Design Information

Weather: Berlin Municipal, NH, US

Winter Design Conditions

Outside db	-10	°F
Inside db	70	°F
Design TD	80	°F

Summer Design Conditions

Outside db	82	°F
Inside db	75	°F
Design TD	7	°F
Daily range	M	
Relative humidity	50	%
Moisture difference	12	gr/lb

Heating Summary

Structure	34110	Btuh
Ducts	611	Btuh
Central vent (SER=50% 20 cfm)	835	Btuh
Heat recovery		
Humidification	0	Btuh
Piping	0	Btuh
Equipment load	35555	Btuh

Sensible Cooling Equipment Load Sizing

Structure	10482	Btuh
Ducts	115	Btuh
Central vent (SER=50% 20 cfm)	73	Btuh
Heat recovery		
Blower	0	Btuh
Use manufacturer's data	n	
Rate/swing multiplier	0.87	
Equipment sensible load	9284	Btuh

Infiltration

Method	Blower door
Shielding / stories	3 (partial) / 1
Pressure / AVF	50 Pa / 1185 cfm

	Heating	Cooling
Area (ft²)	1241	1241
Volume (ft³)	15304	15304
Air changes/hour	0.41	0.17
Equiv. AVF (cfm)	104	44

Latent Cooling Equipment Load Sizing

Structure	943	Btuh
Ducts	178	Btuh
Central vent (20 cfm)	156	Btuh
Heat recovery		
Equipment latent load	1276	Btuh
Equipment Total Load (Sen+Lat)	10560	Btuh
Req. total capacity at 0.70 SHR	1.1	ton

Heating Equipment Summary

Make	Generic
Trade	
Model	SEER 18.0, HSPF 9.1
AHRI ref	

Efficiency	9.1 HSPF	
Heating input		
Heating output	11772	Btuh @ 47°F
Temperature rise	28	°F
Actual air flow	394	cfm
Air flow factor	0.011	cfm/Btuh
Static pressure	0	in H2O
Space thermostat		

Capacity balance point = 39 °F

Backup:
Input = 8 kW, Output = 29001 Btuh, 100 AFUE

Cooling Equipment Summary

Make	Generic
Trade	
Cond	SEER 18.0, HSPF 9.1
Coil	
AHRI ref	

Efficiency	14.7 EER, 18 SEER	
Sensible cooling	8281	Btuh
Latent cooling	3549	Btuh
Total cooling	11830	Btuh
Actual air flow	394	cfm
Air flow factor	0.037	cfm/Btuh
Static pressure	0	in H2O
Load sensible heat ratio	0.89	

Calculations approved by ACCA to meet all requirements of Manual J 8th Ed.

Design Conditions

Location:
Berlin Municipal, NH, US
Elevation: 1158 ft
Latitude: 45 °N

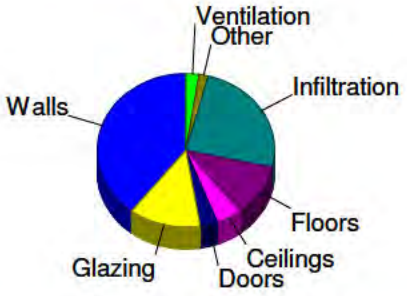
Outdoor:	**Heating**	**Cooling**
Dry bulb (°F)	-10	82
Daily range (°F)	-	24 (M)
Wet bulb (°F)	-	67
Wind speed (mph)	15.0	7.5

Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	80	7
Relative humidity (%)	50	50
Moisture difference (gr/lb)	54.4	12.0

Infiltration:	
Method	Blower door
Shielding / stories	3 (partial) / 1
Pressure / AVF	50 Pa / 1185 cfm

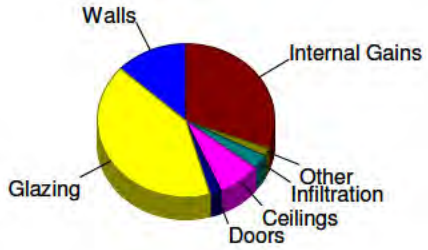
Heating

Component	Btuh/ft²	Btuh	% of load
Walls	6.5	14041	39.5
Glazing	28.2	4656	13.1
Doors	19.9	1113	3.1
Ceilings	1.3	1660	4.7
Floors	3.2	3914	11.0
Infiltration	4.5	8725	24.5
Ducts		611	1.7
Piping		0	0
Humidification		0	0
Ventilation		835	2.3
Adjustments		0	
Total		**35555**	**100.0**



Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	0.7	1406	13.2
Glazing	26.7	4401	41.2
Doors	4.1	229	2.1
Ceilings	0.7	832	7.8
Floors	0	0	0
Infiltration	0.2	323	3.0
Ducts		115	1.1
Ventilation		73	0.7
Internal gains		3290	30.8
Blower		0	0
Adjustments		0	
Total		**10671**	**100.0**



Latent Cooling Load = 1276 Btuh
Overall U-value = 0.065 Btuh/ft²-°F

Data entries checked.

