



## 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 chillers what SEER 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 efficiency of a hydronic (chiller) cooling system. IPLV stands for Integrated Part Load Value, it’s a similar concept to SEER, 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 rating for 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, 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, IPLV, and NPLV are used as a basis for comparison of cooling systems rather than comparing full-speed EER. Since a chiller, 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:

$$IPLV = 0.01A + 0.42B + 0.45C + 0.12D$$

(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)



Chiller IPLV is the rating based on a loop temperature of 44F. Many chiller 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 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.

Chillers are inherently more efficient than regular air conditioners, but even so, there can be large differences in efficiency between chillers. Following is a comparison of Chiltrix to the Carrier Corporation’s top-of-the-line “Greenspeed Intelligence” variable speed 10-ton chiller (it’s the smallest size they make), recognized as one of the most efficient small chillers on the global market and far more efficient than Carrier’s standard chillers.

**Comparison of Chiltrix CX34 to Carrier Greenspeed Chiller**

30RAP AHRI* Capacity Ratings for units with Greenspeed Intelligence									
Size	Capacity		Compressor Power Input (kW)	Fan Power (kW)	Total Power (kW)	Full Load		IPLV	
	Tons	kW				EER	COP	EER	COP
011	9.7	34.1	9.8	1.2	11.0	10.6	3.1	16.8	4.9

Source: <http://www.carrier.com/commercial/en/us/products chillers/chillers/30rap/>

For a comparison of efficiency, see the official Chiltrix CX34 AHRI IPLV and NPLV efficiency data below:

Per AHRI 550/590						
	IPLV			NPLV		
Model	Capacity	EER	COP	Capacity	EER	COP
CX34	25,590	22.21	6.51	30,049	30.58	8.96

When considering the comparative IPLV EER efficiency of these products and to illustrate the efficiency of the patent-pending Chiltrix CX34 chiller heat pump, note that Chiltrix IPLV efficiency is **37% higher** than the Carrier Greenspeed chiller.

And since Chiltrix with DHC has the ability to dynamically operate in the NPLV range at **EER 30.58** or above when indoor humidity conditions permit, the CX34 can often provide efficiency that's **82.8% higher** than the Carrier Greenspeed chiller.

**IPLV Comparison to Other Popular Small Air-To-Water Heat Pumps/Chillers**

Popular Small Chiller Heat Pumps			
Brand	Model	IPLV EER	IPLV COP
Aermec	ANK050H	15.5	4.54
Aermec	ANK045H	14.6	4.28
Chiltrix	CX34	22.21	6.51
MultiAqua	MAC-060HE-03	16.25	4.76
MultiAqua	MHRC2-060-VS-01	15.58	4.56
Spacepak	LAHP48	9.2	2.7
Spacepak	SCM036	12.1	3.55
Spacepak	SCM060	10.8	3.17

**Summary:**

Within the < 10-ton small chiller marketplace, the Chiltrix CX34 is by far the most efficient chiller on the market and beats its competitors in IPLV EER efficiency by **37% up to 150%**. And only Chiltrix has DHC (Dynamic Humidity Control) with the ability to dynamically operate at >= NPLV conditions, allowing CX34 to beat all of the others by **82% up to >300%**.