Home Installation

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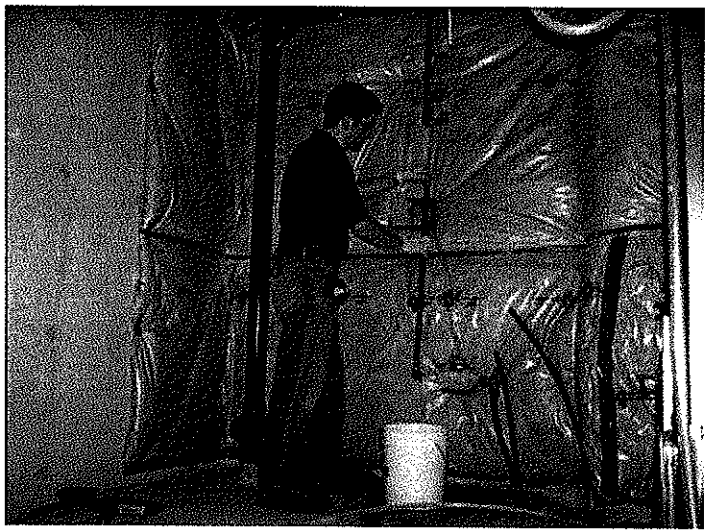

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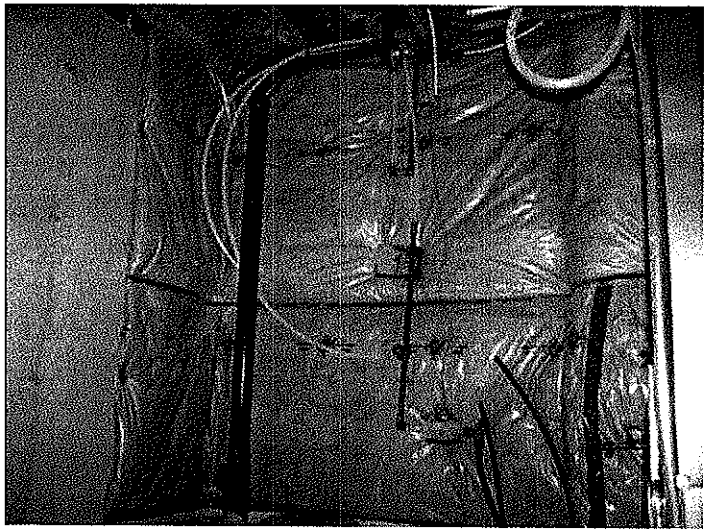

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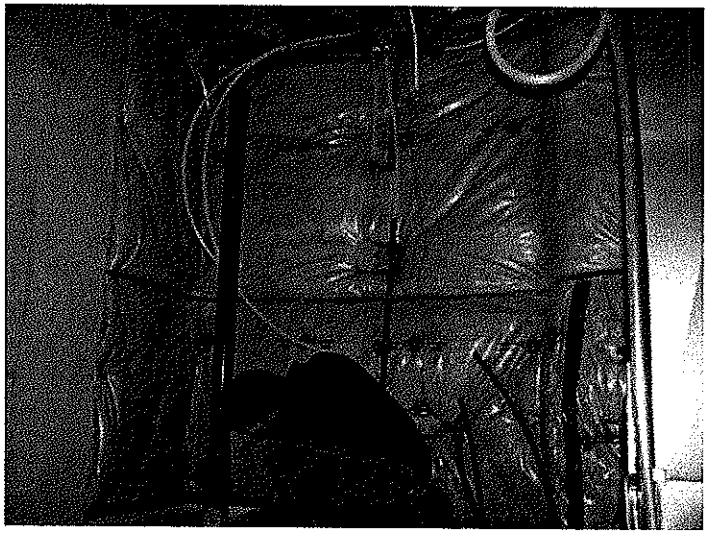

Home Installation

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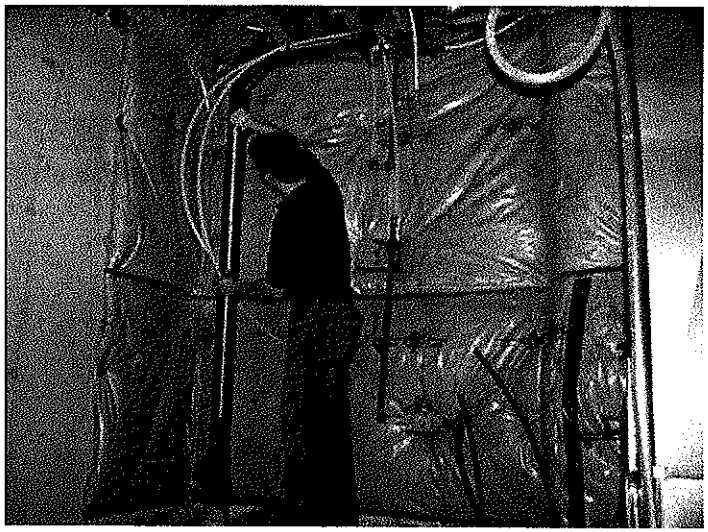

