



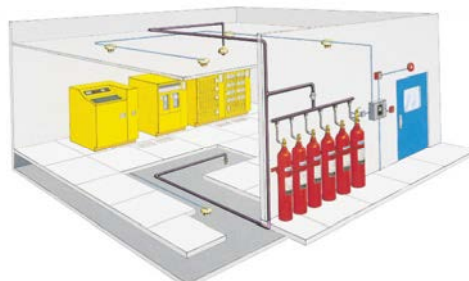
Gaseous Fire Suppression Systems Agent Selection



Gaseous Fire Suppression Systems. Agent Selection

Introduction

With the multiple Suppression System choices for protecting risks consideration should be taken by the fire system designer on a number of factors which will aid the selection of a suitable Gaseous Fire Suppression system during the risk analysis phase.



Synthetic / Manufactured Agents

- HALON 1301 /1211
- NAF-S-111™
- FM200®
- NOVEC 1230™



Natural Occurring Agents

- IG-55 (*iFlow*, Argonite, Proinert)
- IG-541 (*iFlow*, Inergen, Fire-Eater)
- IG-100 & IG-01 (*iFlow*)
- CO₂ (High & Low Pressure)

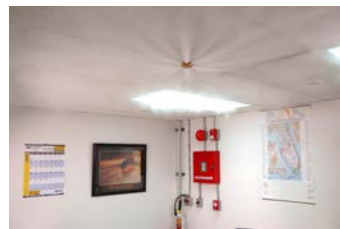


**Gaseous Fire Suppression Systems.
Agent Selection**

Introduction

Considerations:-

1. Extinguishing mechanism.
2. Design concentrations and amount of Agent needed.
3. Safety for people.
4. Cylinder locations and Pipe Distances to risk area.
5. By products.
6. Enclosure over and under pressures.
7. ODP, GWP and TEWI.
8. Agent Holding time.
9. Cost.



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**Gaseous Fire Suppression Systems.
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Introduction

Considerations:-

- Design concentrations and amount of Agent needed.
- Safety for people

Agent	Design concentration Higher class A	NOAEL (No Observed Adverse Effects Level)	LOAEL (Lowest Observed Adverse Effects Level)
IG-55	45.1 %	43.0%	52.0%
IG-541	39.9 %	43.0%	52.0%
FM200®	8.5 %	9.0%	10.5%
NOVEC 1230™	5.6 %	10.0%	10.0%

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Gaseous Fire Suppression Systems. Agent Selection

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Considerations:-

- Pipe Distances (Cylinder storage to risk area)
- By products (Decomposition products post fire situation)
- Agent Holding Times, Room Sealing
- Requirements for Pressure Relief Venting
- System Cost



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Gaseous Fire Suppression Systems. Agent Selection

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Agent Hold Time Considerations:-

- Holding Times, Room Sealing.
- Table below is based on Higher Class A risks, density of mixing air and gaseous agent.
- Air Density is 1.200 kg/m³ @ 20 deg C
- The Higher above 1.200 kg/m³ the lower the predicted agent hold time.

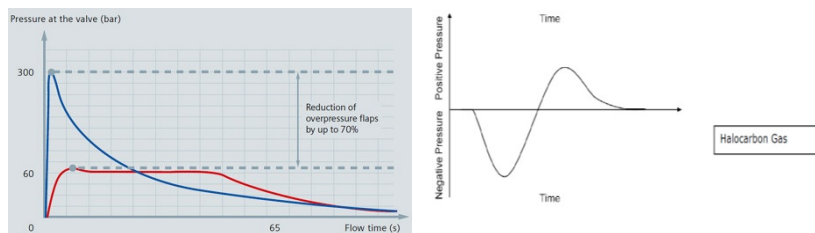
Agent	Density of Mixing Air & Gaseous Agent
IG-541	1.279
IG-55	1.296
FM200®	1.723
NOVEC 1230™	1.912

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Pressure Relief Considerations:-

- Room over / under pressures
- Inert Gases – Consideration for Room Overpressure only
- Synthetic Gases – Consideration for both Room Over & Under pressures

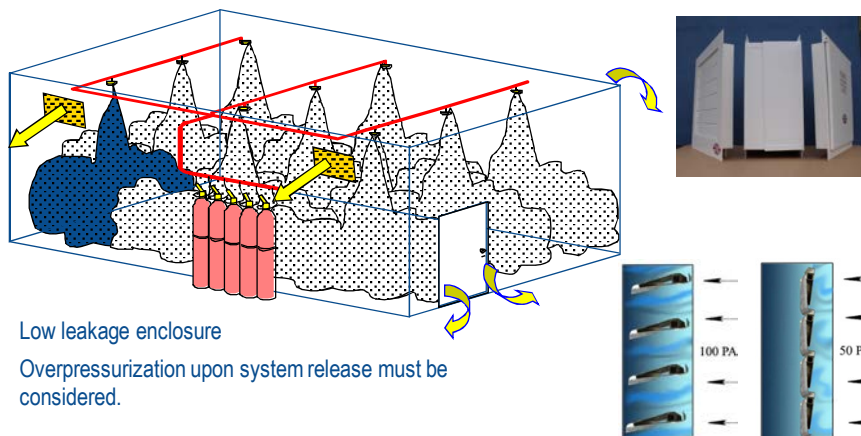


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Pressure Relief Considerations:-

- Low leakage enclosure
- Overpressurization upon system release must be considered.



