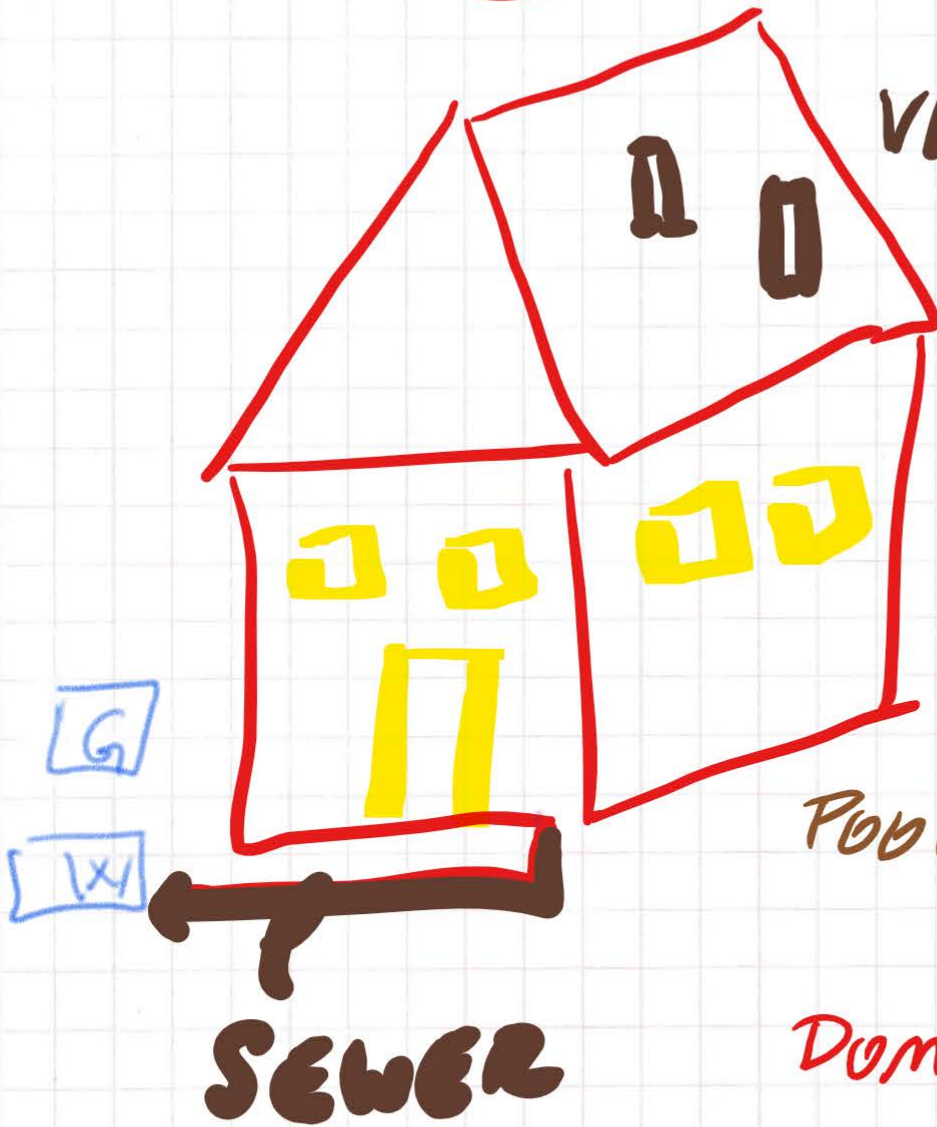


SAUM'S HOUSE



VENT
PIPES

UTILITIES
NEEDED

1) GAS

APPLIANCES

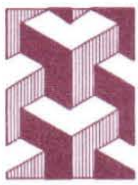
POOL HTR, FAU, ...

2) WATER

DOMESTIC, LANDSCAPE

3) SEWER (VENT

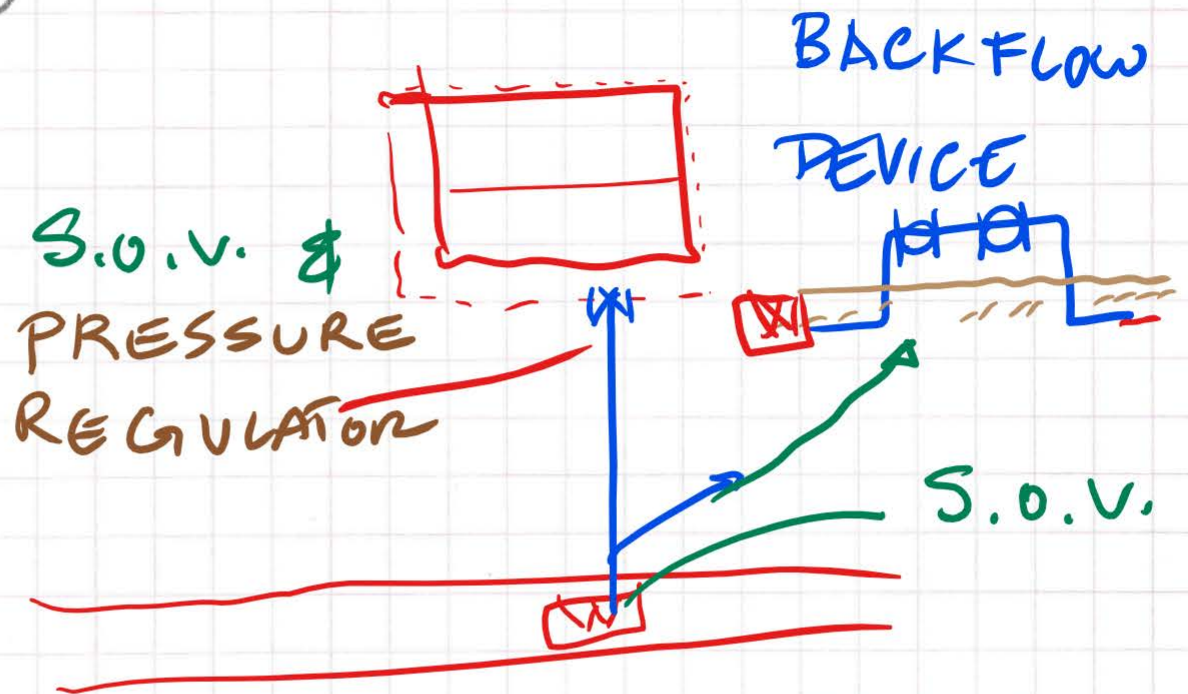
RESTROOMS

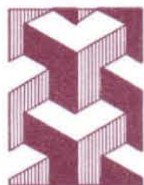


WATER:



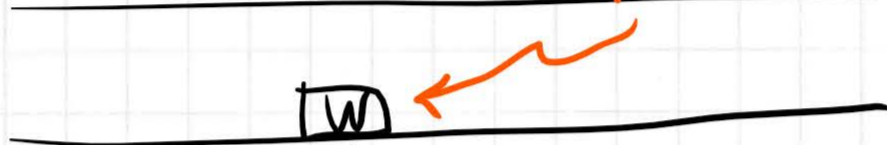
CITY OWNED SIDEWALK





WATER METER

& S.O.V. (A)



B.F.D. ?

WHY?

BACKFLOW DEVICE
ONCE A YEAR
VERIFY

• PRESSURE! PSI

lb/sq inch

• 1 ATMOSPHERE - 14.69 #/in²

• 40 PSI - 60 PSI - 80 PSI → 780 PSI

• HIGH / LOW PSI

• CALL IN & GET DATA

• PRESSURE DROP ACROSS DEVICES

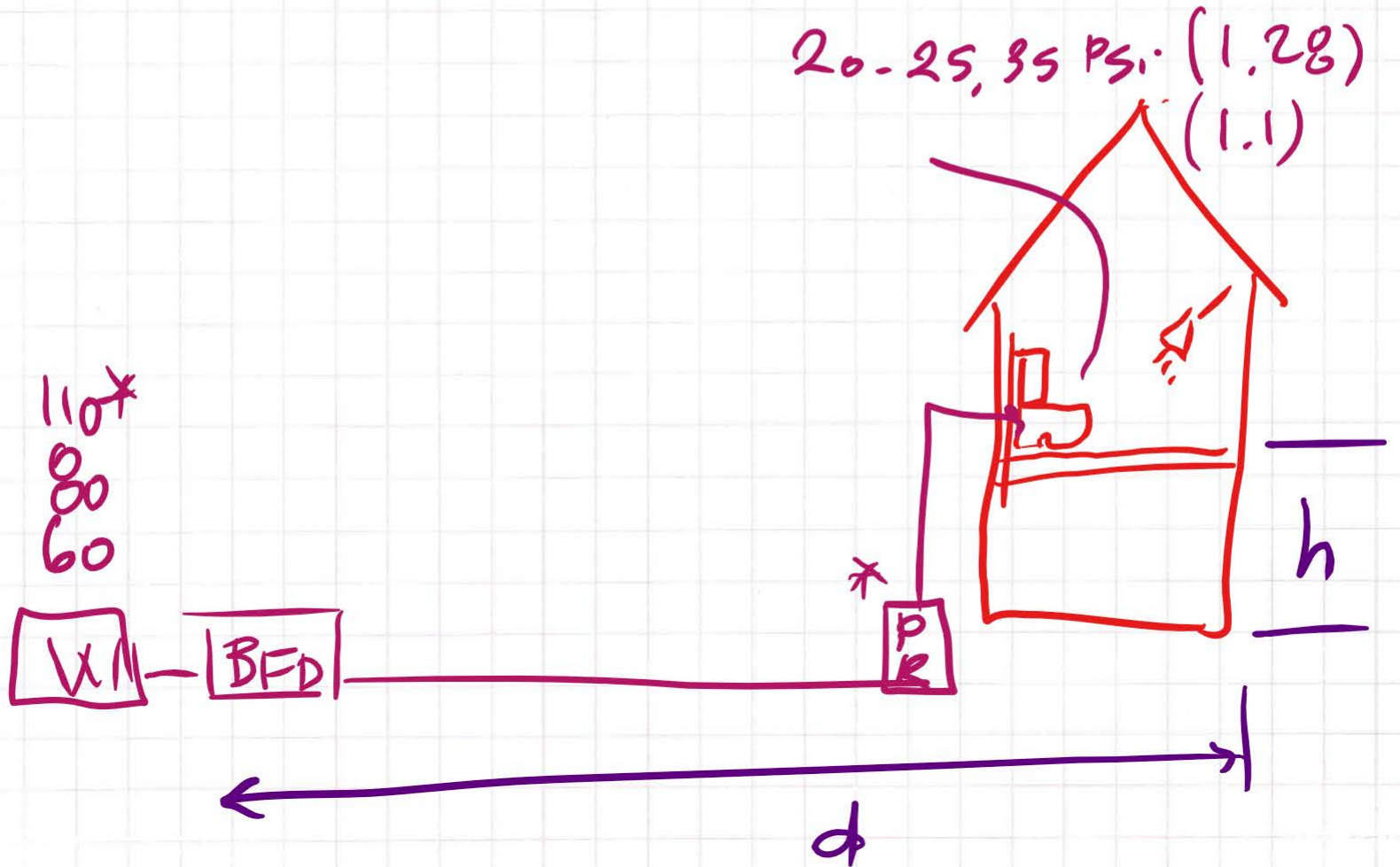


• HYDRAULIC CALCS

• PRESSURE NEEDED: W.I.C. / W/D / INSTA-HOT /

15, 20, 30, 35 ?

