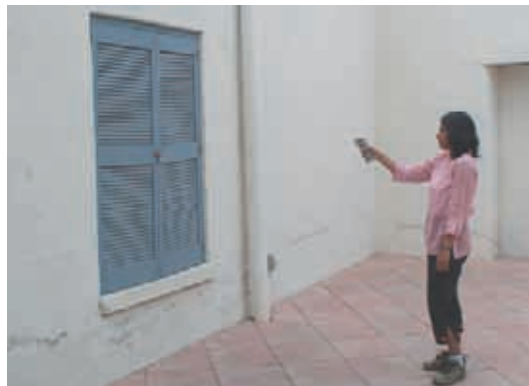


APPENDIX

thermal performance research data

about CalPas3, energy and thermal modeling software:

CalPas is considered one of the most sophisticated energy design/simulation programs for residential and small commercial buildings. It is a useful design tool with a full 8760-hour simulation for predicting the energy performance. It calculates hourly air, surface, and mass temperatures throughout the building, as well as heat transfer among components, the contribution of natural energy to comfort levels, and the mechanical heating or cooling needed to maintain temperatures specified by the designer. The program will model the heating and cooling loads, as well as the exact values of transmittance for each window. Infiltration rates can vary with wind of one-zone or two-zone buildings, with air and storage temperatures (at up to 38 nodes), heat gains and losses, and all heat transfer within the building. Incident solar radiation on each surface is calculated in details, as well as the exact values of transmittance for each window. Infiltration rates can vary with wind speed and indoor-to-outdoor temperature differences. Conduction from a slab or rock bed to an approximate ground temperature is also calculated. You can model any wall or window orientation or type, forced or natural convection between zones, and seasonally and monthly variable shading from shutters, overhangs, and side fins. Ground reflectance can also be specified monthly for each glazing section to represent a horizontal reflector or some special condition. Additionally, movable window insulation, thermal and wind-driven natural convection for cooling (with reduction to account for wind direction), and forced ventilation and evaporative cooling.



(l.) Radbika measures surface temperatures of north facade of Fish House east courtyard using a non-contact infra-red thermal gun. Photo: C. Neumann

(r.) Christina measures surface reflectance of unpaved portions of Fish House east courtyard using a Li-Cor pyrometer. Photo: Radbika Murthy

FIELD MEASUREMENTS

In order to enter the most accurate site data into CalPas 3 for this evaluation of vernacular structures, detailed site information was collected at the case study locations. Measurements were taken at various points on all walls of the building and on the ground surrounding the buildings. Surface temperatures and reflectance were measured in both sun and shade.



Fish House west facade. Photo: C. Neumann

3.23.04 FIELD MEASUREMENTS

FISH STEVENS DUFFIELD HOUSE, MULTICELL HISTORIC ADOBE : TUCSON ARIZONA

WEATHER CONDITIONS

Time	11:00 -13:30		Dew Point (F)	46.4	
Temperature (F)	Mean	76	Humidity	Mean	40
	High	86		High	58
	Low	66		Low	21
Precipitation (in)	3.23.04	0	Wind (mph)	Mean	9.8
	M.T.D.	0.73		Max	15
	Y.T.D.	1.97		Gust	18

SITE CONDITIONS

Tree Details

	x-coord	y-coord	height	diameter	canopy	foliage
Tree 1 (T1) east	15'-2"	1'-6"	25'	24'	6' - 25'	med.
Tree 2 (T2) east	34'	4'-9"	17'	15'	3' - 17'	dense
Tree 3 (T3) east	46'	11'-4"	45'	38'	7' - 45'	dense
Tree 4 (T4) west	8'-11"	48'	14'	9'	5' - 14'	med.
Tree 5 (T5) west	7'-6"	45'-5"	40'	30'	8'- 40'	dense
Tree 6 (T6) west	7'-8"	74'-5"	25'	17'	7'-17'	med.

Temperature (F)

East

T1 (east)	82	T1 Paving (shade)	100
T2 (east)	89	T1 Paving (sun)	104
T3 (east)	87	T2 Foliage in sun	96
wall (shade)	85	door/win. (shade)	104
wall (sun)	86	door/win. (sun)	92
conc. (shade)	85	gravel/ dirt (shade)	89
conc. (sun)	97	gravel/ dirt (sun)	103

Reflectance (btu/ft² hr)

	air	material	a/m		air	material	a/m
dirt (shade around T3)	361.6	55.5	0.15	conc. paving (shade)	352.1	57.1	0.16
dirt (sun around T3)	1268.8	57.1	0.05	conc. paving (sun)	1459.1	269.1	0.18
north wall (shade)	285.5	158.6	0.56	north window (shade)	285.5	22.8	0.08
west wall (shade)	142.5	63.4	0.46	west window (shade)	149	79.3	0.53
west wall (sun)	571	257	0.45	west window (sun)	504.4	19	0.04
red brick paver (sun)	951.6	190.3	0.2				

CALPAS 3 GLOSSARY

CALPAS 3 USER MANUAL Notes, Monthly House Energy Balance

Units and Sign Convention. All values are in kBtu/month. Positive values indicate energy entering the conditioned space. Negative values indicate energy leaving the conditioned space (and going to the outside, or into the storage). Using this convention, all the energy transfers for a unit of time sum to 0.

COND. The energy lost from or gained by the conditioned space due to conduction in kBtu/month. This value includes all transfers through walls and glazing and conduction to the outside of mass elements EXCEPT conduction from the sunspace via UATAHS (on the SSCOUPPING command) and transfer from inside of the sunspace masswall.

SHCOND. The energy lost or gained by the conditioned space via conduction to or from the sunspace, in kBtu/month. The value here is the sum of conduction due to UATAHS coupling specified on the SSCOUPPING command and transfer from the inside of the sunspace masswall. See also MH8.

INFIL. Energy transfer to or from the conditioned space due to infiltration in kBtu/month.

SLR. Total solar gain to conditioned space after the effect of any shutters, shading, solar gain factors, or other gain modifiers; in kBtu/month.

INT. Energy added to the conditioned space by internal gains, in kBtu/month. These gains are specified on the INTGAIN command.

STRG. The net heat gained by or lost from all the house storage combined (masswall, slab, intwall, exwall, rockbed slab, and house air node); in kBtu/month. Over a period of a month, this value is normally relatively small since average mass temperatures usually do not vary greatly.

RB+SS. The sum of the transfer from the rockbed to the house and the transfer from the sunspace to the house, in kBtu/month. These values have been combined to save space on the report.

VENT. Energy removed from conditioned space with outside air ventilation, in kBtu/month.

COOL. Energy removed from the conditioned space by the heating system, in kBtu/month.

HEAT. Energy added to the conditioned space by the heating system, in kBtu/month.

THL, THH, THM. House air temperatures, in degrees Fahrenheit.

- THL** (temperature house low) is the monthly mean of daily minimum house air temperatures
- THH** (temperature house high) is the monthly mean of daily maximum house air temperatures
- THM** (temperature house mean) is the monthly mean of daily house air temperatures

These values show the typical swing of the house air temperature which is useful for assessing comfort conditions, mass effectiveness, and so on.

TSL, TSH, TSM. Sunspace air temperatures, degrees Fahrenheit. Analogous to house temperatures THL, THH, THM.

DBL, DBH, DBM. Outside dry bulb temperatures from the weather file, degrees Fahrenheit. Analogous to house air temperatures THL, THH, THM.

SGL. Mean daily total solar radiation on a horizontal surface (global) from the weather file, Btw/sf.

PEAKS. Peak hourly energy transfers, in kBtu/h, and the day of the month on which each occurred.

- HSCL** is the house cooling hourly peak for the month.
- HSHT** is the house heating hourly peak for the month.
- SSCL** is the sunspace cooling hourly peak for the month.
- SSHT** is the sunspace heating hourly peak for the month.

