APPLICANT CHECKLIST FOR NEW REFRIGERANT APPLICATION SUBMISSION TO ASHRAE SSPC 34

FLAMMABILITY INFORMATION

June 2024

DISCLAIMER:

This checklist has been prepared by SSPC 34 to assist Applicant preparation of a new refrigerant application in accordance with the requirements of ANSI/ASHRAE Standard 34, Designation and Safety Classification of Refrigerants. While every effort has been made to ensure the accuracy of information, this checklist is provided as guidance to Applicants for informational purposes only. This checklist is intended to highlight the key technical input requirements of Standard 34 and published Addenda up to the date of this document. The applicant is responsible for accessing the ASHRAE Standards website for the latest published Addenda to Standard 34. ASHRAE and ASHRAE SSPC 34 are not responsible for errors made as a result of using this document. In cases of any discrepancy or omission, the requirements of ANSI/ASHRAE Standard 34 and its published addenda and errata shall prevail.

This checklist is for reference purposes only and is not intended to replace a refrigerant application. Use of this checklist will not guarantee acceptance of a refrigerant application or designation and classification of the refrigerant.

For further assistance or clarification, please contact ASHRAE staff at standards.section@ashrae.org.

ASHRAE Standard 34 Flammability Checklist			
ASHRAE Standard Section	Refrigerant:		
	Composition:		
	Tolerances:		
Single-Component Refrigerant		**Yes / No**	**Result**
Flammability Testing and Data Reporting		N/A	N/A
6.1.3 & B1	Flammability test in accordance with ASTM E681-2009		
6.1.3 & B1	Test apparatus per Appendix B1 (include a complete description) test flask size, electrode, spark location		
6.1.3 & B1	Test conditions per Appendix B1 (include a complete description)		
6.1.3 & B1	Video of flammability tests available per Appendix B1.7		
6.1.3 & B1	Flammability test @ 60°C (140°F) and 101.3 kPa (14.7 psia) - report as flammable or not flammable		
B1.1	If not flammable, test 3 consecutive concentration increments above stoichiometric composition & where combustion diminished		
B1.8	Flame propagation determination in at least 2 of 3 repeat flammability tests on highest fuel concentration in air		
B1.1	If flammable, report LFL @ 23°C (73.4°F) and 101.3 kPa (14.7 psia)		
6.1.3.5	If flammable and no LFL at 23°C (73.4°F) and 101.3 kPa (14.7 psia), report as $ETFL_{60}$		
B1.9	Tabulation of actual test results including accurate %v/v of test runs and results found - report as a table		
B1.9	Flammability test temperature: ±5°F (±3°C)		
B1.9	Flammability test pressure: ±0.1 psi (±0.7 kPa)		
B1.9	Humidity of test air used: ±0.0005 grams water vapor / gram dry air		
B1.9	Spark duration: ±0.05 sec		
B1.9	Flame propagation angle determination as measured from the point of ignition to the walls of the flask (±5.0 degrees)		
B1.9	Refrigerant/air concentration: 1% increments: ±0.2% by volume		
6.1.3.6	Heat of Combustion calculation in kJ/kg or Btu/lb @ 25°C (77°F) and 101.3 kPa (14.7 psia)		
Composition Reporting		N/A	N/A
9.8	Identify contaminants and impurities that would affect flammability: provide limits for these impurities		
Multi-Component Refrigerant Blend		**Yes / No**	**Result**
WCF Flammability Testing and Data Reporting		N/A	N/A
6.1.3	Determine the WCF (Worst Case of Formulation for Flammability) concentration and provide rationale		
6.1.3 & B1	Flammability test on the WCF in accordance with ASTM E681-2009		
6.1.3 & B1	Test apparatus per Appendix B1 (include a complete description) test flask size, electrode, spark location		
6.1.3 & B1	Test conditions per Appendix B1 (include a complete description)		

6.1.3 & B1	Video of flammability tests available per Appendix B1.7		
6.1.3 & B1	Flammability test @ 60°C (140°F) and 101.3 kPa (14.7 psia) - report as flammable or not flammable		
B1.1 & B1.2	If not flammable, test 3 consecutive concentration increments above stoichiometric composition & where combustion diminished		
B1.8	Flame propagation determination in at least 2 of 3 repeat flammability tests on highest fuel concentration in air		
B1.1 & 9.5.2.4	If flammable, report LFL @ 23°C (73.4°F) and 101.3 kPa (14.7 psia) or for low critical temperature fluids, the temperature determined according to Section 9.5.2.4		
6.1.3.5	If flammable and no WCF LFL at 23°C (73.4°F) (or relevant temp. for low critical temp. fluids) and 101.3 kPa, report as $ETFL_{60}$		
B1.9	Tabulation of actual test results including accurate %v/v of test runs and results found - report as a table		
B1.9	WCF Refrigerant blend composition tested: ±0.1 mass%		
B1.9	Flammability test temperature: ±3°C (± 5°F)		
B1.9	Flammability test pressure: ±0.1 psi (±0.7 kPa)		
B1.9	Humidity of test air used: ±0.0005 grams water vapor / gram dry air		
B1.9	WCF Refrigerant blend/air concentration: 1% increments: ±0.2% by volume		
B1.9	Spark duration: ±0.05 sec		
B1.9	Flame propagation angle determination as measured from the point of ignition to the walls of the flask (± 5.0 degrees)		
B1.4	The mass percent formulation of the tested blend was verified through gas chromatography		
6.1.3.6	Heat of Combustion calculation in kJ/kg or Btu/lb @ 25°C (77°F) and 101.3 kPa (14.7 psia)		
Fractionation Analysis		N/A	N/A
6.1.3	If the components of the blend are all in one class, a fractionation analysis and WCFF flammability testing are not required		
B2.1 & B2.1.1	Worst Case of Fractionation for Flammability (WCFF) composition(s) identified		
B2.2	Fractionation analysis begins with WCF		
B2.1.1	Validate leakage condition model by VLE experiment resulting in the WCFF - tabulated and graphed data		
B2.4.1	WCFF simulating leaks under storage/shipping conditions		
B2.4.1 & 9.5.2.4	Tabulated data supplied at the maximum fill temperature (54.4˚C or other temperature for fluids with critical temperature <54.4˚C)		
B2.4.1	Tabulated data supplied at –40.0°F (–40.0°C) or the bubble point at 14.7 psia (101.3 kPa) plus 18.0°F (10.0°C), whichever is warmer		
B2.4.1	Tabulated data at the temperature that results in the WCFF between the above temperatures if the WCFF does not exist at either of those temperatures. If no temperature between those temperatures results in the WCFF, then the fractionation test shall instead be conducted at 73.4°F (23.0°C)		
B2.4.2	WCFF simulating leaks from equipment		
B2.4.2 & 9.5.2.4	Tabulated data supplied at 60°C or for low critical temperature fluids, the temperature determined according to Section 9.5.2.4		

