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## **IPLV & NPLV – What does it mean and how do other chiller & air-to-water heat pump manufacturers IPLV ratings compare to Chiltrix?**

IPLV is to chilled water units what SEER or SEER2 is to standard air conditioners. It's the official AHRI efficiency rating for chillers and along with NPLV, is the only rating that matters. IPLV is the AHRI and industry-standard way of measuring the overall average seasonal efficiency of a hydronic (chilled water) cooling system. IPLV stands for Integrated Part Load Value, it's a similar concept to SEER/SEER2, where part-load performance is measured and rated so that customers can have a way to do an apples-to-apples comparison of real-world operating efficiency between various brands and models. IPLV and its companion NPLV are both specified in AHRI 550/590.

SEER is "Seasonal EER". There is no SEER or SEER2 rating for air to water heat pumps or chillers. Very similar in concept to SEER, IPLV and NPLV ratings are the ASHRAE/AHRI rating of "real world" seasonal or average performance of air-to-water and water-to-water (geothermal) chillers and heat pumps. Like SEER and SEER2, these ratings put the focus on "part load" performance. Part load performance is the most important metric because a properly sized cooling system is larger than it needs to be 99% of the time. That's because a properly sized air conditioner is specified to perform a proper level of cooling for a particular building on the hottest possible day of the year (looking back at over 20+ years of climate data for the location). 99% of the time, actual conditions are far milder than the hottest possible day. Thus, full speed efficiency is far less important than average part-load efficiency, which is why SEER, SEER2, IPLV, and NPLV are used as a basis for comparison of cooling systems rather than comparing full-speed EER. Since a chilled water system, like most air conditioners, only needs to run at full capacity a small percentage of the time, the IPLV and NPLV ratings are far more important than the full-speed numbers.

IPLV EER is calculated as follows:

$$\text{IPLV} = 0.01A + 0.42B + 0.45C + 0.12D$$

(NPLV uses the same formula)

Where:

A = COP or EER @ 100% Load (Meaning that about 1% of the time the unit needs to run at around 100% capacity)

B = COP or EER @ 75% Load (Meaning that about 42% of the time the unit needs to run at around 75% capacity)

C = COP or EER @ 50% Load (Meaning that about 45% of the time the unit needs to run at around 50% capacity)

D = COP or EER @ 25% Load (Meaning that about 12% of the time the unit needs to run at around 25% capacity)

IPLV is the rating based on a loop temperature (LWT or leaving water temperature) of 44F. Many chilled water system manufacturers such as Chiltrix also offer an NPLV rating. NPLV stands for Non-Standard Part Load Value. In addition to IPLV, Chiltrix uses an NPLV rating for loop water temperature of 55F. The Chiltrix NPLV rating is the rated efficiency of the system when using a non-standard loop temperature. By using properly sized (slightly larger coil) indoor equipment, a 55F loop can meet the same BTU and thermostat-satisfaction requirements as a 44F loop, with the 55F loop having much better system energy efficiency. Proper indoor fan coil unit sizing is especially important to consider when using NPLV system settings or when using the optional Chiltrix [Dynamic Humidity Controller](#) which allows for a continuously variable loop temperature to achieve the highest possible efficiency while tightly managing dehumidification. Chiltrix NPLV ratings are >/= 33% higher than its IPLV ratings.

**Comparison of Chiltrix (Based on California Energy Commission Official Data)**

Note, the highest rated air to water heat pump that is currently certified by the CEC is the Chiltrix CX35 with an IPLV of 23.3 followed by the Chiltrix CX65 / 65X with an IPLV EER of 22.8.

Cooling- Tons	Model Number	IPLV (Seasonal Average EER)	CEC Cooling Capacity
1.5 - 2.5 tons	Chiltrix CX35	23.3	24,037
	Chiltrix CX40/CX40X	20.7	24,660
	Viessman AM2V 020028	16.4	17,600
	MBTEK Apollo AP-EVI-DC-3.5T	18.5	27,300
	Spacepak CC32-18	21.2	17,183
3 - 4 tons	Chiltrix CX65 / CX65X	22.8	45,280
	Chiltrix CX50	21.2	41,285
	Viessman AM2V 034043	16.72	34,121
	Spacepak CC32-40	17.8	35,120
4-6 tons	Chiltrix CX75 / CX75X	19.6	52,545
	Spacepak CC32-60	18.7	52,001
	Viessman AM2V 051078	14.33	51,182
	MBTEK Apollo AP-EVI-DC-5T	17.8	52,000
	MBTEK Apollo AP-EVI-DC-6T	18.7	66,500

**Summary:**

The Chiltrix CX units hold individual cooling efficiency records, and together are the most efficient series of air to water heat pumps on the market, beating their competitors in IPLV EER efficiency by up to 62%. And only Chiltrix has DHC (Dynamic Humidity Control) with the ability to dynamically operate at  $\geq$  NPLV conditions, allowing Chiltrix to beat all the others, by **up to >200%**. See more about dynamic humidity control here:

<https://www.chiltrix.com/documents/Chiltrix-Psychrologix-TS.pdf>

As an aside, it should also be noted that Chiltrix has exceptionally high heating efficiency ratings with officially-certified SCOP (Seasonal Average COP) ratings as high as SCOP 5.36 representing the highest heating efficiency of all air to water heat pumps available in the USA market making the Chiltrix CX-series the most efficient air to water heat pumps for both cooling and heating.