....



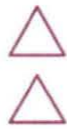
- P-STREET
- METER
- BFD
- SET @ P.R. * > 80 PSI

- HEIGHT

- FIXTURE

= AVAILABLE / (DISTANCE * 1.25) = 5 FPS

VELOCITY
8 FPS



GREEN CODE STUFF :

- RATE OF USE

NOT PART OF ARE
(1.2g, 0.35, 0.5g,
2.0, 1.0, ...)

- WATER METERS NEEDED

- LANDSCAPE ...

Fixture Type	Non-Compliant Plumbing Fixture ¹	Water-Conserving Plumbing Fixture (Fixture Complying with Current Code Applicable to New Construction)		
	Water Usage /Flow Rate	Maximum Water Usage/Flow Rate		
		2013 CPC Ch. 4 2013 CALGreen Div. 4.3	2013 CPC Ch. 4 2013 CALGreen Div. 4.3	2013 CPC Ch. 4 2013 CALGreen Div. 5.3
		Single-Family Residential	Multifamily Residential	Commercial
Water Closets (Toilets)	Exceed 1.6 gallons/flush	Single flush toilets: 1.28 gallons/flush Dual flush toilets: 1.28 gallons/flush effective flush volume (the composite, average flush volume of two reduced flushes and one full flush)		
Urinals	Exceed 1.0 gallon/flush	0.5 gallons/flush		
Showerheads	Exceed 2.5 gallons per minute	2.0 gallons per minute @ 80 psi. Also certified to the performance criteria of U.S. EPA WaterSense Specification for Showerheads (A hand-held shower is considered a showerhead.) For multiple showerheads serving one shower, the combined flow rate of all showerheads and/or other shower outlets controlled by a single valve shall not exceed 2.0 gallons per minute @ 80 psi, or the shower shall be designed to allow only one shower outlet to be in operation at a time.		
Faucets – Lavatory Faucets	Exceed 2.2 gallons per minute	Maximum 1.5 gallons per minute @ 60 psi; minimum 0.8 gallons per minute @ 20 psi	Within units: Maximum 1.5 gallons per minute @ 60 psi; minimum 0.8 gallons per minute @ 20 psi In common and public use areas: 0.5 gallons per minute @ 60 psi	0.5 gallons per minute @ 60 psi
Faucets – Kitchen Faucets	Exceed 2.2 gallons per minute	1.8 gallons per minute @ 60 psi May temporarily increase up to 2.2 gallons per minute @ 60 psi, and must default to maximum 1.8 gallons per minute @ 60 psi Where faucets meeting the above are unavailable, aerators or other means may be used to achieve reduction.	1.8 gallons per minute @ 60 psi May temporarily increase up to 2.2 gallons per minute @ 60 psi, and must default to maximum 1.8 gallons per minute @ 60 psi Where faucets meeting the above are unavailable, aerators or other means may be used to achieve reduction.	1.8 gallons per minute @ 60 psi

MANDATORY REQUIREMENTS CHECKLIST
NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS
(COMPLETE AND INCORPORATE THIS FORM INTO THE PLANS)

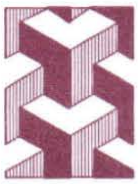
Project Address: _____

Date: _____

ITEM #	CODE SECTION	REQUIREMENT	REFERENCE SHEET (Sheet # or N/A)	COMMENTS (e.g. note #, detail # or reason for N/A)
PLANNING AND DESIGN				
1	4.106.2	Storm water drainage and retention during construction		
2	4.106.3	Grading and paving		
3	4.106.4	Electric vehicle (EV) charging		
4	4.106.7	Reduction of heat island effect for nonroof areas		
ENERGY EFFICIENCY				
5	4.211.5	Space for future solar system installation		
WATER EFFICIENCY & CONSERVATION				
6	4.303.1	Water conserving plumbing fixtures and fittings		
7	4.303.1.3.2	Multiple showerheads serving one shower		
8	4.304.1	Irrigation controllers		
9	4.304.1.1	Irrigation design		
MATERIAL CONSERVATION & RESOURCE EFFICIENCY				
10	4.406.1	Rodent proofing		
11	4.407.3	Flashing details		
12	4.407.4	Material protection		
13	4.408.1	Construction waste reduction of at least 50%		
14	4.410.1	Operation and maintenance manual		
ENVIRONMENTAL QUALITY				
15	4.503.1	Fireplaces and woodstoves		
16	4.504.1	Covering of duct openings and protection of mechanical equipment during construction		
17	4.504.2	Finish material pollutant control		
18	4.504.2.1	- Adhesives, sealants, caulks		
19	4.504.2.2	- Paints and coatings		
20	4.504.2.3	- Aerosol paints and coatings		
21	4.504.2.4	- Verification		
22	4.504.3	Carpet systems		
23	4.504.3.1	Carpet cushion		
24	4.504.4	Resilient flooring systems		
25	4.504.5	Composite wood products		
26	4.505.2.1	Capillary break		

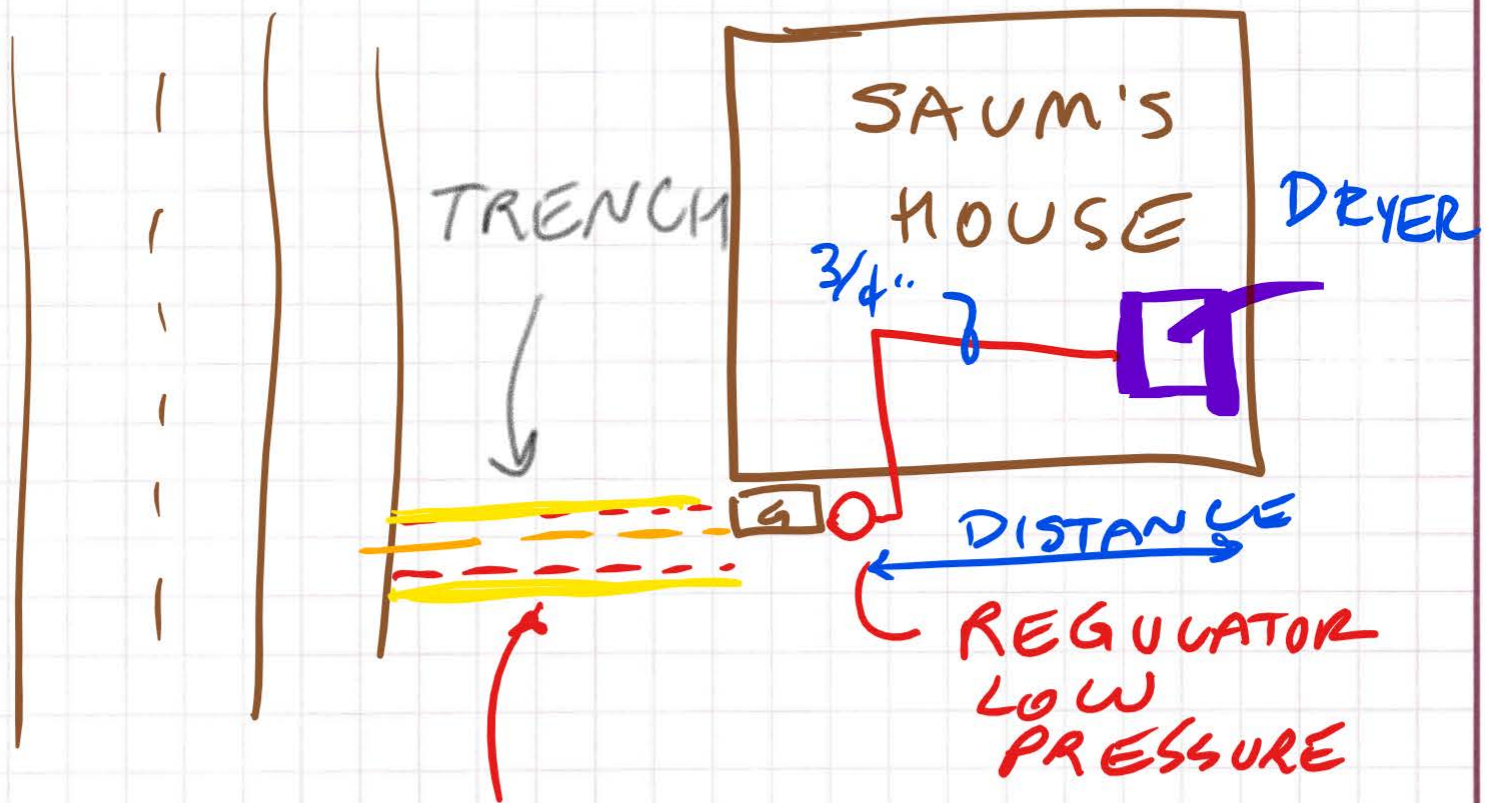


ITEM #	CODE SECTION	REQUIREMENT	REFERENCE SHEET (Sheet # or N/A)	COMMENTS (e.g. note #, detail # or reason for N/A)
27	4.505.3	Moisture content of building materials		
28	4.506.1	Bathroom exhaust fans		
29	4.507.2	Heating and air-conditioning system design		

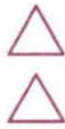
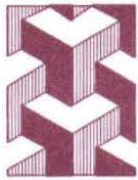


GAS PIPING:

