

## C406 Credit Values - 2021 IECC versus WSEC 2018

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### Summary

The IECC C406 section will achieve less efficiency, carbon or energy, than the WSEC C406 in a majority of projects. In my opinion, it would behoove the TAG to expedite the current mash-up process by using the current WSEC credit system and leave developing and adjusting the credit system for when the TAG takes up code proposals. Fixing and adjusting the IECC values will take time and effort, both numeric values and code language must be adjusted for the differing WSEC base language (DOAS, water heat) and missing WSEC credits (enhanced DOAS, efficient kitchen).

It is my understanding there is a code proposal being developed based upon a future national code credit system proposal which is very similar to the IECC format but will be based upon modeling that better reflects the WSEC base efficiency (90.1-2019) and have some new credits. We are planning on converting the credit values to reflect carbon content and heating fuel assumption differences. The proposal and other possible C406 proposals will take considerable future TAG resources to vet and will serve as a better point of departure for any TAG changes than the current IECC version.

### Credit Comparison Details

To explore the relative strength of the C406 requirements between the two codes a numeric comparison of the credit systems was conducted. For each code, building type, and credit option, the assigned credits were divided by the number of required credits to determine the value attributed to a given option. This helps adjust for the different credit values and for the different number of required credits. For example, the WSEC requires a total of 6 credits and the IECC requires 10 credits. If the credits were equal then the IECC would be more stringent. To compare the credit values we can look at options that are in both codes. A 10% lighting reduction in office is worth 2 credits in the WSEC and 9 in the IECC. A 10% reduction in lighting will get 33% of the required credits in the WSEC and 90% of the required credits in the IECC, this is the relative value – WSEC 33%, IECC 90%. So while the IECC requires 66% more total credits in gives 270% more credit for a 10% lighting reduction.

If this same pattern repeated for all options or just the most common one then it would be clear which system requires the most efficiency. Of course the relative value of the options varies substantially by option and occupancy and the picture is at least somewhat muddled. Differences can be explained by differences in savings prediction methods as well as the metric used to determine a credit. The IECC credits are based upon energy cost using average national residential prices in Group R (\$0.129/kWh, \$1.1588/therm blended fossil fuel rate) and average commercial rates (\$0.1069/kWh, \$0.9065/therm blended fossil fuel rate) for all other occupancies. This is quite different from the WSEC carbon metric.

The table below contains the credit values for all measures that are in both codes and presents the ratio of the relative value. So following the example in the first paragraph, the IECC relative value divided by the WSEC relative value for 10% lighting reductions in office is 270% which is the value one sees in the table. Looking at the table it provides an aggregate view of the relative difficulty of satisfying a codes

total credit requirement. Lower relative credit means potentially additional credits will be required, while higher relative credit ratio means less will be required.

Green (under 100%) indicates credits the IECC gives less credit for. In these cases, DOAS and envelope in particular, the IECC would be tougher as it would require projects do more additional credits since these are not valued as highly as in the WSEC. According to PNNL this is the result of the limited DOAS requirements in the IECC which are reflected in the model. However this item has limited importance in the WSEC due to the mandatory DOAS requirement and balanced heat recovery requirements for all occupancies other than All Other (sans Group A). Envelope is another area where the IECC gives out much less credit relative to the WSEC.

Red/yellow (over 100%) indicates credits the IECC gives more credit for and indicates a weaker requirement. The IECC lighting credits are extreme, offering 2.7 times more credit than the WSEC. The IECC credits are so high that a 10% reduction delivers all credit needed in Group M, and 90% of the required credits in Groups B, E, and Other, and 15% (an IECC option) allows full compliance of all occupancies other than Group-R.

Since we don't have a distribution of which options are most often taken it is hard to develop single conclusion. It is my opinion that lighting option is one of the more common paths and the relative generosity of the IECC results in significantly weaker requirements in non-Group R occupancies. Where the IECC system will only require Group M projects to have a 10% LPD reduction and other occupancies a 15% reduction to achieve total credit requirements, the WSEC system requires a 20% LPD reduction in Group M and a 20% lpd reduction plus some other credit in the other occupancies. Thus the WSEC achieves more efficiency.

Another area of interest is the impact of using an energy cost rather than carbon as the basis for credit values. This is most clearly seen in the three water heat credits where the IECC offers large absolute and relative credit for renewable and efficiency fossil fuel heating and small absolute and relative credit for heat pump water heater compared to the WSEC while the WSEC does offer credit for higher efficiency gas tanks. Of the three options the IECC values heat pump water heater the least while the WSEC values it the most, this is a clear reflection of energy cost versus carbon. By valuing heat pump water heat low, the IECC will require more efficiency than the WSEC but it will also not offer as much encouragement to switch from gas to heat pump water heat.

Credit	Group R-1		Group R-2		Group B		Group E		Group M		All Other		Group R-1		Group R-2		Group B		Group E		Group M		All Other		Comments
	WSEC Credit Values 6 required						IECC Credit Values 10 required						IECC Relative Credit / WSEC Relative Credit (%)												
10% better heating / cooling efficiency	2	3	3	2	1	2	2	2	4	5	5	5	60%	40%	80%	150%	300%	150%							
Reduced lighting power (10%)	1	1	2	2	3	2	2	2	9	9	14	9	120%	120%	270%	270%	280%	270%							IECC out of whack IMO
Reduced lighting power (15%)							3	3	13	13	21	13													IECC has formula for LPD reductions > 15%
Reduced lighting power - 20%	2	3	4	4	6	4	4	4	18	18	28	18	120%	80%	270%	270%	280%	270%							
Enhanced digital lighting controls	NA	NA	1	1	1	1	NA	NA	2	2	3	2			120%	120%	180%	120%							
On-site renewable energy (IECC 0.25W/sf, WSEC 3%)	3	3	3	3	3	3	7	7	9	6	7	7	140%	140%	180%	120%	140%	140%							Not totally comparable WSEC varies amount of renewable by building type, requiring some to have less than the IECC and to have more
Dedicated outdoor air system	4	4	4	NA	NA	4	4	4	2	NA	2	3	60%	60%	30%			45%							In WSEC would only apply to Table C403.3.5 Group-B exclusions and non-Group A Other.
Enhanced DOAS	4	4	4	4	4	4																			
Recovered or renewable water heating	4	5	NA	NA	NA	8	15	15	NA	1	NA	15	225%	180%				113%							
Efficient fossil fuel water heater	NA	NA	NA	NA	NA	NA	9	9	NA	3	NA	9													
Heat pump water heater	11	13	NA	NA	NA	NA	5	5	NA	NA	NA	5	27%	23%											
Enhanced envelope performance	3	6	3	3	3	4	3	3	5	1	4	3	60%	30%	100%	20%	80%	45%							I'd believe the IECC on this one
Reduced air infiltration	1	2	1	1	1	1	3	3	3	NA	1	2	180%	90%	180%		60%	120%							
Enhanced Commercial Kitchen	5	NA	NA	NA	5	5																			
Energy monitoring							1	1	3	2	3	3													
Fault detection and diagnostics system							NA	NA	1	1	1	1													

Green = IECC credit option is more stringent  
Yellow = WSEC-C option is more stringent  
Red = WSEC-C option is much more stringent