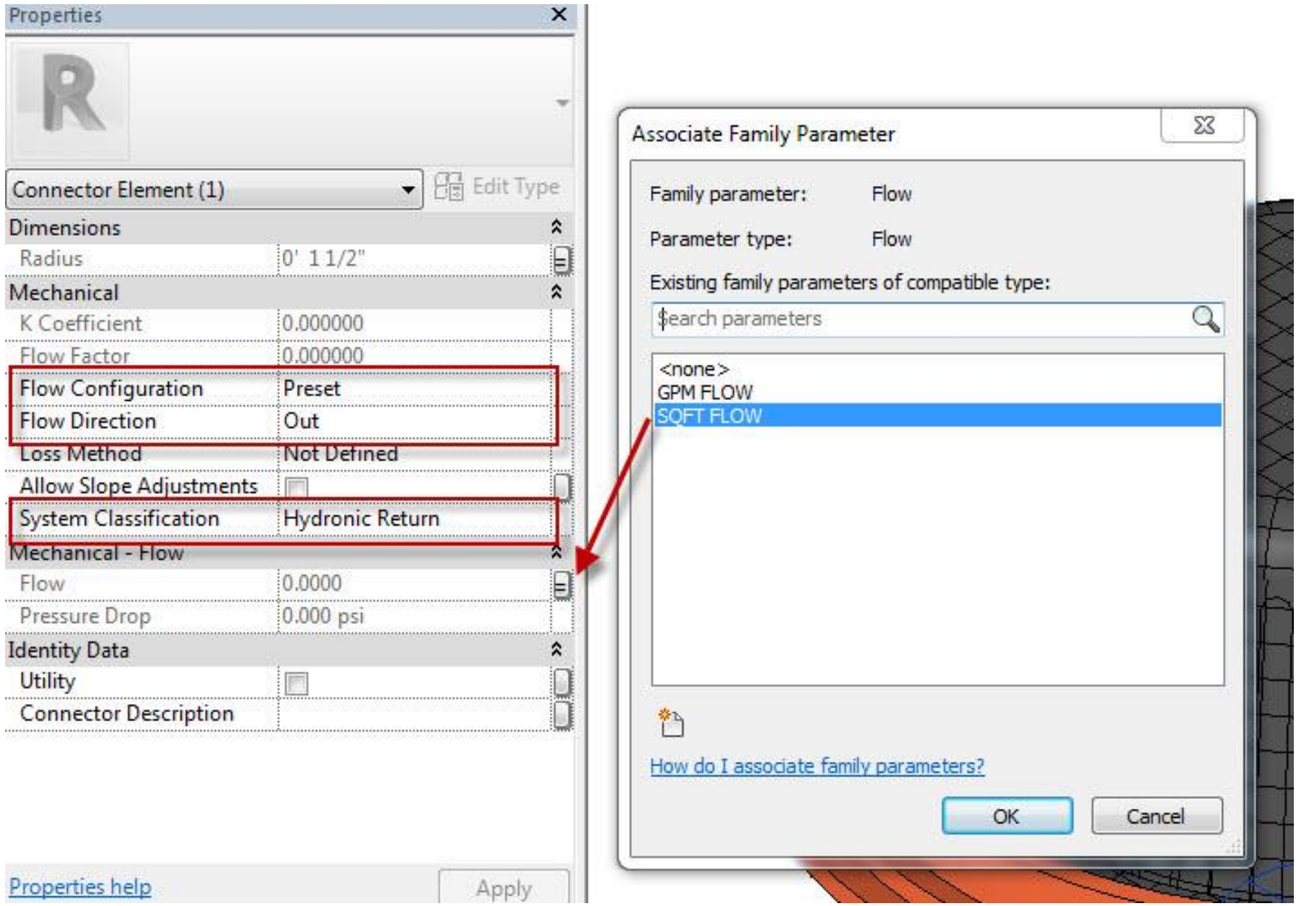
Storm Piping

- Use shared parameters
- Note which parameters are instance or type
- .0104 = Conv. factor of GPM per sq. ft. for 1 in. per hour rainfall
- *Revit uses GPM as unit for flow in piping



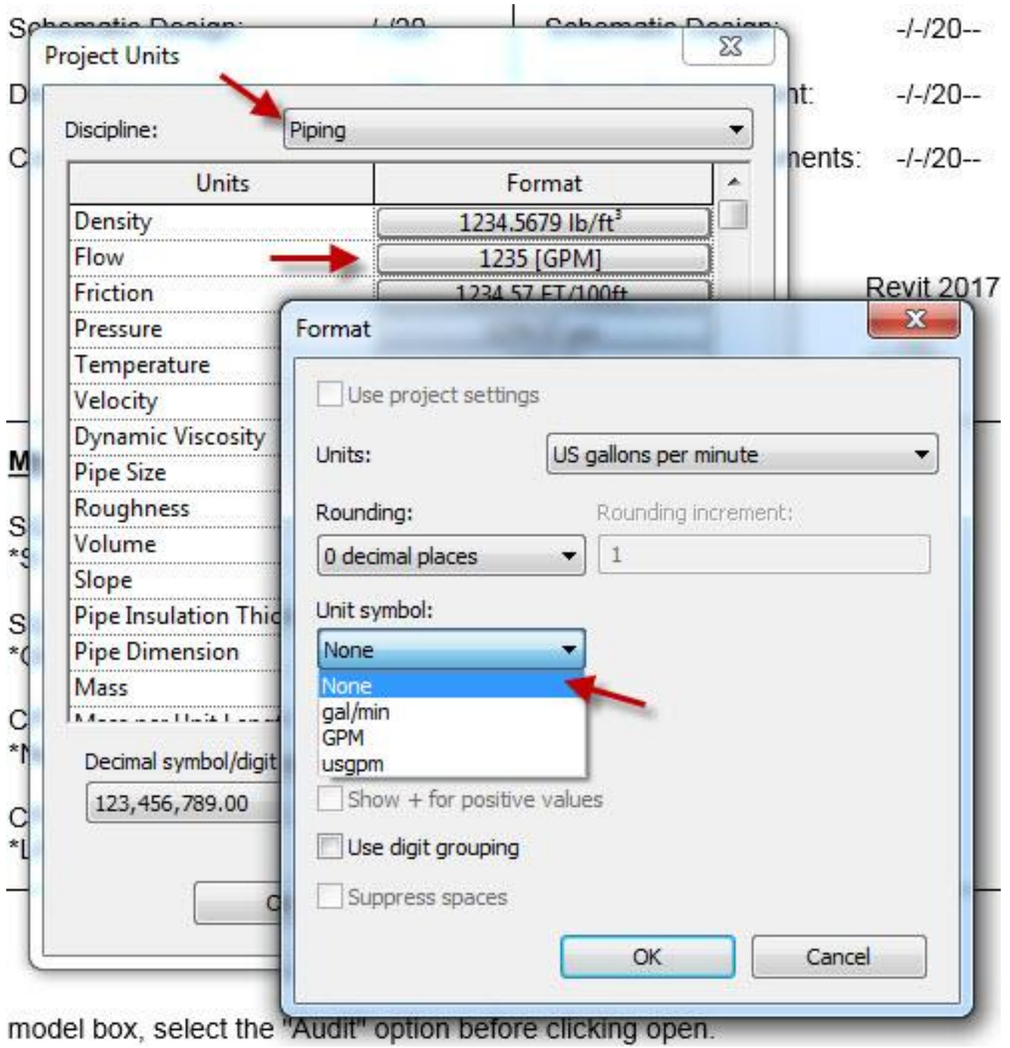
Storm Piping

- In the connector properties it is necessary to have proper flow configuration, direction, system classification and parameter association



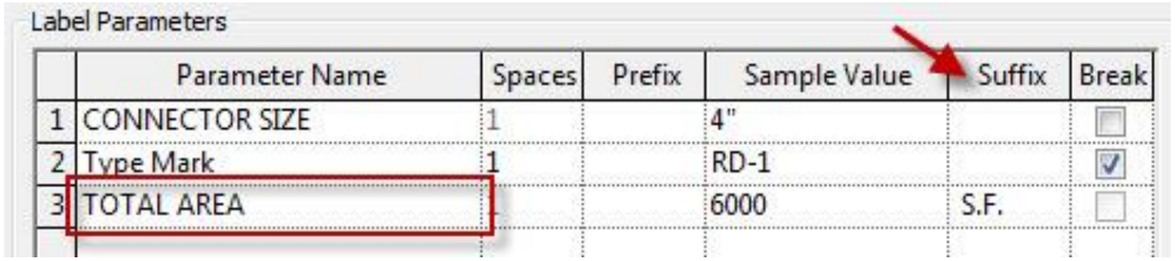
Storm Piping

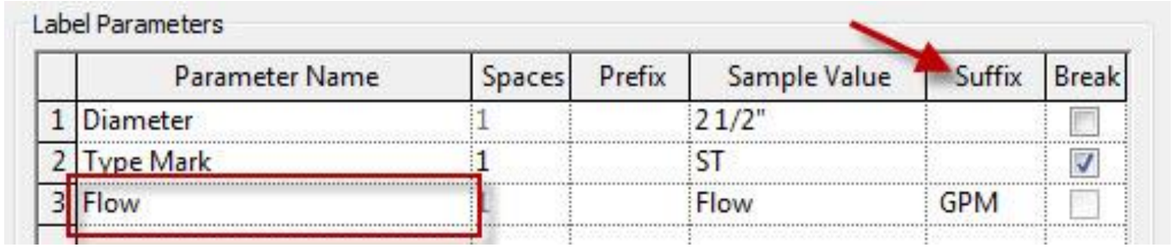
- Remove units from the flow parameter in the family editor and project environment
- Units for flow will be defined in the tag suffix

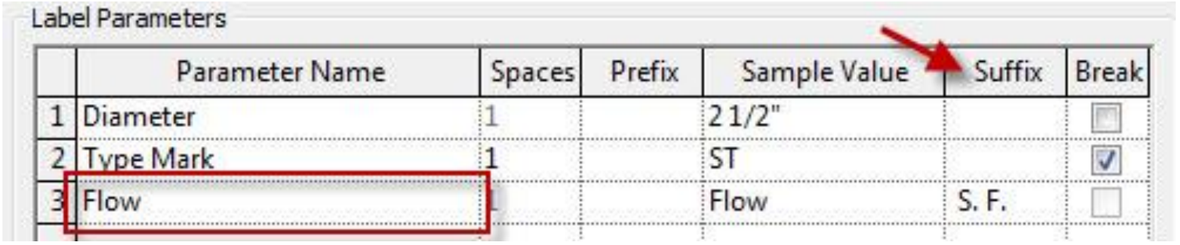


Storm Piping

- Use the shared parameter utilized for total area in the roof drain tag
- Use Revit's flow parameter for pipe tags, with GPM or S.F. as the suffix







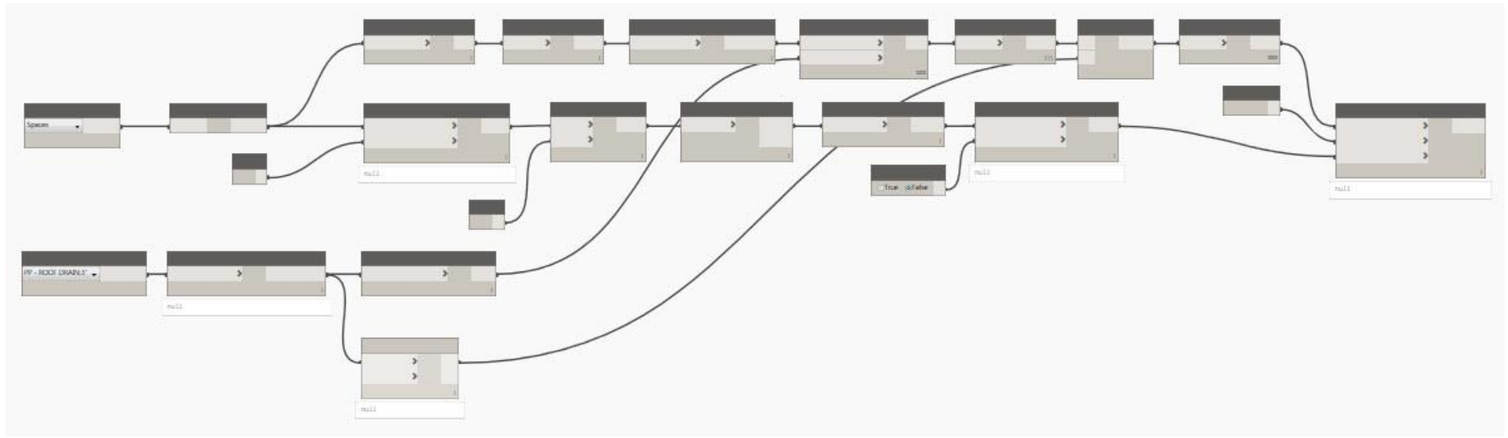
Storm Piping

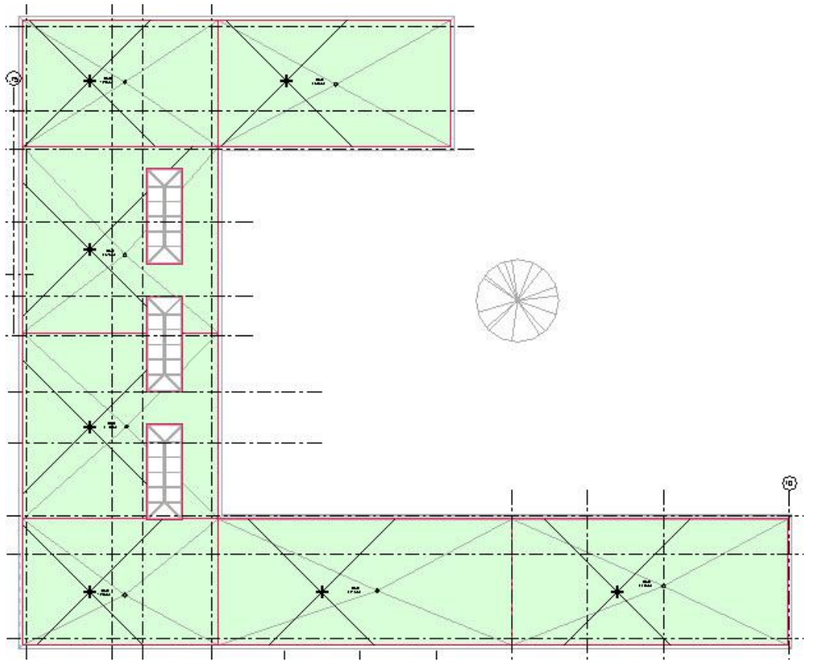
- Create area plans or place spaces on roof plan to easily acquire roof areas for each drain

- Information can be transferred to the roof area parameter manually, with the use of schedules, or with a Dynamo script