GAS PIPING HAS LOW
MED
HIGH
STREET PRESSURES



UTILITY EASEMENT
MUST BE GRANTED



SYSTEM PRESSURES

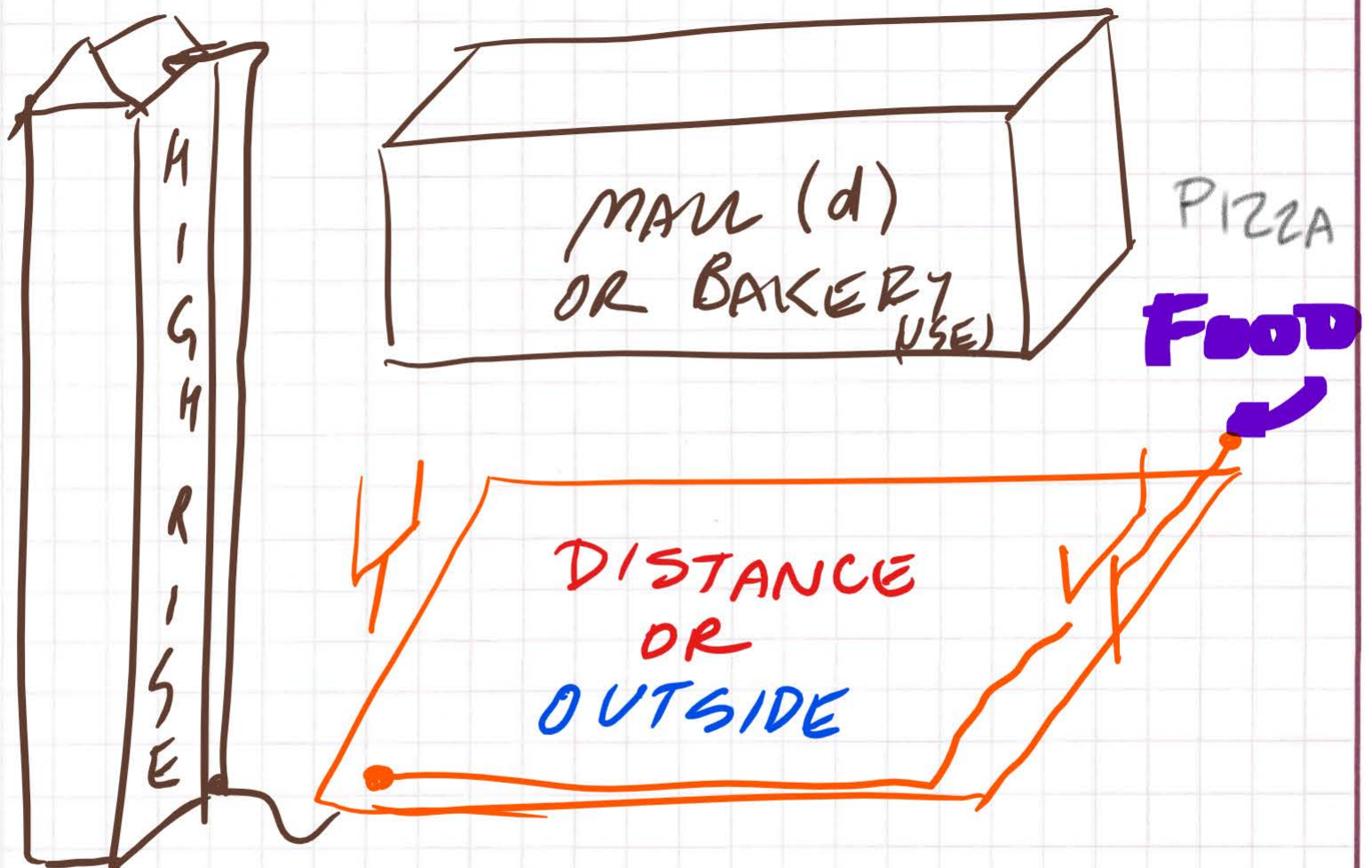
760 PSI IN STREET

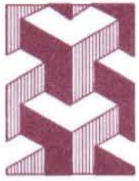
72 PSI → 4-5 PSI FOR CAMPUS
MOVING HOME, FACTORIES

0.25-0.5 PSI NORMAL SETTING

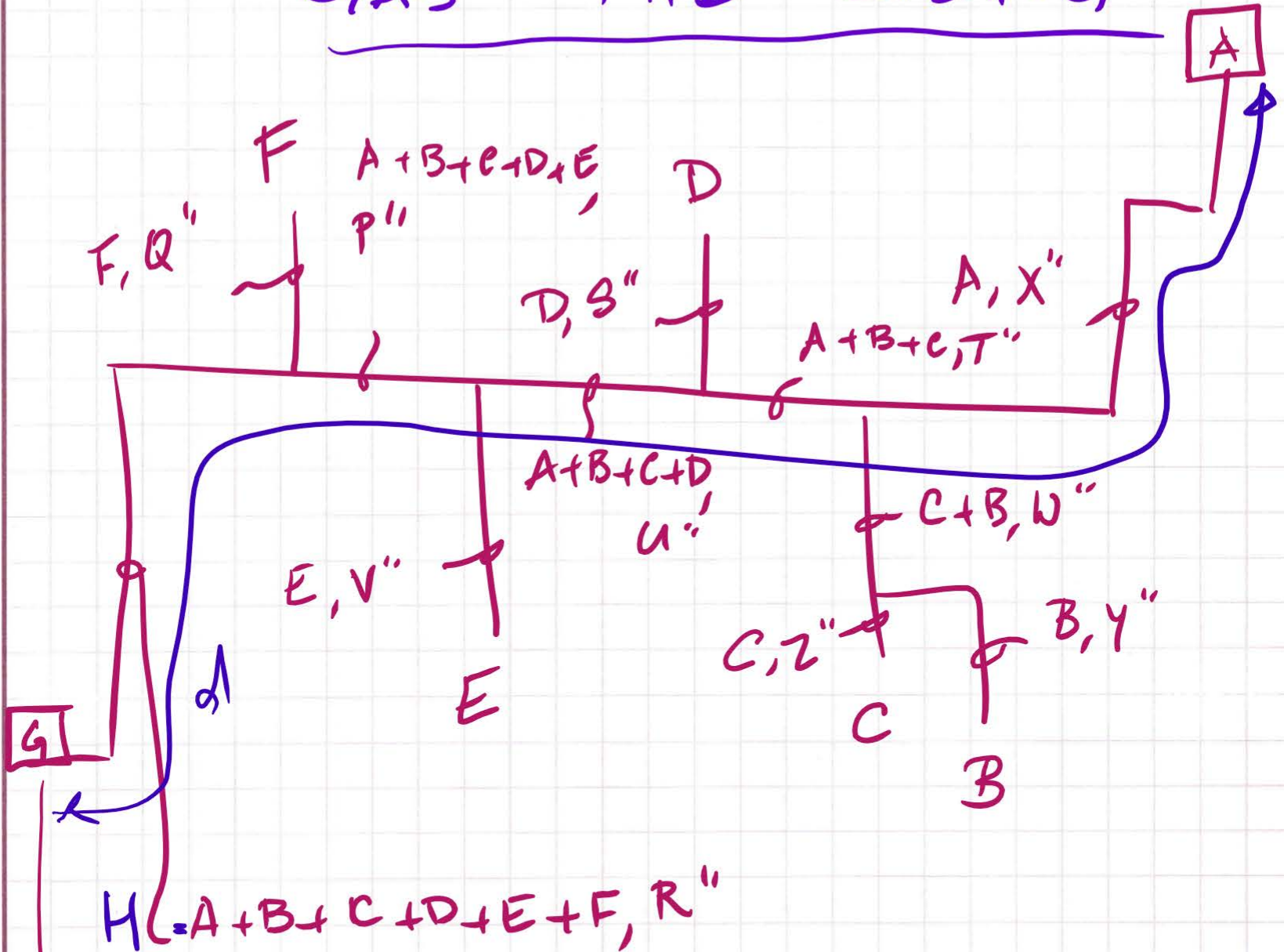
GAS COMPANY WILL NOT DISTRIBUTE

72 PSI ~ 4 OR 5 PSI INSIDE BLDGS
UNLESS MAJOR STRUCTURE





GAS PIPE SIZING



$$H = A + B + C + D + E + F, R''$$

GAS METER = H BTU RATING

@ DISTANCE, d

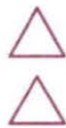
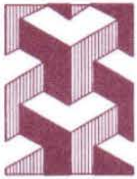
LOOK UP TABLE ϕ PIPES

ARE SIZED.

APPROXIMATE GAS INPUT FOR TYPICAL APPLIANCES

APPLIANCE	INPUT Btu/h. (Approx.)	Cubic Feet of Gas Per Hour
<u>Space Heating Units</u>		
Warm air furnaces:		
Single family	100,000	91
Multifamily, per unit	60,000	55
Hydronic boilers:		
Single family	100,000	91
Multifamily, per unit	60,000	55
<u>Space-and Water-Heating Units</u>		
Hydronic boilers:		
Single family	120,000	109
Multifamily, per unit	75,000	68
<u>Water-Heating Appliances</u>		
Water heaters, automatic:		
storage 30 to 40 gal. tank	35,000	32
Water heater, automatic storage 50 gal. tank	50,000	45
Water heater, automatic instantaneous:		
Capacity at 2 gal./minute	142,800	130
Capacity at 4 gal./minute	285,000	259
Capacity at 6 gal./minute	428,400	389
Water heater, domestic, circulation or side-arm	35,000	32
<u>Cooking Appliances</u>		
Range, freestanding, domestic	65,000	59
Built-in oven/ broiler, domestic	25,000	23
Built-in counter-top range, domestic	40,000	36
<u>Other Appliances</u>		
Clothes dryer, domestic	35,000	32
Gas fireplace - direct vent	40,000	36
Gas log unit	80,000	73
Barbecue	40,000	36
Gaslight	2,500	2