TUCSON WEATHER TMY1 DATA FILE

File Created By: NADER CHALFOUN Date: APRIL 29, 1991

1. City Name: TUCSON 2. Country Name: USA

3. Latitude [deg]: 32.20 4. Hemisphere: NORTHERN

5. Longitude [deg]: 111.00 6. Elevation [ft]: 2584.00

7. Monthly Average Atmospheric Pressure [in. Hg]: JAN= 27.40 FEB= 27.40
MAR= 27.33 APR= 27.27 MAY= 27.24 JUN= 27.25 JUL= 27.31 AUG= 27.35
SEP= 27.32 OCT= 27.36 NOV= 27.38 DEC= 27.39

8. Monthly Average Hourly Solar Radiation on Hz Surface [BTU/ft²]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	74.9	103.6	128.3	107.5	167.7	160.8	146.5	127.1	123.1	97.1	74.0	49.9

9. Monthly Average Hourly Dry Bulb Temperatures [°F]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	50.3	40.2	43.3	58.0	75.4	89.1	85.0	82.7	81.0	65.7	62.3	54.3

10. Monthly Average Hourly Wet Bulb Temperatures [°F]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	42.0	29.5	30.7	47.0	51.0	59.4	71.7	69.5	59.0	52.4	50.3	42.7

11. Monthly Average Hourly Relative Humidities [%]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	55.1	28.6	19.6	49.3	17.9	17.0	55.6	55.5	29.5	48.6	47.1	41.1

12. Monthly Average Hourly Surface Wind Speeds [mph]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	5.6	4.6	7.7	9.2	8.7	10.6	10.2	7.3	8.5	8.1	9.0	5.4

13. Monthly Ave. Hourly Surface Wind Directions [° clockwise from North]:


	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	116.0	153.5	267.9	211.6	217.2	119.7	176.1	193.8	206.0	143.2	166.6	173.3

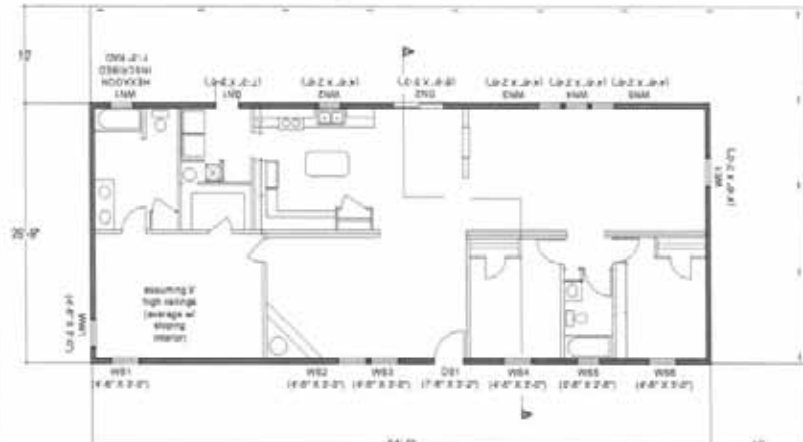
14. Monthly Average Hourly Diffuse Radiation on Hz Surface [BTU/ft²]:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
av	8.0	11.5	17.7	31.7	24.6	24.5	21.6	21.7	17.3	11.2	7.9	12.6

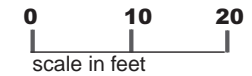
Note: This file is created using the MRT software, a program developed by Dr. N. V. Chalfoun at the Environmental Research Laboratory of the University of Arizona. Correct application and operation of "MRT" is the responsibility of the user. Data was generated from TMY (Typical Meteorological Year) file distributed with the CalPas3 energy simulation software. Actual temperature data may deviate from the one predicted by "HOURLY" due to approximation of values.

SUMMARY OF INPUT

CATEGORIES	MANUFACTURED TRAILER BASE CASE UNINSULATED		
			
SITE	LAT=32 LONG=110 80d E OF 8		
SIZE	DESCRIPTION	BASE	
	OUTSIDE FILM COEFFICIENT	WINDSPEED 8.0 MPH	4.5
INSULATION	WINDFACTOR	SEMI-ENCLOSED URBAN	0.5
	FLOOR AREA (sf)		1650.9
	VOLUME (cf)	AVERAGE 8.75' CEILING	14722.7
	SURFACE AREA WALLS (sf)	WOOD FRAME	1219.7
	SURFACE AREA ROOF (sf)	GREY ASPHALT SHINGLE	1906.4
	TOTAL SURFACE AREA (W+R)		3126.1
	SURFACE TO VOLUME RATIO		17%
	INTERIOR MASS WALL (sf)		
INSULATION	ROOF R VALUE	UNINSULATED	0.04
	WALL R VALUE	UNINSULATED	0.27
	PERIMETER SLAB INSULATION	TJI HUNG ON STEM WALL	
FENESTRATION	SOUTH WINDOW AREA (sf)		55.2
	NORTH WINDOW AREA		45.1
	EAST WINDOW AREA		18.5
	WEST WINDOW AREA		13.5
	TOTAL WINDOW AREA		128.3
	SOUTH WIN./ FLR. AREA RATIO		3.3%
	TOTAL WIN./FLR AREA RATIO		7.7%
	DOUBLE GLAZED LOW-E		NO
	WINDOW MATERIAL		VINYL
	REFLECTIVITY	ROOF REFLECTIVITY	GREY ASPHALT SHINGLE
WALL REFLECTIVITY		LT. BLUE VINYL SIDING	40%
GROUND REFLECTIVITY (april-sept.)		TYP. DESERT GROUND	32
GROUND REFLECTIVITY (oct-march)		TYP. DESERT GROUND	32
BLOWER DOOR	INFILTRATION (AIR CHANGES/ HR.)	NEW HOUSE	9
CONDITIONING	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE



PLAN



SOUTH ELEVATION



WEST ELEVATION



NORTH ELEVATION



EAST ELEVATION

MANUFACTURED HOUSE INSULATED NO VENTILATION

Run: C:\ALINNV.TXT 320 27-MAY-04 12:06:57 Page 1 of 10
 MANUFACTURED INSUL NO VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201

TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1975.4		-2294.2	2175.6	2116.1	-22.0			0	0
FEB	-1930.6		-2371.4	2373.9	1911.3	16.8			0	0
MAR	-2220.6		-2944.1	3109.5	2116.1	-60.8			0	0
APR	-2182.8		-3161.1	3350.6	2047.8	-54.6			0	0
MAY	-2161.1		-3359.7	3422.8	2116.1	-18.1			0	0
JUN	-2023.0		-3191.0	3188.2	2047.8	-22.0			0	0
JUL	-1983.9		-2955.4	2752.3	2116.1	70.9			0	0
AUG	-1934.3		-2863.6	2751.5	2116.1	-69.7			0	0
SEP	-1942.1		-2714.8	2562.7	2047.8	46.4			0	0
OCT	-2057.4		-2678.6	2600.1	2116.1	19.9			0	0
NOV	-1993.6		-2353.8	2210.0	2047.8	89.6			0	0
DEC	-1952.4		-2232.6	2047.4	2116.1	21.5			0	0
TOT	-24357		-33120	32545	24915	18.0			0	0

MONTHLY CONDITIONS (Units as shown)

MON	TEMPERATURES (F)								WTHR (F; Btu/sf) PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	51	72	62				41	63	51	1087	0	0		
FEB	49	77	64				38	66	52	1427	0	0		
MAR	57	87	73				45	74	60	1873	0	0		
APR	65	96	82				51	81	67	2389	0	0		
MAY	72	102	89				56	88	74	2692	0	0		
JUN	84	112	100				70	97	85	2720	0	0		
JUL	86	110	99				75	97	85	2309	0	0		
AUG	84	108	97				74	95	84	2185	0	0		
SEP	80	103	92				70	90	80	1963	0	0		
OCT	68	94	82				58	83	70	1634	0	0		
NOV	57	80	69				47	70	58	1207	0	0		
DEC	50	72	62				41	65	52	1014	0	0		
TOT	67	93	81				56	81	68	1877	0	0		

MANUFACTURED HOUSE INSULATED NATURAL VENTILATION

Run: C:\ALINV.TXT 321 27-MAY-04 12:09:17 Page 1 of 10
 MANUFACTURED INSUL NAT VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201

TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1844.5		-2191.4	2178.7	2116.1	-21.9		-236.90	0	0
FEB	-1566.7		-2085.8	2378.2	1911.3	16.8		-653.83	0	0
MAR	-1057.3		-2031.3	3124.3	2116.1	-42.3		-2109.6	0	0
APR	-152.16		-1567.7	3378.4	2047.8	-17.8		-3688.5	0	0
MAY	479.51		-1287.7	3438.9	2116.1	-31.3		-4715.5	0	0
JUN	902.38		-895.59	3188.2	2047.8	-24.5		-5218.3	0	0
JUL	735.37		-821.81	2752.3	2116.1	50.1		-4832.0	0	0
AUG	619.17		-860.12	2751.5	2116.1	-51.4		-4575.2	0	0
SEP	451.36		-836.82	2562.7	2047.8	44.8		-4269.8	0	0
OCT	-282.59		-1286.0	2616.2	2116.1	14.4		-3178.1	0	0
NOV	-1405.5		-1892.4	2217.4	2047.8	59.6		-1027.0	0	0
DEC	-1719.4		-2049.8	2051.8	2116.1	21.5		-420.17	0	0
TOT	-4840.2		-17806	32639	24915	18.0		-34925	0	0

MONTHLY CONDITIONS (Units as shown)

MON	TEMPERATURES (F)								WTHR (F; Btu/sf) PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	51	71	61				41	63	51	1087	0	0		
FEB	49	74	62				38	66	52	1427	0	0		
MAR	56	80	69				45	74	60	1873	0	0		
APR	62	85	74				51	81	67	2389	0	0		
MAY	66	92	80				56	88	74	2692	0	0		
JUN	74	101	89				70	97	85	2720	0	0		
JUL	78	101	89				75	97	85	2309	0	0		
AUG	76	99	88				74	95	84	2185	0	0		
SEP	73	94	84				70	90	80	1963	0	0		
OCT	65	87	76				58	83	70	1634	0	0		
NOV	56	76	67				47	70	58	1207	0	0		
DEC	50	71	61				41	65	52	1014	0	0		
TOT	63	86	75				56	81	68	1877	0	0		

Note: CALPAS3 is the property of and is licensed by Berkeley Solar Group, 3140 Martin Luther King Jr. Way, Berkeley, CA 94703 (415 843-7600). Correct application and operation of CALPAS3 is the responsibility of the user. Actual building performance may deviate from CALPAS3 predictions due to differences between actual and assumed weather, construction, or occupancy. CALPAS3 is certified for California energy code compliance when used in accordance with the BSG publication "Using CALPAS3 with the California Residential Building Standards."

MANUFACTURED HOUSE NO INSULATION NO VENTING

MANUFACTURED NO INSUL NO VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-2853.7		-1431.3	2191.5	2116.1	-22.6			0	0
FEB	-2749.3		-1561.3	2387.5	1911.3	11.8			0	0
MAR	-3127.5		-2076.6	3132.7	2116.1	-44.6			0	0
APR	-3020.8		-2382.6	3406.5	2047.8	-50.9			0	0
MAY	-2926.1		-2648.6	3483.4	2116.1	-24.8			0	0
JUN	-2698.6		-2541.1	3219.3	2047.8	-27.4			0	0
JUL	-2675.3		-2278.1	2779.3	2116.1	58.1			0	0
AUG	-2645.9		-2195.0	2778.2	2116.1	-53.3			0	0
SEP	-2682.7		-1995.0	2588.0	2047.8	41.8			0	0
OCT	-2931.8		-1861.3	2647.5	2116.1	29.6			0	0
NOV	-2864.0		-1493.0	2227.2	2047.8	81.9			0	0
DEC	-2830.0		-1370.7	2061.7	2116.1	23.0			0	0
TOT	-34006		-23835	32903	24915	22.5			0	0

MONTHLY CONDITIONS (Units as shown)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)			
	THL	THH	THM	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	45	74	58		41	63	51	1087	0	0		
FEB	42	80	60		38	66	52	1427	0	0		
MAR	49	91	69		45	74	60	1873	0	0		
APR	56	101	78		51	81	67	2389	0	0		
MAY	62	108	86		56	88	74	2692	0	0		
JUN	74	117	96		70	97	85	2720	0	0		
JUL	79	115	96		75	97	85	2309	0	0		
AUG	77	113	94		74	95	84	2185	0	0		
SEP	73	108	89		70	90	80	1963	0	0		
OCT	61	98	78		58	83	70	1634	0	0		
NOV	50	82	65		47	70	58	1207	0	0		
DEC	44	75	58		41	65	52	1014	0	0		
TOT	59	97	77		56	81	68	1877	0	0		

MANUFACTURED HOUSE NO INSULATION NATURAL VENTILATION

MANUFACTURED NO INSUL NAT VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)



MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-2320.1		-1336.2	2197.1	2116.1	-22.6		-634.28	0	0
FEB	-1491.9		-1337.2	2394.0	1911.3	11.8		-1487.8	0	0
MAR	48.532		-1510.7	3141.6	2116.1	-42.0		-3753.5	0	0
APR	2128.4		-1465.0	3412.2	2047.8	-34.8		-6088.6	0	0
MAY	3428.1		-1516.4	3483.8	2116.1	-31.5		-7480.1	0	0
JUN	4349.3		-1285.3	3219.3	2047.8	-26.9		-8304.2	0	0
JUL	3378.3		-1199.4	2779.3	2116.1	48.4		-7122.6	0	0
AUG	2948.3		-1198.2	2778.2	2116.1	-45.5		-6598.9	0	0
SEP	2431.4		-1083.7	2588.4	2047.8	41.5		-6025.5	0	0
OCT	928.49		-1173.5	2650.6	2116.1	23.0		-4544.7	0	0
NOV	-1401.2		-1232.3	2232.4	2047.8	78.1		-1724.9	0	0
DEC	-2061.2		-1233.7	2067.9	2116.1	23.0		-912.10	0	0
TOT	12366		-15572	32945	24915	22.5		-54677	0	0

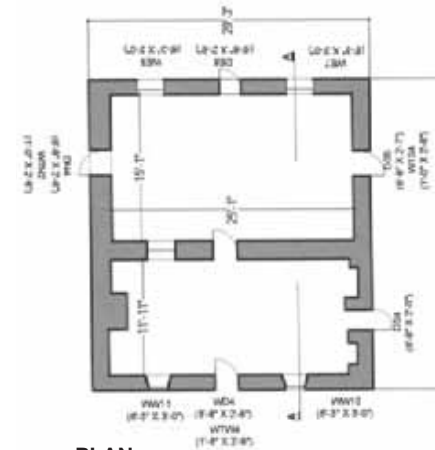
MONTHLY CONDITIONS (Units as shown)-

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)			
	THL	THH	THM	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	45	73	57		41	63	51	1087	0	0		
FEB	42	76	58		38	66	52	1427	0	0		
MAR	49	84	66		45	74	60	1873	0	0		
APR	56	91	74		51	81	67	2389	0	0		
MAY	61	98	81		56	88	74	2692	0	0		
JUN	73	107	91		70	97	85	2720	0	0		
JUL	77	106	91		75	97	85	2309	0	0		
AUG	75	105	89		74	95	84	2185	0	0		
SEP	72	99	85		70	90	80	1963	0	0		
OCT	61	91	75		58	83	70	1634	0	0		
NOV	50	79	64		47	70	58	1207	0	0		
DEC	44	72	57		41	65	52	1014	0	0		
TOT	59	90	74		56	81	68	1877	0	0		

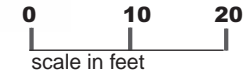
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SUMMARY OF INPUT


