



CAD, BOM, and Model Analysis.

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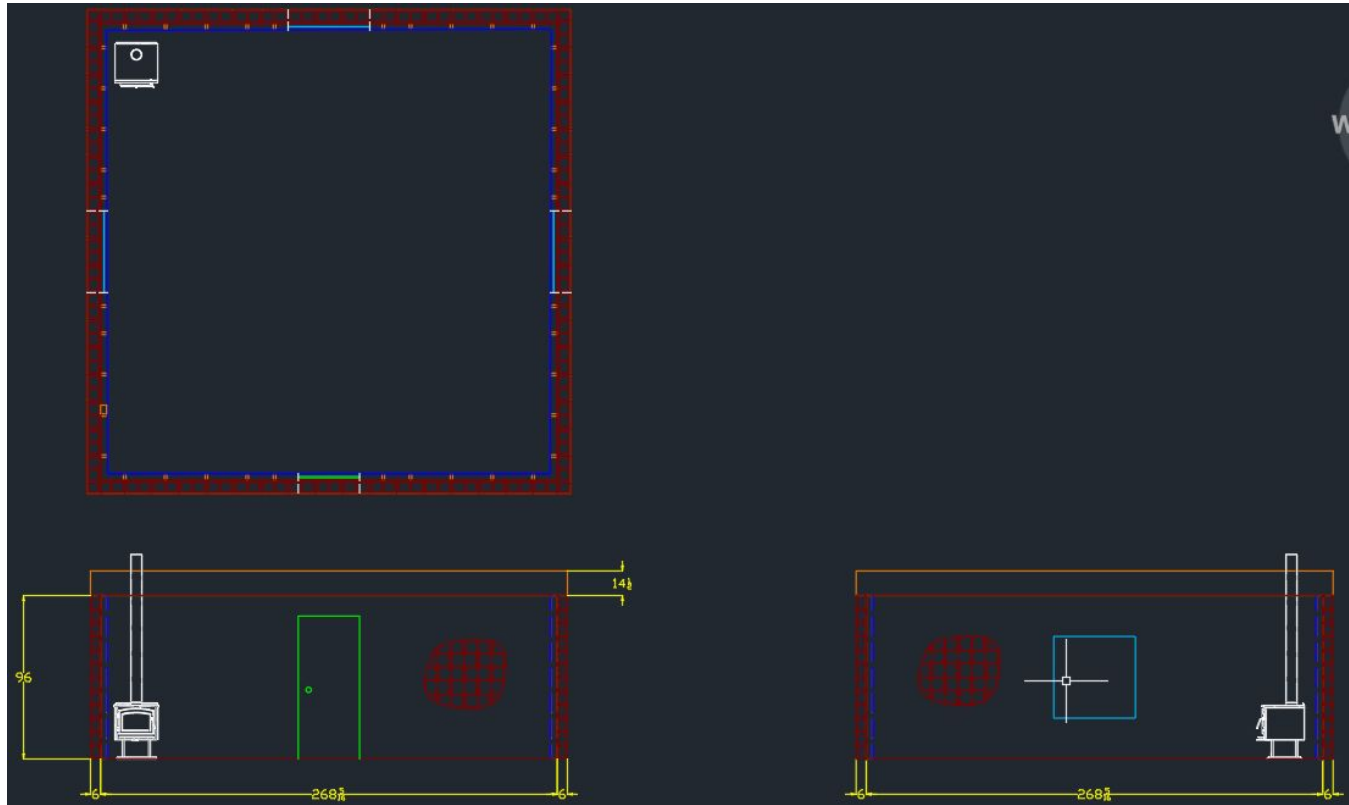
General Assumptions:

- BOM is meant for a 500 sqft home Wall thickness of 10 inches(6"brick, 3.5" air gap, 0.5" sheetrock).
- Total square ft of 4 walls are 688.85.
- Cavity Square feet assumes perfect rectangular prism cavity.
- Insulation blow-in is recommended as a DIY for affordability.
- At settled thickness, cellulose has an R value of approximately $R=3.4-3.8$ per inch of height.
- Assume Flat Roof Height is 1.2 ft high and its cavity is of about 1 ft tall.
- Assume labor will require a 2 day machine rental.
- Note: Insulation is set based on Initial Thickness, but the settled thickness is used to determine R values per inch.
- If Professionals insulate a home assume they take 8 to 10 hours to insulate walls and full ceiling.

