

UTILITY ALLOWANCE STUDY

FEBRUARY 2022

HOUSING CHOICE VOUCHER PROGRAM

RENTON HOUSING AUTHORITY

MR. MARK GROPPER
EXECUTIVE DIRECTOR
RENTON HOUSING AUTHORITY
2900 NE 10TH STREET
RENTON, WASHINGTON 98056-3133
(425) 226-1850







February 20, 2022

Mr. Mark Gropper Executive Director Renton Housing Authority 2900 NE 10th Street Renton, Washington 98056

Dear Mr. Gropper:

Enclosed please find a *final* copy of the 2022 Utility Allowance Update for the *Renton Housing Authority's* Housing Choice Voucher Program.

The allowances were developed in accordance with 24 CFR Part 982.517, using heat loss/gain engineering calculations based upon the thermal characteristics of each building type and considering the climate and standard of living within the local community. The allowances were updated based on the current rates of the local utility providers.

All of the utility rates increased since the previous update was completed in February 2021. Propane and fuel oil saw the largest increases at 20.6% and 15.4%, respectively. The electric rate increased 5.7% while natural gas increased 8.9%. The water and sewer rates increased between 2.0% and 10.9% depending upon the provider. A table comparing the current rates to those used in the 2021 update is included in the enclosed report.

Due to the significant increases in the utility rates since the previous update, we recommend the proposed allowances be implemented according to the Authority's policy.

As always, we appreciate the opportunity to provide this consulting service to you and the **Renton Housing Authority**. If you should require additional information of any kind, please do not hesitate to contact Bart Lewis or myself at (770) 977-4134.

Sincerely,

W. Sawyer Shirley, P. E.

President

National Facility Consultants, Inc.

WSS/bkl

TABLE OF CONTENTS

	TAB No
EXECUTIVE SUMMARY	1
Housing Choice Voucher Utility Allowance Sheets (Form HUD 52667)	2
UTILITY RATE COMPARISON	3
METHODOLOGY	4
SPACE HEATING CONSUMPTION LEVELS	5
AIR CONDITIONING CONSUMPTION LEVELS	6
COOKING CONSUMPTION LEVELS	7
OTHER ELECTRIC CONSUMPTION LEVELS	8
WATER HEATER CONSUMPTION LEVELS	9
WATER AND SEWER CONSUMPTION LEVELS	10
APPENDICES	11
APPENDIX A. – HEATING FORMULAS AND ASSUMPTIONS	
APPENDIX B. – HEAT LOAD TABLES	
APPENDIX C. – DHWH TABLES	
APPENDIX D. – COOLING LOAD TABLES	

EXECUTIVE SUMMARY

Executive Summary

The United States Department of Housing and Urban Development requires that Public Housing Agencies administering Housing Choice Voucher (HCV) Programs review their utility allowances for program participants on at least an annual basis. Based on the results of the review, the allowances should be updated as appropriate. This report contains the updated HCV Utility Allowances for the Renton Housing Authority beginning July 1, 2022.

The Renton Housing Authority administers a variety of housing types using a variety of fuels. The units analyzed consist of zero through five bedroom Duplex, Garden Style, High-Rise, Mobile Home, Single Family, and Townhouse units. The fuel types studied for each unit type and size are natural gas, electricity, fuel oil, and propane. Allowances were also developed for water, sewer and sanitation service. Additionally, allowances were developed for various pieces of medical equipment to allow the Authority to increase the Utility Allowances for disabled persons who require supplementary utility consumption.

The allowances were developed using estimated consumption figures and applicable utility rates. Consumption figures for each category were developed using standard engineering heat loss/gain calculation methods and the standard consumption levels for various systems and equipment. These consumption figures were sub-divided by category and bedroom size, and the rate estimates including any relevant adjustments and riders were applied. The proposed allowances were then compared with the Authority's current allowances. The allowances for HCV Housing in Renton are presented on the following pages.

Form (HUD - 52667) can be photocopied and used directly by the Authority to establish housing allowances for tenant furnished utilities and other services.

HCV UTILITY ALLOWANCES (FORM HUD 52667)

U.S. Department of Housing and Urban Development

Utility Allowance Schedule

Office of Public and Indian Housing

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority	Duplex	7/1/2022				
				DLLAR ALLOWANCE		•
UTILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
HEATING						
a. Natural Gas	\$22	\$25	\$30	\$32	\$37	\$40
b. Electric	\$32	\$37	\$45	\$51	\$60	\$66
c. Heat Pump	\$18 \$61	\$21 \$68	\$25 \$80	\$28 \$88	\$33 \$103	\$36 \$111
d. Fuel Oil e. Propane	\$55	\$62	\$73	\$80	\$93	\$101
· 1					· · · · · · · · · · · · · · · · · · ·	
AIR CONDITIONING	\$2	\$3	\$3	\$4	\$5	\$6
COOKING						
a. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
b. Electric	\$9	\$10	\$12	\$12	\$13	\$14
c. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
WATER HEATING						
a. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
b. Electric	\$9	\$16	\$22	\$35	\$49	\$63
c. Fuel Oil	\$23	\$31	\$39	\$55	\$72	\$89
d. Propane	\$24	\$33	\$41	\$59	\$77	\$95
WATER						
a. In - City of Renton	\$24	\$29	\$34	\$48	\$64	\$81
b. Out - City of Renton	\$36	\$43	\$51	\$72	\$96	\$122
c. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
SEWER						
a. In - City of Renton	\$81	\$81	\$81	\$81	\$81	\$81
b. Out - City of Renton	\$122	\$122	\$122	\$122	\$122	\$122
c. Soos Creek	\$70	\$70	\$70	\$70	\$70	\$70
SURFACE WATER	\$16	\$16	\$16	\$16	\$16	\$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
RANGE	\$4	\$4	\$4	\$4	\$4	\$4
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
- 111111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1111 - 1	<u> </u>	***				
ACTUAL FAMILY ALLOWANCES: (May t				UTILITY		PER MONTH
compute allowance while searching for a unit	.)			OR SERVICE		
HEAD OF HOUSEHOLD				HEATING		\$
, , , , , , ,				AIR CONDITIONING		\$
UNIT ADDRESS				COOKING		\$
				OTHER ELECTRIC		\$
				WATER HEATING		\$
				WATER		\$
				SEWER		9
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				TRASH COLLECTION	1	3
				REFRIGERATOR		\$
				RANGE		\$
NUMBER OF BEDROOMS				OTHER		\$
				TO		s

U.S. Department of Housing and Urban Development Office of Public and Indian Housing

Utility Allowance Schedule

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority			Garden	7/1/2022		
			MONTHLY DO	OLLAR ALLOWANCE		
JTILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
HEATING	£10	621	625	620	¢22	624
. Natural Gas	\$18 \$25	\$21 \$31	\$25 \$36	\$28 \$44	\$32 \$51	\$36 \$57
. Heat Pump	\$14	\$17	\$20	\$24	\$29	\$32
. Fuel Oil	\$48	\$58	\$66	\$77	\$90	\$98
. Propane	\$44	\$53	\$60	\$70	\$81	\$89
AIR CONDITIONING	\$2	\$3	\$3	\$4	\$5	\$6
COOKING						
. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
o. Electric	\$9	\$10	\$12	\$12	\$13	\$14
. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
WATER HEATING						
. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
o. Electric	\$9	\$16	\$22	\$35	\$49	\$63
. Fuel Oil	\$23	\$31	\$39	\$55	\$72	\$89
I. Propane	\$24	\$33	\$41	\$59	\$77	\$95
VATER						
. In - City of Renton	\$24	\$29	\$34	\$48	\$64	\$81
. Out - City of Renton	\$36	\$43	\$51	\$72	\$96	\$122
. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
SEWER	¢01	601	601	601	601	601
. In - City of Renton . Out - City of Renton	\$81 \$122	\$81 \$122	\$81 \$122	\$81 \$122	\$81 \$122	\$81 \$122
. Soos Creek	\$70	\$70	\$70	\$70	\$70	\$70
SURFACE WATER	\$16	\$16	\$16	\$16	\$16	\$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
	\$4	\$4	\$4	\$4	\$3 \$4	\$4
RANGE			1			
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
ACTUAL FAMILY ALLOWANCES: (May be	used by the family to			IUTILITY		PER
ompute allowance while searching for a unit.)				OR SERVICE		MONTH
IEAD OF HOUSEHOLD		·		HEATING		\$
				AIR CONDITIONING		\$
JNIT ADDRESS				COOKING		\$
				OTHER ELECTRIC		\$
				WATER HEATING		s
				WATER HEATING		•
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				SEWER		3
				TRASH COLLECTION	4	\$
				REFRIGERATOR		\$
				RANGE		\$
IUMBER OF BEDROOMS				OTHER		\$
				TO	ΓAL	\$

U.S. Department of Housing and Urban Development Office of Public and Indian Housing

Utility Allowance Schedule

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority			High-Rise	7/1/2022		
				LLAR ALLOWANCE		
UTILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
HEATING a. Natural Gas	\$12	\$13	\$15	\$17	\$19	\$20
b. Electric	\$13	\$16	\$19	\$23	\$26	\$29
c. Heat Pump	\$7	\$9	\$10	\$13	\$14	\$16
d. Fuel Oil	\$30	\$34	\$39	\$45	\$50	\$55
e. Propane	\$28	\$32	\$36	\$42	\$46	\$50
AIR CONDITIONING	\$2	\$2	\$3	\$3	\$4	\$5
COOKING				1		
a. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
b. Electric	\$9	\$10	\$12	\$12	\$13	\$14
c. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
WATER HEATING						
a. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
b. Electric	\$9	\$16	\$22	\$35	\$49	\$63
c. Fuel Oil d. Propane	\$23 \$24	\$31 \$33	\$39 \$41	\$55 \$59	\$72 \$77	\$89 \$95
· · · · · · · · · · · · · · · · · · ·	J24	\$33	341	\$39	\$77	\$93
WATER	004	600	624	640	064	***
a. In - City of Renton b. Out - City of Renton	\$24 \$36	\$29 \$43	\$34 \$51	\$48 \$72	\$64 \$96	\$81 \$122
c. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
SEWER	\$20	924	\$30	\$40	\$03	200
a. In - City of Renton	\$81	\$81	\$81	\$81	\$81	\$81
b. Out - City of Renton	\$122	\$122	\$122	\$122	\$122	\$122
c. Soos Creek	\$70	\$70	\$70	\$70	\$70	\$70
SURFACE WATER	\$16	\$16	\$16	\$16	\$16	\$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
RANGE	\$4	\$4	\$4	\$4	\$4	\$4
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
_						•
ACTUAL FAMILY ALLOWANCES: (May be compute allowance while searching for a unit.)	used by the family to			UTILITY OR SERVICE		PER MONTH
	20					-
HEAD OF HOUSEHOLD				HEATING		\$
				AIR CONDITIONING		\$
UNIT ADDRESS				COOKING		\$
				OTHER ELECTRIC		\$
				WATER HEATING		\$
				WATER		\$
				SEWER		\$
				TRASH COLLECTION		\$
				REFRIGERATOR		\$
				RANGE		s
NUMBER OF BEDROOMS				OTHER		\$
TOTAL OF DEDICOTING				TOT	'Δ1	s
				101	n.	19

U.S. Department of Housing and Urban Development

Utility Allowance Schedule

Office of Public and Indian Housing

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority			Mobile Home	7/1/2022		
			_	LLAR ALLOWANCE		
TILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
IEATING . Natural Gas	\$23	\$26	\$31	\$36	\$38	\$45
. Electric	\$32	\$38	\$47	\$57	\$61	\$72
. Heat Pump	\$18	\$21	\$26	\$31	\$33	\$40
. Fuel Oil	\$61	\$69	\$83	\$98	\$104	\$122
. Propane	\$55	\$63	\$75	\$88	\$94	\$110
AIR CONDITIONING	\$2	\$2	\$3	\$4	\$4	\$5
COOKING						
. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
. Electric	\$9	\$10	\$12	\$12	\$13	\$14
. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
VATER HEATING						
. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
. Electric	\$9	\$16	\$22	\$35	\$49	\$63
. Fuel Oil	\$23	\$31	\$39	\$55	\$72	\$89
. Propane	\$24	\$33	\$41	\$59	\$77	\$95
VATER			İ			<u> </u>
. In - City of Renton	\$24	\$29	\$34	\$48	\$64	\$81
Out - City of Renton	\$36	\$43	\$51	\$72	\$96	\$122
. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
EWER						
. In - City of Renton	\$81	\$81	\$81	\$81	\$81	\$81
Out - City of Renton	\$122	\$122	\$122	\$122	\$122	\$122
. Soos Creek SURFACE WATER	\$70 \$16	\$70 \$16	\$70 \$16	\$70 \$16	\$70 \$16	\$70 \$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
RANGE	\$4	\$4	\$4	\$4	\$4	\$4
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
ACTUAL FAMILY ALLOWANCES: (May be ompute allowance while searching for a unit.)	used by the family to			OR SERVICE		PER MONTH
IEAD OF HOUSEHOLD				HEATING		\$
				AIR CONDITIONING	•	\$
INIT ADDRESS				COOKING	•	s
INIT ADDRESS						-
				OTHER ELECTRIC		\$
				WATER HEATING		\$
				WATER		\$
				SEWER		\$
				TRASH COLLECTION	N	\$
				REFRIGERATOR		s
				1		•
WIN ADED OF DEDDOCES				RANGE		3
IUMBER OF BEDROOMS				OTHER		\$
				TO	TAL	\$

U.S. Department of Housing and Urban Development Office of Public and Indian Housing

Utility Allowance Schedule

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority			Single Family	7/1/2022		
			MONTHLY DO	LLAR ALLOWANCE		
UTILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
HEATING a. Natural Gas	\$28	\$34	\$37	\$43	\$47	\$50
b. Electric	\$43	\$52	\$60	\$70	\$79	\$84
Heat Pump	\$24	\$29	\$33	\$39	\$44	\$47
1. Fuel Oil	\$77	\$91	\$103	\$119	\$131	\$139
e. Propane	\$70	\$82	\$93	\$107	\$118	\$126
AIR CONDITIONING	\$2	\$3	\$4	\$5	\$6	\$7
COOKING						
a. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
b. Electric	\$9	\$10	\$12	\$12	\$13	\$14
c. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
WATER HEATING						
a. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
b. Electric	\$9	\$16	\$22	\$35	\$49	\$63
c. Fuel Oil	\$23	\$31	\$39	\$55	\$72	\$89
d. Propane	\$24	\$33	\$41	\$59	\$77	\$95
WATER		_				
a. In - City of Renton	\$24	\$29	\$34	\$48	\$64	\$81
b. Out - City of Renton	\$36	\$43	\$51	\$72	\$96	\$122
c. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
SEWER a. In - City of Renton	\$81	\$81	601	601	***	***
b. Out - City of Renton	\$122	\$122	\$81 \$122	\$81 \$122	\$81 \$122	\$81 \$122
c. Soos Creek	\$70	\$70	\$70	\$70	\$70	\$70
SURFACE WATER	\$16	\$16	\$16	\$16	\$16	\$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
RANGE	\$4	\$4	\$4	\$4	\$4	\$4
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
					4.2	1 4
ACTUAL FAMILY ALLOWANCES: (May be compute allowance while searching for a unit.)	used by the family to			UTILITY		PER
			100	OR SERVICE		MONTH
HEAD OF HOUSEHOLD				HEATING		\$
				AIR CONDITIONING		\$
UNIT ADDRESS				COOKING		\$
				OTHER ELECTRIC		\$
				WATER HEATING		\$
				WATER		\$
				SEWER		\$
				TRASH COLLECTION	1	\$
				REFRIGERATOR		<u> </u>
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WHIMPED OF BEDDOC'S				RANGE		3
NUMBER OF BEDROOMS				OTHER		\$
				TO	ΓAL	\$

U.S. Department of Housing and Urban Development

Utility Allowance Schedule

Office of Public and Indian Housing

LOCALITY/PHA			UNIT TYPE			DATE
Renton Housing Authority	Townhouse			7/1/2022		
				LAR ALLOWANCE		
JTILITY OR SERVICE	0-BR	1-BR	2-BR	3-BR	4-BR	5-BR
IEATING	620	624	607	620	622	620
. Natural Gas	\$20 \$29	\$24 \$35	\$27	\$29	\$33 \$53	\$38 \$61
. Electric	\$29 \$16	\$35 \$19	\$41 \$23	\$46 \$26	\$30	\$34
. Heat Pump . Fuel Oil	\$55	\$64	\$74	\$81	\$92	\$105
. Propane	\$53	\$58	\$67	\$74	\$84	\$95
AIR CONDITIONING	\$2	\$3	\$3	\$4	\$5	\$6
COOKING	Ψ2	Ψ3	Ψ3	Ů-	Ψ3	40
n. Natural Gas	\$6	\$6	\$8	\$8	\$9	\$9
o. Electric	\$9	\$10	\$12	\$12	\$13	\$14
. Propane	\$16	\$17	\$20	\$22	\$24	\$25
OTHER ELECTRIC	\$25	\$28	\$31	\$36	\$40	\$47
WATER HEATING					***	1
n. Natural Gas	\$9	\$12	\$16	\$22	\$29	\$36
o. Electric	\$9	\$16	\$22	\$35	\$49	\$63
. Fuel Oil	\$23	\$31	\$39	\$55	\$72	\$89
. Propane	\$24	\$33	\$41	\$59	\$77	\$95
VATER						
. In - City of Renton	\$24	\$29	\$34	\$48	\$64	\$81
o. Out - City of Renton	\$36	\$43	\$51	\$72	\$96	\$122
. Soos Creek	\$20	\$24	\$30	\$46	\$65	\$85
SEWER			27			
ı. In - City of Renton	\$81	\$81	\$81	\$81	\$81	\$81
o. Out - City of Renton	\$122	\$122	\$122	\$122	\$122	\$122
:. Soos Creek	\$70	\$70	\$70	\$70	\$70	\$70
SURFACE WATER	\$16	\$16	\$16	\$16	\$16	\$16
TRASH COLLECTION	\$24	\$24	\$24	\$24	\$24	\$24
REFRIGERATOR	\$5	\$5	\$5	\$5	\$5	\$5
RANGE	\$4	\$4	\$4	\$4	\$4	\$4
OTHER: Natural Gas Basic Charge	\$12	\$12	\$12	\$12	\$12	\$12
					·	1
ACTUAL FAMILY ALLOWANCES: (May be	used by the family to			OR SERVICE		PER
compute allowance while searching for a unit.)				OR SERVICE		MONTH
HEAD OF HOUSEHOLD				HEATING		\$
****				AIR CONDITIONING		\$
UNIT ADDRESS				COOKING		\$
				OTHER ELECTRIC		\$
				WATER HEATING		\$
				WATER		s
				SEWER		\$
				l.		
				TRASH COLLECTION		3
				REFRIGERATOR		\$
				RANGE		\$
NUMBER OF BEDROOMS	<u> </u>			OTHER		\$
				TOT	'AT	\$

Medical Equipment Allowances

Item	Hrs/Day	Wattage	Monthly Consumption (kWh)	Allowance
Oxygen Concentrator	18	400	219	\$22
Nebulizer	2	75	5	\$1
Electric Hospital Bed	0.2	200	1	\$1
Alternating Pressure Pad	24	70	51	\$5
Low Air-Loss Mattress	24	120	88	\$9
Power Wheelchair/Scooter	3	360	33	\$4
CPAP Machine	10	30	9	\$1

Oxygen Concentrator

Use per day varies, assume 12 to 24 hours a day.

