

Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

<http://aucache.autodesk.com/social/visualization.html>

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.

M/E/P/E Design process

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HVAC Solution, Inc, VBFA, Professional Engineers

www.hvacsolution.com

Class summary

M/E/P/F engineering from **concept** to **completion** using schematic design software and Revit.

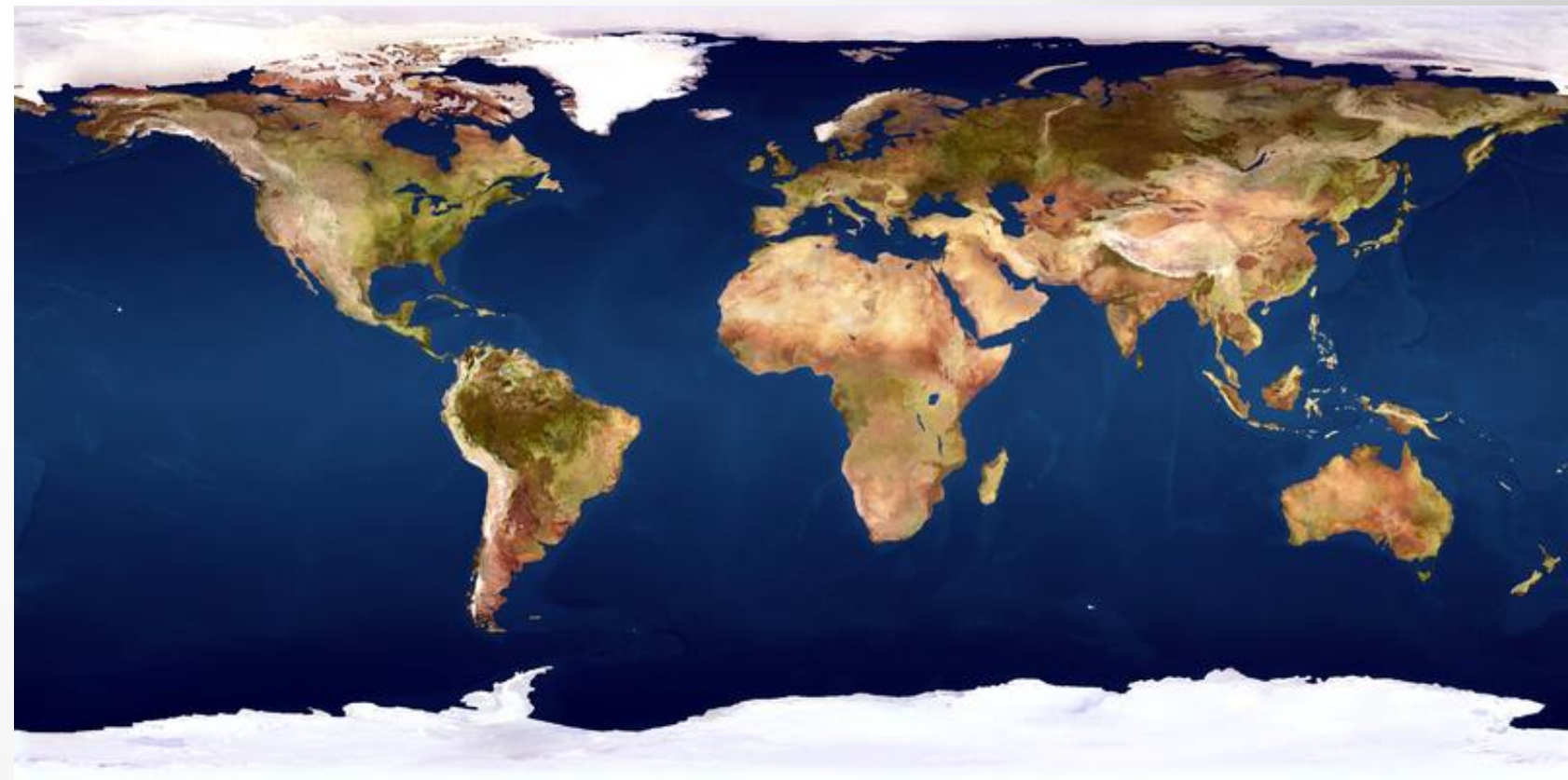
Key learning objectives

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

- Understand one possible M/P/E/F design workflow process.
- Share data between schematic design software and Revit.

Introduction

- VBFA Consulting engineers:
 - 100+ personnel.
 - (4) offices, Utah and Arizona
- Local projects:
 - Hospitals, laboratories, schools...
- International projects:
 - Argentina, Chile, Italy, Fiji, Columbia, DR Congo...



Presentation: Goal

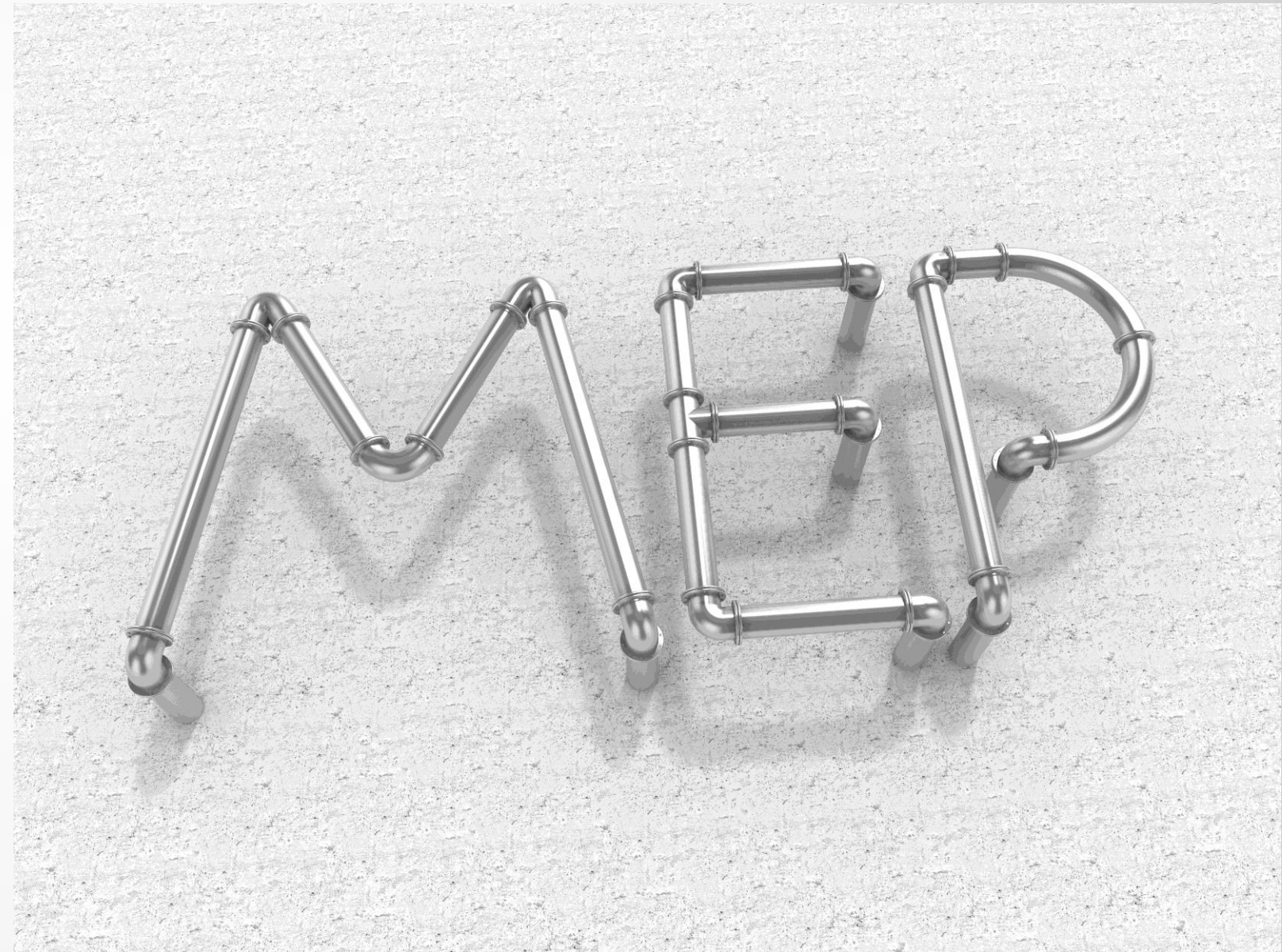
- Sociological studies show:
You can actually die from boredom.
- My goal: An un-boring presentation.



M/E/P/F Engineering

M/E/P/F engineering: What is it?

- Mechanical
- Electrical
- Plumbing
- Fire protection



M/E/P/F engineering: Where is it?

- Homes
- Schools
- Universities
- Hospitals
- Office buildings
- Sports facilities
- Hotels



M/E/P/E engineering: Success defined

- Integration without irritation
 - See no mechanical
 - Hear no mechanical
 - Feel no mechanical



M/E/P/E engineering: ~~Easy~~

- Every project is custom.
- Hard.
 - “Rocket science is easy.”
- Fast paced.
- Decisions = \$\$\$.
- Diverse:
 - Boilers, chillers, ductwork, piping, humidity, dehumidification, pressurization, heat exchangers, pumps, controls, fire protection...



M/E/P/F software

M/E/P/F software: Steps

- Idea/modeling.
- Modeling/idea.
 - Idea or model first?
- Detail.



