# The Big Chill

## SEATTLE BUILDING ENCLOSURE COUNCIL

HYDROFLUOROCARBON LEGISLATION FOR WASHINGTON
4/16/2020

ABBEY BROWN – WASHINGTON STATE DEPT OF ECOLOGY
PAUL LEWANDOWSKI – OWENS-CORNING
DAN WHITMORE & ARI ANDERSON – RDH BUILDING SCIENCE

# Panelist: Paul Lewandowski

- → Director of Regulatory Law at Owens Corning, 20 years
- → Practicing environmental lawyer for 29 years
- → Environmental Science background
  - › Georgetown University, J.D. – 1992
  - › Univ. of Maryland, MA Public Health – 1981
  - › Univ. of Michigan, BS Biology - 1978

# Panelist: Abbey Brown

- → Greenhouse Gas Reduction Specialist,
  - – Climate Policy Section, WA Department of Ecology
- → Formerly worked for:
  - › Environmental Defense Fund
  - › NYC Mayor's Office of Sustainability,
  - › World Resources Institute
- → 10 years of environmental policy experience
  - › Bard College, B.A. Political Science – 2011
  - › The Middlebury Institute of International Studies, M.A. International Environmental Policy – 2019

# Seattle Building Enclosure Council

# HB -1112/SB -5426:

- → Signed May 7th into Law
- → Regulates emissions from Hydrofluorocarbons
- → By Jan. 1, 2020 — prohibits HFCs in specific applications, such as propellants, rigid polyurethane and spray foam applications, and supermarket refrigeration systems

# Hydrofluorocarbons and Global Warming

- → Replaced HCFCs which were phased out in response to the Montreal Protocol
- → 1000 times more global warming potential than CO2
- → Kigali Accord, officials from 170 countries met to amend the Montreal protocol to phase out HFCs
- → Scientists estimate that the phasing out of HFC could prevent nearly ***½˚C of warming***
- → In WA, HFCs account for an estimated 4% of all GHG emissions


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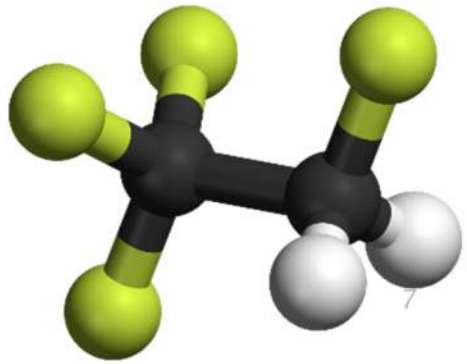
# Hydrofluorocarbons and Global Warming

Project Drawdown ranks HFC Management as #1 impact for GHG reduction. **89.74 GT**

| | Total Atmospheric CO2-EQ Reduction |
|---|---|
| #2 Wind Turbines | 84.6 GT |
| #8 Solar Farms | 36.9 GT |
| #10 Rooftop Solar | 24.6 GT |
| #26 Electric Vehicles | 10.8 GT |
| #31 Insulation | 8.27 GT |
| #79 Net Zero Buildings | N/A |



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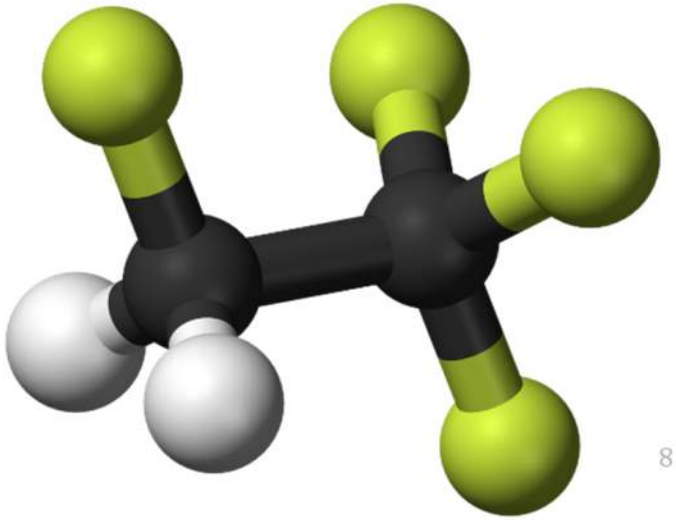
# National and International Legislation