General Assumptions Cont.

- Solar furnace in BOM is not the exact same model chosen in the analysis, however they have similar energy output and size
- Costs of installation for the solar furnace and duct work are not included in the BOM
- Estimated cost for installing duct work: ~\$1000 [11]
- Estimated time to install solar furnace and solar panel: ~8 hours [12]
- Estimated cost to install solar furnace and panel: ~\$500 [13]

Model 0: Datum Model (Coal furnace & no insulation)



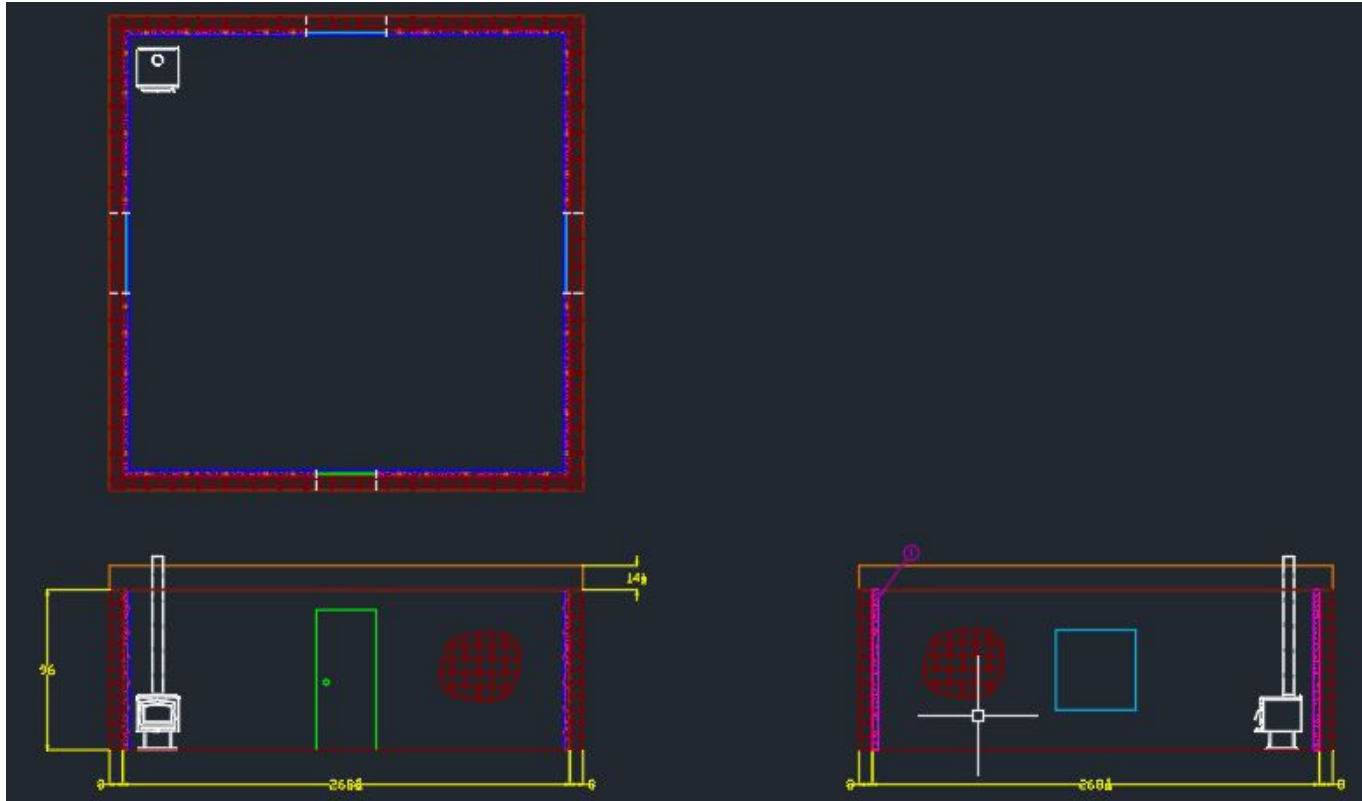
Model 0: Datum Energy Consumption

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	8.97	8.04	7.77	5.67	3.62	1.13	0.24	0.56	1.40	3.78	7.26	9.10	57.53
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	8.97	8.04	7.77	5.67	3.62	1.13	0.24	0.56	1.40	3.78	7.26	9.10	57.53

