Presented to:

HPSC Contractor Forum

CSA F280 Readiness & A2L Refrigerants

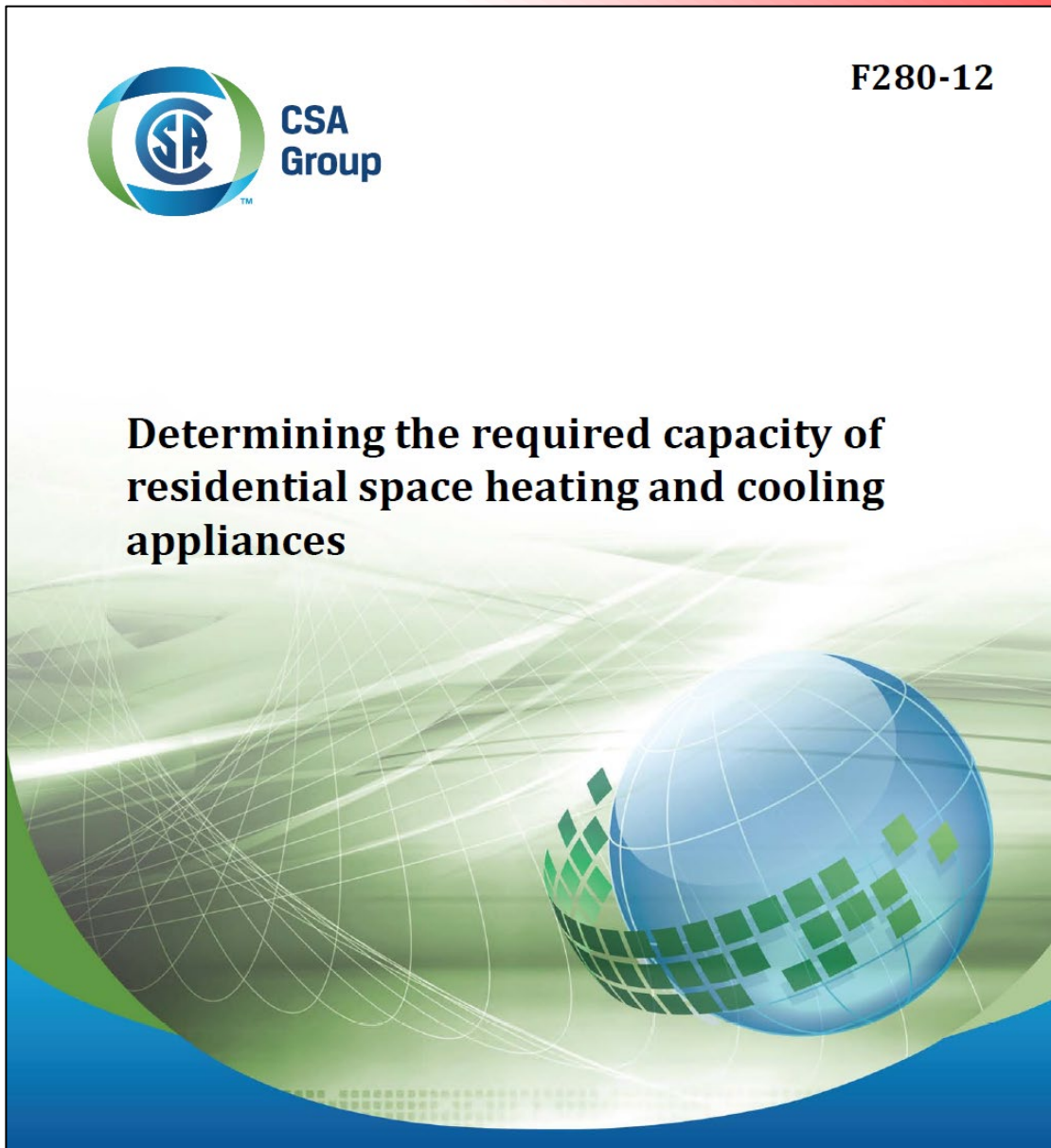
Presented by:

Todd Backus, P.Eng.