- → EU: In 2006 F-Gas Regulation adopted to reduce HFC's
- → SNAP (Significant New Alternatives Policy) Standards from 2015 Passed by California, New York, many other states, and WA
- → Canada is phasing out HFC's - beginning Jan 1st 2021
- → Bi-Partisan legislation at the nation level is being proposed: HR 5544 and S. 2754 w/ 32 co-sponsors. (Dispute of HFC derailed Senate Bill S. 2657 earlier in March)

http://dynatempintl.com/an-update-on-the-state-by-state-hfc-phase-down/

https://www.politico.com/newsletters/morning-energy/2020/03/25/



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DEPARTMENT OF ECOLOGY
State of Washington

**Abbey Brown**
*Greenhouse Gas Reduction Specialist*
abbey.brown@ecy.wa.gov

April 16, 2020

**The Department of Ecology adopted a rule in 2019 to transition away from using hydrofluorocarbons (HFCs) in products and equipment starting Jan. 1, 2020.**

## Why is this new law important?

Hydrofluorocarbons, or HFCs, are greenhouse gases that are thousands of times more powerful than carbon dioxide. It makes sense to stop using them when there are alternatives available that are safer for the environment.

## Who does the law apply to?

The law applies to manufacturers, importers, and distributors of products that contain restricted HFCs.

# Deadlines for manufacturers

**The restrictions go into effect at different times for each product category:**

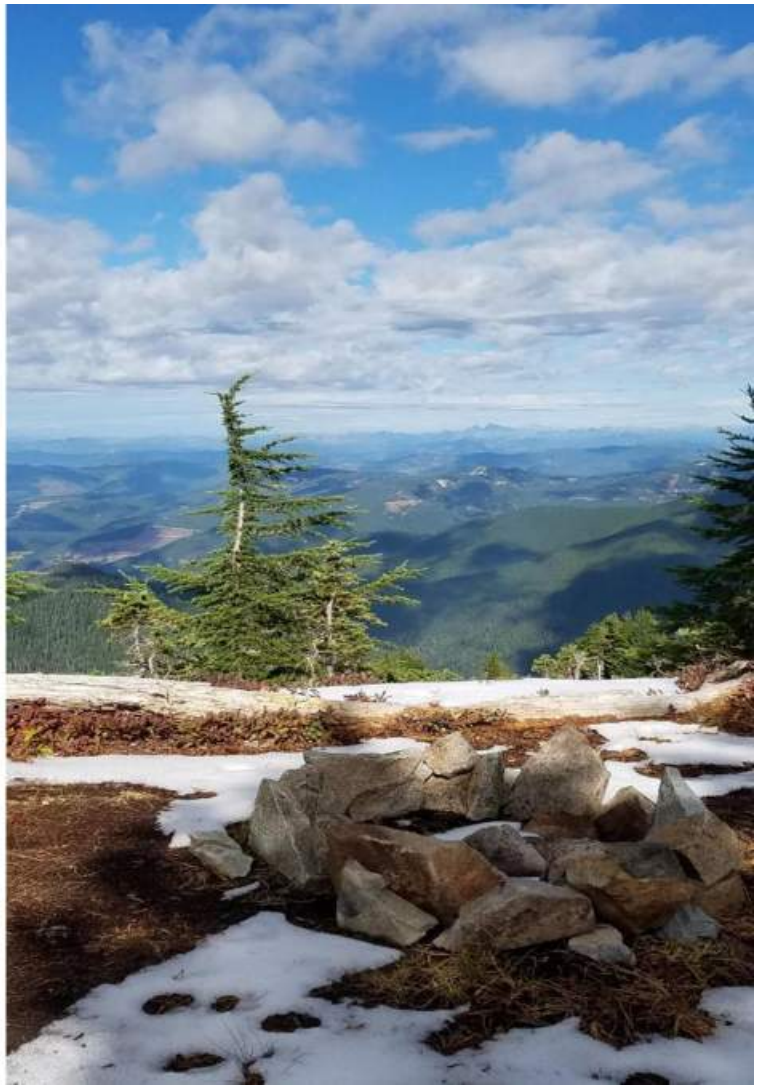
Jan. 1, 2020 — propellants, rigid polyurethane, spray insulating foam, and new supermarket refrigeration systems