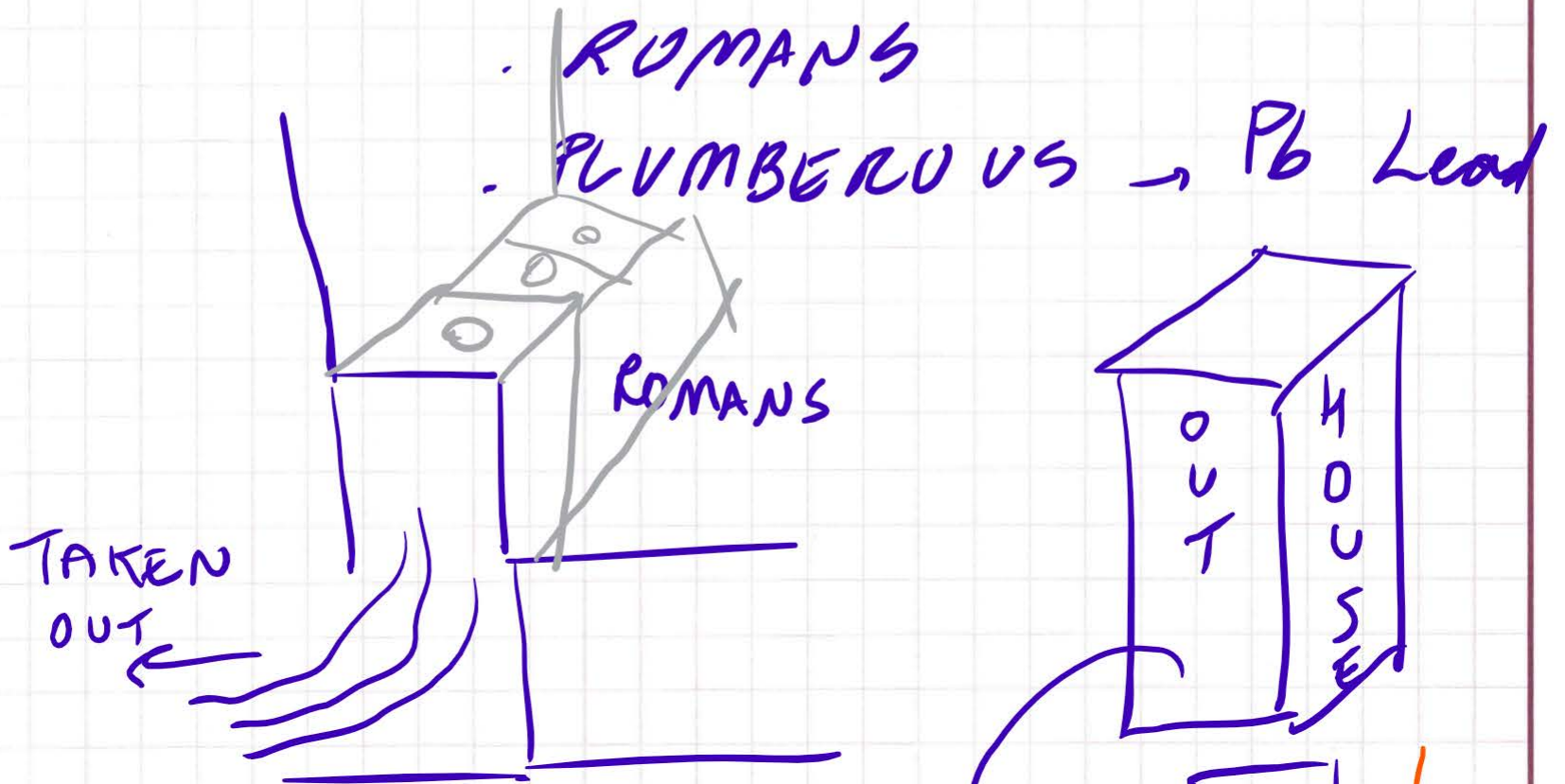
For SI units: 1 Btu per hour = .0293 W



ORIGIN: OUT HOUSES

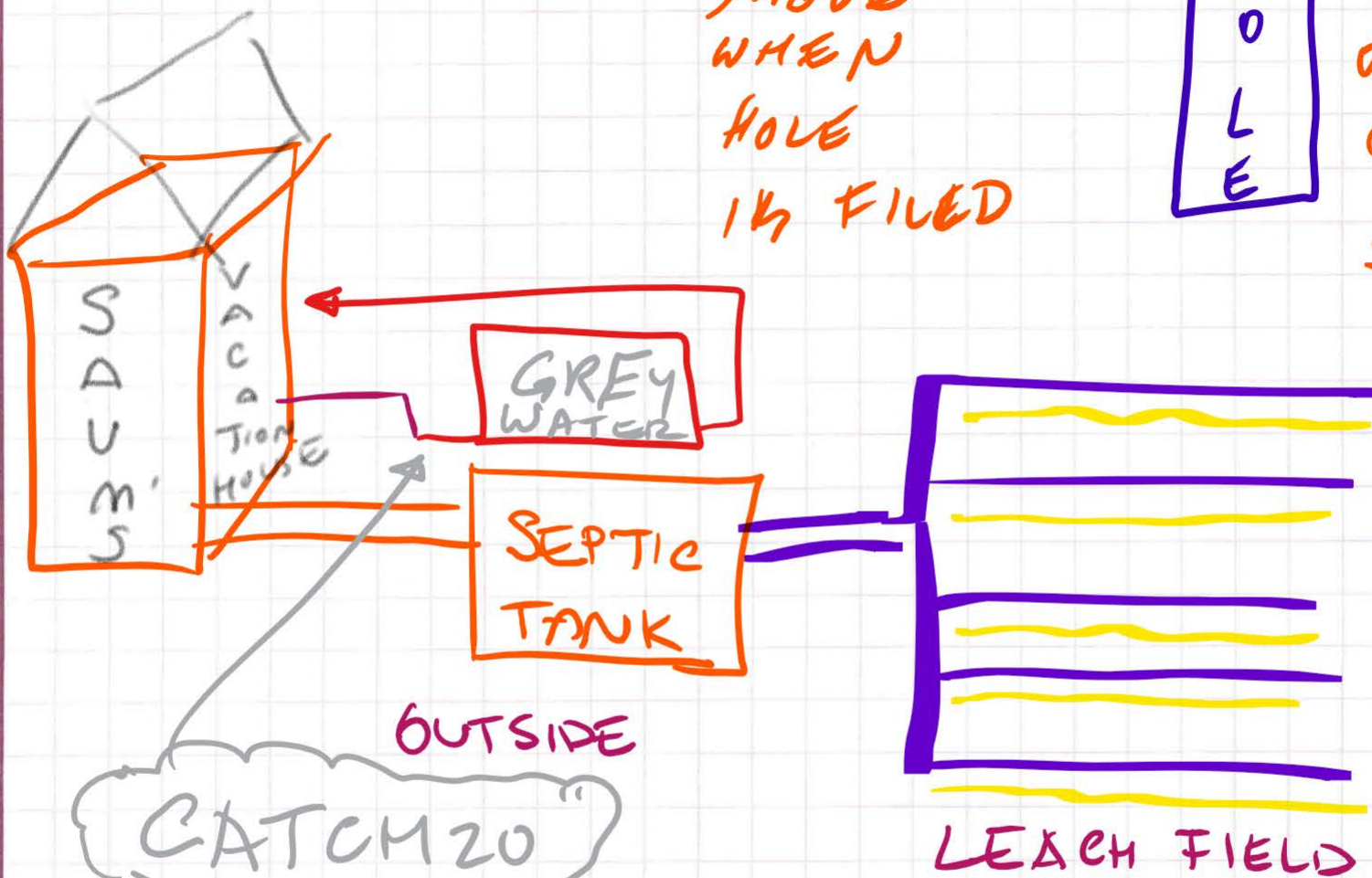
ROMANS

PLUMBEROUS → Pb Lead



MOVE
WHEN
HOLE
IS
FILLED

H
O
L
E
1
0
0
0
5

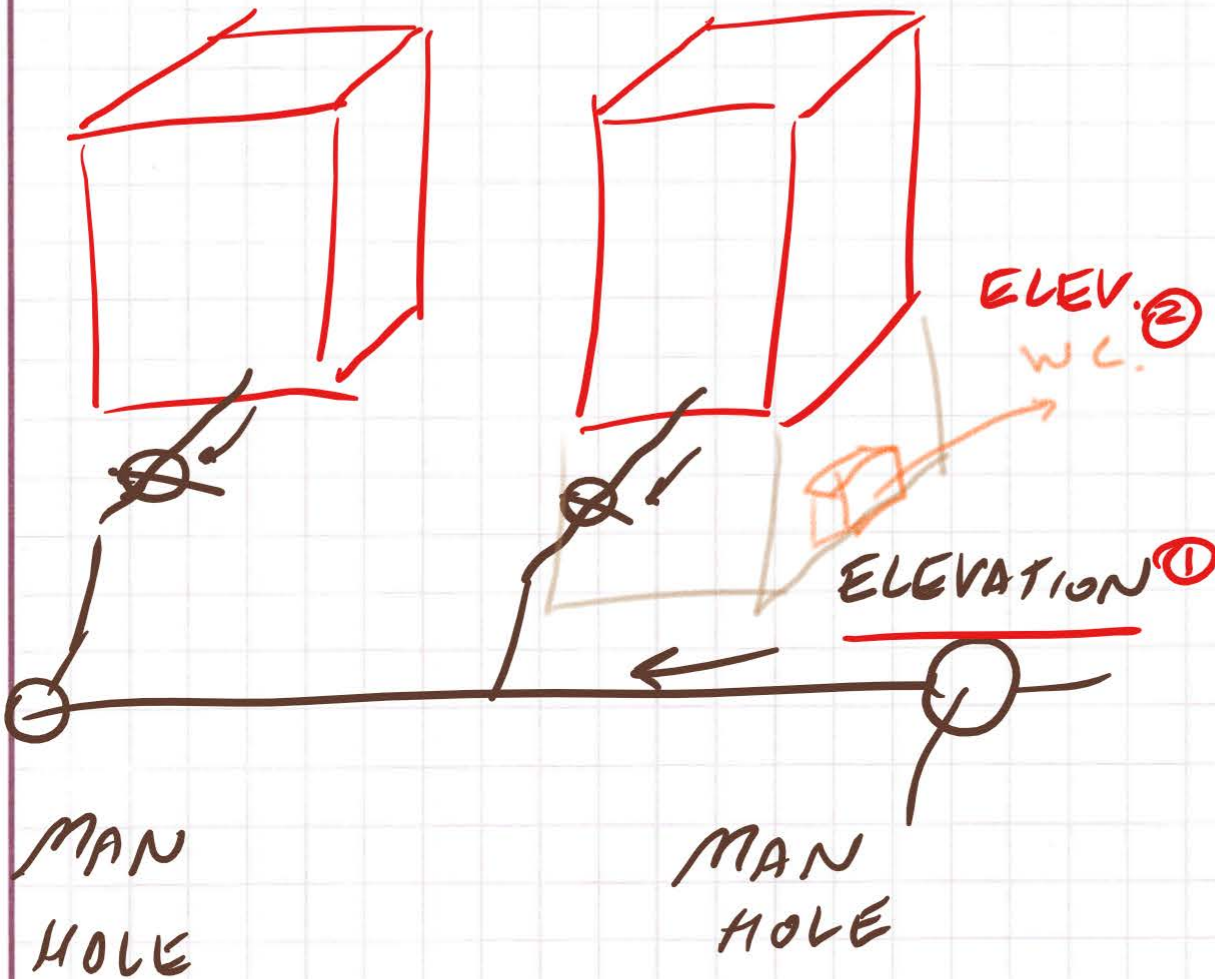




PUBLIC

VS

PRIVATE



- OUTHOUSE
- SEPTIC TANK (SERVICE)
- LEACH FIELD

ELEVATION ①
VS
② } NEED BACKFLOW DEVICE

VERIFY ?



SIZING: EACH FIXTURE HAS F.U.

ADD ALL F.U.'S = TOTAL THEN

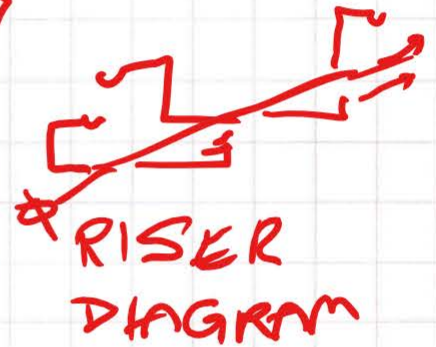
SEWER
2" 8

3" 35

4" 216

6" 720

VENT



OLD RESIDENTIAL : 3" TYP.