The 5-Liter model uses 400 W, the 3-Liter model uses 320 W.

Nebulizer

A medicine delivery system used mostly for pediatric care.

Used 4-6 times a day for 20 minutes at a time at 75 W.

Semi/Fully Electric Hospital Beds

Use depends on adjustments. 200 W.

Alternating Pressure Pad

An air-filled mattress overlay.

Used 24 hours a day for someone who is bed-ridden.

Low Air-Loss Mattress

Takes the place of mattress - air-filled pressurized mattress.

Cycles air around every 15-20 minutes.

Power Wheelchairs and Scooters

Need to be charged approximately 8 hours every 3 days.

Batteries are 120 V, 3 Amp, 360 W.

CPAP Machines

Used for Sleep Apnea. Machines run only at night for people who have a tendency to stop breathing at night. At maximum pressure they use 40 Watts. On average - 30Watts.

UTILITY RATE COMPARISON

Renton Housing Authority Housing Choice Voucher Program Utility Rate Comparison February-2022

February 2021	February 2022	Percent
Rate**	Rate	Change
\$7.49	\$7.49	0.0%
\$7.49	\$7.49	0.0%
\$0.093071	\$0.091344	
m \$0.000000	(\$0.000417)	
e A) \$0.000314	\$0.000314	
\$0.004659	\$0.003825	
(\$0.007386)	(\$0.006689)	
\$0.000000	\$0.003314	
al Rate) \$0.002135	\$0.002135	
(\$0.001440)	(\$0.001391)	ļ
Credit (\$0.000061)	\$0.000000	i
(\$0.000043)	(\$0.000021)	
\$0.000000	\$0.000000	
(\$0.003016)	\$0.000850	
\$0.003209	\$0.003072	
\$0.001064	\$0.001352	
als (\$0.000884)	(\$0.000884)	
\$0.091622	\$0.096804	5.7%
ļ		
\$0.113277	\$0.111175	
n \$0.000000	(\$0.000417)	
e A) \$0.000314	\$0.000314	
\$0.004659	\$0.003825	
(\$0.007386)	(\$0.006689)	
\$0.000000	\$0.003314	
al Rate) \$0.002135	\$0.002135	
(\$0.001440)	(\$0.001391)	
Credit (\$0.000061)	\$0.000000	
(\$0.000043)	(\$0.000021)	
\$0.000000	\$0.000000	
(\$0.003016)	\$0.000850	
\$0.003209	\$0.003072	
\$0.001064	\$0.001352	
ds (\$0.000884)	(\$0.000884)	
\$0.111828	\$0.116635	4.3%
ıls	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

Renton Housing Authority Housing Choice Voucher Program Utility Rate Comparison February-2022

Utility	Provider	Type of Charge	February 2021 Rate**	February 2022 Rate	Percent Change
		Basic Charge (per month)	\$11.52	\$11.52	0.0%
!		All therms (per therm)		-	
i		Delivery Charge	\$0.428570	\$0.419640	
		Low Income Program	\$0.007010	\$0.003650	
		Property Tax Tracker	\$0.019710	\$0.022750	
		Excess Deferred Income Tax	(\$0.013880)	\$0.003140	
		Temporary Federal Income Tax Rate Credit	(\$0.000680)	\$0.000000	
		Expedited Rate Filing Rate Adj.	\$0.000000	\$0.000000	
Gas	Puget Sound Energy	Revenue Decoupling Adj. Mechanism	\$0.012320	\$0.022520	
	1 3	Cost Recovery Mechanism Pipeline Repl.	\$0.017700	\$0.022580	
		Cost of Gas	\$0.381290	\$0.463400	
		Deferred Account Adjustment	\$0.023320	\$0.001230	
		Deferred Account Adjustment (Supp. Rate A	\$0.000000	\$0.000000	
		Deferred Account Adjustment (Supp. Rate B	\$0.024950	\$0.024950	
	i	Gas Conservation Program Charge	\$0.021790	\$0.020190	
		Excess Deferred Income Tax Reversals	(\$0.001370)	(\$0.001370)	
		Total	\$0.920730	\$1.002680	8.9%
Fuel Oil	Genesee Energy and All Discount Heating Oils	Average Consumption Charge (per gallon)	\$2.990	\$3.450	15.4%
Propane	Suburban and Ferrellgas Propane	Average Consumption Charge (per gallon)	\$2.09	\$2.52	20.6%

Renton Housing Authority Housing Choice Voucher Program Utility Rate Comparison February-2022

Utility	Provider	Type of Charge	February 2021 Rate**	February 2022 Rate	Percent Change
		Basic Charge (per month)	\$18.31	\$18.68	2.0%
	City of Renton	Consumption Charge (per CCF) 0 - 500 CCFs per month 500 - 1000 CCFs per month Over 1000 CCFs per month	\$2.64 \$3.55 \$4.48	\$2.69 \$3.62 \$4.57	1.9% 2.0% 2.0%
Water		Basic Charge (per month)	\$15.88	\$16.35	3.0%
1	Soos Creek Water and Sewer District	Consumption Charge (per CCF) 0 - 500 CCFs per month 500 - 1000 CCFs per month Over 1000 CCFs per month	\$2.00 \$4.10 \$5.15	\$2.17 \$4.25 \$5.35	8.5% 3.7% 3.9%
		Single Family (per month)	\$31.12	\$31.74	2.0%
	City of Renton	Other Users Base Charge (per month) Consumption Charge (per CCF)	\$31.12 \$3.51	\$31.74 \$3.58	2.0% 2.0%
Sewer	Soos Creek Water and Sewer District	Sewer System Maintenance(per month) King Co. Treatment Charge (per month) Total Charge (per month)	\$19.14 \$47.37 \$66.51	\$21.22 \$49.27 \$70.49	10.9% 4.0% 6.0%
	King County	Single Family (per month)	\$47.37	\$49.27	4.0%
Surface Water	City of Renton	Monthly Charge	\$15.45	\$15.76	2.0%
Sanitation	City of Renton	Monthly Charge	\$23.53	\$24.00	2.0%

^{*}The last time the utility allowances were updated.

METHODOLOGY

Methodology

The Renton Housing Authority's Housing Choice Voucher Utility Allowances were developed by applying local utility rates to estimated consumption levels for various systems and equipment. Allowances were established for Duplex, Garden, High-Rise, Mobile Home, Single Family, and Townhouse unit types with bedroom sizes zero (efficiency) through five. The specific utility categories for which allowances were made include Heating, Air Conditioning, Cooking, Other Electric, Water Heating, Water, Sewer, Sanitation, an allowance for a Refrigerator and a Range, and a Medical Disability Allowance. This section provides a brief summary of how the allowances were established for each category and includes assumptions and estimates made in the process.

Heating

Utility allowances were set for four types of heating fuels/systems: natural gas, electric, fuel oil, and propane. Consumption levels for each category were developed using standard engineering heat loss/gain calculation methods. The variables in the formula include design heat loss, number of heating degree-days, and the design temperature difference. The formula where all variables are defined and global variable values are listed can be found in Appendix A of this report. The design heat loss calculations also take into consideration the thermal design characteristics of each structure type. Due to the variance in HCV housing construction, certain general assumptions concerning the thermal characteristics and size of each unit type were made.

The assumptions made in order to calculate the heat loss for each unit type (e.g., one bedroom apartment, three bedroom single family, etc.) can be broken down into two categories: dimensions and thermal characteristics.

Dimensions

Area of ceiling

Area of net exterior wall

Area of windows

Area of doors

Crack length of windows and doors

Perimeter foot length

Thermal Characteristics

R-value of ceiling

R-value of walls

R-value of windows

R-value of doors

Infiltration factor

(windows/doors)

Perimeter insulation factor

Heating (cont.)

The specific values of each sub-category can be found in Appendix A. The assumptions concerning dimensions are based on engineering estimates of the average unit for each type and size. The assumptions of thermal characteristics are based on HUD Handbook 7420.7, The Administrative Practices Handbook for the Section 8 Existing Housing Program, Chapter 5, Housing Quality Standards, page 5-7, paragraph (c), Tenant Preference. While this HUD handbook has expired, the regulation itself remains valid and the handbook continues to be a useful tool. "The tenant may...determine the acceptability of the amount of weather stripping and insulation to prevent inadequate heat distribution and excessive air infiltration. The tenant may also determine if storm doors and windows are important. If the PHA believes that weather stripping and insulation for the unit are inadequate, this concern should be discussed with the tenant or owner."

In other words, it is the tenant's responsibility to select a unit that has adequate thermal characteristics (insulation, weather stripping, etc.). The Authority is only responsible to the tenant in so far as to inform the tenant that the unit he/she has selected is inadequate in this respect. The Authority must inform the tenant that he/she should select a unit with adequate thermal characteristics and that it is not the Authority's responsibility to pay the additional cost associated with high utility bills resulting from inadequate thermal characteristics. The Authority should also inform the owner that the unit would not be recommended to tenants until its thermal characteristics have been improved. The specific value of each thermal characteristic has been set at what we recommend as the minimum acceptable level. These values can be found in Appendix A.

Cooking

Natural gas, electricity, and propane have been considered for cooking fuels. Consumption allowances were calculated using the following method with the following assumptions.

Assumptions:

- Estimated energy consumed by a gas range is 25,000 BTUs per hour of operation
- Assume 65% of the gas burner used during meal preparation
- Estimated energy consumed by an electric range is 2.5 kWh
- Range operation time per day to prepare meals

0 BR = 1.2 hours 1 BR = 1.25 hours 2 BR = 1.5 hours 3 BR = 1.6 hours 4 BR = 1.75 hours 5 BR = 1.8 hours

Formulations:

Therms/Month = $\frac{25,000 \text{ BTUs x } .65/\text{Hr x Hours x } 30 \text{ days/Month}}{100,000}$

Gallons/Month = $\frac{25,000 \text{ BTUs x .65/Hr x Hours x 30 days/Month}}{95,500}$

kWh/Month = Hours/day x 2.5 kw x 30 days/Month

Other Electric

This category includes items such as lighting, refrigeration, microwave, television, and other necessary appliances. Standard consumption levels for all items were added together to obtain the total consumption for the Other Electric category. The full amount of the monthly service charge for electricity has been included in the Other Electric category since all tenants must pay this charge. In contrast, it would not be accurate to split the service charge between Heating and Other Electric because some tenants may use natural gas heat.

Water Heating

As with heating, allowances for Water Heating were developed using engineering based calculations. Assumptions were made as to the number of people living in each bedroom size and the amount of hot water used per person per day. Appendix C contains all relevant calculations and assumptions.

Water and Sewer

Water consumption is calculated based on assumptions concerning the number of people living in the unit and the amount of water each person uses in his/her daily activities.

Ranges and Refrigeration

Allowances were made for Ranges and Refrigerators in the event that these items are not furnished by the landlord/owner. The allowances are based on the cost of a refrigerator and the cost of a range spread over the expected life of the appliance. The following details the cost allowances, as they are included on each Utility Allowance schedule:

Appliance	Total Cost	Life Exp.	Monthly A	<u> Allowance</u>
Small Refrigerator	\$580	10 yrs	\$4.83	\$5
Large Refrigerator	\$690	10 yrs	\$5.75	\$ 6
Small Range	\$480	10 yrs	\$4.00	\$4
Large Range	\$520	10 yrs	\$4.50	\$5

Medical Equipment Allowances

We have determined typical monthly consumption figures for several different types of medical equipment in order for the Authority to make additional utility allowances for residents who request supplementary utility consumption due to a disability. This is completed by using a typical wattage for each piece of equipment and converting to monthly kWh by estimating the hours per day of required use. The table that outlines these consumption and cost allowances has been included with the Utility Allowance HUD forms in Tab 2 of this report.

Utility Rate Estimates

Electricity

Some HCV participants reside in homes with electric space heating, water heating and/or cooking. The resulting allowance is based on Puget Sound Energy's current residential electric rates. These rates are also used for other electric uses such as lighting, appliances, etc. The following details the electric rates as they are used in the utility allowance calculations.

Puget Sound Energy

Basic Charge	\$7.49 per month
1st 600 kWh	
Energy Charge	\$0.091344 per kWh
Revenue Decoupling Adj. Mechanism	(\$0.000417) per kWh
Revenue Decoupling Adj. Mechanism (Supplemental Rate A)	\$0.000314 per kWh
Electric Conservation Service Rider	\$0.003825 per kWh
Energy Exchange Credit	(\$0.006689) per kWh
Power Cost Adjustment	\$0.003314 per kWh
Power Cost Adjustment (Supplemental Rate)	\$0.002135 per kWh
Federal Wind Power Credit	(\$0.001391) per kWh
Temporary Federal Income Tax Credit	\$0.000000 per kWh
Renewable Energy Credit	(\$0.000021) per kWh
Expedited Rate Filing Adjustment	\$0.000000 per kWh
Excess Deferred Income Tax	\$0.000850 per kWh
Property Tax Tracker	\$0.003072 per kWh
Low Income Program	\$0.001352 per kWh
Excess Deferred Income Tax Reversals	(\$0.000884) per kWh
Total Rate	\$0.096804 per kWh

All remaining kWh	
Energy Charge	\$0.111175 per kWh
Revenue Decoupling Adj. Mechanism	(\$0.000417) per kWh
Revenue Decoupling Adj. Mechanism (Supplemental Rate A)	\$0.000314 per kWh
Electric Conservation Service Rider	\$0.003825 per kWh
Energy Exchange Credit	(\$0.006689) per kWh
Power Cost Adjustment	\$0.003314 per kWh
Power Cost Adjustment (Supplemental Rate)	\$0.002135 per kWh
Federal Wind Power Credit	(\$0.001391) per kWh
Temporary Federal Income Tax Credit	\$0.000000 per kWh
Renewable Energy Credit	(\$0.000021) per kWh
Expedited Rate Filing Adjustment	\$0.000000 per kWh
Excess Deferred Income Tax	\$0.000850 per kWh
Property Tax Tracker	\$0.003072 per kWh
Low Income Program	\$0.001352 per kWh
Excess Deferred Income Tax Reversals	(\$0.000884) per kWh
Total Rate	\$0.116635 per kWh

City Tax 6%

Natural Gas

Other HCV participants reside in homes that use natural gas for space heating, water heating and/or cooking. The allowance for these uses is based on Puget Sound Energy's current residential natural gas rates. The following details the natural gas rates as they are used in the utility allowance calculations.

Puget Sound Energy

Basic Charge	\$11.52 per month
Delivery Charge	\$0.419640 per therm
Low Income Program	\$0.003650 per therm
Property Tax Tracker	\$0.022750 per therm
Expedited Rate Adjustment	\$0.000000 per therm
Revenue Decoupling Adj. Mechanism	\$0.022520 per therm
Cost Recovery Mechanism Pipeline Repl.	\$0.022580 per therm
Gas Cost	\$0.463400 per therm
Deferred Account Adjustment	\$0.001230 per therm
Gas Conservation Program Charge	\$0.020190 per therm
Excess Deferred Income Tax	\$0.003140 per therm
Temporary Federal Income Tax Adjustment	\$0.000000 per therm
Deferred Account Adjustment (Supp. Rate A)	\$0.000000 per therm
Deferred Account Adjustment (Supp. Rate B)	\$0.024950 per therm
Excess Deferred Income Tax Reversals	(\$0.001370) per therm
Total Charge	\$1.002680 per therm

City Tax 6%

Propane

Some HCV participants reside in homes where space heating, water heating and/or cooking is provided by propane-fired appliances. The utility allowance for these homes is based on the current residential rates of Suburban Propane and Ferrellgas, two local propane suppliers. The following details the propane rates as they are used in the utility allowance calculations.

Suburban Propane

Consumption Charge

\$2.56 per gallon

Ferrellgas

Consumption Charge

\$2.48 per gallon

Average

\$2.52 per gallon

Fuel Oil

Some HCV participants live in homes which use fuel oil-fired appliances to provide space heating and/or water heating. The allowance for these homes is based on the current residential fuel oil price as provided by two local suppliers, Genesee Energy and All Discount Heating Oils. The following details the fuel oil rates as they are used in the utility allowance calculations.

Genesee Energy

Consumption Charge

\$3.39 per gallon

All Discount Heating Oils

Consumption Charge

\$3.51 per gallon

Average

\$3.45 per gallon

Water and Sewer

Allowances are also provided for water and sewer costs. The resulting allowances are based on the City of Renton, King County and Soos Creek's residential water and sewer rates. The water and sewer rates used for calculating the utility allowances for the HCV participants are as follows.

City of Renton - Water

Base Charge	\$18.68 per month
-------------	-------------------

Consumption Cost

0 – 500 CF	\$2.69 per CCF
600 – 1000 CF	\$3.62 per CCF
Over 1000 CF	\$4.57 per CCF

City of Renton - Sewer

The above rates are for customers who live inside the city limits. Rates for customers who live outside the city limits are 1.5 times the above rates.

