

# Olympia Electrification Reach Code (Version 1)

**Note: This is an early draft of Olympia’s proposed electrification reach code. This draft is no longer under consideration and is provided for reference only. Please see Version 2 for the most recent draft of proposed code amendments.**

This document describes concepts that have been proposed for inclusion in a reach code for Olympia that will expand the electrification of building and building loads in Olympia. The 2021 WSEC includes new provisions that will substantially expand the use of electric equipment and substantially decrease the use of combustion equipment in new buildings. These requirements are meant to build on the gains made in the forthcoming WSEC to take new construction in Olympia all the way to full electrification (with some important flexibility for specific load types) and accelerate the electrification retrofits of existing buildings undergoing additions and alterations.

The table below includes a high-level summary of all of the proposed code concepts. Each proposed code concept follows in the order that they would be located in the WSEC. Each code concept is presented as proposed code language and a reason statement describing what the code language accomplishes. The code language is presented as a modification to the language found in the 2021 WSEC where WSEC language that is being removed is formatted as ~~strikethrough~~ and new language is formatted as underline.

Measure	Description
<b>New Construction Whole-Building Electrification Requirements</b>	
Require All-Electric buildings	This proposal prohibits the installation of combustion equipment in commercial buildings. It includes targeted exceptions for process loads like manufacturing, equipment in commercial kitchens, make-up air systems for “contaminated” air flows for which heat pumps paired with energy recovery are not feasible alternatives and buildings that are required to have back-up power for space heating.
Increase code stringency for mixed-fuel buildings	Increase the credit requirement in C406 for buildings that include combustion equipment as part of the exception to all-electric buildings.
<b>Existing Building Electrification Requirements</b>	
This section includes provisions that require or enable the electrification of specific gas end uses at certain building lifecycle events in existing buildings. They have been tailored to coordinate with the forthcoming version of WSEC, particularly the allowances for like-for-like gas equipment replacements in WSEC.	
Electrification of Substantial Improvements	This proposal prohibits combustion equipment from being used to serve buildings undergoing substantial alterations.

All-Electric Additions	This proposal prohibits the installation of combustion equipment in additions, and prohibits additions from being served by combustion equipment.
Commercial Gas Pipe Testing	When replacement gas equipment is installed, the gas piping is required to be leakage tested.
Limit exceptions to space heating electrification retrofit requirements in WSEC	This proposal reduces the number and scope of exceptions to mandatory heat pump requirements for space heating in WSEC.
Limit exceptions to water heating electrification retrofit requirements in WSEC	This proposal reduces the number and scope of exceptions to mandatory heat pump requirements for water heating in WSEC.
Heat Pumps for Split System AC Compressors	Require the installation of heat pumps for split-system AC compressor replacements and the configuration of existing combustion and resistance heating equipment as supplementary heat.
Service Upgrade	Require replacement service connections to be sized for full building electrification.
<b>Additional Existing Building Efficiency Requirements</b>	
This section includes a small number of high-value efficiency requirements for existing buildings.	
Commercial HVAC Control Upgrade	New HVAC equipment in alterations must have controls that comply with current code requirements.

## All-Electric Buildings

Code Language:

### SECTION C202 GENERAL DEFINITIONS

Add new definitions as follows:

**ALL-ELECTRIC BUILDING.** A building that contains no combustion equipment, or plumbing for combustion equipment, installed within the building, or building site.

**APPLIANCE.** A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

**COMBUSTION EQUIPMENT.** Any equipment or appliance used for space heating, service water heating, cooking, clothes drying, or lighting that uses fuel gas or fuel oil.

**COMMERCIAL COOKING APPLIANCE.** Appliances used in a commercial food service establishment for heating or cooking food and which produce grease vapors, steam, fumes, smoke or odors that are required to be removed through a local exhaust ventilation system. Such appliances include deep fat fryers, upright broilers, griddles, broilers, steam-jacketed kettles, hot-top ranges, under-fired broilers (charbroilers), ovens, barbecues, rotisseries, and similar appliances. For the purpose of this definition, a food service establishment shall include any building or a portion thereof used for the preparation and serving of food.

### SECTION C401 GENERAL

Revise text as follows:

**C401.2 Application.** Commercial buildings shall be all-electric buildings and shall comply with Section C401.2.1 or C401.2.2.

