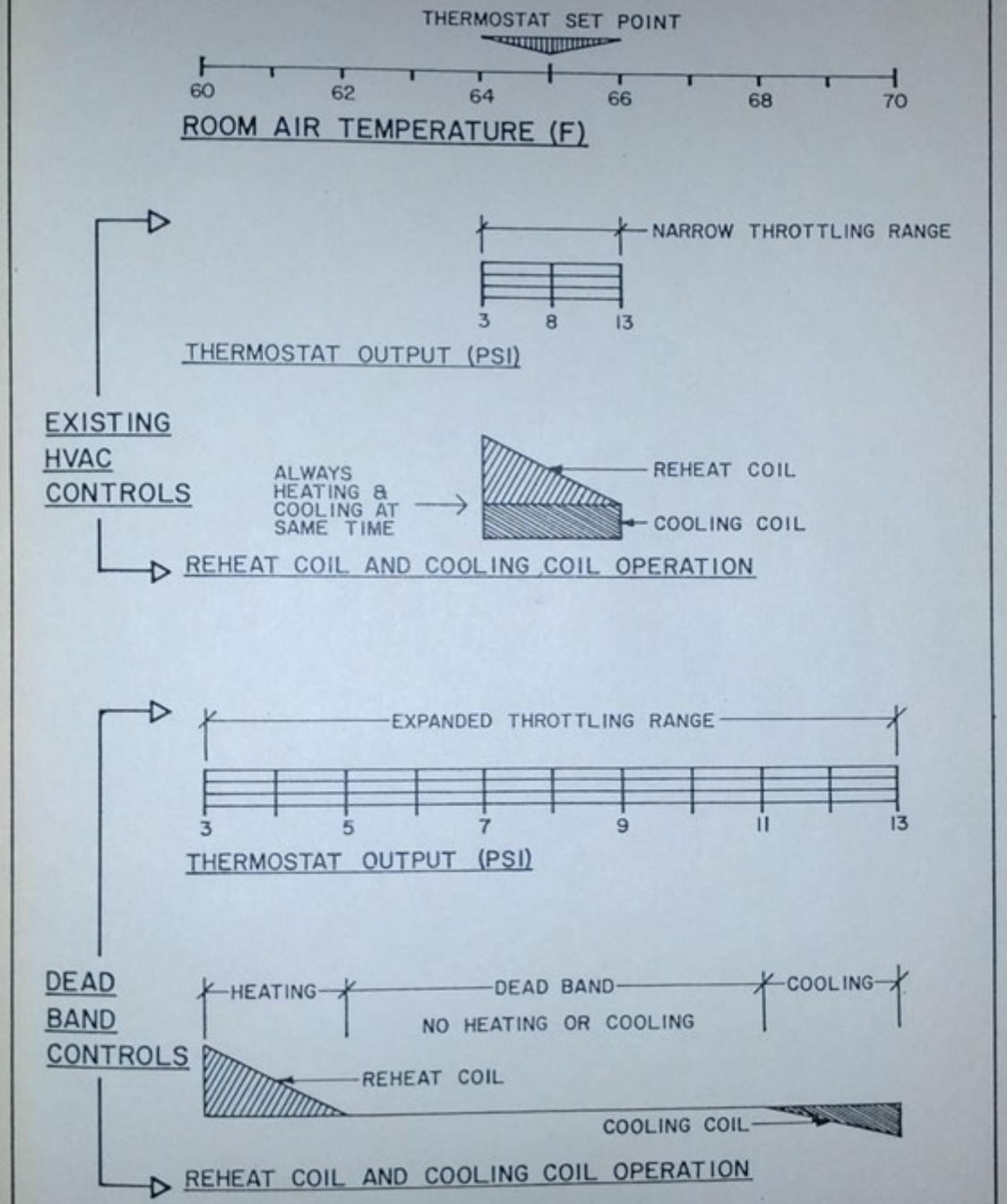
Thermos Bottle Buildings

Roy Swain, P.E.


EVEN
LICENSE
ONLY
Today



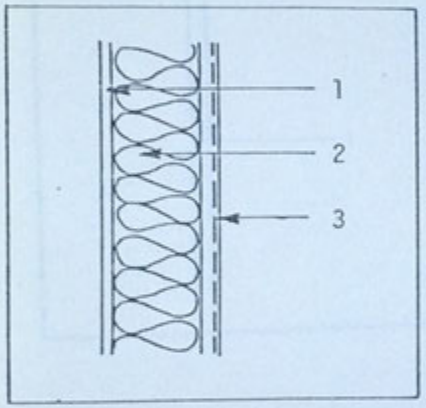
PAOLUCCIO CONSULTING ENGINEERS	HERSHEY FOODS CORPORATION ENERGY CONSERVATION PROJECT	FIGURE 8