CATEGORIES	URBAN CASE #1 DUFFIELD HOUSE		
	 		
	LAT=32 LONG=118 14d E OF S		
SITE	DESCRIPTION		BASE
	OUTSIDE FILM COEFFICIENT	WINDSPEED 7.5 MPH	4.0
	WINDFACTOR	SEMI-ENCLOSED URBAN	0.5
SIZE	FLOOR AREA (sf)		174.4
	VOLUME (cf)	AVERAGE 12' CEILING	802.8
	SURFACE AREA WALLS (sf)	22" ADOBE	1624.3
	SURFACE AREA ROOF (sf)	BUILT UP ROOFING (B.U.R.)	1705.5
	TOTAL SURFACE AREA (W+R)		3329.8
	SURFACE TO VOLUME RATIO		41%
	INTERIOR MASS WALL	1 1/2" ADOBE WALL 2 SIDES x 235.3 SF	18.6 B.T. 470.4 sf
	INSULATION	ROOF R VALUE	NEW B.U.R. ABOVE ORIGINAL EARTH ROOF
	WALL R VALUE	22" ADOBE W/ PLASTER	0.81
	PERIMETER SLAB INSULATION	CONC. SLAB	NO
FENESTRATION	SOUTH WINDOW AREA (sf)	SHUTTERS	2.5
	NORTH WINDOW AREA	SHUTTERS	2.8
	EAST WINDOW AREA	SHUTTERS	41.5
	WEST WINDOW AREA	SHUTTERS	41.5
	TOTAL WINDOW AREA		88.3
	SOUTH WIN./ FLR. AREA RATIO		3%
	TOTAL WIN./FLR AREA RATIO		13%
	DOUBLE GLAZED LOW-E	SINGLE PANE	NO
	WINDOW MATERIAL	LIGHT CURTAINS INSIDE CORALY BLUE SHUTTERS	WOOD
	REFLECTIVITY	ROOF REFLECTIVITY	SILVER PAINTED B.U.R.
WALL REFLECTIVITY		WHITE PLASTER	80%
GROUND REFLECTIVITY (april-sept.)		SITE SURVEYED	0.4
GROUND REFLECTIVITY (oct.-march)		TYP. DESERT GROUND	0.3
BLOWER DOOR	INFILTRATION (AIR CHANGES/ HR.)	150 YR. OLD HOUSE	2.5
CONDITIONING	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE

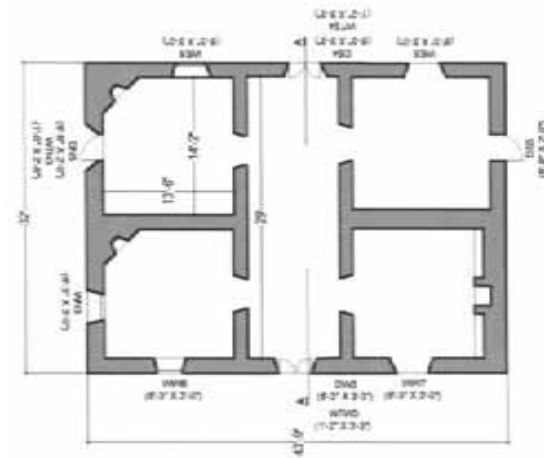


PLAN

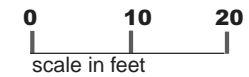


SUMMARY OF INPUT

CATEGORIES	URBAN CASE #2 STEVENS HOUSE		
			
SITE	DESCRIPTION		BASE
	OUTSIDE FILM COEFFICIENT	WINDSPEED 7.5 MPH	4.0
	WINDFACTOR	SEMI-ENCLOSED URBAN	0.5
SIZE	FLOOR AREA (sf)		1019.4
	VOLUME (cf)	AVERAGE 12' CEILING	12232.8
	SURFACE AREA WALLS (sf)	22" ADOBE	2364.5
	SURFACE AREA ROOF (sf)	BUILT UP ROOFING (B.U.R.)	1070.0
	TOTAL SURFACE AREA (W+R)		3434.5
	SURFACE TO VOLUME RATIO		28.1%
	INTERIOR MASS WALL	16" ADOBE WALL 2 SIDES x 850.0 SF	71.3 If 1710.0 m ²
	INSULATION	ROOF R VALUE	NEW B.U.R. ABOVE ORIGINAL EARTH ROOF
	WALL R VALUE	22" ADOBE W/ PLASTER	0.51
	PERIMETER SLAB INSULATION	GONG SLAB	NO
FENESTRATION	SOUTH WINDOW AREA (sf)	SHUTTERS	0.0
	NORTH WINDOW AREA	SHUTTERS	2.6
	EAST WINDOW AREA	SHUTTERS	41.3
	WEST WINDOW AREA	SHUTTERS	41.4
	TOTAL WINDOW AREA		86.3
	SOUTH WIN./ FLR. AREA RATIO		0%
	TOTAL WIN./FLR AREA RATIO		8.3%
	DOUBLE GLAZED LOW-E	SINGLE PANE	NO
	WINDOW MATERIAL	LIGHT CURTAINS INSIDE COBALT BLUE SHUTTERS	WOOD
	REFLECTIVITY	ROOF REFLECTIVITY	SILVER PAINTED B.U.R.
WALL REFLECTIVITY		WHITE PLASTER	80%
GROUND REFLECTIVITY (april-sept.)		SITE SURVEYED	0.4
GROUND REFLECTIVITY (oct.-march)		TYP. DESERT GROUND	0.3
BLOWER DOOR	INFILTRATION (AIR CHANGES/ HR.)	150 YR. OLD HOUSE	2.5
CONDITIONING	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE



PLAN



SOUTH ELEVATION

WEST ELEVATION



NORTH ELEVATION

EAST ELEVATION

URBAN ADOBE: DUFFIELD HOUSE NATURAL VENTILATION
 DUFFIELD BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)
 M O N T H L Y H O U S E E N E R G Y B A L A N C E (kBtu; + into house)

MON	GAINS & LOSSES					TRANSFERS				
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-3093.4		-2.592	1288.8	2116.1	-303		0	0	0
FEB	-3769.1		-2.955	1564.9	1911.3	289		0	0	0
MAR	-2066.2		-2.357	918.47	2116.1	-943	-4.056	0	0	0
APR	-704.52		-1.633	917.54	2047.8	-664	-1588.7	0	0	0
MAY	1165.1		-0.496	434.30	2116.1	-460	-3245.7	0	0	0
JUN	1554.5		-0.312	405.04	2047.8	-978	-3010.2	0	0	0
JUL	337.59		-0.574	335.78	2116.1	743	-3549.3	0	0	0
AUG	955.53		-0.435	325.01	2116.1	-535	-2847.5	0	0	0
SEP	129.57		-0.579	536.01	2047.8	760	-3487.5	0	0	0
OCT	-1012.9		-1.275	601.47	2116.1	484	-2195.5	0	0	0
NOV	-4619.2		-3.168	1359.3	2047.8	1440	-245.00	0	0	0
DEC	-4289.8		-3.051	1194.7	2116.1	962		0	0	0
TOT	-15413		-19.428	9881.3	24915	794		-20174	0	0

M O N T H L Y C O N D I T I O N S (Units as shown)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	59	63	61				41	63	51	1087	0	0		
FEB	61	67	64				38	66	52	1427	0	0		
MAR	66	71	68				45	74	60	1873	0	0		
APR	70	76	73				51	81	67	2389	0	0		
MAY	71	79	76				56	88	74	2692	0	0		
JUN	81	89	86				70	97	85	2720	0	0		
JUL	84	91	88				75	97	85	2309	0	0		
AUG	82	88	86				74	95	84	2185	0	0		
SEP	78	85	82				70	90	80	1963	0	0		
OCT	72	77	75				58	83	70	1634	0	0		
NOV	68	72	70				47	70	58	1207	0	0		
DEC	61	65	63				41	65	52	1014	0	0		
TOT	71	77	74				56	81	68	1877	0	0		

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URBAN ADOBE: STEVENS HOUSE NATURAL VENTILATION
 STEVENS BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)
 M O N T H L Y H O U S E E N E R G Y B A L A N C E (kBtu; + into house)