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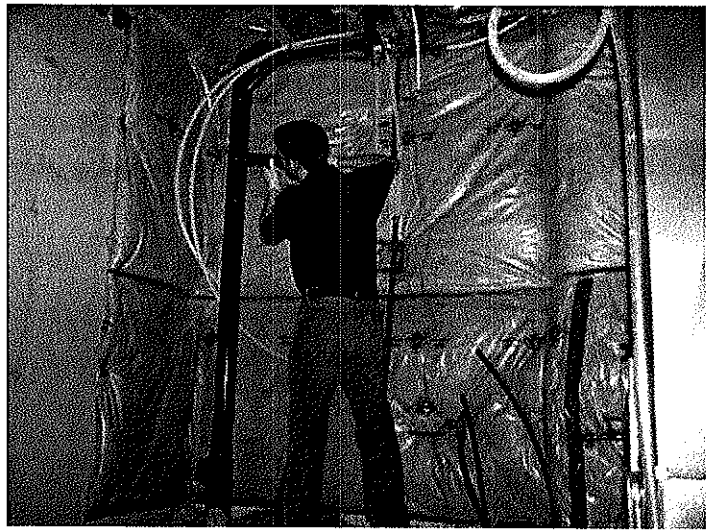

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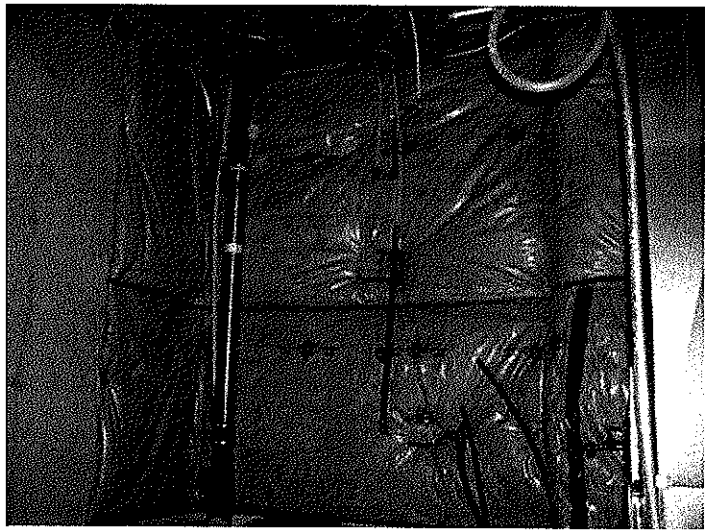
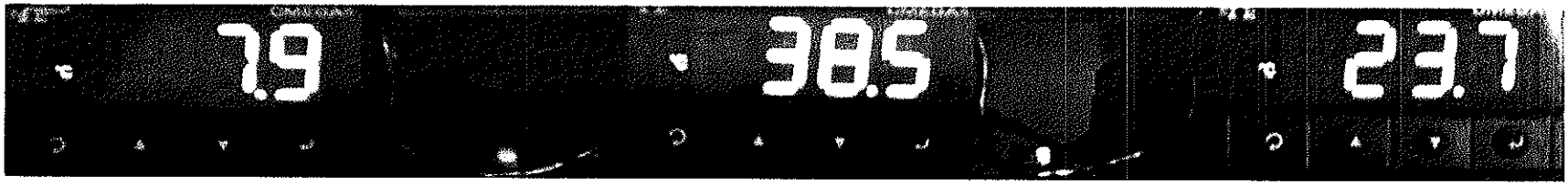