M/E/P/F software: 1. Envelope modeling

1. Automatic take-off (Revit).
2. Semi-automatic perimeter take-off.
3. Non-automatic hand take-off.

Chvac - Full Commercial HVAC Loads Calculation Program
VBFA
Salt Lake City, UT 84111

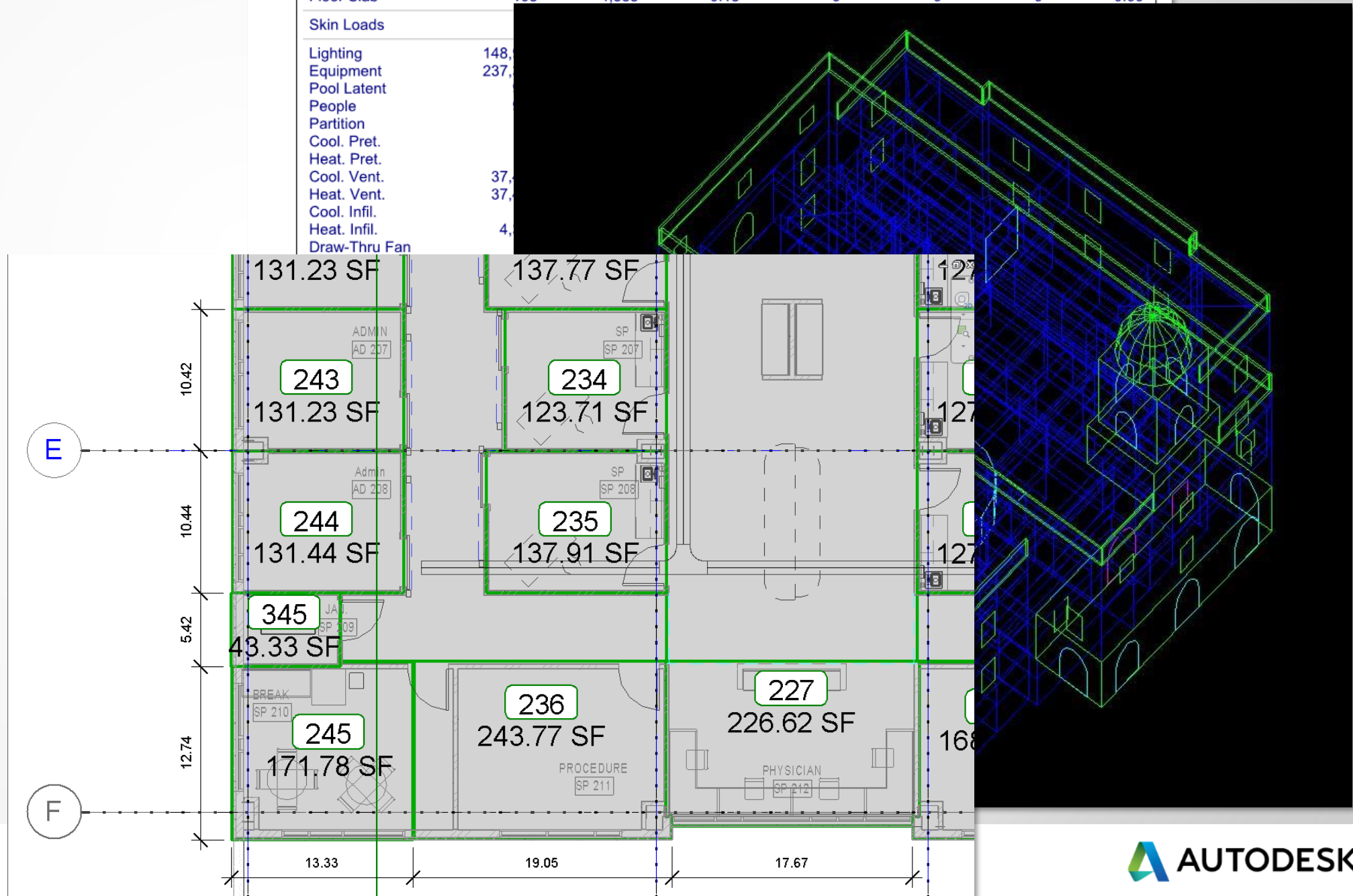
Elite Software Development, Inc.
Salem
Page 2

Building Summary Loads
Building peaks in August at 3pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	0	0	0.00	0	0	0	0.00
Wall	28,624	96,013	2.89	0	37,585	37,585	0.94
Glass	13,254	372,160	11.19	0	338,834	338,834	8.51
Floor Slab	105	4,385	0.13	0	0	0	0.00

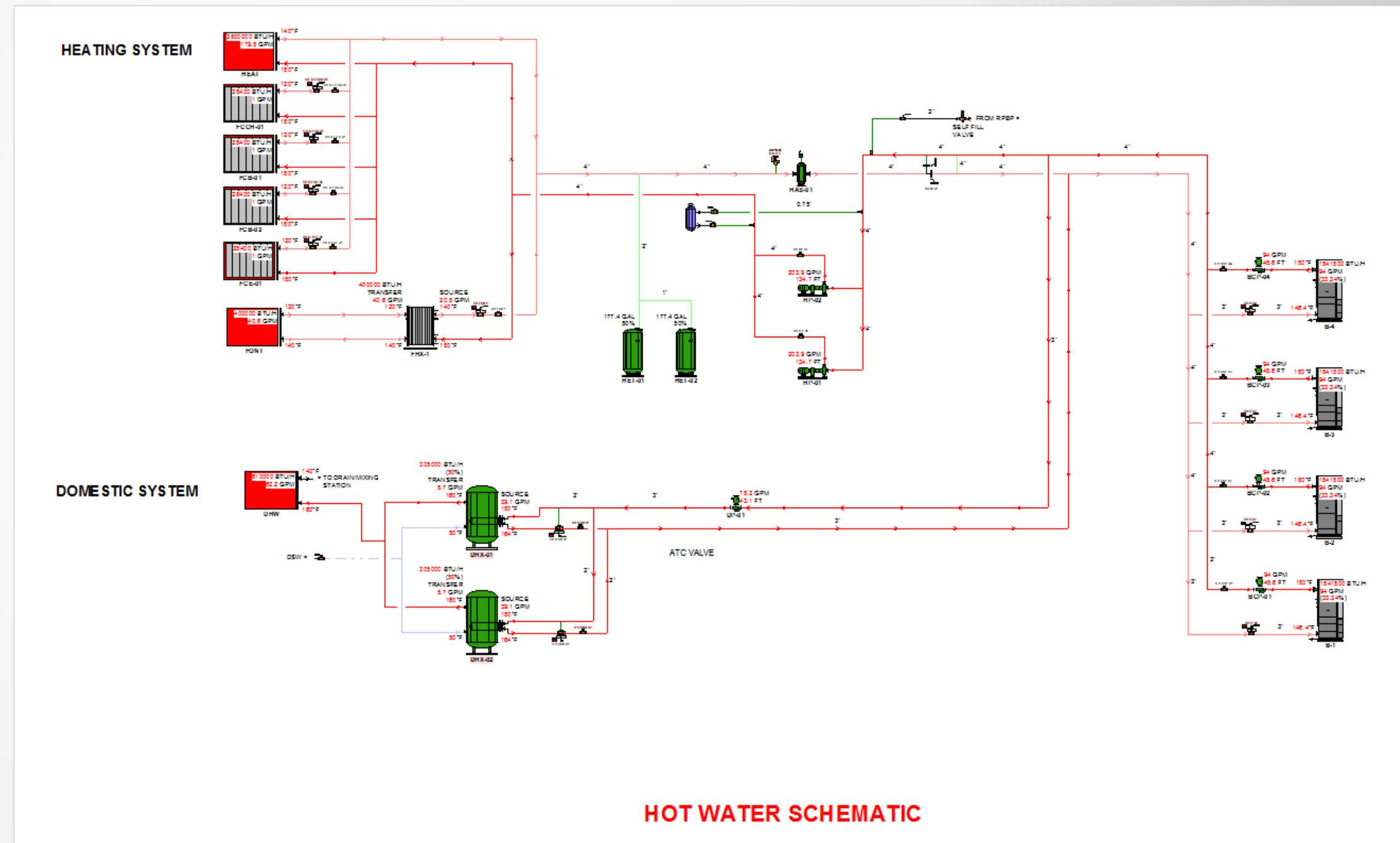
Skin Loads

Lighting	148,
Equipment	237,
Pool Latent	
People	
Partition	
Cool. Pret.	
Heat. Pret.	
Cool. Vent.	37,
Heat. Vent.	37,
Cool. Infil.	
Heat. Infil.	4,
Draw-Thru Fan	



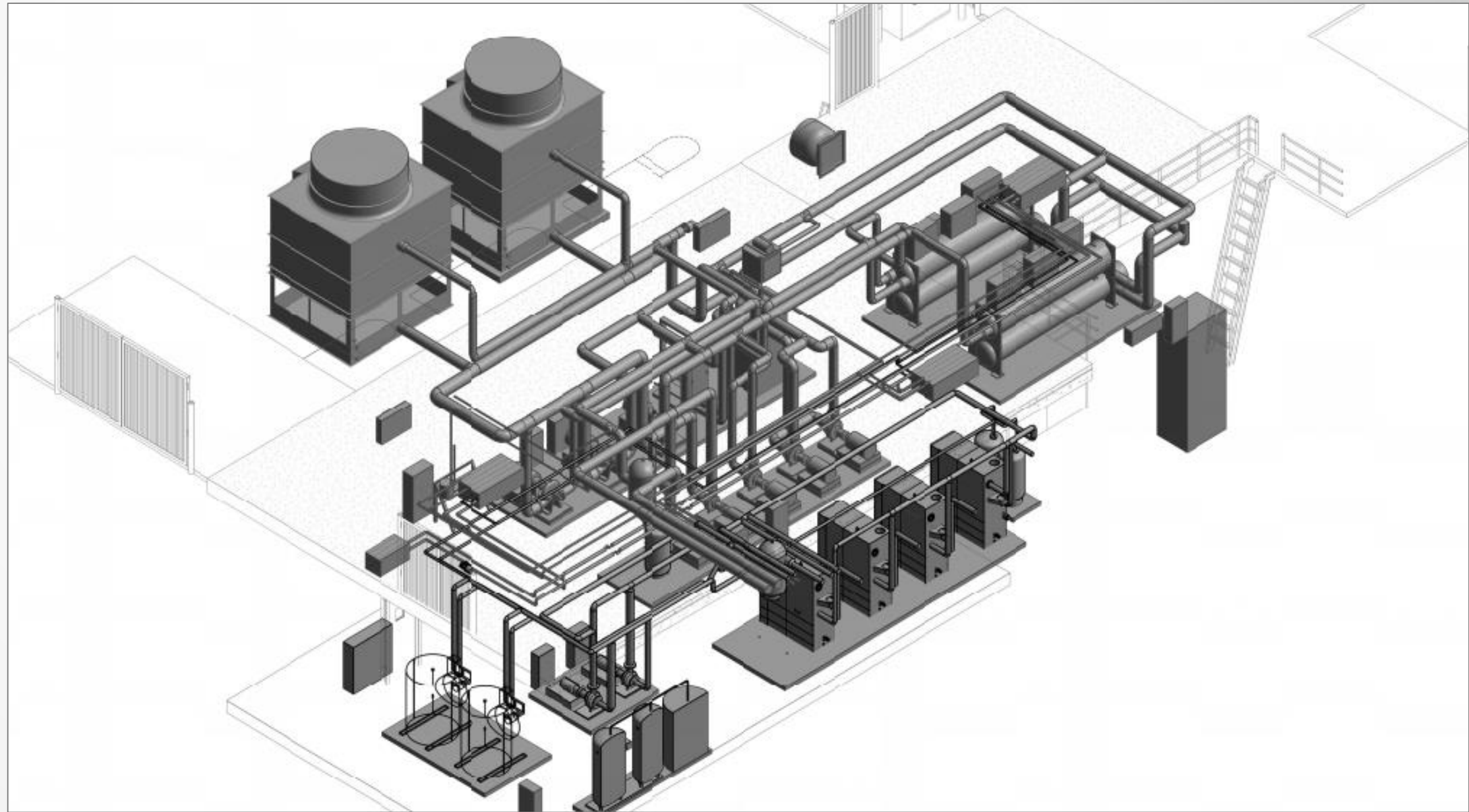
M/E/P/F software: 2. Systems modeling = schematics