<*Roof Drain Areas>

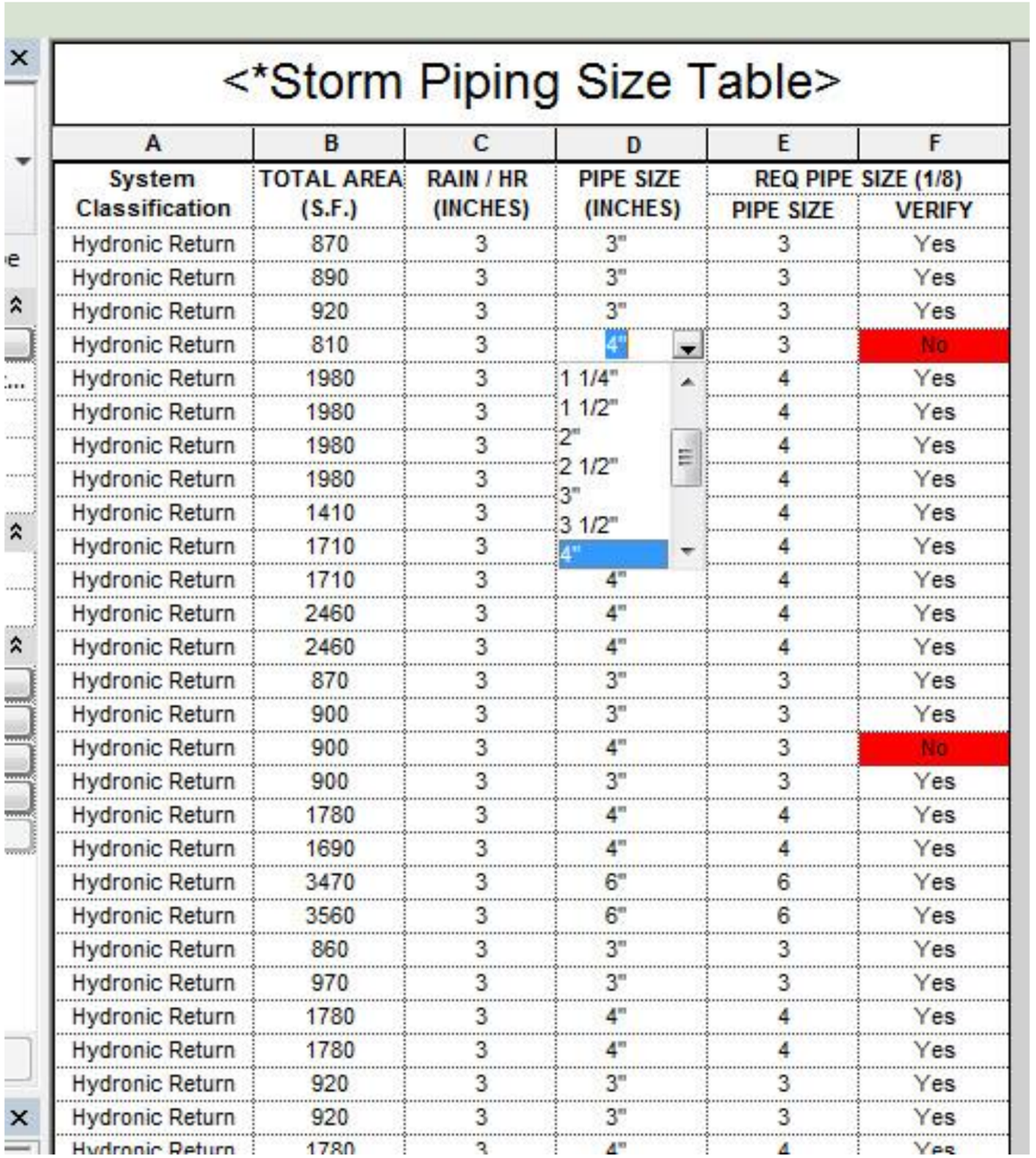
A	B	C	D	E	F
SPACE NAME	AREA (SQUARE FEET)				
ABBREV.	ROOF AREA	WALL WASH	TOTAL AREA	ACTUAL SIZE	REQ. SIZE
PFP - Roof Level					
Roof	1966 SF				
RD-1	1965	0	1965	4"	4
Roof	2515 SF				
RD-1	2515	180	2695	6"	6
Roof	2451 SF				
RD-1	2450	210	2660	6"	6
Roof	1958 SF				
RD-1	1960	0	1960	4"	4
Roof	2943 SF				
RD-1	2945	0	2945	6"	6
Roof	2768 SF				
RD-1	2770	0	2770	6"	6
Roof	2336 SF				
RD-1	2335.000000	0	2335	4"	4





Storm Piping

- After flow is populated in the piping system, pipe size can be adjusted to the correct sizes
- Pipe size can be changed manually in plan or a 3D view, in a pipe schedule, or with a Dynamo script

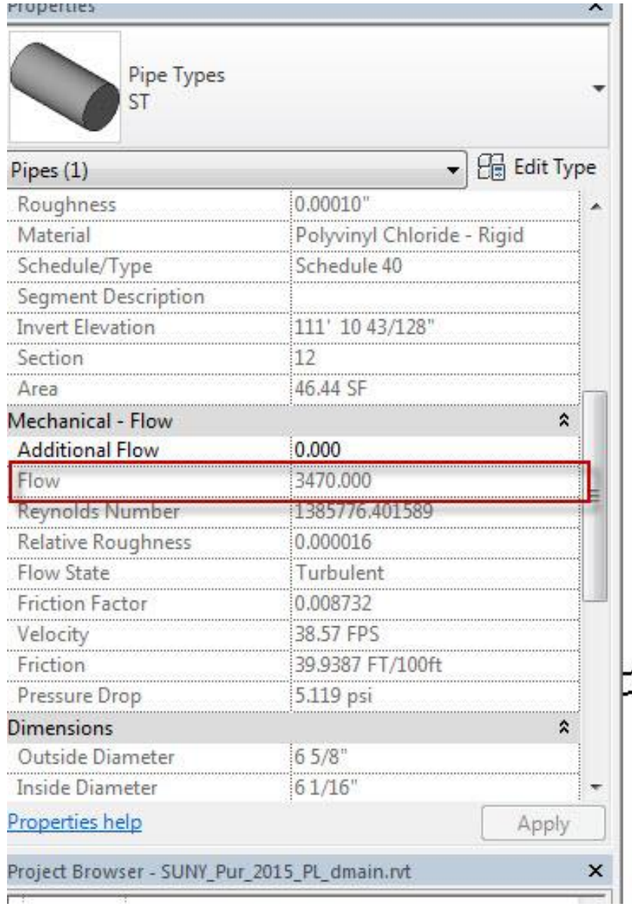


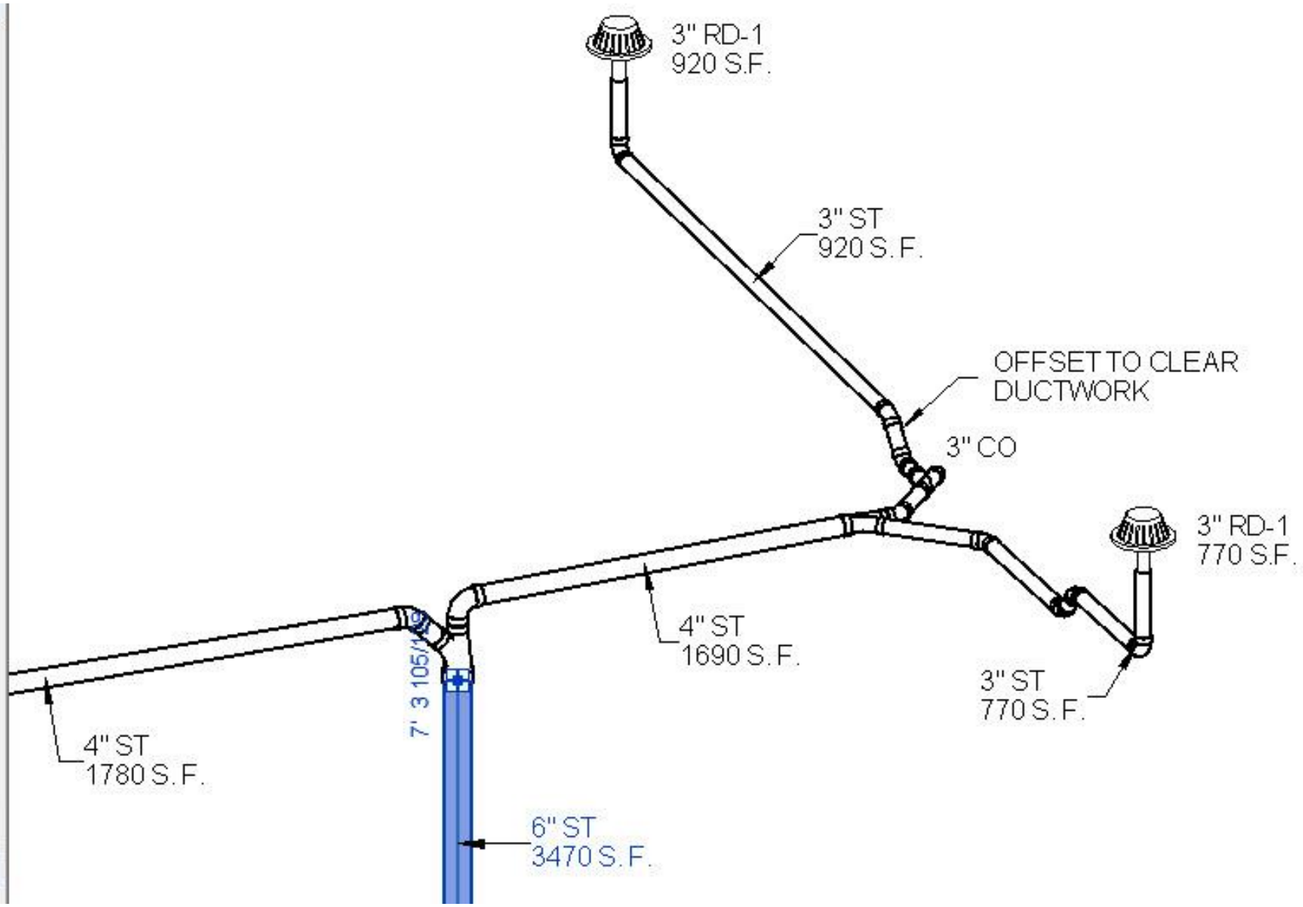
<*Storm Piping Size Table>

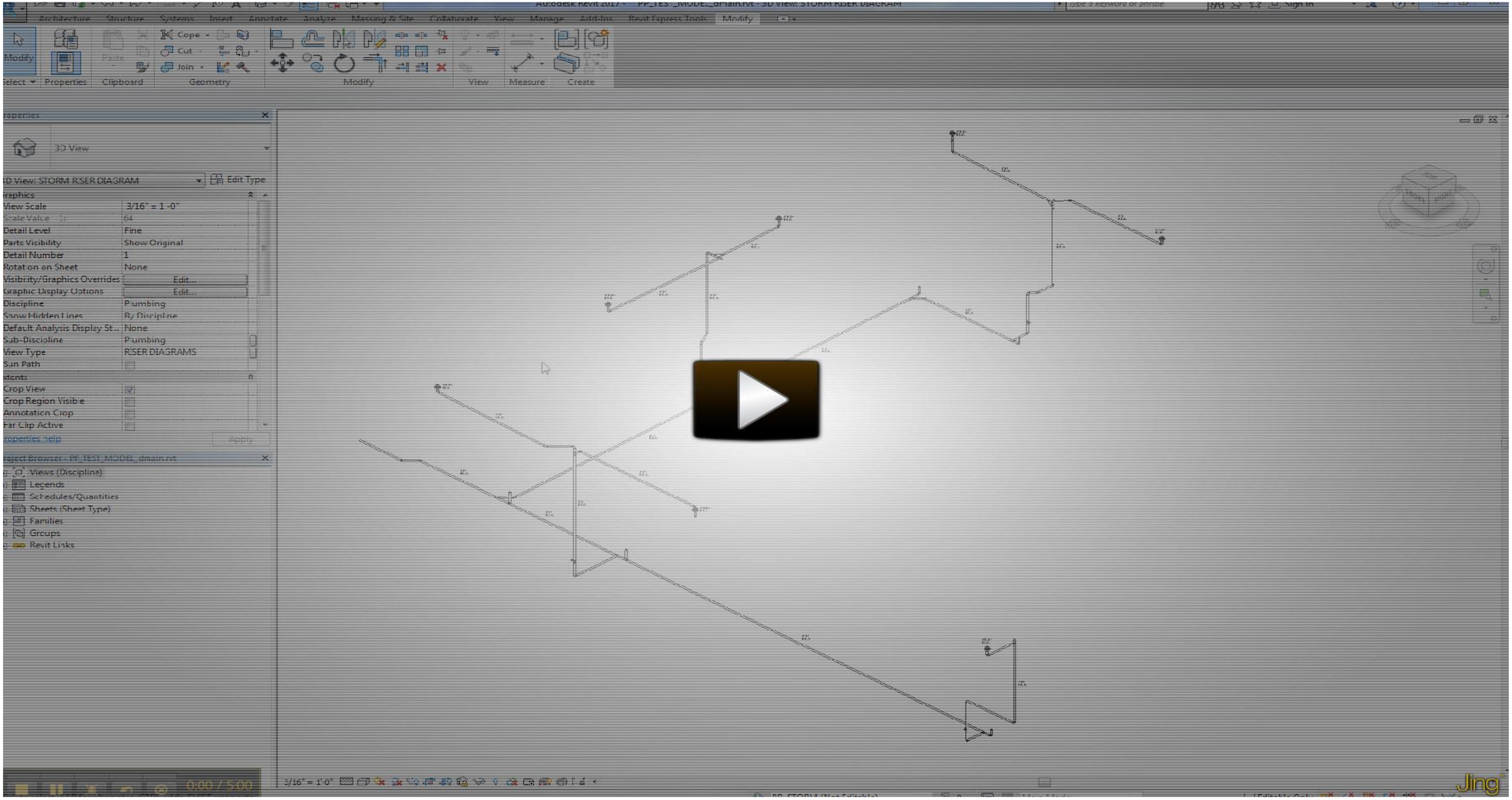
A	B	C	D	E	F
System Classification	TOTAL AREA (S.F.)	RAIN / HR (INCHES)	PIPE SIZE (INCHES)	REQ PIPE SIZE (1/8) PIPE SIZE	REQ PIPE SIZE (1/8) VERIFY
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	890	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	810	3	4"	3	No
Hydronic Return	1980	3	1 1/4"	4	Yes
Hydronic Return	1980	3	1 1/2"	4	Yes
Hydronic Return	1980	3	2"	4	Yes
Hydronic Return	1980	3	2 1/2"	4	Yes
Hydronic Return	1410	3	3"	4	Yes
Hydronic Return	1710	3	3 1/2"	4	Yes
Hydronic Return	1710	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	900	3	4"	3	No
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1690	3	4"	4	Yes
Hydronic Return	3470	3	6"	6	Yes
Hydronic Return	3560	3	6"	6	Yes
Hydronic Return	860	3	3"	3	Yes
Hydronic Return	970	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes

Storm Piping

- With flow automatically populated and the piping sized correctly, tags allow for quick annotation