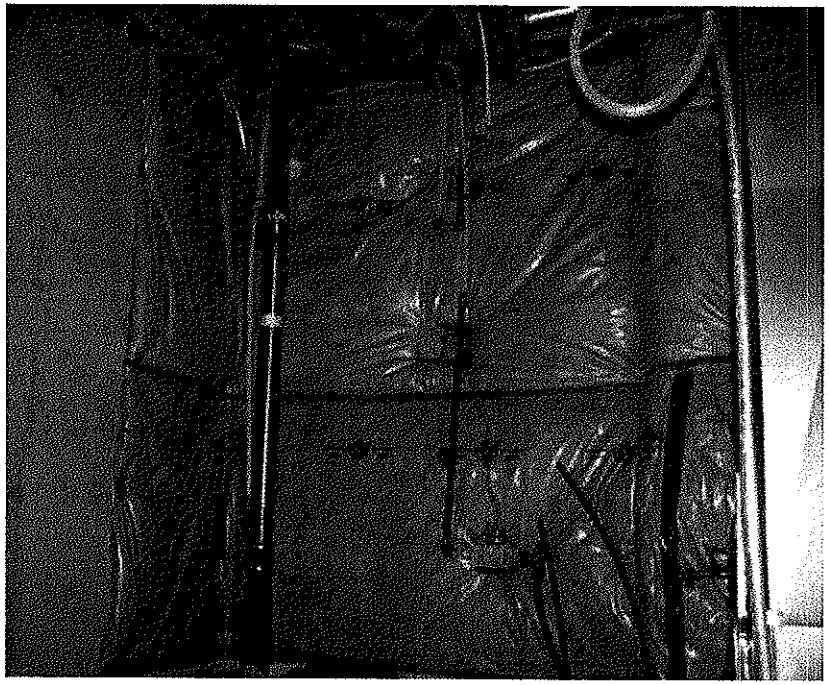
When to Insulate DWHR Units

- virtually no heat loss from drain water heat recovery unit installed in room kept at 70°
- insulate DWHR unit to prevent condensation when bottom half of unit can be below dew point temperature during operation (enclosed in a wall)
- insulate when temperature of drain water exceeds 120F

Temperature Rise on 49.2 eff @ 2.5 gpm

Fresh Inlet ~ 46°F **Drain Inlet ~ 101°F** **Fresh Outlet ~ 75°F**





DWHR Residential Program Partners

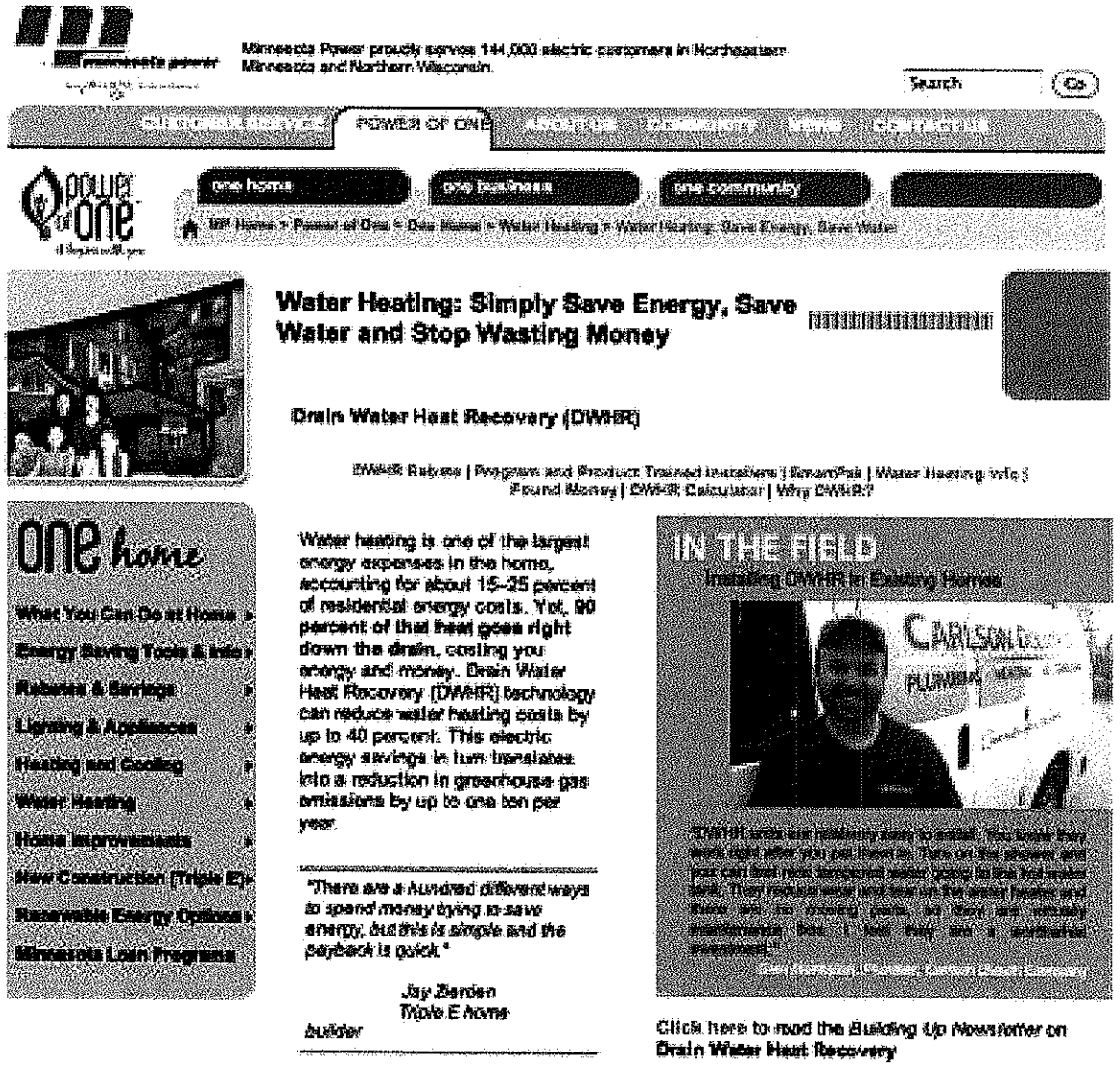
- **Utility rebates:** Union Gas, Enbridge, Gaz Metro, Minnesota Power, Virginia Public Utilities and others
- **Energy Efficiency Programs:** Energy Star For New Homes in United States & Canada, LEED, state grant programs