- Idea modeling = schematic drawing.
 - 10% of project effort.
 - 40% of project cost.



M/E/P/F software: 3. Add detail = Revit

- Revit provides project detail.
 - 90% of project effort.
 - 60% of project cost.



M/E/P/F software: Workflow process

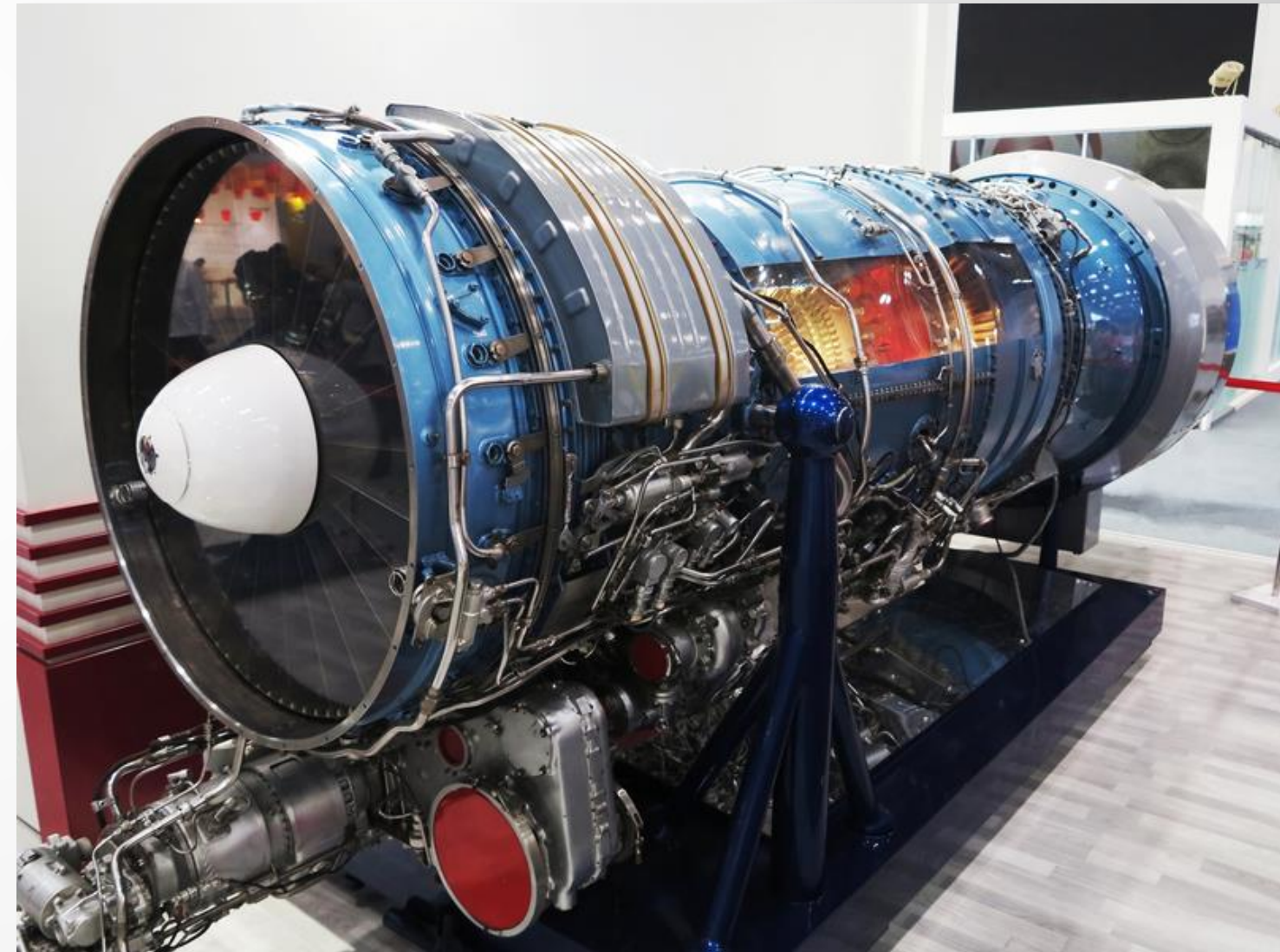
1. **Revit** – envelope and element modeling, energy, loads.
2. **Schematic software** – concept design.
3. **Schematic software** – equipment selection.
4. **Revit** – schematic & equipment connection.
5. **Revit** – equipment and systems design.
6. **Revit** – final drawings.



Simple to complex

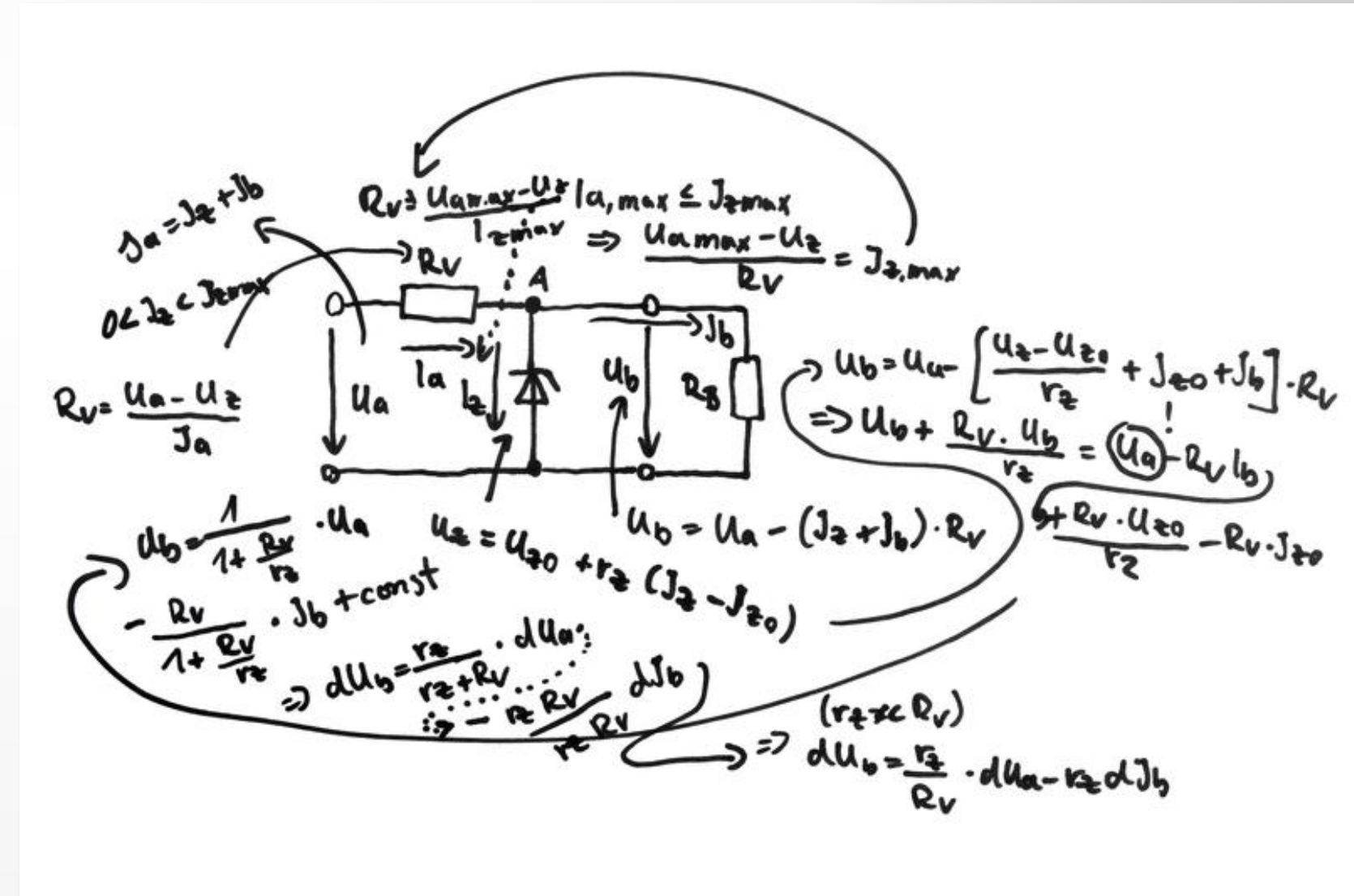
Simple to complex: **Only simple stuff works**

- Only simple stuff works:
 - “Jet engines are simple.”
- Ideas build on each other.
- Simple allows the complex to exist.