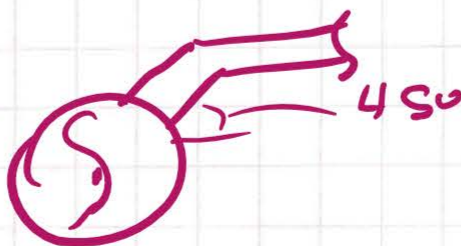
DESIGN MIN : 4"

LARGER BLDGS : 6", 8", 10", 12"
H. RISE

ALWAYS DESIGN 1/4" PER FT

IF 1/8" / FT. TABUL * 0.9 → 4" = 176 FU

STANDARDS:



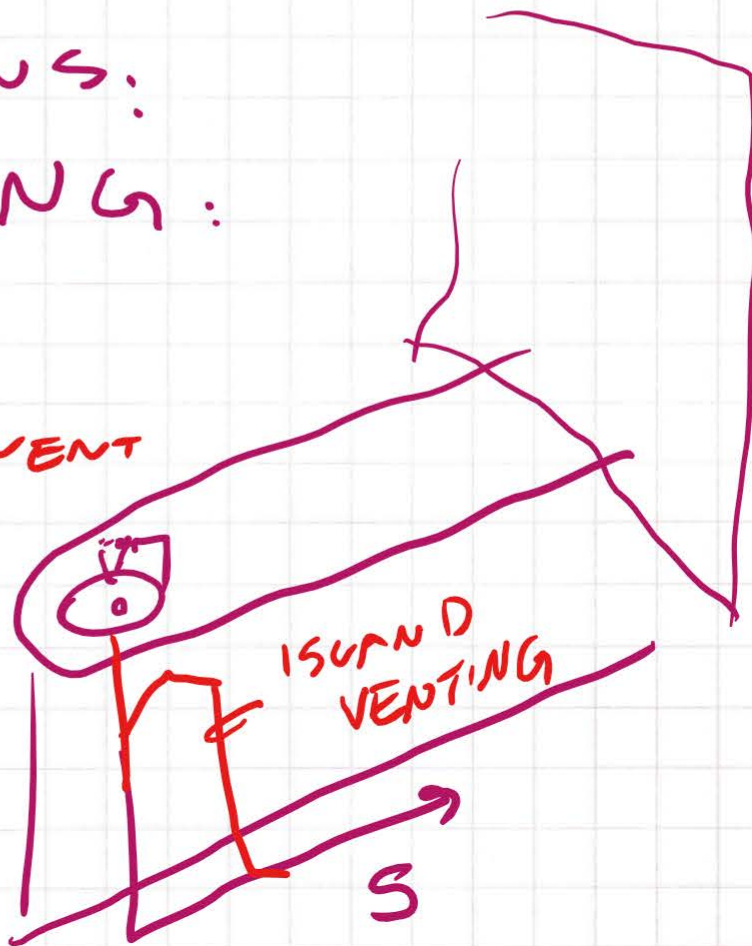


SPECIAL DESIGNS:

- ISLAND VENTING:

- COMBINATION SEWER/VENT

<2016



- NEW 2016 CIRCUIT VENTING

- WET VENTING

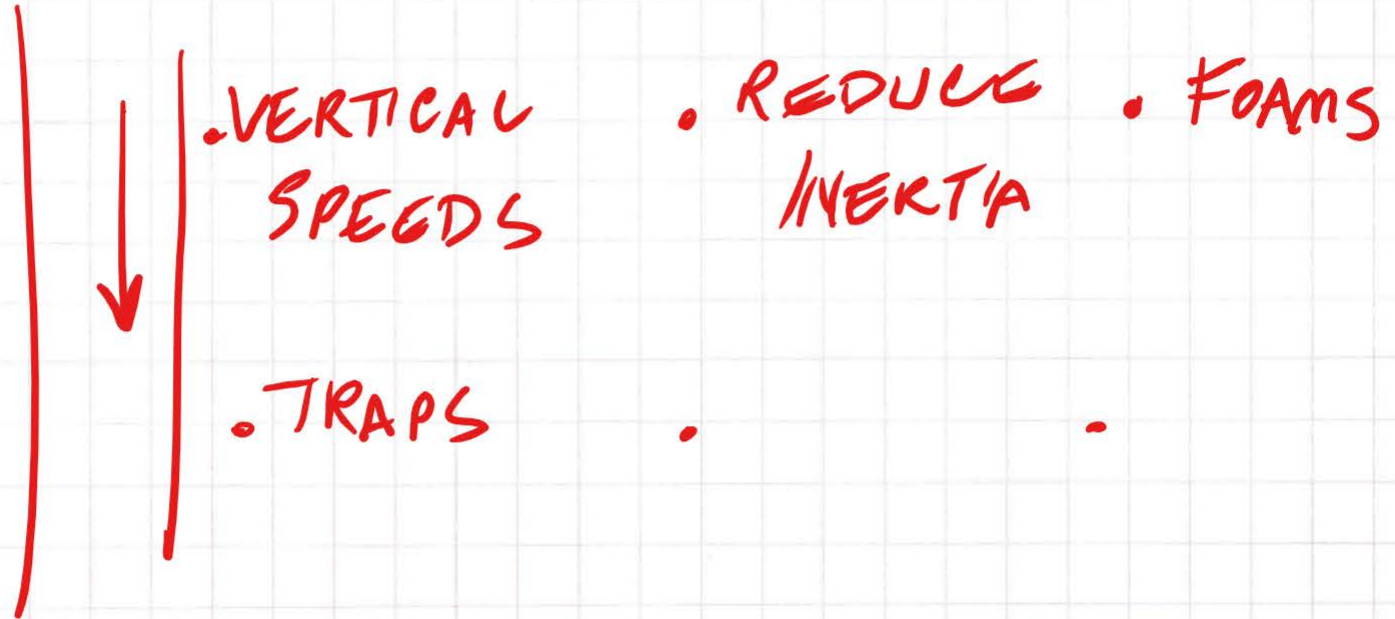
- TRAP CONNECTIONS

- TRAP PRIMERS

- 704.3 U.P.C.



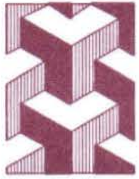
HIGH RISE IS DIFFERENT:



INSTALL FUTURE PLUMBING WALLS.

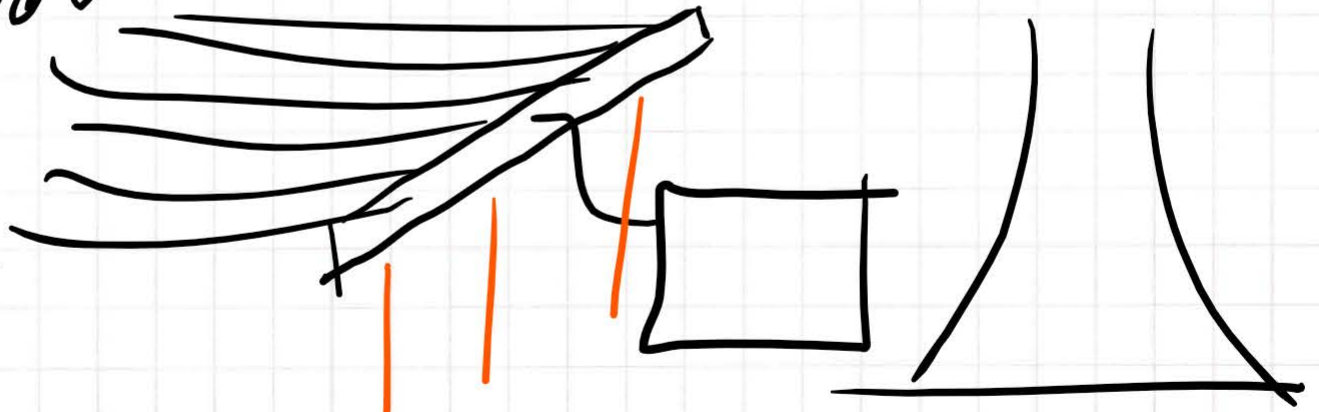
PLAN CHECK CORRECTIONS:

- 1) LOADING OF PIPES (F.U.'S)
- 2) CLEAN OUTS
- 3) VENTS
- 4) ...

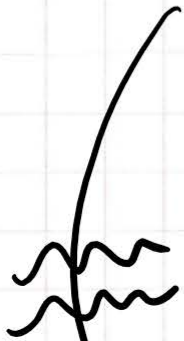


ELECTRICAL

120,000 V

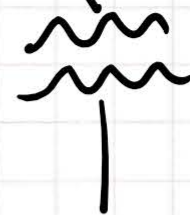


SAN ONOFRE



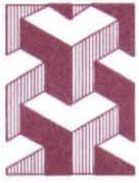
CAMPUS: 4160 V

- GAS PLANT
- UNIVERSITIES
-
-



240V	240V	200V	480V	480V
3φ	3φ	3φ	3φ	3φ
3W	4W	3W	3W	4W
Δ	Δ	Y	Δ	Y

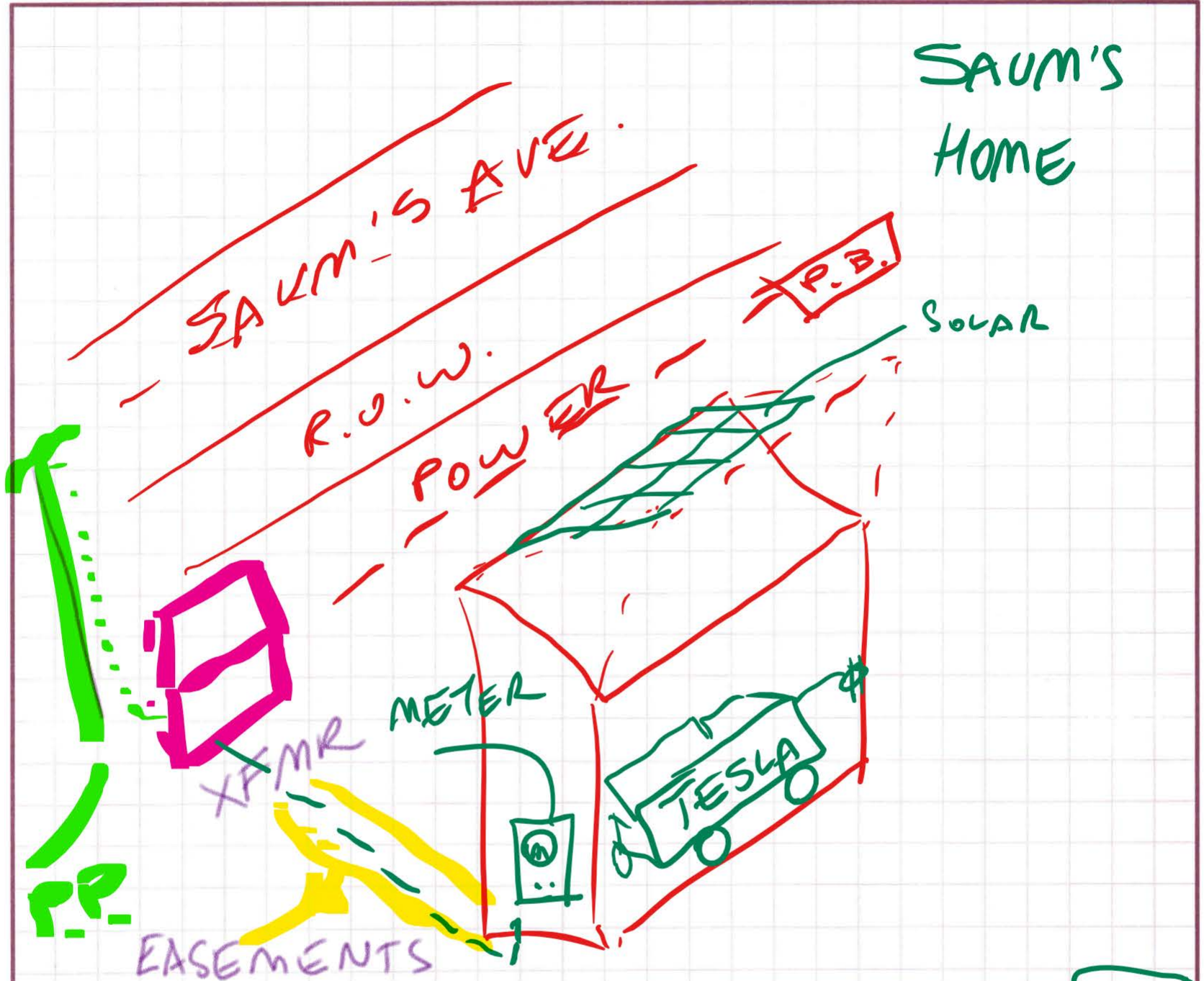
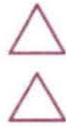
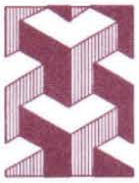
WITHIN BUILDINGS



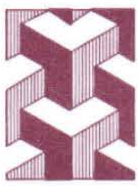
MOTOR TAKE ELECTRICITY

TURBINE GENERATE ELECTRICITY

- POWER PLANT SENDS EXCITED ELECTRONS @ V.
- HIGH VOLTAGE: & SMALL CURRENTS
POWER: VOLTAGE * I
V. HIGH V. LOW
- APPROXIMATELY 10-15% LOSS THRU WIRES / AMBIENT (ENERGY LOSS)
- THIS IS WHY LOCAL ELECTRICITY IS BETTER (COGEN PLANT, SOLAR, ...)
- ONCE ARRIVES OUR BUILDINGS CODES APPLY < 600 VOLTS OR LESS.
- WIRES CARRY ELECTRICITY & THERMAL LOSS, VOLTAGE LOSS IS IN WIRE
- WIRE GAGES HAVE LIMITED CAPACITY.