April 29th, 2025

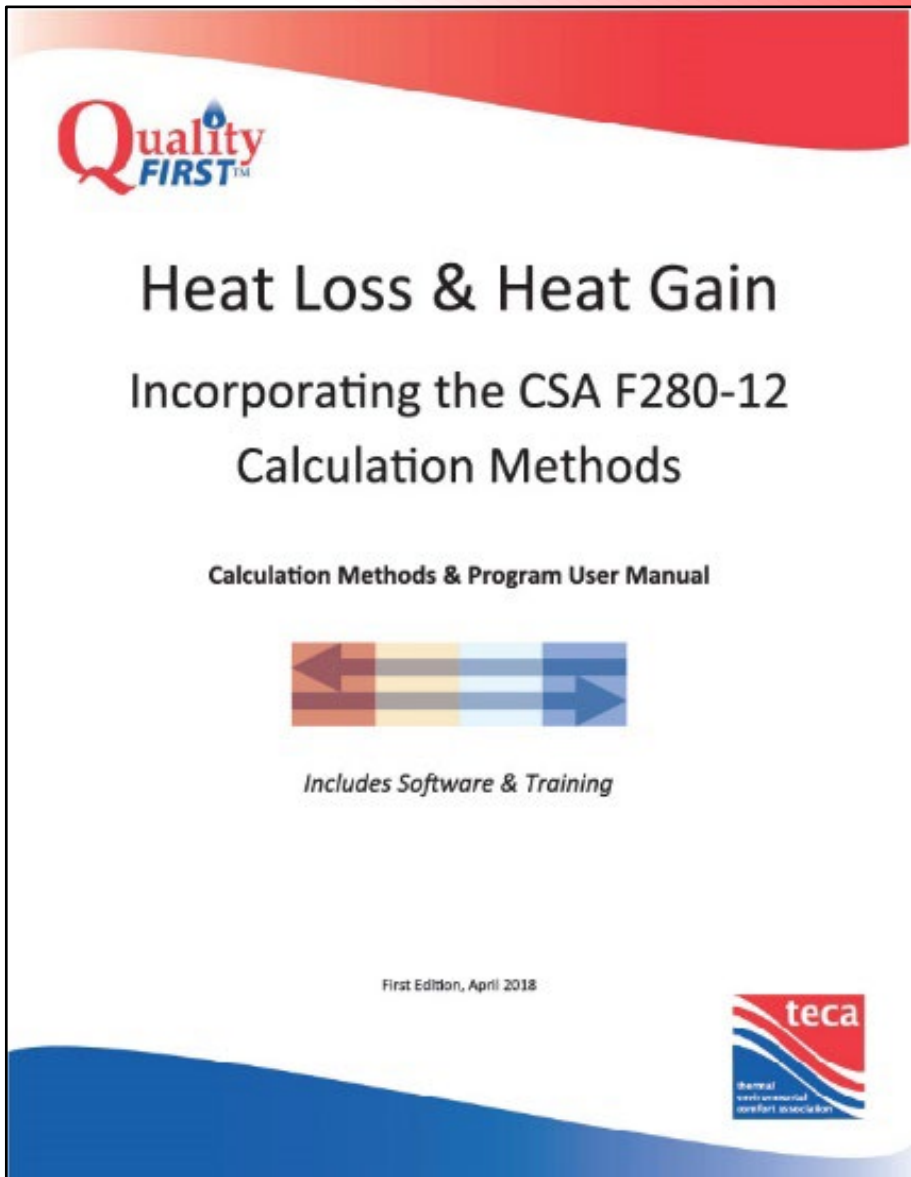
AGENDA

1. Introduction
2. CSA F280-12 Standard
3. Certified Calculators
4. BCBC & NBC Requirements
5. A2L Refrigerants
6. A2L Properties & Flammability
7. Relevant Standards
8. Q & A



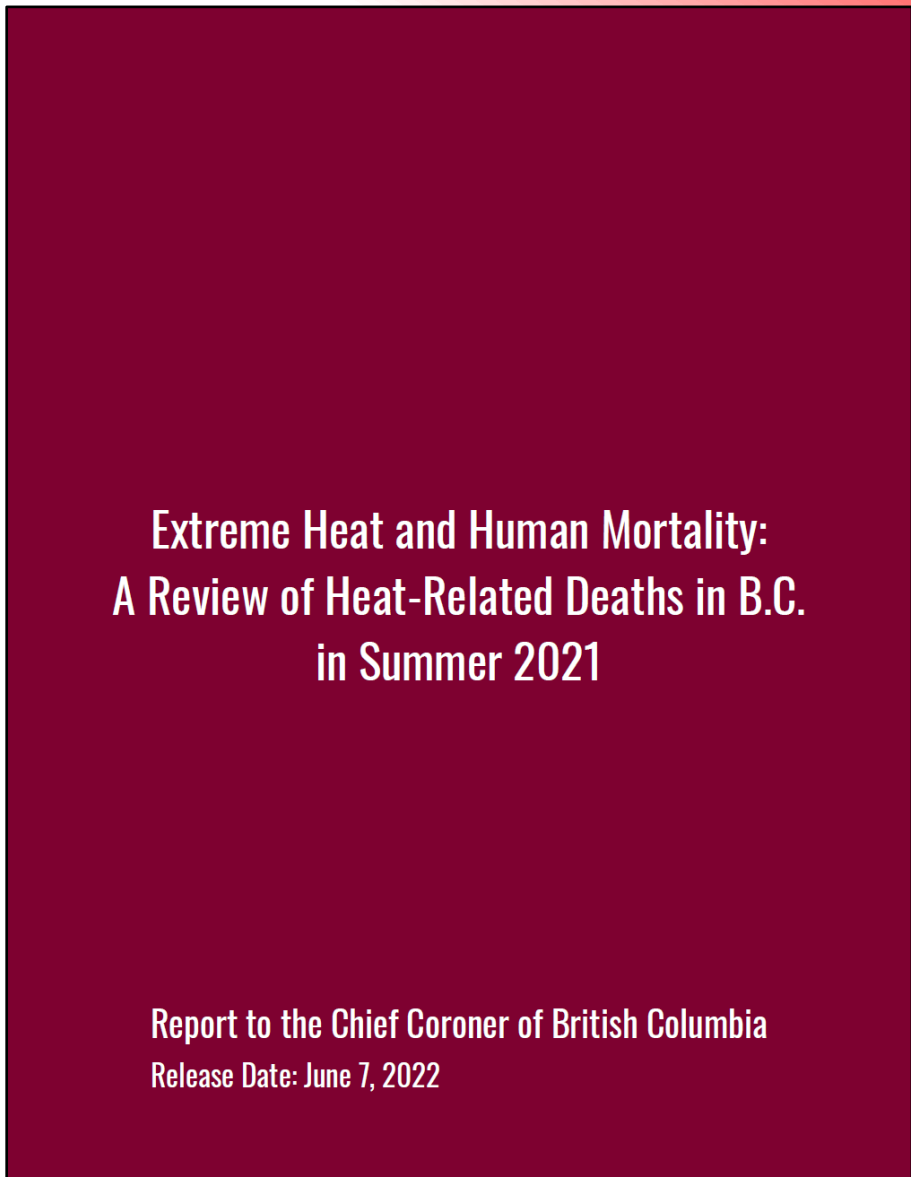
ABOUT TECA

- Non-Profit Trade Association
- Our Mission:
  - Further Education in the HVAC Industry
  - Develop & Provide Training in the HVAC Industry
  - Practical Training for Trades People & Inspectors
  - Advocate for the HVAC Trades to Government
  - Advise Regulators & Building Officials on Best Practices



