2021 **IECC**

Top Proposals Explained

This Top Proposals Explained guide provides information on a subset of energy efficiency proposals to be voted on in the 2021 IECC update. New Buildings Institute has attempted to provide a non-technical description of what each proposal achieves, the intended impact or reason for the proposed changed, an estimate of energy savings and costs when known.

If passed by validated Governmental Member Voting Representatives, these proposals are estimated to improve the energy code by 10-15% over the 2018 version of the IECC. They are listed in numerical order, with residential first and commercial second. A glossary at the end can assist potential voters with unfamiliar terms.

Residential Proposals

Code Change Proposal and Vote		Proposal Description	Intended Impact / Reason for Change	Estimated Energy Savings	Cost / Cost Effectiveness
RE 7	AMPC1	Increases the installed lighting efficacy requirements to 65 lumens/watt for lamps and 45 lumens/watt for luminaires.	This proposal recognizes the market shift to LED lighting and away from compact fluorescent lights.	Residential LEDs, especially ENERGY STAR®-certified products, use at least 75% less energy, and last 25 times longer, than incandescent lighting, according to the U.S. Department of Energy.	Over its lifetime, a single 15,000-hour ENERGY STAR®-certified LED bulb would save about $80 compared to a CFL. The cost of LEDs has been steadily declining over the last several years and is expected to continue to decline. A spot check of Home Depot in early 2019 at the time this proposal was written showed that a warm white, 60W equivalent A-lamp is as low as $1.24 for both CFL and LED when purchased in packs.
RE 29	AS	Results in better wall insulation in cold climates (Climate Zones 4 and 5) by requiring cavity and continuous insulation.	Continuous insulation is an important component of a high-performance building. Placing insulation on the face of wall studs is the most effective insulation practice for reducing heat loss in cold climates. It also reduces moisture issues in wall cavities that can lead to durability issues and mold growth.	In Climate Zone 4, energy model results suggest savings of 5.7%. In Climate Zone 5, this savings is estimated to be 4.3%.	Continuous insulation may have increased first costs. However, continuous insulation can be "traded off" by using the other compliance approaches, which increase efficiencies in other building areas or systems that may be less expensive than installing continuous insulation.

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RE 32	AS	Results in increased slab edge insulation in Climate Zone 3 and increased insulation performance in Climate Zones 4 and 5.	Slab edge insulation is important for reducing heat loss during the heating season. Requiring slab edge insulation in Climate Zone 3 will increase comfort and efficiency. Requiring that slab edge insulation be buried deeper will reduce heat loss through the slab in colder climates.	Climate Zone 3 – 6.8% Climate Zone 4 – 2.5% Climate Zone 5 – 2.2%	This would require slab edge insulation to be installed in Climate Zone 3 and slab edge insulation to be installed deeper in Climates 4 and 5. However, the code allows insulation to be "traded off" by using the other compliance approaches, which increase efficiencies in other building areas or systems that may be less expensive than installing insulation.
RE 33	AS	Increase ceiling insulation in hot climates (Climate Zones 2 and 3).	The two primary cooling loads for buildings in hot climates are from the roof and glazing. Increasing roof insulation levels to R-49 in hot climates is effective in reducing heat gain from the hot attic into the house.	Climate Zone 2 - 0.7% Climate Zone 3 - 0.9%	This change would require higher ceiling insulation to be installed if using the prescriptive approach. However, the code allows insulation to be "traded off" by using the other compliance approaches, which increase efficiencies in other building areas or systems that may be less expensive than installing ceiling insulation.
RE 35	AMPC1	Results in better windows in Climate Zones 2 to 4.	The typical home loses more than 25% of its heat through windows. This proposal will reduce heat gain through the windows by lowering the required U factor. It will also help lower the cooling load.	Climate Zone 2 - 0.9% Climate Zone 3 - 1.0 % Climate zone 4 - 1.1%	Low-e coated windows are typically used to meet the solar heat gain coefficient (SHGC) requirements in these climate zones. In many cases the windows on the market in these climate zones already meet the code requirement resulting in no additional first cost of construction.
RE 36	AS	Results in better insulation in above-and below-grade walls in Climate Zones 4 to 8.	RE36 increases the ceiling R-value to R-60, which will help reduce heat loss through the roof and help mitigate issues such as ice damming. Higher R-values in areas that have high cooling loads will also reduce heat gain from the hot attic to the house resulting in lower air conditioning loads.	Climate zone 4 - 0.6%. Climate Zone 5 - 0.7%. Climate Zone 6 - 0.6%. Climate Zone 7 0 0.5%. Climate Zone 8 - 0.4%.	This change will require higher ceiling insulation to be installed in all cases if using the prescriptive approach. However, the insulation can be "traded off" by using the UA Alternative, raised heel or oversized trusses, Simulated Performance or ERI compliance approach and increasing efficiencies in other parts of the building or systems that may be less expensive than installing higher ceiling insulation.
RE 37	AS	Requires a solar heat gain coefficient (SHGC) of 0.40 in Climate Zone 5.	Climate Zone 5 includes areas with high cooling loads (e.g. Boise, ID and Reno, NV). Lower SHGC windows is an effective method of reducing cooling loads and can be used in cooling load calculations to downsize air conditioning sizing.	Not Available	Windows that are being installed in Climate Zone 5 typically already meet this requirement because the low-e coating used to meet the U-factor requirement also lowers the SHGC values to the low range (0.30) if not lower. There is no additional first cost with this proposal.