- METER IS FED FROM 200A (~400A)
- METER HAS MAIN. MUST BE READILY AVAILABLE FOR SCE.
- MAIN SIZE IMPORTANT
- IMPACT OF SOLAR, TESLA, GENERATOR
- XFMR - HEADACHE FOR CLIENTS



BASIC EQUATION:

POWER: VOLT * AMPERAGE

VOLT : RESISTANCE * AMPERAGE

$$\frac{1000 \text{ WATTS}}{120 \text{ VOLTS}} = \text{CURRENT}$$

15A #14 WIRE RESIDENTIAL ONLY

20A #12 WIRE MIN. COMMERCIAL

. IF > 3 HRS REDUCE BY 0.90 OR 90%
FOR BREAKERS

. GFCI _____ ≈ 6' FROM WATER

. ARC FAULT _____ NOW MOST OF
RESIDENTIALS

. VOLTAGE DROP $240 \times 0.95 = \text{MIN LAST BRANCH}$
5%



$200V \times 0.95 \rightarrow \text{MIN VOLT}$



FAULT CURRENT: "SHORT"



$$V = IR$$

$$R \text{ WRENCH} = 0.0001$$

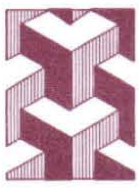
$$120V = I (0.0001) \rightarrow I = 1,200,000 \text{ A } \Omega$$

$$240V = I (0.0001) \rightarrow I = 2,400,000 \text{ A}$$

HOW MUCH AMPERAGE KILLS A PERSON?

GFCI WAS SET TO SAFETY
of ELECTRICITY & WATER

WHAT IS THE AMPERAGE SETTING
of GFCI @ 120V?



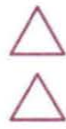
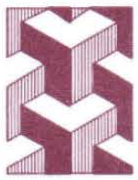
- 0.00% A of 120V
WILL PARALYZE YOU.
- GFCI SETTINGS 0.005A.

THEREFORE: YOU NEED POWER
COMPANY FAULT CURRENT
TO INSURE SAFETY & TRIPPING HAZARDS
of BUILDINGS.

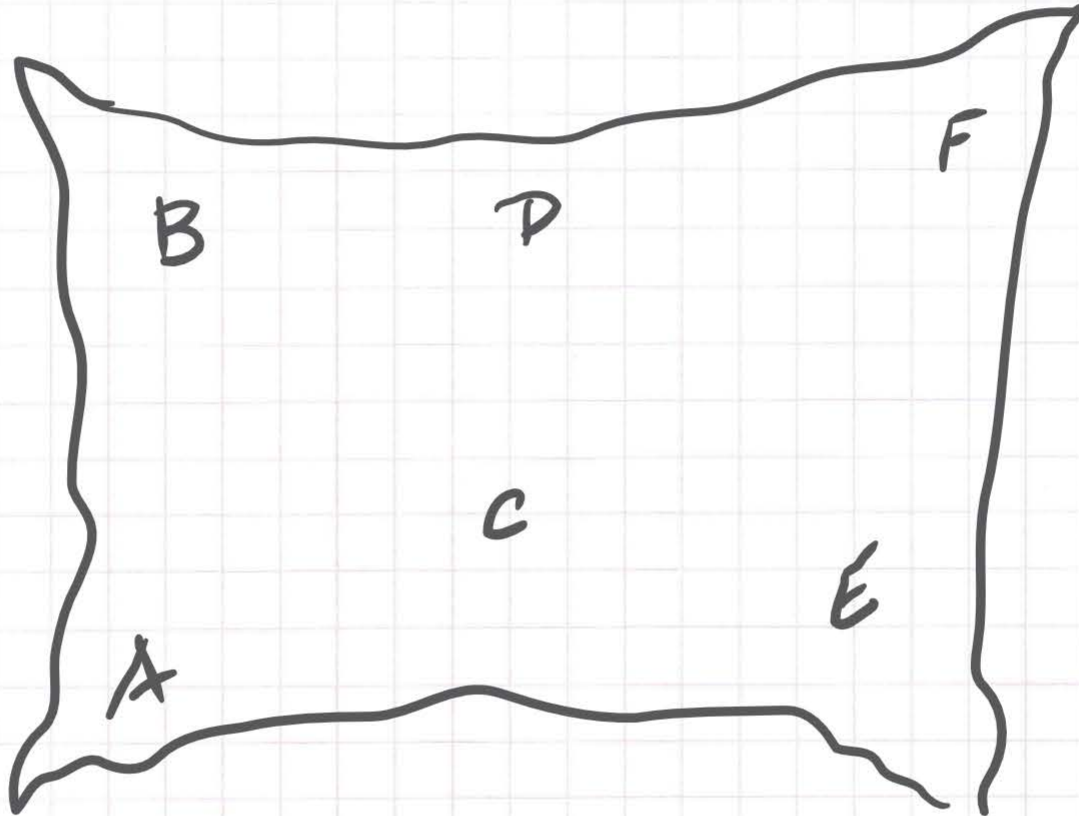
UTILITY COMPANIES KNOW OR WILL
CALL FAULT CURRENT THRU THEIR
ENTIRE SYSTEMS.

NORMAL: 65,000 AMP ASYMMETRIC
INRUSH
CURRENT

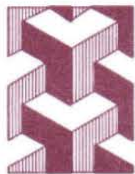
42,000 AMP NORMAL
ALL BASED UTILITY CALCS FOR A
REGION. DO NOT COMPLETE W/O DATA.



SAUM'S HOME IN SAUM'S TOWN, USA
CLIMATE = ? A, B, C, D, E, F



- NEED COOLING & HEATING TO BE 75°F
~ 50% HUMIDITY INSIDE
- AIR CIRCULATION 6 AIR CHANGE/HR
- WHOLEHOUSE FAN
- EXHAUST FUME / ODOR
- KITCHEN, STEAM ROOM, DRYER, ...
- WHAT TYPE OF SYSTEM ?