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Environmental Considerations:-

- ODP, GWP and TEWI.
- ODP = Ozone Depleting Potential
- GWP = Global Warming Potential
- CO₂, used as the reference over 100 years
- SGG = Synthetic Greenhouse Gas lifetime
- SGG = impact over lifetime
- TEWI = Total Environmental Warming Impact and lifetime



Inert Gases have **ZERO** Ozone Depleting Potential, **ZERO** Global Warming Potential and **ZERO** Total Environmental Warming Impact.

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Gaseous Fire Suppression Systems. Agent Selection

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Agent Comparison Table

Name	NOVEC 1230™	Inert Gas	FM200® (HFC-227ea)
Ingredients	1,1,1,2,2,4,5,5- NONAFLURO-4- (TRIFLOUROMETHYL) - 3-PENTAN ONE 99.9%	IG-541 Nitrogen 52% Argon 40% CO ₂ 8% IG-55 Argon 50% Nitrogen 50%	Heptaflouropropane 99.6%
Stored as	Liquid	Compressed Gas	Liquid
Propellant	N2 in Cylinder	NA	N2 in Cylinder
Storage Pressure	25 / 42 Bar	300 Bar	25 / 42 Bar
Room Pressure relief required	Yes (Over / Under pressures)	Yes (Overpressure)	Yes (Over / Under pressures)
Appearance	Colourless, Low Odour	Colourless, Odourless	Colourless, Odourless

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Gaseous Fire Suppression Systems. Agent Selection

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Agent Comparison Table

Name	NOVEC 1230™	Inert Gas	FM200® (HFC-227ea)
Closest Cylinder Filling	Most Major Capital Cities	Most Major Capital Cities Some SupaGas centres	Most Major Capital Cities
Design Concentration Higher Class A - Electrical	5.6%	IG-541 = 39.9% IG-55 = 45.1%	8.5%
Pipe, fittings	Schedule 40 Pipe, Galvanised Steel fittings	Schedule 40 Pipe, 3000lb fittings	Schedule 40 Pipe, Galvanised Steel fittings
How it works	Heat Absorption	Inert gas, reduces oxygen levels to between 11 and 12%	80% Cooling 20% Chemical Action
Suitable for Class of Fire	A,B,E	A,B,E	A,B,E
Safe for Humans	At design concentration	At design concentration	At design concentration

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Gaseous Fire Suppression Systems. Agent Selection

Introduction

Agent Comparison Table

Name	NOVEC 1230™	Inert Gas	FM200® (HFC-227ea)
Ozone Depleting Potential	0	0	0
Global Warming Potential	1	0	2900
Atmospheric Life	5 days	NA	33 Years
Environmental Controls	None	None	* see below
Cylinder Storage	Inside or adjacent risk area	Inside, adjacent or remote from risk area	Inside or adjacent risk area
Actuation	Solenoid type, Auto or Manual, Cable, Pressure	Solenoid type, Auto or Manual, Pressure	Solenoid type, Auto or Manual, Cable, Pressure
Discharge Duration	6 to 10 seconds	Maximum 60 seconds	6 to 10 seconds

* Listed By Dept Environment Water Heritage and the Arts as a controlled substance (imports).
Installers and maintainers require license from the FPAA. Owners / Maintainers must report discharges.
Permits required from ODS & SGG Board for discharge tests.

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Agent Comparison Table

Name	NOVEC 1230™	Inert Gas	FM200® (HFC-227ea)
Room sealing requirements	Extremely well sealed	Well sealed	Very well sealed
Fan Test Retention Time (100m³)	6.2 Minutes FAIL	20.2 Minutes PASS	7.6 Minutes FAIL
Fan Test Retention Time (500m³)	11.5 Minutes PASS	35.4 Minutes PASS	13.1 Minutes PASS
Fan Test Retention Time (1500m³)	19.9 Minutes PASS	48.2 Minutes PASS	22.0 Minutes PASS

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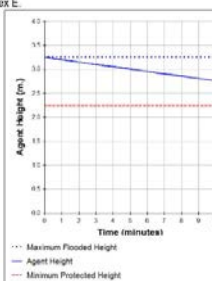
Room Integrity Test Example - IG541

