WASHINGTON STATE ENERGY CODE 2021

Major Changes & Impacts for Architects

C403.1.4

Space Heating

Prohibits use of electric resistance and fossil fuel in space heating with limited exceptions.

IMPACT RATINGS

C411

Renewable Energy

Requires on-site renewable energy generation at 0.5 W/sf of gross floor area for all buildings >10,000sf.

IMPACT RATINGS

C404

Heat Pump Domestic Water Heating

Requires air-source heat pumps for domestic hot water (at least 50% of peak load).

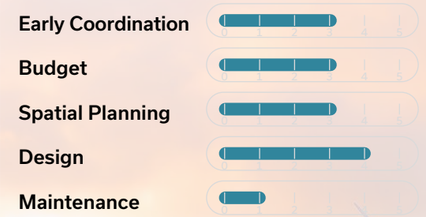
IMPACT RATINGS

C406

Energy Efficiency and Load Management

Overhauled point system. New measures target energy efficiency and load management.

IMPACT RATINGS

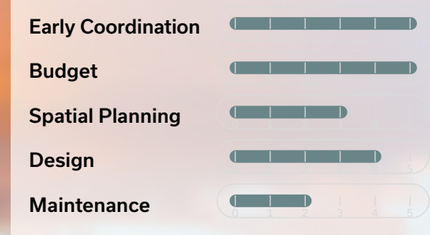


C401.3

Fossil Fuel Compliance Path

Introduces an alternative fossil fuel compliance path with additional efficiency requirements and electrification readiness.

IMPACT RATINGS

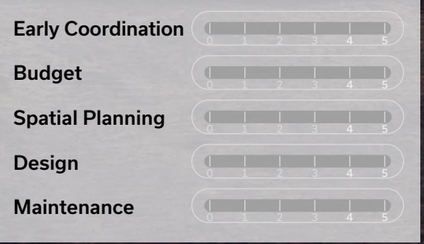


C503.4

Existing Building Mechanical Systems

Changes in space conditioning of existing buildings require electrification with limited exceptions.

IMPACT RATINGS



C407.3

Building Performance

Now requires projects following the Total Building Performance path to meet compliance with two targets: regulated site energy and total site energy.

IMPACT RATINGS

C402.5

Air Leakage

Removes any leniency from air leakage tests that exceed the 0.25cfm/sf target.

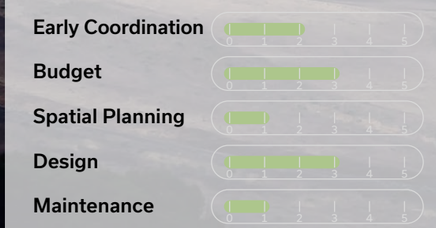
IMPACT RATINGS

C402.4

Glazed Assembly Performance

Decreased U-values for all vertical fenestration and curtainwalls.

IMPACT RATINGS



C405

Exterior Lighting Power Allowances

Reduced exterior lighting power allowances require design teams to verify compliance.

IMPACT RATINGS

APPENDIX + INCENTIVES

C403.1.4

Space Heating

Prohibits use of electric resistance and fossil fuel in space heating with limited exceptions.

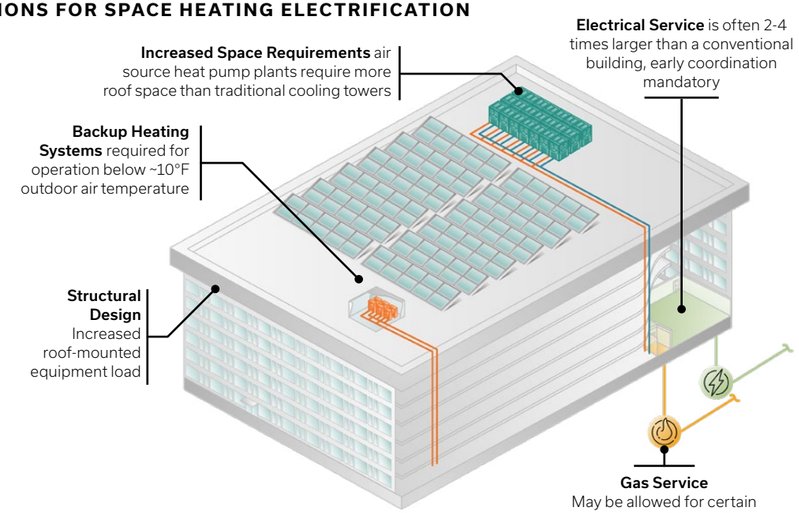
This major change pushes HVAC systems towards high-efficiency, low-temperature hydronic systems using heat pump technology.