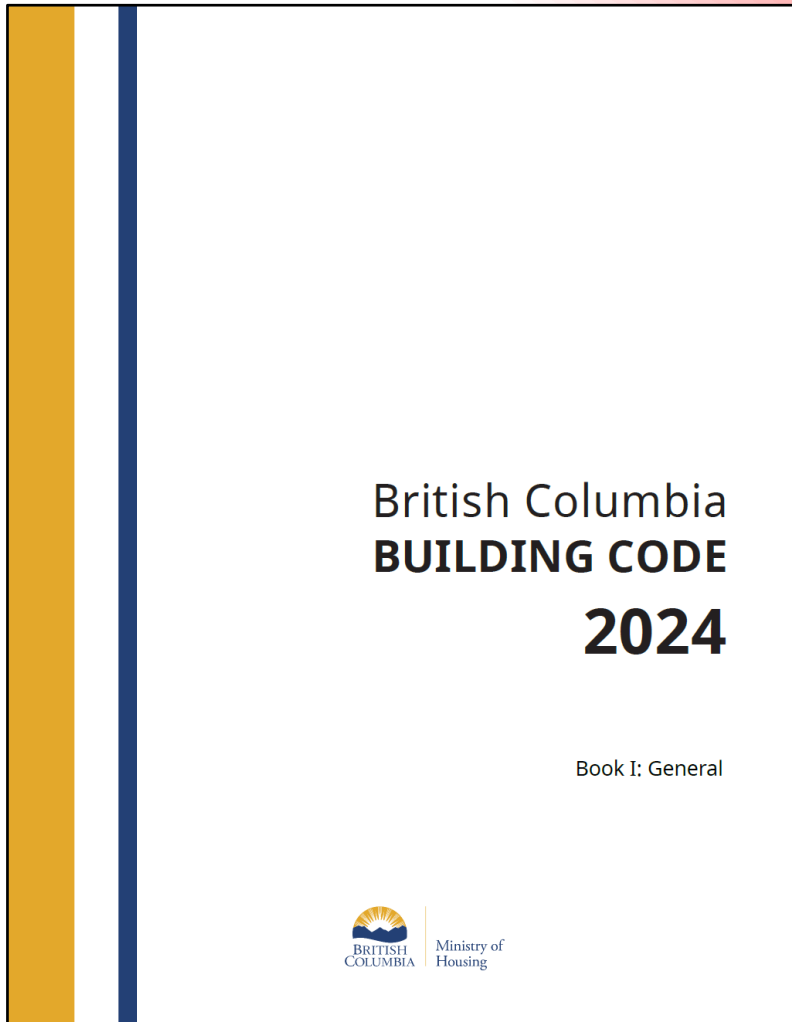
EXTREME HEAT REPORT

- Extreme heat wave (or heat dome)
- 619 deaths from extreme heat
  - June 25th - July 1st, 2021
  - 98% of deaths occurred indoors
- High pressure area trapped heat for days & set record temperatures
  - Many locations hit 40°C (104°F)
  - Overnight temperatures stayed high



CODE REQUIREMENTS

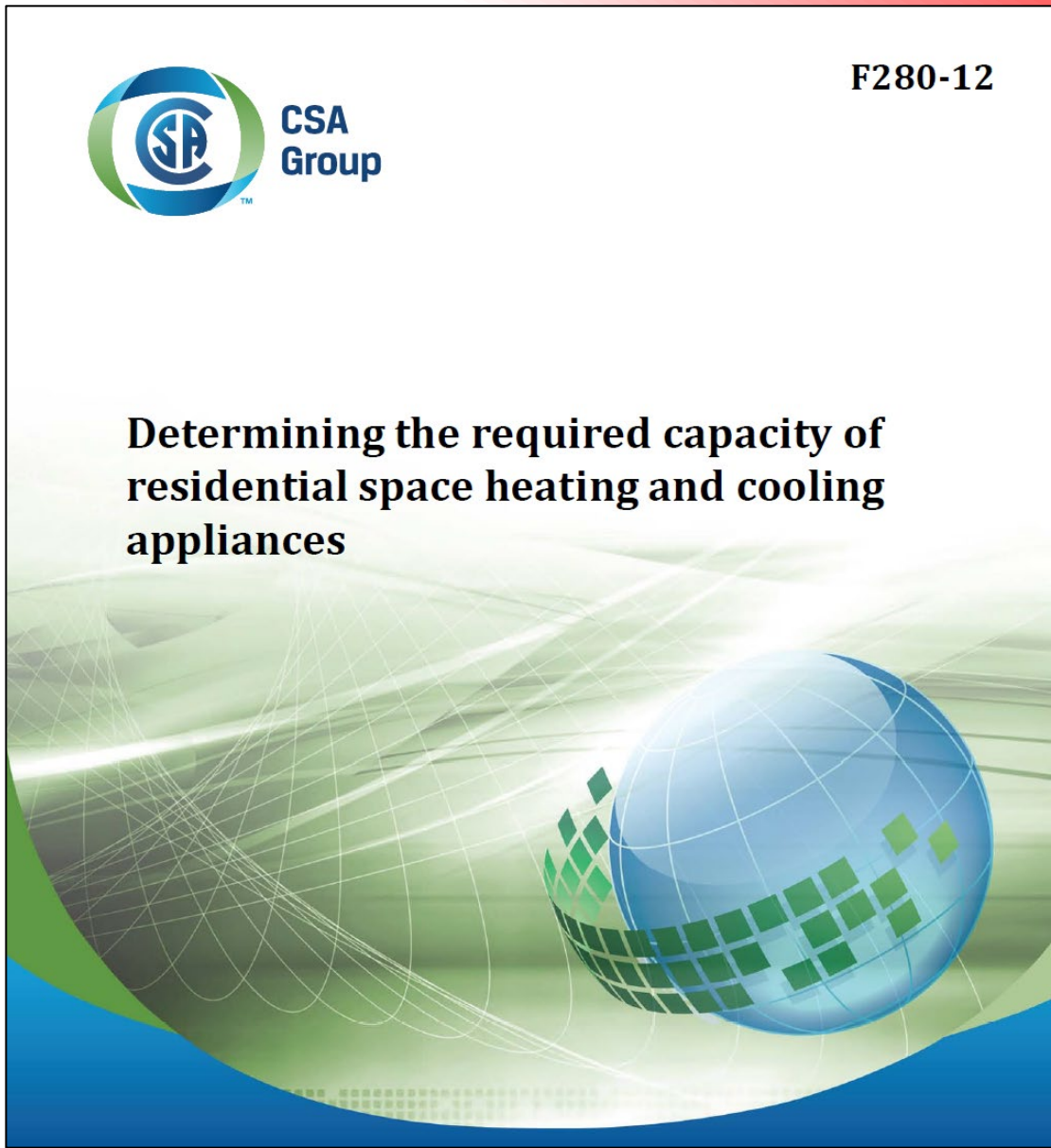
- Heating & Cooling Equipment to be sized using CSA F280-12 standard **- 9.33.5.1)**
- Design temperatures are prescriptive **- 9.33.3.1.**
  - Indoor Setpoint Temperatures
  - Outdoor Design Temperatures
- One room must be able to maintain 26°C
  - **9.33.3.1.(2)**