B2.4.2	Tabulated data supplied at –40.0°F (–40.0°C) or the bubble point at 14.7 psia (101.3 kPa) plus 18.0°F (10.0°C), whichever is warmer		
B2.4.2	Tabulated data at the temperature that results in the WCFF between the above temperatures if the WCFF does not exist at either of those temperatures. If no temperature between those temperatures results in the WCFF, then the fractionation test shall instead be conducted at 73.4°F (23.0°C)		
B2.6	Fractionation analysis data submitted		
B2.6	Fractionation or leak test temperature: ±0.1°C (±0.2°F)		
B2.6	Tabulated liquid and vapor compositions at each leaked increment (±0.1 mass %)		
B2.6	If modeled - report model accuracy at conditions that predict the WCFF		
WCFF Flammability Testing and Data Reporting		N/A	N/A
6.1.3 & B1	WCFF flammability test @ 60°C and 101.3 kPa (14.7psia) - report as flammable or not flammable		
B1.1 & B1.2	If not flammable, test 3 consecutive concentration increments above stoichiometric composition & where combustion diminished		
B.1.8	Flammability determined by flame propagation in at least 2 of 3 repeat flammability tests on highest fuel concentration in air		
B1.1 & 9.5.2.4	If flammable, report LFL @ 23°C (73.4°F) and 101.3 kPa (14.7 psia) or for low critical temperature fluids, the temperature determined according to Section 9.5.2.4		
6.1.3.5	If flammable and no LFL of WCFF at 23°C (73.4°F) and 101.3 kPa, report as $ETFL_{60}$		
B1.9	Tabulation of actual test results including accurate %v/v of test runs and results found - report as a table		
B1.9	WCFF Refrigerant blend composition tested: ±0.1 mass%		
B1.9	Flammability test temperature: ±3°C (±5°F)		
B1.9	Flammability test pressure: ±0.1psi (±0.7 kPa)		
B1.9	Humidity of test air used: ±0.0005 grams water vapor / gram dry air		
B1.9	WCFF Refrigerant blend/air concentration: 1% increments: ±0.2% by volume		
B1.9	Spark duration: ±0.05 sec		
B1.9	Flame propagation angle determination as measured from the point of ignition to the walls of the flask (± 5.0 degrees)		
B2.3	The mass percent formulation of the tested blend was verified through gas chromatography		
6.1.3.6	Heat of Combustion calculation in kJ/kg or Btu/lb @ 25°C (77°F) and 101.3 kPa (14.7 psia)		
For Refrigerants with Low Critical Temperature			
9.5.2.4	Physical property calculations should be conducted per guidance in 9.5.2.4		
B2.4.1	Fill calculations for the fractionation analysis should be carried out using the saturated liquid density at a temperature Tf = Tb + 0.8 (Tc-Tb) per B2.4.1		
Composition Reporting Requirements		N/A	N/A
9.8	Identify contaminants and impurities that would affect flammability: provide limits for these impurities		
Burning Velocity Test Evaluation (Optional – for 2L classification)		**Yes / No**	**Result**

6.1.3	Identification and full description of test method employed		
6.1.3	Demonstrated burning velocity of R-32 to be 6.7 ± 0.7 cm/s @ 23.0°C (73.4°F) and 101.3 kPa (14.7 psia)		
6.1.3	If new refrigerant burning velocity >6.7 cm/s, demonstrated burning velocity of R-152a to be 23.0 ± 2.3 cm/s @ 23.0°C (73.4°F) and 101.3 kPa (14.7 psia)		
6.1.3	Dry air (less than 0.00015 g of water vapor per gram of dry air) containing 21.0% ± 0.1% O_2		
6.1.3	Flammable gas minimum purity of 99.5% by weight		
6.1.3	Burning velocity of the refrigerant (in cm/s) – duplicate test results from the LFL to at least 125% of the stoichiometric concentration		
6.1.3	Calculate burning velocity form a least-squares fit to the measured data		
6.1.3.2.4	Report if burning velocity ≤10 cm/s @ 23.0°C (73.4°F) and 101.3 kPa (14.7 psia); request 2L classification		