HEAT TRANSFER COEFFICIENT
PROPOSED CONSTRUCTION ASSEMBLY

Form 3

WALL TYPE /

Prepared by: John Paoluccio Consulting Engineers P-189



Sketch of Construction Assembly

WEIGHT: 7 lb/ft^2

Check one:

Wall X

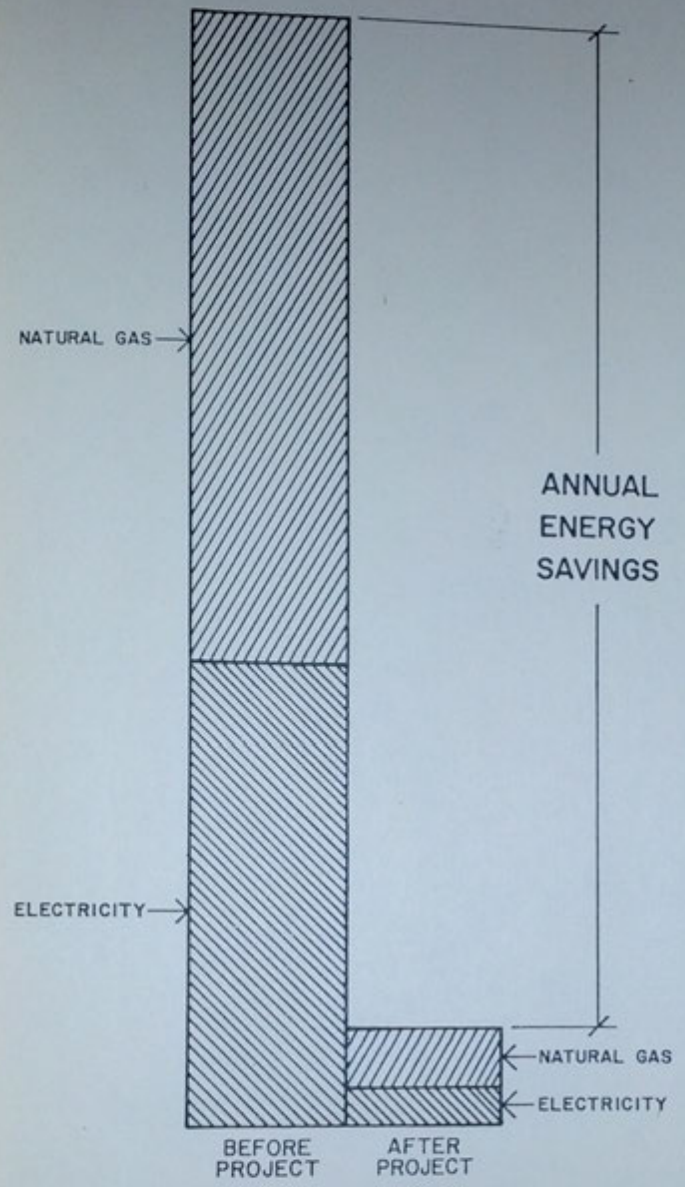
Roof ____

Floor ____

FRAMING:
2" x 4" @ 16" o.c.

List of Construction Components	R
1. 0.5" Gypsum or Plaster Board, 50 lb./cu. ft.	0.45
2. R-11 Mineral Fiber Insulation	11.00
3. 26 ga. Steel Sheet Metal Panel	0
4.	
5.	
6.	
7.	
8.	

Inside Surface Air Film	0.68 cooling	0.68 heating
Outside Surface Air Film	0.25 cooling	0.17 heating
Total Resistance R_t	12.38 cooling	12.30 heating
U-Value ($1/R_t$)	0.0808 cooling	0.0813 heating
U-Value Adjusted for Framing	0.11 summer	0.11 winter