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RE 112	AS	Reduces heat and conditioned air loss.	This proposal requires that all ducts be tested for air leakage. Ensuring ductwork is airtight will ensure that each room receives the quantity of conditioned air that it needs for heating or cooling the space. This will reduce hot and cold areas in the home.	Energy savings is difficult to calculate for this provision. When spaces are not comfortable, occupants may adjust the thermostat up to receive more heated air or down if the space is not sufficiently cool. Weighted averages of energy modeling results suggest that the impact of raising or lowering the thermostat 1˚F is 4.1% increased energy use for heating and 3.0% increase for cooling.	Typically, ductwork is located in both conditioned and unconditioned space and the entire duct system is already tested under code. In some cases, all the ducts are in conditioned space, so no testing is currently required. In such a case there would be an increased cost due to this requirement. Duct testing costs vary by region.
RE 139	AS	Requires heat recovery ventilators (HRVs) or energy recovery ventilators (ERVs) are installed for ventilation systems in Climate Zones 7 and 8.	ERVs and HRVs pre-heat (or cool) ventilated air entering the space prior to entering the house. They result in significant energy savings when coupled with mechanical ventilation.	Energy cost annual savings for ERVs or HRVs are approximately $138 to $233, according to Natural Resources Defense Council.	The first costs of construction (including costs for appliance, equipment and installation) is expected to increase by approximately $830 compared to an exhaust-only system.
RE 147	AS	Requires buildings be electrification ready.	This proposal requires that electric outlets be installed by water heaters, gas furnaces and gas ranges. Space must also be provided to install a heat pump water heater.	This proposal readies the house to install electric heat pumps for space heating and cooling, heat pump water heaters, electric ranges and dryers. Installing the outlets at the time of construction is significantly less expensive than retrofitting the house afterwards. This also gives the occupant a choice on appliances.	Cost will be dependent on installing an additional 120V/220V outlet next to each of appliances and also the additional capacity needed in the breaker box.
RE 148	AM PC1 and PC2	This proposal adds a requirement for R-occupancy buildings (such as multifamily buildings) to meet the exterior lighting requirements in the commercial section.	These buildings are technically commercial occupancies but are subject to the residential code, and therefore have no efficiency requirements for site lighting.		

