



Note No. 2

Northern Forest Research Centre

Edmonton, Alberta

FOREST FIRE FLAME-INHIBITING (LONG-TERM) RETARDANTS USED IN CANADA

Chemical fire retardant compounds used in wild-fire control are manufactured according to prescribed formulations. Product quality control is carefully monitored during the manufacturing process. The level of performance of these products under field conditions may not necessarily reflect laboratory test criteria; therefore, the combustion inhibiting capabilities could vary across the wide range of forest fuel and fire circumstances to which they are applied.

There are no established specifications in Canada to which commercial retardant formulations must adhere. Accordingly, the following summary is presented solely as a source of product-specific information on the chemical, mixing, and other significant attributes of the fire retardant compounds currently marketed in Canada.

The information presented here has been synthesized and adapted from various sources and has been approved by the individual manufacturers. Inclusion of a product in this note does not imply endorsement or certification by the Northern Forest Research Centre or the Canadian Forestry Service.

Additional information, including costs, may be obtained from the respective product manufacturers as follows:

Fire-Trol Retardants:

Chemonics Industries (Canada) Limited
P.O. Box 745
1860 Kelly Douglas Road
Kamloops, B.C.
V2C 5M4

Phos-Chek Retardants:

Monsanto Canada Inc.
P.O. Box 201
464 Riverside Road
Abbotsford, B.C.
V2S 4N8

*R. Lieskovsky
R. Newstead*

April 1980



An aerial tanker releasing a load of long-term fire retardant.

FOREST FIRE FLAME-INHIBITING (LONG-TERM) RETARDANTS USED IN CANADA

Brand name	Composition ¹	Percentage	Mixing ratio		Mixed density	Viscosity ²
			kg/L (lb/gal) H ₂ O	kg/L (lb/gal) solution	kg/L (lb/gal)	mPa·s or centipoise
Fire-Trol 100	Ammonium sulphate (NH ₄) ₂ SO ₄ (21-0-0)	65.6	0.33 (3.30)	0.28 (2.80)	1.13 (11.3)	1500-2500 (20-40 s
	Attapulgate clay thickener	32.8				Marsh funnel
	Iron oxide coloring	1.1				large tip)
	Corrosion inhibitor	0.5				
Fire-Trol 931-L	Ammonium phosphate (Allied APP 10-34-0)	93.0	0.37 (3.70)	0.30 (3.00)	1.10 (11.0)	50-100 (45-60 s
	Attapulgate clay thickener and color carrier	4.0	at 4:1 ratio or	at 4:1 ratio or	at 4:1 ratio or	Marsh funnel large tip,
	Iron oxide coloring	1.5	0.30	0.25	1.08	concentrate
	Corrosion inhibitor	1.5	(3.00) at 5:1 ratio	(2.50) at 5:1 ratio	(10.8) at 5:1 ratio	only)
Fire-Trol 931 APS	Ammonium phosphate (MAP-DAP suspension 9.4-32.4-0)	93.0	0.29 (2.90) at 5:1 ratio	0.24 (2.40) at 5:1 ratio	1.07 (10.7) at 5:1 ratio	700-1700 (55-75 s Marsh funnel
	Attapulgate clay thickener and color carrier	4.0				large tip, concentrate
	Iron oxide coloring	1.5				only)
	Corrosion inhibitor	1.5				
	Guar gum thickener (liquid)	variable (0.5-1.6% by volume)				
Fire-Trol 934	Ammonium phosphate (Allied APP 10-34-0)	97.72	0.37 (3.70)	0.30 (3.00)	1.11 (11.1)	50-100
	Corrosion inhibitor	1.50	at 4:1 ratio	at 4:1 ratio	at 4:1 ratio	
	Wetting agent	0.78	(Note: Can be used at variable ratios, e.g., 6:1, 8:1, 10:1, etc.)			
Fire-Trol 936	All characteristics as in Fire-Trol 934 with exception of 0.10% biodegradable dye and 97.62% ammonium phosphate					
Phos-Chek XB	Monoammonium phosphate NH ₄ H ₂ PO ₄ (11-55-0)	89.0	0.14 (1.37)	0.13 (1.28)	1.06 (10.6)	1500-2000 (41-57 s
	Guar gum thickener	7.0				Marsh funnel
	Iron oxide coloring	2.0				large tip)
	Corrosion inhibitors and stabilizers	2.0				
Phos-Chek XB-H	Monoammonium phosphate NH ₄ H ₂ PO ₄ (11-55-0)	92.0	0.14 (1.37)	0.13 (1.28)	1.06 (10.6)	750-1000 (24-29 s
	Guar gum thickener	4.5				Marsh funnel
	Iron oxide coloring	1.5				large tip)
	Corrosion inhibitors and stabilizers	2.0				
Phos-Chek 259	Diammonium phosphate (NH ₄) ₂ HPO ₄ (21-53-0)	92.5	0.14 (1.37)	0.13 (1.28)	1.07 (10.7)	50-150 (40-55 s
	Guar gum thickener	2.5				Marsh funnel
	Iron oxide coloring	1.0				small tip)
	Corrosion inhibitors and stabilizers	4.0				