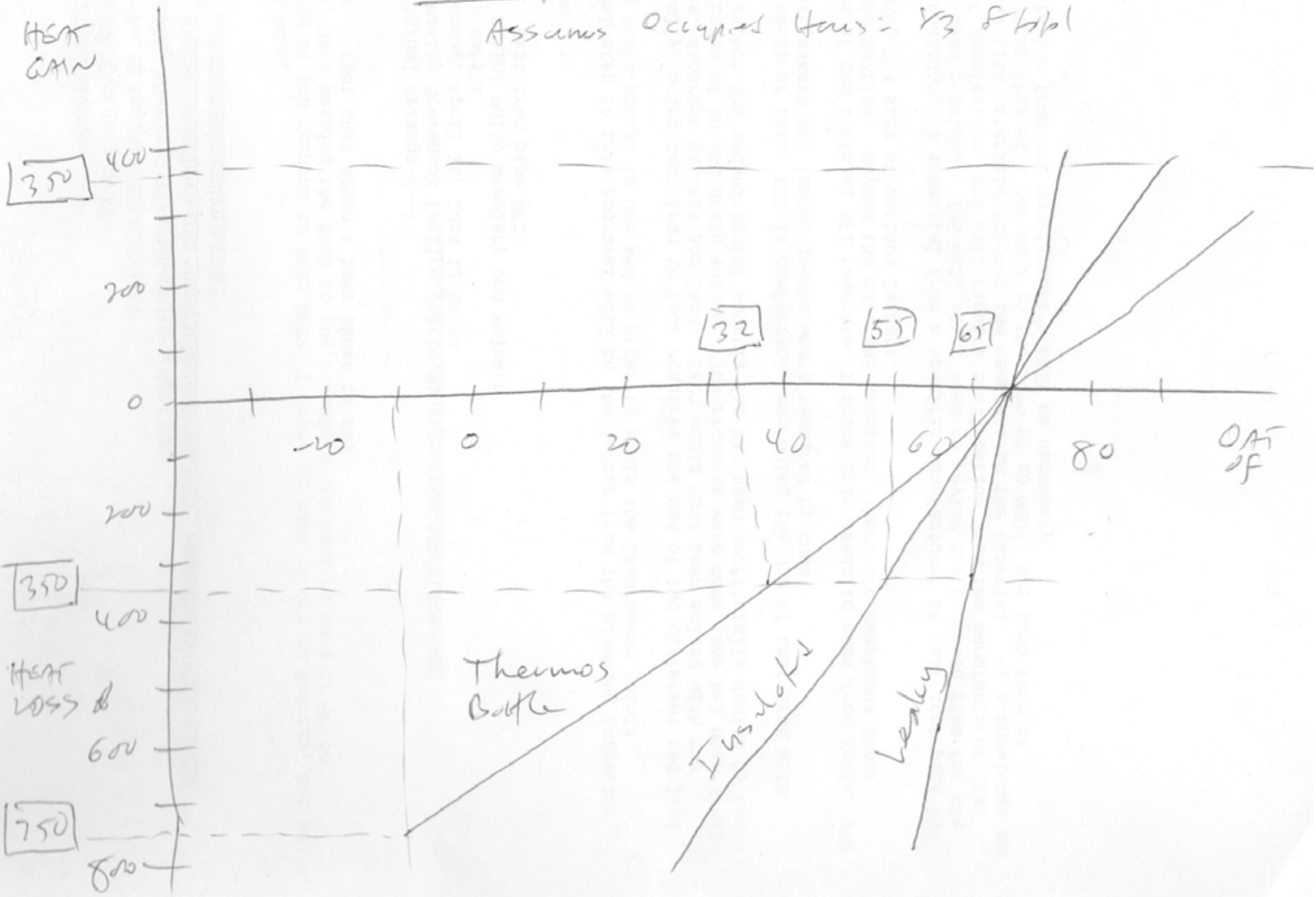
PROJECT SUMMARY

CONDITIONED WAREHOUSE & PACKAGING ROOM

PAOLUCCIO CONSULTING ENGINEERS	HERSHEY FOODS CORPORATION	FIGURE 1
	ENERGY CONSERVATION PROJECT	

Heating/Cooling Balance Point Graph

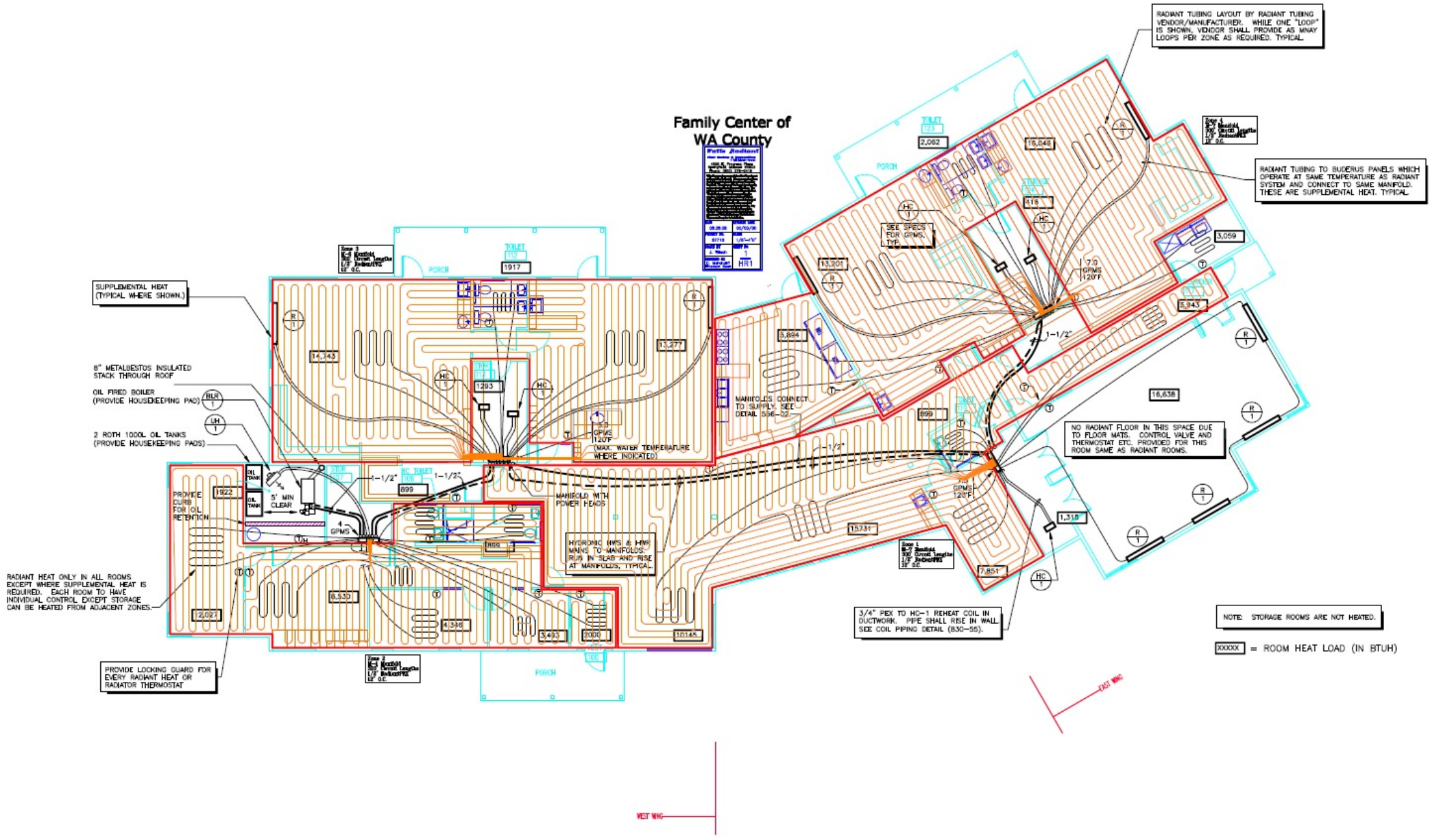
Assumes Occupied Hours: 1/3 of total



Lyme Inn


VECTOR

Radiant Floor




Digital Sound Level Meter
UNDER
50
FAST
100
41.9
dB
Range 30dB ~130dB
MAX
LEVEL
A/C
FAST
SLOW


TELAIRE
668 ppm
36.8
enter
power
mode

“Thermos Bottle” Building Design Heat Loss -10°F outside, 70°F Inside

Building Element	Heat Loss
R-60 Roof	10%
R-40 Walls (and Doors)	25%
R-20 Basement/Foundation Walls	25%
R-10 Basement Floor	5%
R-5 Windows (10% of floor area)	35%
Total	100%
Approximate BTUH/ Sq. Ft.	5
For typical 150 Sq. Ft. Room:	750 BTUH (Hair Dryer on “Low”)

Note: Excludes infiltration/ventilation

“Thermos Bottle” Building Design Internal Heat Gain Per Person 0-150 Sq. Ft./Person

Heat Source	Btuh/Person
Body Heat (Sensible)	250
Lights*	400
Plug Loads**	400
Total	1050

*0.75 Watts/Sq. Ft. x 150 Sq. Ft. x 3.412 Btuh/Watt (=384)

** Wilkins and Hosni, Plug Load Design Factors (ASHRAE Journal, May 2011, P. 30.

Ventilation Air for One Person

15 cfm/ x 1.08 = 16 Btuh

$$\frac{\text{300 Btuh net heat gain}}{\text{16 Btuh/°F}} = \sim 20°F$$

Therefore at -10°F outside air the 15 cfm of ventilation air needs to be at 55°F (!) to balance out the net heat gain assuming 75°F inside.

And assuming zero solar heat gain through the windows.