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Systems
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Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Revit Extreme Tools
Modify
Cope
Cut
Join
Properties
Clipboard
Geometry
Modify
View
Measure
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3D View
3D View: STORM RISER DIAGRAM
Edit Type
Graphics
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3/16" = 1'-0"
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64
Detail Level
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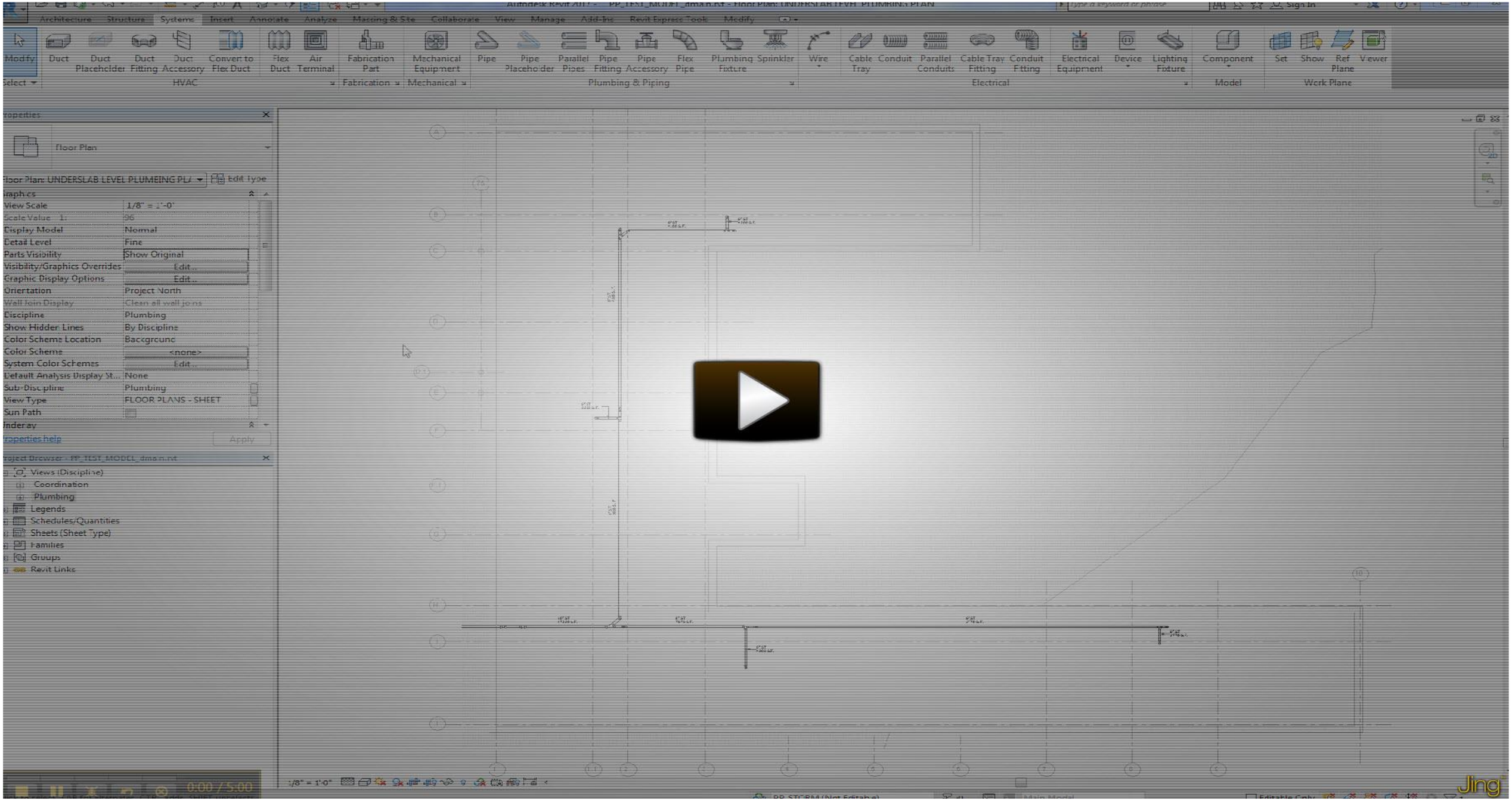
3/16" = 1'-0"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Duct Placeholder
Duct Fitting
Duct Accessory
Convert to Flex Duct
Flex Duct
Air Terminal
HVAC
Fabrication Part
Fabrication
Mechanical Equipment
Mechanical
Pipe
Pipe Placeholder
Parallel Pipes
Pipe Fitting
Pipe Accessory
Flex Pipe
Plumbing Fixture
Sprinkler
Plumbing & Piping
Wire
Cable Tray
Conduit
Parallel Conduits
Cable Tray Fitting
Conduit Fitting
Electrical Equipment
Electrical
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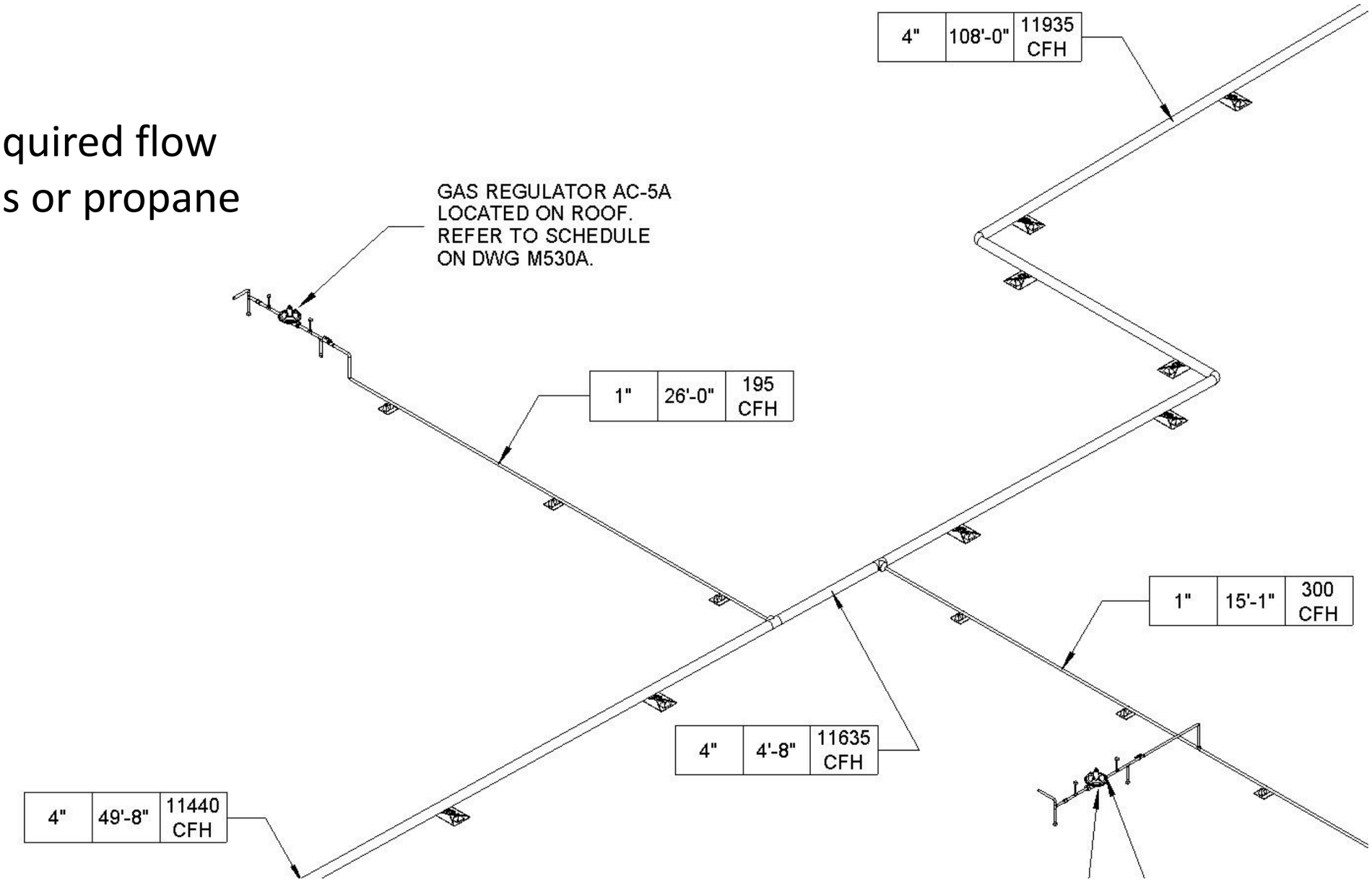
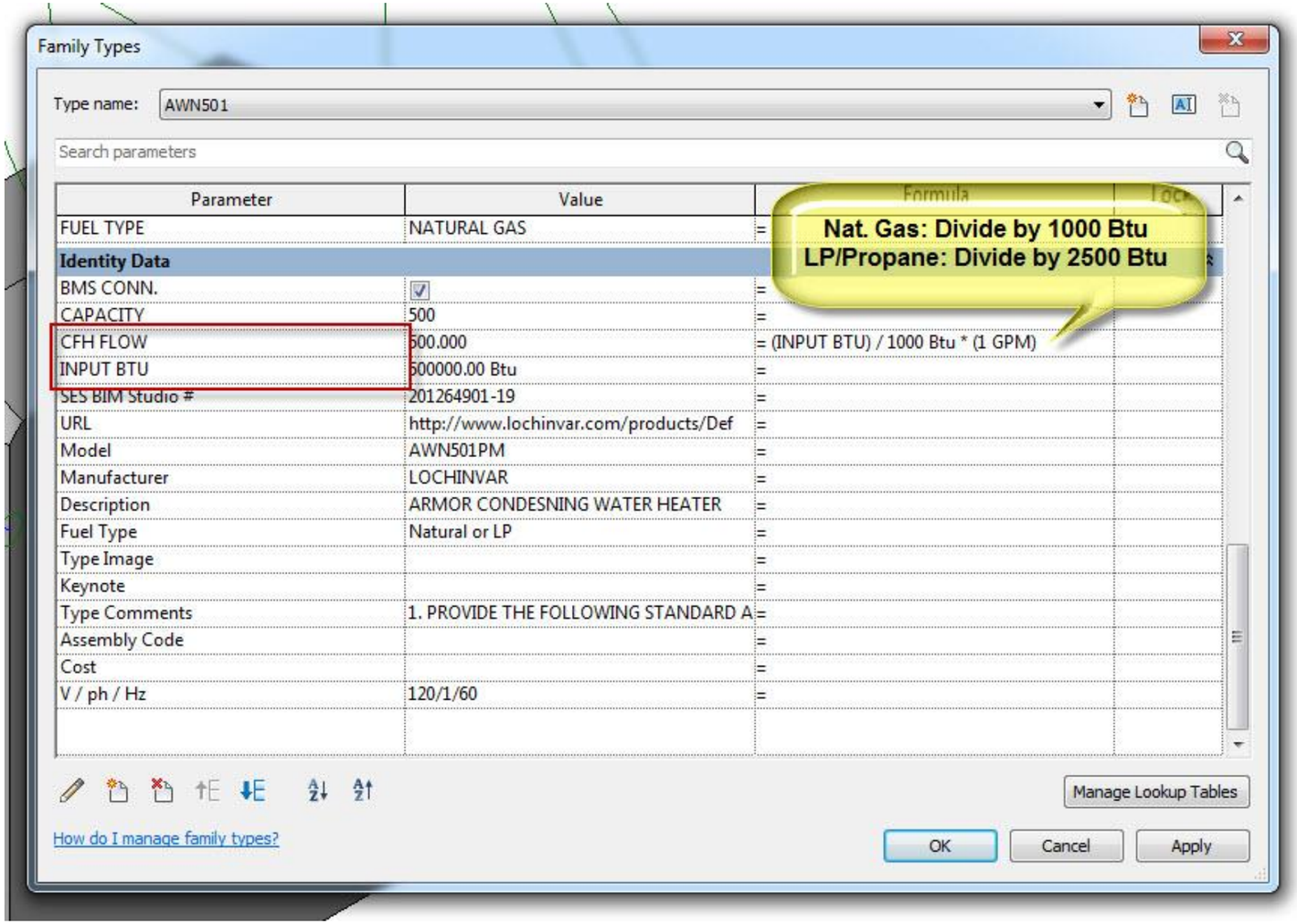
Gas Piping

- Automate required flow of natural gas or propane in CFH



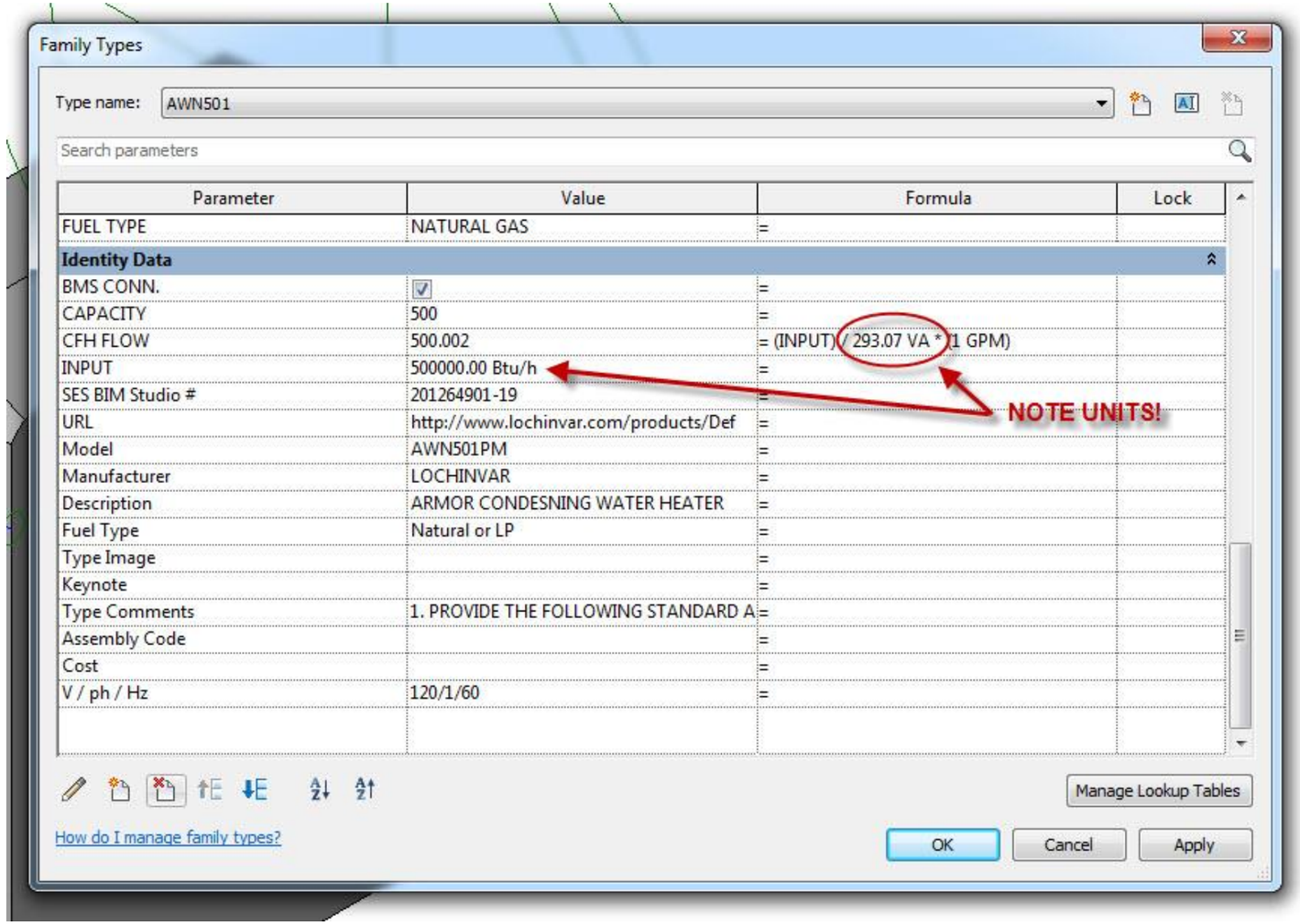
Gas Piping

- Again, use shared parameters and note which are instance or type
- 1000 Btu/h = 1 CFH (Natural Gas)
- 2500 Btu/h = 1 CFH (LP/Propane)
- *Revit uses GPM as unit for flow in piping



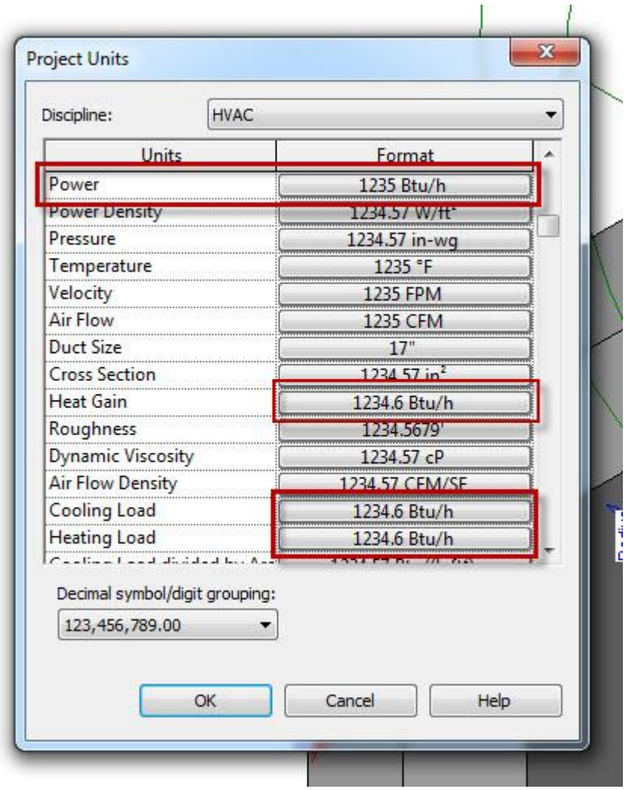
Gas Piping

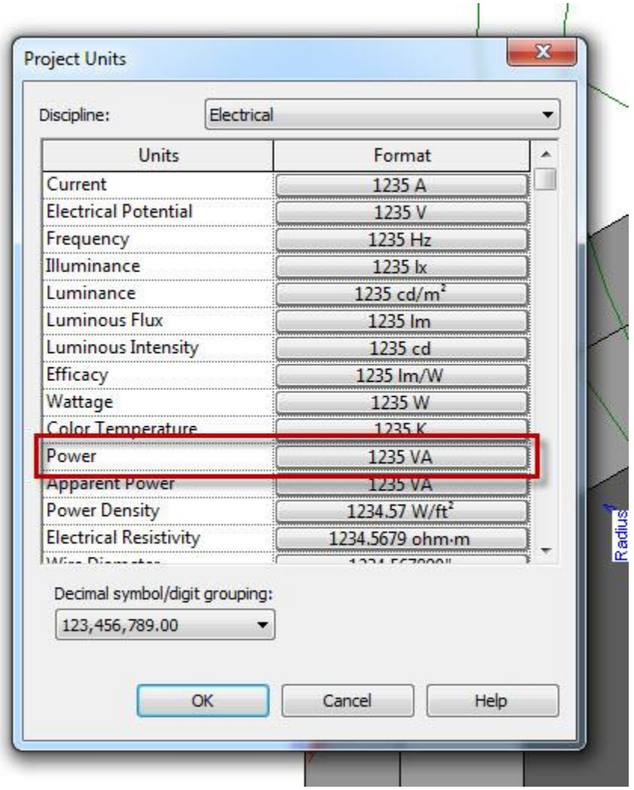
- You may have seen Revit convert display units of Btu/h to VA, this is due to the internal base units that Revit utilizes
- 1 Btu/h = 0.29307107 VA
- Specifying a more accurate value for VA will still give the proper numerical value, but we can prevent the unit conversion if desired