The datum model determines the yearly energy consumption from coal to be 57.53 BTU *000,000. This is the basis other models will be compared to to consider energy reduction.

Model 1: Insulation in Walls Only.



Model 1 BOM

BILL OF MATERIALS						
ITEM #	QTY	UNITS	DESCRIPTION	VENDOR	PART NUMBER	COST
1	13	EA	R13-60 Blow In Insulation bag	HOME DEPOT	100318635	157.45
2	1	EA	Green Fiber Insulation Blower	Home Depot	N/A	50
3	10	HR	Two Insulators	N/A	N/A	410
4	1	EA	8 oz. Lightweight Spackling	HOME DEPOT	0542HD	3.98
						621.43

Model 1: Btu Cost Analysis

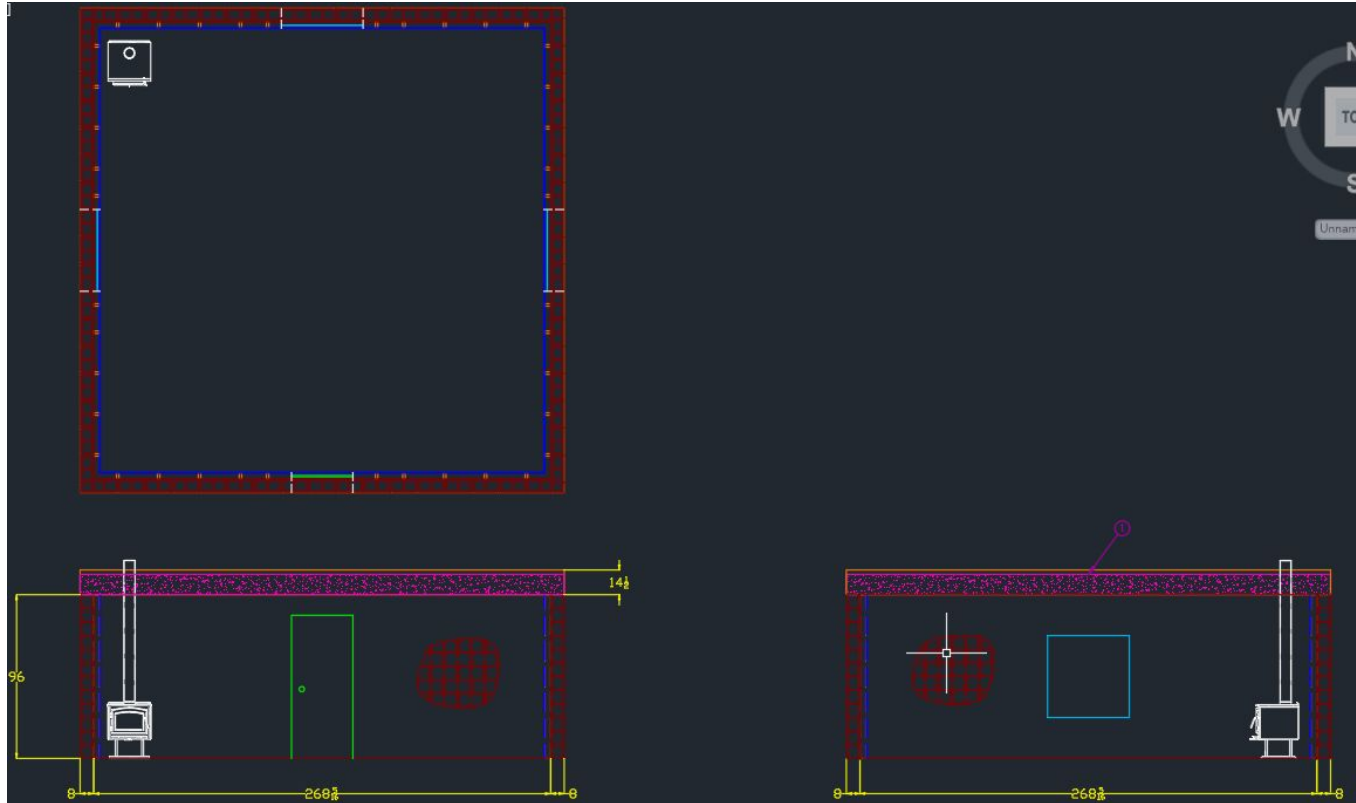
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	7.00	6.10	5.60	3.90	2.38	0.71	0.11	0.31	0.71	2.32	4.59	6.81	40.54
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	7.00	6.10	5.60	3.90	2.38	0.71	0.11	0.31	0.71	2.32	4.59	6.81	40.54