Economizer Cooling

Per person, ignoring heat loss, at 150 Sq. Ft. / Person

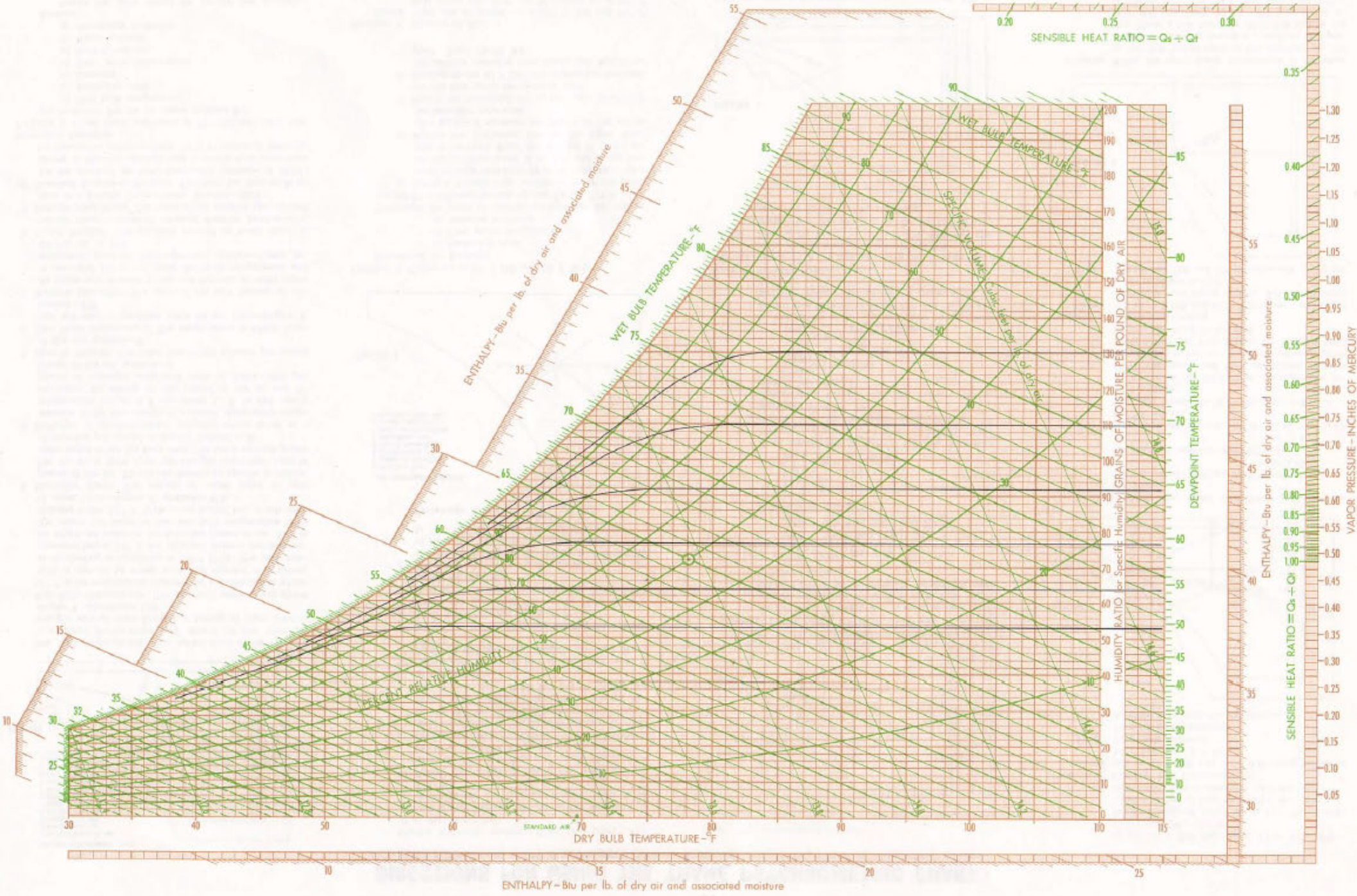
$Q = CFM \times 1.08 \times \Delta T$

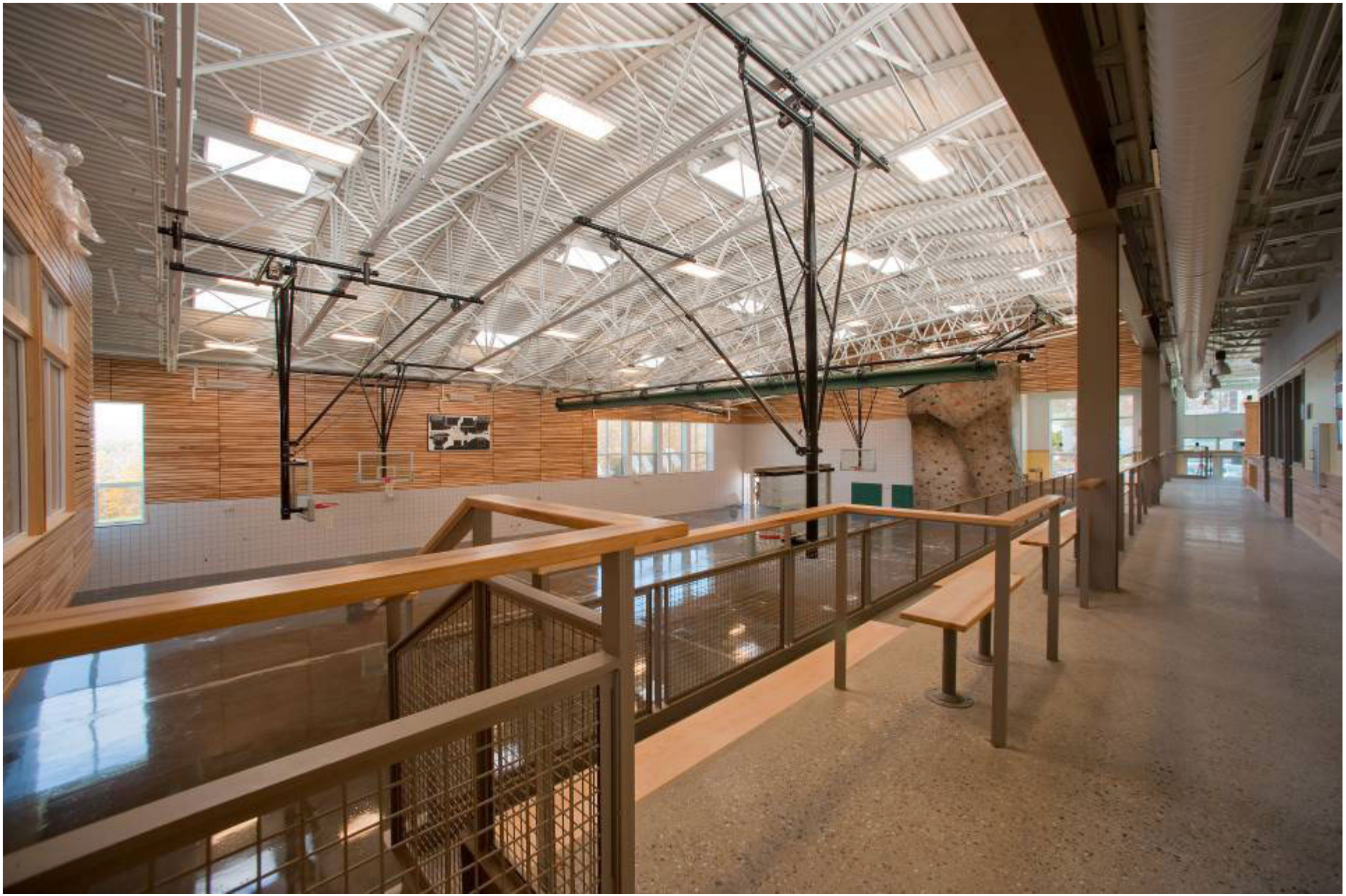
For 1050 Btuh/person heat gain:

- For 20°F ΔT = 50 CFM
  - Or 1/3 CFM per Sq. Ft.
- For 10°F ΔT = 100 CFM
  - Or 2/3 CFM per Sq. Ft.
- For 5°F ΔT = 200 CFM
  - Or 1-1/3 CFM per Sq. Ft.