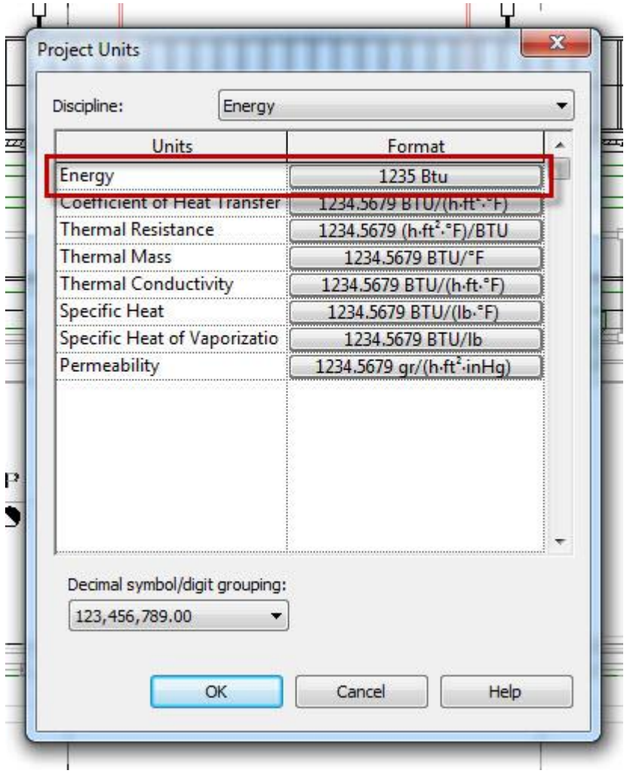


Gas Piping

- Several parameters utilize the same display unit type, but not all parameters have their own internal unit (such as HVAC heating load and power, Elec. power, etc.)
- 1 Btu/h = 0.23907107 W = 0.23907107 VA



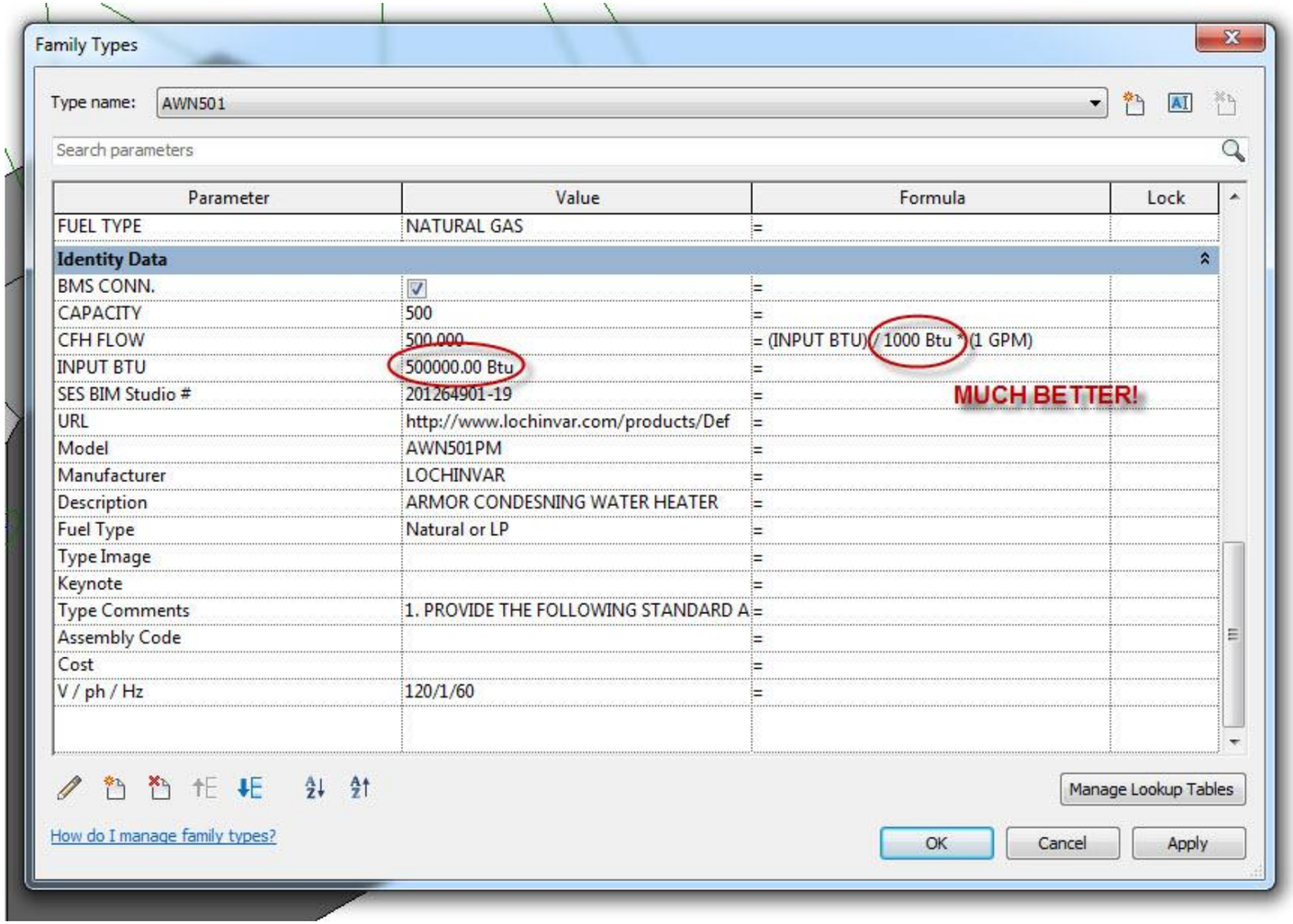




Gas Piping

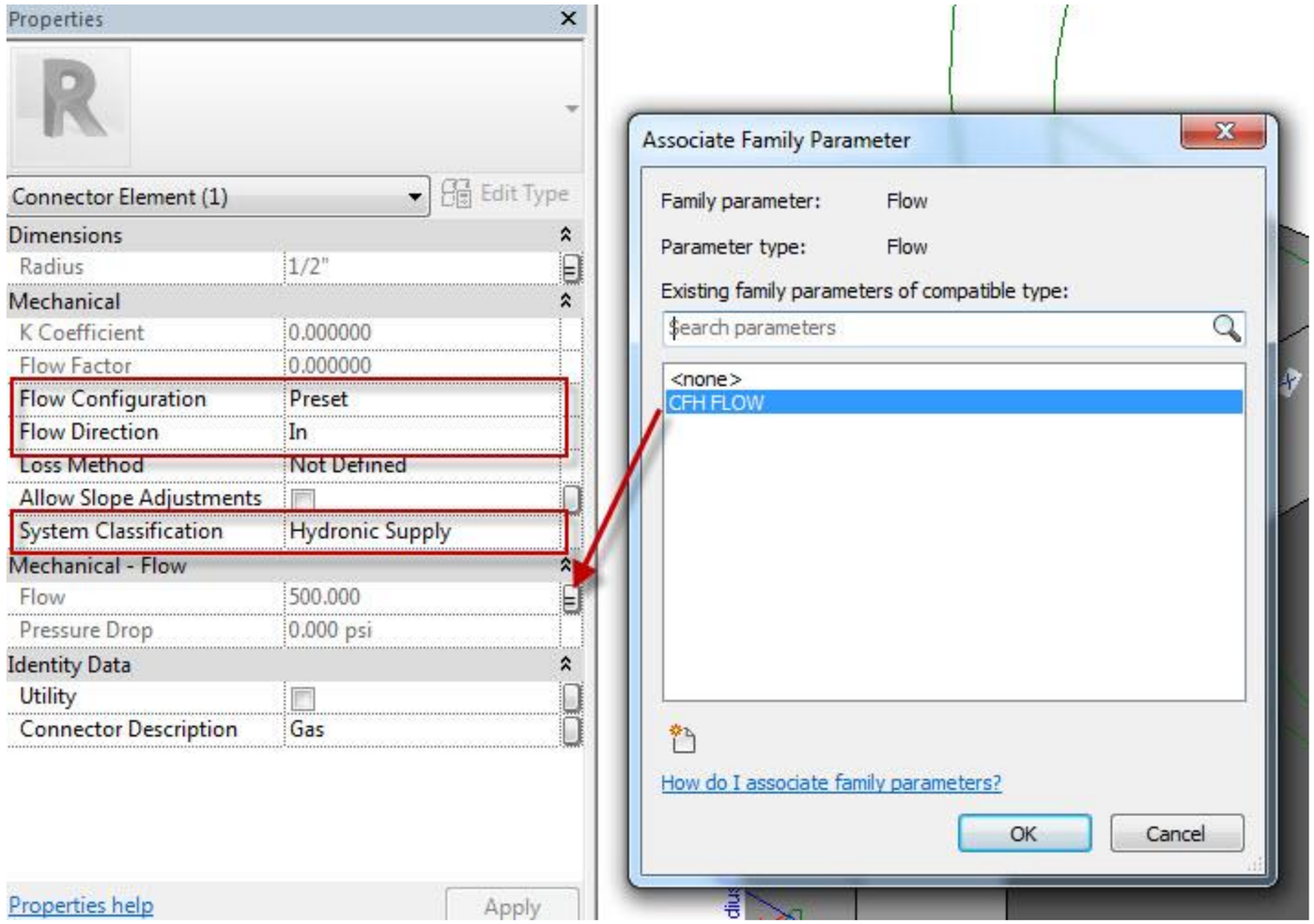
- Since the conversion we use is assuming Btu's per hour, we can utilize a parameter as a number or in Btu instead of Btu/h

- Revit will not convert from Btu and the formula will show what we want to see



Gas Piping

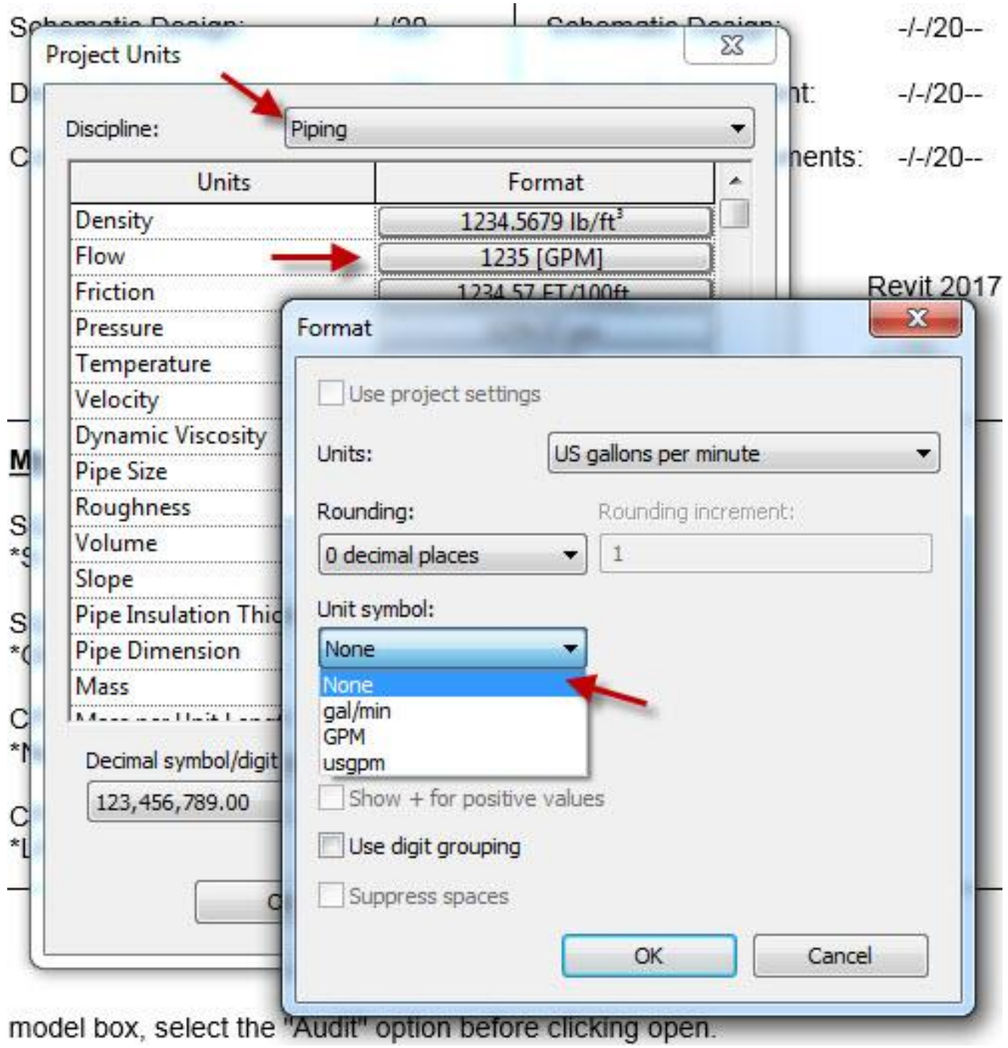
- In the connector properties it is necessary to have proper flow configuration, direction, system classification and parameter association



Gas Piping

- Again, remove units from the flow parameter in the family editor and project environment if not already done

- Units for flow will be defined in the tag suffix



Gas Piping

- Use the shared parameter utilized for total demand in the equipment tag.
- Use Revit's Flow parameter for pipe tags, with CFH as the suffix.