Test date/time	2013/06/07 14:13	Net protected volume, V_p	89 m³
Tester	Ryan Moffet	Maximum Flooded Height, H_f	3.25 m
Certified to Level:	2 - Single fan NFPA room test	Minimum Protected Height, H_m	2.24 m
Signature		Static during discharge, P_{st}	0.0 Pa
Elevation above sea level	0 m	Operating temperature	20 C
Correction method	NFPA 2001 (2000) Formula A-3-5.3.3	Initial concentration, C_i	42.74%
Correction factor	1	Leaking during retention	No
Agent	INERGEN by Weight (IG-541)	Agent quantity	50 m³
Actual total leakage, A_t	0.0490 m³/s	Minimum concentration, C_{min}	42.74%
Actual lower leakage, A_l	0.0245 m³/s	Minimum retention time	10.0 minutes

Below ceiling leakage defaulting to worst case – 50% of total leakage.

This enclosure was tested in compliance with ISO 14520.1 Annex E. Assuming no continual mixing during the retention period, enclosure leakage could allow sufficient agent to be lost to cause an anti-agent interface to descend from a Maximum Protected Height of 3.25 m, to the Minimum Protected Height specified of 2.24 m. The retention time would then be 21.5 minutes which exceeds the minimum retention time of 10 minutes. The enclosure therefore **passes** this acceptance procedure.

Notes Example using IG-541 (Inergen) or other similar Inert Gas



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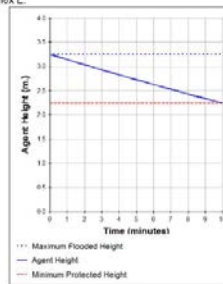
Room Integrity Test Example - FM200

Test date/time	2013/06/07 14:20	Net protected volume, V_0	89 m ³
Tester	Ryan Moffet	Maximum Flooded Height, H_0	3.25 m.
Certified to Level:	2 - Single fan NFPA room test	Minimum Protected Height, H_1	2.24 m.
Signature		Static during discharge, P_{st}	0.0 Pa
Elevation above sea level	0 m.	Operating temperature	20 C
Correction method	NFPA 2001 (2000) Formula A-3-5.3.3	Initial concentration, C	8.50%
Correction factor	1	Mixing during retention	No
Agent	FM200	Agent quantity	8 m ³
Actual total leakage, A_t	0.0490 m ²	Minimum concentration, C_{min}	8.50%
Actual lower leakage, A_l	0.0245 m ²	Minimum retention time	10.0 minutes

Below ceiling leakage defaulting to worst case – 50% of total leakage.

This enclosure was tested in compliance with ISO 14520.1 Annex E. Assuming no continual mixing during the retention period, enclosure leakage could allow sufficient agent to be lost to cause an air/agent interface to descend from a Maximum Protected Height of 3.25 m. to the Minimum Protected Height specified of 2.24 m.
The retention time would then be 10.1 minutes which exceeds the minimum retention time of 10 minutes. The enclosure therefore **passes** this acceptance procedure.

Notes **Example using FM200 gas**



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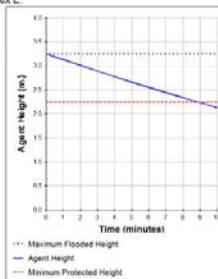
Room Integrity Test Example - NOVEC

Test date/time	2013/06/07 14:16	Net protected volume, V_0	89 m ³
Tester	Ryan Moffet	Maximum Flooded Height, H_0	3.25 m.
Certified to Level:	2 - Single fan NFPA room test	Minimum Protected Height, H_1	2.24 m.
Signature		Static during discharge, P_{st}	0.0 Pa
Elevation above sea level	0 m.	Operating temperature	20 C
Correction method	NFPA 2001 (2000) Formula A-3-5.3.3	Initial concentration, C	5.60%
Correction factor	1	Mixing during retention	No
Agent	Novec 1230	Agent quantity	5 m ³
Actual total leakage, A_t	0.0490 m ²	Minimum concentration, C_{min}	5.60%
Actual lower leakage, A_l	0.0245 m ²	Minimum retention time	10.0 minutes

Below ceiling leakage defaulting to worst case – 50% of total leakage.

This enclosure was tested in compliance with ISO 14520.1 Annex E. Assuming no continual mixing during the retention period, enclosure leakage could allow sufficient agent to be lost to cause an air/agent interface to descend from a Maximum Protected Height of 3.25 m. to the Minimum Protected Height specified of 2.24 m.
The retention time would then be 8.9 minutes which is less than the minimum retention time of 10 minutes. The enclosure therefore **FAILS** this acceptance procedure.

Notes **Example using NOVEC gas**



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Questions ?