King County - Sewer

Base Charge – single family	\$49.27 per month
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Soos Creek - Water

Base Charge	\$16.35 per month
Consumption 0 – 500 CF	\$2.17 per CCF
500 – 1000 CF	\$4.25 per CCF

\$5.35 per CCF

1001 - 1500 CF

Soos Creek - Sewer

Maintenance of the Sewer System\$21.22 per monthKing County Treatment Charge\$49.27 per monthTotal Sewer Charges\$70.49 per month

Sanitation

City of Renton

\$24.00 per month

SPACE HEATING CONSUMPTION LEVELS

Space Heating Consumption Levels and Cost Figures

-			
			\$20 \$24 \$27 \$29 \$33 \$38
model in	house	Month Month	20 23 30 30
	Town	Month	17 20 23 26 29 33
	Ċ	Month	\$28 \$34 \$37 \$43 \$47 \$50
	amily	Herms/ Fan Kwh/ Month Month	30 34 31 31
	Single	I herms/ Month	28 32 37 44 44
TROOP THE	(Cost per Month	\$23 \$26 \$31 \$38 \$38
	Home	Therms/ Fan kWh/ Month Month	26 30 37 40 48
GAS	Mobile	Therms/ Month	19 26 30 33 38
STURAL		Cost per Month	\$12 \$13 \$15 \$17 \$19 \$20
TING - N	High-Rise	Fan kWh/ Month	11 13 15 17 19
HIEA	High	Therms/ Month	10 11 12 14 16
		Cost per Month	\$18 \$21 \$25 \$28 \$32 \$36
· · · · · · · · · · · · · · · · · · ·	den	Therms/ Fan kWh/ Month Month	17 25 21 28
	Gar	Therms/ Month	15 18 24 28 31
	11		\$22 \$25 \$30 \$37 \$37
	olex	Therms/ Fan kWh/	33 33 33 33 33 33 33 33 33 33 33 33 33
	Du	Therms/ Month	25 28 33 33 35
NEW STREET		Sq. Ft.	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000
		Bedrooms	0 - 2 6 4 8

Based on an average cost per therm of \$1.002680

			_							_
		Cost per Month		\$29	\$35	<u>2</u> 2	\$46	\$53	\$61	
	Townhouse	Fan kWh/ Month		6	=	13	=	12	14	
	Town	kWh per Month		274	328	388	438	208	583	
	V.	Cost per Month	THOUS IN	\$43	\$52	\$60	\$70	879	\$84	
	amily	Fan kWh/		14	17	14	16	14	4	
	Single F	kWh per Fan kWh/	MOUNT	404	489	571	699	753	908	
1823 TOURS		Cost per	Mollin	\$32	\$38	\$47	\$57	\$61	\$72	
	Home	Fan kWh/	Monin	12	14	8	17	19	22	
RNACE	Mobile Home	kWh per	Month	304	357	439	534	572	682	
TRIC FU		Cost per	Monta	\$13	\$16	\$19	\$23	\$26	\$29	
ING - ELEC	Rise	h per Fan kWh/ Cos	Month	5	9	7	7	- 00	6	5
HEATIN	High-	kWh per	Month	123	148	176	214	246	274	
		Cost per	Month	\$25	531	836	3	\$51	\$57	
	den	kWh per Fan kWh/	Month	90	. 2	2	2	12	13	
	Can	kWh per	Month	232	290	341	415	490	244	
			Month	\$32	233	573	851	260	\$66	
	Duplex	cWh per Fan kWh/	Month	9	2	! !	5 2	1 1	15	
STATE OF STATE OF	Dag	kWh per	Month	306	353	476	482	175	625	
THE STATE OF THE S			Sq. F.	400.550	500 700	200-100	1000-1200	1300-1500	1600-2000	
NEWS STATE			Bedrooms	c	> -	- c	4 6	٦ ٣	r vo	

Based on an average cost per kWh of \$0.096804

	Cost per Month	90	3 2	9;	<u> </u>	2
		\$16	\$2	\$2	\$3	
house	kWh per Fan kWh/ Month Month	€ 4	. 2	4	4	2
Town	kWh per Month	153	217	245	284	326
	Cost per Month	\$24	\$33	\$39	\$4	247
Family	kWh per Fan kWh/ Month Month	S	o v	9	S	8
Single	kWh per Month	226	319	374	421	450
	Cost per Month	\$18	\$26	\$31	\$33	\$40
Mobile Home	Wh per Fan kWh/ Month Month	4 4	n v9	9	7	00
Mobile	kWh per Month	170	245	298	320	381
	Cost per Month	\$7	6 S	\$13	\$14	\$16
High-Rise	Fan kWh/ Month	61 (~1 m	. 71	3	е
High-	kWh per Month	69	S &	120	137	153
	Cost per Month	\$14	\$17	\$25	\$29	\$32
Jen	kWh per Fan kWh/ Month Month	ε,	4 4	4	4	S
Sa	kWh per Month	130	791 161	232	274	304
	Cost per Month	\$18	\$21	\$28	\$33	\$36
lex	wh per Fan kWh/	4	4 v	0 4	5	2
Dug	kWh per Month	171	197	269	319	349
	Sq. Ft.	400-550	200-700	1000-1200	1300-1500	1600-2000
	Bedrooms	0	– ເ	4 65	4	٧.

Based on an average cost per kWh of \$0,096804

Space Heating Consumption Levels and Cost Figures

		Cost per Month	55	*	4/			501	
STATE OF THE PARTY	_		- i	9	→	<u>دې</u>	<u>ده</u>	\$	
	Townhouse	Fan kW Montf	7 78	3 :	9	31	36	42	
	Town	Gallons per Fan kWh/ Month Month	4 i	1	19	21	24	27	
		Cost per Month	277	164	\$103	\$119	\$131	\$139	
	Family	Fan kWh/ Month	4 6	2	4	48	9	43	
	Single	Gallons per Fan kWh/ Month Month	20	57	27	31	35	37	
		Cost per Month	\$61	\$69	\$83	\$6\$	\$104	\$122	
	Home	Fan kWh/ Month	36	4.7	25	52	26	99	
[]	Mobile	Gallons per Fan kWh/ Month Month	91	<u>8</u>	21	25	27	32	
FUELO		Cost per Month	\$30	\$34	\$39	\$45	\$50	\$55	
EATING	High-Rise	Fan kWh/ Month	15	8	21	21	24	27	
		Gallons per Fan kWh/ Month Month	∞ .	6	01	12	13	4	
		Cost per Month	\$48	\$58	\$66	277	\$30	86\$	
	den .	Fan kWh/ Month	24	30	35	30	35	39	
	Car	Gallons per Fan kWh/ Cost per Month Month Month	13	15	17	20	24	26	
		ost pe	\$61	\$68	\$80	\$88	\$103	\$111	
Marine Pro	lex lex	Gallons per Fan kWh/ C	31	36	43	34	4	45	
はいのでは	Dug	Gallons per Month	91	<u>8</u>	21	23	27	29	
		Sq. Ft.	400-550	500-700	700-900	1000-1200	1300-1500	1600-2000	
		Bedrooms	0	-	2	3	4	· v	

Based on an average cost per gallon of \$3.45

	Cost per	Month	\$51 \$67 \$74 \$74 \$84 \$95
	iouse Fan kWh/	Month	20 28 27 30 30
Shreen Says	Townl	Month Month	21 24 27 39 34
	Cost per	Month	\$70 \$82 \$93 \$107 \$118 \$126
	'amily Fan kWh/	Month	30 34 31 31 31
	Single F	Month	25 29 34 34 29 34 43 29 46 31
	100	Month	\$55 \$63 \$75 \$88 \$94 \$110
	Home Fan kWh/	Month	26 30 37 37 40 48
A	Mobile Home	Month Month	33 4 33 34 33 34 33 34 34 34 34 34 34 34
PROPAN			\$28 \$32 \$36 \$42 \$46
EATING.	Rise Fan VWh/	Month	11 13 15 17 19 19 19 19 19 19 19 19 19 19 19 19 19
H	High-Rise	Month Month	10 12 13 17 17
		Month	\$44 \$53 \$60 \$70 \$81
811(120)6418	den Een 1937h/	Month	21 22 25 25 28
N 19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Garden	Month	33 3 5 5 5 1 6 1 6 1 6 1 6 1 6 1 6 1 6 1 6 1
		Month	\$55 \$62 \$73 \$80 \$93 \$101
DASO SULA	plex	q. Ft. Month Month	22 26 31 32 32
	Du	Month	34 29 20 34 34 34 34 34 34 34 34 34 34 34 34 34
		Sq. Ft.	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000
		Bedrooms	0 1 7 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9

Based on an average cost per gallon of \$2.52

AIR-CONDITIONING CONSUMPTION LEVELS

Air Conditioning Consumption Levels and Cost Figures

		en Kalahir			TENELLE	AIR C	CONDITIO	NING					
Bedrooms	Sq. Ft.	<u>Du</u> kWh per <u>Year</u>	plex Cost per Month	<u>Ga</u> kWh per <u>Year</u>	rden Cost per Month	<u>High</u> kWh per <u>Year</u>	-Rise Cost per Month	<u>Mobi</u> kWh per <u>Year</u>	le Home Cost per Month	<u>Single</u> kWh per <u>Year</u>	Cost per Month	<u>Tow</u> kWh per <u>Year</u>	Cost per Month
0 1 2 3 4 5	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000	222 295 376 487 618 728	\$2 \$3 \$3 \$4 \$5 \$6	220 294 374 488 618 728	\$2 \$3 \$3 \$4 \$5 \$6	193 246 300 406 506 598	\$2 \$2 \$3 \$3 \$4 \$5	202 261 324 421 517 636	\$2 \$2 \$3 \$4 \$4 \$5	241 324 414 535 675 792	\$2 \$3 \$4 \$5 \$6 \$7	221 295 375 486 615 728	\$2 \$3 \$3 \$4 \$5 \$6

Based on an average cost per kWh of \$0.096804

Air Conditioning Consumption Levels

Townhouse

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0 1 2 3 4 5	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000	7,363 10,432 13,789 18,386 23,762 28,467	10 10 10 10 10 10	240 240 240 240 240 240 240	221 295 375 486 615 728

Garden

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0	400-550	7,317	10	240	220
1	500-700	10,418	10	240	294
2	700-900	13,741	10	240	374
3	1000-1200	18,468	10	240	488
4	1300-1500	23,886	10	240	618
5	1600-2000	28,490	10	240	728

Duplex

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0	400-550	7,396	10	240	222
1	500-700	10,443	10	240	295
2	700-900	13,835	10	240	376
3	1000-1200	18,445	10	240	487
4	1300-1500	23,886	10	240	618
5	1600-2000	28,468	10	240	728

Air Conditioning Consumption Levels

Single

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0 1 2 3 4 5	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000	8,177 11,630 15,413 20,438 26,258 31,161	10 10 10 10 10 10	240 240 240 240 240 240 240	241 324 414 535 675 792

Mobile Home

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0 1 2 3 4 5	400-550 500-700 700-900 1000-1200 1300-1500 1600-2000	6,547 9,035 11,655 15,678 19,705 24,657	10 10 10 10 10 10	240 240 240 240 240 240 240	202 261 324 421 517 636

High-Rise

Bedrooms	Sq. Ft.	Cooling BTUH	SEER	Full Load Hours	Electric Consumption
0	400-550	6,201	10	240	193
1 1	500-700	8,388	10	240	246
2	700-900	10,670	10	240	300
3	1000-1200	15,074	10	240	406
4	1300-1500	19,245	10	240	506
5	1600-2000	23,074	10	240	598

COOKING CONSUMPTION LEVELS

Cooking Consumption Levels and Cost Figures

COOKING - NATURAL GAS								
<u>Bedrooms</u>	<u>Sq. Ft.</u>	Therms per Month	Cost per Month					
0	400-550	6	\$6					
1	500-700	6	\$6					
2	700-900	7	\$8					
3	1000-1200	8	\$8					
4	1300-1500	9	\$ 9					
5	1600-2000	9	\$9					

Based on an average cost per therm of \$1.002680

	COOKING - ELECTRIC					
<u>Bedrooms</u>	<u>Sq. Ft.</u>	kWh per <u>Month</u>	Cost per <u>Month</u>			
0	400-550	90	\$9			
1	500-700	94	\$10			
2	700-900	113	\$12			
3	1000-1200	120	\$12			
4	1300-1500	131	\$13			
5	1600-2000	135	\$14			

Based on an average cost per kWh of \$0.096804

	COOKING - PROPANE							
<u>Bedrooms</u>	<u>Sq. Ft.</u>	Gallons per <u>Month</u>	Cost per Month					
0	400-550	6	\$16					
1	500-700	6	\$17					
2	700-900	8	\$20					
3	1000-1200	8	\$22					
4	1300-1500	9	\$24					
5	1600-2000	9	\$25					

Based on an average cost per gallon of \$2.52

OTHER ELECTRIC CONSUMPTION LEVELS

Other Electric Consumption Levels and Cost Figures

	OTHER ELECTRIC								
<u>Bedrooms</u>	Sq. Ft.	kWh per <u>Month</u>	Cost per <u>Month</u>						
0	400-550	171	\$25						
1	500- 700	191	\$28						
2	700-900	224	\$31						
3	1000-1200	271	\$36						
4	1300 -1500	309	\$40						
5	1600-2000	378	\$47						

Costs are based on an average of \$0.096804 per kWh plus a base charge of \$7.49 per month

Estimated Monthly Electrical Consumption Levels

NUMBER OF	LIGHTING	REFRIG	TV	RADIO	SM.APPL.	FAN	TOTAL
BEDROOMS	kWh	kWh	kWh	kWh	kWh	(For 6 months)	kWh
0 BR 1 BR 2 BR 3 BR 4 BR 5 BR Typical Value	61 81 108 149 189 243	67 67 67 67 67 67 67	21 21 21 21 21 21 21	4 4 4 4 4 4	17 17 21 25 29 33 24	2 2 4 6 8 10	171 191 224 271 309 378

WATER HEATER CONSUMPTION LEVELS

Domestic Hot Water Heating Consumption Levels and Cost Figures

	DOMESTIC HOT WATER HEATING Natural Gas							
<u>Bedrooms</u>	<u>Sq. Ft.</u>	Therms per Month	Cost per <u>Month</u>					
0	400-550	9	\$9					
1	500-600	12	\$12					
2	700-900	15	\$16					
3	1000-1200	21	\$22					
4	1300 -1500	28	\$29					
5	1600-2000	34	\$36					

Based on an average cost per therm of \$1.002680

	DOMESTIC HOT WATER HEATING Electricity								
<u>Bedrooms</u>	Sq. Ft.	kWh per <u>Month</u>	Cost per Month						
0	400-550	92	\$9						
1	500-600	155	\$16						
2	700-900	218	\$22						
3	1000-1200	343	\$35						
4	1300 -1500	478	\$49						
5	1600-2000	611	\$63						

Based on an average cost per kWh of \$0.096804

Domestic Hot Water Heating Consumption Levels and Cost Figures

DOMESTIC HOT WATER HEATING Propane							
<u>Sq. Ft.</u>	Gallons per <u>Month</u>	Cost per Month					
400-550	9	\$24					
500-600	12	\$33					
700-900	16	\$41					
1000-1200	22	\$59					
1300 -1500	29	\$77					
1600-2000	36	\$95					
	Sq. Ft. 400-550 500-600 700-900 1000-1200 1300 -1500	Propane Sq. Ft. Month 400-550 9 500-600 12 700-900 16 1000-1200 22 1300 -1500 29					

Based on an average cost per gallon of \$2.52

DOMESTIC HOT WATER HEATING Fuel Oil							
<u>Bedrooms</u>	<u>Sq. Ft.</u>	Gallons per Month	Cost per <u>Month</u>				
0	400-550	6	\$23				
1	500-600	8	\$31				
2	700-900	11	\$39				
3	1000-1200	15	\$55				
4	1300 -1500	20	\$72				
5	1600-2000	24	\$89				

Based on an average cost per gallon of \$3.45

WATER AND SEWER CONSUMPTION LEVELS

Water, Sewer and Sanitation Consumption Levels and Cost Figures

Consumption Levels and Cost Figures

				WATER,	SEWER AND SA	NITATION				
		Wate	er Costs			Sewe	r Costs			
NUMBER OF BEDROOMS	WATER CONSUMPTION	In - City of Renton	Soos Creek	Out - City of Renton	SEWER USAGE	In - City of Renton	Out - City of Renton	Soos Creek	SURFACE WATER	GARBAGE COLLECTION
0 BR 1 BR 2 BR 3 BR 4 BR 5 BR	2 4 6 9 13	\$24 \$29 \$34 \$48 \$64 \$81	\$20 \$24 \$30 \$46 \$65 \$85	\$36 \$43 \$51 \$72 \$96 \$122	2 4 6 9 13	\$81 \$81 \$81 \$81 \$81 \$81	\$122 \$122 \$122 \$122 \$122 \$122	\$70 \$70 \$70 \$70 \$70 \$70	\$16 \$16 \$16 \$16 \$16 \$16 \$16	\$24 \$24 \$24 \$24 \$24 \$24

Water, Sewer and Sanitation Consumption Levels and Cost Figures

Gross Water Consumption

Type	Occupants	Toilet	Shower	Dishes	Clothes	Cooking	Hands	Other	Gal/Day	Gal/Month	CCF/Month
Туре	The second division in the second		15,00	1.50	2.00	0.30	 1,00	1,00	45,80	1,393	1.86
0 BR	1,00	25.(X)		3.00	4.00	0.60	2.00	2.00	91.60	2,786	3.72
1 BR	2.00	50,00	30.00			0.90	3,00	3.00	137,40	4,179	5.59
2 BR	3.00	75,00	45.00	4.50	6.00			5.00	229.00	6,965	9.31
3 BR	5,00	125,00	75,00	7.50	10,00	1.50	5,00				13.04
4 BR	7.00	175.00	105,00	10.50	14.00	2.10	7.00	7.00	320.60	9,752	
S BR	9.00	225.00	135,00	13.50	18,00	2.70	 9,00	9.00	412-20	12,538	16.76

Туре	Gallons	Times	Usage	
Foilet Flush	5	x	5	Flushes per person per day
Shower	15	x	1	Showers per person per day
Dishload	3	x	0.5	Dishloads per person per day
Laundry	10	x	0.2	Clothesloads per person per day
Meal	0.1	x	.3	Meals per person per day
Handwashing	0.1	x	10	Handwashings per person per day
Other	i	x	1	per person per day

APPENDICES

APPENDIX A. – HEATING FORMULAS AND ASSUMPTIONS

Heating Consumption Levels

The following formulas were used in the calculation of the overall heat loss for each unit type and size. These formulas were taken from Modern Heating, Ventilating and Air Conditioning by George E. Clifford.