Sample US Utility Programs Examined

- **Minnesota Power**
  $ 400 rebate (website)

- **Virgina Public Utilities**
  $ 400 rebate (review application form)

Minnesota Power DWHR Web Site



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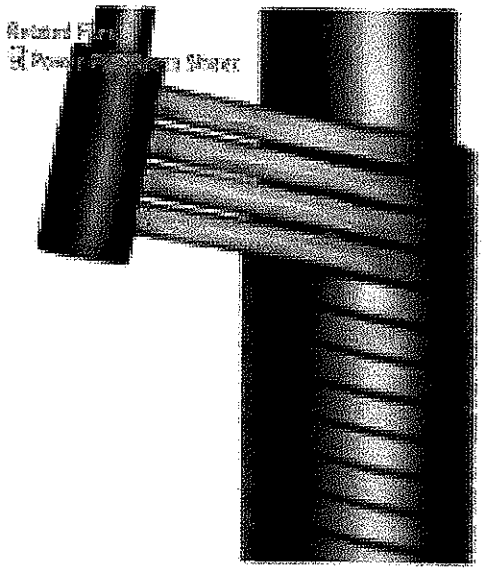
Power-Pipe™ Drain Water Heat Recovery



EFI is proud to produce products that have earned the U.S. government ENERGY STAR® label. ENERGY STAR is the government backed program that helps us all save money and protect our environment with energy efficient products and practices.

DWHR Partners in Canada

Sears

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Direct Energy

ENBRIDGE

MATTAMY homes

GazMétro
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REID'S HERITAGE GROUP
A Heritage of Quality, Built One Home at a Time Since 1978

COOPERATIVE D'HABITATION VILLAGE CLOVERDALE

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SEARCH

You are here: Home » Shop » Building Supplies » Plumbing » Water Heaters & Access. » Parts & Accessories » Power-Pipe - 3 In. Diam, 48 In. Long (Price includes drain connectors)

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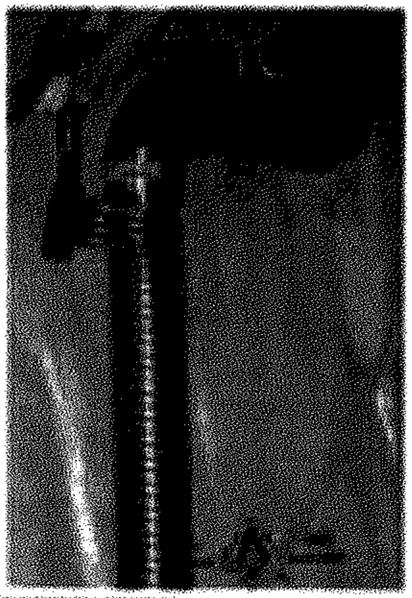
Back to Parts & Accessories

MORE
Power-Pipe™
Water Heaters & Access.

YOU MAY ALSO LIKE:

Reflecto-Foil Water Heater Jacket



ONLINE EXCLUSIVE

Be the first to write a review

PRINT PAGE | TELL A FRIEND

Power-Pipe™

Power-Pipe - 3 In. Diam, 48 In. Long (Price includes drain connectors)

- Model: R3-48
- Internet/Cat #: 938035
- Saves up to 30 percent on water heating
- Return on investment of 15 to 50 percent - one of the highest for energy saving products!
- Reduces greenhouse gas emissions in one home by up to 1 tonne/year
- Easy, do-it-yourself installation
- Maintenance-free