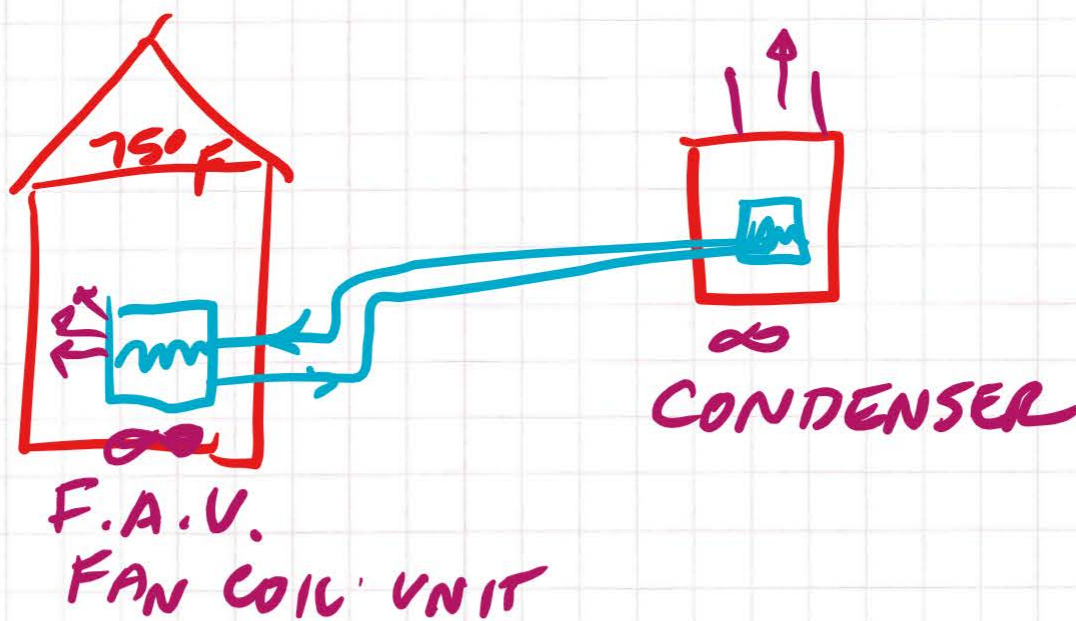
SYSTEMS SAUM'S HOUSE IN SAUMSTOWN, USA

32°F, <32°F, 7100°F <100°F

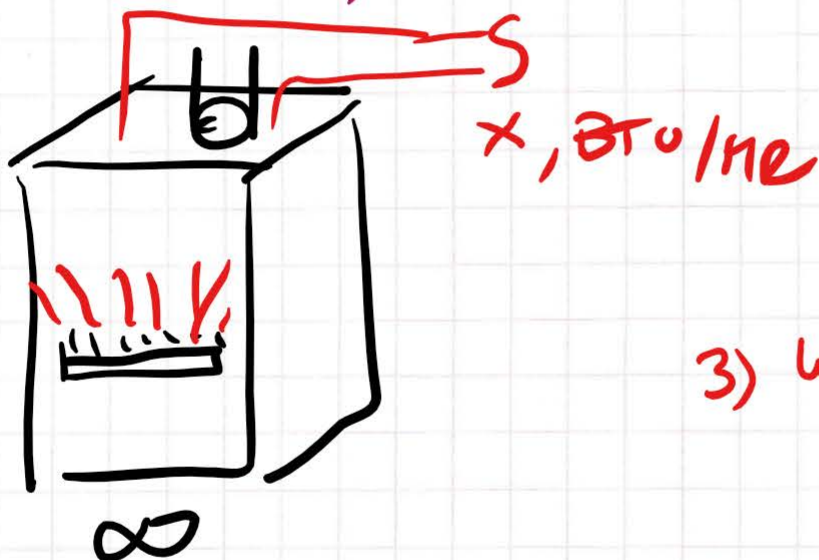
LOUISIANA, PALM DESERT, NEWPORT BCH

MOST COMMON IN USA

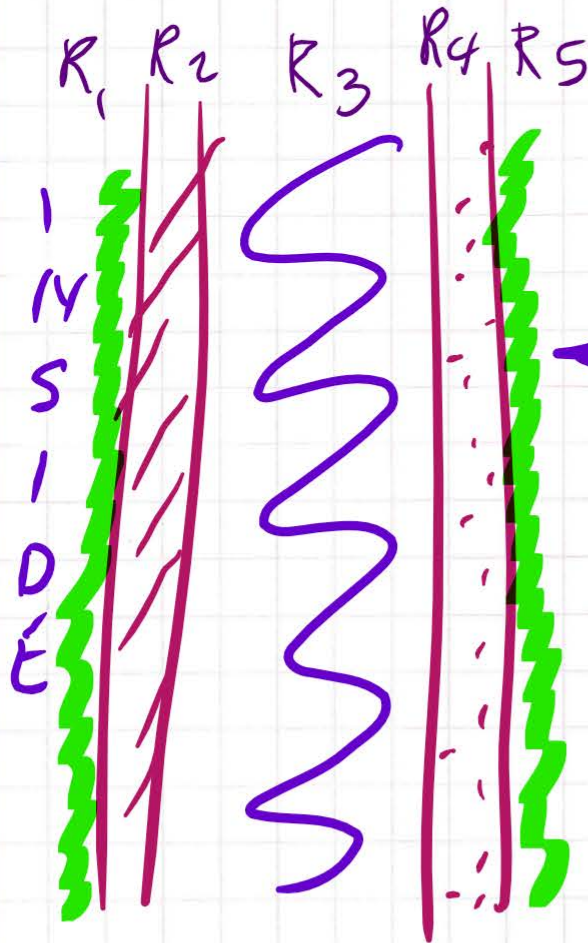
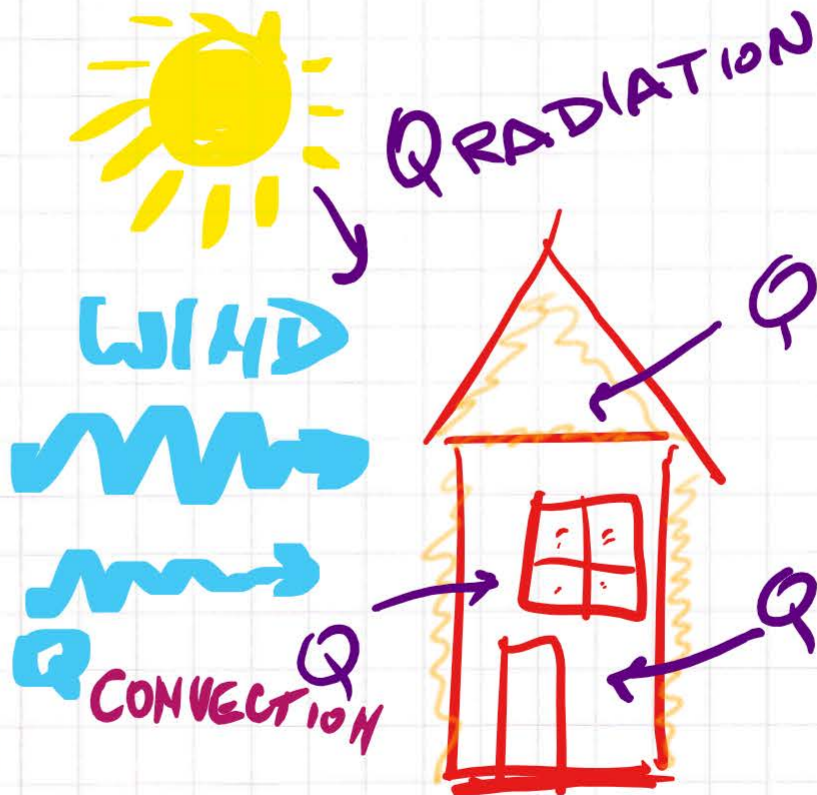
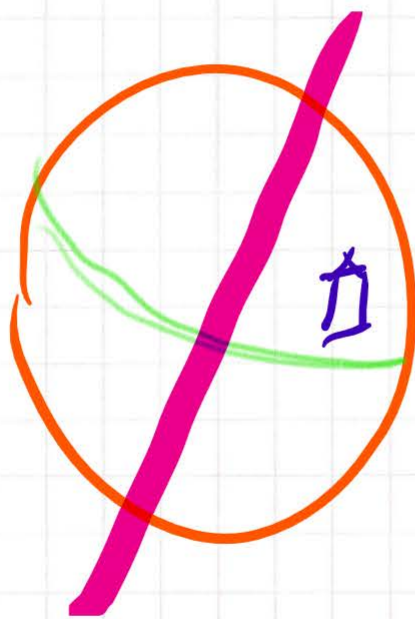
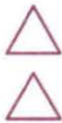
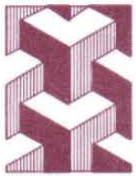
1) COOLING



2) HEATING FORCED AIR UNIT. GAS



3) WHAT IS HEAT PUMP?



OUTSIDE
Q CONDUCTION

$$R = \sum R$$

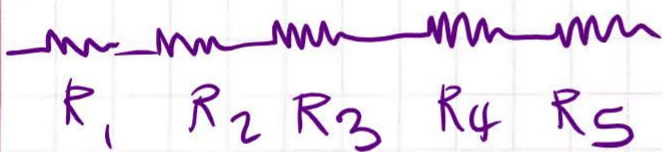
$$= R_1 + R_2 + R_3 + R_4 + R_5$$

BUY BATS

HOME DEPOT

LOWE'S

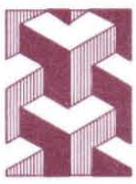
- R11
- R13
- R15
- R19
- R22
- R30
- R38



THERMAL

CONDUCTIVITY, K =

$$1/R = 1/\text{RESISTANCE}$$



INSULATIONS ARE BAT INSULATION

R-11 , R-13 2x4

R-15 , R-19 2x6

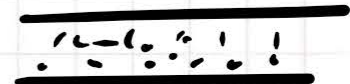
~R22 ? 2x6

R-30 2x10

R-39 2x12



RIGID INSULATION



1-INCH- R5, R7, ~R10

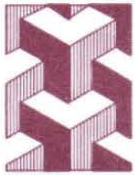
RIGID IS NOW USED EXT. W/
VAPOR BARRIER

→ RIGID + V.B.



T-24

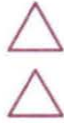
T-24 GUIDES THIS DOE, COM CHECK, ...