HEAT LOSS FORMULATIONS

1. Roof/Ceiling Loss

(Roof Area) x (Roof/Ceiling "U" Factor) x Delta T = Btuh

2. Wall Loss

(Wall Area) x (Wall "U" Factor) x Delta T = Btuh

3. Window Loss

(Window Area) x (Window "U" Factor) x Delta T = Btuh

4. <u>Door Loss</u>

(Door Area) x (Door "U" Factor) x Delta T = Btuh

5. Crack Loss Formulations

Crack Method for Windows and Doors Wind Velocity - 15 mph

Crack Infiltration Factor (CFM/LF) x Crack Length (LF) x Delta T(F) x 1.08 BTUH-F/CFM

6. Perimeter Heat Loss

(Exterior Perimeter Foot Length) x (Perimeter Factor) = Btuh

Heating Formulations Variable Values

The following page contains the formulation used to calculate the Annual Heating Load for each unit type and size. All the variables and constants are defined. The formula and all of the constants were adopted from Heating, Ventilating and Air Conditioning by George E. Clifford.

1. Calculation of Annual Heating Load

$$E = \frac{(H \times D \times 24hours)}{(T \times K \times V)} \times (cd)$$

Where:

E =Fuel or energy consumption for the estimate period, Btu

H = Design heat loss, including infiltration and ventilation, Btu/h

D = Number of heating degree days for the estimated period

T = Design temperature difference in degrees F

K = A correction factor that includes the effects of rated full load efficiency, port load performance, oversizing and energy conservation devices

V = Heating value of fuel, units consistent with H and E

cd = Empirical correction factor for heating effect versus degrees days

H = Is calculated by the heat-load tables and is based upon the U-values determined by the physical survey of each unit type

2. <u>Information for Calculations</u>

- Winter Design Temperature Difference is 38.2° F based on a Design Dry Bulb of 29.8° F for Seattle, Washington and a Design Temperature of 68° F. Occupants, appliances, and heat from the sun supply the remaining heat necessary to reach 72° F.
- Summer Design Temperature Difference is 5° F based on a Design Dry Bulb of 80° F for Seattle, Washington and a Design Temperature of 75° F.
- ➤ K value for a conventional, atmospherically vented natural gas furnace is 65%.
- ➤ Heating Degree-Day Value is 4532 based on data for Seattle, Washington.
- Cooling Degree-Day Value is 192 based on data for Seattle, Washington.

Assumptions for Annual Heat Loss Calculations

Global Data

Design Temp. Diff.(F) = 38.4Heating Degree Days = 4532

Duplex

Dimensions	0	1	2	3	4	5
Perimeter Foot Length	67	75	85	92	104	109
Roof Area(SF)	500	625	800	950	1,200	1,325
Exterior Wall Area(SF)	454	392	428	458	500	515
Window Area(SF)	45	70	100	120	155	175
Exterior Door Area(SF)	38	38	38	38	38	38
Crack Length of Windows	40	80	100	120	140	180
Crack Length of Doors	40	40	40	40	40	40
Size of heating system	42,000	42.000	42,000	60,000	60,000	60,000

<u>Garden</u>

Dimensions	0	1	2	3	4	5
Perimeter Foot Length	54	61	66	78	87	92
Roof Area(SF)	475	600	700	975	1.200	1,350
Exterior Wall Area(SF)	353	382	391	466	500	522
Window Area(SF)	45	70	100	120	155	175
Exterior Door Area(SF)	38	38	38	38	38	38
Crack Length of Windows	40	80	100	120	140	180
Crack Length of Doors	40	40	40	40	40	40
Size of heating system	42,000	42,000	42,000	60,000	60,000	60,000

Assumptions for Annual Heat Loss Calculations

High-Rise

Dimensions	0	1	2	3	4	5
Perimeter Foot Length	0	0	0	0	0	0
Roof Area(SF)	0	0	0	0	0	0
Exterior Wall Area(SF)	197	220	249	267	276	326
Window Area(SF)	45	58	73	100	122	136
Exterior Door Area(SF)	20	20	20	20	20	20
Crack Length of Windows	40	63	86	105	128	142
Crack Length of Doors	20	20	20	20	20	20
Size of heating system	42,000	42,000	42,000	60,000	60,000	60,000

Mobile Home

Dimensions	0	1	2	3	4	5
Perimeter Foot Length	89	93	101	109	110	115
Roof Area(SF)	325	400	550	750	800	1.000
Exterior Wall Area(SF)	498	543	634	746	757	829
Window Area(SF)	41	59	78	92	110	145
Exterior Door Area(SF)	38	38	38	38	38	38
Crack Length of Windows	35	51	65	80	95	120
Crack Length of Doors	40	40	40	40	40	40
Size of heating system	36,000	36,000	36,000	44,000	44.000	44,000

Single Family

Dimensions	0	1	2	3	4	5
Perimeter Foot Length	98	110	114	122	124	126
Roof Area(SF)	600	750	925	1,225	1,400	1,525
Exterior Wall Area(SF)	690	751	810	932	966	992
Window Area(SF)	56	88	125	150	194	220
Exterior Door Area(SF)	38	38	38	38	38	38
Crack Length of Windows	56	104	128	152	184	195
Crack Length of Doors	40	40	40	40	40	40
Size of heating system	42,000	42.000	60.000	60,000	80,000	80,000

Assumptions for Annual Heat Loss Calculations

Townhouse

Dimensions	0		2	3	4	5
Perimeter Foot Length	40	43	48	53	59	66
Roof Area(SF)	250	300	375	450	550	700
Exterior Wall Area(SF)	549	585	637	691	745	845
Window Area(SF)	45	70	100	120	155	175
Exterior Door Area(SF)	38	38	38	38	38	38
Crack Length of Windows	40	80	100	120	140	180
Crack Length of Doors	40	40	40	40	40	40
Size of heating system	42,000	42,000	42.000	60,000	60,000	60,000_

Minimum Standards	Coal	Electric	Heat Pump	Mobile Home	Natural Gas	Oil	Wood
Thermal Resistance	R-Value	R-Value	R-Value	R-Value	R-Value	R-Value	R-Value
R-value of ceiling	15.00	15.00	15.00	13.00	15.00	15.00	15.00
R value of exterior walls	9.01	9.01	9.01	6.99	9.01	9.01	9.01
R value of windows	1.61	1.61	1.61	1.61	1.61	1.61	1.61
R value of doors	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Window fit:	average	average	average	average	average	average	average
Door fit:	average	average	average	average	average	average	average

APPENDIX B. - HEAT LOAD TABLES

Back-Up Calculations - Heat Load Tables

Heat-Load Tables

The HCV Utility Allowance Study for the Renton Housing Authority produced many possible scenarios. This information has been organized, set to dollar figures, and presented in six simple forms in the Executive Summary. The following section contains sample tables for the possible scenarios. These tables contain information on the dimensions and thermal characteristics used for each heat load calculation and are organized first by bedroom size and then by fuel type and building type.

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER						
Unit Type:	Duplex	Heating Degree Days =	4532			
Number of Bed		Design Temp. Diff. $(F) =$	38			
Heating Fuel:	Natural Gas	Correction Factor (CD) =	0.62			
APARTMENT	DATA:					
	Number of Stories Per Unit:	1				
	Perimeter Linear Footage:	85	ft.			
	Perimeter Factor:	17.24	Btuh/lf			
	Perimeter Heat Loss:	1463.03	Btuh			
	Roof Square Footage:	800	sq.ft.			
	Roof U-Value:	0.067	Btuh/F-sf			
	Roof Heat Loss:	2048.00	Btuh			
	Exterior Wall Area:	428	sq.ft.			
	Wall U-Value:	0.11	Btuh/F-sf			
	Wall Heat Loss:	1822.97	Btuh			
	Window Area:	100	sq.ft.			
	Window U-Value:	0.62	Btuh/F-sf			
	Window Heat Loss:	2380.80	Btuh			
	Door Area:	38	sq.ft.			
	Door U-Value:		Btuh/F-sf			
	Door Heat Loss:	846.34	Btuh			
	Window Crack Length:	100	ft			
	Infiltration Loss Factor:	0.15	CFM / Lf			
	Infiltration Loss:	622.08	Btuh			
	Door Crack Length:	40	ft			
	Infiltration Loss Factor:	0.15	CFM / Lf			
	Infiltration Loss:	248.83	Btuh			
	Total Apartment Heat Loss Rate:	9432.05	Btuh			
	Estimated Heating System Overall I	Efficiency: 65%)			
	Standing Pilot? (yes or no)	Yes	3			
	Pilot BTU/hr.:	500	BTU/hr.			
	Pilot Operating Hours:		hrs/yr			
	Pilot Consumption:	4380	kBTU/yr			
	Heating Fuel? (Natural Gas, Electric	c, Propane) Natural Gas	3			
	Estimated Heating System Consump	otion: 299	THERMS			
	Heating System Fan? (yes or no)	Yes				
	Heating Output:	27,300				
	Fan Size:	400	Watts			

933 hours

373 kWh

Fan Operating Hours:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER						
Unit Type:		Garden	Heat	ing Degree Days =	4532	
Number of Bed	lrooms:	2		gn Temp. Diff.(F) =	38	
Heating Fuel:		Natural Gas	Corre	ection Factor (CD) =	0.62	
C						
APARTMENT						
		Stories Per Unit:		1	_	
		Linear Footage:		66		
	Perimeter I				Btuh/lf	
	Perimeter I	Heat Loss:		1140.45	Btuh	
	Roof Squa	re Footage:		700	sq.ft.	
	Roof U-Va	_			Btuh/F-sf	
	Roof Heat	Loss:		1792.00	Btuh	
				201		
	Exterior W				sq.ft.	
	Wall U-Va				Btuh/F-sf	
	Wall Heat	Loss:		1667.24	Blun	
	Window A	rea:		100	sq.ft.	
	Window U	-Value:			Btuh/F-sf	
	Window H	eat Loss:		2380.80	Btuh	
	D A	_		20	C	
	Door Area				sq.ft.	
	Door U-Va			846.34	Btuh/F-sf	
	Door Heat	LOSS:		040.34	Diun	
	Window C	rack Length:		100	ft	
	Infiltration	Loss Factor:		0.15	CFM / Lf	
	Infiltration	Loss:		622.08	Btuh	
	Door Crac	k I enath:		40	ft	
		Loss Factor:			CFM / Lf	
	Infiltration			248.83		
	m . 1 1		ъ.		D. I	
	-	tment Heat Loss		7557.29		
		Heating System (overall Efficien			
	Pilot BTU	Pilot? (yes or no)		Yes	BTU/hr.	
		ating Hours:			hrs/yr	
	Pilot Cons				kBTU/yr	
	I Hot Colls	атрион.		4300	KD I O/ yI	
	Heating Fu	iel? (Natural Gas	, Electric, Prop			
		Heating System (•		THERMS	
		stem Fan? (yes o	or no)	Yes		
	Heating O	utput:		27,300		
	Fan Size:				Watts	
	Fan Opera	ting Hours:		748	hours	

Fan Energy:

299 kWh

Renton Housing Authority

HOUSING CHOICE VOUCHER						
Unit Type:	High-Rise	Heating Degree Days =	4532			
Number of Bedrooms:	2	Design Temp. Diff. $(F) =$	38			
Heating Fuel:	Natural Gas	Correction Factor (CD) =	0.62			
APARTMENT DATA:						
Number of	of Stories Per Unit:	1				
Perimeter	r Linear Footage:	0	ft.			
Perimeter	•	17.24	Btuh/lf			
Perimeter	r Heat Loss:	0.00	Btuh			
Roof Sau	are Footage:	0	sq.ft.			
Roof U-V	_		Btuh/F-sf			
Roof Hea	at Loss:	0.00	Btuh			
Exterior '	Wall Area:	249	sq.ft.			
Wall U-V			Btuh/F-sf			
Wall Hea		1061.34				
Window	Amon	72	ag ft			
Window	U-Value:		sq.ft. Btuh/F-sf			
	Heat Loss:	1737.98				
William	neat Loss.	1737.96	Diun			
Door Are	ea:		sq.ft.			
Door U-	Value:	0.58	Btuh/F-sf			
Door Hea	at Loss:	445.44	Btuh			
Window	Crack Length:	86	ft			
Infiltration	on Loss Factor:	0.15	CFM / Lf			
Infiltration	on Loss:	534.99	Btuh			
Door Cra	ack Length:	20	ft			
Infiltratio	on Loss Factor:		CFM / Lf			
Infiltration	on Loss:	124.42	Btuh			
Total Ap	artment Heat Loss Rate:	3904.17	Btuh			
Estimate	d Heating System Overa	Il Efficiency: 65%)			
Standing	Pilot? (yes or no)	Yes	5			
Pilot BT	U/hr.:	500	BTU/hr.			
Pilot Ope	erating Hours:	8760	hrs/yr			
Pilot Cor	nsumption:	4380	kBTU/yr			
Heating 1	Fuel? (Natural Gas, Elec	etric, Propane) Natural Gas	3			
-	d Heating System Consu	_ · · · · · · · · · · · · · · · · · · ·	THERMS			
	System Fan? (yes or no)	-	3			
Heating (23,400	Btuh			
E Ci	_	400	Watta			

400 Watts

451 hours 180 kWh

Fan Size:

Fan Energy:

Fan Operating Hours:

Renton Housing Authority HOUSING CHOICE VOUCHER

	HOUSING CIT	OICE VOCCHER	
Unit Type: Number of Bedrooms: Heating Fuel:	Mobile Home 2 Natural Gas	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62
APARTMENT DATA:			
	of Stories Per Unit:	1	
Floor So	quare Footage:	550	ft.
	er Factor:	2.30	Btuh/lf
Floor H	eat Loss:	1265.00	Btuh
Roof So	juare Footage:	550	sq.ft.
Roof U-			Btuh/F-sf
Roof He	eat Loss:	1624.62	Btuh
Exterior	Wall Area:	634	sq.ft.
Wall U-			Btuh/F-sf
Wall He	eat Loss:	3483.98	Btuh
Windov	v Area:	78	sq.ft.
	v U-Value:		Btuh/F-sf
Window	v Heat Loss:	1857.02	Btuh
Door A	rea:	38	sq.ft.
Door U	-Value:		Btuh/F-sf
Door H	eat Loss:	846.34	Btuh
Window	w Crack Length:	65	ft
	ion Loss Factor:	0.15	CFM / Lf
Infiltrat	ion Loss:	404.35	Btuh
Door C	rack Length:	40	ft
	ion Loss Factor:		CFM / Lf
Infiltrat	ion Loss:	248.83	Btuh
Total A	partment Heat Loss Rate	e: 9730.14	Btuh
	ed Heating System Over	rall Efficiency: 65%	1
	g Pilot? (yes or no)	Yes	
	ΓU/hr.:		BTU/hr.
-	perating Hours: onsumption:		hrs/yr kBTU/yr
Pilot Co	onsumption:	4300	KB I U/yI
•	Fuel? (Natural Gas, Ele	•	
	ed Heating System Cons	•	THERMS
_	System Fan? (yes or no		
Heating Fan Siz	g Output:	23,400	Watts
	erating Hours:		hours
Fan En	_	·	kWh
		• • •	

Renton Housing Authority

HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER						
Unit Type: Number of Bedrooms: Heating Fuel:	Single Family 2 Natural Gas	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62			
APARTMENT DATA:						
Number	of Stories Per Unit:	1				
Perimete	r Linear Footage:	114	ft.			
Perimete			Btuh/lf			
Perimete	r Heat Loss:	1965.59	Btuh			
Roof Sq	uare Footage:	925	sq.ft.			
Roof U-	Value:	0.067	Btuh/F-sf			
Roof He	at Loss:	2368.00	Btuh			
Exterior	Wall Area:	810	sq.ft.			
Wall U-	Value:	0.11	Btuh/F-sf			
Wall He	at Loss:	3453.58	Btuh			
Window	Area:	125	sq.ft.			
Window	U-Value:		Btuh/F-sf			
Window	Heat Loss:	2976.00	Btuh			
Door Ar	ea:	38	sq.ft.			
Door U-	Value:		Btuh/F-sf			
Door He	at Loss:	846.34	Btuh			
Window	Crack Length:	128	ft			
	on Loss Factor:	0.15	CFM / Lf			
Infiltrati	on Loss:	796.26	Btuh			
Door Cr	ack Length:	40	ft			
	on Loss Factor:		CFM / Lf			
Infiltrati	on Loss:	248.83	Btuh			
Total Ap	partment Heat Loss Rate	e: 12654.59	Btuh			
	d Heating System Over	rall Efficiency: 65%				
Standing	g Pilot? (yes or no)	Yes				
Pilot BT			BTU/hr.			
•	erating Hours:		hrs/yr			
Pilot Co	nsumption:	4380	kBTU/yr			
_	Fuel? (Natural Gas, Ele	-	;			
	d Heating System Cons	-	THERMS			
	System Fan? (yes or no					
Heating	Output:	39,000	Btuh			

400 Watts

877 hours

351 kWh

Fan Size:

Fan Energy:

Fan Operating Hours:

Renton Housing Authority

HOUSING CHOICE VOUCHER

		HOUSING CI	IOICE VOUCHER		
Unit Type: Number of Be Heating Fuel:	drooms:	Townhouse 1 Natural Gas	Heating Deg Design Temp Correction F	•	4532 38 0.62
_					
APARTMENT					
		of Stories Per Unit:		2	
		r Linear Footage:		43	
	Perimete				Btuh/lf
	Perimete	r Heat Loss:		746.60	Btuh
	Roof Squ	iare Footage:		300	sq.ft.
	Roof U-V			0.067	Btuh/F-sf
	Roof He	at Loss:		768.00	Btuh
	Exterior	Wall Area:		585	sq.ft.
	Wall U-V	/alue:		0.11	Btuh/F-sf
	Wall Hea	at Loss:		2492.74	Btuh
	Window	Area:		70	sq.ft.
		U-Value:			Btuh/F-sf
	Window	Heat Loss:		1666.56	Btuh
	Door Are	ea:		38	sq.ft.
	Door U-				Btuh/F-sf
	Door He			846.34	
	Window	Crack Length:		80	ft
		on Loss Factor:			CFM / Lf
	Infiltration			497.66	
	Door Cr	ack Length:		40	f.
		on Loss Factor:			CFM / Lf
	Infiltration			248.83	
	Total Ar	artment Heat Loss Ra	te•	7266.73	Rtuh
	_	d Heating System Ove		65%	
		Pilot? (yes or no)	run Emoioney.	Yes	
	Pilot BT				BTU/hr.
		erating Hours:			hrs/yr
	_	nsumption:			kBTU/yr
	Heating	Fuel? (Natural Gas, El	lectric, Propane)	Natural Gas	
	_	d Heating System Cor	_		THERMS
		System Fan? (yes or n	•	Yes	
	Hastina	O	-,	27 200	