Annual Energy Reduction from Datum: 16.99 BTU *000,000



Model 2: Insulation in Ceiling Only



Model 2 BOM

BILL OF MATERIALS						
ITEM #	QTY	UNITS	DESCRIPTION	VENDOR	PART NUMBER	COST
1	25	EA	R13-60 Blow In Insulation bag	HOME DEPOT	100318635	319.68
2	1	EA	Green Fiber Insulation Blower	Home Depot	N/A	50
3	10	HR	Two Insulators	N/A	N/A	410.00
4	1	EA	8 oz. Lightweight Spackling	HOME DEPOT	0542HD	3.98
						783.66

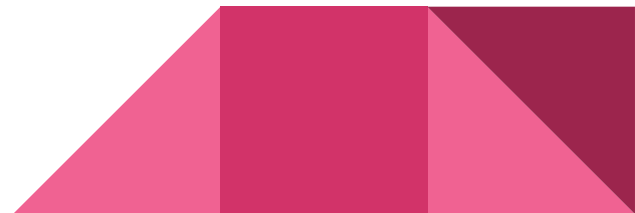
Model 2: Btu Cost Analysis

Gas Consumption (Btu x000,000)

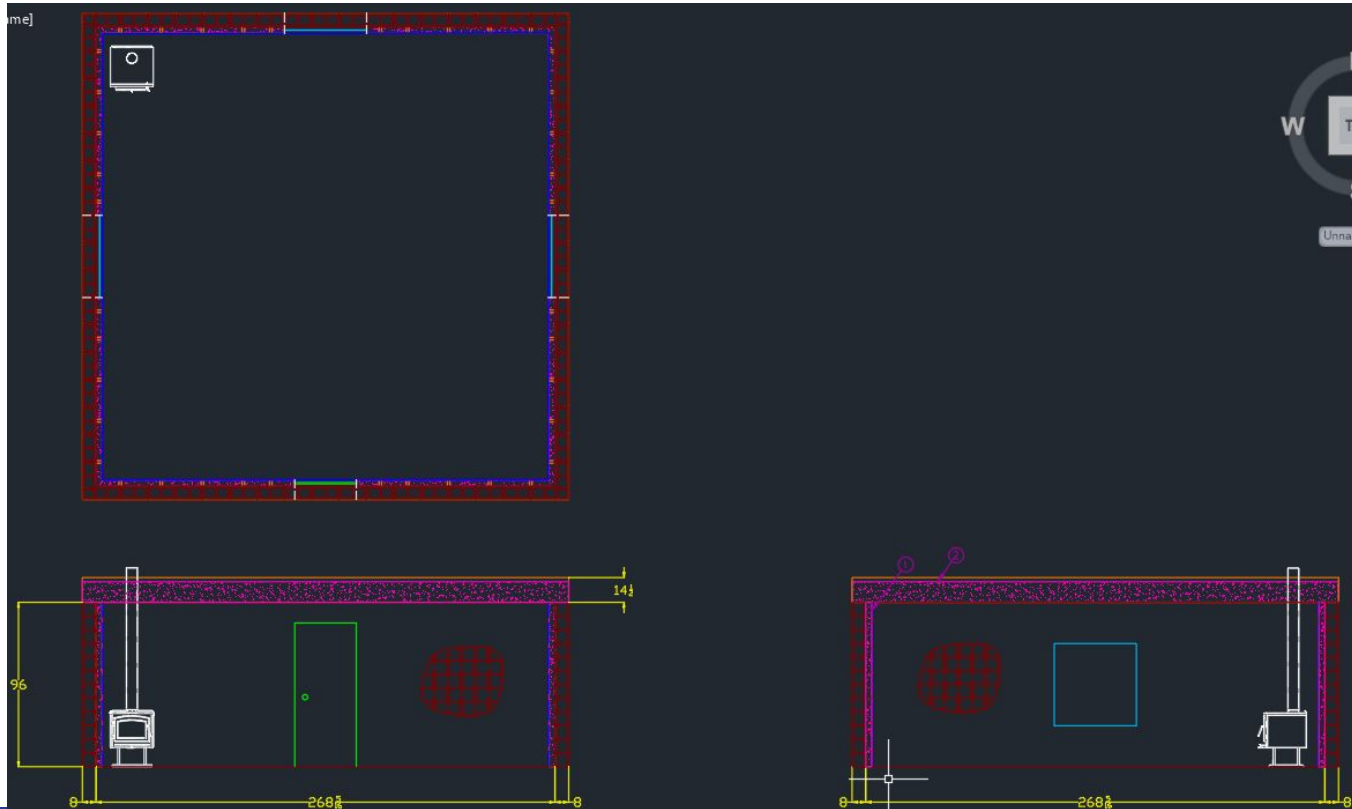
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	8.57	7.74	7.32	5.21	3.17	0.84	0.12	0.29	0.79	2.81	6.23	8.54	51.64
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	8.57	7.74	7.32	5.21	3.17	0.84	0.12	0.29	0.79	2.81	6.23	8.54	51.64

Annual Energy Reduction from Datum: 5.89 BTU *000,000

These results show a much smaller BTU reduction compared to installing only wall insulation.



Model 3: Full Insulation(Walls and Ceiling)



Model 3 BOM

BILL OF MATERIALS						
ITEM #	QTY	UNITS	DESCRIPTION	VENDOR	PART NUMBER	COST
1	13	EA	R13-60 Blow In Insulation bag	HOME DEPOT	100318635	157.45
2	25	EA	R13-60 Blow In Insulation bag	HOME DEPOT	100318635	319.68
3	1	EA	Green Fiber Insulation Blower	Home Depot	N/A	50
4	10	HR	Two Insulators	N/A	N/A	410.00
5	1	EA	8 oz. Lightweight Spackling	HOME DEPOT	0542HD	3.98
						941.11