CSA F280 STANDARD

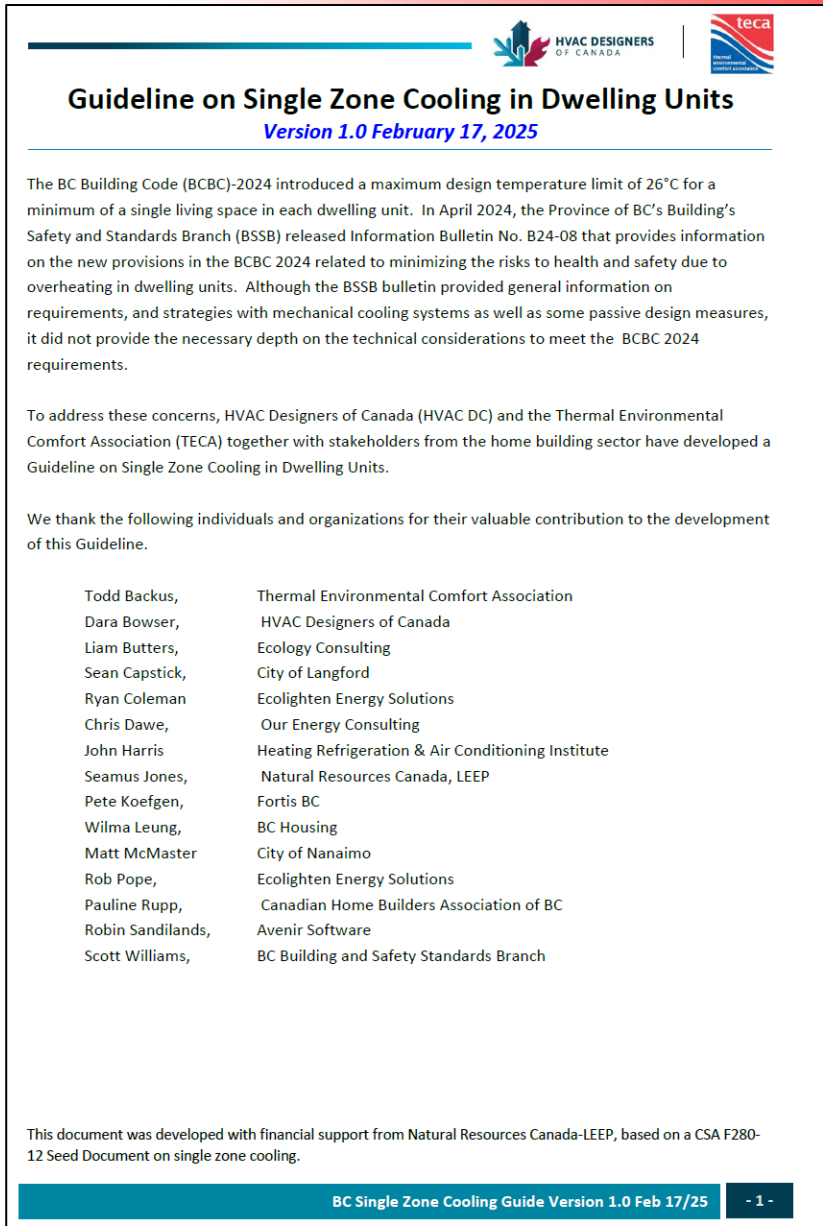
Scope of CSA F280-12 (R2021):

- Calculation method for heat loss & heat gain
- Used for selecting equipment
- Applies to Part 9 Buildings
- **Does not** comment on distribution systems or installation practices
- **Only outputs peak loads!**



CSA F280 STANDARD

- For **entire dwelling** heating & cooling
- **NOT** designed to model a single room
  - Assumptions must be made to model a single room
- **TECA & HVAC DC:**
  - Completed modeling guidelines



HVAC DESIGNERS OF CANADA | teca

Guideline on Single Zone Cooling in Dwelling Units

Version 1.0 February 17, 2025

The BC Building Code (BCBC)-2024 introduced a maximum design temperature limit of 26°C for a minimum of a single living space in each dwelling unit. In April 2024, the Province of BC's Building's Safety and Standards Branch (BSSB) released Information Bulletin No. B24-08 that provides information on the new provisions in the BCBC 2024 related to minimizing the risks to health and safety due to overheating in dwelling units. Although the BSSB bulletin provided general information on requirements, and strategies with mechanical cooling systems as well as some passive design measures, it did not provide the necessary depth on the technical considerations to meet the BCBC 2024 requirements.

To address these concerns, HVAC Designers of Canada (HVAC DC) and the Thermal Environmental Comfort Association (TECA) together with stakeholders from the home building sector have developed a Guideline on Single Zone Cooling in Dwelling Units.

We thank the following individuals and organizations for their valuable contribution to the development of this Guideline.

Todd Backus,	Thermal Environmental Comfort Association
Dara Bowser,	HVAC Designers of Canada
Liam Butters,	Ecology Consulting
Sean Capstick,	City of Langford
Ryan Coleman	Ecolighten Energy Solutions
Chris Dawe,	Our Energy Consulting
John Harris	Heating Refrigeration & Air Conditioning Institute
Seamus Jones,	Natural Resources Canada, LEEP
Pete Koefgen,	Fortis BC
Wilma Leung,	BC Housing
Matt McMaster	City of Nanaimo
Rob Pope,	Ecolighten Energy Solutions
Pauline Rupp,	Canadian Home Builders Association of BC
Robin Sandilands,	Avenir Software
Scott Williams,	BC Building and Safety Standards Branch

This document was developed with financial support from Natural Resources Canada-LEEP, based on a CSA F280-12 Seed Document on single zone cooling.

CSA F280 CALCULATORS

F280-12 Software Verified according to the procedure set out in F280-12, Section 8.

COMPANY NAME	SOFTWARE NAME	ROOM BY ROOM	WHOLE HOUSE	CONDITIONS	WEBSITE
Building Technology Services	Building Tech F280	✓	✓	Click Here	BuildingTech
Avenir Software Inc	HeatCAD/LoopCAD	✓	✓	Click Here	HeatCAD LoopCAD
Thermal Environmental Comfort Association	Teca Heat Loss & Heat Gain Calculator	✓	✓	Click Here	teca
Volta Research Inc	Volta Snap		✓	Click Here	volta SNAP
MiTek Inc	Right-Suite Universal	✓	✓	Click Here	www.wrightsoft.com
Sustainable HVAC Design Inc	Sustainable HVAC F280	✓	✓	Click Here	
McCallum HVAC Design Inc	Mecha F280	✓	✓	Click Here	MCCALLUM HVAC DESIGN INC design excellence with on time delivery

Current List of Certified Calculators: https://hvacdc.ca/?page_id=406

HVAC DESIGNERS OF CANADA

VERIFIED F280 SOFTWARE

HVAC DESIGNERS OF CANADA – VERIFIED F280 SOFTWARE

CSA F280 READINESS

How Ready is the HVAC Industry?