$690.00

QUANTITY 1

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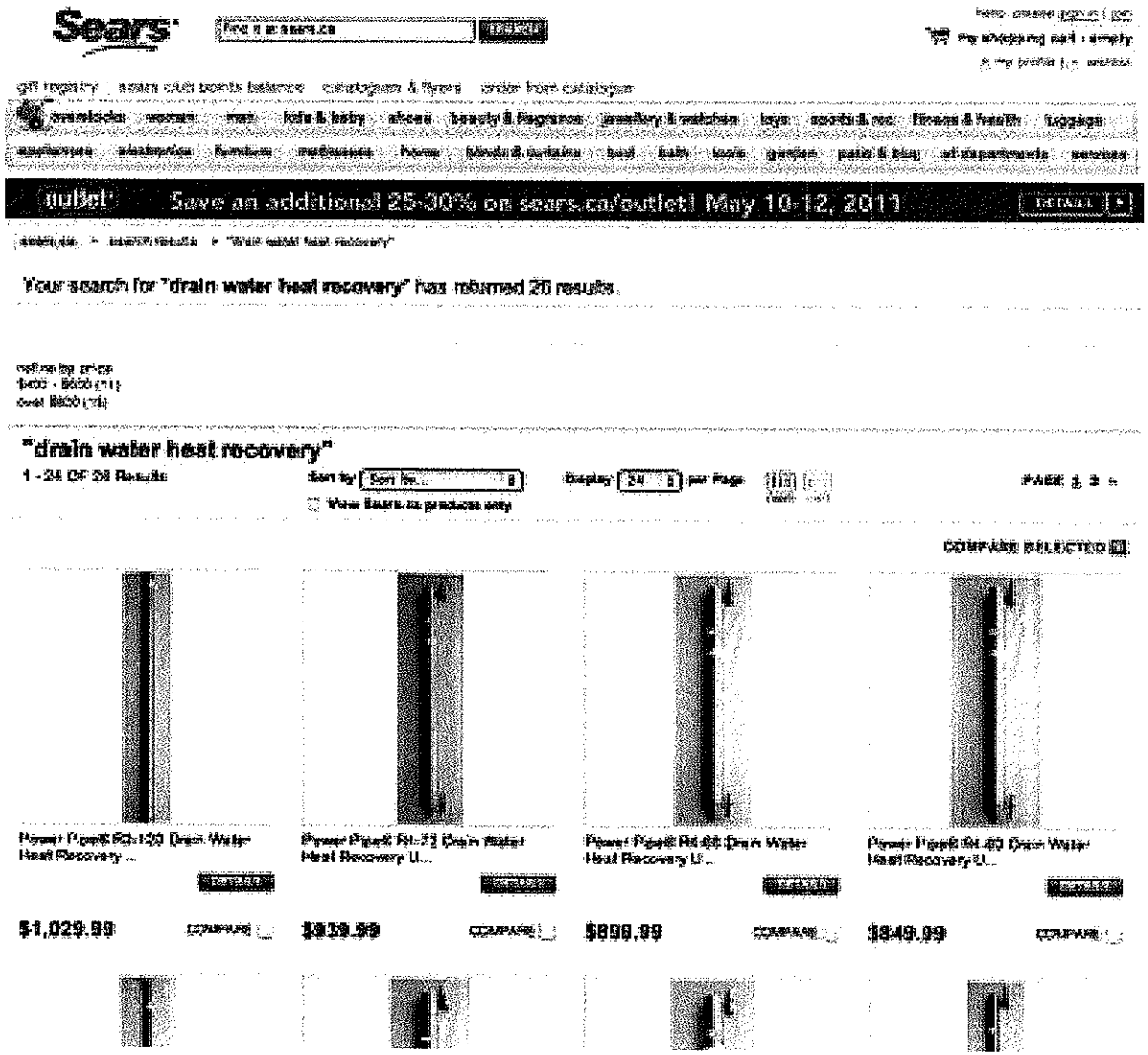
Prices may vary by store

Sears Canada Web Site



Some Other References

Government of France:

http://www.rt-batiment.fr/fileadmin/documents/RT2005/titre_V/Arrete_Titre_V_14_octobre_2010_Power_Pipe.pdf

Government of Canada:

http://oee.nrcan.gc.ca/residential/personal/retrofit-homes/drain.cfm?attr=4

Minnesota Power:

http://www.mnpower.com/powerofone/one_home/waterheating/dwhr/

U.S. DOE:

http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13040

Sears Canada

http://www.sears.ca/stores/shop/search?langId=1&storeId=10051&catalogId=10001&N=0&Ntk=level1&Ntt=drain+water+heat+recovery&Nty=1&D=drain+water+heat+recovery&Ntx=mode+matchall&Dx=mode+matchall&initialquery=true&internalSearch=true

Home Depot Canada:

http://www.homedepot.ca/catalog/drain-water-heat-recovery/173006

DWHR Credit in US Energy Star® for Homes Version 2

Energy Factor (EF) Enhancement

e.g. 0.67 EF gas water heater without DWHR to 0.93 EF with DWHR Efficiency of 57% at 2.25gpm

Limitation / Be Aware:

-Does not give actual energy savings

-Ensure that home energy simulation software does not reduce space heating with increased input Water Heating EF

Advantage:

-On a level playing field with other water heating technologies (e.g. Tankless)

-Easy to compare technologies

-Is widely applicable for Residential labeling programs (e.g. Energy Star)

DWHR Credit in US Energy Star® for Homes Version 2

Glenn T. Chinery EPA **ENERGY STAR® for Homes** March 2004

Policy Recommendations for the HERS Community to Consider regarding HERS point credit for Waste Water Heat Recovery Devices

Executive Summary

The performance of a waste water heat recovery device[1] in a typical residential water heating installation was analyzed[2] and Energy factor (EF) enhancement coefficients determined as a function of fuel (electricity or gas), GAMA Directory/DOE EF[3], volume of hot water use, water main inlet temperature, proportion of hot water use that is "batch" vs. "continuous"[4], heat exchanger effectiveness of the device, and waste water stream