27,300 Btuh

400 Watts

719 hours

288 kWh

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Renton Housing Authority

HOUSING CHOICE VOUCHER						
Unit Type:	Duplex	Heating Degree Days =	4532			
Number of Bed	rooms: 1	Design Temp. Diff. $(F) =$	38			
Heating Fuel:	Electric	Correction Factor (CD) =	0.62			
APARTMENT	DATA:					
	Number of Stories Per Unit:	1				
	Perimeter Linear Footage:	75	ft.			
	Perimeter Factor:	17.24	Btuh/lf			
	Perimeter Heat Loss:	1293.15	Btuh			
	Roof Square Footage:	625	sq.ft.			
	Roof U-Value:		Btuh/F-sf			
	Roof Heat Loss:	1600.00	Btuh			
	Exterior Wall Area:	392	sq.ft.			
	Wall U-Value:		Btuh/F-sf			
	Wall Heat Loss:	1670.86	Btuh			
	Window Area:	70	sq.ft.			
	Window U-Value:		Btuh/F-sf			
	Window Heat Loss:	1666.56	Btuh			
	Door Area:	38	sq.ft.			
	Door U-Value:		Btuh/F-sf			
	Door Heat Loss:	846.34	Btuh			
	Window Crack Length:	80	ft			
	Infiltration Loss Factor:	0.15	CFM / Lf			
	Infiltration Loss:	497.66	Btuh			
	Door Crack Length:	40	ft			
	Infiltration Loss Factor:	0.15	CFM / Lf			
	Infiltration Loss:	248.83	Btuh			
	Total Apartment Heat Loss Rate	e: 7823.40	Btuh			
	Estimated Heating System Over	rall Efficiency: 95%	b			
	Standing Pilot? (yes or no)	No)			
	Pilot BTU/hr.:	0	BTU/hr.			
	Pilot Operating Hours:	0	hrs/yr			
	Pilot Consumption:	0	kBTU/yr			
	Heating Fuel? (Natural Gas, Ele	ectric, Propane) Electric	c 11			
	Estimated Heating System Cons	sumption: 4,237	KWH			
	Heating System Fan? (yes or no	Ye	S			
	Heating Output:	39,900				
	E O'	400	337-44-			

400 Watts

362 hours145 kWh

Fan Size:

Fan Energy:

Fan Operating Hours:

Renton Housing Authority

	HOUSING O	CHOICE VOUCHER	
Unit Type:	Garden	Heating Degree Days =	4532
Number of Bed	drooms: 1	Design Temp. Diff.(F) =	38
Heating Fuel:	Electric	Correction Factor (CD) =	0.62
APARTMENT	DATA:		
	Number of Stories Per Unit:	1	
	Perimeter Linear Footage:	61	ft.
	Perimeter Factor:	17.24	Btuh/lf
	Perimeter Heat Loss:	1055.85	Btuh
	Roof Square Footage:	600	sq.ft.
	Roof U-Value:	0.067	Btuh/F-sf
	Roof Heat Loss:	1536.00	Btuh
	Exterior Wall Area:	382	sq.ft.
	Wall U-Value:		Btuh/F-sf
	Wall Heat Loss:	1627.80	Btuh
	Window Area:	70	sq.ft.
	Window U-Value:	0.62	Btuh/F-sf
	Window Heat Loss:	1666.56	Btuh
	Door Area:	38	sq.ft.
	Door U-Value:	0.58	Btuh/F-sf
	Door Heat Loss:	846.34	Btuh
	Window Crack Length:	80	ft
	Infiltration Loss Factor:	0.15	CFM / Lf
	Infiltration Loss:	497.66	Btuh
	Door Crack Length:	40	ft
	Infiltration Loss Factor:		CFM / Lf
	Infiltration Loss:	248.83	Btuh
	Total Apartment Heat Loss R		
	Estimated Heating System Ov		
	Standing Pilot? (yes or no)		
	Pilot BTU/hr.:		BTU/hr.
	Pilot Operating Hours:		hrs/yr
	Pilot Consumption:	0	kBTU/yr
	Heating Fuel? (Natural Gas, I	<u>-</u>	
	Estimated Heating System Co	=	
	Heating System Fan? (yes or		
	Heating Output:	39,900	
	E 0'	400	XX7-44-

400 Watts

298 hours119 kWh

Fan Size:

Fan Energy:

Fan Operating Hours:

Renton Housing Authority HOUSING CHOICE VOUCHER

		HOUSHV	d choice	VOCHER		
Unit Type: Number of Bec Heating Fuel:	drooms:	High-Rise 1 Electric		Heating Degree I Design Temp. De Correction Factor	iff.(F) =	4532 38 0.62
APARTMENT	· DATA·					
711 711(11)121(1		Stories Per Uni	it:		1	
		Linear Footage:			0	ft.
	Perimeter I				17.24	Btuh/lf
	Perimeter I	Heat Loss:			0.00	Btuh
	Roof Squar	re Footage:			0	sq.ft.
	Roof U-Va	_				Btuh/F-sf
	Roof Heat	Loss:			0.00	Btuh
	Exterior W	'all Area:			220	sa.ft.
	Wall U-Va					Btuh/F-sf
	Wall Heat	Loss:			937.73	Btuh
	Window A	rea:			58	sq.ft.
	Window U					Btuh/F-sf
	Window H	eat Loss:			1380.86	Btuh
	Door Area				20	sq.ft.
	Door U-Va					Btuh/F-sf
	Door Heat				445.44	
	Window C	rack Length:			63	ft
		Loss Factor:				CFM / Lf
	Infiltration	Loss:			391.91	Btuh
	Door Crac	k Length:			20	ft
		Loss Factor:				CFM / Lf
	Infiltration	Loss:			124.42	Btuh
	Total Apai	tment Heat Los	s Rate:		3280.36	Btuh
	-	Heating System		fficiency:	95%	
	Standing P	ilot? (yes or no)		No	
	Pilot BTU	/hr.:			0	BTU/hr.
	•	ating Hours:				hrs/yr
	Pilot Cons	umption:			0	kBTU/yr
	Heating Fu	uel? (Natural Ga	as, Electric,	, Propane)	Electric	
		Heating System	_	tion:	1,777	kWh
		ystem Fan? (yes	or no)		Yes	
	Heating O	utput:			34,200	
	Fan Size:	et II.				Watts
	-	ting Hours:				hours kWh
	Fan Energ	у.			/1	W AA 11

Renton Housing Authority HOUSING CHOICE VOUCHER

Number of Bedrooms: 2 Design Temp. Diff.(F) = 38	Unit Type	Mobile Home	Heating Dagree Days -	4532
Heating Fuel: Electric Correction Factor (CD) = 0.62	Unit Type:		Heating Degree Days =	
APARTMENT DATA: Number of Stories Per Unit: Floor Square Footage: Perimeter Factor: Floor Heat Loss: Roof Square Footage: Roof U-Value: Roof Heat Loss: Exterior Wall Area: Wall U-Value: Window Area: Window U-Value: Window Heat Loss: Door Area: Door U-Value: Door Heat Loss: Door Grack Length: Infiltration Loss Factor: Infiltration Loss Total Apartment Heat Loss Rate: Estimated Heating System Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Heating System Fan? (yes or no) Heat Loss: Habitation Loss Hunh Fso Hunh				
Number of Stories Per Unit: Floor Square Footage: 550 sq. ft. Perimeter Factor: 2.30 Btuh/lf Floor Heat Loss: 1265.00 Btuh Roof Square Footage: 550 sq.ft. Roof U-Value: 0.077 Btuh/F-sf Roof Heat Loss: 1624.62 Btuh Exterior Wall Area: 634 sq.ft. Wall U-Value: 0.14 Btuh/F-sf Wall Heat Loss: 3483.98 Btuh Window Area: 78 sq.ft. Window U-Value: 0.62 Btuh/F-sf Window Heat Loss: 1857.02 Btuh Door Area: 38 sq.ft. Door U-Value: 0.58 Btuh/F-sf Door Heat Loss: 846.34 Btuh Window Crack Length: 65 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: 0 hrs/yr Pilot Consumption: 0 kBTU/yr Heating System Fan? (yes or no) Heating System Fan? (yes or no) Electric S.270 kWh Fas Size: 34,200 Btuh Fan Size: 526 hours	ricating r det.	Biccaric	correction ructor (CD) =	0.02
Floor Square Footage: 550 sq. ft.	APARTMENT DA	ТА:		
Perimeter Factor:				
Floor Heat Loss:				
Roof Square Footage:				
Roof U-Value: 0.077 Btuh/F-sf Roof Heat Loss: 1624.62 Btuh Exterior Wall Area: 634 sq.ft. Wall U-Value: 0.14 Btuh/F-sf Wall Heat Loss: 3483.98 Btuh Window Area: 78 sq.ft. Window U-Value: 0.62 Btuh/F-sf Window Heat Loss: 1857.02 Btuh Door Area: 0.58 Btuh/F-sf Door U-Value: 0.58 Btuh/F-sf Door Heat Loss: 846.34 Btuh Window Crack Length: 65 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 404.35 Btuh Door Crack Length: 40 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) No Pilot Operating Hours:	Floo	or Heat Loss:	1265.00	Btuh
Roof Heat Loss: 1624.62 Btuh	Roo	of Square Footage:	550	sq.ft.
Exterior Wall Area:		_	0.077	Btuh/F-sf
Wall U-Value: 0.14 Btuh/F-sf Wall Heat Loss: 3483.98 Btuh Window Area: 78 sq.ft. Window U-Value: 0.62 Btuh/F-sf Window Heat Loss: 1857.02 Btuh Door Area: 38 sq.ft. Door U-Value: 0.58 Btuh/F-sf Door Heat Loss: 846.34 Btuh Window Crack Length: 65 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 404.35 Btuh Door Crack Length: 40 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) No Pilot Doperating Hours: 0 hrs/yr Pilot Consumption: 0 kBTU/hr. Heating Fuel? (Natural Gas, Electric, Propane) Electric Estimated Heating System Consumption: 5,270 kWh Heating Output: 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours: 526 hours	Roo	of Heat Loss:	1624.62	Btuh
Wall U-Value: 0.14 Btuh/F-sf Wall Heat Loss: 3483.98 Btuh Window Area: 78 sq.ft. Window U-Value: 0.62 Btuh/F-sf Window Heat Loss: 1857.02 Btuh Door Area: 38 sq.ft. Door U-Value: 0.58 Btuh/F-sf Door Heat Loss: 846.34 Btuh Window Crack Length: 65 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 404.35 Btuh Door Crack Length: 40 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) No Pilot Doperating Hours: 0 hrs/yr Pilot Consumption: 0 kBTU/hr. Heating Fuel? (Natural Gas, Electric, Propane) Electric Estimated Heating System Consumption: 5,270 kWh Heating Output: 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours: 526 hours	Exte	erior Wall Area:	634	sa.ft.
Wall Heat Loss: 3483.98 Btuh Window Area: 78 sq.ft. Window U-Value: 0.62 Btuh/F-sf Window Heat Loss: 1857.02 Btuh Door Area: 38 sq.ft. Door U-Value: 0.58 Btuh/F-sf Door Heat Loss: 846.34 Btuh Window Crack Length: 65 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 404.35 Btuh Door Crack Length: 40 ft Infiltration Loss Factor: 0.15 CFM / Lf Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) No Pilot BTU/hr.: 0 BTU/hr. Pilot Consumption: 0 kBTU/yr Heating Fuel? (Natural Gas, Electric, Propane) Electric Estimated Heating System Consumption: 5,270 kWh Heating Output: 34,200 Btuh Fan Size:				-
Window U-Value: Window Heat Loss: Door Area: Door U-Value: Door Heat Loss: Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Door Crack Length: Infiltration Loss Factor: Infiltration Loss Infiltration Loss: Infiltration Loss Factor: Infiltration Loss: Infiltration Los				
Window U-Value: Window Heat Loss: Door Area: Door U-Value: Door Heat Loss: Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Door Crack Length: Infiltration Loss Factor: Infiltration Loss Infiltration Loss: Infiltration Loss Factor: Infiltration Loss: Infiltration Los				
Window Heat Loss: Door Area: Door U-Value: Door Heat Loss: Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: 400 Watts Fan Operating Hours: 526 hours				-
Door Area: Door U-Value: Door U-Value: Door Heat Loss: 846.34 Btuh Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss: Door Crack Length: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Double CFM / Lf Infiltration Loss: Double CFM / Lf Infiltration Loss: Infiltration Loss Infi				
Door U-Value: Door Heat Loss: 846.34 Btuh Window Crack Length: Infiltration Loss Factor: Infiltration Loss: 404.35 Btuh Door Crack Length: Infiltration Loss: 404.35 Btuh Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: 40 ft Infiltration Loss: 248.83 Btuh Total Apartment Heat Loss Rate: 9730.14 Btuh Estimated Heating System Overall Efficiency: 95% Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: 0 bTU/hr. Pilot Consumption: 0 kBTU/yr Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Fasting Output: 400 Watts Fan Operating Hours: 526 hours	WII	idow Heat Loss:	1637.02	Diun
Door Heat Loss: Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Infiltr	Doo	or Area:	38	sq.ft.
Window Crack Length: Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 526 hours	Doo	or U-Value:	0.58	Btuh/F-sf
Infiltration Loss Factor: Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Fastimated Heating System Consumption: Heating Output: Fan Size: Fan Operating Hours: 5.270 kWh Yes 400 Watts 526 hours	Doo	or Heat Loss:	846.34	Btuh
Infiltration Loss: Door Crack Length: Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Fastimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 540 404.35 Btuh 40 615 617 618 618 619 619 619 619 619 619	Wir	ndow Crack Length:	65	ft
Door Crack Length: Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Fan Size: Fan Operating Hours: 40 ft 0.15 CFM / Lf 248.83 Btuh 810h 8248.83 Btuh 825% 826 by 9730.14 Btuh 825% 826 Btuh 827 827 828 828 828 828 828 828	Infi	Itration Loss Factor:	0.15	CFM / Lf
Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Fan Size: Fan Operating Hours: 10.15 CFM / Lf 248.83 Btuh 9730.14 Btuh Btuh Btuh Btuh BTU/hr. 0 BTU/hr. 0 hrs/yr Electric 5,270 kWh Yes 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours:	Infi	Itration Loss:	404.35	Btuh
Infiltration Loss Factor: Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Fan Size: Fan Operating Hours: 10.15 CFM / Lf 248.83 Btuh 9730.14 Btuh Btuh Btuh Btuh BTU/hr. 0 BTU/hr. 0 hrs/yr Electric 5,270 kWh Yes 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours:	Doc	or Crack Length:	40	ft
Infiltration Loss: Total Apartment Heat Loss Rate: Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 248.83 Btuh 9730.14 Btuh 95% No BTU/hr. 0 hrs/yr Electric 5,270 kWh Yes 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours: 526 hours		-		
Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 95% No BTU/hr. 0 BTU/hr. 0 kBTU/yr Electric 5,270 kWh Yes 4400 Watts 5400 Watts 5506 hours			248.83	Btuh
Estimated Heating System Overall Efficiency: Standing Pilot? (yes or no) Pilot BTU/hr.: Pilot Operating Hours: Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 95% No BTU/hr. 0 BTU/hr. 0 kBTU/yr Electric 5,270 kWh Yes 4400 Watts 5400 Watts 5506 hours	Tot	al Apartment Heat Loss Rate	9730.14	Btuh
Standing Pilot? (yes or no) Pilot BTU/hr.: 0 BTU/hr. Pilot Operating Hours: 0 hrs/yr Pilot Consumption: 0 kBTU/yr Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: 5,270 kWh Heating System Fan? (yes or no) Heating Output: 5 400 Watts Fan Operating Hours: 5 526 hours		=		
Pilot BTU/hr.: Pilot Operating Hours: O hrs/yr Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Tan Operating Hours: O BTU/hr. O hrs/yr Electric 5,270 kWh Yes 4400 Watts Fan Operating Hours: 526 hours)
Pilot Consumption: Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: 5 kBTU/yr Electric 5,270 kWh Yes 34,200 Btuh 400 Watts	Pilo	ot BTU/hr.:	0	BTU/hr.
Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Fan Operating Hours: Electric 5,270 kWh Yes 4400 Watts 526 hours	Pilo	ot Operating Hours:	0	hrs/yr
Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Yes 400 Watts Fan Operating Hours: 5,270 kWh Yes 4,200 Btuh 400 Watts	Pilo	ot Consumption:	0	kBTU/yr
Estimated Heating System Consumption: Heating System Fan? (yes or no) Heating Output: Fan Size: Yes 400 Watts Fan Operating Hours: 5,270 kWh Yes 4,200 Btuh 400 Watts	Hea	ating Fuel? (Natural Gas. Ele	ctric, Propane) Electric	;
Heating System Fan? (yes or no) Yes Heating Output: 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours: 526 hours		_	' 1 '	
Heating Output: 34,200 Btuh Fan Size: 400 Watts Fan Operating Hours: 526 hours			•	
Fan Operating Hours: 526 hours				Btuh
1 6		• .	400	Watts
Fan Energy: 210 kWh	Fan	Operating Hours:	526	hours
	Fan	Energy:	210	kWh