**Exception:** The following equipment and load types shall be permitted to utilize fuel gas provided the building complies with Section C406.1.3:

1. Industrial and manufacturing processes.
2. Commercial Cooking Appliances
3. Make-up air systems where energy recovery ventilation is prohibited by the International Mechanical Code.
4. Where it has been demonstrated to the building official that the building is required by an applicable law or regulation to provide space heating with an emergency power system or a standby power system.

Add text as follows:

**C406.1.3 Buildings with combustion equipment.** Where a new building includes combustion equipment, the credits required by Section C406.1 shall be increased by ten percent, rounded up to the nearest whole number.

### Reason Statement:

This proposal builds on electrification requirements in the 2021 WSEC and requires that new buildings be all electric and not include combustion equipment. It includes important exceptions for certain gas loads in buildings that are especially challenging to electrify for technological or market reasons including:

- Industrial/manufacturing processes. These are not technically building loads and are industrial loads located within buildings. While there are feasible electric options for some industrial/manufacturing equipment, their feasibility is very situation-specific, and it would not be appropriate for the building code to regulate this kind of equipment.
- Commercial kitchens are effectively food manufacturing facilities in buildings. Many restaurants and food processors have production processes that have been developed around gas-fired equipment. While electric options exist for nearly all commercial kitchen equipment, the transition can be challenging for businesses and staffs and therefore this equipment is exempted from the electrification requirement.
- High-volume make-up air systems for contaminated exhaust air streams. Some applications within buildings (commercial cooking, labs) have exhaust requirements that necessitate very high make-up air volumes. The requirements for make-up air tempering often cannot be met by heat pump equipment due to lower capacities. This can generally be solved by pairing heat pump equipment with energy recover equipment. However, when the air stream is contaminated, energy recovery is generally not allowed by the mechanical code, eliminating this option. Therefore, these systems have been exempted from the electrification requirement.
- Some occupancies, particularly emergency and healthcare occupancies are required by law to have space heating that can run on backup power during a power outage. Running all-electric systems from backup power would substantially increase the need for onsite fuel storage. Therefore, these systems have been exempted. The terms “emergency power system” and “standby power system” are defined terms in the building code.

## Electrification of Substantial Improvements

### Code Language:

Add new definition as follows:

**SUBSTANTIAL IMPROVEMENT.** Any *repair*, reconstruction, rehabilitation, *alteration*, *addition* or other improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained *substantial damage*, any repairs are considered substantial improvement regardless of the actual *repair* work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

Add section as follows:

**C501.7 Substantial improvements.** *Combustion equipment* shall not be permitted to serve *substantial improvements*.

**Exception:** The following equipment and load types shall be permitted to utilize *fuel gas* provided the *building* complies with Section C406.1.3:

1. Industrial and manufacturing processes.
2. Commercial Cooking Appliances
3. Make-up air systems where energy recovery ventilation is prohibited by the International Mechanical Code.
4. Where it has been demonstrated to the building official that the building is required by an applicable law or regulation to provide space heating with an emergency power system or a standby power system.
5. Combustion equipment with a permitted installation date within the previous ten (10) years.

### Reason Statement:

This proposal prohibits combustion equipment from serving substantial alterations, effectively requiring the majority of buildings undergoing substantial improvements to be all-electric. The definition of substantial improvement comes from the IBC and IEBC. The term generally aligns with vernacular use of "major renovation," which is not defined in code. It is used as a threshold for when certain flood protection requirements are triggered for existing building alterations. As substantial alterations are projects major construction projects with significant scope and (by definition) significant budget relative to building value, they provide a reasonable opportunity to require electrification retrofit of the building.

Like the new construction requirement, the code section includes important exceptions for certain gas loads in buildings that are especially challenging to electrify for technological or market reasons

including: commercial manufacturing/industrial loads, kitchen equipment, make-up air systems where electric alternatives are especially challenging and buildings where the heating system is required by law to be able to run on backup power (primarily healthcare facilities). It also includes an exception for combustion equipment that is less than 10 years old so that recently installed equipment does not need to be replaced substantially ahead of its end of service life.

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## Commercial Gas Pipe Testing for Equipment Replacement

### Code Language:

*Add new definition as follows:*

**FUEL GAS.** A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

*Add sections as follows:*

**C501.8 Fuel gas pipe testing.** All *fuel gas* piping serving new *combustion equipment* shall be tested in accordance with Section 406 of the *International Fuel Gas Code*.