Jan. 1, 2021 — new refrigerated food processing and dispensing equipment, and compact residential refrigerators

Jan. 1, 2022 — new residential refrigerators, and new and existing vending machines

Jan. 1, 2023 — new uses in cold-storage warehouses and built-in residential refrigerators

Jan. 1, 2024 — new uses in centrifugal and positive displacement industrial chillers



# HFC Legislation & U.S. Climate Alliance States

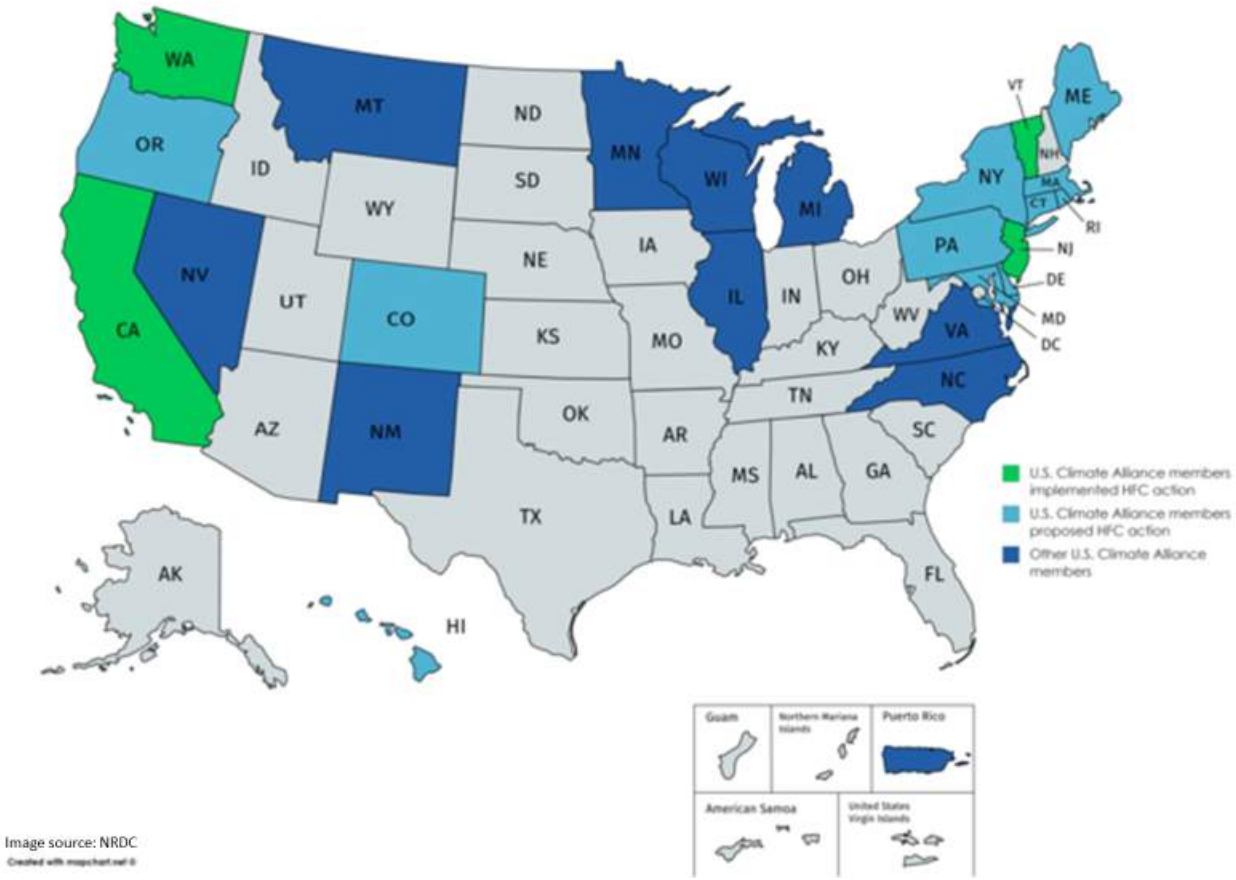



Image source: NRDC

# How will this effect our buildings?

# Building Industry Steps

## Regulation of Refrigerants


Image Source: California Air Resources Board

https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