POTENTIAL IMPLICATIONS FOR SPACE HEATING ELECTRIFICATION

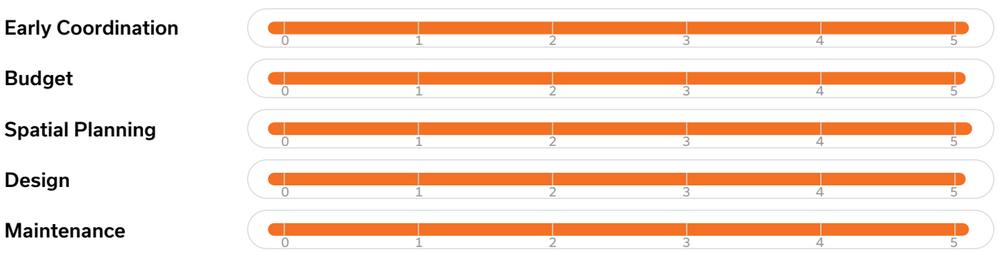
New Technologies
Requires involved owner training and onboarding during startup

Budget Impacts
Potential increased system cost and installation cost, some contractors may lack familiarity with ASHP systems.

Increased Acoustic Mitigation
Outdoor equipment runs year-round and during the evening (unlike traditional boiler/chiller plants)



IMPACT RATINGS



THE FOLLOWING ARE SOME NOTABLE EXCEPTIONS

Electric resistance heating is permitted during heat pump defrost.

Note this exception does not extend to fossil fuel.

Internal electric resistance heaters are permitted as supplemental heating for air-to-air heat pumps when the heating load cannot otherwise be met. Controls and sizing conditions apply.

Electric resistance (in Climate Zone 4 or 5) or fossil fuel (in Climate Zone 5 only) are permitted as supplemental heating for air-to-water heat pumps. Controls and sizing conditions apply.

Fossil fuel for dedicated outside air system energy recovery ventilation auxiliary pre-heating of outside air up to 55°F is permitted under defrost conditions in Climate Zone 5 where buildings do not have hydronic systems. This is permitted with electric resistance for CZ-4 and CZ-5 as well.

You may connect to an existing steam or hot water district energy system even if it uses fossil fuels.

Makeup air for commercial kitchen exhaust is permitted to be heated using electric resistance (in Climate Zone 4 or 5) or fossil fuel (in Climate Zone 5 only).

Electric resistance supplemental heating is also permitted for ground-source heat pumps. Controls and sizing conditions apply.

Essential facilities are excluded. Groups I-2 and I-3 occupancies by regulation are required to have in place redundant emergency backup systems.

ADDITIONAL EXCEPTIONS

- Low heating capacity less than 2.5 Watt/sf may be heated using electric resistance.
- Small systems which provide less than 5% of the total building HVAC or floor area.
- Small buildings less than 2500 square feet may use electric resistance.
- Specific conditions that require fossil fuel or electric resistance approved by code official.
- Freeze protection is permitted to use electric resistance.

DESIGNER NOTES

Current Air Source Heat Pump technology on the market is not capable of operating reliably below about 5°F, which requires projects to provide supplemental heating systems (back-up boilers). New natural refrigerant heat pump technology entering the market promises to eliminate the need for backup heating sources in cold climates.

Rocky Mountain Institute Innovation Center BASALT, CO
ARCHITECT: **ZGF ARCHITECTS** LIVING BUILDING PETAL CERTIFIED, LEED PLATINUM

C411

Renewable Energy

Requires on-site renewable energy generation at 0.5 W/sf of GFA for all buildings greater than 10,000 square feet.

Exceptions are based on limited roof space or extensive shading. Projects qualifying for exceptions to omit renewable installation are required to earn 18 additional points under C406 to compensate, which could have a wide range of implications for the project due to the variety of measures now offered under C406.