#### **Exceptions:**

1. For the purposes of demonstrating compliance with this section, unexposed pipe joints and welds shall not be required to be exposed for examination during the test.
2. Where it has been demonstrated to the code official that the *fuel gas* piping has met the requirements of this section within the previous five years.
3. Where compliance with this section would require interruption of *fuel gas* supply to *combustion equipment* that serves other tenant spaces or other *dwelling units*, provided all exposed pipe joints of the piping subject to the requirements of this section have been inspected for leaks by means of an *approved* gas detector, a noncorrosive leak detection fluid or other *approved* leak detection method once the equipment has been placed in operation.

### Reason Statement:

Gas piping degrades over time, creating the possibility of natural gas leakage. Even though the natural gas is treated with mercaptan to give it that rotten egg smell, small leaks may go undetected, particularly in buildings where pipes are not exposed and older buildings that are likely to have envelopes that are less tight than newer construction. According to US DOE, building leakage accounts for nearly 27% of the natural gas leakage in the US natural gas distribution system. Leaking natural gas represents a loss in energy, and even small leaks can add up over long periods of time. Additionally, natural gas is also a potent Green House Gas, with over 86 times the global warming potential of CO<sub>2</sub> on a short-term basis.

The installation of new gas equipment provides an ideal time to test gas pipe leakage. Contractors are already on site and the gas will often be partially or fully turned off for the new equipment installation. Additionally, new equipment installation can disturb and inflict additional stresses on existing piping, creating opportunities for the formation of new leaks where existing natural gas piping has weakened but not previously failed.

This provision requires that existing fuel gas piping be tested like a new installation according to the International Fuel Gas Code (IFGC). It includes targeted exceptions for elements of the IFGC testing methodology that is not appropriate for existing buildings. It also includes an exception for piping that has been tested in the last five years to prevent repeated testing. Finally, it includes an exception to ensure that testing requirements don't necessitate other tenants losing service, which could be a

considerable in larger buildings with multiple tenant spaces. In those cases, it only requires visual inspection of the exposed joints with a testing fluid.

Savings will vary based on the level of degradation of the natural gas piping and whether any leaks were detected which will subsequently be eliminated.

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## Commercial Addition Electrification

Code Language:

*Add section as follows:*

**C502.1.1 Combustion equipment.** *Additions shall not be permitted to contain combustion equipment and new equipment installed to serve additions shall not be combustion equipment.*

**Exception:** *The following equipment and load types shall be permitted to utilize fuel gas provided the building complies with Section C406.1.3:*

1. Industrial and manufacturing processes.
2. Commercial Cooking Appliances
3. Make-up air systems where energy recovery ventilation is prohibited by the International Mechanical Code.
4. Where it has been demonstrated to the building official that the building is required by an applicable law or regulation to provide space heating with an emergency power system or a standby power system.

Reason Statement:

This section requires additions to effectively be all-electric by prohibiting them from containing or being served by new combustion equipment additions combustion equipment. This requirement would prohibit the extension of existing systems that utilize combustion equipment to serve the addition.

Like the new construction requirement, the code section includes important exceptions for certain gas loads in buildings that are especially challenging to electrify for technological or market reasons including: commercial manufacturing/industrial loads, kitchen equipment, make-up air systems where electric alternatives are especially challenging and buildings where the heating system is required by law to be able to run on backup power (primarily healthcare facilities).

## Commercial HVAC Control Upgrade

### Code Language:

*Add section as follows:*

**C503.4.1.2 Controls.** New heating and cooling equipment that are part of the alteration shall be provided with controls that comply with Section C403.4.

**Exception:** Systems with direct digital control of individual zones reporting to a central control panel

### Reason Statement:

In many cases, WSEC only requires that new portions of HVAC systems comply with the requirements for new construction. This leaves many unaltered portions of the HVAC system unaffected, including controls (other than DOAS controls). Controls are a vital component of effective and efficient operation of heating and cooling systems and older controls that do not meet current code requirements significantly hamper efficiency in buildings. Obsolete controls also increase the operational costs for building owners and tenants. Codes like WSEC have relied on HVAC controls as a cost-effective means of delivering energy efficiency in buildings, so this is a significant missed opportunity. Equipment replacement is an ideal time to also upgrade controls. Contractors are onsite, operation of the HVAC system is already disrupted, and the cost of controls would generally be a small line-item cost in the project.