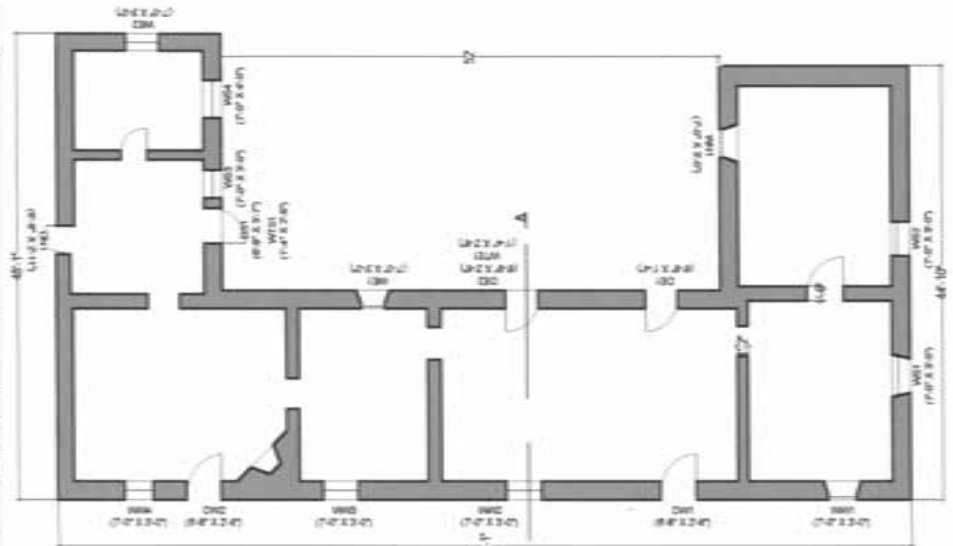
MON	GAINS & LOSSES					TRANSFERS				
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1079.5		-1556.2	1060.9	2116.1	-529			0	0
FEB	-1829.6		-1943.7	1310.1	1911.3	539			0	0
MAR	66.394		-1318.3	799.84	2116.1	-1628			0	0
APR	215.17		-1450.0	844.45	2047.8	-1622			0	0
MAY	113.83		-1552.6	396.28	2116.1	-1051			0	0
JUN	604.62		-1274.5	378.67	2047.8	-1718			0	0
JUL	-1582.3		-2055.3	316.32	2116.1	1179			0	0
AUG	-220.88		-1482.8	297.16	2116.1	-694			0	0
SEP	-1715.6		-2007.5	480.55	2047.8	1169			0	0
OCT	-1906.5		-2013.8	506.60	2116.1	1269			0	0
NOV	-3544.9		-2602.3	1112.9	2047.8	2923			0	0
DEC	-2556.3		-2138.0	972.13	2116.1	1571			0	0
TOT	-13436		-21395	8475.9	24915	1408			0	0

M O N T H L Y C O N D I T I O N S (Units as shown)

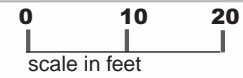
MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	53	57	55				41	63	51	1087	0	0		
FEB	54	60	57				38	66	52	1427	0	0		
MAR	60	65	63				45	74	60	1873	0	0		
APR	68	73	71				51	81	67	2389	0	0		
MAY	75	80	78				56	88	74	2692	0	0		
JUN	85	90	88				70	97	85	2720	0	0		
JUL	89	92	90				75	97	85	2309	0	0		
AUG	86	89	87				74	95	84	2185	0	0		
SEP	83	86	85				70	90	80	1963	0	0		
OCT	73	77	75				58	83	70	1634	0	0		
NOV	62	66	64				47	70	58	1207	0	0		
DEC	55	59	57				41	65	52	1014	0	0		
TOT	70	75	73				56	81	68	1877	0	0		

SUMMARY OF INPUT

CATEGORIES	URBAN CASE #3 FISH HOUSE			
	 			
SITE	LAT=32 LONG=110 14d E OF 5			
	DESCRIPTION		BASE	
SIZE	OUTSIDE FILM COEFFICIENT	WINDSPEED 7.5 MPH	4.0	
	WINDFACTOR	SEMI-ENCLOSED URBAN	0.5	
	FLOOR AREA (sf)		2135.0	
INSULATION	VOLUME (cf)	AVERAGE 12' CEILING	25630.8	
	SURFACE AREA WALLS (sf)	22" ADOBE	5337.1	
	SURFACE AREA ROOF (sf)	BUILT UP ROOFING (B.U.R.)	2242.7	
	TOTAL SURFACE AREA (W+R)		7579.8	
	SURFACE TO VOLUME RATIO		29.8%	
	INTERIOR MASS WALL	14" ADOBE WALL 2 SIDES x 927.8 SF		77.3 F 1855.2 sf
	ROOF R VALUE	NEW 8.11" ADOBE ORIGINAL EARTH ROOF		0.2
FENESTRATION	WALL R VALUE	22" ADOBE W/ PLASTER	0.51	
	PERIMETER SLAB INSULATION	CONC. SLAB	NO	
REFLECTIVITY	SOUTH WINDOW AREA (sf)	SHUTTERS	94.3	
	NORTH WINDOW AREA	SHUTTERS	21.0	
	EAST WINDOW AREA	SHUTTERS	48.6	
	WEST WINDOW AREA	SHUTTERS	92.5	
	TOTAL WINDOW AREA		256.4	
	SOUTH WIN./ FLR. AREA RATIO		4.0%	
	TOTAL WIN./FLR AREA RATIO		12%	
	DOUBLE GLAZED LOW-E	SINGLE PANE		NO
	WINDOW MATERIAL	LIGHT CURTAINS INSIDE COBALT BLUE SHUTTERS		WOOD
	BLOWER DOOR	ROOF REFLECTIVITY	SILVER PAINTED B.U.R.	81%
WALL REFLECTIVITY		WHITE PLASTER	80%	
GROUND REFLECTIVITY (april-augpt.)		SITE SURVEYED		0.4
GROUND REFLECTIVITY (oct.-march)		TYP. DESERT GROUND		0.3
CONDITIONING	INFILTRATION (AIR CHANGES/ HR.)	150 YR. OLD HOUSE	2.5	
	NATURAL VENTILATION		YES	
	HEATING & COOLING SYSTEM	PASSIVE	NONE	



PLAN



WEST ELEVATION



EAST ELEVATION



SOUTH ELEVATION

NORTH ELEVATION

URBAN ADOBE: FISH HOUSE NO VENTILATION

FISH NO VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)
 M O N T H L Y H O U S E E N E R G Y B A L A N C E (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1953.7		-3310.4	4349.9	2116.1	-1178			0	0
FEB	-3453.9		-4065.1	4500.5	1911.3	1084			0	0
MAR	1443.6		-2448.9	2244.7	2116.1	-3292			0	0
APR	1813.6		-2740.9	2230.3	2047.8	-3287			0	0
MAY	1817.3		-2894.2	1074.3	2116.1	-2075			0	0
JUN	2797.9		-2373.8	983.41	2047.8	-3390			0	0
JUL	-1765.6		-3724.1	865.58	2116.1	2459			0	0
AUG	1140.2		-2581.3	882.07	2116.1	-1525			0	0
SEP	-2423.7		-3760.8	1693.8	2047.8	2397			0	0
OCT	-2796.0		-3747.3	1906.6	2116.1	2474			0	0
NOV	-7175.5		-5342.3	4460.3	2047.8	5898			0	0
DEC	-5221.5		-4462.1	4248.3	2116.1	3255			0	0
TOT	-15777		-41451	29440	24915	2819			0	0

M O N T H L Y C O N D I T I O N S (Units as shown)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	53	58	55				41	63	51	1087	0	0		
FEB	54	60	57				38	66	52	1427	0	0		
MAR	59	65	62				45	74	60	1873	0	0		
APR	67	73	70				51	81	67	2389	0	0		
MAY	74	80	77				56	88	74	2692	0	0		
JUN	84	90	87				70	97	85	2720	0	0		
JUL	88	92	90				75	97	85	2309	0	0		
AUG	85	89	87				74	95	84	2185	0	0		
SEP	82	86	84				70	90	80	1963	0	0		
OCT	72	77	74				58	83	70	1634	0	0		
NOV	62	67	64				47	70	58	1207	0	0		
DEC	54	59	57				41	65	52	1014	0	0		
TOT	69	75	72				56	81	68	1877	0	0		