Allows for off-site renewables, including community renewable energy and renewable power purchase agreements. Off-site renewables are credited at a reduced rate based on a Renewable Energy Factor determined by their location and procurement method.

DESIGNER NOTES

Washington State has a 100kW net-metering limit. Arrays exceeding 100kW should utilize storage to maximize their renewable energy payback.

IMPACT RATINGS

	0	1	2	3	4	5
Early Coordination						
Budget						
Spatial Planning						
Design						
Maintenance						

Bullitt Center · SEATTLE, WA
ARCHITECT: **MILLER HULL** LIVING BUILDING CERTIFIED, ALL ELECTRIC

C404

Heat Pump Domestic Water Heating

Requires air-source heat pumps for domestic hot water (at least 50% of peak load).

SOME EXCEPTIONS INCLUDE

- Existing district energy including those using fossil fuels
- Small water heaters (electric resistance)
- Point of use water heaters (electric resistance)
- Solar thermal, waste heat recovery, and GSHPs can offset the HPWP
- 24 kW +0.1 W/GSF allowable electric resistance
- Low carbon district energy
- Electric boosters for approved high-temperature applications
- Essential occupancies

IMPACT RATINGS

	0	1	2	3	4	5
Early Coordination						
Budget						
Spatial Planning						
Design						
Maintenance						

C406

Energy Efficiency & Load Management

The point system has been completely overhauled and different occupancy types need to hit different credit thresholds.

This code requires projects to meet a credit threshold for "energy efficiency measures," of which there are 31, and a separate credit threshold for "load management measures," of which there are 7. This means more flexibility, but can also mean more complexity in selection of measures and early estimation of credits — several of which are prorated based on the actual design.

For example, a new commercial Group B construction, the design must meet 42 credits of energy efficiency and 27 credits for load management. Below are measures most likely to require the architect's attention:

ENERGY EFFICIENCY MEASURES

- **Improved low-carbon district energy systems** requires increased coordination
- **Reduced lighting**
- **Lamp efficacy improvement** only applicable to dwelling units
- **Renewable energy**
- **Point-of-use water heater** saves space
- **Enhanced envelope performance**
- **Base reduced air leakage and enhanced reduced air leakage** enhanced code pushes further to 0.0825 cfm/sf

LOAD MANAGEMENT MEASURES

- **All load management measures** require coordination with BMS systems for additional sensors and controls
- **Automated shading load management** requires additional coordination with envelope and glazing
- **Electric energy storage** additional space needs for storage, additional permitting requirements, and fire protection
- **Cooling energy storage** additional space needs for storage
- **Service hot water energy storage** additional space needs for storage
- **Building thermal mass** requires coordination with envelope, BMS, and envelope openings

Washington State Energy Code 2021 Credits

Energy Efficiency | REQUIRES 42 CREDITS

NA Dwelling unit HVAC control	11 Improved HVAC TSPR	3 Improve cooling and fan efficiency	3 Improve heating efficiency	4 Low-carbon district energy system
12 Improved low-carbon district energy system	21 High performance DOAS	2 Fault detection and diagnostics	18 10% reduced lighting power	36 20% reduced lighting power
NA Lamp efficacy improvement	NA Residential lighting control	6 Enhanced lighting control	13 Renewable Energy	NA Shower Drain Heat Recovery
13 Service Water Heat Recovery	17 Heat pump water heating	4 Heat trace system	19 Point-of-use water heater	NA SHW distribution right sizing
4 High performance SHW temp maintenance	2 High efficiency SHW circulation system	NA Low-flow residential showerheads	13 Enhanced envelope performance	6 Base reduced air infiltration
11 Enhanced reduced air infiltration	18 Enhanced commercial kitchen equipment	NA Enhanced residential kitchen equipment	NA Enhanced residential laundry equipment	5 Efficient elevator equipment

Load Management | REQUIRES 27 CREDITS

27 Lighting load management	42 HVAC load management	12 Automated shading
126 Electric energy storage	14 Cooling energy storage	59 Service hot water energy storage
50 Building thermal mass		

NOTE: LOAD MANAGEMENT CREDITS ARE NOT REQUIRED FOR TI PROJECTS

LEGEND

- Shell + Core
- Shell + Core and TI

POPULAR CREDITS

- Shell + Core
- Shell + Core and TI

NOTE: ABOVE IS FOR B OCCUPANCY. CREDIT REQUIREMENTS VARY BY OCCUPANCY.