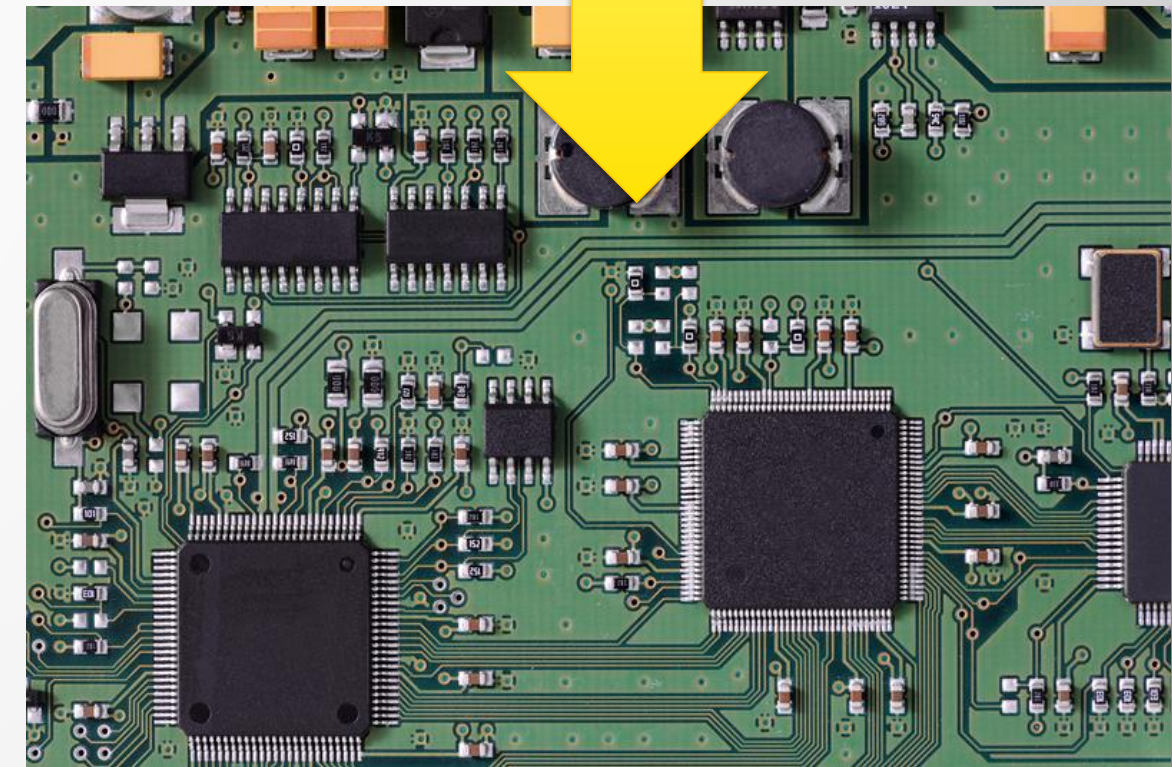
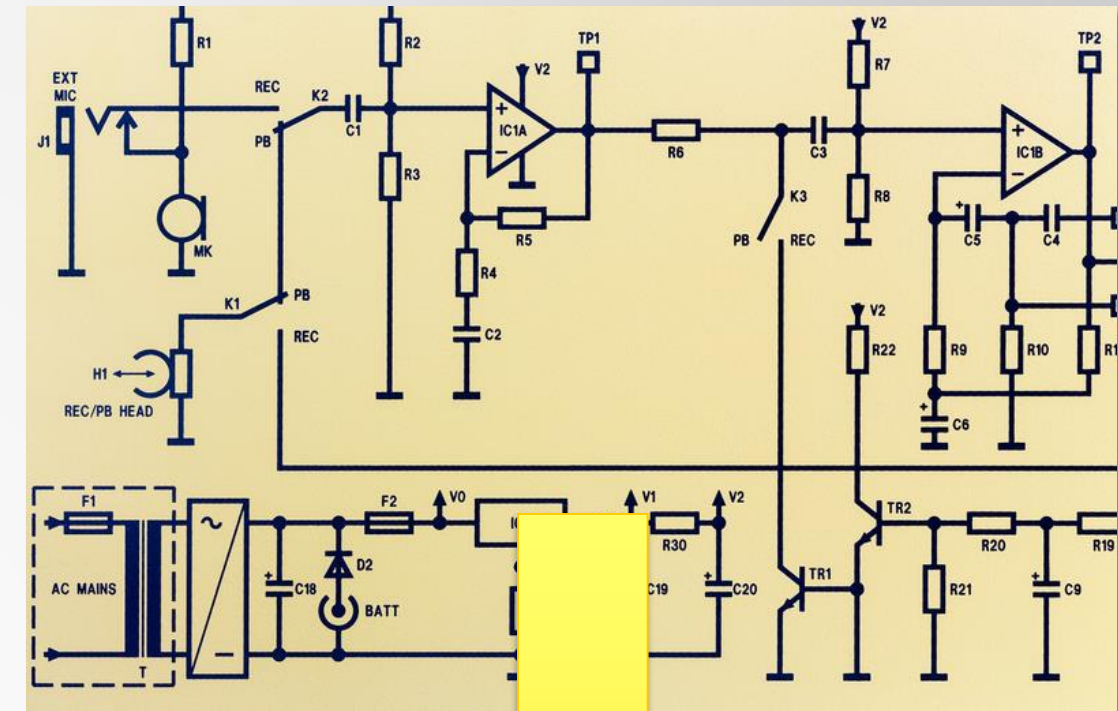
Simple to complex: What is complex?

- Complex is:
 - Anything which requires discussion.
 - A load of stuff you can't keep in your head all at once.



Simple to complex: Move along

- A schematic is quick way to express complex ideas.
- Schematics allow the simple to move to the more complex.



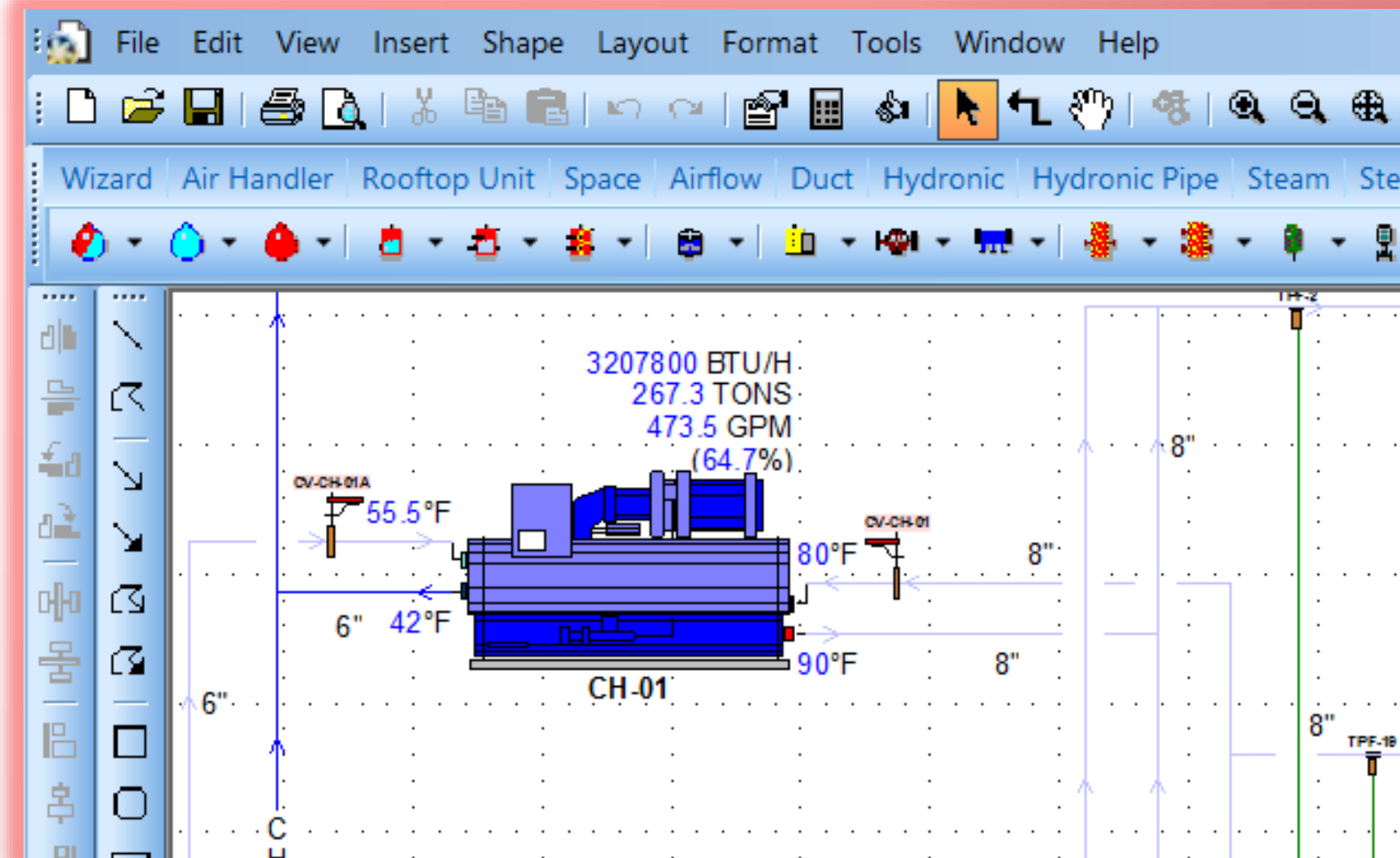
Simple to complex: Communication

- Schematics help with clear communication.
 - Quick.
 - Clear.