URBAN ADOBE: FISH HOUSE NATURAL VENTILATION

FISH NAT VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)
 M O N T H L Y H O U S E E N E R G Y B A L A N C E (kBtu; + into house)


MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1982.8		-3284.0	4349.9	2116.1	-1176		0	0	0
FEB	-3488.0		-4033.9	4500.5	1911.3	1087		0	0	0
MAR	1384.5		-2405.6	2244.7	2116.1	-3276		0	0	0
APR	2450.0		-2279.4	2236.0	2047.8	-3142		-1256.7	0	0
MAY	4774.0		-734.64	1076.8	2116.1	-1678		-5524.6	0	0
JUN	6174.5		32.846	983.41	2047.8	-3212		-5967.5	0	0
JUL	2422.9		-783.64	865.58	2116.1	2490		-7166.9	0	0
AUG	4482.3		-258.91	882.07	2116.1	-1804		-5371.8	0	0
SEP	1592.2		-896.95	1693.8	2047.8	2561		-7048.5	0	0
OCT	-582.67		-2234.9	1908.9	2116.1	1854		-3090.4	0	0
NOV	-7172.8		-5296.2	4460.5	2047.8	5865		-14.840	0	0
DEC	-5242.7		-4435.4	4248.3	2116.1	3250		0	0	0
TOT	4811.2		-26611	29451	24915	2821		-35441	0	0

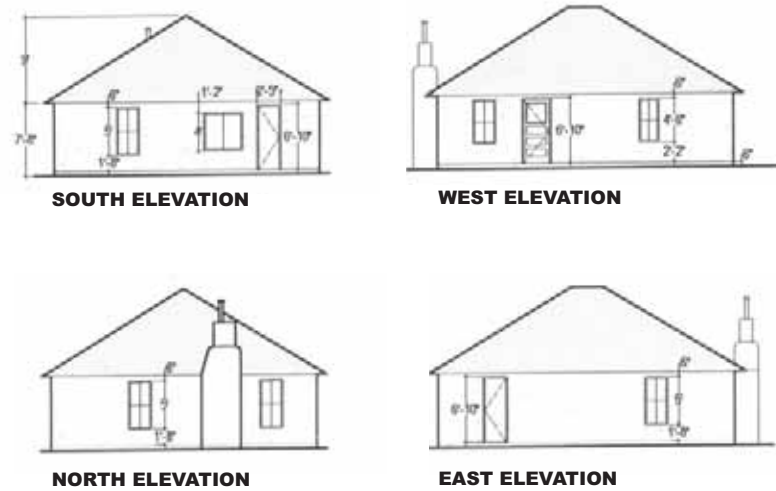
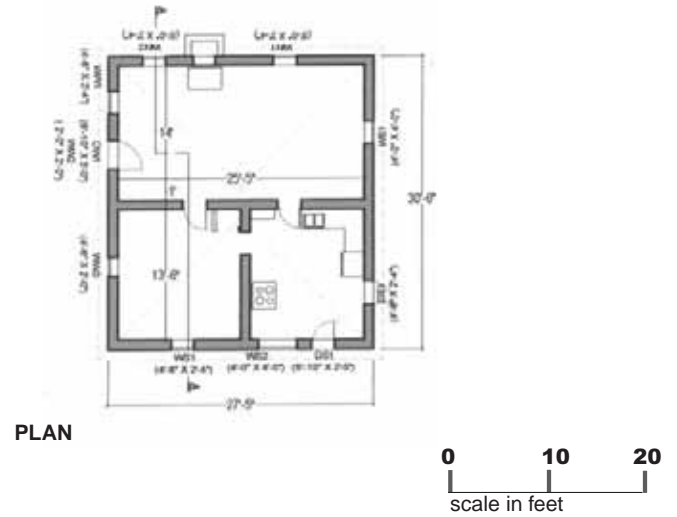
M O N T H L Y C O N D I T I O N S (Units as shown)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	53	58	55				41	63	51	1087	0	0		
FEB	54	60	57				38	66	52	1427	0	0		
MAR	59	65	62				45	74	60	1873	0	0		
APR	66	73	70				51	81	67	2389	0	0		
MAY	70	78	75				56	88	74	2692	0	0		
JUN	80	88	84				70	97	85	2720	0	0		
JUL	83	89	86				75	97	85	2309	0	0		
AUG	81	87	84				74	95	84	2185	0	0		
SEP	77	84	81				70	90	80	1963	0	0		
OCT	70	75	73				58	83	70	1634	0	0		
NOV	62	67	64				47	70	58	1207	0	0		
DEC	54	59	57				41	65	52	1014	0	0		
TOT	67	74	71				56	81	68	1877	0	0		


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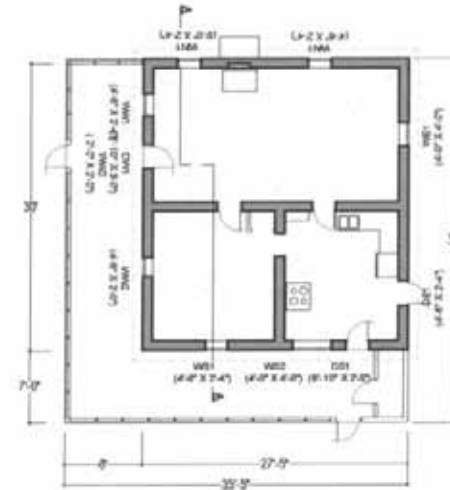
SUMMARY OF INPUT

CATEGORIES	RURAL CASE #1 UPSHAW PHASE 1: SQUARE ADOBE PLAN		
			
SITE	LAT=31 LONG=108 7d E OF 6		
SIZE	DESCRIPTION		BASE
	OUTSIDE FILM COEFFICIENT	AVE. WINDSPEED 15.0 MPH	6.0
INSULATION	WINDFACTOR	OPEN SITE A FEW LARGE TREES	0.75
	FLOOR AREA (sf)		629.7
	VOLUME (cf)	AVERAGE 7.75' CEILING	4827.8
	SURFACE AREA WALLS (sf)	12" ADOBE	893.7
	SURFACE AREA ROOF (sf)	SILVER GALV. MTL. ROOF	1122.0
	TOTAL SURFACE AREA (W+R)		1815.7
	SURFACE TO VOLUME RATIO		37.6%
	INTERIOR MASS WALL	12" ADOBE WALL 2 SIDES x 252.8 SF	31.8 B 505.6 SF
FENESTRATION	ROOF R VALUE	GALV. METAL W/ ROCK WOOL INSUL.	0.1
	WALL R VALUE	12" ADOBE W/ PLASTER	0.83
REFLECTIVITY	PERIMETER SLAB INSULATION	CONC. SLAB	NO
	SOUTH WINDOW AREA (sf)		27.5
	NORTH WINDOW AREA		23.0
	EAST WINDOW AREA		11.5
	WEST WINDOW AREA		23.8
	TOTAL WINDOW AREA		102.3
	SOUTH WIN./ FLR. AREA RATIO		4.4%
	TOTAL WIN./FLR AREA RATIO		13.8%
	DOUBLE GLAZED LOW-E	SINGLE PANE	NO
	WINDOW MATERIAL	NO LIGHT CURTAINS NO SHUTTERS	WOOD
BLOWER DOOR	ROOF REFLECTIVITY	SILVER GALV. MTL. ROOF	61%
	WALL REFLECTIVITY	WHITE PLASTER	80%
	GROUND REFLECTIVITY (april-sept.)	GRASSLAND -DRY	0.32
	GROUND REFLECTIVITY (oct.-march)	GRASSLAND -DRY	0.32
CONDITIONING	INFILTRATION (AIR CHANGES/ HR.)	75 YR. OLD HOUSE	2.5
	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE

