

CSA Heat Pump Test Procedure Update

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Canadian Standards Association (CSA) Dynamic ASHP Test Procedure

- Response to stakeholder needs
 - Realistic test standard for variable capacity equipment
 - Seasonal efficiency for local climate zones
- Committee established 2015 and hosted by CSA
- CSA “Express Document”- voluntary test standard
- Residential air-to-air systems
- Stakeholder review draft prior to public comment
- PG&E, NEEA, NRCAN, EPRI & others: lab testing in support of test standard development

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Express Doc Objectives

- Voluntary test standard
- Residential capacities
- Ducted/ductless including central ducted
- Single/multiple terminal units
- No heat recovery
- Applicable to variable capacity heat pump and air conditioner efficiency
 - Test method can also be used equally with single and 2-stage equipment
- Load based testing rather than fixed-speed operation (e.g. DOE test)

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Dynamic Test Procedure

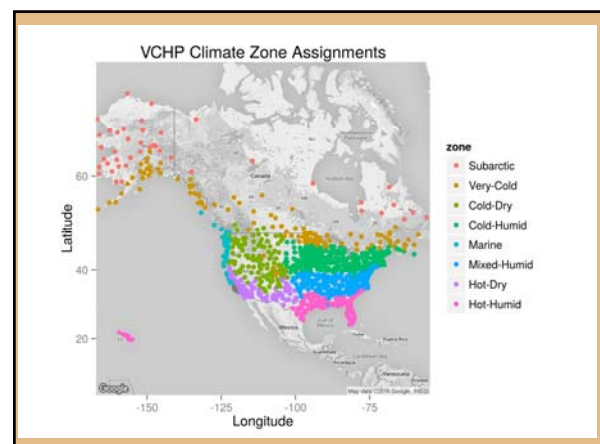
- Indoor room has imposed load; equipment on-board controls govern compressor, fan and defrost
- Test and report results under a wide range of outdoor conditions
 - 6 outdoor temperatures for cooling, 7 for heating
- Tests for two heating and two cooling climate types
 - Dry / humid
- Address a wide range of building loads
 - Includes cycling behavior at low loads
 - Heating to -15°F (or lowest operating temperature)
 - Cooling to 113°F (or highest operating temperature)

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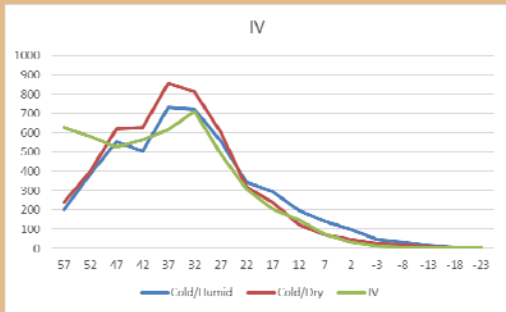
Climate-based Ratings

- 8 North American climate zones
- Based on Building America climates (simplified)
 - Grouping analysis done by Ecotope
- Test results used to create bin model for annual performance for each climate
- Includes
 - Seasonal COPs for heating /cooling in each climate
 - Optional: standby, crankcase & pan heater kWh
 - Performance data for hourly computer simulations

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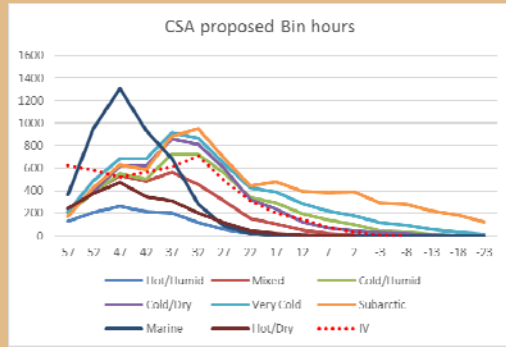


Cold climates example



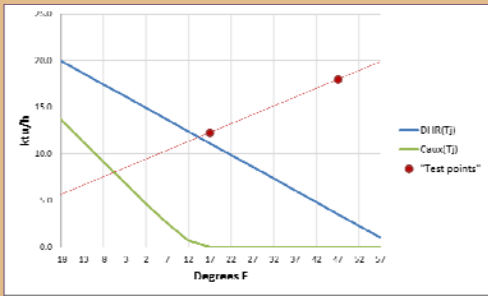
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CSA Heating Bins



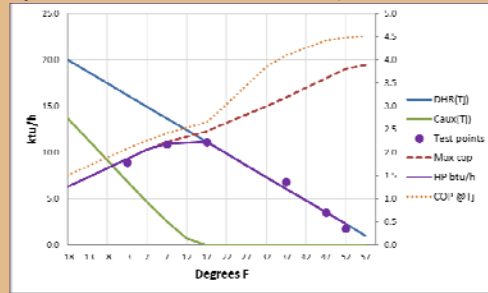
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Conventional Heating Performance Approach - Illustrative



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Dynamic Performance (Illustrative)



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Dynamic testing

- Includes native fan, cycling, and defrost behavior in single test procedure
- Requires minimal extrapolation
- Generates data for use in hourly whole building simulations

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Compare: CSA lab test vs. AHRI values

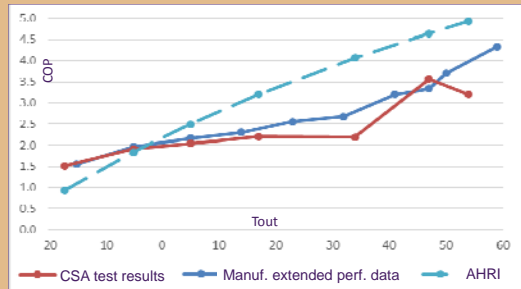
- Dynamic vs. fixed speed

Test result				210/240 values (approx)			
Tod	Output	Watts	COP	Tod	Output	Watts	COP
-17	9435	1827	1.5	-17	2347	733	0.9
-5	12287	1884	1.9	-5	4907	785	1.8
5	15030	2160	2.0	5	7040	828	2.5
17	15972	2128	2.2	17	9600	880	3.2
34	9033	1212	2.2	34	13227	954	4.1
47	4021	330	3.6	47	16000	1010	4.6
54	2307	211	3.2	54	17493	1040	4.9

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CSA Test, Manuf. data, AHRI values

- Test results match manufacturer heating data fairly well
- (AHRI shown for illustration purposes)



Application Rating

- Normative Annex
- Allows re-calculating of ratings for specific operating conditions:
 - Different UA of building (load line)
 - Different climate
 - Fixed capacity, or no auxiliary heat

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Progress

- Several labs have completed test runs
 - Will continue, to check for issues / refinements
- Stakeholder draft was released in April
- Public comment later this summer
 - Exact date TBD

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