PSYCHROMETRIC CHART

Barometric Pressure 29.921 Inches of Mercury



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CITY MULTI


EXIT


EXIT


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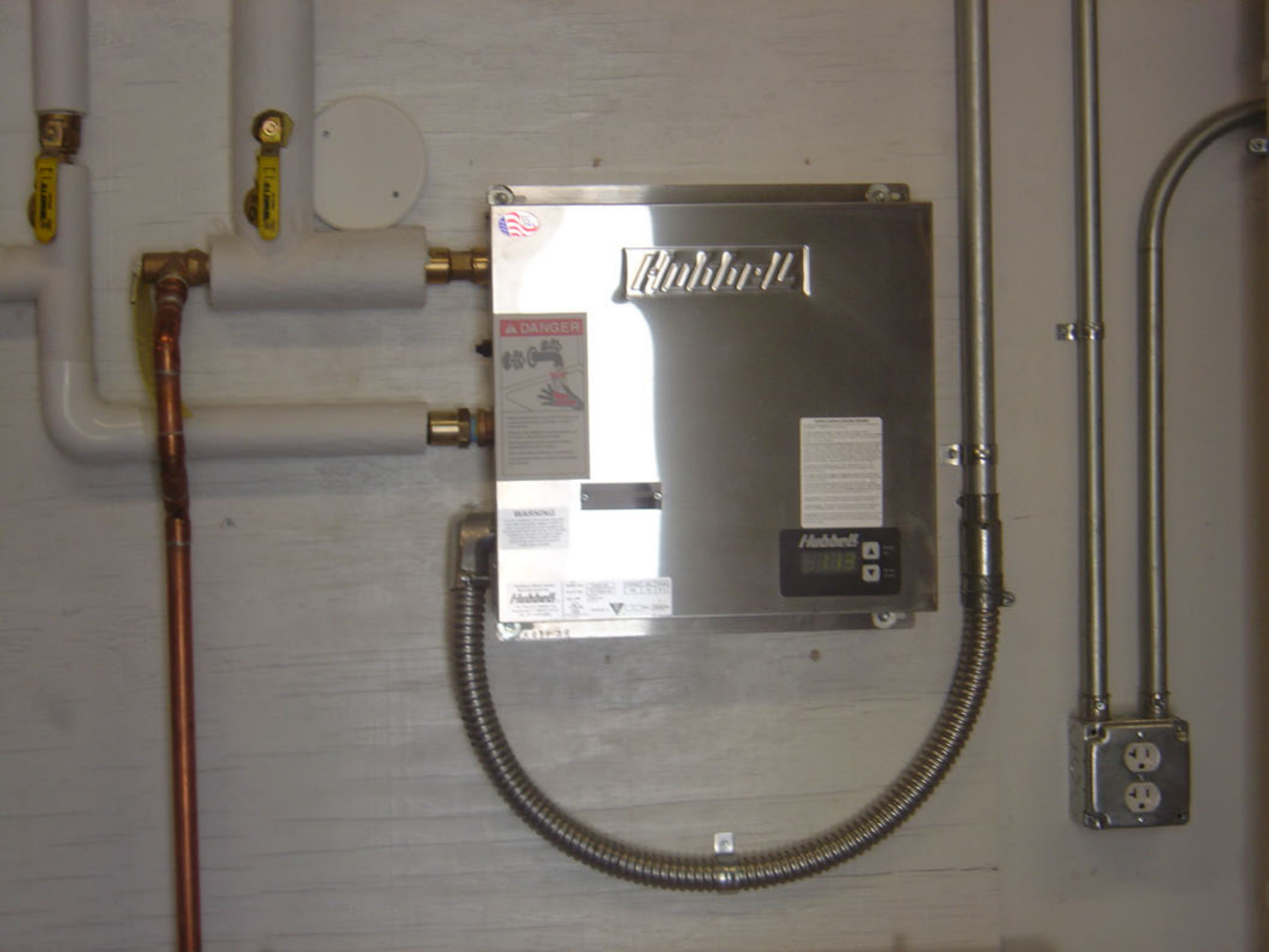
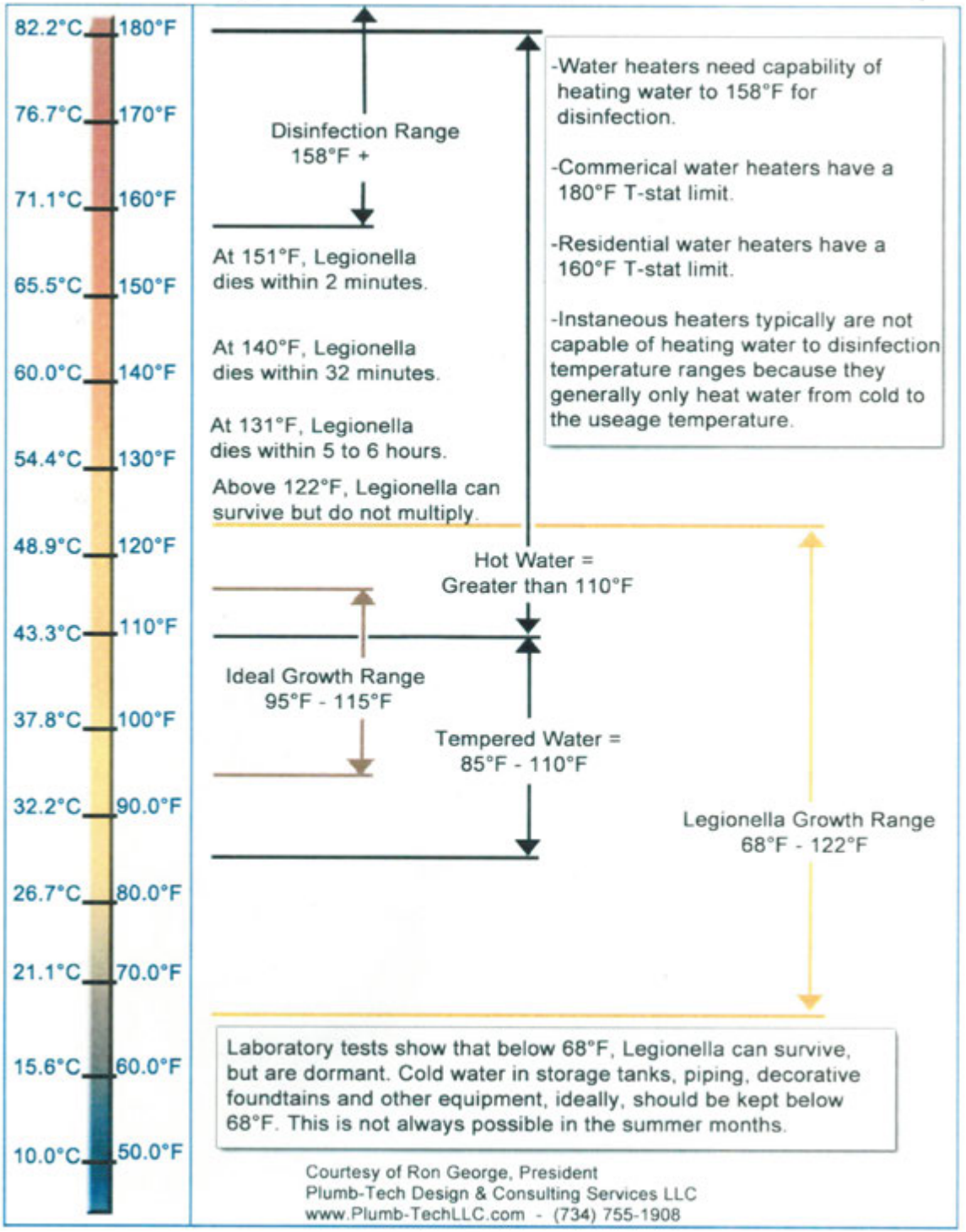
RECO USA
HEATING WATER SUPPLY
HEATING WATER RETURN