NOTE:

-GFX is the tradename of a specific proprietary DWHR

-Wast Water Heat Recovery is not the "industry accepted term"

DWHR Credit in US Energy Star® for Homes Version 2

Regression Equations

For the simulations performed for this study the % energy factor enhancement coefficients are predicted by the following curve-fit equations, where,

HXeff = waste water heat recovery device heat exchanger effectiveness [dimensionless] for any particular installation

EF_{DOE} = the DOE energy factor rating of a water heater [dimensionless]

RE = the DOE recovery efficiency rating of a water heater [dimensionless]

gpd = average gallons per day of hot water use [gallons per day]

T_{main} = avg. water main inlet temperature [F] (i.e., avg. annual ambient air temperature)

Note: although these simulations were for water heaters of particular specified sizes, the analysis the equations are valid for other sizes since the thermal losses due to different sizes are embodied in the GAMA/DOE EF value.

The curve fits of the regression equations to the actual EF enhancement coefficient and energy cost savings data are shown graphically in the Results section above.

Electric: 52-gallon tank, EF_{DOE} ranging from 0.80 to 0.94

EF enhancement factor = $(HXeff/0.5)^{1.15} * (1.35 + 0.285 * Ln (EF_{DOE}^{0.8} * gpd^{0.06} / [(T_{main}+453)/453)]^{5.5}))$

- So, GFX-enhanced new energy factor = old energy factor * EF enhancement factor
- How to use in HERS Calculations: Multiply the water heater's EF_{DOE} by the EF enhancement factor and enter this new value as the EF_{DOE} in the HERS rating algorithm (i.e., as a HERS rating software input). (R^2=0.95)

Gas: 40-gallon tank, EF_{DOE} ranging from 0.54 to 0.68

EF enhancement factor = $(HXeff/0.5)^{1.18} * (1.3015 + 0.284 * Ln (EF_{DOE}^{0.66} / RE^{0.8} * gpd^{0.095} * [(T_{main}+453)/453)]^{5.18}))$

- So, GFX-enhanced new energy factor = old energy factor * EF enhancement factor
- How to use in HERS Calculations: Multiply the water heater's EF_{DOE} by the EF enhancement factor and enter this new value as the EF_{DOE} in the HERS rating algorithm (i.e., as a HERS rating software input). (R^2=0.95)

Example: Natural Gas Water Heating and DWHR

Mixed Climates with Natural Gas Water Heating

DWHR Rated Effectiveness	Gas Tank Mixed Climate 2 bedrooms	Gas Tank Mixed Climate 3 bedrooms	Gas Tank Mixed Climate 4 bedrooms	Gas Tank Mixed Climate 5 bedrooms
42.0%	0.960	0.964	0.967	0.970
44.0%	1.014	1.018	1.022	1.025
46.0%	1.069	1.073	1.077	1.080
48.0%	1.124	1.128	1.132	1.136
50.0%	1.179	1.184	1.188	1.192
52.0%	1.235	1.240	1.244	1.248
54.0%	1.291	1.297	1.301	1.305
56.0%	1.348	1.353	1.358	1.362
57.0%	1.376	1.382	1.387	1.391
58.0%	1.405	1.411	1.416	1.420
60.0%	1.462	1.468	1.473	1.478
62.0%	1.520	1.526	1.531	1.536
64.0%	1.578	1.584	1.590	1.595
66.0%	1.636	1.643	1.649	1.654
68.0%	1.695	1.702	1.708	1.713
70.0%	1.754	1.761	1.767	1.773
72.0%	1.813	1.821	1.827	1.833

For example, DWHR (57% efficiency at 2.25gpm) and with a Gas Water Heater having an EF=0.67, the "EF for Water Heating" is now **EF=0.93** (which is 0.67*1.387) according to EPA methodology for a 4 Bedroom Home on Gas Water Heating in a mixed climate zone

Example: Electric Water Heating and DWHR

Mixed Climates with Electric Water Heating

DWHR Rated Effectiveness	Electric Tank Mixed Climate 2 bedrooms	Electric Tank Mixed Climate 3 bedrooms	Electric Tank Mixed Climate 4 bedrooms	Electric Tank Mixed Climate 5 bedrooms
42.0%	0.996	0.999	1.001	1.003
44.0%	1.051	1.054	1.056	1.058
46.0%	1.106	1.109	1.111	1.113
48.0%	1.162	1.165	1.167	1.169
50.0%	1.217	1.221	1.223	1.226
52.0%	1.274	1.277	1.280	1.282
54.0%	1.330	1.334	1.336	1.339
56.0%	1.387	1.390	1.393	1.396
57.0%	1.415	1.419	1.422	1.425
58.0%	1.444	1.448	1.451	1.454
60.0%	1.501	1.505	1.509	1.511
62.0%	1.559	1.563	1.567	1.569
64.0%	1.617	1.621	1.625	1.628
66.0%	1.675	1.680	1.683	1.686
68.0%	1.734	1.738	1.742	1.745
70.0%	1.793	1.797	1.801	1.805
72.0%	1.852	1.856	1.860	1.864