Design Conditions

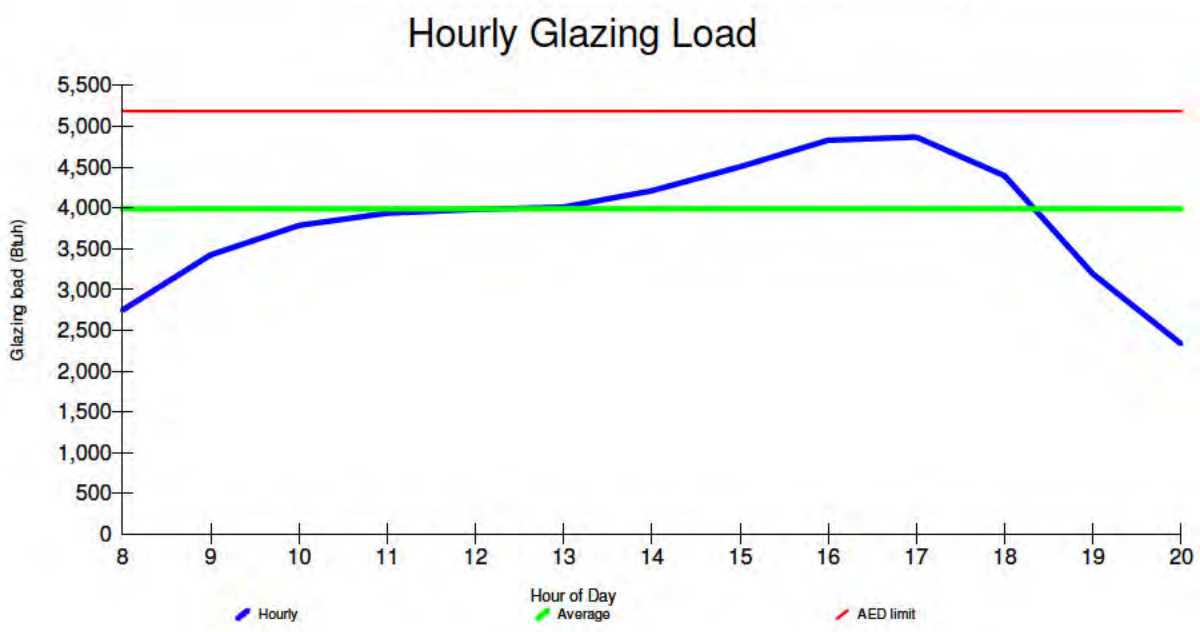
Location:
Berlin Municipal, NH, US
Elevation: 1158 ft
Latitude: 45 °N

Outdoor:	**Heating**	**Cooling**
Dry bulb (°F)	-10	82
Daily range (°F)	-	24 (M)
Wet bulb (°F)	-	67
Wind speed (mph)	15.0	7.5

Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	80	7
Relative humidity (%)	50	50
Moisture difference (gr/lb)	54.4	12.0

Infiltration:

Test for Adequate Exposure Diversity



Maximum hourly glazing load exceeds average by 22.0%.

House has adequate exposure diversity (AED), based on AED limit of 30%.