Hubbell
Top
PERFORMER
PLUS
LOUISVILLE


Hubbell
DANGER
Hubbell

Legionella Temperatures



Courtesy of Ron George, President
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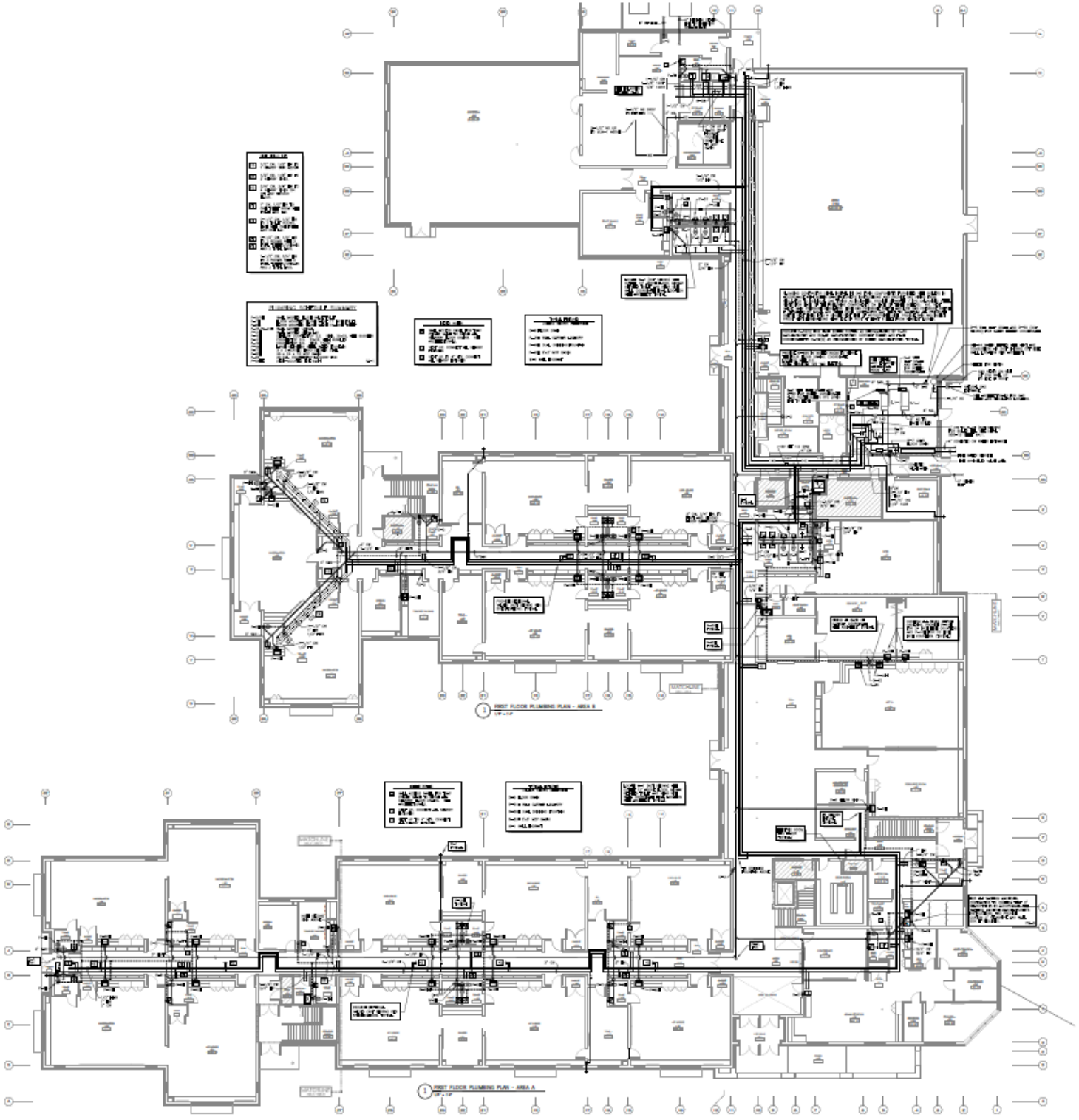

Moving Towards Simplicity