Simple to complex: Intelligent schematic software demonstration

- Steps:
 1. Build a schematic.
 2. Data is passed from component to component.
 3. Equipment is sized.
 4. Controls schematics are produced.
 5. Schematics and schedules are exported.



Efficiency

Efficiency: **My product**

- I sell:
 - Time.
 - Ideas.



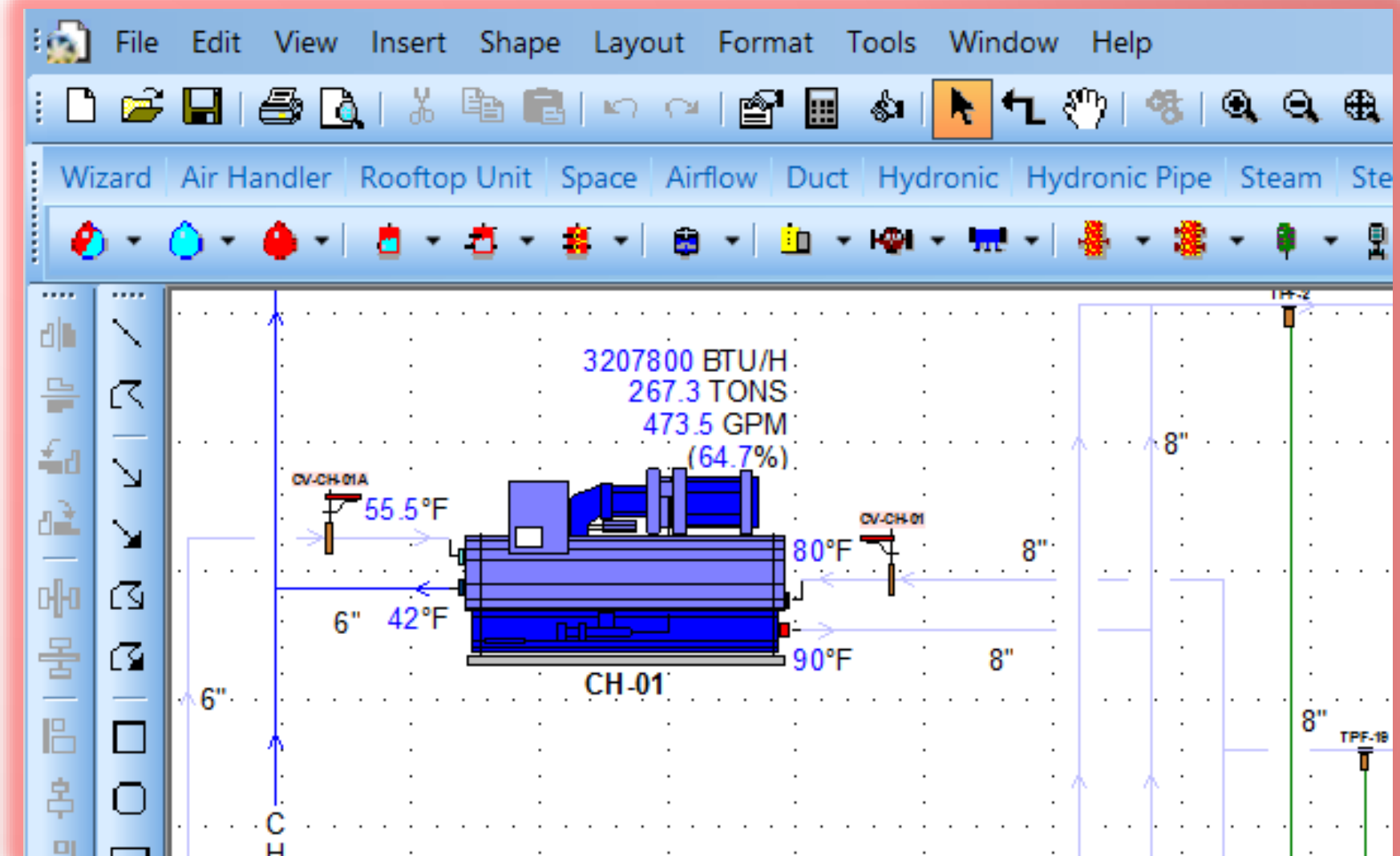
Efficiency: Smart?

- No real tangible product.
- I am paid to be smart.
 - I have to be better than my competition can lie.
 - Lack of planning by others does constitute an emergency for me.
 - There is no mercy when you are paid to be smart.



Efficiency: Demonstration

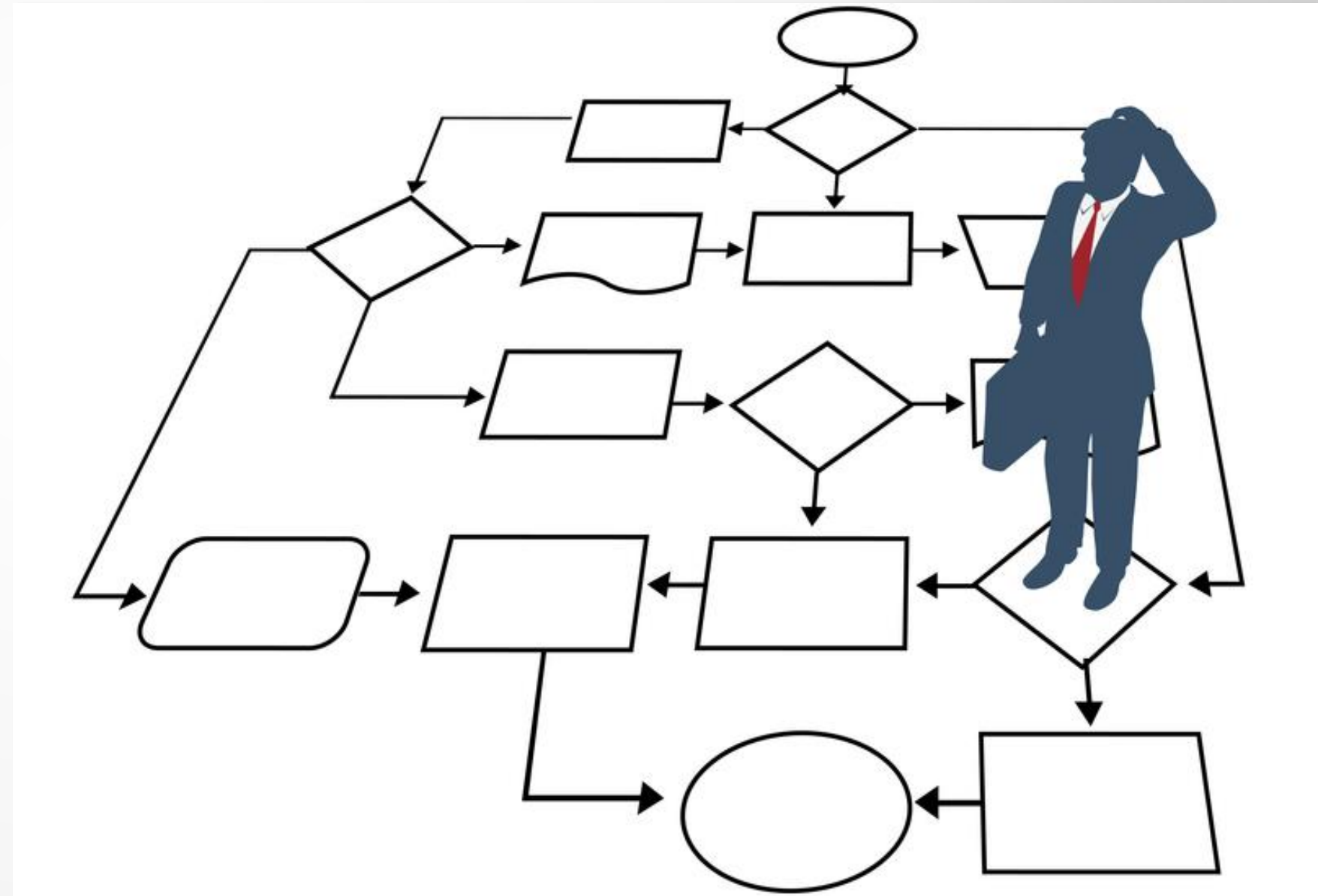
- Work smarter:
 - Workflow continuance.
 - Stop the “eye-wash” cycle.
 - Central data storage.
 - Fully formed ideas = inherent error checking.
 - Project repetition.
 - Clear communication of design intent.



Engineering process

Engineering: The process

- A need for a building.
- **Ideas sold.**
- **Ideas handed-off.**
- **Ideas detailed.**
- Construction.



Engineering: Idea staff

- Management:
 - Sells ideas.
 - Short attention.