AED excursion: 0 Btuh

Design Information

	Htg	Clg
Outside db (°F)	-10	82
Inside db (°F)	70	75
Design TD (°F)	80	7
Daily range	-	M
Inside humidity (%)	50	50
Moisture difference (gr/lb)	54	12

Infiltration

Method	Blower door
Shielding / stories	3 (partial) / 1
Pressure / AVF	50 Pa / 1185 cfm

HEATING EQUIPMENT

Make	Generic
Trade	
Model	SEER 18.0, HSPF 9.1
AHRI ref	

Efficiency	9.1 HSPF	
Heating input		
Heating output	11772	Btuh @ 47°F
Temperature rise	28	°F
Actual air flow	394	cfm
Air flow factor	0.011	cfm/Btuh
Static pressure	0	in H2O
Space thermostat		

Capacity balance point = 39 °F

Backup:
Input = 8 kW, Output = 29001 Btuh, 100 AFUE

COOLING EQUIPMENT

Make	Generic
Trade	
Cond	SEER 18.0, HSPF 9.1
Coil	
AHRI ref	

Efficiency	14.7 EER, 18 SEER	
Sensible cooling	8281	Btuh
Latent cooling	3549	Btuh
Total cooling	11830	Btuh
Actual air flow	394	cfm
Air flow factor	0.037	cfm/Btuh
Static pressure	0	in H2O
Load sensible heat ratio	0.89	

ROOM NAME	Area (ft²)	Htg load (Btuh)	Clg load (Btuh)	Htg AVF (cfm)	Clg AVF (cfm)
1 Bed 1	221	5751	1026	65	38
1 Mud Rm	135	8509	2196	97	82
1 Kitchen	289	5576	2482	63	92
1 Bath	92	1792	428	20	16
1 Bed 2	158	5062	1002	57	37
1 Living Rm	276	7897	3416	90	127
1 Hall	70	134	46	2	2

First Floor	1241	34721	10598	394	394
Other equip loads		835	73		
Equip. @ 0.87 RSM			9284		
Latent cooling			1276		
TOTALS	1241	35555	10560	394	394

1	Name of Room					First Floor				1 Bed 1			
2	Running Feet of Exposed Wall					158.5 ft				29.8 ft			
3	Ceiling Ht (Ft) and Gross Wall Area (SqFt)					15.3 ft		4109.7 ft²		16.1 ft		711.0 ft²	
4	Room Dimensions (Ft) and Floor Plan Area (SqFt)							1241.0 ft²		14.5 x 15.3 ft		221.1 ft²	
5	Ceiling Slope (Deg.) and Gross Ceiling Area (SqFt)					0 °		1241.0 ft²		0 °		221.1 ft²	
	Type of Exposure	Const., Number	Panel Faces	HTM		Area or Length	Btuh			Area or Length	Btuh		
				Htg.	Clg.		Heating	S-Clg	L-Clg		Heating	S-Clg	L-Clg
6	Wall	12B-0sw	ne	7.71	1.35	293	1837	322		113	792	139	
.	Glaz	U30 S35	ne	23.85	20.89	10	248	217		10	248	217	
.	Glaz	U55 S55	ne	43.73	33.32	25	1102	840		0	0	0	
.	Door	Door U25	ne	19.88	4.09	19	371	76		0	0	0	
11	Wall	15B-10sfc-6	ne	5.51	0.06	311	1714	19		120	663	7	
	Wall	12B-0sw	se	7.71	1.35	230	1614	283		119	837	147	
	Glaz	U30 S35	se	23.85	27.60	21	496	574		10	248	287	
	Wall	12C-0sw	se	7.23	1.03	104	454	65		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	17	412	477		0	0	0	
	Glaz	U55 S55	se	43.73	43.86	6	240	241		0	0	0	
	Door	Door U25	se	19.88	4.09	19	371	76		0	0	0	
	Wall	15B-10sfc-6	se	5.51	0.06	245	1348	15		127	697	8	
	Wall	12B-0sw	sw	7.71	1.35	207	1375	241		0	0	0	
	Glaz	U30 S35	sw	23.85	27.60	28	676	783		0	0	0	
	Wall	12C-0sw	sw	7.23	1.03	94	676	97		0	0	0	
	Wall	15B-10sfc-6	sw	5.51	0.06	311	1714	19		0	0	0	
	Wall	12B-0sw	nw	7.71	1.35	230	1506	264		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	35	830	727		0	0	0	
	Wall	12C-0sw	nw	7.23	1.03	104	454	65		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	17	412	361		0	0	0	
	Glaz	U55 S55	nw	43.73	33.32	6	240	183		0	0	0	
	Door	Door U25	nw	19.88	4.09	19	371	76		0	0	0	
	Wall	15B-10sfc-6	nw	5.51	0.06	245	1348	15		0	0	0	
	Ceil	R-60 Attic	-	1.34	0.67	1241	1660	832		221	296	148	
	Flor	21A-28t	-	0.53	0.00	1106	584	0		221	117	0	
	Flor	22A-wpm	-	93.81	0.00	135	3330	0		0	0	0	
12	Infiltration	Heating Load (Btuh)		Effect ACH	0.41	WAR 1.00	8725			WAR 0.20	1720		
		Sensible Load (Btuh)			0.17			323				64	
		Latent Load (Btuh)							343				
13	Internal	a Occupants at 230 and 200 Btuh				3		690	600	0		0	0
		b Scenario number						2600				0	
		c Default Adjustments											
		d Custom Appliances						0	0			0	0
		e Plants							0				0
14	Subtotals	Sum lines 6 through 12					34110	10482	943		5617	1012	
15	Duct Loads	EHLF & ESGF		0.018	0.011		611	115			134	14	
		ELG							178				36
16	Ventilation Loads	Vent Cfm	20	E Cfm	20		835	73	156				
17	Winter Humidification Load			Gal/Day	0		0						
18	Piping Load						0						
19	Blower Heat							0					
20	AED Excursion & Latent Moisture Migration Load							0				-5	
21	Total Load	Sum lines 13 through 19					35555	10671	1276		5751	1026	