Credit Requirements by Occupancy

OCCUPANCY GROUPS	R-1	R-2	B	E	M	Other
New Building Energy Efficiency	54	41	42	48	74	49
Building Additions Energy Efficiency	27	20	21	23	36	21
New Building Load Management	12	15	27	15	13	26

C401.3

Fossil Fuel Compliance Path

To mitigate legal risk of the code following the Berkeley case ruling, the Code Council introduced an alternative prescriptive fossil fuel compliance path with stringent additional efficiency requirements and electrification readiness.

To comply with fossil fuel space or service water heating, projects will need to obtain additional C406 credits. C407 Total Building Performance is not available when opting for the fossil fuel compliance path..

Additional efficiency requirements aim to normalize the energy efficiency between an all-electric building and one using fossil-fuel based heat sources. Required additional credits may be prorated based on the installed capacity of fossil fuel equipment as a ratio to total capacity, offering increased flexibility.

To support electrification of the building in the future, C401.3.6 requires electrification readiness. Projects using the fossil fuel compliance path are required to:

1. Provide space electrical branch circuit conduit sized to support future heat pump heating
2. Provide spare electrical service entrance conduits for future main electrical service upgrade to support electrified heating
3. Provide adequate space to accommodate electrical service upgrade
4. Plan for transformers and other equipment necessary for service upgrade on site, including vaults and associated cooling

IMPACT RATINGS

Early Coordination
Budget
Spatial Planning
Design
Maintenance

Fossil Fuel Compliance Path Additional C406 Credits

OCCUPANCY GROUPS	R-1	R-2	B	E	M	OTHER
Baseline Credits	54	41	42	48	74	49
Fossil Fuel Space Heating Additional Credits	+7	+24	+101	+38	+111	+56
Fossil Fuel Service Water Heating Additional Credits	+198	+212	+27	+17	+79	+107

OHSU Knight Cancer Research Building PORTLAND, OR
ARCHITECT. **SRG PARTNERSHIP**

C503.4

Existing Building Mechanical Systems

Addition or replacement of central HVAC or Water Heating must comply with new all-electric heating requirements. Permissible to use the alternate fossil fuel compliance path, or the building performance pathway for compliance.

NOTABLE EXCEPTIONS

- Like-for-like singular piece of heating equipment in an existing system at end of life
- Where mechanical cooling is not added to an existing system
- Replacement of existing oil-fired and steam boilers
- Where compliance would trigger an unplanned electrical service upgrade
- Alternate fossil fuel compliance options (C503.4.6) require min efficiency + 5%
- AHJ can decide if impractical due to existing constraints, such as mechanical space, existing structure
- Does not require replacement of existing ductwork, but may require replacement of hydronic piping due to low temperature hydronics

DESIGNER NOTES

Early coordination with the AHJ will be crucial to understand how they will interpret your project conditions, and if your scope will trigger an HVAC electrification upgrade.

IMPACT RATINGS

Early Coordination
Budget
Spatial Planning
Design
Maintenance

C407.3

Total Building Performance

Factors are updated, and the section now requires projects following the performance based compliance path to meet compliance with two targets (as opposed to the one emissions target previously required).

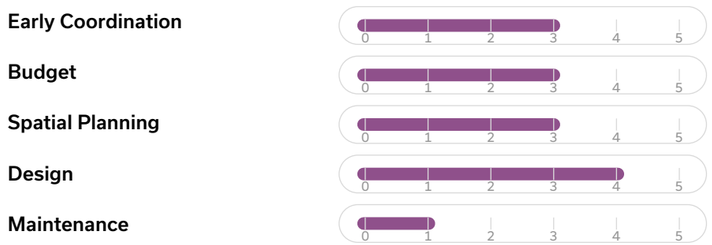
— **A regulated site energy target** excludes contributions from renewables and unregulated load savings.

— **A total site energy target** includes contributions from renewables and improvements in unregulated loads.

DESIGNER NOTES

Emissions targets were removed from code language as a legal risk mitigation measure following the outcome of the Berkeley case.