Code Change Proposal and Vote		Proposal Description	Intended Impact / Reason for Change	Estimated Energy Savings	Cost / Cost Effectiveness
RE 182	AS	Requires the minimum level of efficiency for the building envelope be no worse than the prescriptive requirements of the current code if using renewables to comply with the Energy Rating Index (ERI) approach.	This proposal will ensure that using renewables for compliance with the ERI approach will not lower the efficiency of the building envelope. The building envelope is critical to building energy performance over the life of the building. Envelope is most easily addressed in new construction, since it is much harder to retrofit efficiency. This proposal requires that the envelope be built correctly from the start, using current code minimum requirements, by removing a tradeoff for extra solar panels.	Not available	No additional first costs.
RE 192	AS	Improves the target ERI values, which were weakened from the 2015 to the 2018 version of IECC.	Lowers ERI values by 5-8 points	Reducing ERI scores will result in an increase in efficiency of from 5 to 8% over the values in the 2018 IECC. This can be achieved by increasing the efficiencies in the building alone without the use of use of renewables.	The additional first cost to meet the target ERI values will vary based on the construction of the building envelope, efficiency of the HVAC and water heating systems and appliances. In many cases credit can be taken for high efficiency HVAC and water heating systems or ENERGY STAR®-certified appliances, which may already be planned for the project.
RE 209	AS	This Flex Point option allows builders to select one of five packages options to achieve a 5% increase in efficiency.	This Flex Point option is a similar format to the Washington State residential code. The package options are buildable bundles of measures. Pre-determined packages allow the code user to receive credit for higher levels of efficiency in the building envelope, tighter building envelope, and more efficient HVAC, water heating system or duct system.	Energy savings is 5%.	
RE 223	AMPC2	Provides an optional path for jurisdictions that want to add an Appendix to the code that achieves zero energy.	RE223 is a zero energy home proposal that emphasizes efficiency to reduce grid impacts. It prescribes the addition of renewable energy to meet an ERI score of 0.	Complying with the ERI score before renewables represents 18 to 25% reduction in the building energy use.	No additional first costs are available. This proposal is an appendix so jurisdictions have the option to adopt RE223 or not. The ERI scores were found to be achievable by the ASHRAE 90.2 committee.
CE 9 Part II	AS	The proposal clarifies that energy conservation must be considered in assessing alternatives to IECC requirements.	The purpose of this code change proposal is to help ensure that energy conservation will be considered in any request for approval of alternative materials, designs, or methods of construction.		This code change proposal will not increase or decrease the cost of construction

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CE12 Part II	AS	Improves the thermal envelope of new buildings constructed to meet "above code" programs.	This proposal applies a minimum thermal envelope backstop similar to the one that applies to the Energy Rating Index in Section R406. If a minimum backstop is necessary for the ERI, it stands to reason that a minimum backstop would be even more valuable in an even less fully defined and potentially less rigorous "above code" program.		This code change proposal will not increase or decrease the cost of construction
CE 21	AMPC1	This proposal updates the definitions of biomass-related renewable energy for greater clarity and specificity to ensure that biomass-based sources of energy can reasonably be considered renewable energy.	There are many ways to generate energy from biomass energy. The revised language makes the proper distinction between geothermal energy sources and geothermal heat pumps. The revision also limits the biomass sources to those that meet specifications as waste products. CE 21 also ensures that virgin material of unknown origin is not used as a steady source of energy.	This proposal ensures that an old definition of biomass energy is not used as a trade-off for energy efficiency in Section C406.	This code change proposal will not increase or decrease the cost of construction
CE 35	AM	Clarifies the definition of above-grade wall insulation to ensure that all elements of the exterior wall, including edges of floors, are insulated.	CE35 clarifies the definition of above-grade wall, eliminating a loophole. It ensures all building elements serve as functional parts of the wall – especially floor edges and between-floor spandrels.	This proposal closes a loophole in the definition of an above grade wall to improve the efficiency of the overall wall assembly.	CE35 would not increase or decrease the cost of construction. This modification simply clarifies the code.
CE 61	AS	Results in better roof insulation.	These changes increase the ceiling insulation R-values and corresponding U-values in cold climates for multifamily and other commercial buildings. This will result in reduced energy use for heating and cooling and increased comfort for the occupants.	This measure has passed the ASHRAE energy savings and cost effectiveness analysis.	Costs vary based on construction type. The additional first costs can be optimized by using the Component Performance Alternative and "trading off" levels of efficiency for increased efficiency levels in other parts of the building envelope.
CE 63 + CE 64	AS, AS	Results in more insulation in above-grade and below-grade walls.	CE63 increases the efficiency of metal building, metal-framed and wood-framed walls by increasing the R-values and corresponding U-factors in colder climates. This results in reduced energy use, increased occupant comfort and a more resilient building.	This has passed the ASHRAE energy savings and cost effectiveness analysis.	Additional first cost for metal building walls will be minor. For metal framed walls the additional first cost will be the cost of additional continuous insulation. The additional first costs can be optimized by using the Component Performance Alternative and trading off levels of efficiency for increased efficiency levels in other parts of the building envelope.