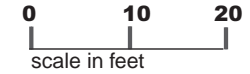


SUMMARY OF INPUT

CATEGORIES	RURAL CASE #2 UPSHAW PHASE 2: PORCH ADDITION		
			
SITE	LAT=31 LONG=108 7d E OF S		
	DESCRIPTION		BASE
SIZE	OUTSIDE FILM COEFFICIENT	AVE. WINDSPEED 15.0 MPH	6.0
	WINDFACTOR	OPEN SITE A FEW LARGE TREES	0.75
SIZE	FLOOR AREA (sf)		629.7
	VOLUME (cf)	AVERAGE 7.75' CEILING	4827.9
	SURFACE AREA WALLS (sf)	12" ADOBE	693.7
	SURFACE AREA ROOF (sf)	SILVER GALV. MTL. ROOF	1122.0
	TOTAL SURFACE AREA (W+R)		1815.7
	SURFACE TO VOLUME RATIO		37.6%
	INTERIOR MASS WALL	12" ADOBE WALL 2 SIDES x XXX SF	51.8 SF 806.6 sf
	INSULATION	ROOF R VALUE	GALV. METAL W/ ROCK WOOL INSUL.
WALL R VALUE		12" ADOBE W/ PLASTER	0.03
PERIMETER SLAB INSULATION		CONC. SLAB	NO
FENESTRATION	SOUTH WINDOW AREA (sf)	7.5' DEEP PORCH	27.5
	NORTH WINDOW AREA		23.0
	EAST WINDOW AREA		11.5
	WEST WINDOW AREA	8' DEEP PORCH	23.8
	TOTAL WINDOW AREA		85.8
	SOUTH WIN./ FLR. AREA RATIO		4.4%
	TOTAL WIN./FLR AREA RATIO		13.6%
	DOUBLE GLAZED LOW-E	SINGLE PANE	NO
	WINDOW MATERIAL	NO LIGHT CURTAINS NO SHUTTERS	WOOD
	REFLECTIVITY	ROOF REFLECTIVITY	SILVER GALV. MTL. ROOF
WALL REFLECTIVITY		WHITE PLASTER	80%
GROUND REFLECTIVITY (april-sept.)		GRASSLAND -DRY	0.32
GROUND REFLECTIVITY (oct.-march)		GRASSLAND -DRY	0.32
BLOWER DOOR	INFILTRATION (AIR CHANGES/ HR.)	75 YR. OLD HOUSE	2.5
CONDITIONING	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE



PLAN



SOUTH ELEVATION



WEST ELEVATION





NORTH ELEVATION



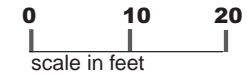
EAST ELEVATION

SUMMARY OF INPUT

CATEGORIES	RURAL CASE #X UPSHAW PHASE		
			
	LAT=31 LONG=108 7d E OF 8		
SITE	DESCRIPTION		BASE
	OUTSIDE FILM COEFFICIENT	AVE. WINDSPEED 15.0 MPH	8.0
SIZE	WINDFACTOR	OPEN SITE A FEW LARGE TREES	0.75
	FLOOR AREA (sf)		1169.5
	VOLUME (cf)	AVERAGE 7.75' CEILING	15305.9
	SURFACE AREA WALLS (sf)	12" ADOBE	1186.1
	SURFACE AREA ROOF (sf)	SILVER GALV. MTL. ROOF	1731.8
	TOTAL SURFACE AREA (W+R)		2918.9
	SURFACE TO VOLUME RATIO		19%
INSULATION	INTERIOR MASS WALL	12" ADOBE WALL 2 SIDES x 367.6 SF	44.7 # 715.2 sf
	ROOF R VALUE	GALV. METAL W/ ROCK WOOL INSUL.	0.1
	WALL R VALUE	12" ADOBE W/ PLASTER	0.93
FENESTRATION	PERIMETER SLAB INSULATION	CONG. SLAB	NO
	SOUTH WINDOW AREA (sf)	DEEP PORCH PARTIAL COVERAGE	39.3
	NORTH WINDOW AREA		37.0
	EAST WINDOW AREA		24.0
	WEST WINDOW AREA	DEEP PORCH PARTIAL COVERAGE	23.8
	TOTAL WINDOW AREA		124.1
	SOUTH WIN./ FLR. AREA RATIO		3.3%
	TOTAL WIN./FLR AREA RATIO		10.6%
	DOUBLE GLAZED LOW-E	SINGLE PANE	NO
	WINDOW MATERIAL	NO LIGHT CURTAINS NO SHUTTERS	WOOD
	REFLECTIVITY	ROOF REFLECTIVITY	SILVER GALV. MTL. ROOF
WALL REFLECTIVITY		WHITE PLASTER	80%
GROUND REFLECTIVITY (april-sept.)		GRASSLAND DRY	0.32
GROUND REFLECTIVITY (oct.-march)		GRASSLAND DRY	0.32
BLOWER DOOR	INFILTRATION (AIR CHANGES/ HR.)	75 YR. OLD HOUSE	2.5
CONDITIONING	NATURAL VENTILATION		YES
	HEATING & COOLING SYSTEM	PASSIVE	NONE



PLAN



SOUTH ELEVATION



NORTH ELEVATION



WEST ELEVATION



EAST ELEVATION

RURAL ADOBE: UPSHAW 1- NATURAL VENTILATION

UPSHW 1 BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

* Note: Graphs reflect adjusted temperatures for cooler climate
 Sierra Vista AZ (higher elev.) vs. Tucson AZ
 Sierra Vista Ave. DBT Oct.-March (winter) - 9% < Tucson
 Sierra Vista Ave. DBT April-September (summer) - 8% < Tucson

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-2146.9		-1213.1	1482.4	2116.1	-231		0	0	0
FEB	-2205.8		-1228.8	1444.5	1911.3	76.0		0	0	0
MAR	-1985.5		-1254.1	1623.7	2116.1	-398	-88.534	0	0	0
APR	-1244.0		-955.56	1578.7	2047.8	-278	-1143.6	0	0	0
MAY	-419.22		-593.14	1697.9	2116.1	-154	-2642.6	0	0	0
JUN	-191.19		-476.77	1601.2	2047.8	-212	-2762.2	0	0	0
JUL	-445.10		-486.91	1392.6	2116.1	334	-2921.2	0	0	0
AUG	-191.63		-446.48	1369.8	2116.1	-368	-2467.4	0	0	0
SEP	-502.53		-483.66	1401.7	2047.8	313	-2786.8	0	0	0
OCT	-1283.7		-844.01	1617.0	2116.1	138	-1747.8	0	0	0
NOV	-2759.6		-1395.6	1505.1	2047.8	694	-112.18	0	0	0
DEC	-2588.3		-1346.0	1461.5	2116.1	345		0	0	0
TOT	-15963		-10724	18176	24915	260	-16672	0	0	0

MONTHLY CONDITIONS (Units as shown)

* THM adjusted to right of THM w/ Tucson AZ Weather Files)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	56	62	59 (55)				41	63	51	1108	0	0		
FEB	56	64	60 (56)				38	66	52	1447	0	0		
MAR	63	71	67 (62)				45	74	60	1889	0	0		
APR	68	78	73 (67)				51	81	67	2401	0	0		
MAY	71	83	78 (72)				56	88	74	2694	0	0		
JUN	81	93	88 (81)				70	97	85	2721	0	0		
JUL	84	94	88 (81)				75	97	85	2313	0	0		
AUG	82	91	87 (80)				74	95	84	2193	0	0		
SEP	78	87	83 (76)				70	90	80	1978	0	0		
OCT	71	80	75 (69)				58	83	70	1654	0	0		
NOV	63	70	67 (62)				47	70	58	1228	0	0		
DEC	57	63	60 (55)				41	65	52	1034	0	0		
TOT	69	78	74 (68)				56	81	68	1890	0	0		

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RURAL ADOBE: UPSHAW 2 PORCH - NO VENTILATION

UPSHW 1 BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

* Note: Graphs reflect adjusted temperatures for cooler climate
 Sierra Vista AZ (higher elev.) vs. Tucson AZ
 Sierra Vista Ave. DBT Oct.-March (winter) - 8% < Tucson
 Sierra Vista Ave. DBT April-September (summer) - 7% < Tucson