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER					
Unit Type:		Single Family	Heating Degree	e Days =	4532
Number of Bed	lrooms:	2	Design Temp. 1	Diff.(F) =	38
Heating Fuel:		Electric	Correction Fac	tor (CD) =	0.62
APARTMENT	DATA:				
	Number of	f Stories Per Unit:		1	
	Perimeter	Linear Footage:		114	ft.
	Perimeter	-		17.24	Btuh/lf
	Perimeter	Heat Loss:		1965.59	Btuh
	Roof Squa	are Footage:		925	sq.ft.
	Roof U-V				Btuh/F-sf
	Roof Heat			2368.00	
	Exterior V	Vall Area:		810	sq.ft.
	Wall U-V				Btuh/F-sf
	Wall Heat			3453.58	
	wali neal	LUSS.		3433.30	Diuli
	Window A	Area:		125	sq.ft.
	Window U	J-Value:		0.62	Btuh/F-sf
	Window I	Heat Loss:		2976.00	Btuh
	Door Area	a:		38	sq.ft.
	Door U-V	alue:		0.58	Btuh/F-sf
	Door Hear	t Loss:		846.34	Btuh
	Window (Crack Length:		128	ft
		n Loss Factor:			CFM / Lf
	Infiltration			796.26	
	Door Crac	ek I enoth:		40	ft
		n Loss Factor:			CFM / Lf
	Infiltration			248.83	
	Total Ana	rtment Heat Loss Rat	۵۰	12654.59	Rtub
		Heating System Ove		95%	
		Pilot? (yes or no)	rail Efficiency.	No	
	Pilot BTU	•			BTU/hr.
	-	rating Hours:			hrs/yr
	Pilot Cons	sumption:		U	kBTU/yr
	Heating F	uel? (Natural Gas, El	ectric, Propane)	Electric	
	Estimated	Heating System Con	sumption:	6,854	KWH
		ystem Fan? (yes or no	-	Yes	
	Heating C	•		57,000	
	Fan Size:	•			Watts
	E O	TT		410	L

410 hours

164 kWh

Fan Operating Hours:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type: Number of Bedi Heating Fuel:	rooms:	Townhouse 2 Electric		Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62	
APARTMENT	DATA:					
	Number of	Stories Per Unit:			2	
	Perimeter I	Linear Footage:		48	ft.	
	Perimeter I	Factor:		17.24	Btuh/lf	
	Perimeter I	Heat Loss:		834.72	Btuh	
	Roof Squai	re Footage:		375	sq.ft.	
	Roof U-Va	lue:		0.067	Btuh/F-sf	
	Roof Heat	Loss:		960.00	Btuh	
	Exterior W	all Area:		637	sq.ft.	
	Wall U-Va	lue:		0.11	Btuh/F-sf	
	Wall Heat	Loss:		2713.43	Btuh	
	Window A	rea:		100	sq.ft.	
	Window U	-Value:		0.62	Btuh/F-sf	
	Window H	eat Loss:		2380.80	Btuh	
	Door Area	:		38	sq.ft.	
	Door U-Va	ilue:		0.58	Btuh/F-sf	
	Door Heat	Loss:		846.34	Btuh	
	Window C	rack Length:		100	ft	
	Infiltration	Loss Factor:		0.15	CFM / Lf	
	Infiltration	Loss:		622.08	Btuh	
	Door Crac	k Length:		40	ft	
		Loss Factor:			CFM / Lf	
	Infiltration	Loss:		248.83	Btuh	
	-	tment Heat Loss Ra		8606.20		
		Heating System Ove	erall Ef			
	_	ilot? (yes or no)		N	-	
	Pilot BTU				BTU/hr.	
	-	ating Hours:			hrs/yr	
	Pilot Cons	umption:		C	kBTU/yr	

Heating Fuel? (Natural Gas, Electric, Propane)

Estimated Heating System Consumption:

Heating System Fan? (yes or no)

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Electric

4,661 KWH

400 Watts

399 hours

160 kWh

Yes

39,900 Btuh

Renton Housing Authority

HOUSING CHOICE VOUCHER					
Unit Type:		Ouplex	_	Degree Days =	4532
Number of Bedro				emp. Diff.(F) =	38
Heating Fuel:	H	leat Pump	Correction	on Factor (CD) =	0.62
APARTMENT I	DATA:				
N	Number of S	tories Per Unit:		1	
F	Perimeter Li	near Footage:		85	ft.
	Perimeter Fa				Btuh/lf
	Perimeter He			1463.03	
F	Roof Square	Footage:		800	sq.ft.
	Roof U-Valu				Btuh/F-sf
	Roof Heat Lo			2048.00	
F	Exterior Wal	l Area:		428	sq.ft.
	Wall U-Valu				Btuh/F-sf
	Wall Heat Lo			1822.97	
,	Window Are	a·		100	sq.ft.
	Window U-V				Btuh/F-sf
	Window U-V			2380.80	
`	William Hea	it LUSS.		2380.80	Dtuli
Ι	Door Area:			38	sq.ft.
I	Door U-Valu	ie:		0.58	Btuh/F-sf
I	Door Heat L	oss:		846.34	Btuh
1	Window Cra	ck Length:		100	ft
	nfiltration L	-		0.15	CFM / Lf
I	nfiltration L	oss:		622.08	Btuh
I	Door Crack 1	Length:		40	ft
	nfiltration L	•		· ·	CFM / Lf
	nfiltration L			248.83	
7	Γotal Apartn	nent Heat Loss Ra	te:	9432.05	Btuh
		eating System Ove		170%	
		ot? (yes or no)	, .	No	
	Pilot BTU/h			_ · ·	BTU/hr.
	Pilot Operati				hrs/yr
	Pilot Consun	-			kBTU/yr
		•			•
	_	? (Natural Gas, E	_		
		eating System Cor	-	2,855	KWH
1	Tankina Cask	E9 (-1	Vac	

Yes

63,000 Btuh

400 Watts

155 hours

62 kWh

Heating System Fan? (yes or no)

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOLICHER

HOUSING CHOICE VOUCHER				
Unit Type:	Garden	Heating Degree Days =	4532	
Number of Bedrooms:	3	Design Temp. Diff.(F) =	38	
Heating Fuel:	Heat Pump	Correction Factor (CD) =	0.62	
APARTMENT DATA	:			
Numbe	er of Stories Per Unit:	1		
Perime	eter Linear Footage:	78	ft.	
	eter Factor:	17.24	Btuh/lf	
Perime	eter Heat Loss:	1345.95	Btuh	
Roof S	quare Footage:	975	sq.ft.	
Roof U	J-Value:	0.067	Btuh/F-sf	
Roof F	leat Loss:	2496.00	Btuh	
Exterio	or Wall Area:	466	sq.ft.	
Wall U	J-Value:	0.11	Btuh/F-sf	
Wall F	Heat Loss:	1988.41	Btuh	
Windo	w Area:	120	sq.ft.	
Windo	w U-Value:	0.62	Btuh/F-sf	
Windo	w Heat Loss:	2856.96	Btuh	
Door A	Area:	38	sq.ft.	
Door U	J-Value:	0.58	Btuh/F-sf	
Door I	Heat Loss:	846.34	Btuh	
Windo	w Crack Length:	120	ft	
Infiltra	ation Loss Factor:	0.15	CFM / Lf	
Infiltra	ation Loss:	746.50	Btuh	
Door (Crack Length:	40	ft	
	ation Loss Factor:		CFM / Lf	
Infiltra	ation Loss:	248.83	Btuh	
Total .	Apartment Heat Loss Rat	te: 9183.03	Btuh	
	ated Heating System Ove			
Standi	ng Pilot? (yes or no)	No		
	BTU/hr.:		BTU/hr.	
	Operating Hours:		hrs/yr	
Pilot C	Consumption:	0	kBTU/yr	
	ng Fuel? (Natural Gas, El	- · · · · · · · · · · · · · · · · · · ·		
	ated Heating System Con	•	KWH	
	ng System Fan? (yes or no			
	ng Output:	90,000		
Fan Si			Watts	
Eon O	parating Hours:	105	houre	

Fan Operating Hours:

Fan Energy:

105 hours

42 kWh

Renton Housing Authority

HOUSING CHOICE VOUCHER				
Unit Type:	High-F		Heating Degree Days =	4532
Number of Bedr	ooms: 3		Design Temp. Diff. $(F) =$	38
Heating Fuel:	Heat P	ump	Correction Factor (CD) =	0.62
APARTMENT	DATA:			
	Number of Stories	Per Unit:	1	
	Perimeter Linear F			ft.
	Perimeter Factor:			Btuh/lf
	Perimeter Heat Lo	ss:		Btuh
	Roof Square Foota	age:		sq.ft.
•	Roof U-Value:			Btuh/F-sf
]	Roof Heat Loss:		0.00	Btuh
]	Exterior Wall Are	a:	267	sq.ft.
•	Wall U-Value:		0.11	Btuh/F-sf
,	Wall Heat Loss:		1138.06	Btuh
,	Window Area:		100	sq.ft.
•	Window U-Value:			Btuh/F-sf
,	Window Heat Los	s:	2380.80	Btuh
	Door Area:		20	sq.ft.
	Door U-Value:			Btuh/F-sf
	Door Heat Loss:		445.44	
	Window Crack Le	-	105	
	Infiltration Loss F	actor:		CFM / Lf
	Infiltration Loss:		653.18	Btuh
	Door Crack Lengt	h:	20	ft
	Infiltration Loss F	actor:	0.15	CFM / Lf
	Infiltration Loss:		124.42	Btuh
	Total Apartment I	Heat Loss Rate:	4741.90	Btuh
	Estimated Heating	System Overall Ef	ficiency: 170%	
	Standing Pilot? (y	es or no)	No	ı
	Pilot BTU/hr.:		0	BTU/hr.
	Pilot Operating H	ours:	0	hrs/yr
	Pilot Consumption			kBTU/yr
	Heating Fuel? (Na	ntural Gas, Electric,	Propane) Heat Pump)
	_	System Consumpti		KWH
	Haating System E	•	Vos	

Heating System Fan? (yes or no)

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Yes

66,000 Btuh

400 Watts

74 hours30 kWh

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER				
Unit Type: Number of Bedrooms:	Mobile Home 3	Heating Degree Days = Design Temp. Diff.(F) =	4532 38	
Heating Fuel:	Heat Pump	Correction Factor (CD) =	0.62	
APARTMENT DATA	:			
Numbe	er of Stories Per Unit:	1		
Floor S	Square Footage:	750	sq. ft.	
	ter Factor:		Btuh/lf	
Floor F	leat Loss:	1725.00	Btuh	
Roof S	quare Footage:	750	sq.ft.	
Roof U	J-Value:		Btuh/F-sf	
Roof H	leat Loss:	2215.38	Btuh	
Exterio	or Wall Area:	746	sq.ft.	
Wall U	J-Value:	0.14	Btuh/F-sf	
Wall H	leat Loss:	4098.39	Btuh	
Windo	w Area:	92	sq.ft.	
Windo	w U-Value:	0.62	Btuh/F-sf	
Windo	w Heat Loss:	2190.34	Btuh	
Door A	Area:	38	sq.ft.	
Door U	J-Value:	0.58	Btuh/F-sf	
Door F	Heat Loss:	846.34	Btuh	
Windo	w Crack Length:	80	ft	
Infiltra	tion Loss Factor:	0.15	CFM / Lf	
Infiltra	tion Loss:	497.66	Btuh	
Door (Crack Length:	40	ft	
	tion Loss Factor:	0.15	CFM / Lf	
Infiltra	tion Loss:	248.83	Btuh	
Total A	Apartment Heat Loss Rate:	11821.94	Btuh	
	ited Heating System Overall E	Efficiency: 170%)	
Standi	ng Pilot? (yes or no)	No)	
Pilot B	STU/hr.:		BTU/hr.	
Pilot C	perating Hours:		hrs/yr	
Pilot C	Consumption:	0	kBTU/yr	

Heating Fuel? (Natural Gas, Electric, Propane)	Heat Pump	
Estimated Heating System Consumption:	3,578	KWH
Heating System Fan? (yes or no)	Yes	
Heating Output:	66,000	Btuh
Fan Size:	400	Watts
Fan Operating Hours:	185	hours
Fan Energy:	74	kWh

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type: Number of Heating Fue		Single Family 3 Heat Pump	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62
APARTME	NT DATA:			
711 711(11)12		of Stories Per Unit:	1	
		Linear Footage:	122	ft.
	Perimeter			Btuh/lf
		Heat Loss:	2103.52	
	1 crimeter	Ticat Boss.	2103.32	Dian
	Roof Squ	are Footage:	1225	sq.ft.
	Roof U-V	/alue:	0.067	Btuh/F-sf
	Roof Hea	at Loss:	3136.00	Btuh
	Eutonion	Wall Area:	022	sa ft
	Wall U-V			sq.ft. Btuh/F-sf
	Wall Hea	it Loss:	3972.56	Blun
	Window	Area:	150	sq.ft.
	Window	U-Value:	0.62	Btuh/F-sf
	Window	Heat Loss:	3571.20	Btuh
	ъ .		20	6
	Door Are			sq.ft.
	Door U-			Btuh/F-sf
	Door Hea	at Loss:	846.34	Btun
	Window	Crack Length:	152	ft
		on Loss Factor:	0.15	CFM / Lf
	Infiltratio		945.56	Btuh
	Door Cro	ale Lamath	40	c.
		nck Length: on Loss Factor:		CFM / Lf
	Infiltratio		248.83	
		л 2000.	240.03	Diun
		artment Heat Loss Rate:	14824.01	Btuh
	Estimate	d Heating System Overall	Efficiency: 170%	
	Standing	Pilot? (yes or no)	No)
	D'1 - D'0	T T //	^	TO CENT I (I

Heating Fuel? (Natural Gas, Electric, Propane)	Heat Pump
Estimated Heating System Consumption:	4,487 KWH
Heating System Fan? (yes or no)	Yes
Heating Output:	90,000 Btuh
Fan Size:	400 Watts
Fan Operating Hours:	170 hours
Fan Energy:	68 kWh

Pilot BTU/hr.:

Pilot Operating Hours:

Pilot Consumption:

0 BTU/hr. 0 hrs/yr

0 kBTU/yr

Renton Housing Authority HOUSING CHOICE VOUCHER

	HOUSING CHOICE VOUCHER						
Unit Type:		Townhouse	Heating De	gree Days =	4532		
Number of Bedr	ooms:	2	_	np. Diff. $(F) =$	38		
Heating Fuel:		Heat Pump	Correction	Factor (CD) =	0.62		
APARTMENT I	рата.						
		Stories Per Unit:		2			
		Linear Footage:		48	ft.		
	Perimeter 1	-			Btuh/lf		
		Heat Loss:		834.72			
•	D (C)	T		275	C A		
	-	re Footage:			sq.ft.		
	Roof U-Va				Btuh/F-sf		
1	Roof Heat	Loss:		960.00	Btuh		
]	Exterior W	all Area:		637	sq.ft.		
•	Wall U-Va	ilue:		0.11	Btuh/F-sf		
•	Wall Heat	Loss:		2713.43	Btuh		
•	Window A	rea:		100	sq.ft.		
	Window U				Btuh/F-sf		
	Window H			2380.80			
,	ъ .			20	6		
	Door Area				sq.ft.		
	Door U-V				Btuh/F-sf		
]	Door Heat	Loss:		846.34	Btuh		
· ·	Window C	rack Length:		100	ft		
]	Infiltration	Loss Factor:		0.15	CFM / Lf		
Ī	Infiltration	Loss:		622.08	Btuh		
j	Door Crac	k Length:		40	ft		
		Loss Factor:		0.15	CFM / Lf		
	Infiltration			248.83			
	Total Apa	rtment Heat Loss Ra	· •	8606.20	Rtuh		
	-	Heating System Ove		170%			
		Pilot? (yes or no)	ian Efficiency.	No			
	Pilot BTU				BTU/hr.		
	_	ating Hours:			hrs/yr		
	Pilot Cons	umption:		0	kBTU/yr		
	Heating F	uel? (Natural Gas, El	ectric, Propane)	Heat Pump			
	Estimated	Heating System Con	sumption:	2,605	KWH		
	Heating S	ystem Fan? (yes or n	0)	Yes			
	Heating O	utput:		63,000	Btuh		
	Fan Size:			400	Watts		
	F 0			1.41	L		

141 hours

56 kWh

Fan Operating Hours:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER						
Unit Type:		Duplex		Heating Degree D	ays =	4532
Number of Bedr	ooms:	2		Design Temp. Dif	f.(F) =	38
Heating Fuel:		Fuel Oil		Correction Factor	(CD) =	0.62
APARTMENT I	DATA:					
1	Number of	Stories Per Unit:			1	
J	Perimeter I	Linear Footage:			85	ft.
1	Perimeter F	actor:			17.24	Btuh/lf
]	Perimeter I	Heat Loss:			1463.03	Btuh
1	Roof Squar	e Footage:			800	sq.ft.
1	Roof U-Va	lue:			0.067	Btuh/F-sf
1	Roof Heat	Loss:		2	2048.00	Btuh
]	Exterior W	all Area:			428	sq.ft.
7	Wall U-Va	lue:			0.11	Btuh/F-sf
,	Wall Heat	Loss:			1822.97	Btuh
•	Window A	rea:			100	sq.ft.
,	Window U	-Value:			0.62	Btuh/F-sf
,	Window H	eat Loss:		:	2380.80	Btuh
1	Door Area:	:			38	sq.ft.
]	Door U-Va	ilue:			0.58	Btuh/F-sf
]	Door Heat	Loss:			846.34	Btuh
,	Window C	rack Length:			100	ft
•	Infiltration	Loss Factor:			0.15	CFM / Lf
	Infiltration	Loss:			622.08	Btuh
	Door Cracl	k Length:			40	ft
		Loss Factor:			0.15	CFM / Lf
	Infiltration	Loss:			248.83	Btuh
	Total Apar	tment Heat Loss	Rate:		9432.05	Btuh
	Estimated 1	Heating System C	Overall E	fficiency:	55%	
	Standing P	ilot? (yes or no)			Yes	
	Pilot BTU/	hr.:				BTU/hr.
	•	ating Hours:				hrs/yr
	Pilot Cons	umption:			4380	kBTU/yr
		iel? (Natural Gas,			Fuel Oil	
	Estimated	Heating System C	Consumpt	tion:	249	GALLONS
	TT C	. E 0./	× .		37	

Yes

23,100 Btuh 400 Watts

> 1,304 hours **522 kWh**

Heating System Fan? (yes or no)