This missed opportunity is particularly significant given the adoption of a Building Performance Standards (BPS) in the state of Washington. BPS policies set performance levels for existing buildings. This creates a need for the Olympia energy code to be much more pro-active in tailoring requirements specifically for existing buildings. Building energy retrofits that are implemented as part of alterations, additions and changes in occupancy are far more cost-effective than stand-alone retrofit projects implemented only to meet a BPS. By incorporating reasonable and cost-effective retrofits into typical existing building projects, the Olympia energy code will both provide additional energy, carbon and cost savings to building owners and tenants and help ensure that more building retrofits are undertaken at opportune and cost-effective times.

This proposal requires that thermostatic controls be brought into compliance with current control requirements when equipment is replaced. It includes an exception for systems with complex central control systems where control upgrades would be far more involved. The proposal does not require the installation of new controls, so existing controls that already meet current code requirements would already be in compliance with this new section.

## Heat Pumps for Split System AC Compressors

Code Language:

*Add the following section:*

**C503.4.3.1 Cooling equipment replacements.** Where existing unitary air conditioners and condensing units are replaced, they shall be replaced with heat pumps configured to provide space heating. Existing space heating *combustion equipment* that serves the same cooling zone shall be configured as supplementary heat in accordance with Section C403.4.1.1.

Reason Statement:

Unitary air conditioners are essentially cooling-only heat pumps. AC replacement therefore provides a valuable opportunity to electrify or partially electrify space heating. This section requires that when AC equipment is replaced that it gets replaced with a heat pump that is configured to also provide heating.

It also requires that any existing heating system be reconfigured as supplementary heating. This allows existing heating equipment to remain as a backup heating system, which is particularly important in buildings that are required to have emergency backup power for space heating.

## Commercial Space Heating Electrification

### Code Language:

*Modify exception 7 of Section C503.4.6 as follows:*

**C503.4.6 Addition or replacement of heating appliances.** Where a mechanical heating appliance is added or replaced, the added or replaced appliance shall comply with Section C403.1.4 ~~or with an alternate compliance option in Table C503.4.6.~~

#### **EXCEPTIONS:**

1. Terminal unit equipment including, but not limited to, hydronic VAV boxes, electric resistance VAV boxes, electric duct heaters, water source heat pumps, fan coils, or VRF indoor units that are served by an unaltered central system.
2. Air handling equipment with hydronic coils.
3. Air handling equipment designed for 100 percent outdoor air that is not subject to the requirements in Section C403.3.5 or that qualifies for an exception to Section C403.3.5.
4. Replacement of existing oil-fired boilers.
5. Replacement of existing steam boilers with steam distribution to terminal units and the associated boiler feed equipment.
6. Where compliance with Section C403.1.4 would trigger an unplanned utility electrical service upgrade based on the NEC 220.87 method for determining existing loads.
7. Like-for-like replacement of a single heating appliance is permitted where that appliance is failing, requires immediate replacement, and where no other HVAC work is planned, provided the new heating appliance complies with an alternate compliance option in Table C503.4.6.

### Reason Statement:

The 2021 WSEC prohibits the installation of gas-fired and electric resistance space heating. However, this requirement is effectively limited to new buildings since a broad range of exceptions in Chapter 5 allow for gas-fired and electric resistance equipment installations for most space heating equipment replacements. For example, exception 7 to Section C503.4.6 allows for like-for-like replacements of existing gas-fired provided it is failing, which applies to a large portion of gas furnace replacements.

This proposal limits these exceptions to encourage greater compliance with the heat pump requirements in Section C403.1.4. It removes the alternate compliance options in Table C503.4.6 from Section C503.4.6. As a result, only the exempted equipment types in the exceptions will be able to avoid the heat pump requirements in Section C403.1.4.

The proposal then creates an additional requirement for like-for-like replacements that qualify for exception 7. Like-for-like replacements would be required to comply with one of the options in Table C503.4.6. These generally require higher efficiency equipment than the base code.

The combination of these two modifications limits the exemptions to replacement scenarios where heat pump retrofits are more complex/costly and further encourages heat pump retrofits in those heating system replacements where they are generally more straightforward (such as furnace replacements).