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REVISIONS

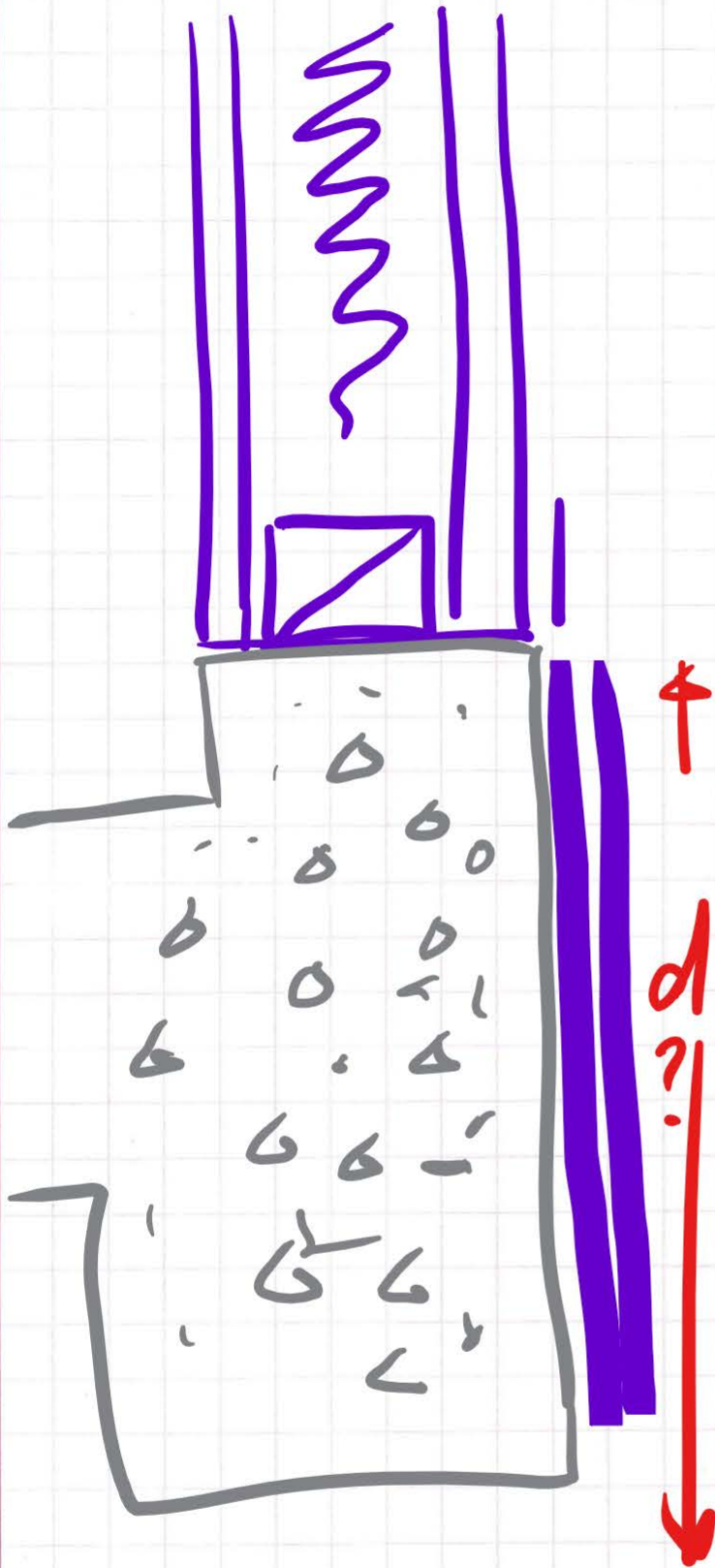


12/21/16
DATE: _____ SHEET: M6
PROJECT: ARE-BS
SUBJECT: MECHANICAL
RE: DESIGN

DETAILS

CIVIL . STRUCTURAL . ELECTRICAL . MECHANICAL . PLUMBING . ENERGY . LEED . GREEN

ENGINEERING & CONSULTING

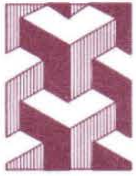


**EXTERIOR
SLAB
EDGE**

**INSULATION
R-2 → R=?**

T-24

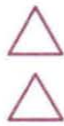
**EVERY ONE
MISSES
THIS**



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REVISIONS

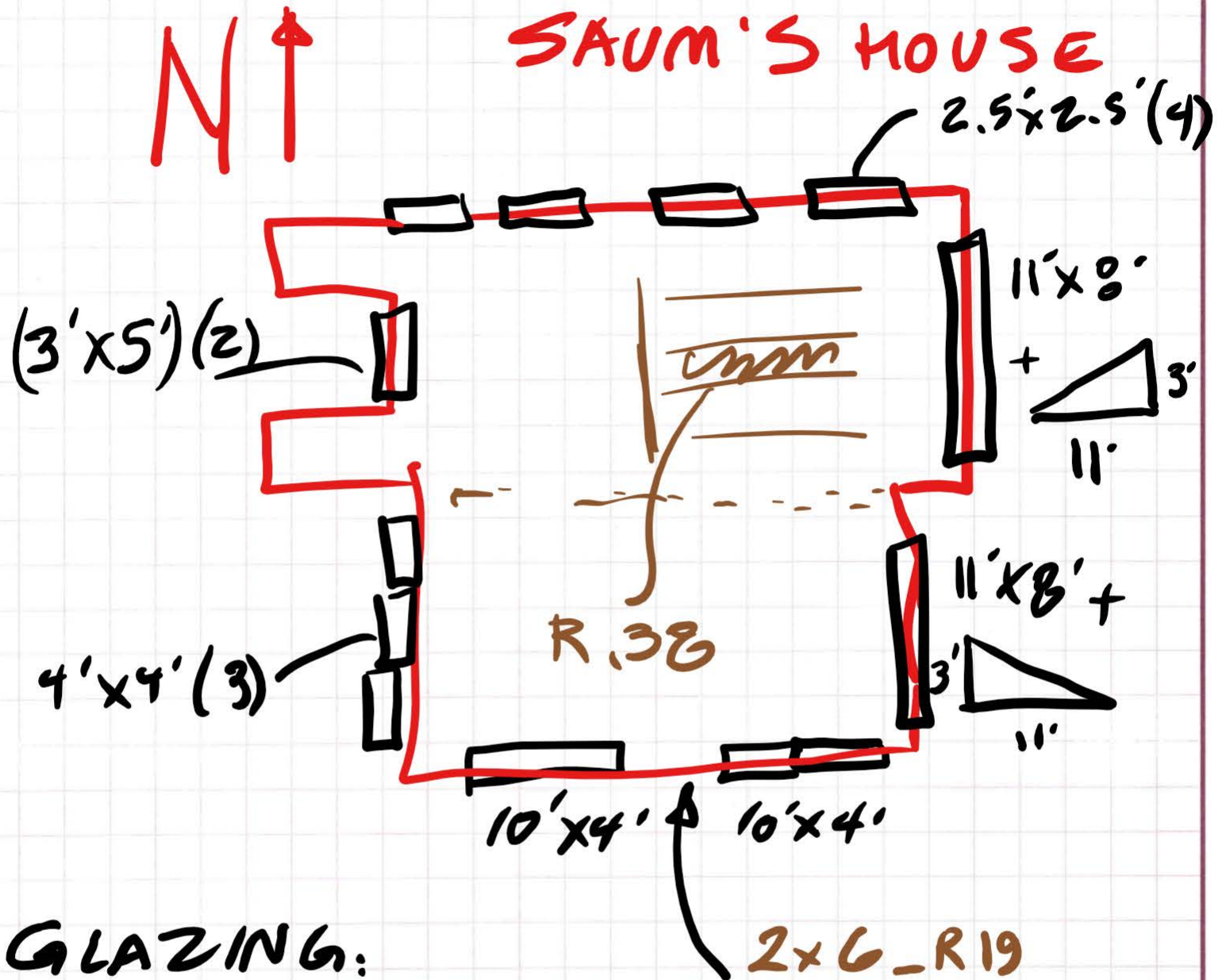


12/21/16
DATE: _____ SHEET: **M7**
PROJECT: **ARE BS**
SUBJECT: **MECHANICAL**
RE: **DESIGN**

DETAILS

CIVIL . STRUCTURAL . ELECTRICAL . MECHANICAL . PLUMBING . ENERGY . LEED . GREEN

ENGINEERING & CONSULTING



GLAZING:

SOLAR BAN 70 FILM

DOUBLE PANE

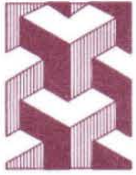
U = 0.24 - 0.26

SHGC: SOLAR HEAT GAIN ~

~0.23

NORTH: 30
EAST: 100
SOUTH: 120
WEST: 100

} BTU/HR/SQ FT
RADIATION



. RADIATION

$$\sum \text{AREA} \times \text{SHG} = Q$$

$$\text{CONDUCTION: } Q = \frac{\sum U A T}{\sum A T / R}$$

. CONVECTION: ADDED THIN FILM
IN CONDUCTION

TOTAL EXTERIOR CLIMATE LOAD:

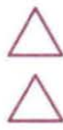
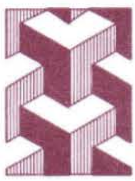
$$\sum Q_R + \sum Q_C = \text{TOTAL } Q$$

↳ Q_R IN T

PEOPLE LOAD ~ 350-550 BTU/PERSON

LIGHTING LOAD ~ WATTS × 1.354

OTHER LOADS ~ ELECTRICAL
LOADS



HOUSE: $Q = \Sigma Q = \text{RADIATION} +$
 $\text{CONDUCTION} +$
 $\text{PEOPLE} + \text{O.S.A.} + \text{COMPUTER} +$
 $\text{MISC.} =$

400 ϕ / TON - 500 ϕ / TON

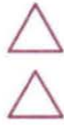
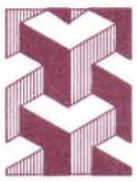
COMMERCIAL: 200 ϕ \rightarrow 400 ϕ
 \sim 300 ϕ / TON \sim OFFICE TON

WHAT IS A TON? 1 TON of ICE
MELTING IN 24 HRS. HEAT OF
FUSION

12,000 BTU/hr \times 24 = 9

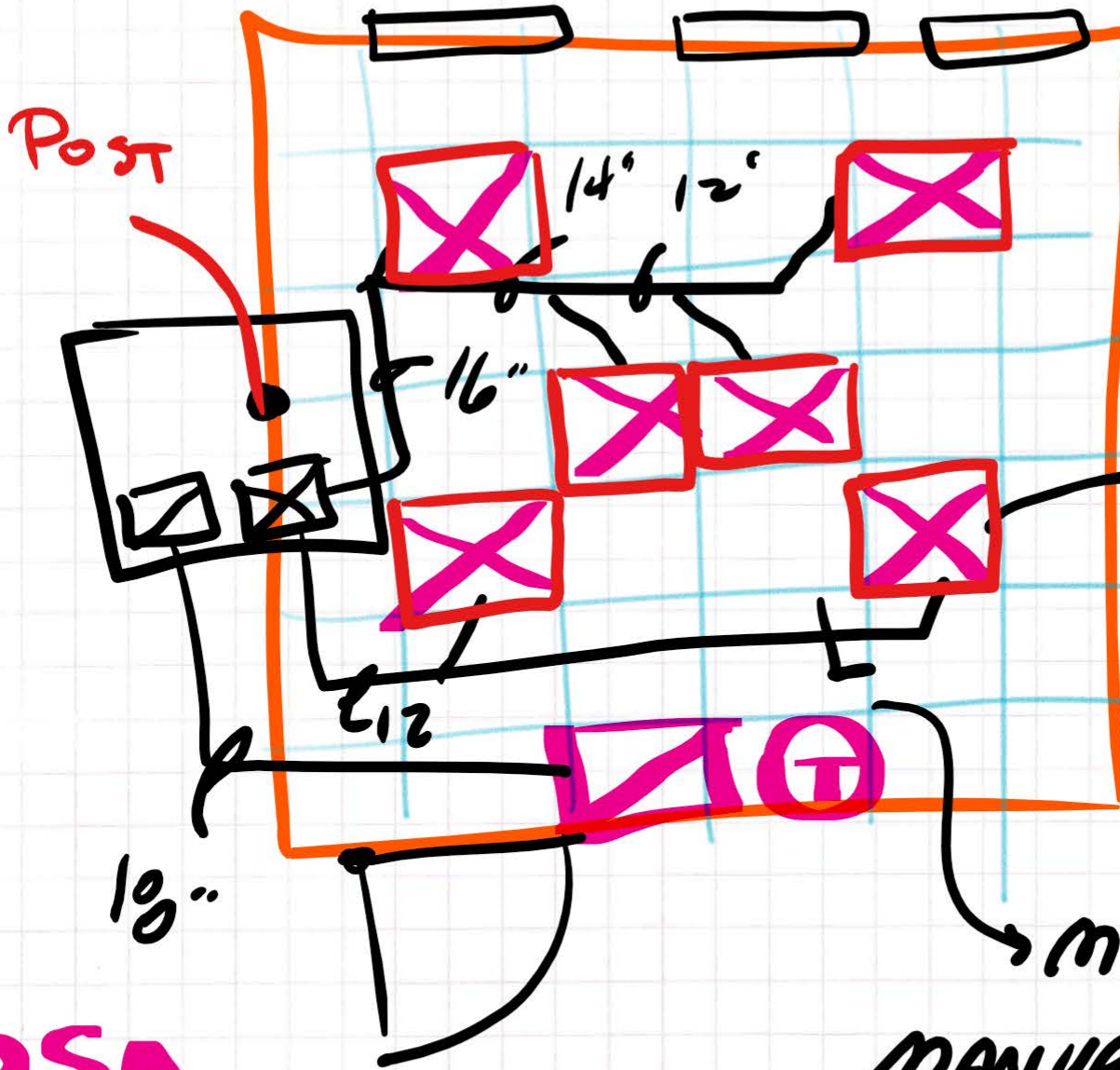
1 TON = 12,000 BTU/HR = 12 $\frac{\text{KBTU}}{\text{HR}}$

3 TON = 36, 4 = 4%, 5 = 60 $\frac{\text{KBTU}}{\text{HR}}$



DAY STON

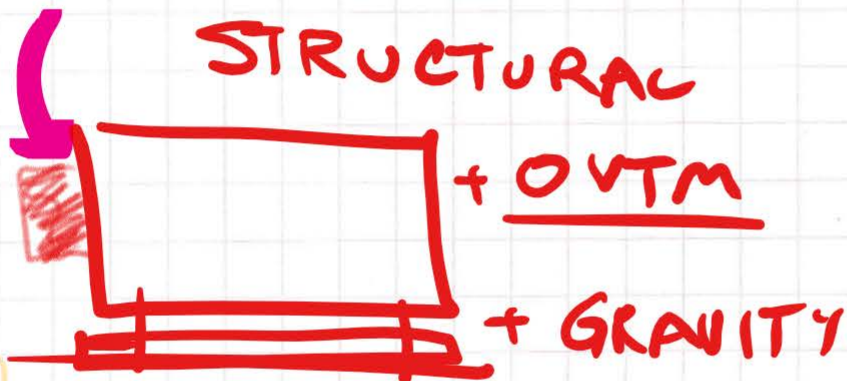
STOP
= 2400
= 2000
CFM



$\frac{2000}{6} =$
 $\sim 333 \text{ CFM}$
EACH
9" OR
10"

MVD
MANUAL
VOLUME
DAMPER

DSA.



SCREENS