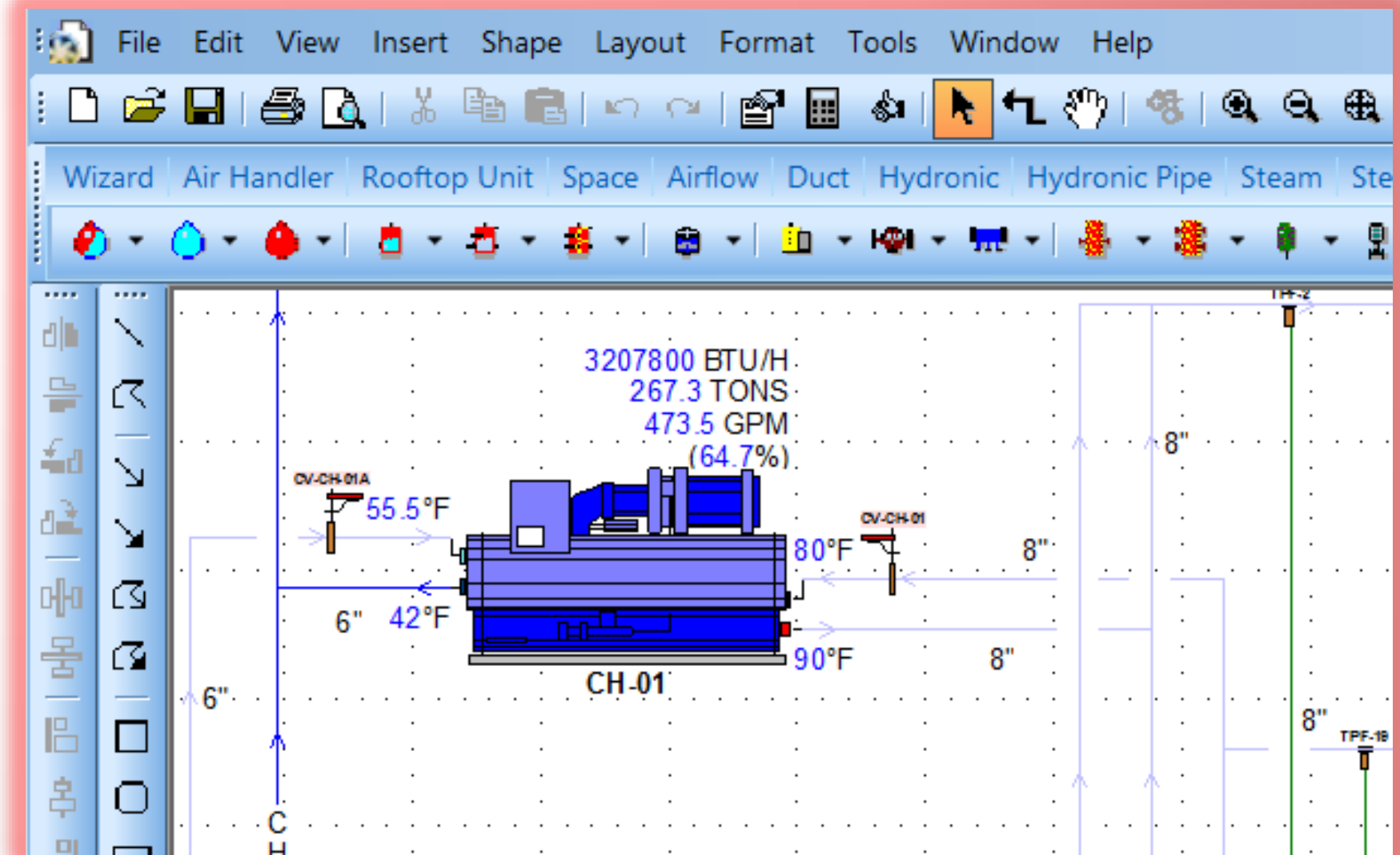
Engineering: Management needs

- Need to produce concept fast.
 - The first concept often sticks.
- Need intuitive tools.
 - Short attention.
- Need to clearly communicate design intent.
- Need efficiency gain.

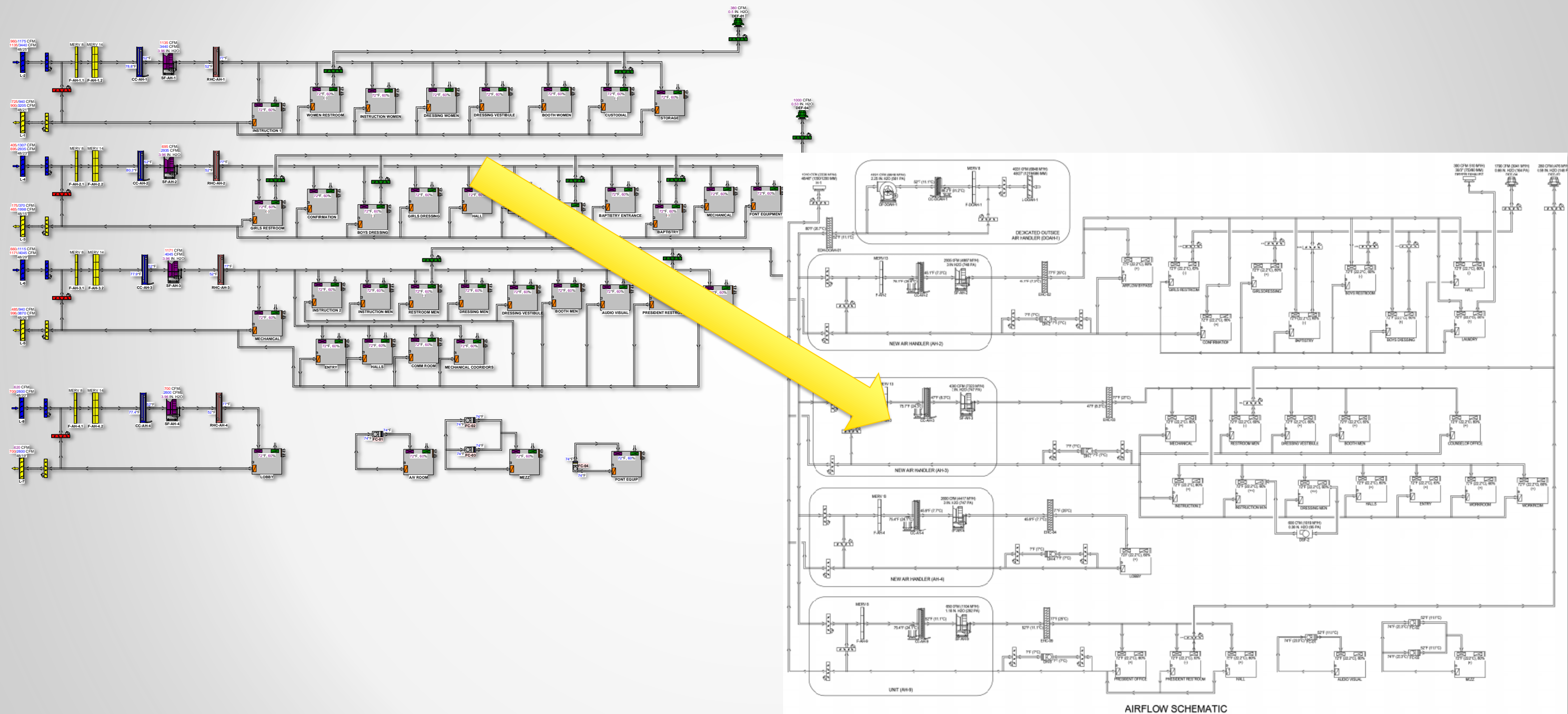


Engineering: Revit connection demonstration

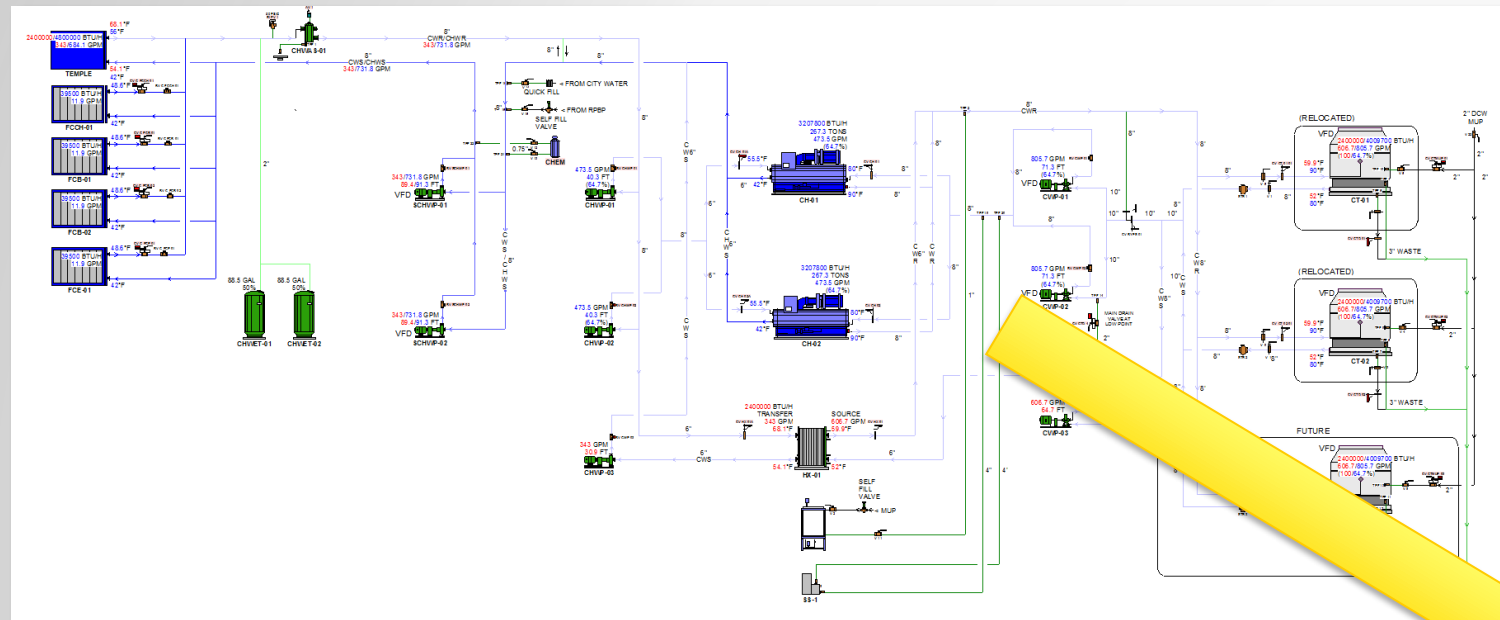
- Schematic transfer:
 - Dxf link.
- Schedule transfer:
 - Dxf link.
 - Revit schedules.



