

Flamblocker CF7 Technical Working Principle & Fire Suppression Methodology

Introduction

Flamblocker CF7 is an advanced firefighting and thermal control additive designed to enhance the extinguishing and cooling capabilities of water during fire suppression operations.

Unlike conventional firefighting methods that primarily rely on water evaporation and flame knockdown, CF7 operates as a combined:

- Heat extraction system
- Thermal stabilization system
- Surface isolation system
- Deep penetration cooling system
- Re-ignition prevention agent

The operational objective of CF7 is not only to suppress visible flames, but also to aggressively reduce retained thermal energy inside burning materials and prevent thermal re-escalation.

CF7 is typically mixed with water in low concentrations and applied through standard firefighting equipment.

1. Fundamental Fire Suppression Principle

Fire can only continue when the three elements of the fire triangle remain present:

1. Heat
2. Fuel
3. Oxygen

Flamblocker CF7 primarily attacks the fire by aggressively removing heat from the combustion process while simultaneously creating separation between fuel surfaces and active combustion zones.

The result is:

- Rapid temperature reduction
- Interruption of combustion
- Reduced heat transfer
- Suppression of re-ignition

2. Two-Phase Cooling Mechanism

Phase 1 — Flash Cooling / Initial Thermal Shock

Immediately upon contact with the fire, the CF7-water mixture initiates a rapid thermal extraction effect.

During these first milliseconds:

- Water absorbs large amounts of thermal energy
- CF7 enhances the interaction between the water and the heated surface
- Surface temperatures begin dropping extremely rapidly
- Visible flame intensity decreases quickly

This first phase can be described as a high-speed “flash cooling” or thermal shock effect.

Operationally, this reduces:

- Flame propagation
- Surface heat radiation
- Heat transfer toward surrounding fuel sources

This rapid initial cooling is particularly important in:

- Wildfires
- Waste fires
- Battery fires
- Deep-seated fires
- Industrial material fires

where uncontrolled thermal spread is a major risk factor.

Phase 2 — Sustained Deep Cooling

After the initial flash cooling phase, CF7 continues working by extending the active cooling duration of the water.

Under normal circumstances, water exposed to extreme temperatures rapidly evaporates, limiting its cooling duration.

CF7 modifies this behaviour by improving the thermal stability and surface retention characteristics of the water mixture.

This enables:

- Longer contact time on heated surfaces
- Continued heat absorption
- Deeper penetration into burning materials
- Extended cooling beyond the initial application moment

According to operational observations and developer explanations, the CF7-water mixture can remain thermally active on surfaces exposed to temperatures significantly exceeding the normal boiling point of water.

In practice, this means the extinguishing medium continues extracting heat from the fire environment for a substantially longer period than water alone.

The operational consequence is critical:

The fire loses thermal energy faster than it can regenerate thermal energy.

Once sufficient heat has been removed from the combustion process, the fire collapses.

3. Thermal Energy Encapsulation

A core principle behind CF7 is the management and containment of thermal energy at the surface level of burning materials.

Rather than functioning purely as a traditional foam blanket, CF7 acts as a thermal control layer.

The agent assists in:

- Isolating hot surfaces
- Reducing heat transfer
- Suppressing radiant heat spread
- Slowing thermal propagation into adjacent fuel

This is particularly relevant in:

- Forest fires
- Landfill fires
- Waste storage fires
- Biomass fires
- Lithium-ion battery incidents

where large quantities of retained internal heat normally continue driving re-ignition.

4. Fuel Surface Isolation Effect

In addition to heat removal, CF7 also affects the fuel component of the fire triangle.

After application, CF7 leaves an active residual layer on the affected material surfaces.

For example, in a forest fire scenario:

- Burning wood becomes coated with the CF7-water mixture
- Even after part of the water phase evaporates, residual CF7 components remain attached to the material surface
- This layer assists in separating burning material from surrounding combustible material

Operationally, this creates:

- Reduced flame spread
- Reduced heat transfer between fuel sources
- Reduced oxygen interaction at the surface
- Lower re-ignition probability

In practical firefighting terms, CF7 helps compartmentalize the combustion process at the fuel surface.