Commercial Proposals

Code Change Proposal and Vote		Proposal Description	Intended Impact / Reason for Change	Estimated Energy Savings	Cost / Cost Effectiveness
CE 66	AS	Results in more efficient floors.	CE 66 increases the insulation R-value and corresponding U-factor requirement for concrete floors resulting in increased occupant comfort especially for multifamily buildings with floors over parking garages.	Not Available but has passed the ASHRAE energy savings and cost effectiveness analysis.	Additional first costs would be minor.*
CE 68	AS	Improves building efficiency by requiring more efficient low-capacity ventilation fans such as bathroom and exhaust fans.	Exhaust fan efficacies were introduced in the code in 2012 IECC for whole-house ventilation in low-rise residential buildings, but have never been included for dwelling units in the commercial provisions of the IECC. Increasing the efficiencies of the fans will reduce energy use in these buildings.	Estimated energy savings is 0.5%.	Cost of fans vary dramatically depending on flow rate, finishes, design, and acoustics. Some may even add features like lights, sensors, or heaters which cost more. This proposal can result in no incremental first costs or short simple paybacks where incremental costs are incurred. In some cases, fans that meet this requirement can cost less.
CE 69	AS	Revises building envelope requirements (including thermal insulation, thermal envelope assembly).	CE 69 adopts ASHRAE's more efficient requirements for unheated slab insulation in climate zones 7-8.	CE 69 reduces building energy costs and improves long-term energy efficiency.	The code change proposal will increase the cost of construction but has been deemed cost-effective by ASHRAE committee.
CE 96 + CE 97	AM, AM	Increases whole-building efficiency by requiring air leakage testing.	Air leakage can be a significant source of energy waste in buildings, contributing to higher heating and cooling costs for building owners and occupants, and increased risk related to comfort and durability. Air tightness testing can result in more attention to envelope assembly air barrier sealing and significantly reduced building leakage.	Based on PNNL analysis, the energy cost savings data ranges from $6.64 to $44.02 per thousand square feet of floor area in mid-rise apartment buildings, and $5.07 to $71.88 per thousand square feet of floor area in offices buildings.	Cost of testing varies based on building type and Climate Zone.
CE 99	AM	Increases whole-building efficiency by requiring air barrier verification/ commissioning.	The prescriptive air barrier requirements currently used in the IECC are not achieving the necessary level of performance. CE99 includes a proven sequence of requirements to ensure both effectiveness, ease of implementation and ease of enforcement.	The whole-building energy savings estimate is 13% if coupled with air leakage testing.	CE 99 would increase the cost of construction. Lawrence Berkeley National Laboratory studied the benefits of building envelope commissioning, noting that commissioning only costs about $1.16/ sf for new construction., with a payback period of as little as 14 months.