# Building Industry Steps

## Refrigerants

→ Used in heating, cooling, refrigeration, etc. equipment for Mechanically moving energy

→ Main ones (R-22, R-410a and R-134a) being phased out due to high Global Warming Potential

→ New ones in use and development

→ Can be captured and recycled or incinerated, but only ~10% compliance

→ Global Warming Potential
  → GWP
  → $CO^2$ = 1 GWP (baseline)

| Refrigerant | GWP |
|---|---|
| $CO^2$ | 1 |
| Methane (Natural Gas) | 28-36 |
| R-22 | 1810 |
| R-410a | 1610 |
| R-134a | 1430 |
| R-744 | 1 |

https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

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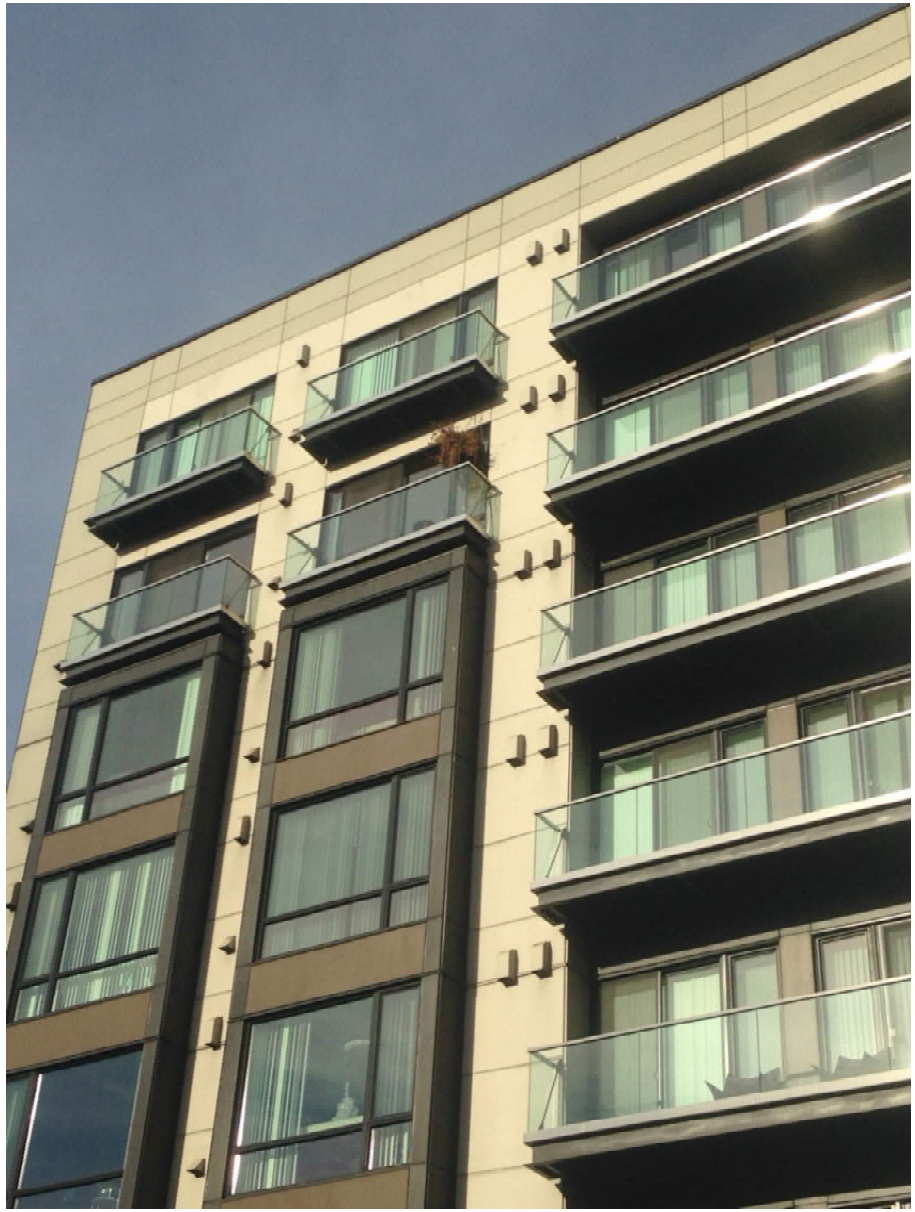
# Building Industry Steps