- New Construction
- Retrofits
- Room-by-room vs. block load calcs
- Single room cooling requirements

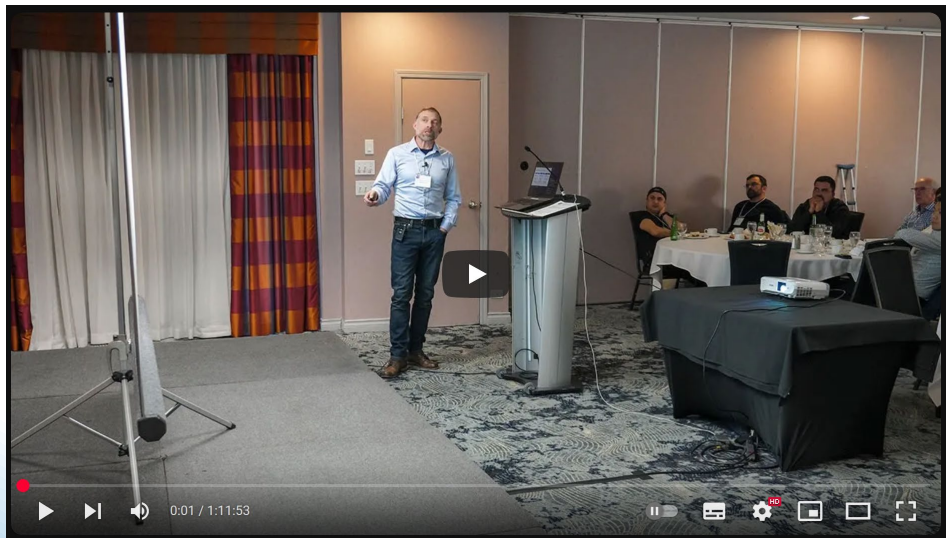
A2L REFRIGERANTS

A2L & Low Global Warming Potential (GWP) Transition

https://www.youtube.com/watch?v=13XdOcT4X-Q&t=1s

Presented by: Micah van der Heide,

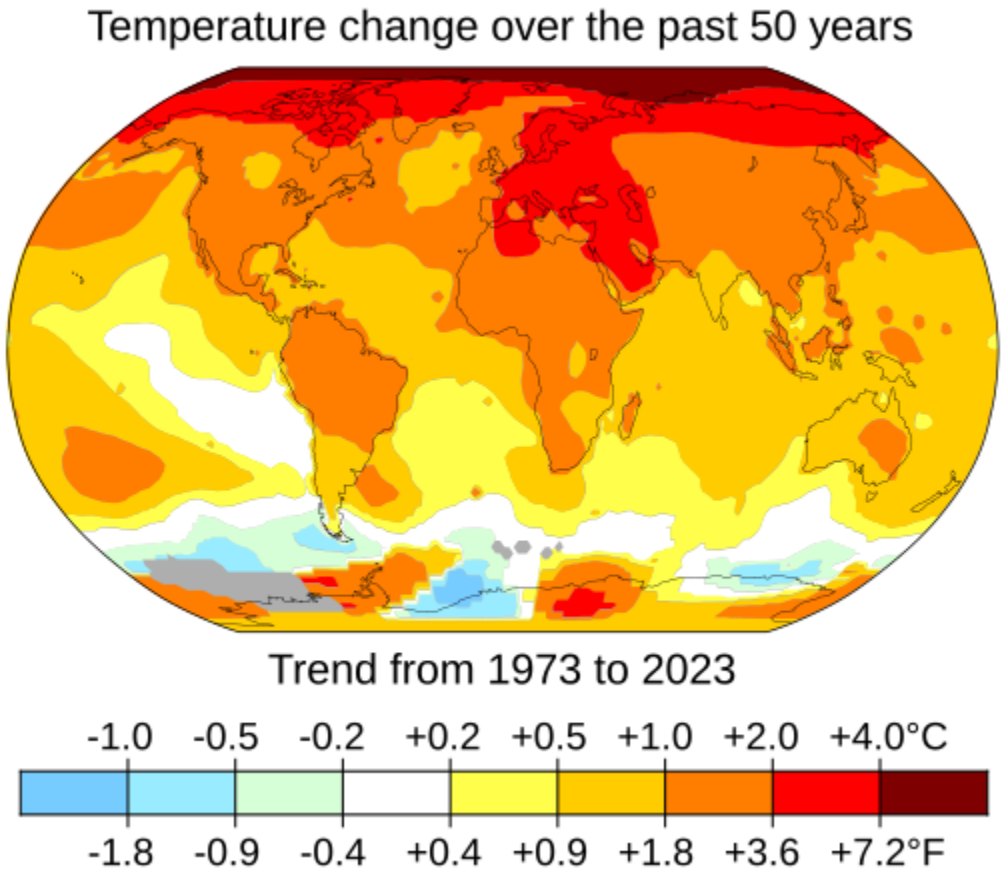
RSE/Technical Support & Training Manager, Refrigerative Supply



WHY A2L?

Why are we changing to A2L Refrigerants?

- International Agreements
  - Kigali Amendment to Montreal Protocol
- Climate Change
  - Lower GWP Requirements
- Refrigerants with Low GWP Values are Mildly Flammable



SALES FOR R-410a

R-410a Refrigerant is being phased out

- USA is driving the reduction of R-410a equipment sales
- Systems & Products are being phased out
  - Between 1 to 3 years depending on system style
- Components for repairs will not be phased out

A2L REFRIGERANTS

- **R-454b is likely going to be the most popular selection**
- R-32 will also be used
- The red stripe will be identify A2L cylinders

REFRIGERANT COMPOSITION

Refrigerant	R-12	R-22	R-410a	R-32	R-454b
Category	CFC	HCFC	HFC	HFC	HFC/HFO
Classification	A1	A1	A1	A2L	A2L
Composition	--	--	R-32 / R-125 (50/50 wt%)	--	R-32 / R-1234yf (68.9/38.1wt %)
ODP	1.0	.055	0	0	0
GWP		1810	2088	675	466
Refrigerant Oil	Mineral	Mineral	POE / PVE	POE / PVE	POE