Label Parameters

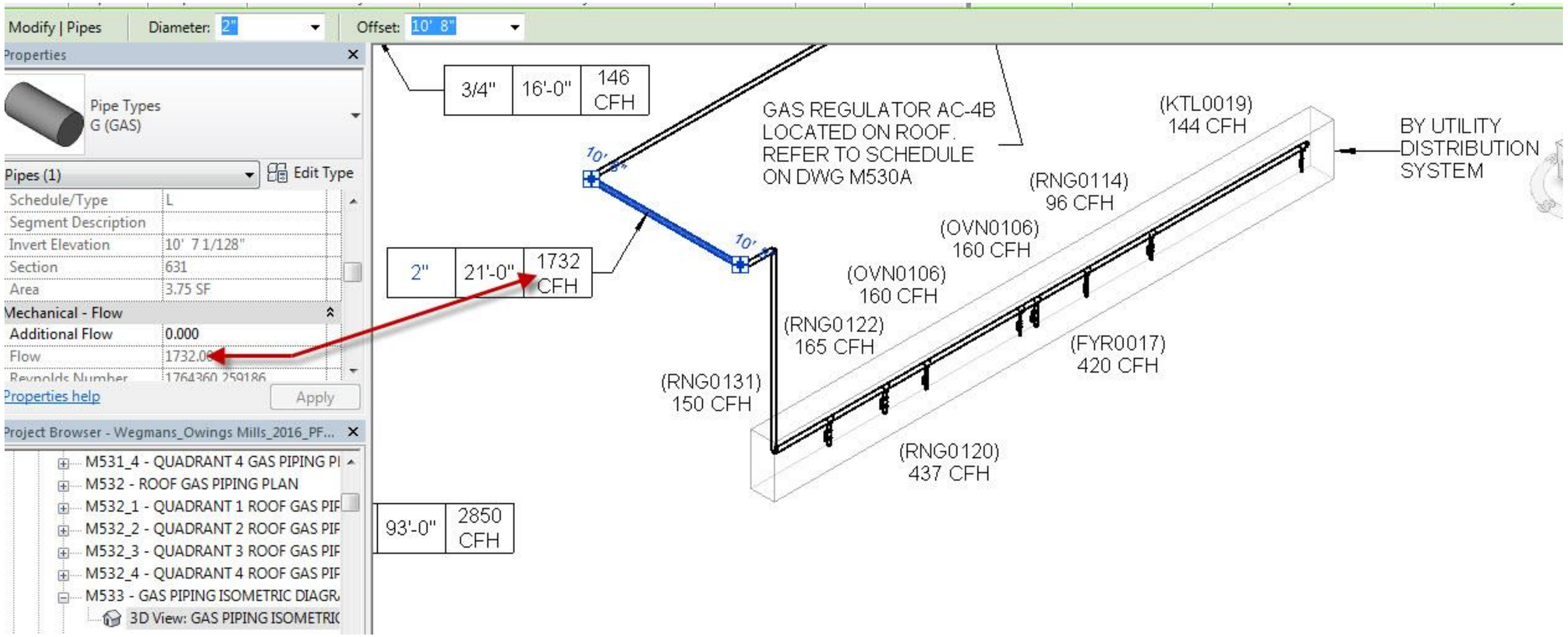
	Parameter Name	Spaces	Prefix	Sample Value	Suffix	Break
1	Type Mark	1		AC-12		☑
2	CFH FLOW	1		1000	CFH	☐

Label Parameters

	Parameter Name	Spaces	Prefix	Sample Value	Suffix	Break
1	Diameter	1		2 1/2"		☐
2	Type Mark	1		G		☑
3	Flow	1		4000	CFH	☐

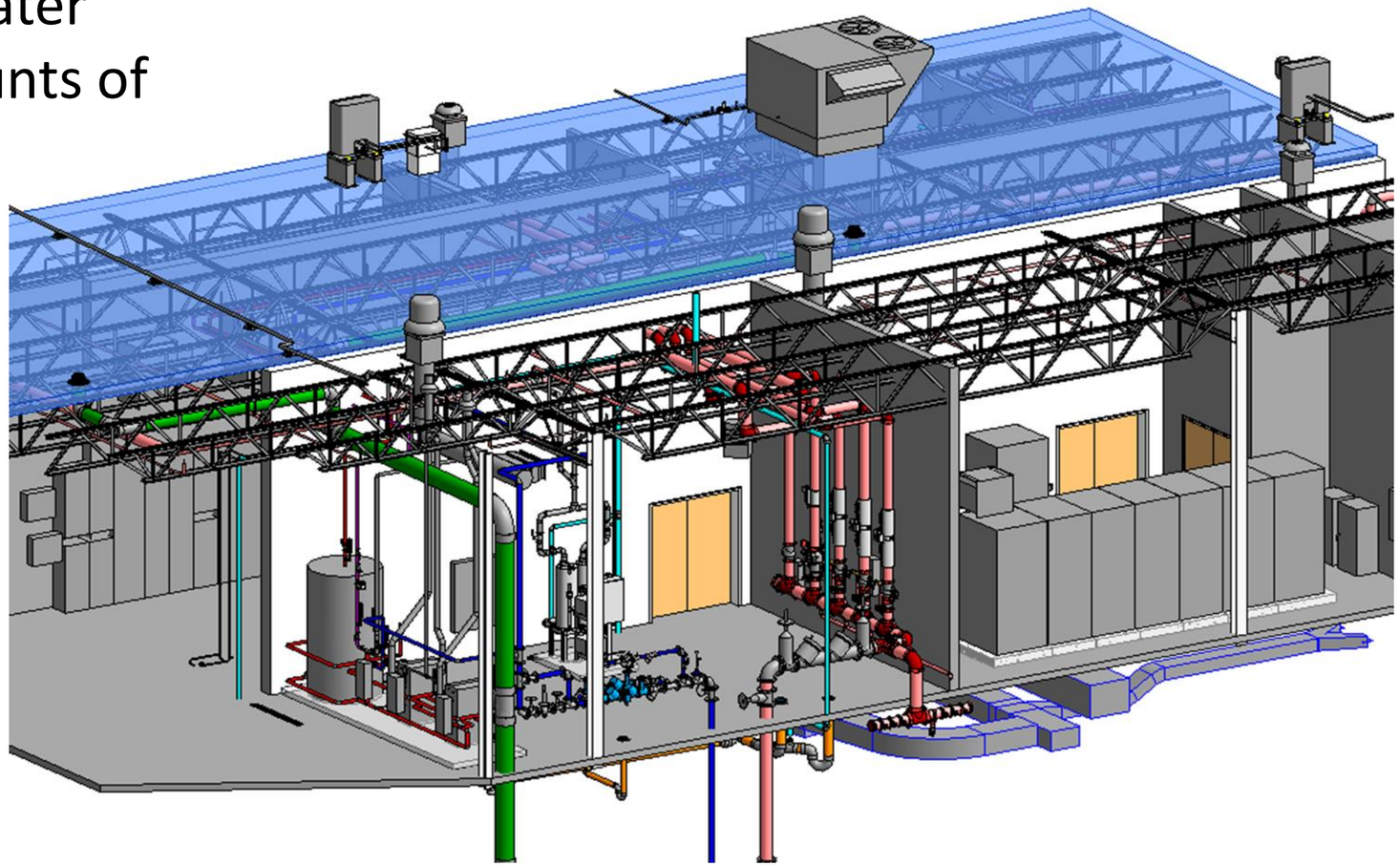
Gas Piping

- With flow automatically populated, tags allow for quick annotation and sizing



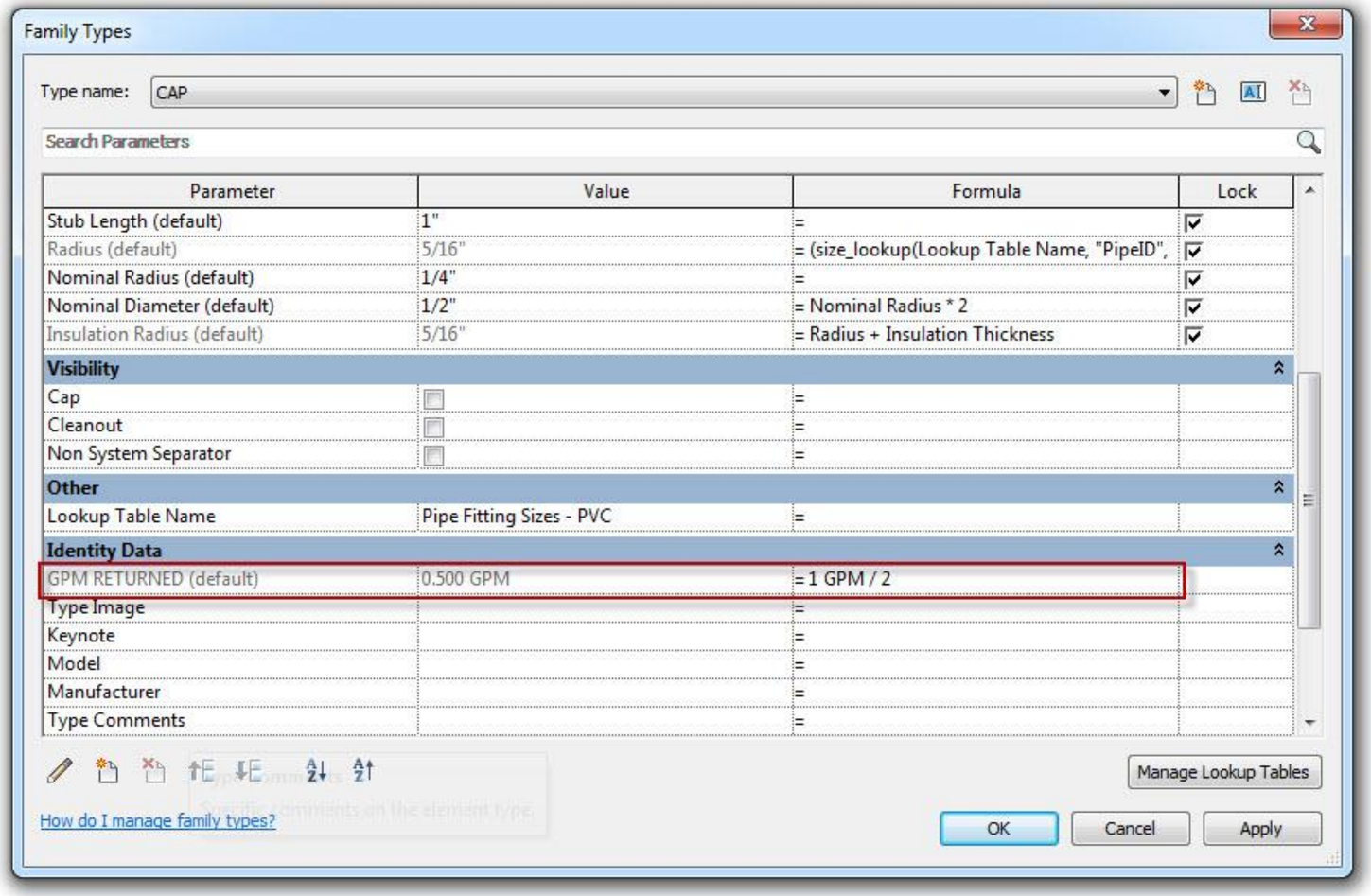
HWR & Other Piping Systems

- Using the flow parameter to transfer information can be used for other piping systems as well, such as hot water returned in GPM, or outlet counts of medical or lab gas.



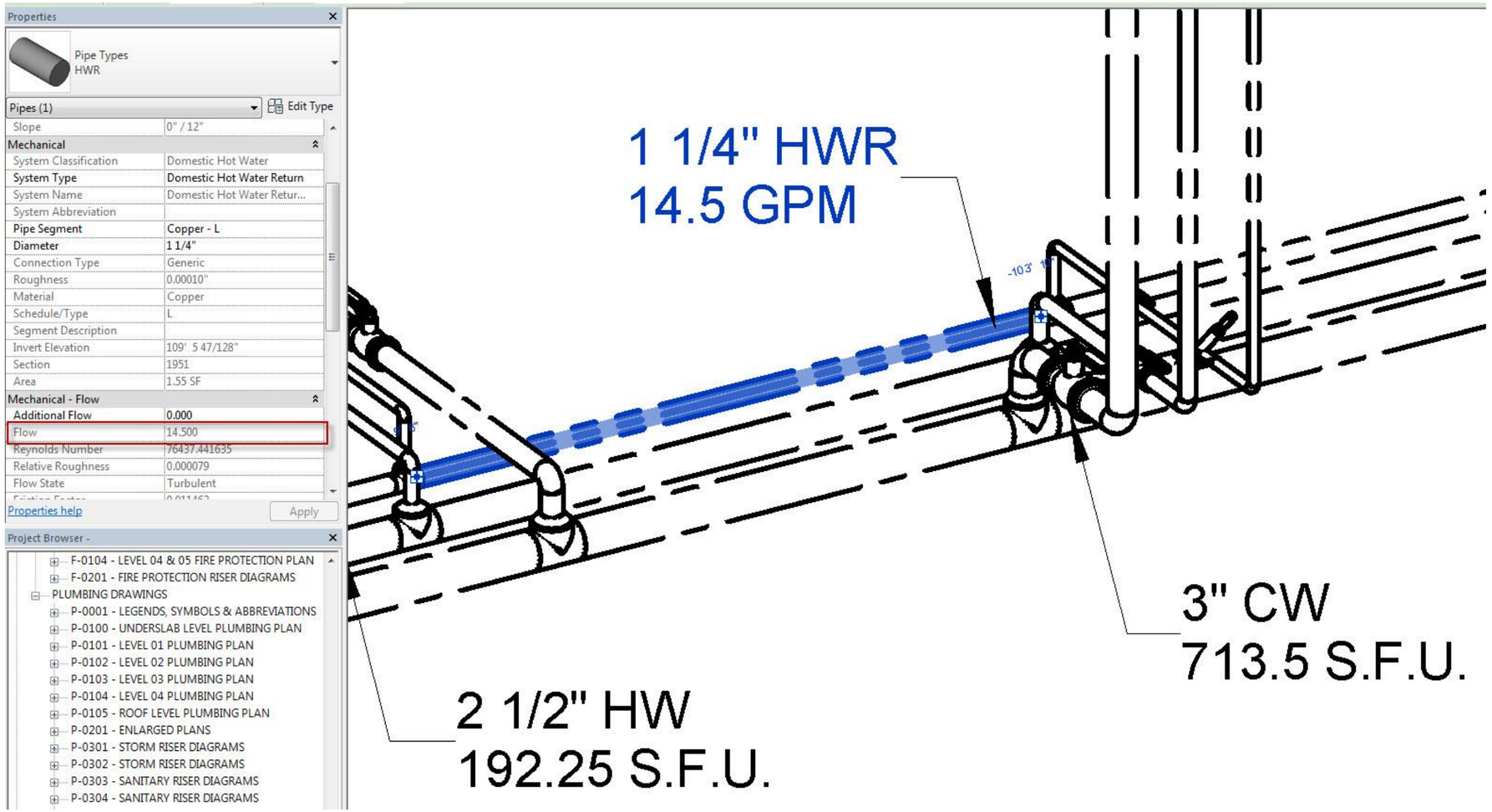
HWR & Other Piping Systems

- Adding a value for GPM returned will populate the flow for each section of piping within the system for quick tagging and sizing
- The flow configuration is preset, flow direction is in and system classification is domestic hot water
- The associated parameter for flow is GPM RETURNED