## Commercial SHW Electrification

### Code Language:

*The exception to Section C503.5 shall be modified as follows:*

**EXCEPTION:** The following equipment is not required to comply with Section C404.2.1:

1. Boilers where the equipment being replaced represents 60 percent or more of the input capacity of the service water heating system. Replacement of a single electric resistance or fuel-fired service water heating appliance with a unit that is the same type and has the same or higher efficiency and the same or lower capacity, provided there are no other alterations made to the existing service water heating system size or configuration.
2. Where compliance with Section C404.2.1 would require occupants of Group R or Group I to vacate all or part of the building. Replacement of any of the following water heater appliances:
  - 2.1. ~~Electric water heaters with an input of 12 kW or less.~~
  - 2.2. ~~Gas storage water heaters with an input of 75,000 Btu/h or less.~~
  - 2.3. ~~Gas instantaneous water heaters with an input of 200,000 Btu/h or less and 2 gallons or less of storage.~~
3. ~~Where it has been determined by the code official that existing building constraints including, but not limited to, available floor space or ceiling height, or limitations of the existing structure, or electrical service capacity, make compliance technically infeasible.~~
4. Where compliance with Section C404.2.1 would require an unplanned change to the building electrical service

### Reason Statement:

The 2021 edition of WSEC includes a new provision that requires that 50% of the SHW capacity of a building to be served by heat pumps. However, wide-ranging exceptions in Chapter 5 exempt nearly all SHW equipment replacements from this requirement.

This proposal significantly reduces those exemptions so that many water heater replacements would require the conversion to heat pump water heater models. It removes the exemptions for like-for-like replacements and all small, residential-scale water heaters. In order to maintain exceptions for difficult-to-retrofit water heating equipment, the proposal replaces those exceptions with the following:

- An exception for boiler systems where the replaced boilers represent 60 percent or more of the input capacity of the service water heating system. This will address nearly all central boiler systems.

The use of the 60% threshold will encourage the partial electrification of central gas boiler systems that utilize multiple, smaller ganged boilers. In these systems, a “lead” boiler can often be replaced with a heat pump water heater to provide baseload heating and paired with one or more gas boilers that are well-suited to dealing with peaking loads. In boiler rooms where there is space for the HPWH, the system efficiency is further increased since the HPWH can scavenge waste heat from the remaining boilers. The remaining exemption for technical infeasibility would address where this partial electrification or “hybrid heat” configuration simply won’t work due to space or other technical constraints.

- An exception for Group R and Group I occupancies where a heat pump water heater retrofit would require the occupants to vacate the building. Group R and I occupancies are the

occupancy types where people live. This exception ensures that emergency replacements in these buildings will not have to undergo a heat pump water heater retrofit that would necessitate people leaving their homes or accommodations.

- An exception for any HPWH retrofit that would require a building electrical service upgrade. This is a broadening of the existing technical infeasibility exception for building service upgrades in exception #3 (which has been struck). The exception is being broadened for this particular issue because the exemptions have generally been narrowed, which will increase the number of buildings for which this issue will be a barrier to HPWH replacements.

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## Commercial Service Upgrade

Code Language:

*Add section as follows:*

**C503.7.8 Electrical Service replacement.** Where a *building* electrical service is replaced, the new electrical service shall include additional electrical capacity for the following as applicable:

1. Replacement of *combustion equipment* used for cooking with electric cooking equipment
2. Replacement of *combustion equipment* used for space heating with electric heat pump equipment or reverse-cycle chiller sized for the heating load of the *building* in accordance with C403.3.1 based on the existing *building* features
3. Replacement of *combustion equipment* used for water heating with electric heat pump equipment sized for the service hot water load of the *building*.
4. Addition of electric vehicle charging infrastructure that complies with OMC 16.100.000 ELECTRIC VEHICLE PARKING.

The required capacity of space and water heating equipment shall be reduced by any energy recovery systems serving the heat or space heating equipment in the *building*.

**Exception:** Where it has been demonstrated to the *code official* that compliance with this section would increase the total cost of the electrical service replacement to the *building* owner by more than 25 percent.

Reason Statement:

One substantial obstacle to electrification retrofits in buildings is the need to upgrade the capacity of the building electrical service. These unplanned service upgrades can add substantial costs to an electrification retrofit project. This proposal reduces those obstacles by ensuring that all \*planned\* service replacements are sized for full building electrification. In this way, the building will be ready for a more effective electrification retrofit in the future.