Engineering: Schematics and Revit in concert



Engineering: Schedules and Revit in concert



AIR HANDLER SCHEDULE											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	AIR			COMPONENTS		ELECTRICAL		PHYSICAL	
			SUPPLY AIRFLOW (CFM)	STATE (F)	STATIC PRESSURE (IN WG)	COILS	STATES	WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)
AA-1	RECO-10000000	RECO-1	10000	70.0	0.1	COIL-1	COIL-1	1.0	0.75	1.0	0.75
AA-2	RECO-10000000	RECO-2	10000	70.0	0.1	COIL-2	COIL-2	1.0	0.75	1.0	0.75
AA-3	RECO-10000000	RECO-3	10000	70.0	0.1	COIL-3	COIL-3	1.0	0.75	1.0	0.75
AA-4	RECO-10000000	RECO-4	10000	70.0	0.1	COIL-4	COIL-4	1.0	0.75	1.0	0.75
AA-5	RECO-10000000	RECO-5	10000	70.0	0.1	COIL-5	COIL-5	1.0	0.75	1.0	0.75
AA-6	RECO-10000000	RECO-6	10000	70.0	0.1	COIL-6	COIL-6	1.0	0.75	1.0	0.75

PROJECT SCHEDULE					
YEAR	LOCATION	HEATING SEASON (F)	COOLING SEASON (F)	WOTOR (HP)	NOTES
2015	RECO-1	70.0	70.0	1.0	

FILTER SCHEDULE											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	Filtration	Type	Material	USE		PHYSICAL		NOTES	
						WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)		
FA-1	FA-1000	FA-1	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		
FA-2	FA-1000	FA-2	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		
FA-3	FA-1000	FA-3	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		
FA-4	FA-1000	FA-4	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		
FA-5	FA-1000	FA-5	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		
FA-6	FA-1000	FA-6	FA-1000	FA-1000	FA-1000	1.0	0.75	1.0	0.75		

FAN SCHEDULE											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	FAN TYPE	AIR		ELECTRICAL		PHYSICAL		NOTES	
				SUPPLY AIRFLOW (CFM)	STATE (F)	WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)		
FA-1	FA-1000	FA-1	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		
FA-2	FA-1000	FA-2	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		
FA-3	FA-1000	FA-3	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		
FA-4	FA-1000	FA-4	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		
FA-5	FA-1000	FA-5	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		
FA-6	FA-1000	FA-6	FA-1000	10000	70.0	1.0	0.75	1.0	0.75		

1. VARIATION IN FAN SPEEDS TO THE SECTION OF AIR HANDLER

ELECTRIC COIL SCHEDULE											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	COIL TYPE	AIR		ELECTRICAL		PHYSICAL		NOTES	
				SUPPLY AIRFLOW (CFM)	STATE (F)	WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)		
EC-1	EC-1000	EC-1	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		
EC-2	EC-1000	EC-2	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		
EC-3	EC-1000	EC-3	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		
EC-4	EC-1000	EC-4	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		
EC-5	EC-1000	EC-5	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		
EC-6	EC-1000	EC-6	EC-1000	10000	70.0	1.0	0.75	1.0	0.75		

1. COIL COOLING

DX COIL SCHEDULE											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	COIL TYPE	AIR		ELECTRICAL		PHYSICAL		NOTES	
				SUPPLY AIRFLOW (CFM)	STATE (F)	WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)		
CC-1	CC-1000	CC-1	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		
CC-2	CC-1000	CC-2	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		
CC-3	CC-1000	CC-3	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		
CC-4	CC-1000	CC-4	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		
CC-5	CC-1000	CC-5	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		
CC-6	CC-1000	CC-6	CC-1000	10000	70.0	1.0	0.75	1.0	0.75		

CONDENSING UNIT SCHEDULE - AIR COOLED											
ID	MANUFACTURER AND MODEL NUMBER	LOCATION	CONDENSING UNIT TYPE	AIR		ELECTRICAL		PHYSICAL		NOTES	
				SUPPLY AIRFLOW (CFM)	STATE (F)	WOTOR (HP)	WOTOR (KW)	WOTOR (HP)	WOTOR (KW)		
CU-1	CU-1000	CU-1	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		
CU-2	CU-1000	CU-2	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		
CU-3	CU-1000	CU-3	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		
CU-4	CU-1000	CU-4	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		
CU-5	CU-1000	CU-5	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		
CU-6	CU-1000	CU-6	CU-1000	10000	70.0	1.0	0.75	1.0	0.75		

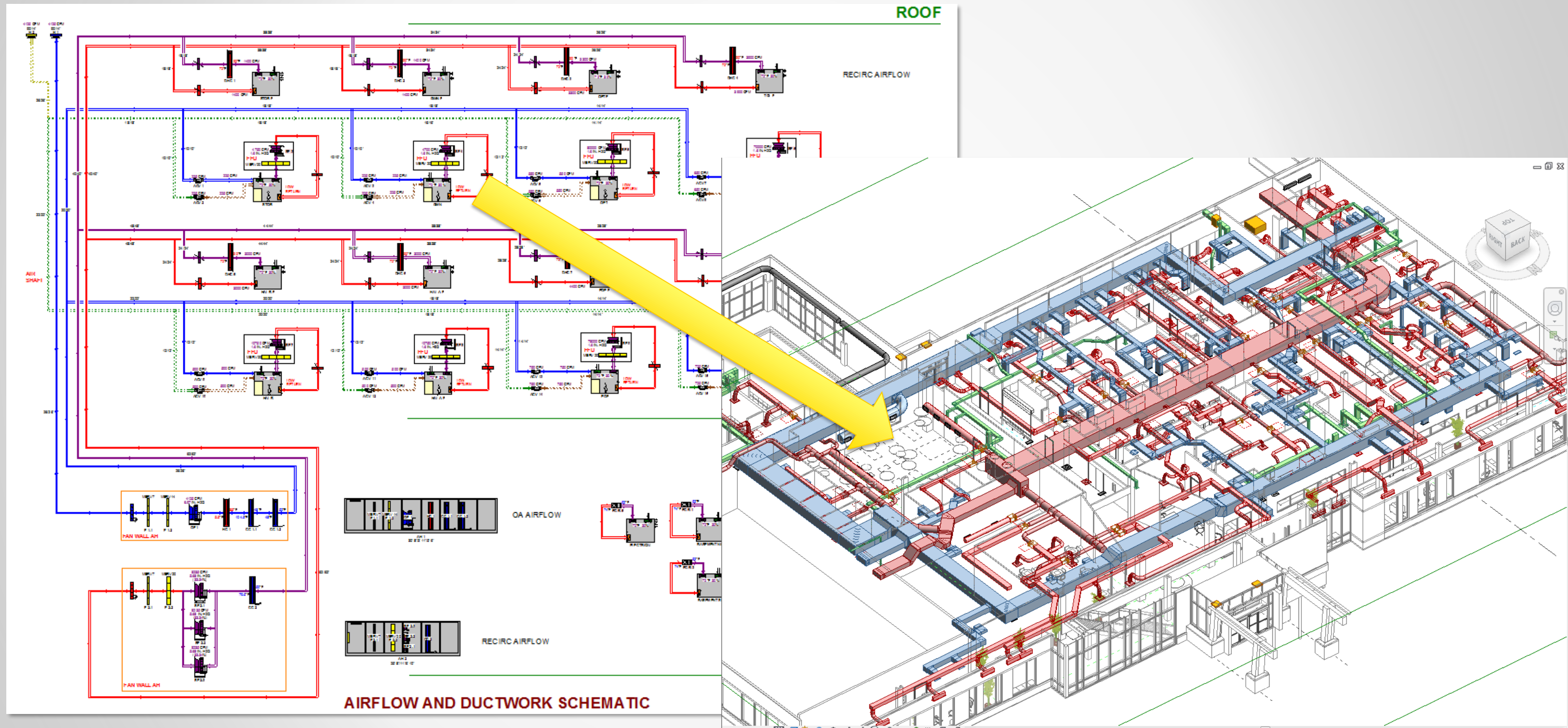
1. PROVIDE UNIT WITH FACTORY REFRIGERANT LINE SET
2. PROVIDE MATCHED AND BALANCED COOLING COIL AND CONDENSING UNIT FROM SINGLE SUPPLIER
3. PROVIDE UNIT WITH FACTORY REFRIGERANT LINE SET AND CONDENSING UNIT FROM SINGLE SUPPLIER
4. PROVIDE CONDENSING UNIT WITH FACTORY REFRIGERANT LINE SET AND CONDENSING UNIT FROM SINGLE SUPPLIER

Engineering: What do you need?

- What schematics are needed:
 - Hot water system.
 - Steam system.
 - Chilled water system.
 - Controls.
 - Plumbing.