1	Name of Room					1 Mud Rm				1 Kitchen			
2	Running Feet of Exposed Wall					35.5 ft				23.0 ft			
3	Ceiling Ht (Ft) and Gross Wall Area (SqFt)					8.5 ft		395.3 ft²		16.1 ft		721.3 ft²	
4	Room Dimensions (Ft) and Floor Plan Area (SqFt)					11.0 x 12.3 ft		134.8 ft²		16.5 x 17.5 ft		288.8 ft²	
5	Ceiling Slope (Deg.) and Gross Ceiling Area (SqFt)					0 °		134.8 ft²		0 °		288.8 ft²	
	Type of Exposure	Const., Number	Panel Faces	HTM		Area or Length	Btuh			Area or Length	Btuh		
				Htg.	Clg.		Heating	S-Clg	L-Clg		Heating	S-Clg	L-Clg
6	Wall	12B-0sw	ne	7.71	1.35	0	0	0		0	0	0	
.	Glaz	U30 S35	ne	23.85	20.89	0	0	0		0	0	0	
.	Glaz	U55 S55	ne	43.73	33.32	0	0	0		0	0	0	
.	Door	Door U25	ne	19.88	4.09	0	0	0		0	0	0	
11	Wall	15B-10sfc-6	ne	5.51	0.06	0	0	0		0	0	0	
	Wall	12B-0sw	se	7.71	1.35	0	0	0		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	0	0	0		0	0	0	
	Wall	12C-0sw	se	7.23	1.03	104	454	65		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	17	412	477		0	0	0	
	Glaz	U55 S55	se	43.73	43.86	6	240	241		0	0	0	
	Door	Door U25	se	19.88	4.09	19	371	76		0	0	0	
	Wall	15B-10sfc-6	se	5.51	0.06	0	0	0		0	0	0	
	Wall	12B-0sw	sw	7.71	1.35	0	0	0		43	251	44	
	Glaz	U30 S35	sw	23.85	27.60	0	0	0		10	248	287	
	Wall	12C-0sw	sw	7.23	1.03	94	676	97		0	0	0	
	Wall	15B-10sfc-6	sw	5.51	0.06	0	0	0		137	754	8	
	Wall	12B-0sw	nw	7.71	1.35	0	0	0		137	945	166	
	Glaz	U30 S35	nw	23.85	20.89	0	0	0		14	334	292	
	Wall	12C-0sw	nw	7.23	1.03	104	454	65		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	17	412	361		0	0	0	
	Glaz	U55 S55	nw	43.73	33.32	6	240	183		0	0	0	
	Door	Door U25	nw	19.88	4.09	19	371	76		0	0	0	
	Wall	15B-10sfc-6	nw	5.51	0.06	0	0	0		145	800	9	
	Ceil	R-60 Attic	-	1.34	0.67	135	180	90		289	386	194	
	Flor	21A-28t	-	0.53	0.00	0	0	0		289	152	0	
	Flor	22A-wpm	-	93.81	0.00	135	3330	0		0	0	0	
12	Infiltration	Heating Load (Btuh)		Effect ACH	0.41	WAR 0.16	1368			WAR 0.18	1576		
		Sensible Load (Btuh)			0.17			51				58	
		Latent Load (Btuh)											
13	Internal	a Occupants at 230 and 200 Btuh				0		0	0	0		0	0
		b Scenario number						500				1200	
		c Default Adjustments											
		d Custom Appliances						0	0			0	0
		e Plants							0				0
14	Subtotals	Sum lines 6 through 12					8509	2196			5446	2448	
15	Duct Loads	EHLF & ESGF		0.018	0.011		0	0			130	34	
		ELG							0				46
16	Ventilation Loads	Vent Cfm	20	E Cfm	20								
17	Winter Humidification Load			Gal/Day	0								
18	Piping Load												
19	Blower Heat												
20	AED Excursion & Latent Moisture Migration Load							-85				190	
21	Total Load	Sum lines 13 through 19					8509	2196			5576	2482	