Model 3: Btu Cost Analysis

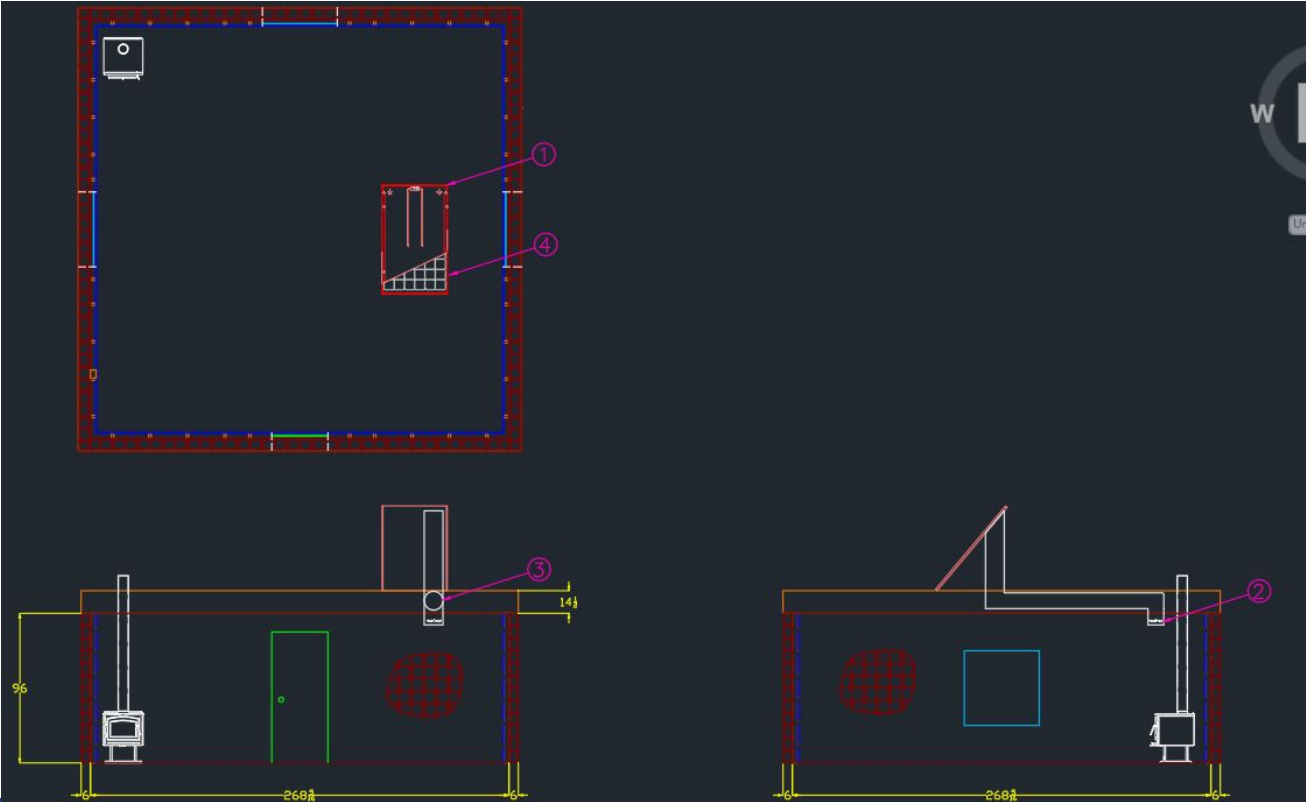
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	5.39	4.86	4.63	3.43	2.19	0.60	0.09	0.16	0.32	1.47	3.31	5.08	31.53
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	5.39	4.86	4.63	3.43	2.19	0.60	0.09	0.16	0.32	1.47	3.31	5.08	31.53

Annual Energy Reduction from Datum: 26 BTU *000,000

The Energy Reduction is much larger when compared to only insulating the walls or ceiling.

Model 4: Datum Model with Solar furnace.



Model 4 BOM

BILL OF MATERIALS						
ITEM #	QTY	UNITS	DESCRIPTION	VENDOR	PART NUMBER	COST
1	1	EA	Solar Furnace	Silicon Solar	N/A	950
2	1	EA	Duct Booster Fan (8 in. diameter)	Amazon	N/A	23.94
3	1	EA	Ducting (25 feet) (12 in. diameter)	Spycor	N/A	50.77
4	1	EA	Solar Panel (100 Watt)	Grape Solar	727458	128.7
						1153.41

Model 4: Btu Cost Analysis


Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.53	3.21	2.98	2.12	1.26	0.30	0.00	0.01	0.07	0.75	2.09	3.31	19.62
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3.53	3.21	2.98	2.12	1.26	0.30	0.00	0.01	0.07	0.75	2.09	3.31	19.62

Annual BTU Reduction from Datum: 37.91 BTU*000,000



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