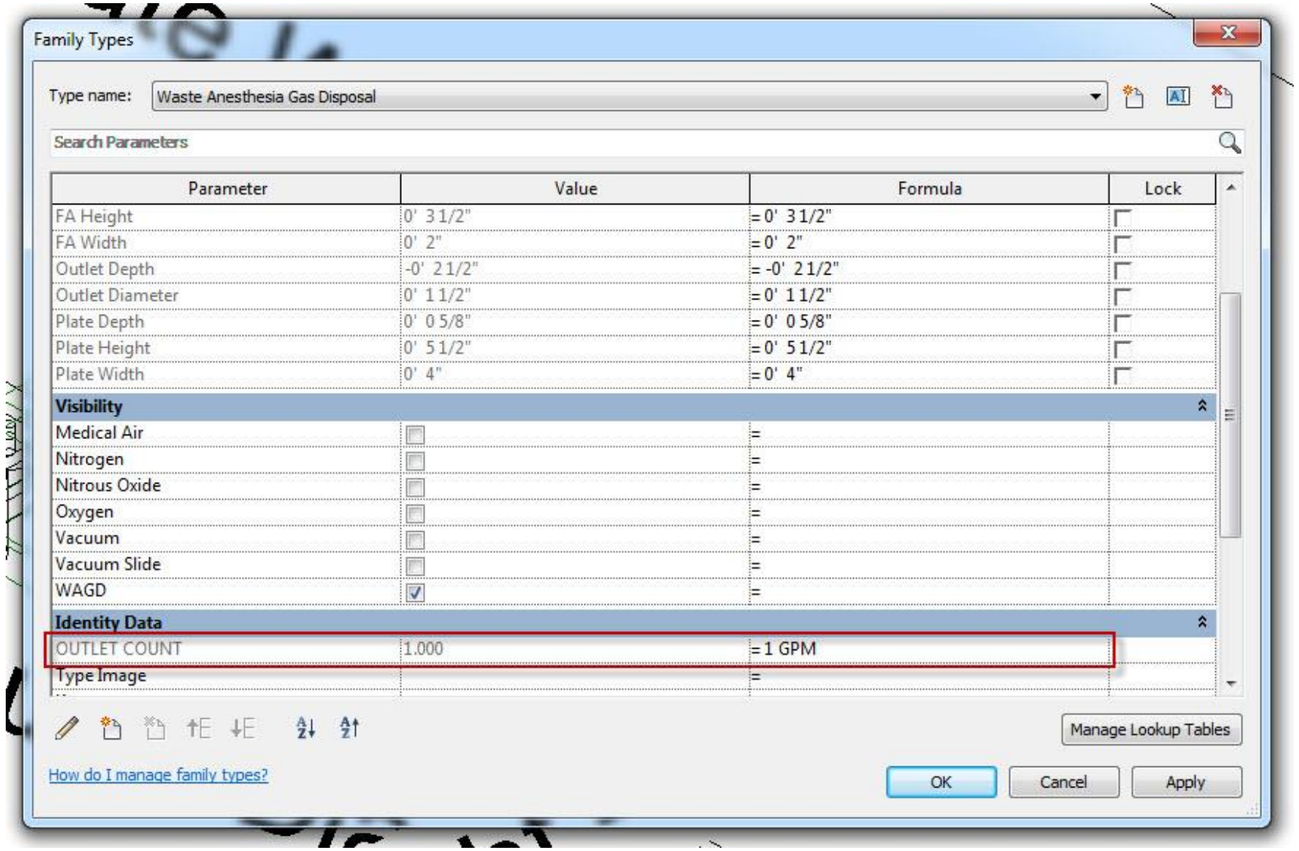
HWR & Other Piping Systems

- With flow automatically populated, tags allow for quick annotation and sizing



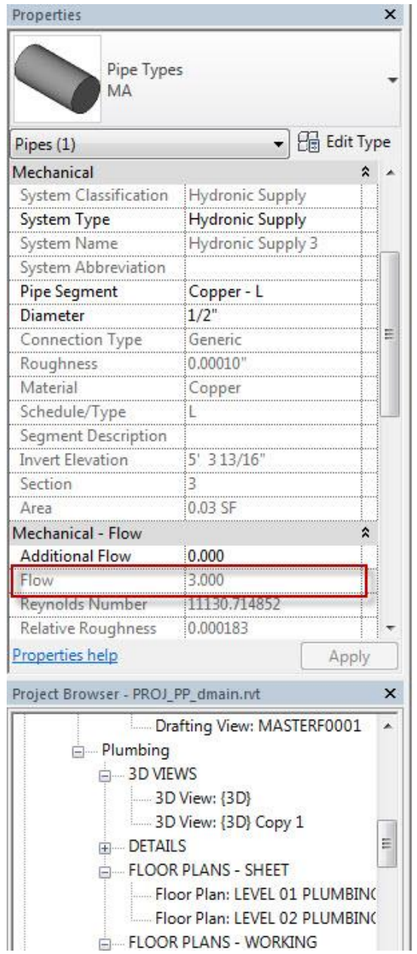
HWR & Other Piping Systems

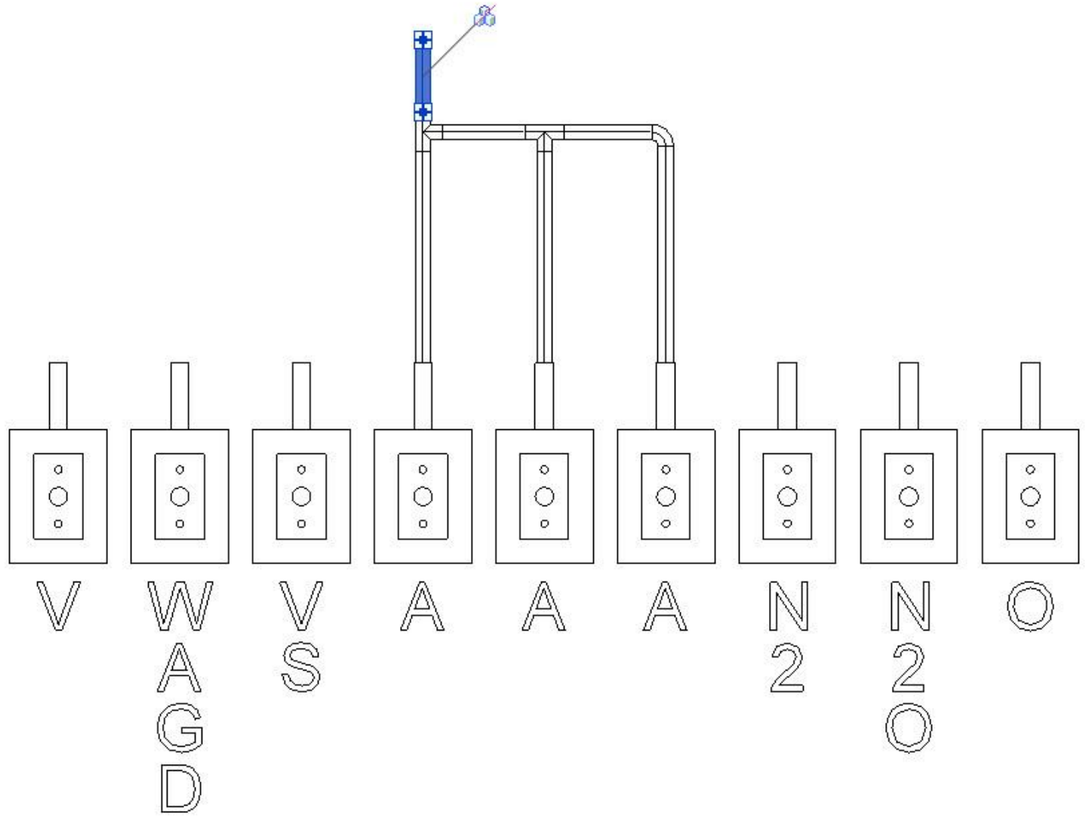
- Another instance where we can utilize the flow parameter is to count total connected outlets in a medical or lab gas piping system
- The outlet count value is set to 1, flow configuration is preset, flow direction is in and system classification is hydronic supply
- The associated parameter for flow is OUTLET COUNT



HWR & Other Piping Systems

- The outlet counts being associated with the modeled piping allows for quick and easy sizing when designing the system, or when making revisions for changes in building layout





Schedules & Calc. Sheets

- Automate schedules for use on drawing sheets, in design narratives or as working tools within the model

GREASE INTERCEPTOR SCHEDULE

ABBREV.	QTY.	MANUFACTURER	MODEL NO.	CAPACITY		LOCATION	REMARKS
				FLOW (GPM)	GREASE (LBS)		
GI-1	1	SCHIER PRODUCTS	GB-20	20 GPM	109 LBS	COFFEE	1, 2, 3, 4, 5, 6
GI-2	3	SCHIER PRODUCTS	GB-50	50 GPM	249 LBS	PIZZA, BAKERY	1, 2, 3, 4, 5, 6
GI-3	1	SCHIER PRODUCTS	GB-75	75 GPM	616 LBS	DELI	1, 2, 3, 4, 5, 6
GI-4	1	SCHIER PRODUCTS	GB-250	100 GPM	1076 LBS	CENTRAL PREP	1, 2, 3, 4, 5, 6
GI-5	1	SCHIER PRODUCTS	GBHF-250-200	200 GPM	400 LBS	DESSERTS	1, 2, 3, 4, 5, 6
GI-6	2	SCHIER PRODUCTS	GBHF-250-250	250 GPM	500 LBS	CENTRAL PREP, SCULLERY CORRIDOR	1, 2, 3, 4, 5, 6

REMARKS:

1. SEAMLESS HDPE CONSTRUCTION.
2. ASME A112.14.3 (TYPE C) COMPLIANT.
3. FIELD ADJUSTABLE RISER (VERIFY LENGTH PRIOR TO ORDERING).
4. NO HUB CONNECTION.
5. BUILT-IN FLOW CONTROL.
6. A LAMINATED SIGN SHALL BE STENCILED ON OR IN THE IMMEDIATE AREA OF THE GREASE TRAP OR INTERCEPTOR IN LETTERS ONE-INCH HIGH. THE SIGN SHALL STATE IN EXACT LANGUAGE:

IMPORTANT
THIS GREASE TRAP/INTERCEPTOR SHALL BE INSPECTED AND THOROUGHLY CLEANED ON A REGULAR AND FREQUENT BASIS. FAILURE TO DO SO COULD RESULT IN DAMAGE TO THE PIPING SYSTEM, AND THE MUNICIPAL OR PRIVATE DRAINAGE SYSTEM(S).

GAS EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT NO.	LOCATION	CFH	DORMONT BLUE HOSE	DORMONT HOSE LENGTH	RESTRAINING CABLE	SWIVELMAX	BALL VALVE	REMARKS
(FYR0013)	ASIAN	280	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(RNG0130)	ASIAN	150	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0133)	ASIAN	287	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(KTL0004)	BAKERY	100	(1) 1675BP	48"	RCD48	(2) SM75	3/4"	1, 2, 3
(OVN0131)	BAKERY	175	(1) 1675BP	48"	RCD48	(2) SM75	3/4"	1, 2, 3
(OVN0131)	BAKERY	175	(1) 1675BP	48"	RCD48	(2) SM75	3/4"	1, 2, 3
(OVN0131)	BAKERY	175	(1) 1675BP	48"	RCD48	(2) SM75	3/4"	1, 2, 3
(FYR0017)	BURGER BAR	420	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(KTL0024)	BURGER BAR	91	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0111)	BURGER BAR	120	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0111)	BURGER BAR	120	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0113)	BURGER BAR	243	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(FYR0010)	KITCHEN	280	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(KTL0019)	KITCHEN	144	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(OVN0106)	KITCHEN	160	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(OVN0106)	KITCHEN	160	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0114)	KITCHEN	96	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0122)	KITCHEN	180	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0131)	KITCHEN	150	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(OVN0172)	PIZZA	336	(2) 1675BP	36"	-	-	3/4"	2, 3
(FYR0013)	VOLCANES	280	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(FYR0013)	VOLCANES	280	(1) 16100BP	48"	RCD48	(2) SM100	BY UDS	1, 2, 3
(OVN0177)	VOLCANES	45	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0135)	VOLCANES	45	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0135)	VOLCANES	45	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0135)	VOLCANES	45	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0136)	VOLCANES	245	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0137)	VOLCANES	245	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0137)	VOLCANES	245	(1) 1675BP	48"	RCD48	(2) SM75	BY UDS	1, 2, 3
(RNG0138)	VOLCANES	120	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0139)	VOLCANES	108	(1) 1650BP	48"	RCD48	(2) SM50	BY UDS	1, 2, 3
(RNG0140)	VOLCANES	90	(1) 1650BP	48"	RCD48	(2) SM50	1/2"	1, 2, 3

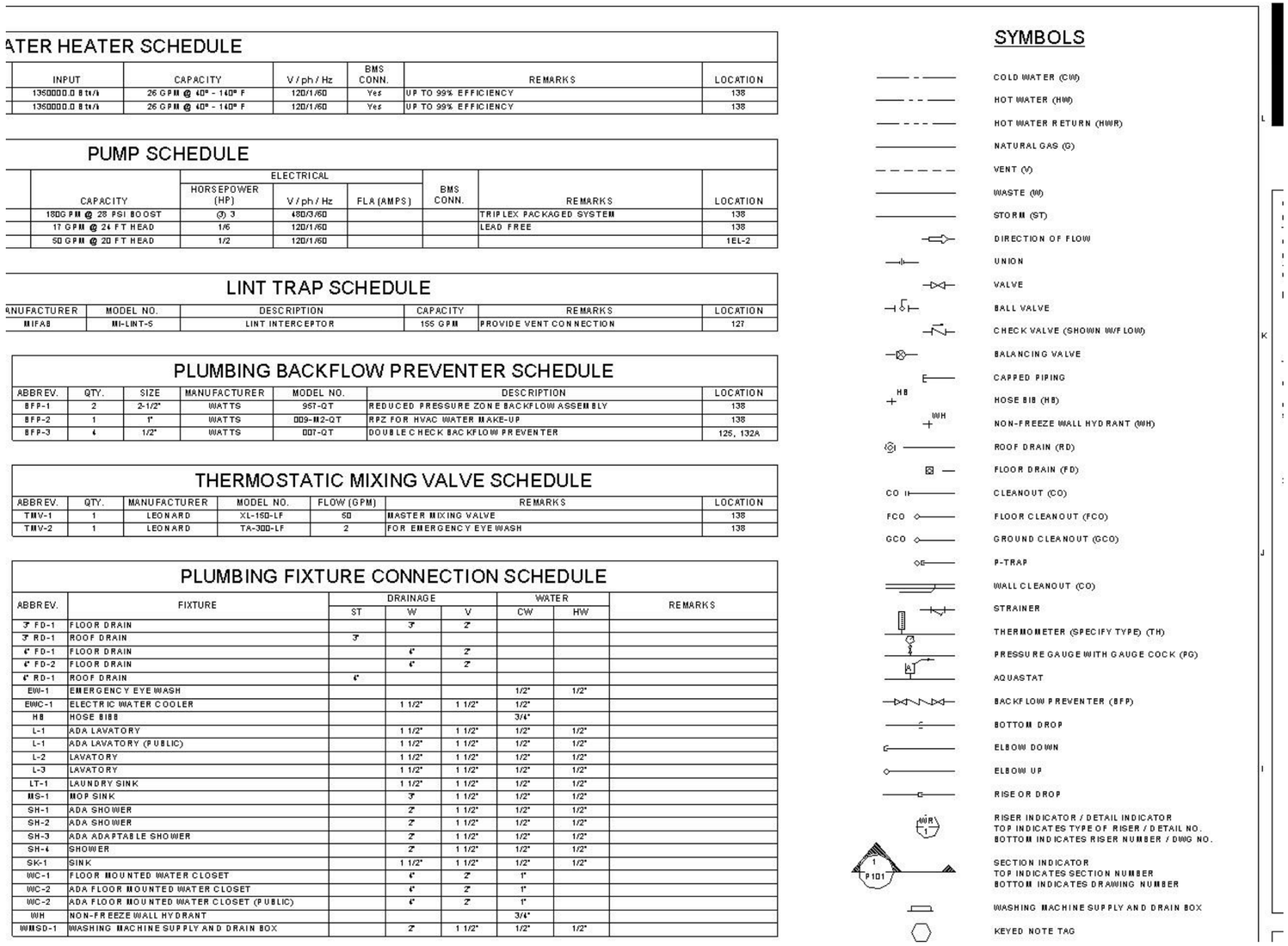
REMARKS:

1. INCLUDES RESTRAINING CABLE, SWIVELMAX AND DORMONT BLUE HOSE (LENGTH INDICATED). CONTRACTOR SHALL USE INCREASERS/REDUCERS AS REQUIRED TO MATCH APPLIANCE CONNECTION SIZE. BUSHINGS SHALL NOT BE USED.
2. CONTRACTOR SHALL INSTALL ALL LISTED PARTS.
3. LOCKABLE VALVE, MILWAUKEE BA-475B-LL OR EQUAL (PROVIDED BY CAPTIVEAIRE AS PART OF UDS (UTILITIES DISTRIBUTION SYSTEM) IN CENTRAL PREP. CONTRACTOR SHALL USE INCREASERS/REDUCERS AS REQUIRED TO MATCH HOSE SIZE. BUSHINGS SHALL NOT BE USED.)