1	Name of Room					1 Bath				1 Bed 2			
2	Running Feet of Exposed Wall					9.0 ft				26.3 ft			
3	Ceiling Ht (Ft) and Gross Wall Area (SqFt)					16.1 ft			375.0 ft²	16.1 ft			627.4 ft²
4	Room Dimensions (Ft) and Floor Plan Area (SqFt)					9.0 x 10.3 ft			92.3 ft²	1.0 x 158.0 ft			158.0 ft²
5	Ceiling Slope (Deg.) and Gross Ceiling Area (SqFt)					0 °			92.3 ft²	0 °			158.0 ft²
	Type of Exposure	Const., Number	Panel Faces	HTM		Area or Length	Btuh			Area or Length	Btuh		
				Htg.	Clg.		Heating	S-Clg	L-Clg		Heating	S-Clg	L-Clg
6	Wall	12B-0sw	ne	7.71	1.35	0	0	0		0	0	0	
.	Glaz	U30 S35	ne	23.85	20.89	0	0	0		0	0	0	
.	Glaz	U55 S55	ne	43.73	33.32	0	0	0		0	0	0	
.	Door	Door U25	ne	19.88	4.09	0	0	0		0	0	0	
11	Wall	15B-10sfc-6	ne	5.51	0.06	0	0	0		0	0	0	
	Wall	12B-0sw	se	7.71	1.35	0	0	0		111	777	136	
	Glaz	U30 S35	se	23.85	27.60	0	0	0		10	248	287	
	Wall	12C-0sw	se	7.23	1.03	0	0	0		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	0	0	0		0	0	0	
	Glaz	U55 S55	se	43.73	43.86	0	0	0		0	0	0	
	Door	Door U25	se	19.88	4.09	0	0	0		0	0	0	
	Wall	15B-10sfc-6	se	5.51	0.06	0	0	0		118	651	7	
	Wall	12B-0sw	sw	7.71	1.35	70	491	86		94	633	111	
	Glaz	U30 S35	sw	23.85	27.60	7	155	179		11	273	316	
	Wall	12C-0sw	sw	7.23	1.03	0	0	0		0	0	0	
	Wall	15B-10sfc-6	sw	5.51	0.06	75	411	5		100	549	6	
	Wall	12B-0sw	nw	7.71	1.35	0	0	0		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	0	0	0		0	0	0	
	Wall	12C-0sw	nw	7.23	1.03	0	0	0		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	0	0	0		0	0	0	
	Glaz	U55 S55	nw	43.73	33.32	0	0	0		0	0	0	
	Door	Door U25	nw	19.88	4.09	0	0	0		0	0	0	
	Wall	15B-10sfc-6	nw	5.51	0.06	0	0	0		0	0	0	
	Ceil	R-60 Attic	-	1.34	0.67	92	123	62		158	211	106	
	Flor	21A-28t	-	0.53	0.00	92	49	0		158	83	0	
	Flor	22A-wpm	-	93.81	0.00	0	0	0		0	0	0	
12	Infiltration	Heating Load (Btuh)		Effect ACH	0.41	WAR 0.06	520			WAR 0.17	1517		
		Sensible Load (Btuh)			0.17			19				56	
		Latent Load (Btuh)											
13	Internal	a Occupants at 230 and 200 Btuh				0		0	0	0		0	0
		b Scenario number						0				0	
		c Default Adjustments											
		d Custom Appliances						0	0			0	0
		e Plants							0				0
14	Subtotals	Sum lines 6 through 12					1750	422			4944	988	
15	Duct Loads	EHLF & ESGF		0.018	0.011		42	6			118	14	
		ELG							15				25
16	Ventilation Loads	Vent Cfm	20	E Cfm	20								
17	Winter Humidification Load			Gal/Day	0								
18	Piping Load												
19	Blower Heat												
20	AED Excursion & Latent Moisture Migration Load							71				-38	
21	Total Load	Sum lines 13 through 19					1792	428			5062	1002	