Refrigerants

→ SeaBEC contribution

→ Make the enclosure work better: reduce heating and cooling needs

→ Fewer refrigerants required



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# Building Industry Steps

Regulation of Blowing Agents

→ Primarily in 'foam' products

→ Rigid board stock

› Polystyrene

– Extruded: XPS (current)

– Expanded: EPS

› Polyisocyanurate: Poly-Iso

→ Applied in place

› Polyurethane

– Spray

– Pour

| Chemical | GWP |
|---|---|
| CFC-12 | 10,900 |
| CFC-11 | 4,750 |
| HFC-227ea | 3,220 |
| HCFC-142b | 2,310 |
| HCFC-22 | 1,810 |
| HFC-134a | 1,430 |
| HFC-245fa | 1,030 |
| HFC-365mfc | 794 |
| HCFC-141b | 725 |
| HFC-152a | 124 |
| Cyclopentane | <25 |
| n-Pentane | <25 |
| Methyl Formate | <25 |
| Methylal | <25 |
| Other HFOs | <25 |
| HFO-1234ze | 6 |
| Isobutane | 3 |
| Di-methyl Ether | 1 |
| $CO_2$ | 1 |

# Building Industry Steps

→ More is not always better

## Insulation and Blowing Agents

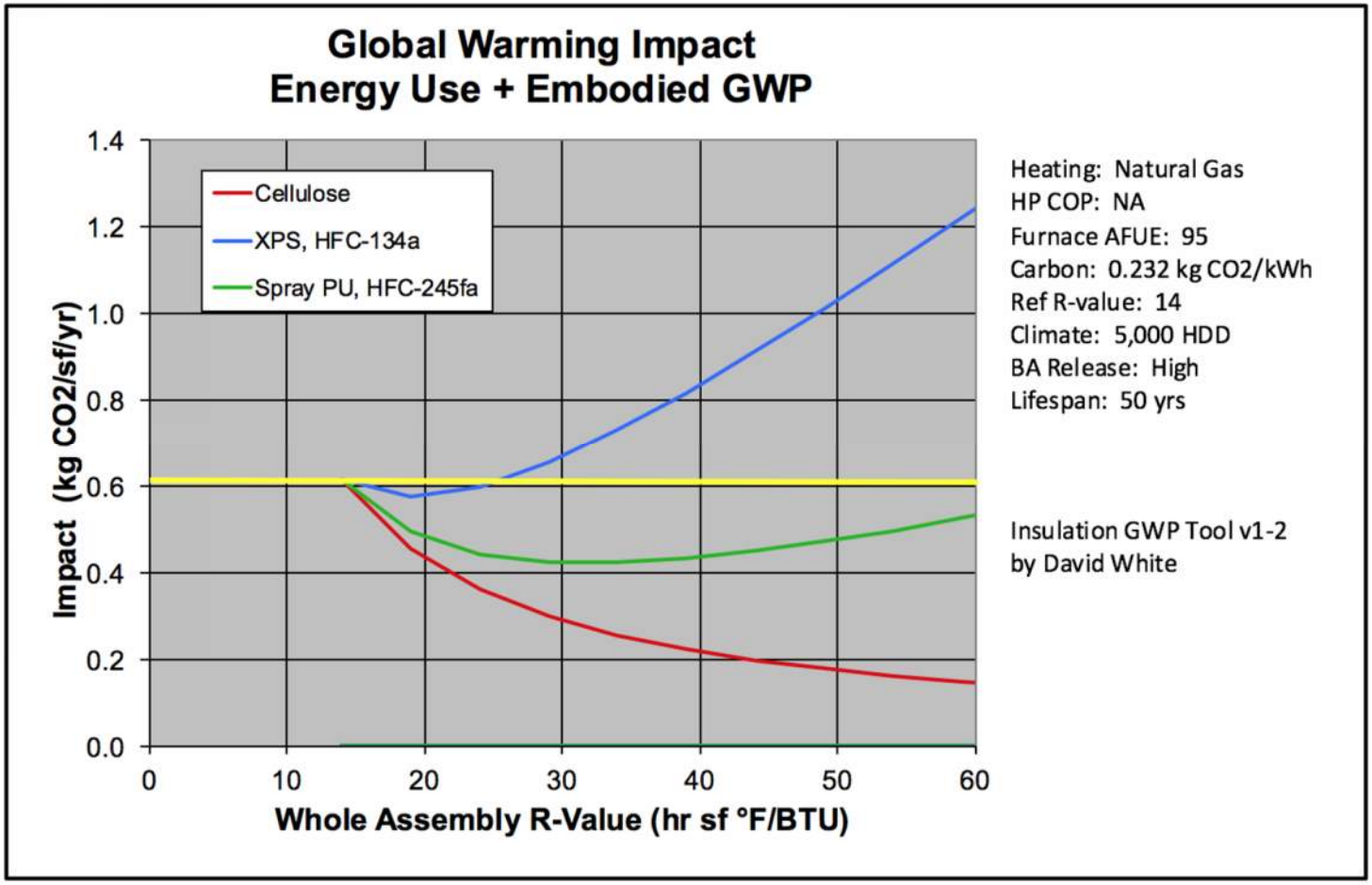


Image Source: Energy Vanguard and David White

# XPS: Extruded Polystyrene

<u>High performance choice for</u>

→ Exposure to bulk water

→ Esp. hydrostatic pressure

→ Manufacturers

→ Dow/Dupont

→ Owens-Corning

→ Kingspan

→ Is There a substitute to HFC-based products?

Image Source: RDH

# EPS: Expanded Polystyrene

Choice for

→ Low *GWP*

→ Exposure to bulk water

→ Geofoam/structural

→ Concerns with exposure to elevated hydrostatic pressures

Image Source: WA State Dept. of Transportation

# Polyurethane Spray Foam

<u>High performance choice for</u>

→ Moisture control

  → At certain densities

→ Air control

→ Complicated installations

→ R per inch (R-5.5 to 7)

→ Concerns?

  → Many

  → This is a manufacturing process

# Polyurethane Spray Foam

AKA "Two Part Foam"