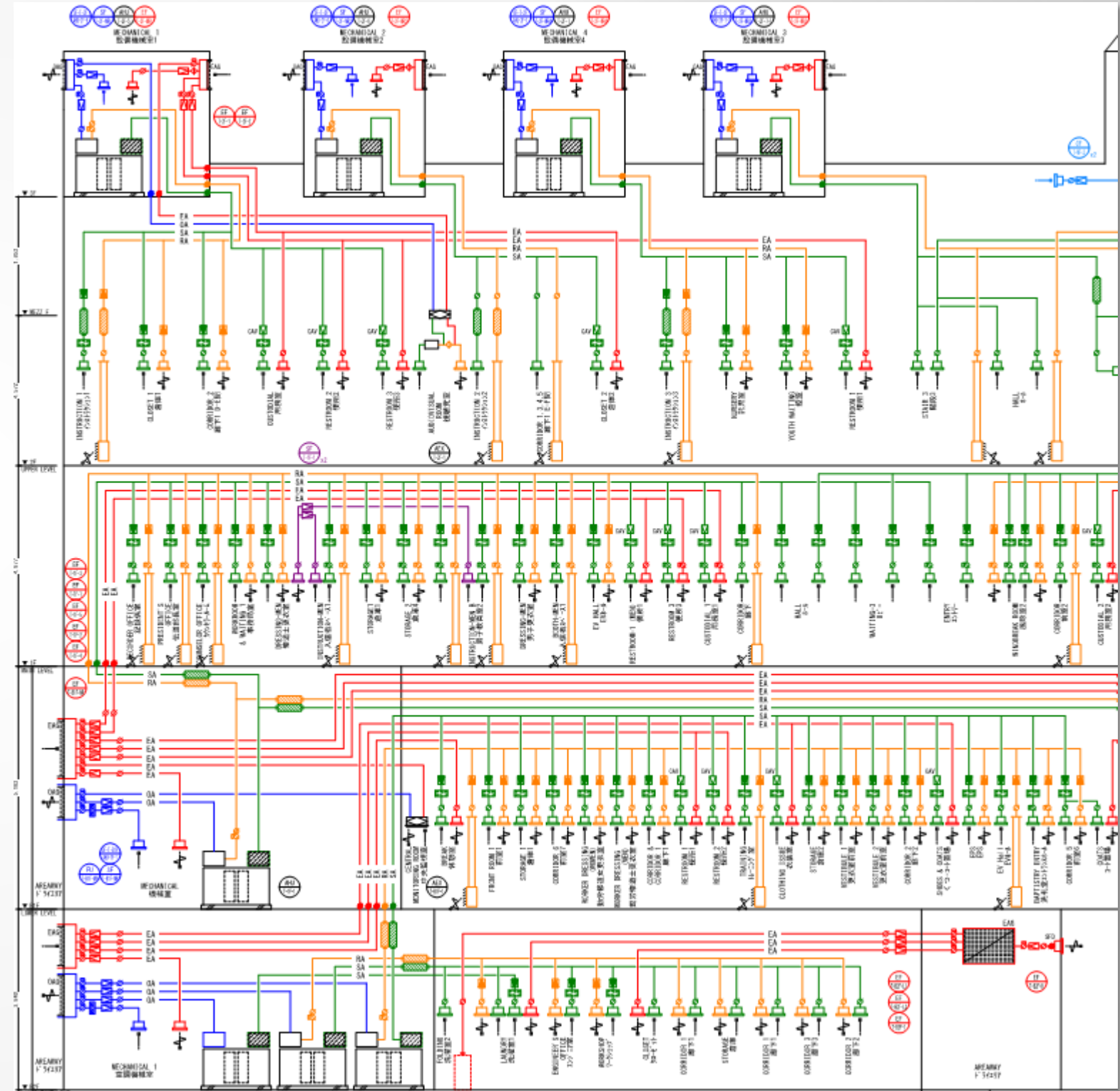


Engineering: Don't forget the air



Engineering: Airflow schematics

- Most complex system
- Usually omitted in the US.
- More present outside the US.



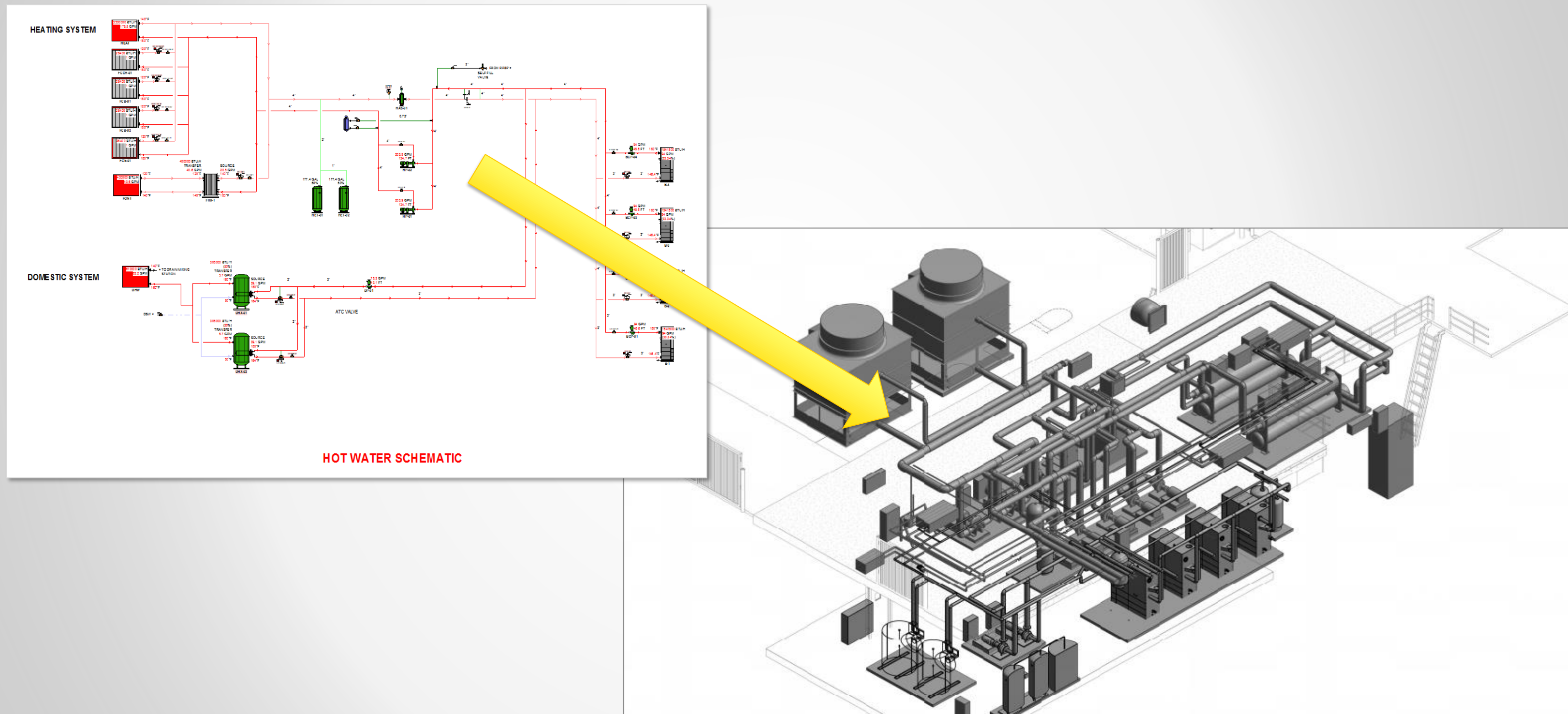
Summary

Summary: Workflow process

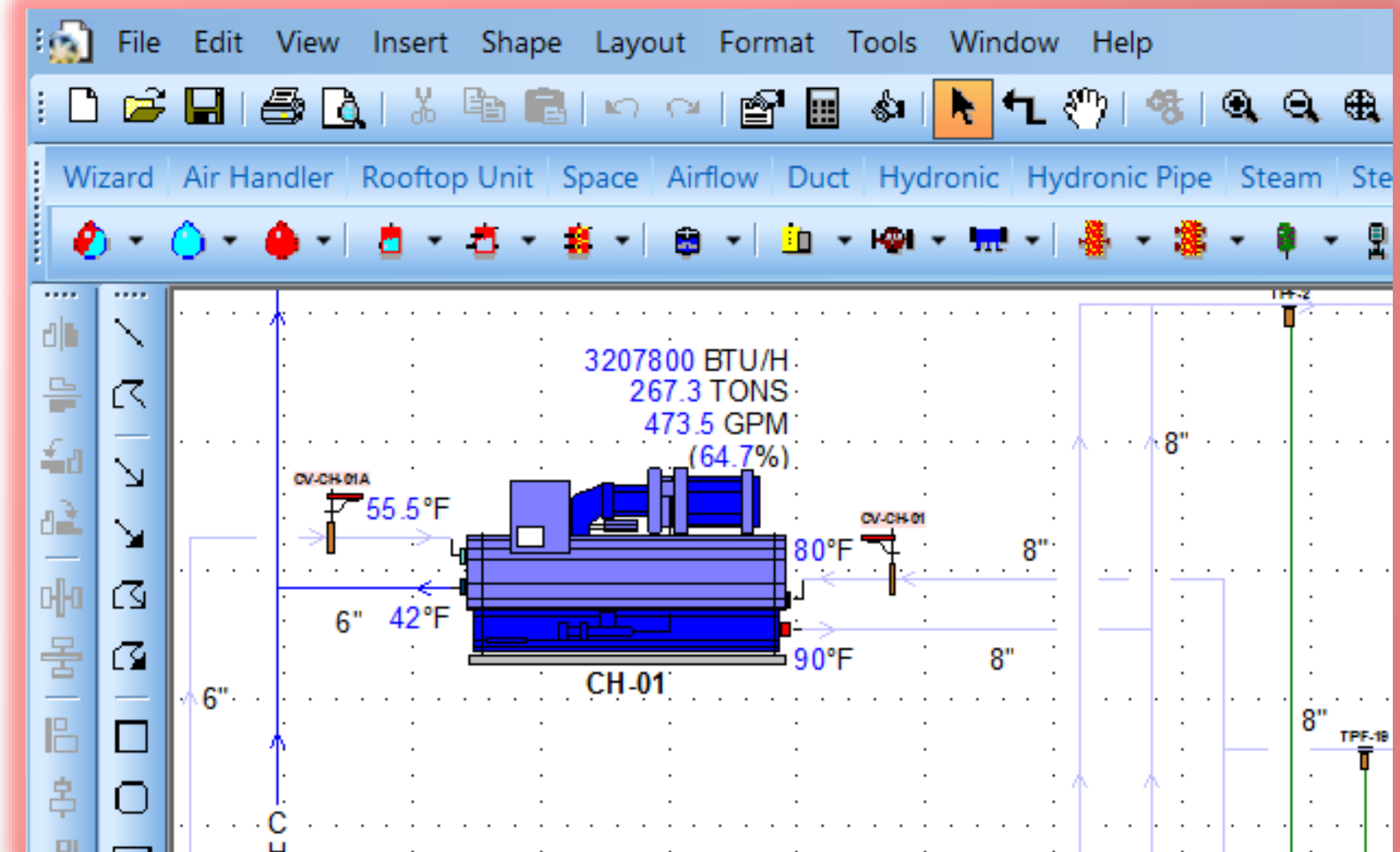
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6. **Revit** – final drawings.



Summary: Simple to complex = schematic to Revit



Summary: Sample project



Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time



Questions



A group of four diverse young adults are jumping and cheering in a modern, industrial-style office or studio. The man on the left is wearing an orange t-shirt and jeans, with his arms raised. The woman on the right is wearing a black blazer over a white shirt and blue pants, also with her arms raised. Two other people are in the background, also appearing to be part of the celebration. The setting has exposed brick walls, large windows, and modern lighting.

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