1	Name of Room					1 Living Rm				1 Hall			
2	Running Feet of Exposed Wall					35.0 ft				0 ft			
3	Ceiling Ht (Ft) and Gross Wall Area (SqFt)					16.1 ft		836.5 ft²		16.1 ft		304.2 ft²	
4	Room Dimensions (Ft) and Floor Plan Area (SqFt)					23.0 x 12.0 ft		276.0 ft²		1.0 x 70.1 ft		70.1 ft²	
5	Ceiling Slope (Deg.) and Gross Ceiling Area (SqFt)					0 °		276.0 ft²		0 °		70.1 ft²	
	Type of Exposure	Const., Number	Panel Faces	HTM		Area or Length	Btuh			Area or Length	Btuh		
				Htg.	Clg.		Heating	S-Clg	L-Clg		Heating	S-Clg	L-Clg
6	Wall	12B-0sw	ne	7.71	1.35	179	1045	183		0	0	0	
.	Glaz	U30 S35	ne	23.85	20.89	0	0	0		0	0	0	
.	Glaz	U55 S55	ne	43.73	33.32	25	1102	840		0	0	0	
.	Door	Door U25	ne	19.88	4.09	19	371	76		0	0	0	
11	Wall	15B-10sfc-6	ne	5.51	0.06	191	1051	12		0	0	0	
	Wall	12B-0sw	se	7.71	1.35	0	0	0		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	0	0	0		0	0	0	
	Wall	12C-0sw	se	7.23	1.03	0	0	0		0	0	0	
	Glaz	U30 S35	se	23.85	27.60	0	0	0		0	0	0	
	Glaz	U55 S55	se	43.73	43.86	0	0	0		0	0	0	
	Door	Door U25	se	19.88	4.09	0	0	0		0	0	0	
	Wall	15B-10sfc-6	se	5.51	0.06	0	0	0		0	0	0	
	Wall	12B-0sw	sw	7.71	1.35	0	0	0		0	0	0	
	Glaz	U30 S35	sw	23.85	27.60	0	0	0		0	0	0	
	Wall	12C-0sw	sw	7.23	1.03	0	0	0		0	0	0	
	Wall	15B-10sfc-6	sw	5.51	0.06	0	0	0		0	0	0	
	Wall	12B-0sw	nw	7.71	1.35	94	562	99		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	21	496	434		0	0	0	
	Wall	12C-0sw	nw	7.23	1.03	0	0	0		0	0	0	
	Glaz	U30 S35	nw	23.85	20.89	0	0	0		0	0	0	
	Glaz	U55 S55	nw	43.73	33.32	0	0	0		0	0	0	
	Door	Door U25	nw	19.88	4.09	0	0	0		0	0	0	
	Wall	15B-10sfc-6	nw	5.51	0.06	100	549	6		0	0	0	
	Ceil	R-60 Attic	-	1.34	0.67	276	369	185		70	94	47	
	Flor	21A-28t	-	0.53	0.00	276	146	0		70	37	0	
	Flor	22A-wpm	-	93.81	0.00	0	0	0		0	0	0	
12	Infiltration	Heating Load (Btuh)		Effect ACH	0.41	WAR 0.23	2023			WAR 0	0		
		Sensible Load (Btuh)			0.17			75				0	
		Latent Load (Btuh)											
13	Internal	a Occupants at 230 and 200 Btuh				3		690	600	0		0	0
		b Scenario number						900				0	
		c Default Adjustments											
		d Custom Appliances						0	0			0	0
		e Plants							0				0
14	Subtotals	Sum lines 6 through 12					7713	3369			131	45	
15	Duct Loads	EHLF & ESGF		0.018	0.011		184	47			3	1	
		ELG							44				11
16	Ventilation Loads	Vent Cfm	20	E Cfm	20								
17	Winter Humidification Load			Gal/Day	0								
18	Piping Load												
19	Blower Heat												
20	AED Excursion & Latent Moisture Migration Load							-131				-2	
21	Total Load	Sum lines 13 through 19					7897	3416			134	46	