Type	Diameter	Length	EST_Area	Size	Count	Family
CD (CONDENSATE)	3/4"	559.1		3/4"ø	158	Pipe Types
CD (CONDENSATE)	1"	7.9		1"ø	2	Pipe Types
CD (CONDENSATE)	1 1/4"	63.7		1 1/4"ø	10	Pipe Types
CD (CONDENSATE)	1 1/2"	396.0		1 1/2"ø	278	Pipe Types
CD (CONDENSATE): 448		1026.6			448	
CO2 (CARBON DIOXIDE)	1/2"	1765.9		1/2"ø	76	Pipe Types
CO2 (CARBON DIOXIDE)	6"	56.2		6"ø	18	Pipe Types
CO2 (CARBON DIOXIDE): 94		1822.1			94	
COOKING OIL	1/2"	1486.9		1/2"ø	58	Pipe Types
COOKING OIL: 58		1486.9			58	

Schedules & Calc. Sheets

- The most common use of schedules is for placement on sheets
- Utilizing automated schedules allows for better coordination in the drawing set, as well as less time to complete or revise the project
- Information displayed in the schedule is taken from parameters in the family



ATER HEATER SCHEDULE

	INPUT	CAPACITY	V / ph / Hz	BMS CONN.	REMARKS	LOCATION
	1350000.0 Btu/h	26 GPM @ 40° - 140° F	120/1/60	Yes	UP TO 99% EFFICIENCY	138
	1350000.0 Btu/h	26 GPM @ 40° - 140° F	120/1/60	Yes	UP TO 99% EFFICIENCY	138

PUMP SCHEDULE

	CAPACITY	ELECTRICAL			BMS CONN.	REMARKS	LOCATION
		HORSEPOWER (HP)	V / ph / Hz	FLA (AMPS)			
	180 GPM @ 28 PSI BOOST	(3) 3	480/3/60			TRIPLEX PACKAGED SYSTEM	138
	17 GPM @ 24 FT HEAD	1/6	120/1/60			LEAD FREE	138
	50 GPM @ 20 FT HEAD	1/2	120/1/60				1EL-2

LINT TRAP SCHEDULE

ANUFACTURER	MODEL NO.	DESCRIPTION	CAPACITY	REMARKS	LOCATION
MIFAB	MI-LINT-5	LINT INTERCEPTOR	155 GPM	PROVIDE VENT CONNECTION	127

PLUMBING BACKFLOW PREVENTER SCHEDULE

ABBREV.	QTY.	SIZE	MANUFACTURER	MODEL NO.	DESCRIPTION	LOCATION
BFP-1	2	2-1/2"	WATTS	957-QT	REDUCED PRESSURE ZONE BACKFLOW ASSEMBLY	138
BFP-2	1	1"	WATTS	009-M2-QT	RPZ FOR HVAC WATER MAKE-UP	138
BFP-3	4	1/2"	WATTS	007-QT	DOUBLE CHECK BACKFLOW PREVENTER	125, 132A

THERMOSTATIC MIXING VALVE SCHEDULE

ABBREV.	QTY.	MANUFACTURER	MODEL NO.	FLOW (GPM)	REMARKS	LOCATION
TMV-1	1	LEONARD	XL-150-LF	50	MASTER MIXING VALVE	138
TMV-2	1	LEONARD	TA-300-LF	2	FOR EMERGENCY EYE WASH	138

PLUMBING FIXTURE CONNECTION SCHEDULE

ABBREV.	FIXTURE	DRAINAGE			WATER		REMARKS
		ST	W	V	CW	HW	
3" FD-1	FLOOR DRAIN		3"	2"			
3" RD-1	ROOF DRAIN	3"					
4" FD-1	FLOOR DRAIN		4"	2"			
4" FD-2	FLOOR DRAIN		4"	2"			
4" RD-1	ROOF DRAIN	4"					
EW-1	EMERGENCY EYE WASH				1/2"	1/2"	
EWC-1	ELECTRIC WATER COOLER		1 1/2"	1 1/2"	1/2"		
HB	HOSE BIBB				3/4"		
L-1	ADA LAVATORY		1 1/2"	1 1/2"	1/2"	1/2"	
L-1	ADA LAVATORY (PUBLIC)		1 1/2"	1 1/2"	1/2"	1/2"	
L-2	LAVATORY		1 1/2"	1 1/2"	1/2"	1/2"	
L-3	LAVATORY		1 1/2"	1 1/2"	1/2"	1/2"	
LT-1	LAUNDRY SINK		1 1/2"	1 1/2"	1/2"	1/2"	
MS-1	MOP SINK		3"	1 1/2"	1/2"	1/2"	
SH-1	ADA SHOWER		2"	1 1/2"	1/2"	1/2"	
SH-2	ADA SHOWER		2"	1 1/2"	1/2"	1/2"	
SH-3	ADA ADAPTABLE SHOWER		2"	1 1/2"	1/2"	1/2"	
SH-4	SHOWER		2"	1 1/2"	1/2"	1/2"	
SK-1	SINK		1 1/2"	1 1/2"	1/2"	1/2"	
WC-1	FLOOR MOUNTED WATER CLOSET		4"	2"	1"		
WC-2	ADA FLOOR MOUNTED WATER CLOSET		4"	2"	1"		
WC-2	ADA FLOOR MOUNTED WATER CLOSET (PUBLIC)		4"	2"	1"		
WH	NON-FREEZE WALL HYDRANT				3/4"		
WMSD-1	WASHING MACHINE SUPPLY AND DRAIN BOX		2"	1 1/2"	1/2"	1/2"	

SYMBOLS

- COLD WATER (CW)
- HOT WATER (HW)
- HOT WATER RETURN (HWR)
- NATURAL GAS (G)
- VENT (V)
- WASTE (W)
- STORM (ST)
- DIRECTION OF FLOW
- UNION
- VALVE
- BALL VALVE
- CHECK VALVE (SHOWN W/FLOW)
- BALANCING VALVE
- CAPPED PIPING
- HB — HOSE BIB (HB)
- WH — NON-FREEZE WALL HYDRANT (WH)
- ROOF DRAIN (RD)
- FLOOR DRAIN (FD)
- CO — CLEANOUT (CO)
- FCO — FLOOR CLEANOUT (FCO)
- GCO — GROUND CLEANOUT (GCO)
- P-TRAP
- WALL CLEANOUT (CO)
- STRAINER
- THERMOMETER (SPECIFY TYPE) (TH)
- PRESSURE GAUGE WITH GAUGE COCK (PG)
- AQUASTAT
- BACKFLOW PREVENTER (BFP)
- BOTTOM DROP
- ELBOW DOWN
- ELBOW UP
- RISE OR DROP
- WR / 1 — RISER INDICATOR / DETAIL INDICATOR
  TOP INDICATES TYPE OF RISER / DETAIL NO.
  BOTTOM INDICATES RISER NUMBER / DWG NO.
- 1 / P101 — SECTION INDICATOR
  TOP INDICATES SECTION NUMBER
  BOTTOM INDICATES DRAWING NUMBER
- WASHING MACHINE SUPPLY AND DRAIN BOX
- KEYED NOTE TAG

Schedules & Calc. Sheets

- Information such as fixture unit loads are automatically populated and can be inserted in design narratives.

<FIXTURE UNIT LOADS>

A	B	C	D	E	F	G	H	I	J	K
ABBREV.	DESCRIPTION	QTY.	WASTE		COLD WATER 100%		HOT WATER 100%		HOT WATER 75%	
			FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL
LEVEL 01										
4" FD-1	FLOOR DRAIN	18	2	36	0	0	0	0	0	0
4" FD-2	FLOOR DRAIN	10	2	20	0	0	0	0	0	0
EW-1	EMERGENCY EYE WASH	1	0	0	0	0	1	1	0.75	0.75
EWC-1	ELECTRIC WATER COOLER	1	0.5	0.5	0.25	0.25	0	0	0	0
HB	HOSE BIBB	1	0	0	2.5	2.5	0	0	0	0
L-1	ADA LAVATORY	3	1	3	0.5	1.5	0.5	1.5	0.375	1.125
L-1	ADA LAVATORY (PUBLIC)	2	1	2	1.5	3	1.5	3	1.125	2.25
L-2	LAVATORY	12	1	12	0.5	6	0.5	6	0.375	4.5
L-3	LAVATORY	10	1	10	0.5	5	0.5	5	0.375	3.75
LT-1	LAUNDRY SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	2	2	4	1	2	1	2	0.75	1.5
SH-3	ADA ADAPTABLE SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-4	SHOWER	10	2	20	1	10	1	10	0.75	7.5
SK-1	SINK	2	2	4	3	6	3	6	2.25	4.5
WC-1	FLOOR MOUNTED WATER CLOSET	10	3	30	6	60	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	4	3	12	6	24	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET (PUBLIC)	2	4	8	10	20	0	0	0	0
WH	NON-FREEZE WALL HYDRANT	5	0	0	2.5	12.5	0	0	0	0
WMSD-1	WASHING MACHINE SUPPLY AND DRAIN BOX	10	4	40	3	30	3	30	2.25	22.5
		107		209.5		189.25		71		53.25
LEVEL 02										
3" FD-1	FLOOR DRAIN	22	2	44	0	0	0	0	0	0

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FIXTURE UNIT LOADS

ABBREV.	DESCRIPTION	QTY.	WASTE		COLD WATER 100%		HOT WATER 100%		HOT WATER 75%	
			FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL
LEVEL 01										
4" FD-1	FLOOR DRAIN	18	2	36	0	0	0	0	0	0
4" FD-2	FLOOR DRAIN	10	2	20	0	0	0	0	0	0
EW-1	EMERGENCY EYE WASH	1	0	0	0	0	1	1	0.75	0.75
EWC-1	ELECTRIC WATER COOLER	1	0.5	0.5	0.25	0.25	0	0	0	0
HB	HOSE BIBB	1	0	0	2.5	2.5	0	0	0	0
L-1	ADA LAVATORY	3	1	3	0.5	1.5	0.5	1.5	0.375	1.125
L-1	ADA LAVATORY (PUBLIC)	2	1	2	1.5	3	1.5	3	1.125	2.25
L-2	LAVATORY	12	1	12	0.5	6	0.5	6	0.375	4.5
L-3	LAVATORY	10	1	10	0.5	5	0.5	5	0.375	3.75
LT-1	LAUNDRY SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	2	2	4	1	2	1	2	0.75	1.5
SH-3	ADA ADAPTABLE SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-4	SHOWER	10	2	20	1	10	1	10	0.75	7.5
SK-1	SINK	2	2	4	3	6	3	6	2.25	4.5
WC-1	FLOOR MOUNTED WATER CLOSET	10	3	30	6	60	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	4	3	12	6	24	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET (PUBLIC)	2	4	8	10	20	0	0	0	0
WH	NON-FREEZE WALL HYDRANT	5	0	0	2.5	12.5	0	0	0	0
WMSD-1	WASHING MACHINE SUPPLY AND DRAIN BOX	10	4	40	3	30	3	30	2.25	22.5
		107		209.5		189.25		71		53.25
LEVEL 02										
3" FD-1	FLOOR DRAIN	22	2	44	0	0	0	0	0	0
L-1	ADA LAVATORY	5	1	5	0.5	2.5	0.5	2.5	0.375	1.875
L-2	LAVATORY	21	1	21	0.5	10.5	0.5	10.5	0.375	7.875
L-3	LAVATORY	20	1	20	0.5	10	0.5	10	0.375	7.5
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-3	ADA ADAPTABLE SHOWER	3	2	6	1	3	1	3	0.75	2.25
SH-4	SHOWER	20	2	40	1	20	1	20	0.75	15
WC-1	FLOOR MOUNTED WATER CLOSET	20	3	60	6	120	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	5	3	15	6	30	0	0	0	0
		119		217		200.25		50.25		37.6875
LEVEL 03										
3" FD-1	FLOOR DRAIN	22	2	44	0	0	0	0	0	0
L-1	ADA LAVATORY	5	1	5	0.5	2.5	0.5	2.5	0.375	1.875
L-2	LAVATORY	21	1	21	0.5	10.5	0.5	10.5	0.375	7.875
L-3	LAVATORY	20	1	20	0.5	10	0.5	10	0.375	7.5
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-3	ADA ADAPTABLE SHOWER	3	2	6	1	3	1	3	0.75	2.25
SH-4	SHOWER	20	2	40	1	20	1	20	0.75	15
WC-1	FLOOR MOUNTED WATER CLOSET	20	3	60	6	120	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	5	3	15	6	30	0	0	0	0
		119		217		200.25		50.25		37.6875
LEVEL 04										
3" FD-1	FLOOR DRAIN	22	2	44	0	0	0	0	0	0
L-1	ADA LAVATORY	5	1	5	0.5	2.5	0.5	2.5	0.375	1.875
L-2	LAVATORY	21	1	21	0.5	10.5	0.5	10.5	0.375	7.875
L-3	LAVATORY	20	1	20	0.5	10	0.5	10	0.375	7.5
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-3	ADA ADAPTABLE SHOWER	3	2	6	1	3	1	3	0.75	2.25
SH-4	SHOWER	20	2	40	1	20	1	20	0.75	15
WC-1	FLOOR MOUNTED WATER CLOSET	20	3	60	6	120	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	5	3	15	6	30	0	0	0	0
		119		217		200.25		50.25		37.6875
LEVEL 05										
HB	HOSE BIBB	1	0	0	2.5	2.5	0	0	0	0
		1		0		2.5		0		0
TOTAL		465		860.5		792.5		221.75		166.3125

Schedules & Calc. Sheets

- Other spreadsheets for design narratives or submissions can also be replaced with automated schedules such as roof drainage calculations or gas loads.

CANNONDESIGN

[redacted]

NOTE:

EQUIV. PIPE LENGTH FACTOR: 1.15
1 CFH = 1000 BTU/H

PRELIMINARY GAS LOADS

LOCATION / EQUIPMENT CONNECTED	QTY.	INPUT CFH	TOTAL LOAD CFH	CONN. SIZE	MIN. PRESS. REQ.
ASIAN					
FRYER	1	280	280		
KETTLE	1	144	144		
RANGE	1	150	150		
RANGE	1	287	287		
			861		
BAKERY					
KETTLE	1	100	100		
OVEN	3	175	525		
			625		
BURGER BAR					
FRYER	1	280	280		
GRIDDLE	2	50	100		
OVEN	1	160	160		
RANGE	1	146	146		
			686		
CENTRAL PREP					
FRYER	1	280	280		

CANNONDESIGN

[redacted]

ROOF DRAINAGE CALCULATIONS

ABBREV.	RAINFALL (INCHES / HR)	ROOF AREA (S.F.)	WALL WASH (S.F.)	TOTAL AREA DRAINED (S.F.)	PRIMARY DRAINS	
					REQUIRED DRAIN CAP. (GPM)	SIZE OF PIPE (INCHES)
3" RD-1	3	520	120	640	19.968	3"
3" RD-1	3	650	0	650	20.28	3"
3" RD-1	3	530	120	650	20.28	3"
3" RD-1	3	730	0	730	22.776	3"
3" RD-1	3	760	0	760	23.712	3"
3" RD-1	3	770	0	770	24.024	3"
3" RD-1	3	780	0	780	24.336	3"
3" RD-1	3	810	0	810	25.272	3"
3" RD-1	3	820	0	820	25.584	3"
3" RD-1	3	820	0	820	25.584	3"
3" RD-1	3	820	0	820	25.584	3"
3" RD-1	3	820	0	820	25.584	3"
3" RD-1	3	860	0	860	26.832	3"
3" RD-1	3	860	0	860	26.832	3"
3" RD-1	3	870	0	870	27.144	3"
3" RD-1	3	870	0	870	27.144	3"
3" RD-1	3	890	0	890	27.768	3"
3" RD-1	3	900	0	900	28.08	3"
3" RD-1	3	900	0	900	28.08	3"
3" RD-1	3	920	0	920	28.704	3"
3" RD-1	3	920	0	920	28.704	3"
3" RD-1	3	970	0	970	30.264	3"
4" RD-1	3	950	190	1140	35.568	4"
4" RD-1	3	970	360	1330	41.496	4"
TOTAL:		19710	790	20500	639.6	

CALCULATIONS:

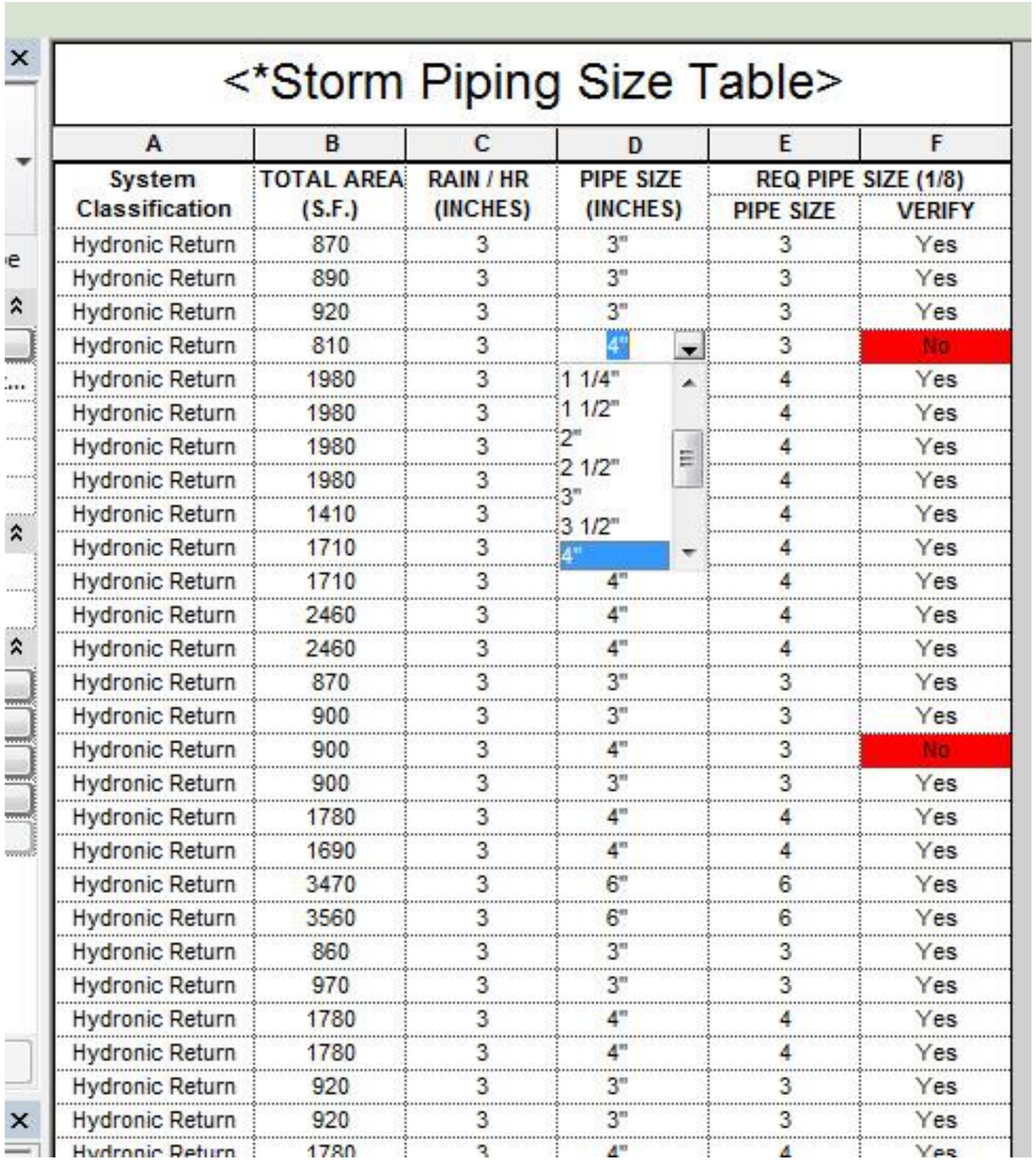
.0104 GPM = 1 S.F. @ 1" RAIN / HR.

(n) = PIPE COEFFICIENT OF ROUGHNESS (IF NECESSARY)

TOTAL GPM = .0104 * (n) * RAIN/HR RATE * [ROOF AREA + WALL WASH]

Schedules & Calc. Sheets

- Schedules can also be used as a working tool in the model
- Calculated values can be simple or complex, including long formulas and conditional statements
- It is recommended to type formulas in word or notepad, then copy and paste into Revit



<*Storm Piping Size Table>

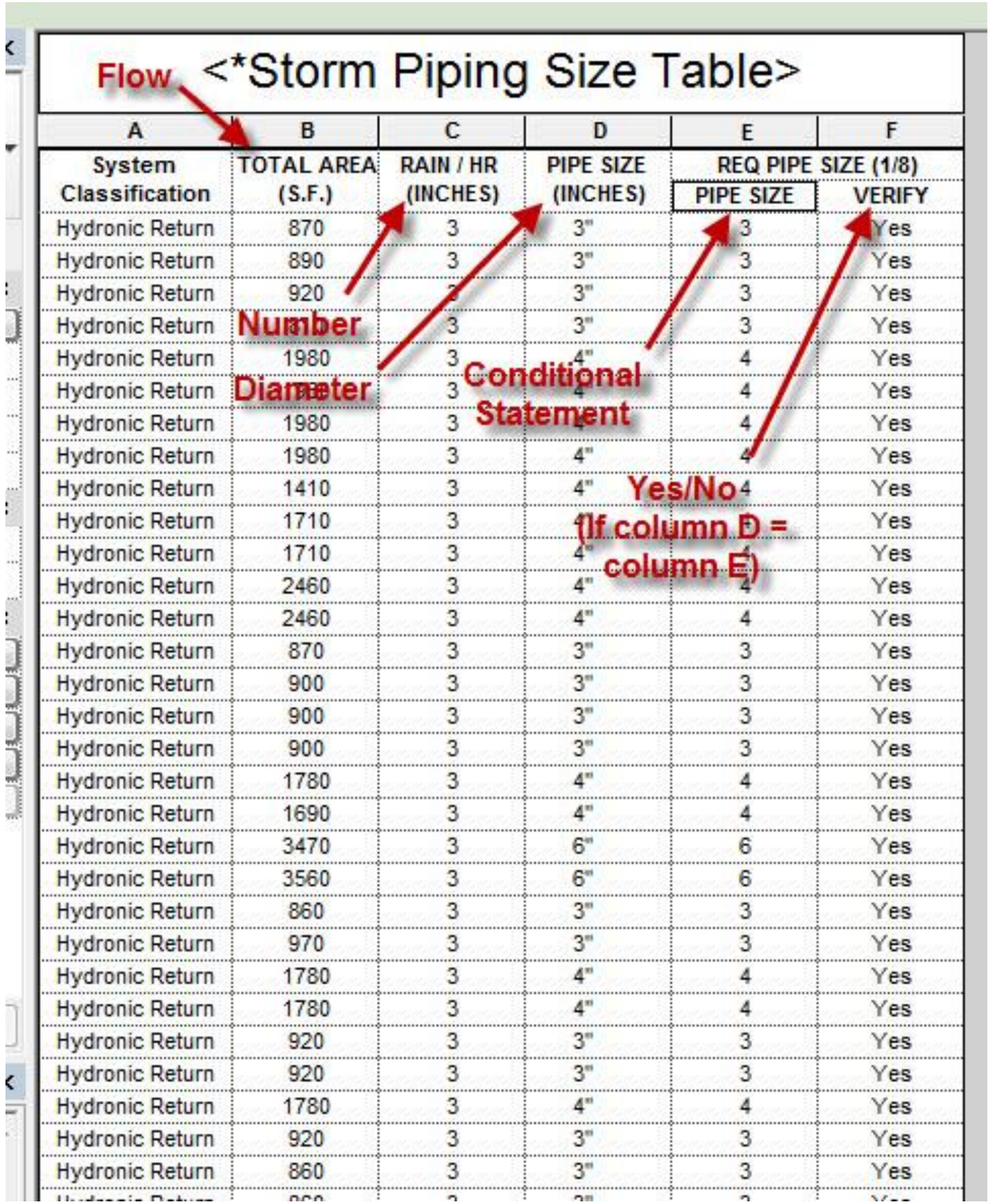
A	B	C	D	E	F
System Classification	TOTAL AREA (S.F.)	RAIN / HR (INCHES)	PIPE SIZE (INCHES)	REQ PIPE SIZE (1/8) PIPE SIZE	REQ PIPE SIZE (1/8) VERIFY
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	890	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	810	3	4"	3	No
Hydronic Return	1980	3	1 1/4"	4	Yes
Hydronic Return	1980	3	1 1/2"	4	Yes
Hydronic Return	1980	3	2"	4	Yes
Hydronic Return	1980	3	2 1/2"	4	Yes
Hydronic Return	1410	3	3"	4	Yes
Hydronic Return	1710	3	3 1/2"	4	Yes
Hydronic Return	1710	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	900	3	4"	3	No
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1690	3	4"	4	Yes
Hydronic Return	3470	3	6"	6	Yes
Hydronic Return	3560	3	6"	6	Yes
Hydronic Return	860	3	3"	3	Yes
Hydronic Return	970	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes

Schedules & Calc. Sheets

- EXAMPLE: If you wanted to use a conditional statement in a calculated value to specify a pipe size based on a particular flow, it may look something like this:

  if(Flow < 34 GPM, 3, if(Flow < 78 GPM, 4, if(Flow < 223 GPM, 6, if(Flow < 478 GPM, 8, if(Flow < 861 GPM, 10, if(Flow < 1385 GPM, 12, 15))))))

- While this will work, it may not be something that can regularly be reused project to project, so a Dynamo script may work better (It would be nice if Revit let us apply key schedules to piping!)

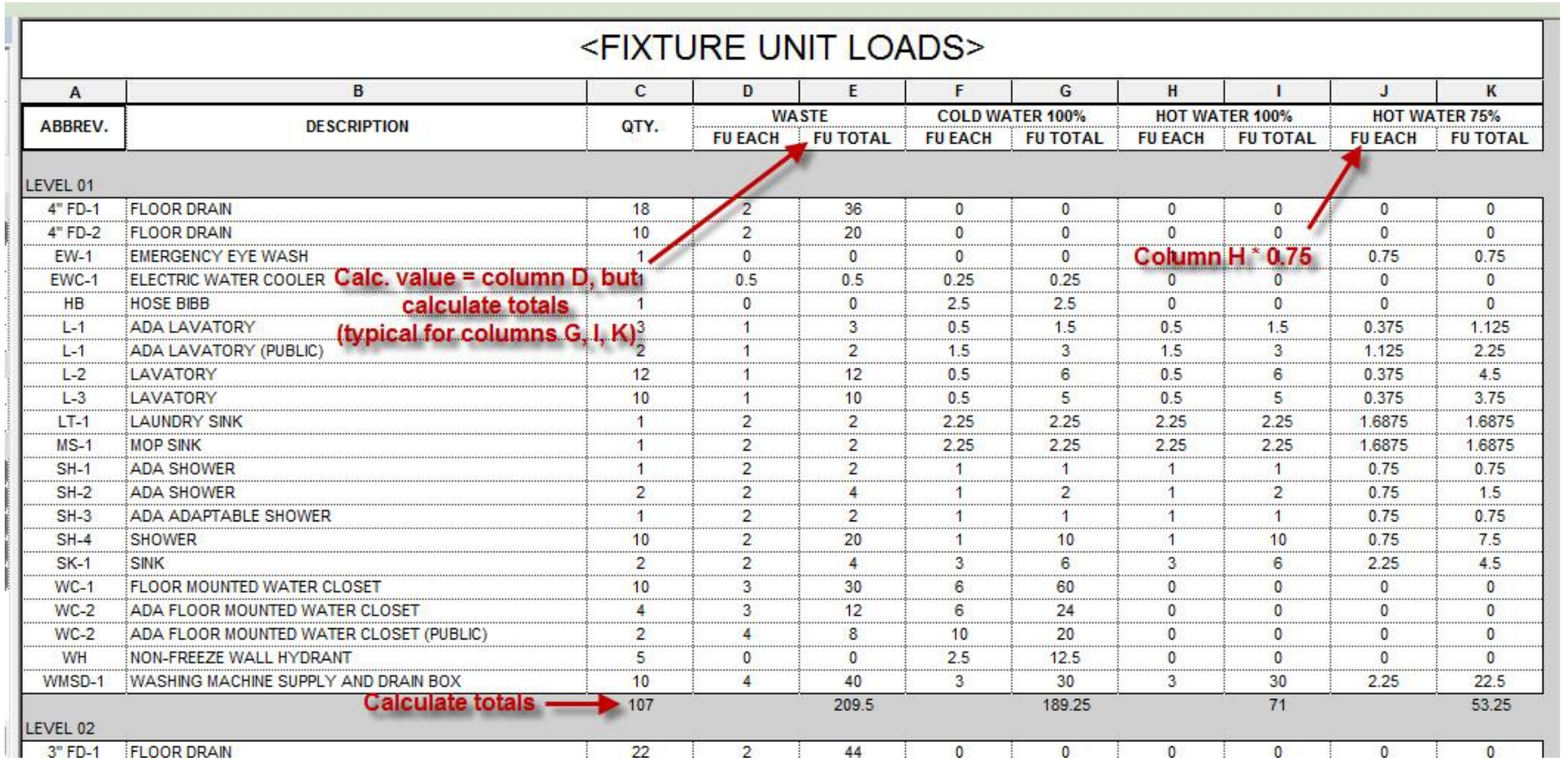


<Storm Piping Size Table>

A	B	C	D	E	F
System Classification	TOTAL AREA (S.F.)	RAIN / HR (INCHES)	PIPE SIZE (INCHES)	REQ PIPE SIZE (1/8) PIPE SIZE	REQ PIPE SIZE (1/8) VERIFY
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	890	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	1980	3	4"	4	Yes
Hydronic Return	1980	3	4"	4	Yes
Hydronic Return	1980	3	4"	4	Yes
Hydronic Return	1980	3	4"	4	Yes
Hydronic Return	1410	3	4"	4	Yes
Hydronic Return	1710	3	4"	4	Yes
Hydronic Return	1710	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	2460	3	4"	4	Yes
Hydronic Return	870	3	3"	3	Yes
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	900	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1690	3	4"	4	Yes
Hydronic Return	3470	3	6"	6	Yes
Hydronic Return	3560	3	6"	6	Yes
Hydronic Return	860	3	3"	3	Yes
Hydronic Return	970	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	1780	3	4"	4	Yes
Hydronic Return	920	3	3"	3	Yes
Hydronic Return	860	3	3"	3	Yes

Schedules & Calc. Sheets

- EXAMPLE: You want to show a quantity for each fixture type in a project, SFU and DFU for each as well as total, and total fixture units for the project



<FIXTURE UNIT LOADS>

A	B	C	D	E	F	G	H	I	J	K
ABBREV.	DESCRIPTION	QTY.	WASTE		COLD WATER 100%		HOT WATER 100%		HOT WATER 75%	
			FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL	FU EACH	FU TOTAL
LEVEL 01										
4" FD-1	FLOOR DRAIN	18	2	36	0	0	0	0	0	0
4" FD-2	FLOOR DRAIN	10	2	20	0	0	0	0	0	0
EW-1	EMERGENCY EYE WASH	1	0	0	0	0	Column H * 0.75		0.75	0.75
EWC-1	ELECTRIC WATER COOLER	1	0.5	0.5	0.25	0.25	0	0	0	0
HB	HOSE BIBB	1	0	0	2.5	2.5	0	0	0	0
L-1	ADA LAVATORY	3	1	3	0.5	1.5	0.5	1.5	0.375	1.125
L-1	ADA LAVATORY (PUBLIC)	2	1	2	1.5	3	1.5	3	1.125	2.25
L-2	LAVATORY	12	1	12	0.5	6	0.5	6	0.375	4.5
L-3	LAVATORY	10	1	10	0.5	5	0.5	5	0.375	3.75
LT-1	LAUNDRY SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
MS-1	MOP SINK	1	2	2	2.25	2.25	2.25	2.25	1.6875	1.6875
SH-1	ADA SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-2	ADA SHOWER	2	2	4	1	2	1	2	0.75	1.5
SH-3	ADA ADAPTABLE SHOWER	1	2	2	1	1	1	1	0.75	0.75
SH-4	SHOWER	10	2	20	1	10	1	10	0.75	7.5
SK-1	SINK	2	2	4	3	6	3	6	2.25	4.5
WC-1	FLOOR MOUNTED WATER CLOSET	10	3	30	6	60	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET	4	3	12	6	24	0	0	0	0
WC-2	ADA FLOOR MOUNTED WATER CLOSET (PUBLIC)	2	4	8	10	20	0	0	0	0
WH	NON-FREEZE WALL HYDRANT	5	0	0	2.5	12.5	0	0	0	0
WMSD-1	WASHING MACHINE SUPPLY AND DRAIN BOX	10	4	40	3	30	3	30	2.25	22.5
	Calculate totals →	107		209.5		189.25		71		53.25
LEVEL 02										
3" FD-1	FLOOR DRAIN	22	2	44	0	0	0	0	0	0

Calc. value = column D, but calculate totals (typical for columns G, I, K)

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