IMPACT RATINGS



Wanapum Heritage Center MATTAWA, WA
ARCHITECT: **MITHUN**

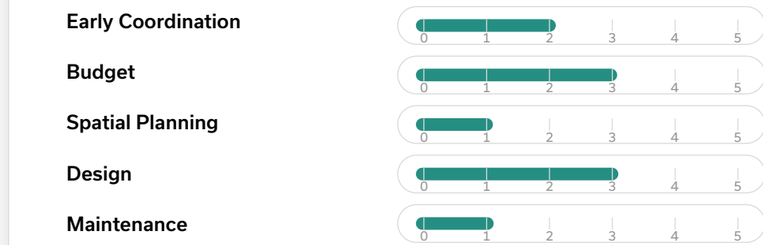
C402.5

Air Leakage

Removes any leniency from air leakage tests that exceed the 0.25cfm/sf target.

Previously there was some leniency in requiring a project to hit 0.25cfm/sf. Tests reporting 0.40 cfm/sf were permitted provided subsequent detection, repairs, and documentation were conducted. The new language requires not only that leaks are detected and repaired but that repairs and subsequent testing are conducted until the envelope meets 0.25cfm/sf or lower. This will make the development of details in the envelope with the contractor more important to limit the time and money spent on repairing leaks and testing.

IMPACT RATINGS



C402.4

Glazed Assembly Performance

Decreased U-values for all vertical fenestration and curtainwalls by about 10%.

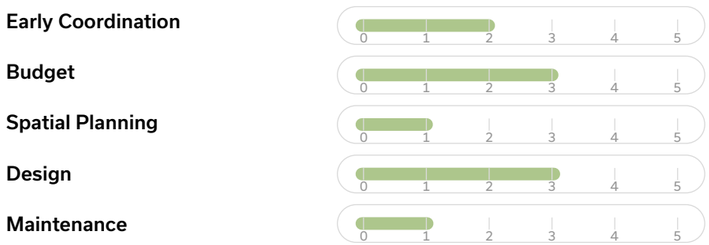
Increased performance requirements for glazed assemblies:

- **Curtainwall, site-build, and AW:**
  - Fixed: U-0.38 → U-0.34
  - Operable: U-0.40 → U-0.36
- **All others:**
  - Fixed: U-0.30 → U-0.26
  - Operable: U-0.30 → U-0.28

Tighter performance criteria pushes selections towards high-end double glazed (aluminum), low-end triple glazed (aluminum), and double-glazed fiberglass.

Projects may choose to follow the Component Performance Alternative compliance path (based on total proposed vs allowable UA) and make up for lower-performing windows with higher performing walls, roofs, etc. Few changes have been made to performance requirements of opaque assemblies. Coordination of elements within the envelope will be needed if following this path.

IMPACT RATINGS



Bush School, Upper School SEATTLE, WA
ARCHITECT: **MITHUN** PASSIVE HOUSE, LEED ZERO ENERGY

C405

Exterior Lighting

Code has reduced power allowances for exterior lighting.

Base site allowance is reduced by 20%-55% from 2018 depending on the zone. Similar reductions are applied to individual exterior spaces. While the reductions are significant and require acknowledgment, existing lighting technologies are capable of meeting these thresholds.

Designers should verify compliance with reduced allowances.