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER					
Unit Type:		Garden	Heating D	egree Days =	4532
Number of B	edrooms:	2	_	mp. Diff. $(F) =$	38
Heating Fuel	<u>.</u>	Fuel Oil	-	Factor (CD) =	0.62
_					
APARTMEN					
		f Stories Per Unit:		1	C.
		Linear Footage:		66	
	Perimeter			17.24	Btuh/lf
	Perimeter	Heat Loss:		1140.43	Blun
	Roof Squa	are Footage:		700	sq.ft.
	Roof U-V	alue:		0.067	Btuh/F-sf
	Roof Hear	t Loss:		1792.00	Btuh
	Exterior V	Vall Area		301	sq.ft.
	Wall U-V				Btuh/F-sf
	Wall Heat			1667.24	
	Wall Hou	2000.		1007.21	2
	Window A	Area:		100	sq.ft.
	Window I				Btuh/F-sf
	Window I	Heat Loss:		2380.80	Btuh
	Door Area	a:		38	sq.ft.
	Door U-V				Btuh/F-sf
	Door Hea	t Loss:		846.34	Btuh
	Window (Crack Length:		100	ft
		n Loss Factor:			CFM / Lf
	Infiltratio			622.08	
				022.00	
		ck Length:		40	- -
		n Loss Factor:			CFM / Lf
	Infiltratio	n Loss:		248.83	Blun
	Total Apa	artment Heat Loss I	Rate:	7557.29	Btuh
	Estimated	Heating System O	verall Efficiency:	55%	
	Standing	Pilot? (yes or no)		Yes	
	Pilot BTU	J/hr.:			BTU/hr.
	_	rating Hours:			hrs/yr
	Pilot Con	sumption:		4380	kBTU/yr
	Heating F	Fuel? (Natural Gas,	Electric, Propane)	Fuel Oil	
	•	Heating System C			GALLONS
		system Fan? (yes or	•	Yes	
	Heating C		•	23,100	Btuh
	Fan Size:	•		400	Watts
	Fan Oper	ating Hours:		1,045	hours
	East East			410	L-XX/L

418 kWh

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER					
Unit Type: Number of Bed Heating Fuel:	High-Rise rooms: 2 Fuel Oil	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62		
APARTMENT	DATA:				
	Number of Stories Per Unit:	1			
	Perimeter Linear Footage:	0	ft.		
	Perimeter Factor:	17.24	Btuh/lf		
	Perimeter Heat Loss:	0.00	Btuh		
	Roof Square Footage:	0	sq.ft.		
	Roof U-Value:		Btuh/F-sf		
	Roof Heat Loss:	0.00	Btuh		
	Exterior Wall Area:	249	sq.ft.		
	Wall U-Value:		Btuh/F-sf		
	Wall Heat Loss:	1061.34	Btuh		
	Window Area:	73	sq.ft.		
	Window U-Value:		Btuh/F-sf		
	Window Heat Loss:	1737.98	Btuh		
	Door Area:	20	sq.ft.		
	Door U-Value:		Btuh/F-sf		
	Door Heat Loss:	445.44	Btuh		
	Window Crack Length:	86	ft		
	Infiltration Loss Factor:	0.15	CFM / Lf		
	Infiltration Loss:	534.99	Btuh		
	Door Crack Length:	20	ft		
	Infiltration Loss Factor:		CFM / Lf		
	Infiltration Loss:	124.42	Btuh		
	Total Apartment Heat Loss Rate:	3904.17	Btuh		
	Estimated Heating System Overa	Il Efficiency: 55%			
	Standing Pilot? (yes or no)	Yes			
	Pilot BTU/hr.:		BTU/hr.		
	Pilot Operating Hours:		hrs/yr		
	Pilot Consumption:	4380	kBTU/yr		
	Heating Fuel? (Natural Gas, Elec	-			
	Estimated Heating System Consu	-	GALLONS		
	Heating System Fan? (yes or no)				
	Heating Output:	19,800	Btuh		

400 Watts

630 hours

252 kWh

Fan Size:

Fan Energy:

Fan Operating Hours:

Renton Housing Authority HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER				
Unit Type: Number of Bedroo Heating Fuel:	Mobile Home oms: 2 Fuel Oil	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532 38 0.62	
APARTMENT DA	\TA ·			
	imber of Stories Per Unit:	1		
Flo	oor Square Footage:	550	sq. ft.	
	rimeter Factor:	2.30	Btuh/lf	
Flo	oor Heat Loss:	1265.00	Btuh	
Ro	oof Square Footage:	550	sq.ft.	
	oof U-Value:		Btuh/F-sf	
	oof Heat Loss:	1624.62		
Ev	terior Wall Area:	634	sq.ft.	
	all U-Value:		Btuh/F-sf	
	all Heat Loss:	3483.98		
	indow Area:		sq.ft.	
	indow U-Value:	1857.02	Btuh/F-sf	
W	indow Heat Loss:	1837.02	Biun	
Do	oor Area:	38	sq.ft.	
Do	oor U-Value:	0.58	Btuh/F-sf	
Do	oor Heat Loss:	846.34	Btuh	
W	indow Crack Length:	65	ft	
	filtration Loss Factor:	0.15	CFM / Lf	
In	filtration Loss:	404.35	Btuh	
De	oor Crack Length:	40	ft	
	filtration Loss Factor:	0.15	CFM / Lf	
In	filtration Loss:	248.83	Btuh	
То	otal Apartment Heat Loss Rat	e: 9730.14	Btuh	
	timated Heating System Ove			
	anding Pilot? (yes or no)	Yes	;	
Pi	lot BTU/hr.:	500	BTU/hr.	
	lot Operating Hours:		hrs/yr	
Pi	lot Consumption:	4380	kBTU/yr	
Н	eating Fuel? (Natural Gas, El	ectric, Propane) Fuel Oil		
	stimated Heating System Con	- · · · · · · · · · · · · · · · · · · ·	GALLONS	
	eating System Fan? (yes or no	yes Yes	;	
	eating Output:	19,800		
	an Size:		Watts	
	n Operating Hours:		hours	
Fa	nn Energy:	628	kWh	

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	Single Family	Heating Degree Days =	4532
Number of Bedrooms:	1	Design Temp. Diff.(F) =	38
Heating Fuel:	Fuel Oil	Correction Factor (CD) =	0.62
4 D 4 D 00 4 E 1 VII D 4 II 4			

APARTMENT DATA:

:	Fuel Oil	Correction Factor (CD) =	0.62
ΙT	DATA:		
	Number of Stories Per Unit:	1	
	Perimeter Linear Footage:	110	ft.
	Perimeter Factor:	17.24	Btuh/lf
	Perimeter Heat Loss:	1896.62	Btuh
	Roof Square Footage:	750	sq.ft.
	Roof U-Value:	0.067	Btuh/F-sf
	Roof Heat Loss:	1920.00	Btuh
	Exterior Wall Area:	751	sq.ft.
	Wall U-Value:		Btuh/F-sf
	Wall Heat Loss:	3200.45	Btuh
	Window Area:	88	sq.ft.
	Window U-Value:	0.62	Btuh/F-sf
	Window Heat Loss:	2083.20	Btuh
	Door Area:	38	sq.ft.
	Door U-Value:	0.58	Btuh/F-sf
	Door Heat Loss:	846.34	Btuh
	Window Crack Length:	104	ft
	Infiltration Loss Factor:	0.15	CFM / Lf
	Infiltration Loss:	646.96	Btuh
	Door Crack Length:	40	ft
	Infiltration Loss Factor:	0.15	CFM / Lf
	Infiltration Loss:	248.83	Btuh
	Total Apartment Heat Loss Rate:	10842.40	Btuh
	Estimated Heating System Overall E	fficiency: 55%	
	Standing Pilot? (yes or no)	Yes	
	Pilot BTU/hr.:	500	BTU/hr.
	Pilot Operating Hours:	8760	hrs/yr
	Pilot Consumption:	4380	kBTU/yr
	Harring Foods (National Con Florance	Dramana) Eval Oil	

- 1101 - 1 011 - 11011		
Heating Fuel? (Natural Gas, Electric, Propane)	Fuel Oil	
Estimated Heating System Consumption:	281	GALLONS
Heating System Fan? (yes or no)	Yes	
Heating Output:	23,100	Btuh
Fan Size:	400	Watts
Fan Operating Hours:	1,499	hours
Fan Energy:	600	kWh

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	Townhouse	Heating Degree Days =	4532
Number of Bedrooms:	1	Design Temp. Diff. $(F) =$	38
Heating Fuel:	Fuel Oil	Correction Factor (CD) =	0.62

APARTMENT DATA:

	` ,	
DATA:		
Number of Stories Per Unit:	2	
Perimeter Linear Footage:	43	ft.
Perimeter Factor:	17.24	Btuh/lf
Perimeter Heat Loss:	746.60	Btuh
Roof Square Footage:	300	sq.ft.
Roof U-Value:	0.067	Btuh/F-sf
Roof Heat Loss:	768.00	Btuh
Exterior Wall Area:	585	sq.ft.
Wall U-Value:	0.11	Btuh/F-sf
Wall Heat Loss:	2492.74	Btuh
Window Area:	70	sq.ft.
Window U-Value:	0.62	Btuh/F-sf
Window Heat Loss:	1666.56	Btuh
Door Area:	38	sq.ft.
Door U-Value:	0.58	Btuh/F-sf
Door Heat Loss:	846.34	Btuh
Window Crack Length:	80	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	497.66	Btuh
Door Crack Length:	40	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	248.83	Btuh
Total Apartment Heat Loss Rate:	7266.73	Btuh
Estimated Heating System Overall Efficiency:	55%	
Standing Pilot? (yes or no)	Yes	
Pilot BTU/hr.:	500	BTU/hr.
Pilot Operating Hours:	8760	hrs/yr
Pilot Consumption:	4380	kBTU/yr

Heating Fuel? (Natural Gas, Electric, Propane)	Fuel Oil	
Estimated Heating System Consumption:	199	GALLONS
Heating System Fan? (yes or no)	Yes	
Heating Output:	23,100	Btuh
Fan Size:	400	Watts
Fan Operating Hours:	1,004	hours
Fan Energy:	402	kWh

Renton Housing Authority

HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER				
Unit Type:	-	Heating Degree Days =	4532	
Number of Be		Design Temp. Diff.(F) =	38	
Heating Fuel:	Propane	Correction Factor (CD) =	0.62	
APARTMEN'	ΓDATA:			
	Number of Stories Per Unit:	1		
	Perimeter Linear Footage:	75	ft.	
	Perimeter Factor:	17.24	Btuh/lf	
	Perimeter Heat Loss:	1293.15	Btuh	
	Roof Square Footage:	625	sq.ft.	
	Roof U-Value:	0.067	Btuh/F-sf	
	Roof Heat Loss:	1600.00	Btuh	
	Exterior Wall Area:	392	sq.ft.	
	Wall U-Value:	0.11	Btuh/F-sf	
	Wall Heat Loss:	1670.86	Btuh	
	Window Area:	70	sq.ft.	
	Window U-Value:	0.62	Btuh/F-sf	
	Window Heat Loss:	1666.56	Btuh	
	Door Area:	38	sq.ft.	
	Door U-Value:	0.58	Btuh/F-sf	
	Door Heat Loss:	846.34	Btuh	
	Window Crack Length:	80	ft	
	Infiltration Loss Factor:	0.15	CFM / Lf	
	Infiltration Loss:	497.66	Btuh	
	Door Crack Length:	40	ft	
	Infiltration Loss Factor:	0.15	CFM / Lf	
	Infiltration Loss:	248.83	Btuh	
	Total Apartment Heat Loss Rate:	7823.40	Btuh	
	Estimated Heating System Overall Eff	ficiency: 65%		
	Standing Pilot? (yes or no)	Yes	;	
	Pilot BTU/hr.:	500	BTU/hr.	
	Pilot Operating Hours:		hrs/yr	
	Pilot Consumption:	4380	kBTU/yr	
	Heating Fuel? (Natural Gas, Electric,	Propane) Propane	:	
	Estimated Heating System Consumption	on: 267	GALLONS	
	TT -! O - T O /	17		

Yes

27,300 Btuh

400 Watts

774 hours

310 kWh

Heating System Fan? (yes or no)

Heating Output:

Fan Operating Hours:

Fan Size:

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	Garden	Heating Degree Days =	4532
Number of Bedrooms:	3	Design Temp. Diff.(F) =	38
Heating Fuel:	Propane	Correction Factor (CD) =	0.62

APARTMENT DATA:

211111		
Number of Stories Per Unit:	1	
Perimeter Linear Footage:	78	ft.
Perimeter Factor:	17.24	Btuh/lf
Perimeter Heat Loss:	1345.95	Btuh
Roof Square Footage:	975	sq.ft.
Roof U-Value:	0.067	Btuh/F-sf
Roof Heat Loss:	2496.00	Btuh
Exterior Wall Area	466	sa ft

Exterior Wall Area:	466	sq.ft.
Wall U-Value:	0.11	Btuh/F-sf
Wall Heat Loss:	1988.41	Btuh

Window Area:	120	sq.ft.
Window U-Value:	0.62	Btuh/F-sf
Window Heat Loss:	2856.96	Btuh

Door Area:	38	sq.ft.
Door U-Value:	0.58	Btuh/F-sf
Door Heat Loss:	846.34	Btuh

Window Crack Length:	120	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	746.50	Btuh

Door Crack Length:	40	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	248.83	Btuh

Total Apartment Heat Loss Rate:	9183.03 Btuh
Estimated Heating System Overall Efficiency:	65%
Standing Pilot? (yes or no)	Yes
Pilot BTU/hr.:	500 BTU/hr.
Pilot Operating Hours:	8760 hrs/yr
Pilot Consumption:	4380 kBTU/yr

Heating Fuel? (Natural Gas, Electric, Propane) Estimated Heating System Consumption:	Propane 306 GAL	LONS
Heating System Fan? (yes or no)	Yes	
Heating Output:	39,000 Btuh	
Fan Size:	400 Watts	;
Fan Operating Hours:	636 hours	
Fan Energy:	254 kWh	

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	High-Rise	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532
Number of Bedrooms:	3		38
Heating Fuel:	Propane		0.62
APARTMENT DATA:			

Number of Stories Per Unit:	1
Perimeter Linear Footage:	0 ft.
Perimeter Factor:	17.24 Btuh/lf

Perimeter Heat Loss: 0.00 Btuh

Roof Square Footage: 0 sq.ft.

Roof Square Footage: 0 sq.ft.

Roof U-Value: 0.067 Btuh/F-sf
Roof Heat Loss: 0.00 Btuh

Exterior Wall Area: 267 sq.ft.

Wall U-Value: 0.11 Btuh/F-sf

Wall Heat Loss: 1138.06 Btuh

Window Area: 100 sq.ft.
Window U-Value: 0.62 Btuh/F-sf
Window Heat Loss: 2380.80 Btuh

Door Area:20 sq.ft.Door U-Value:0.58 Btuh/F-sfDoor Heat Loss:445.44 Btuh

Window Crack Length: 105 ft
Infiltration Loss Factor: 0.15 CFM / Lf
Infiltration Loss: 653.18 Btuh

Door Crack Length:

Infiltration Loss Factor:

Infiltration Loss:

20 ft

0.15 CFM / Lf

124.42 Btuh

Total Apartment Heat Loss Rate: 4741.90 Btuh Estimated Heating System Overall Efficiency: 65% Standing Pilot? (yes or no) Yes

Pilot BTU/hr.:500BTU/hr.Pilot Operating Hours:8760hrs/yrPilot Consumption:4380kBTU/yr

Heating Fuel? (Natural Gas, Electric, Propane)
Estimated Heating System Consumption:
Heating System Fan? (yes or no)
Heating Output:
Fan Size:
Fan Operating Hours:

Propane

180 GALLONS

Yes

4800 Btuh

400 Watts

448 hours

Fan Energy:

179 kWh

Renton Housing Authority

HOUSING CHOICE VOUCHER

HOUSING CHOICE VOUCHER			
Unit Type:	Mobile Home	Heating Degree Days =	4532
Number of Bedrooms:	3	Design Temp. Diff. $(F) =$	38
Heating Fuel:	Propane	Correction Factor (CD) =	0.62
APARTMENT DATA:			
Number	of Stories Per Unit:	1	
Floor Sq	uare Footage:	750	sq. ft.
Perimete	_		Btuh/lf
Floor He	at Loss:	1725.00	Btuh
Roof Sa	are Footage:	750	sq.ft.
Roof U-V	_		Btuh/F-sf
Roof He		2215.38	
	Wall Area:		sq.ft.
Wall U-V			Btuh/F-sf
Wall Hea	at Loss:	4098.39	Btuh
Window	Area:	92	sq.ft.
Window	U-Value:	0.62	Btuh/F-sf
Window	Heat Loss:	2190.34	Btuh
Door Are	ea:	38	sq.ft.
Door U-			Btuh/F-sf
Door He		846.34	
Window	Crack Length:	80	ft
	on Loss Factor:		CFM / Lf
Infiltration		497.66	
mman	JII LUSS.	497.00	Diuli
Door Cra	ack Length:	40	= -
	on Loss Factor:		CFM / Lf
Infiltration	on Loss:	248.83	Btuh
Total Ap	artment Heat Loss Rate	e: 11821.94	Btuh
Estimate	d Heating System Over	rall Efficiency: 65%	·
Standing	Pilot? (yes or no)	Yes	•
Pilot BT	U/hr.:	500	BTU/hr.
Pilot Op	erating Hours:	8760	hrs/yr
_	nsumption:	4380	kBTU/yr
Ugatina	- Fuel? (Natural Gas, Ele	ectric, Propane) Propane	-
	•	•	GALLONS
	d Heating System Cons	•	
_	System Fan? (yes or no		
Heating	-	28,600	
Fan Size			Watts
Fan Ope	rating Hours:		hours

447 kWh

Fan Energy:

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	Single Family	Heating Degree Days = Design Temp. Diff.(F) = Correction Factor (CD) =	4532
Number of Bedrooms:	3		38
Heating Fuel:	Propane		0.62
APARTMENT DATA:	of Stories Day Units	1	

T DATA:		
Number of Stories Per Unit:	1	
Perimeter Linear Footage:	122	ft.
Perimeter Factor:	17.24	Btuh/lf
Perimeter Heat Loss:	2103.52	Btuh
Roof Square Footage:	1225	sq.ft.
Roof U-Value:	0.067	Btuh/F-sf
Roof Heat Loss:	3136.00	Btuh
Exterior Wall Area:	932	sq.ft.
Wall U-Value:	0.11	Btuh/F-sf
Wall Heat Loss:	3972.56	Btuh
Window Area:	150	sq.ft.
Window U-Value:	0.62	Btuh/F-sf
Window Heat Loss:	3571.20	Btuh
Door Area:	38	sq.ft.
Door U-Value:	0.58	Btuh/F-sf
Door Heat Loss:	846.34	Btuh
Window Crack Length:	152	ft
Infiltration Loss Factor	0.15	CFM / I f