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1576.7		-956.79	662.88	2116.1	-237			0	0
FEB	-1697.7		-1000.2	719.13	1911.3	65.3			0	0
MAR	-1687.4		-1119.5	1087.7	2116.1	-384			0	0
APR	-1555.2		-1108.8	1009.2	2047.8	-381			0	0
MAY	-1666.9		-1173.9	893.48	2116.1	-164			0	0
JUN	-1504.2		-1088.4	785.32	2047.8	-233			0	0
JUL	-1889.6		-1158.5	624.15	2116.1	299			0	0
AUG	-1417.7		-1011.3	619.56	2116.1	-298			0	0
SEP	-1805.8		-1088.9	522.79	2047.8	314			0	0
OCT	-1779.2		-1075.5	554.80	2116.1	178			0	0
NOV	-2486.1		-1270.6	928.51	2047.8	756			0	0
DEC	-2024.8		-1092.4	644.42	2116.1	344			0	0
TOT	-21091		-13145	9051.9	24915	260			0	0

MONTHLY CONDITIONS (Units as shown)

* THM adjusted to right of THM w/ Tucson AZ Weather Files)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	54	60	57 (52)				41	63	51	1108	0	0		
FEB	55	62	59 (54)				38	66	52	1447	0	0		
MAR	62	70	67 (61)				45	74	60	1889	0	0		
APR	70	78	74 (68)				51	81	67	2401	0	0		
MAY	77	85	81 (75)				56	88	74	2694	0	0		
JUN	88	95	91 (84)				70	97	85	2721	0	0		
JUL	90	96	93 (86)				75	97	85	2313	0	0		
AUG	87	93	90 (83)				74	95	84	2193	0	0		
SEP	84	89	87 (80)				70	90	80	1978	0	0		
OCT	73	80	77 (71)				58	83	70	1654	0	0		
NOV	63	69	66 (60)				47	70	58	1228	0	0		
DEC	56	61	58 (53)				41	65	52	1034	0	0		
TOT	72	78	75 (70)				56	81	68	1890	0	0		

RURAL ADOBE: UPSHAW 2 PORCH- NATURAL VENTILATION

UPSHW 2 NAT VENT BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

* Note: Graphs reflect adjusted temperatures for cooler climate
 Sierra Vista AZ (higher elev.) vs. Tucson AZ
 Sierra Vista Ave. DBT Oct.-March (winter) - 8% < Tucson
 Sierra Vista Ave. DBT April-September (summer) - 7% < Tucson

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1576.7		-956.79	662.88	2116.1	-237		0	0	0
FEB	-1697.7		-1000.2	719.13	1911.3	65.3		0	0	0
MAR	-1657.2		-1105.4	1087.7	2116.1	-384	-44.312	0	0	0
APR	-998.86		-845.24	1010.0	2047.8	-292	-915.38	0	0	0
MAY	-131.19		-460.77	894.05	2116.1	-142	-2271.1	0	0	0
JUN	142.87		-324.27	785.32	2047.8	-215	-2429.4	0	0	0
JUL	-136.76		-346.60	624.15	2116.1	322	-2589.3	0	0	0
AUG	105.43		-309.94	619.56	2116.1	-355	-2164.3	0	0	0
SEP	-152.02		-323.82	522.79	2047.8	312	-2416.4	0	0	0
OCT	-864.20		-655.57	554.87	2116.1	139	-1294.7	0	0	0
NOV	-2407.0		-1237.1	928.51	2047.8	704	-56.567	0	0	0
DEC	-2024.8		-1092.4	644.42	2116.1	344	0	0	0	0
TOT	-11398		-8658.0	9053.4	24915	260	-14181	0	0	0

MONTHLY CONDITIONS (Units as shown)

* THM adjusted to right of THM w/ Tucson AZ Weather Files)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	54	60	57 (52)				41	63	51	1108	0	0		
FEB	55	62	59 (54)				38	66	52	1447	0	0		
MAR	62	70	66 (60)				45	74	60	1889	0	0		
APR	68	77	72 (66)				51	81	67	2401	0	0		
MAY	71	82	77 (71)				56	88	74	2694	0	0		
JUN	80	91	87 (80)				70	97	85	2721	0	0		
JUL	83	92	88 (81)				75	97	85	2313	0	0		
AUG	81	90	86 (79)				74	95	84	2193	0	0		
SEP	77	86	82 (75)				70	90	80	1978	0	0		
OCT	70	78	74 (68)				58	83	70	1654	0	0		
NOV	63	69	66 (61)				47	70	58	1228	0	0		
DEC	56	61	58 (53)				41	65	52	1034	0	0		
TOT	68	76	73 (68)				56	81	68	1890	0	0		

RURAL ADOBE: UPSHAW 3 ADDITION - NATURAL VENTILATION

UPSHW 3 BY: NEUMANN CALPAS3 V3.12 License: PC0201
 TUCSON, AZ Weather: TUCSON.AZ (Tucson AZ ETMY)

* Note: Graphs reflect adjusted temperatures for cooler climate
 Sierra Vista AZ (higher elev.) vs. Tucson AZ
 Sierra Vista Ave. DBT Oct.-March (winter) - 8% < Tucson
 Sierra Vista Ave. DBT April-September (summer) - 7% < Tucson

MONTHLY HOUSE ENERGY BALANCE (kBtu; + into house)

MON	GAINS & LOSSES						TRANSFERS			
	COND	SHCND	INFIL	SLR	INT	STRG	RB+SS	VENT	COOL	HEAT
JAN	-1784.3		-2224.4	2172.5	2116.1	-268		0	0	0
FEB	-1840.7		-2294.8	2151.4	1911.3	69.4		0	0	0
MAR	-1620.9		-2418.2	2453.6	2116.1	-469	-39.854	0	0	0
APR	-1075.1		-2100.4	2432.0	2047.8	-394	-894.26	0	0	0
MAY	-350.62		-1563.6	2616.2	2116.1	-172	-2637.2	0	0	0
JUN	120.23		-1108.1	2494.7	2047.8	-242	-3301.4	0	0	0
JUL	-151.75		-1109.8	2167.9	2116.1	421	-3463.1	0	0	0
AUG	111.69		-982.29	2121.6	2116.1	-472	-2873.0	0	0	0
SEP	-251.25		-1095.4	2163.8	2047.8	380	-3262.8	0	0	0
OCT	-1227.9		-1908.8	2452.8	2116.1	149	-1587.6	0	0	0
NOV	-2487.5		-2699.2	2220.5	2047.8	916	-37.403	0	0	0
DEC	-2192.8		-2462.5	2130.8	2116.1	391	0	0	0	0
TOT	-12751		-21967	27578	24915	309	-18097	0	0	0

MONTHLY CONDITIONS (Units as shown)

* THM adjusted to right of THM w/ Tucson AZ Weather Files)

MON	TEMPERATURES (F)				WTHR (F; Btu/sf)				PEAKS (kBtuh)					
	THL	THH	THM	TSL	TSH	TSM	DBL	DBH	DBM	SGL	HSCL/DY	HSHT/DY	SSCL/DY	SSHT/DY
JAN	52	60	56 (52)				41	63	51	1108	0	0		
FEB	51	62	57 (52)				38	66	52	1447	0	0		
MAR	58	70	64 (59)				45	74	60	1889	0	0		
APR	65	77	71 (65)				51	81	67	2401	0	0		
MAY	70	83	77 (71)				56	88	74	2694	0	0		
JUN	79	93	87 (80)				70	97	85	2721	0	0		
JUL	82	93	88 (81)				75	97	85	2313	0	0		
AUG	80	91	86 (79)				74	95	84	2193	0	0		
SEP	76	87	82 (75)				70	90	80	1978	0	0		
OCT	68	79	74 (68)				58	83	70	1654	0	0		
NOV	59	68	63 (58)				47	70	58	1228	0	0		
DEC	52	61	56 (52)				41	65	52	1034	0	0		
TOT	66	77	72 (66)				56	81	68	1890	0	0		

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