→ Many manufacturers for whole end product

→ Limited manufacturers for blowing agents

→ Few options for compliant blowing agents

› Honeywell Solstice

› Chemours Opteon 1100

→ "Generation 4" products are on the market

→ *This is a manufacturing process*

# CANADIAN HFO Medium Density Closed Cell Foam

| Properties | Test Method | Insulthane EXTREME | Walltite CM01 | NexSeal 2.0 | Sopra Spf 202 | Heatlok Soya HFO | ProSeal HFO T2 |
|---|---|---|---|---|---|---|---|
| Trade Name | | Insulthane EXTREME | Walltite CM01 | NexSeal 2.0 | Sopra Spf 202 | Heatlok Soya HFO | ProSeal HFO T2 |
| Foam Color | | Burnt Sienna | Purple | Army Green | Grey | Blue | Platinum |
| CCMC# | | 13697-L | 14100-L | 14087-L | 14141-L | 14078-L | 14139-L |
| Manufacturer | | Elastochem | BASF | SES | Soprema | Demilec | Icynene |
| Foam Type | LTTR | TYPE 2 | TYPE 1 | TYPE 1 | TYPE 2 | TYPE 1 | No Data Sheet Available |
| LTTR RSI (50mm) | CAN/ULC S 770 | 2.10 | 1.82 | 1.87 | 2.10 | 1.88 | |
| LTTR R-Value/inch | CAN/ULC S 770 | 6.1 | 5.3 | 5.4 | 6.1 | 5.4 | |
| Compressive Strength | ASTM- D-1621 | 26 psi<br>180 kPa | 34.2 psi<br>236kpa | 32.0 psi<br>223kpa | 26 psi<br>180 kPa | 24.8 psi<br>180 kPa | |
| Core Density | ASTM-D1622 | 1.98 lb/ft$^3$<br>30kg/m$^3$ | 1.85 lb/ft$^3$<br>29.6kg/m$^3$ | 2.17 lb/ft$^3$<br>35kg/m$^3$ | 1.98 lb/ft$^3$<br>30kg/m$^3$ | 2.10 lb/ft$^3$<br>33.7kg/m$^3$ | |
| Open Cell % | ASTM-D-6226 | <3% | 5.60% | 4.17% | <3% | 0% | |
| Tensile | ASTM-D-1623 | 279 kPa | 313 kPa | 221 kPa | 279 kPa | 401 kPa | |
| Water vapour permeance | ASTM-E-96 Core sample @ 50mm | 23<br>ng/Pa.s.m$^2$ | 56.3<br>ng/Pa.s.m$^2$ | 38<br>ng/Pa.s.m$^2$ | 23<br>ng/Pa.s.m$^2$ | 51<br>ng/Pa.s.m$^2$ | |
| Dimensional stability | ASTM-D-2126 @ 70C & 97% RH | -9.6% | 7.0% | 9.2% | -9.6% | 9.4% | |
| Flame Spread | CAN/ULC S-127 | 255 FS | <500 FS | 246 FS | 255 FS | 245 FS | |
| Smoke | CAN/ULC S-103 | 130 SD | <500 SD | <500 SD | 130 SD | <500 SD | |
| Fungi Resistance | ASTM-C-1338 | PASS | PASS | PASS | PASS | PASS | |
| Water Absorption | ASTM-D-2842 | 0.50% | 0.58% | 0.50% | 0.50% | 0.64% | |
| Certification organization | QAP Provider | UFC | CALIBER | UFC | B.P. | CALIBER | |
| Time to occupancy | Hours | 24 | 24 | 24 | 24 | 24 | |
| GreenGuard | Indoor Air Qual. | Gold | Gold | - | Gold | Gold | |
| Recycled Content | Side A+B | 24% | >5% | ?? | 24% | 18% | |
| Global Warming Potential | | 1 | 1 | 1 | 1 | 1 | |

Best Performing
Worst Performing

Good through 2021

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Chart provided by Elastochem

# Building Industry Steps

Blowing Agents

→ SeaBEC contribution

→ Make the enclosure work better: appropriate use, placement and amount of insulation

→ Correct installation of these precious materials

→ Supporting materials with lower GWP

Image Source: RDH

# Further Resources

→ SNAP (Significant New Alternatives Policy) : https://www.epa.gov/snap

→ HFC Prohibitions in California (likely to be very similar in WA) https://ww2.arb.ca.gov/resources/fact-sheets/hydrofluorocarbon-hfc-prohibitions-california

→ Alex Wilson webinar on insulation products (from 2011 but mostly still relevant) https://www.youtube.com/watch?v=vIrBIDO5boE

→ Canadian regulation http://www.gazette.gc.ca/rp-pr/p2/2017/2017-10-18/html/sor-dors216-eng.html

→ David White's Insulation Global Warming Potential Calculator https://www.rightenvironments.com/downloads

# Further Resources: Spray Foam

→ Low GWP Blowing Agents

  → https://www.opteon.com/en/products/foam-blowing/1100

  → https://www.fluorineproducts-honeywell.com/blowingagents/product/solstice-liquid-blowing-agent/

→ Quality Control: https://www.buildingscience.com/sites/default/files/staying_out_of_trouble_with_spf_with_bonus_material_henri_fennell_terry_brennan.pdf

# Discussion + Questions

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