5. Enhanced Soil Penetration & Subsurface Cooling

A significant operational advantage of Flamblocker CF7 in wildfire and deep-seated fire scenarios is its ability to improve water penetration into porous burning materials and natural ground structures.

When mixed with water — including both freshwater and seawater — the CF7-water solution demonstrates enhanced infiltration characteristics compared to water alone.

In practical firefighting operations, this enables the extinguishing medium to:

- Penetrate deeper into forest floors
- Reach root systems and underground hot spots
- Travel further into porous organic materials
- Improve moisture transfer into deep-seated combustion zones

This effect is particularly important in:

- Forest fires
- Wildland fires
- Peat fires
- Root-layer fires
- Biomass stockpile fires
- Landfill fires

where combustion frequently continues below the visible surface.

Subsurface Fire Suppression

One of the most difficult aspects of wildfire suppression is the persistence of underground heat.

Even when surface flames appear extinguished, residual thermal energy may continue burning:

- beneath vegetation,
- inside root systems,
- inside organic soil layers,
- inside mulch, peat, or biomass material.

Conventional water application often struggles to sufficiently penetrate these deeper combustion zones due to rapid runoff, evaporation, or limited infiltration depth.

CF7 assists by improving the ability of the water solution to move deeper into the affected material structure and remain thermally active for longer periods.

Operationally, this results in:

- Improved deep-ground cooling
- Reduced underground thermal retention
- Reduced hidden hot spots
- Reduced flare-up probability
- Improved extinguishment of subsurface combustion

Wildfire Containment Advantage

In wildfire environments, this deep penetration effect contributes to both extinguishment and containment.

By carrying cooling capacity deeper into the vegetation and soil structure, CF7 assists in interrupting underground fire migration pathways that would otherwise continue spreading beneath the visible fire front.

This is particularly valuable in:

- Dry forest terrain
- Peat-rich ground
- Root-dense environments
- Mountainous wildfire zones
- Long-duration wildfires

where underground heat transfer can continue for extended periods even after surface suppression.

6. Re-Ignition Prevention

One of the major operational challenges in modern firefighting is retained internal heat.

Many fires appear extinguished visually while internal temperatures remain high enough for combustion to restart.

CF7 specifically targets this problem through prolonged cooling and thermal stabilization.

By continuing to extract heat after visible flame suppression, CF7 reduces the probability of:

- Thermal rebound
- Deep-seated hot spots
- Re-ignition
- Secondary flare-ups

This is especially important in:

- EV battery fires
- Waste bunkers
- Tire fires
- Biomass storage
- Wildfires
- Industrial process fires

7. Operational Advantages

Compared to Water Alone

Operational observations indicate that CF7 may provide:

- Faster knockdown times
- Longer cooling duration
- Reduced water consumption
- Improved heat penetration
- Improved subsurface cooling
- Lower re-ignition rates
- Improved containment of thermal spread

The exact performance depends on:

- Fire type
- Fuel composition
- Application method
- Mixing percentage
- Environmental conditions
- Fire load and depth

8. Practical Operational Summary

In simplified operational terms, Flamblocker CF7 works through five simultaneous mechanisms:

1. Rapid Flash Cooling

Immediate thermal shock and aggressive initial heat reduction.

2. Sustained Cooling

Extended active cooling duration beyond normal water evaporation behavior.

3. Thermal Isolation

Reduction of heat transfer and radiant heat propagation.

4. Fuel Surface Encapsulation

Formation of a residual layer that assists in separating combustible surfaces from active combustion.

5. Deep Penetration & Subsurface Cooling

Improved infiltration into porous and underground burning materials, enabling deeper heat suppression and reduced re-ignition risk.

Together, these mechanisms attack multiple elements of the fire triangle simultaneously, resulting in:

- Faster extinguishment
- Improved cooling
- Reduced fire spread
- Reduced underground heat retention
- Reduced re-ignition risk
- Improved wildfire containment efficiency

9. Disclaimer / Technical Positioning

The operational mechanisms described above are based on:

- Developer explanations
- Field observations
- Operational testing
- Practical firefighting behaviour observed during applications

Performance may vary depending on operational conditions, fire load, fuel type, environmental factors, and application methodology.

CF7 should always be used in accordance with applicable firefighting procedures, local regulations, and operational command structures.

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