IMPACT RATINGS

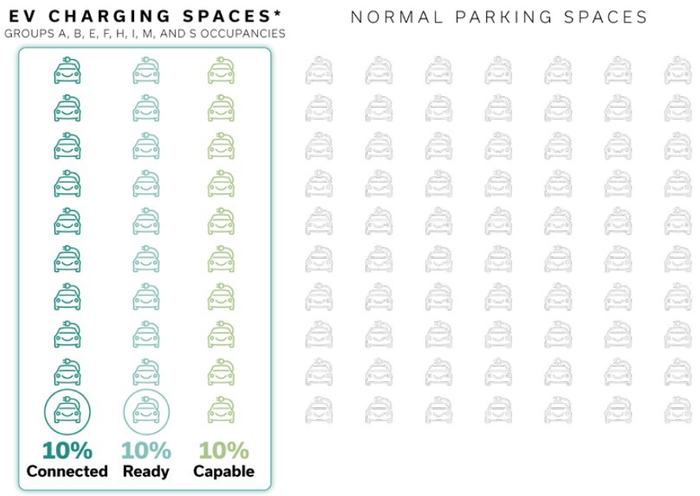
APPENDIX

Additional Notable Changes

- **Commissioning:** Thresholds for required commissioning have been lowered.
- **Domestic Hot Supply and Return piping insulation is required to be 1" thicker than the listed code insulation table thicknesses.** Increased insulation thickness will impact plumbing chase sizes at fixtures.
- **Mechanical penetrations:** for UA envelope calculations, must use U-0.50 for mechanical penetrations.
- **Fan power allowances reduced.**
- **DOAS effectiveness increased.**
- **Demand Response thermostats required.**
- **Demand Control ventilation required** even with energy recovery.
- **Hydronic coil temperature limitations.**
- **District Energy:** New definitions for low-carbon district heating/cooling and how to energy model.
- **Kitchen DCV:** Clarifies definition of demand control kitchen ventilation; demand control required on hoods greater than 2,000 CFM.
- **Pressure Independent Control Valves:** Modulating PICVs required on coils greater than 5 GPM.
- **HVAC Total System Performance Ratio (TSPR):** proposed system TSPR must be greater than or equal to the baseline system TSPR and meet all other prescriptive code requirements. Is required for most libraries, office, educational, retail occupancies, and now, multifamily. Procedure has been clarified.
- **Increased Ventilation:** New exception allows up to 200% of minimum outdoor air required if using 80% effective ERV.
- **Boiler Controls**: Regulates combustion air controls.
- **High Capacity Boiler:** Requires condensing boilers.
- **Hydronic System Max Flow:** Limits flow rates.
- **Demand Response Water Heaters:** Demand response for 40-120 gallons.
- **Storage Tank Insulation:** Increased insulation if over 130°F.
- **Electrical Receptacles:** Required for gas appliances in residential units.
- **Uninterruptible Power Supplies:** Meet ENERGY STAR.
- **Compressed Air Systems:** New requirements.

Washington Administrative Code WAC 51-50-0429 addresses mandatory EV charging infrastructure requirements.

- **Groups A, B, E, F, H, I, M, and S** would require 10% EV stations installed day-one, 10% EV-ready (branch circuit at location), 10% EV-capable (raceway for future circuit), plus an additional 10% EV and 10% EV-ready requirement of the accessible parking spaces.
- **Group R Occupancies:**
  - **Buildings that do not contain more than two dwelling units:** Must have 1 EV-Ready Space for each dwelling unit.
  - **Dwelling units with private garages:** Must have 1 EV-Ready Space for each dwelling unit.
  - **All other Group R Occupancies:** 10% of parking spaces must have charging stations, 25% must be EV Ready, and 10% must be EV Capable



ADA Accessible Parking Spaces: Maximum 10% of accessible parking spaces, rounded to the next whole number, must be EV charging stations, plus 10% rounded to the next whole number must be EV Ready. Minimum one EV charging station and one EV Ready. The EV charging infrastructure may also serve adjacent parking spaces not designated for accessible parking.

POTENTIAL INCENTIVES

HOME

Inflation Reduction Act

Most provisions of the Inflation Reduction Act of 2022 became effective 1/1/2023. The Inflation Reduction Act incentives reduce renewable energy costs for organizations like Green Power Partners – businesses, nonprofits, educational institutions, and state, local, and tribal organizations.

Washington State Energy Revolving Loan Fund

Through the Clean Energy Fund, Commerce provides grants to non-profit lenders who connect small businesses, non-profits, multi-family building owners, and homeowners with low-cost financing for clean energy projects. Grants provided through this program provide revolving loan funds that help to reduce risk and provide inexpensive capital for underserved markets to deploy clean energy projects.

Energy Efficient Commercial Buildings Tax Deduction

Building owners who construct energy efficient buildings or increase the energy efficiency of existing buildings by at least 25% may be able to claim a tax deduction.

Fannie Mae Green Financing

Fannie Mae provides lower interest rates, additional loan proceeds, and a free Energy and Water Audit Report when building achieve Green and Healthy Building certifications.

HOW TO FIND MORE INCENTIVES

DSIRE

DSIRE is a database of state and federal incentives for renewables and efficiency. Enter your project's zip code to find relevant incentives and policies.

USDA Rural Energy for America Program

REAP

Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements.

PAE

A world with clean air, energy, and water for all.

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