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CE 111	AM	Improves building efficiency by detecting HVAC system failures in real time.	Failure to maintain and/or properly control a building's HVAC system will reduce the energy efficiency of that equipment over time. CE 111 requires the installation of fault detection and diagnostics (FDD), which notifies building operators that HVAC equipment is not properly working.	FDD helped ensure high-efficiency HVAC equipment is operating properly.	CE 111 will slightly increase the cost of construction because it will require additional hardware, software and labor during installation.
CE 140	AMPC1	Improves building efficiency by requiring more efficient low-capacity ventilation fans such as bathroom and exhaust fans.	Exhaust fan efficacies were introduced in the code in 2012 IECC for whole-house ventilation in low-rise residential buildings, but have never been included for dwelling units in the commercial provisions of the IECC. Increasing the efficiencies of the fans will reduce energy use in these buildings.	Estimated energy savings is 0.5%.	Cost of fans vary dramatically depending on flow rate, finishes, design, and acoustics. Some may even add features like lights, sensors, or heaters which cost more. This proposal can result in no incremental first costs or short simple paybacks where incremental costs are incurred. In some cases, fans that meet this requirement cost less.
CE 162	AM	Improves lighting efficiency in dwelling and sleeping units in commercial buildings (including high-rise multifamily).	CE 162 shifts the requirements for connected lights in dwelling units to LED lights and away from compact fluorescents lights. LEDs are widely available, offer significant energy savings, better color rendition and are far more acceptable to the consumer.	Estimated energy savings is 0.5%	CE 162 has the potential to increase the cost of construction because it requires higher efficacy lighting (lamps and/or fixtures). However, the cost of LEDs has been steadily declining over the last several years and is expected to continue to decline. This proposal may eliminate some lower-end CFL options and will encourage builders to use newer LED technologies.
CE 209	AM	Improves building efficiency by requiring lighting used for plant growth or maintenance to meet an efficiency of 1.6 micromoles per Joule.	This proposal closes a loophole in the IECC that exempts lighting for plant growth. As written, the 2018 IECC leaves lighting used for energy intensive and rapidly growing indoor horticulture lighting completely exempt from efficiency requirements. The 1.6 micromoles per Joule threshold was developed in collaboration with the American Society of Agricultural and Biological Engineers specifically for lighting used for plant growth and metric can be met with LED lighting.	This provision is estimated to save 78% over commonly used high pressure sodium lamps.	CE 209 has the potential to marginally add to the cost of construction based on the light source selected to meet the requirements.

Code Change Proposal and Vote		Proposal Description	Intended Impact / Reason for Change	Estimated Energy Savings	Cost / Cost Effectiveness
CE 215	AM	Improves building efficiency by ensuring building mechanical systems are functioning properly.	Over time energy efficiency measures degrade and go out of calibration. This results in increased energy consumption over time. CE 215 requires the installation of monitoring subsystems, which alerts building operators when mechanical systems are not operating to specification. For large buildings, this data is further broken out by the major sub-systems (HVAC, lighting, process loads, and plus loads).	The requirements in this proposal save energy by continually monitoring and reporting actionable energy consumption data to building owners and operators.	This code change proposal may increase because it will require additional hardware, software and labor during installation.
CE 216	AM	Improves building efficiency by requiring controlled plug load receptacles for offices, conference rooms, break rooms, etc.	Plug loads are devices that plug into wall outlets which are not currently covered in code. This proposal would require receptacles that can be turned off and on in certain spaces.	Research by New Buildings Institute in 2015 suggests that energy savings by managing plug loads can be 3% of whole-building energy use.	Costs are estimated to be $0.26/square foot for small office implementation and $0.19/square foot for large office.
CE 217 Part I	AM	Results in EV-ready commercial buildings.	Requires a minimum number of parking spaces with electric vehicle charging infrastructure based on the number of parking spaces provided to the building.	This proposal shifts transportation energy from combustion to electricity.	The estimated costs for installing new EV capable charging stations for two spaces in an enclosed parking garage is $210 and for six spaces $310.
CE 217 Part II	AS	Results in electric vehicle (EV)-ready residential building.	Requires a minimum of at least one EV-ready parking space per building. The total number of required EV-ready spaces is based on the total number of parking spaces required for the building.	This proposal shifts transportation energy from combustion to electricity.	Research in 2016 by John Morris for the Northwest Energy Efficiency Alliance shows that the incremental cost of making a new home EV-ready can be as low as $40. Research for San Francisco suggests that retrofitting a new home might cost between $1,500-$4,000.
CE 218	AM	Increases flexibility for builders by allowing builders to choose from numerous options to achieve an additional 2.5% energy savings.	This proposal remedies the problem that current Section C 406 “pick 1” options are unequal depending on the energy efficiency measure, the building type and climate zone. This proposal provides a new points-based approach and allows builders to install options that have the greatest energy-saving potential by awarding them points. Options with large savings receive more points.	Energy savings is 2.5%. This proposal changes the C 406 Options from a “pick 1” to an “earn 10 points” where each point is worth 0.25% as based on energy modeling by Pacific Northwest National Labs.	CE 218 does not require investment, but rather modifies the way the options work in Section C406.