Door Heat Loss:	846.34	Btuh
Window Crack Length:	152	ft
Infiltration Loss Factor:	0.15	CFM / Lf

initiation Loss I actor.	0.15	CI IVI / DI
Infiltration Loss:	945.56	Btuh
Door Crack Length:	40	ft

Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	248.83	Btuh

Total Apartment Heat Loss Rate:	14824.01 Btuh
Estimated Heating System Overall Efficiency:	65%
Standing Pilot? (yes or no)	Yes
Pilot BTU/hr.:	500 BTU/hr.
Pilot Operating Hours:	8760 hrs/yr

Pilot Operating Hours:	8760	hrs/yr
Pilot Consumption:	4380	kBTU/yr

Heating Fuel? (Natural Gas, Electric, Propane)	Propane	
Estimated Heating System Consumption:	465	GALLONS
Heating System Fan? (yes or no)	Yes	
Heating Output:	39,000	Btuh
Fan Size:	400	Watts
Fan Operating Hours:	1,027	hours
Fan Energy:	411	kWh

Renton Housing Authority HOUSING CHOICE VOUCHER

Unit Type:	Townhouse	Heating Degree Days =	4532
Number of Bedrooms:	4	Design Temp. Diff.(F) =	38
Heating Fuel:	Propane	Correction Factor (CD) =	0.62

APARTMENT DATA:

Number of Stories Per Unit:	2	
Perimeter Linear Footage:	59	ft.
Perimeter Factor:	17.24	Btuh/lf
Perimeter Heat Loss:	1010.90	Btuh
Roof Square Footage:	550	sq.ft.
	0.045	D 1 0

Roof Square Footage:	220	sq.it.
Roof U-Value:	0.067	Btuh/F-sf
Roof Heat Loss:	1408.00	Btuh

Exterior Wall Area:	745	sq.ft.
Wall U-Value:	0.11	Btuh/F-sf
Wall Heat Loss:	3175.84	Btuh

Window Area:	155	sq.ft.
Window U-Value:	0.62	Btuh/F-sf
Window Heat Loss:	3690.24	Btuh

Door Area:	38	sq.ft.
Door U-Value:	0.58	Btuh/F-sf
Door Heat Loss:	846.34	Btuh

Window Crack Length:	140	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	870.91	Btuh

Door Crack Length:	40	ft
Infiltration Loss Factor:	0.15	CFM / Lf
Infiltration Loss:	248.83	Btuh :

Total Apartment Heat Loss Rate:	11251.06 Btuh
Estimated Heating System Overall Efficiency:	65%
Standing Pilot? (yes or no)	Yes
Pilot BTU/hr.:	500 BTU/hr.
Pilot Operating Hours:	8760 hrs/yr

Pilot Consumption:

Heating Fuel? (Natural Gas, Electric, Propane)	Propane	
Estimated Heating System Consumption:	364	GALLONS
Heating System Fan? (yes or no)	Yes	
Heating Output:	39,000	Btuh
Fan Size:	400	Watts

4380 kBTU/yr

Fan Energy:	312	kWh
Fan Operating Hours:	779	hours
raii Size.	400	w aus

APPENDIX C. - DHWH TABLES

Back-Up Calculations – DHWH Tables

DHWH Tables

The following section contains the back-up calculation tables for the domestic hot water heaters. The Renton Housing Authority expects HCV residents to have natural gas, electric, propane or fuel oil water heaters. Therefore, this section has a table for each bedroom size with each type of hot water heater. Hot water usage depends on the number of occupants and the size of the tank, and it does not depend on the type of housing unit. Therefore, all tenants in various types of housing units are assumed to consume the same amount of hot water.

Fuel Type:	Natural Gas	
Number of Bedrooms:	1	Bedrooms
Estimated Number of Occupants:	2	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatur	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Natural Gas	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>5,134</u>	kBtu/yr
Total Energy Required:	9,849	kBtu/yr
Primary Fuel Required:	141	Therms/Year

Fuel Type:	Natural Gas	
Number of Bedrooms:	2	Bedrooms
Estimated Number of Occupants:	3	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatur	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Natural Gas	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>7,701</u>	kBtu/yr
Total Energy Required:	12,416	kBtu/yr
Primary Fuel Required:	177	Therms/Year

Electricity	
1	Bedrooms
2	Occupants
13	Gallons/Occupant/Day
1.00	Btu/lb/F
62.32	lb/cf
7.48	gal/cf
0.68	
55	F
120	F
65	F
365	days/yr
24	hrs/day
8,760	hrs/yr
72	F
40	gal
8.00	F-sf-hr/Btu
0.62	F-sf-hr/Btu
100%	
no	
400	Btu/hr
Electricity	
	kBtu/yr
1,211	kBtu/yr
<u>5,134</u>	kBtu/yr
6,345	kBtu/yr
	1 2 13 1.00 62.32 7.48 0.68 55 120 65 365 24 8,760 72 40 8.00 0.62 100% no 400 Electricity

1,859 kWh/Year

Primary Fuel Required:

Fuel Type:	Electricity	
Number of Bedrooms:	2	Bedrooms
Estimated Number of Occupants:	3	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatur	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	100%	
Assumed Standing Pilot?	no	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Electricity	,
Pilot Consumption:		kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>7,701</u>	kBtu/yr
Total Energy Required:	8,912	kBtu/yr

2,611 kWh/Year

Primary Fuel Required:

Fuel Type:	Propane	
Number of Bedrooms:	1	Bedrooms
Estimated Number of Occupants:	2	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatu	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Propane	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>5,134</u>	kBtu/yr
Total Energy Required:	9,849	kBtu/yr
Primary Fuel Required:	147	Gallons/Year

Fuel Type:	Propane	
Number of Bedrooms:	2	Bedrooms
Estimated Number of Occupants:	3	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatu	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Propane	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>7,701</u>	kBtu/yr
Total Energy Required:	12,416	kBtu/yr
Primary Fuel Required:	186	Gallons/Year

Fuel Type:	Fuel Oil	
Number of Bedrooms:	1	Bedrooms
Estimated Number of Occupants:	2	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatu	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	9
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Fuel Oil	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>5,134</u>	kBtu/yr
Total Energy Required:	9,849	kBtu/yr
Primary Fuel Required:	101	Gallons/Year

Fuel Type:	Fuel Oil	
Number of Bedrooms:	2	Bedrooms
Estimated Number of Occupants:	3	Occupants
Estimated Consumption Rate:	13	Gallons/Occupant/Day
Specific Heat of Water:	1.00	Btu/lb/F
Specific Volume of Water:	62.32	lb/cf
Volume Conversion:	7.48	gal/cf
Heuristic Exponent:	0.68	
Estimated Service Water Inlet Temperatu	55	F
Hot Water Supply Temperature:	120	F
Delta T:	65	F
Calender Schedule:	365	days/yr
Daily Schedule:	24	hrs/day
Total Operating Hours:	8,760	hrs/yr
Estimated Air Temperature At Tank:	72	F
Estimated Tank Size:	40	gal
Assumed Tank Insulation (R-Value):	8.00	F-sf-hr/Btu
R-Value of Shell Plus Air:	0.62	F-sf-hr/Btu
Estimated System Efficiency:	70%	
Assumed Standing Pilot?	yes	
Pilot Consumption Rate:	400	Btu/hr
Fuel Type:	Fuel Oil	
Pilot Consumption:	3,504	kBtu/yr
Total Energy Lost:	1,211	kBtu/yr
Consumption Energy Required:	<u>7,701</u>	kBtu/yr
Total Energy Required:	12,416	kBtu/yr
Primary Fuel Required:	128	Gallons/Year

APPENDIX D. - COOLING LOAD TABLES

Back-Up Calculations - Cooling Load Tables

Cooling Load Tables

The following section contains the back-up calculations for the cooling loads for each bedroom size of each housing type. The cooling load determines how many btu/hr are needed to cool the unit to the desired design temperature.

UNIT TYPE: Duplex Cooling Degree Days: 30 **BEDROOM SIZE:** 1 BR Design Temperature Difference: 5 HEAT GAIN THROUGH THE ENVELOPE: Number of Stories: 1 Roof Square Footage: 625 sq.ft. Roof HTM: 0.33 Btu/h-sf Roof Heat Gain: 208 Btu/h Exterior Wall Area: 392 sq.ft. Wall HTM: 1 Btu/h-sf Wall Heat Gain: 218 Btu/h Window Area: 70 sq.ft. Window HTM: 3 Btu/h-sf 42.5 Btu/h-sf Window Radiation: Window Heat Gain: 3192 Btu/h Door Area: 38 sq.ft. Door HTM: 3 Btu/h-sf Door Heat Gain: 110 Btu/h **INFILTRATION:** Sensible: ACH: 0.44 Above Ground Volume: 5000 cu. Ft. Summer Infiltration CFM: 37 CFM Heat Gain: 202 Btu/h Grains Difference: Latent: Heat Gain: 0 Btu/h **OUTSIDE AIR:** Sensible and Latent Heat Gain: 1943 Btu/h OCCUPANTS: Number of Occupants: 2 Heat gain per person: 610 Btu/h Total Heat Gain from Occupants: 1220 Btu/h Heat Gain from Appliances: 2400 Btu/h TOTALS: Sensible Apartment Heat Gain Rate: 9493 Btu/h **Duct Loss:** 949 Btu/h Cooling Load Hours: 240 hrs/yr

185 Watts

44 kWh

10

10443 Btu/h

295 kWh

Cooling Fan Size:

Total Room Load:

SEER:

Annual Fan Consumption:

Annual Cooling Energy

UNIT TYPE:

Garden

Cooling Degree Days:

30

BEDROOM SIZE:

2 BR

Design Temperature Difference:

5

HEAT GAIN THROUGH THE ENVELOPE:

Number of Stories:

- 1

Roof Square Footage: Roof HTM: Roof Heat Gain: 700 sq.ft. 0.33 Btu/h-sf 233 Btu/h

Exterior Wall Area: Wall HTM: Wall Heat Gain: 391 sq.ft. 1 Btu/h-sf 217 Btu/h

Window Area: Window HTM: Window Radiation: Window Heat Gain:

3 Btu/h-sf 42.5 Btu/h-sf 4560 Btu/h

100 sq.ft.

Door Area: Door HTM: Door Heat Gain: 38 sq.ft. 3 Btu/h-sf 110 Btu/h

INFILTRATION:

Sensible:

ACH:

0.44 5600 cu. Ft.

Above Ground Volume:
Summer Infiltration CFM:
Heat Gain:

41 CFM 226 Btu/h

Latent:

Grains Difference:

0

Heat Gain:

0 Btu/h

OUTSIDE AIR:

Sensible and Latent Heat Gain:

2915 Btu/h

OCCUPANTS:

Number of Occupants:

3

Heat gain per person: Total Heat Gain from Occupants: Heat Gain from Appliances: 610 Btu/h 1830 Btu/h 2400 Btu/h

TOTALS:

Sensible Apartment Heat Gain Rate:

12492 Btu/h

Duct Loss:

1249 Btu/h

Cooling Load Hours: Cooling Fan Size: Annual Fan Consumption: SEER: Total Room Load: 240 hrs/yr 185 Watts 44 kWh 10

Annual Cooling Energy

13741 Btu/h
374 kWh

UNIT TYPE:

High-Rise

Cooling Degree Days:

30

BEDROOM SIZE:

2 BR

Design Temperature Difference:

5

HEAT GAIN THROUGH THE ENVELOPE:

Number of Stories:

1

Roof Square Footage: Roof HTM: Roof Heat Gain:

0 sq.ft. 0.33 Btu/h-sf 0 Btu/h

Exterior Wall Area: Wall HTM: Wall Heat Gain:

249 sq.ft. 1 Btu/h-sf 138 Btu/h

Window Area: Window HTM: Window Radiation: Window Heat Gain:

73 sq.ft. 3 Btu/h-sf 42.5 Btu/h-sf 3329 Btu/h

Door Area: Door HTM: Door Heat Gain: 20 sq.ft. 3 Btu/h-sf 58 Btu/h

INFILTRATION:

Sensible:

ACH:

0.44

Above Ground Volume: 0 cu. Ft. Summer Infiltration CFM: 0 CFM Heat Gain: 0 Btu/h

Latent:

Grains Difference:

0

Heat Gain: 0 Btu/h

OUTSIDE AIR:

Sensible and Latent Heat Gain:

2915 Btu/h

OCCUPANTS:

Number of Occupants: Heat gain per person:

3 610 Btu/h

Total Heat Gain from Occupants: Heat Gain from Appliances:

1830 Btu/h 2400 Btu/h

TOTALS:

Sensible Apartment Heat Gain Rate:

10670 Btu/h

Duct Loss:

0 Btu/h

Cooling Load Hours: Cooling Fan Size: Annual Fan Consumption: SEER: Total Room Load:

240 hrs/yr 185 Watts 44 kWh

10

10670 Btu/h

Annual Cooling Energy

300 kWh

UNIT TYPE:

Mobile Home

Cooling Degree Days:

30

BEDROOM SIZE:

2 BR

Design Temperature Difference:

5

HEAT GAIN THROUGH THE ENVELOPE:

Number of Stories:

1

Roof Square Footage: Roof HTM: Roof Heat Gain: 550 sq.ft. 0.38 Btu/h-sf 212 Btu/h

Exterior Wall Area: Wall HTM: Wall Heat Gain: 634 sq.ft. 1 Btu/h-sf 454 Btu/h

Window Area: Window HTM: Window Radiation: Window Heat Gain:

3 Btu/h-sf 42.5 Btu/h-sf 3557 Btu/h

78 sq.ft.

Door Area: Door HTM: Door Heat Gain: 38 sq.ft. 3 Btu/h-sf 110 Btu/h

INFILTRATION:

Sensible:

ACH:

0.44

Above Ground Volume: Summer Infiltration CFM: Heat Gain: 4400 cu. Ft. 32 CFM 178 Btu/h

Latent:

Grains Difference:

0

Heat Gain:

0 Btu/h

OUTSIDE AIR:

Sensible and Latent Heat Gain:

2915 Btu/h

OCCUPANTS:

Number of Occupants:

3

Heat gain per person: Total Heat Gain from Occupants: Heat Gain from Appliances: 610 Btu/h 1830 Btu/h 2400 Btu/h

TOTALS:

Sensible Apartment Heat Gain Rate:

11655 Btu/h 0 Btu/h

Duct Loss:

Cooling Load Hours: Cooling Fan Size: Annual Fan Consumption: SEER: Total Room Load: 240 hrs/yr 185 Watts 44 kWh 10

Annual Cooling Energy

11655 Btu/h
324 kWh

UNIT TYPE:

Single Family

Cooling Degree Days:

30

BEDROOM SIZE:

3 BR

Design Temperature Difference:

5

HEAT GAIN THROUGH THE ENVELOPE:

Number of Stories:

1

Roof Square Footage: Roof HTM: Roof Heat Gain: 1225 sq.ft. 0.33 Btu/h-sf 408 Btu/h

Exterior Wall Area: Wall HTM: Wall Heat Gain: 932 sq.ft. 1 Btu/h-sf 517 Btu/h

Window Area: Window HTM: Window Radiation: Window Heat Gain: 150 sq.ft. 3 Btu/h-sf 42.5 Btu/h-sf 6840 Btu/h

Door Area: Door HTM: Door Heat Gain: 38 sq.ft. 3 Btu/h-sf 110 Btu/h

INFILTRATION:

Sensible:

ACH:

0.44

Above Ground Volume: 9800 cu. Ft.
Summer Infiltration CFM: 72 CFM
Heat Gain: 396 Btu/h

Latent:

Grains Difference: Heat Gain:

0

0 Btu/h

OUTSIDE AIR:

Sensible and Latent Heat Gain:

4858 Btu/h

OCCUPANTS:

Number of Occupants:

5

Heat gain per person: Total Heat Gain from Occupants: Heat Gain from Appliances: 610 Btu/h 3050 Btu/h 2400 Btu/h

TOTALS:

Sensible Apartment Heat Gain Rate:

18580 Btu/h

Duct Loss:

1858 Btu/h

Cooling Load Hours:
Cooling Fan Size:
Annual Fan Consumption:
SEER:
Total Room Load:

240 hrs/yr 185 Watts 44 kWh 10

Annual Cooling Energy

20438 Btu/h

535 kWh

UNIT TYPE: Townhouse Cooling Degree Days: 30

BEDROOM SIZE: 3 BR Design Temperature Difference: 5

HEAT GAIN THROUGH THE ENVELOPE:

Number of Stories: 2

Roof Square Footage:450 sq.ft.Roof HTM:0.33 Btu/h-sfRoof Heat Gain:150 Btu/h

Exterior Wall Area: 691 sq.ft.
Wall HTM: 1 Btu/h-sf
Wall Heat Gain: 383 Btu/h

Window Area:120 sq.ft.Window HTM:3 Btu/h-sfWindow Radiation:42.5 Btu/h-sfWindow Heat Gain:5472 Btu/h

Door Area: 38 sq.ft.
Door HTM: 3 Btu/h-sf
Door Heat Gain: 110 Btu/h

INFILTRATION:

Sensible: ACH: 0.44

Above Ground Volume: 7200 cu. Ft.
Summer Infiltration CFM: 53 CFM
Heat Gain: 291 Btu/h

Latent: Grains Difference: 0

Heat Gain: 0 Btu/h

OUTSIDE AIR:

Sensible and Latent Heat Gain: 4858 Btu/h

OCCUPANTS:

Number of Occupants: 5
Heat gain per person: 610 Btu/h
Total Heat Gain from Occupants: 3050 Btu/h
Heat Gain from Appliances: 2400 Btu/h

TOTALS:

Total Room Load:

Sensible Apartment Heat Gain Rate: 16714 Btu/h

Duct Loss: 1671 Btu/h

Cooling Load Hours:240 hrs/yrCooling Fan Size:185 WattsAnnual Fan Consumption:44 kWhSEER:10

18386 Btu/h

Annual Cooling Energy 486 kWh