For example, a DWHR (57% efficiency at 2.25gpm) and with an Electric Water Heater having an EF=0.92, the "EF for Water Heating" is now **EF=1.31** (which is 0.92*1.422) according to EPA methodology for a 4 Bedroom Home on Electric Water Heating in a mixed climate zone

DWHR Credit in CDN Energy Star® for Homes Version 3

3.10.2. Drainwater Heat Recovery (DHR)

(1) Drainwater Heat Recovery (DHR) technology has demonstrated a significant potential to reduce energy use and peak loads for water heating and is eligible for credits in ENERGY STAR qualified new homes using one of the options below:
  (a) Under Section 3.11 Electrical and Appliances Savings Requirements, or under Section 3.12 Fuel Savings Credits.
  (b) Using a combined energy factor (EF) with a hot water heater, it may meet the EF requirements for water heaters in the Alternative Building Packages described in Section 4.
  (c) Using a combined EF with a hot water heater, or as an Energy Credit, it may be part of alternate compliance using EGNH software as described in Section 5.1.

(2) The combined EF may be calculated as shown in the paper "Drainwater Heat Recovery Credits for ENERGY STAR Qualified New Homes", Energy Building Group Ltd., 21 March, 2006.

(3) The product must be labeled: "Approved for Potable Water". The product must be certified by a Canadian licensed certification company such as ULC, CSA, ETL, etc.

(4) The product must be tested for heat exchange effectiveness at 9.5 lpm flow using hot water drain at 41.0C and entering water supply no greater than 9.5C.

(5) The product must be installed according to the manufacturer's instructions.

(6) Where a single DHR unit is installed in a house with two or more stacks the credit must be reduced by 1/3 if not connected to all the showers in the house.

DWHR Credit in CDN Energy Star® for Homes Version 3

Calculation of the Combined Energy Factor

It is recommended that the credits be based upon the determination of a "Combined Energy Factor", (Ef_combined) which is a reformulation of the US DOE method (ref 2) for testing and rating of water heaters with consideration to addition of a DHR unit to the home. This Ef_combined for a water heating combines both DHR and any primary water heater which has been rated and is listed by GAMA: Gas Appliance Manufacturers Association (www.gamanet.org). This method is general enough to include combinations of all primary energy consuming water heaters and all accepted DHR units as described above; it also considers standby losses separate from recovery efficiency. This method was recently proposed by Gerald Van Decker, P.Eng., M.A.Sc. of RenewABILITY Energy Inc., manufacturer of the Power-Pipe line of DHR products (ref 3).

$$Ef_{combined} = Q_{load} / Q'_{TotalFuel}$$

Where,

$$Q'_{TotalFuel} = Q_{stby} / N_r + Q_{load} * (1 - DHRMaxFactor * N_{DHR} * PF) / Nr$$

Q_{load} = 15,894.46 MJ/year (ref 2)

$$Q_{stby} = Q_{load} * [(N_r / Ef) - 1)]$$

Note: These Equations were developed based upon Energy Balances with the EF Test Methodology.

DHRMaxFactor=.599 was determined from testing by NRCan. N_DHR is the DWHR rated efficiency, PF is 1 for equal flow and 0.75 for unequal flow and Nr is the water heater Recovery Efficiency

DWHR Credit in CDN Hot2000 Software – All Programs

Drain Water Heat Recovery Systems Eligible for Energy Credits	Full Credit (kWh/a)	Half Credit (kWh/a)
EcoInnovation Technologies (ECO-GFX)		
• S3-40 (76 mm/ 3 inch drain at 39% steady state)	1418	709
• S4-40 (102 mm/ 4 inch drain at 39% steady state)	1410	709
• G3-40 (76 mm/ 3 inch drain at 40% steady state)	1673	837
• S3-60 (76 mm/ 3 inch drain at 49% steady state)	1782	891
• S4-60 (102 mm/ 4 inch drain at 51% steady state)	1854	927
Watercycles Energy Recovery Inc. (Watercycles)		
• DX-4048 (102 mm / 4 inch drain at 44% steady state)	1603	802
• DX-3030 (76 mm / 3 inch drain at 42% steady state)	1525	766
Renewability Energy Inc. (PowerPipe)		
• R3-30 (76 mm/ 3 inch drain at 37.9% steady state)	1194	597
• R3-36 (76 mm / 3 inch drain at 37.9% steady state)	1378	689
• R3-42 (76 mm / 3 inch drain at 42.4% steady state)	1544	772
• R3-48 (76 mm / 3 inch drain at 47.3% steady state)	1725	863
• R3-54 (76 mm / 3 inch drain at 49.3% steady state)	1795	898
• R3-60 (76 mm / 3 inch drain at 53.7% steady state)	1961	981
• R3-66 (76 mm / 3 inch drain at 55% steady state)	2009	1005
• R3-72 (76 mm / 3 inch drain at 58.8% steady state)	2149	1075
• R3-120 (76 mm / 3 inch drain at 67.7% steady state)	2478	1239
• R4-24 (102 mm / 4 inch drain at 31.5% steady state)	1142	571
• R4-30 (102 mm / 4 inch drain at 40.4% steady state)	1470	735
• R4-36 (102 mm / 4 inch drain at 42.4% steady state)	1544	772
• R4-42 (102 mm / 4 inch drain at 46.1% steady state)	1681	840
• R4-48 (102 mm / 4 inch drain at 52.7% steady state)	1924	962
• R4-54 (102 mm / 4 inch drain at 54.7% steady state)	1998	999
• R4-60 (102 mm / 4 inch drain at 58.4% steady state)	2135	1067
• R4-66 (102 mm / 4 inch drain at 59.9% steady state)	2190	1095
• R4-72 (102 mm / 4 inch drain at 62.9% steady state)	2301	1150
• R4-120 (102 mm / 4 inch drain at 72.2% steady state)	2644	1322