Code Change Proposal and Vote		Proposal Description	Intended Impact / Reason for Change	Estimated Energy Savings	Cost / Cost Effectiveness
CE 226	AM	This proposal is one of the Section C406 options covered by the CE 218 proposal. It provides additional credit for installing a lighting system that is 15% more efficient than code or by installing more high efficacy lights (LED) in multi-family buildings.	This change will result in a reduction in energy use by the lighting system and a reduction in the cooling load of the building.	This proposal is one option in Section C 406, therefore this proposal is not assigned savings in code beyond the 2.5% in CE 218. However, energy savings accrue when lighting power density is lowered. Actual savings vary depending on climate zone and building type as outlined in the look-up tables.	Selecting this option for multifamily buildings will require higher efficacy lamps in dwelling units and sleeping units. However, these lamps are readily available in the marketplace and are typically less costly than the slightly lower efficacy alternative required under the residential code.
CE 240	AS	This proposal is one of the Section C406 options covered by the CE 218 proposal. It provides points to builders for installing energy-efficient commercial kitchen cooking equipment.	ENERGY STAR®-certified equipment can be used in kitchen applications to meet energy savings required in Section C 406.	This proposal is one option in Section C 406; therefore this proposal is not assigned savings in code beyond the 2.5% in CE 218. However, energy savings accrue when ENERGY STAR®-certified equipment is used.	According to the U.S. EPA, products that earn the ENERGY STAR®-certified label are independently certified to save energy, save money and protect the climate.
CE 262	AS	Results in the installation of battery storage for onsite solar power generation.	CE 262 helps ensure there is design and space consideration for a standard-sized battery rack and for the connections to electrical panels. This proposal helps jurisdictions that are now, or may in the future, face constraints on electric grid capacity from distributed solar generation resources.	This proposal does not directly save energy. Battery storage can mitigate adverse grid impacts.	The code change proposal may increase the cost of construction. It may require a slight increase in design fees and markings on the panels. Beyond that, costs will not increase further if space is available in storage rooms where panels are generally located. Otherwise increased costs are associated with devoting additional 8 square feet of space for battery storage. It is generally much more cost-effective at the time of new construction to design for future installation of this equipment than it is to retrofit later in the building's life.

Glossary/Background

(Terms listed as they appear in the fact sheet)

Energy Rating Index (ERI) – The ERI score is defined as a numerical score where 100 is equivalent to the 2006 IECC and 0 is equivalent to a zero energy home. The lower the score, the less energy the building uses. Builders can meet target ERI scores by increasing the efficiency of the building envelope, installing a more efficient heating, cooling and water heating system, ENERGY STAR®-certified appliances and orienting the building to make best use of the sun. Renewables can also be used to achieve the target ERI values.

Flex Points – Flex Points increase the flexibility of the code. They trust that builders and design professionals will select the most cost-effective and sensible efficiency improvements for a given project. Flex Points improve overall energy efficiency across all IECC compliance paths, including prescriptive simulated performance approaches and Energy Rating Index paths. It offers a points-based table of additional energy efficient options from which an owner, designer or builder may select one or more improvements, as long as they meet the required energy efficiency level. This concept is being incorporated in Washington and Oregon code.

Lighting Efficacy – Lighting efficacy is measured in lumens of light output to watts input with the greater the value, the more efficient the light source.

Low-emissivity (low-e) – Low-emissivity (low-e) coatings on glazing or glass control heat transfer through windows with insulated glazing.

Plug loads – Plug loads are equipment powered by means of an receptacle. They represent all energy uses in a building beyond the regulated heating, ventilation, air conditioning, lighting, and water heating systems. In buildings with efficient regulated loads, plug loads may account for more than 50% of the total energy consumption.

R value – An R-value is the ability of a material to resist heat transfer, and the lower the value, the faster the heat loss. An energy-efficient house has much higher insulation R-values than required by most local building codes.

Solar Heat Gain Coefficient (SHGC) – SHGC is the fraction of incident solar radiation admitted through a window, both directly transmitted and absorbed and subsequently released inward. SHGC is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits.

U value – U-value measures how much heat will transfer through a window. The lower the U-value, the better a window insulates by means of reducing heat flow and maintaining comfortable temperatures.

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