A2L FLAMMABILITY

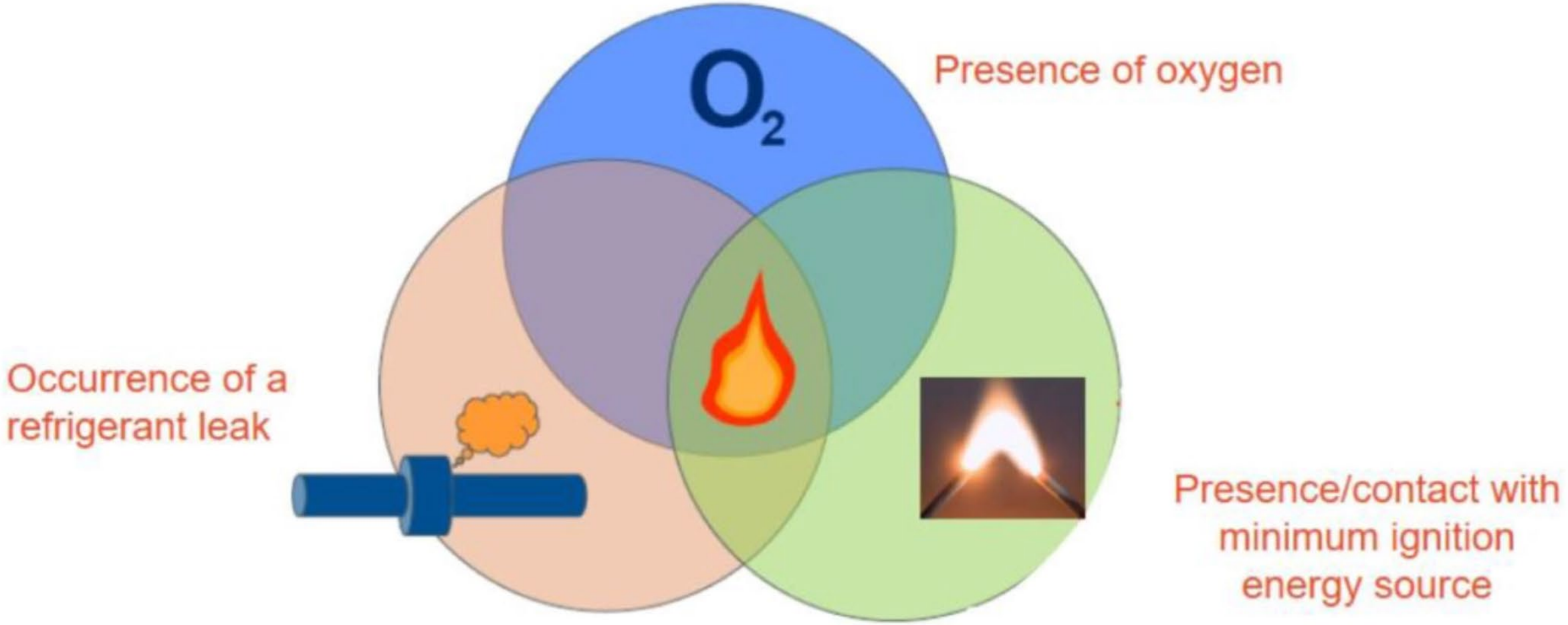
How Flammable are A2L Refrigerants?

- There is a lot of confusion and conflicting information about the flammability of A2L refrigerants

- A2L refrigerants are flammable, but are not nearly as explosive as propane or natural gas

CONDITIONS FOR IGNITION

All 3 elements must be present for ignition to occur!



FLAMMABILITY CLASSES

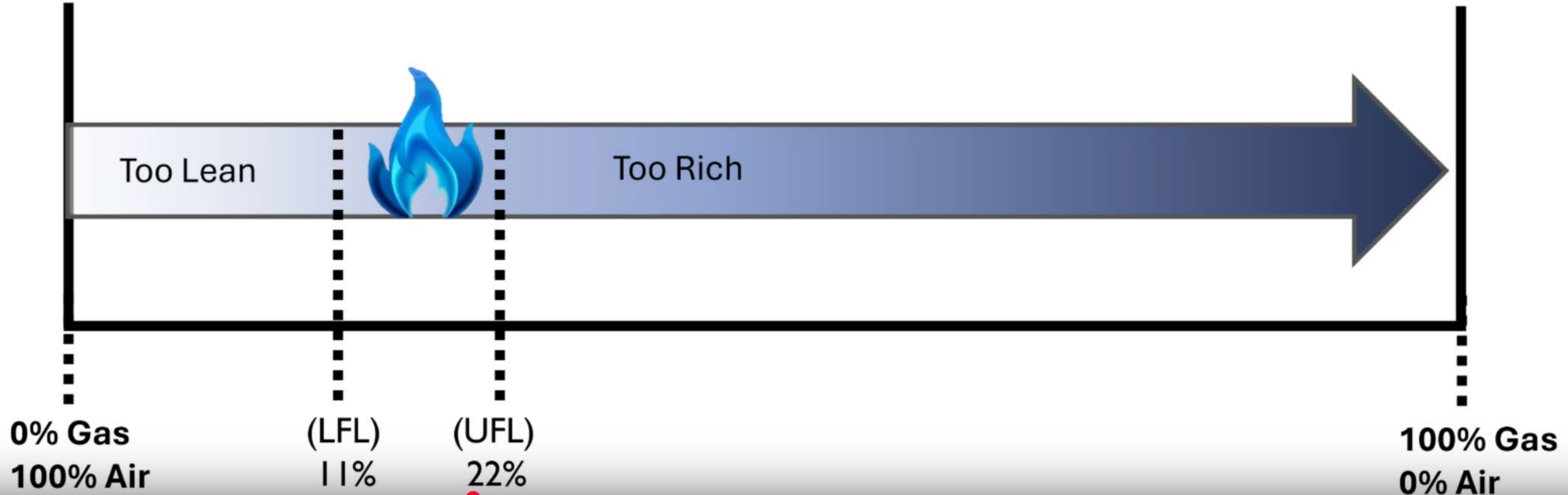
Flammability Class Properties

- Upper & Lower Flammability (UFL/LFL)
- Burn Velocity (BV)
- Heat of Combustion (HoC)
- Minimum Ignition Energy (MIE)

UFL & LFL

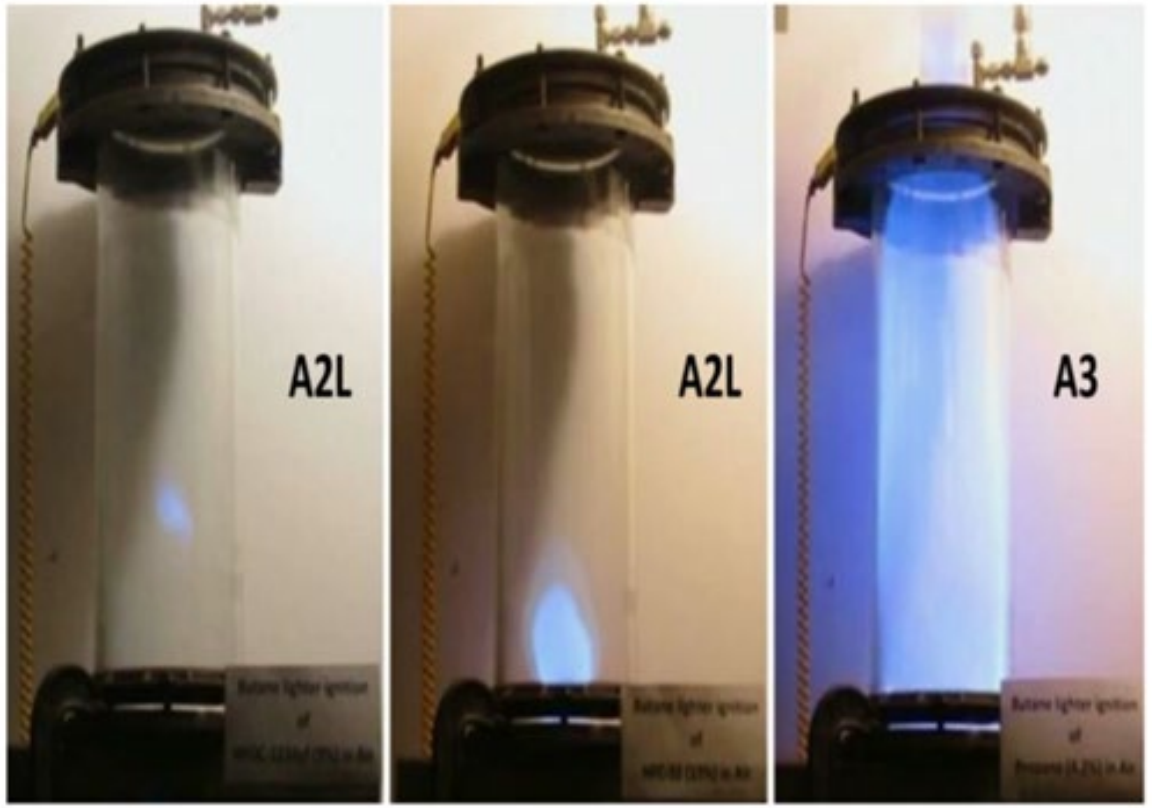
Upper & Lower Flammability (UFL/LFL)