These Numbers are based upon the "Combined Energy Factor" Calculations and Independent Performance Testing according to an NRCan Protocol

A CSA Performance Testing Standard may be released in late 2012 / all Manufacturers are expected to have their units by July 2013

Comparison of DWHR Methods and Moving Forward...

-Both Methods were developed Independently

-Both Methods have the same Purpose

-The U.S. Method Includes Climate Zone

-The Canadian Method is based upon Energy Balance, Results in a Simpler Equation(s) and works for all water heaters and all DWHR Efficiencies

NOTE:

-EF for Water Heaters is fairly good but it is based upon an Average US Climate and an Average US Load

-EF itself does not provide a means to accurately model/ predict actual Hot Water Energy Consumption for any site

Comparison of Methods and Moving Forward...

What is Needed:

-We **Propose** a Method for Calculating "Site Specific EF" based upon: Rated EF, Climate Zone, Load, and use of DWHR (and/or Solar Water Heating)

-This **Site Specific EF** would also make it simple to account for the energy savings from having Efficient Water Distribution Systems because a Reduced Load would easily be considered

-This **Site Specific EF** has been developed and is under Preliminary Review

-It is a based upon a big, yet straightforward equation

-Some results shall now be presented....

Site Specific EF Examples - One Case

Water Heater EF Test Conditions				Water Heater Site Conditions			
Rated Energy Factor	EF	0.67		Site Energy Factor	EF	TBD	
Recovery Efficiency	η_r	79%		Recovery Efficiency	η_r	82%	
Water Heater Temperature	$T_{test,del}$	135	°F	Water Heater Temperature	$T_{test,del}$	120	°F
Cold Water Temperature	$T_{test,in}$	58	°F	Annual Ave Cold Water Temp.	$T_{test,in}$	45	°F
Room Temperature	T_{room}	67.5	°F	Room Temperature	T_{room}	67.5	°F
Volume Per Day	V_{test}	64.3	gal	Volume Per Day	V_{test}	50	gal
				Site EF without DWHR	EF'	0.613	
				DWHR Rated Efficiency		57.0%	
				Plumbing Factor		1	
				Site EF with DWHR	EF"	0.834	
				Energy Factor Modifier	EF"/EF	1.245	

Site Specific EF Examples - Cold Climate

Site Specific Water Heating EF with and without Drain Water Heat Recovery						
Zone: "Cold" Climate			Average Annual Water Mains Temperature:		45	°F
Rated Energy Factor:	EF= 0.67		Recovery Efficiency:		η_r= 82%	
House Detail:	1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	6 Bedrooms
Hot Water Load [gal/day]	40	50	60	70	80	90
DWHR Efficiency						
None	0.581	0.613	0.637	0.655	0.669	0.681
40%	0.705	0.753	0.789	0.817	0.840	0.858
50%	0.745	0.799	0.840	0.871	0.897	0.918
60%	0.789	0.850	0.897	0.933	0.962	0.986

Site Specific EF Examples - Mixed Climate

Site Specific Water Heating EF with and without Drain Water Heat Recovery						
Zone: "Mixed" Climate			Average Annual Water Mains Temperature:		55	°F
Rated Energy Factor:	EF= 0.67		Recovery Efficiency:		η_r= 82%	
House Detail:	1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	6 Bedrooms
Hot Water Load [gal/day]	40	50	60	70	80	90
DWHR Efficiency						
None	0.602	0.632	0.654	0.670	0.683	0.694
40%	0.736	0.782	0.816	0.841	0.862	0.878
50%	0.780	0.831	0.869	0.899	0.922	0.941
60%	0.829	0.887	0.931	0.964	0.991	1.013