- UFL is the maximum concentration to ignite
- LFL is the minimum concentration to ignite



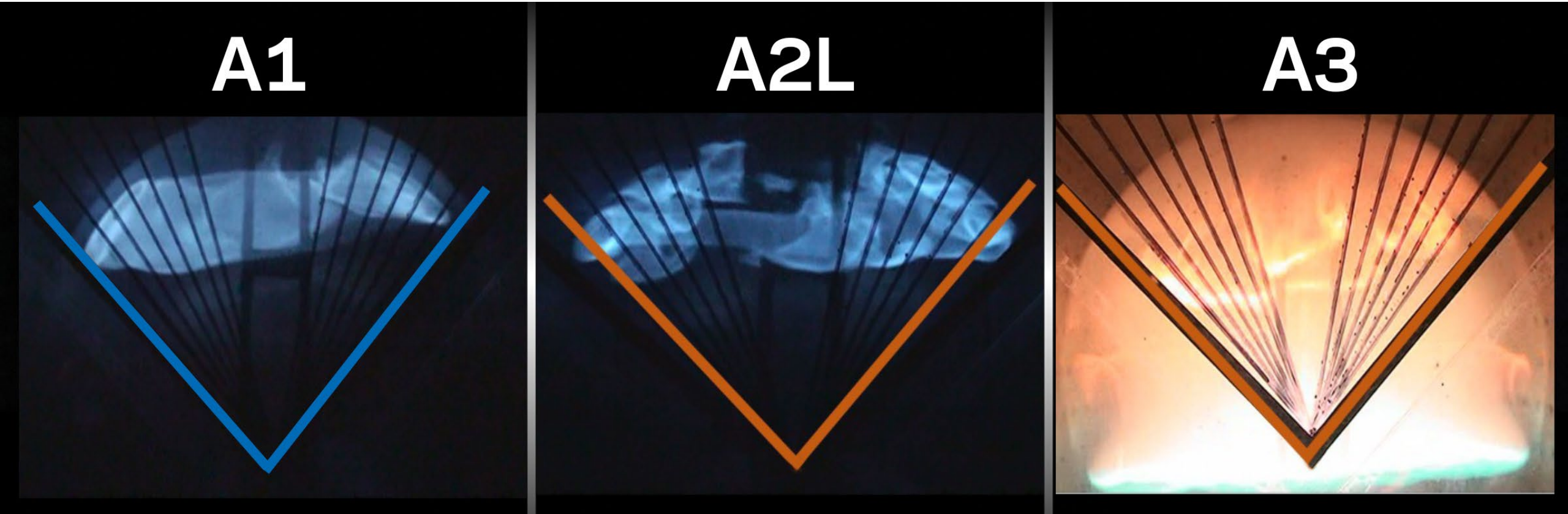
BURN VELOCITY

- The rate in which a flame spreads
- A2L refrigerants have a burn velocity of 10 cm/s or 3.9 in/s



HEAT OF COMBUSTION

- HoC of A2L refrigerants is significantly lower than propane
- Lower HoC reduces the chances of secondary flame spread



MINIMUM IGNITION ENERGY

- MIE is the minimum electrical spark energy in millijoules (mJ) required to ignite the gas mixture
- Most A2L refrigerants are difficult to ignite due to high MIE
- It is improbable that a household item can generate enough energy to create a spark that can ignite A2L refrigerant

REFRIGERANT COMPARISON

REFRIGERANT	R-410a	R-32	R-454b	R-1234yf	R-717	R-290
SAFETY GROUP	A1	A2L	A2L	A2L	B2L	A3
GWP	2088	674	466	4	0	0.072
LFL/UFL	NONE	14.4% / 30%	11.8% / 22%	6.2% / 12%	15% / 30%	2.1% / 10%
AUTO IGNITION TEMPERATURE	750°C 1382°F	648°C 1198°F	496°C 924°F	405°C 761°F	651°C 1203°F	455°C 860°F
MIN. IGNITION ENERGY	NONE	30-1000 mJ	100-300 mJ	5000-10000 mJ	100-300 mJ	0.25 mJ
BURN VELOCITY	NONE	6.7 cm/s	5.2 cm/s	1.5 cm/s	7.2 cm/s	46 cm/s
HEAT OF COMBUSTION	NONE	3869 BTU/lbs	4420 BTU/lbs	4408 BTU/lbs	9673 BTU/lbs	19200 BTU/lbs

VENTILATED SHAFTS

- Refrigerant piping that penetrates two or more floors shall be enclosed in a fire-resistant rated shaft
- When there is 1 or more joints, ventilation must be included

Natural Ventilation
• 4 in min pipe diameter at lowest point • 12sq in. Min free make up air

Mechanical Ventilation
• Min velocity based on cross sectional area of shaft • Continues operation or • Activated by an RDS

A2L STANDARDS

Applicable Standards

- CSA B52:23
- CSA B52HB:16
- UL-60335-2-40
- BC BUILDING CODE 2024
- ASHRAE 15
- ASHRAE 15.2
- ASHRAE 34

HOME PERFORMANCE STAKEHOLDER COUNCIL

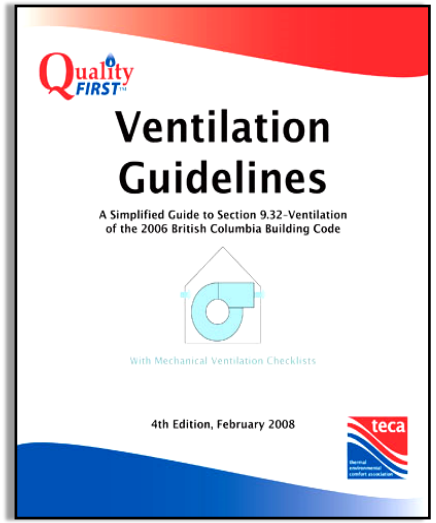
HPCN HVAC Registration Requires Training:

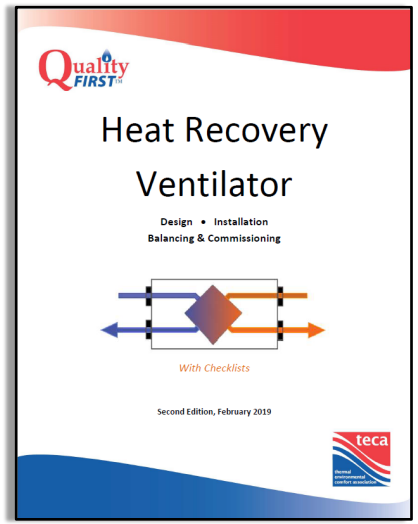
- HLHG Certification
- Principals of Moving Air
- House as a System (HPSC)

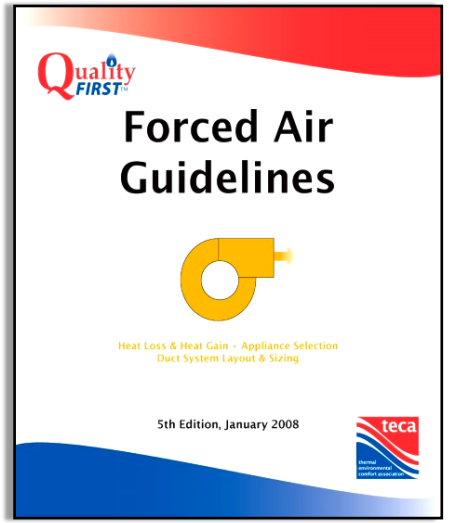
HPCN membership required for many rebates

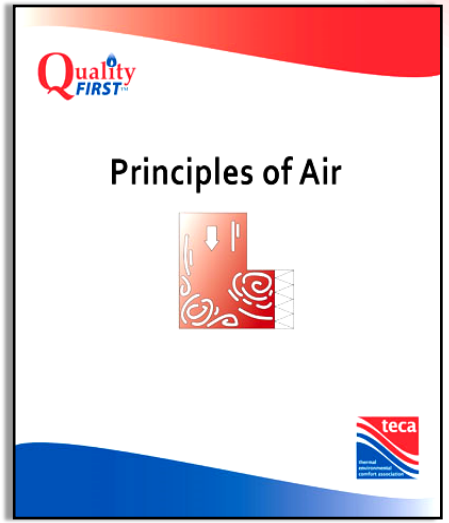
https://guides.co/g/updated-home-performance-contractor-network/231461

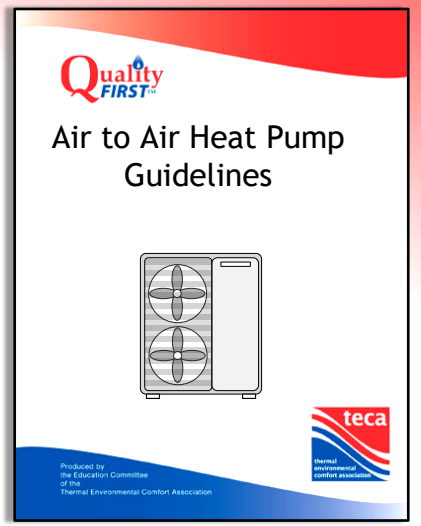
TECA COURSES

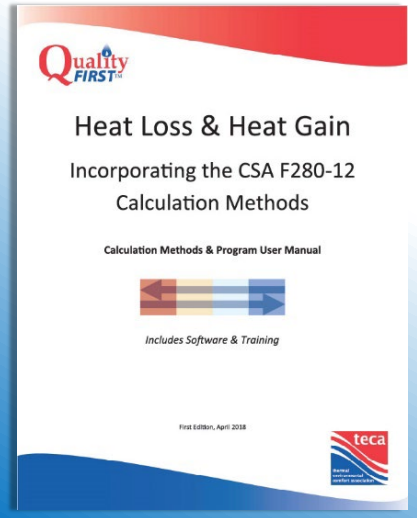


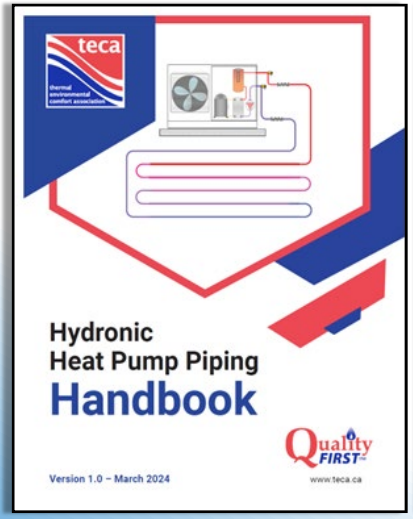


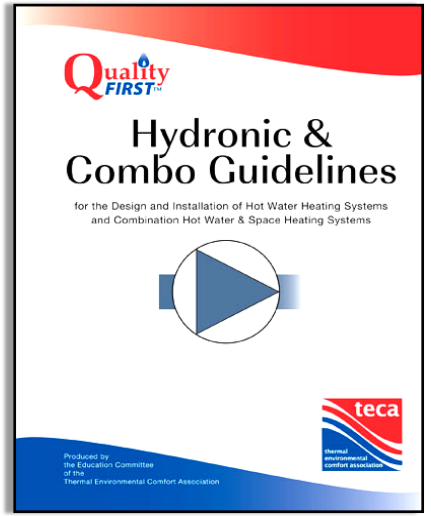


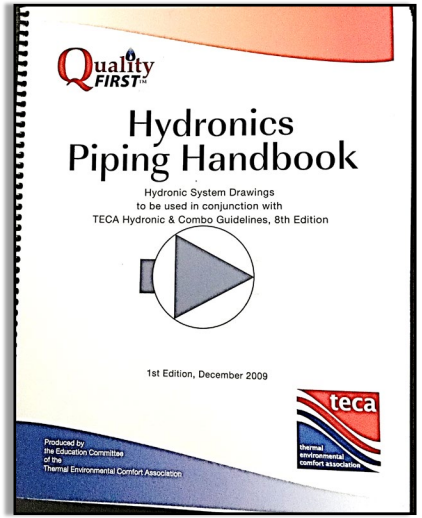












QUESTIONS & COMMENTS?

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