Salt content ³ % by wt in solution	Swellage % by volume	L solution/tonne powder or liquid conc. (gal/ton)	Packaging	Mixing procedure	Application	Storage
15.6	20	3597 (720)	22.7 kg (50 lbs) bags, 625 kg (1378 lb) bulk bins or bulk bags	High shear batch	Aerial— fixed wing	Wet or dry
8.5 P ₂ O ₅ equivalent at 4:1 ratio or 7.2 P ₂ O ₅ equivalent at 5:1 ratio	0	3377 (675) at 4:1 ratio or 4052 (810) at 5:1 ratio	Bulk or 304 kg (670 lb, 45 gal) drum Density: 14.8 lb/gal	Model 600 Canblender; Vari-blender (proportional volume pumping)	Aerial— fixed wing or helicopter	Concentrate only
6.7 P ₂ O ₅ equivalent at 5:1 ratio	0	4170 (832) at 5:1 ratio	Bulk or 295 kg (650 lb, 45 gal) drum Density: 14.4 lb/gal	Model 600 Canblender; Vari-blender (proportional volume pumping)	Aerial— fixed wing or helicopter	Concentrate only
In suspension						
8.6 P ₂ O ₅ equivalent at 4:1 ratio	0	3377 (675) at 4:1 ratio	Bulk or 304 kg (670 lb, 45 gal) drum, 33 kg (74 lb, 5 gal) pail Density: 14.8 lb/gal	Model 60 Canblender; Vari-blender (proportional volume pumping)	Ground or helicopter	Concentrate only
10.75 MAP (6.63 P ₂ O ₅ equivalent)	7	7820 (1560)	1 tonne Phos-bin (2204 lb)	Continuous flow eductor	Aerial— fixed wing	Wet or dry
11.11 MAP (6.86 P ₂ O ₅ equivalent)	7	7820 (1560)	1 tonne Phos-bin 25 kg (55 lb) bags	Continuous flow eductor	Aerial— helicopter	Primarily dry
11.06 DAP (5.95 P ₂ O ₅ equivalent)	7	7820 (1560)	1 tonne Phos-bin 25 kg (55 lb) bags or pails	Continuous flow eductor; Low shear batch	Ground or helicopter	Primarily dry

- ¹ Chemical abbreviations: APP = ammonium polyphosphate; APS = ammonium phosphate suspension; DAP = diammonium phosphate; MAP = monoammonium phosphate.
- ² Viscosity: millipascal second and centipoise are equivalent. All values in the table are Brookfield readings taken at temperatures between 18°C and 24°C (65-75°F) using a no. 2 spindle at 60 rpm for viscosities ≤500 mPa·s or a no. 4 spindle at 60 rpm for viscosities >500 mPa·s.
- ³ Similar P₂O₅ equivalents do not necessarily indicate identical levels of effectiveness, since P₂O₅ availability is influenced by impurities, additives, and the form of phosphate.

REMARKS

Fire-Trol 100

- Viscous slurry.
- Ammonium sulphate only two-thirds as effective as ammonium phosphate.
- Primarily effective in retarding flaming combustion.
- Economical but logistically inconvenient.
- Two-bag product, bulk bins or bulk bags.
- Mixing procedure slow, and mixer horsepower and mixing time critical (abrasive when in motion).

Fire-Trol 931-L

- Low viscous solution.
- Inhibits glowing and flaming combustion.
- Minimal handling.
- Mixing equipment versatile and offers wide range of mixing ratios.
- Demand mixing system for continuous production.

Fire-Trol 931 APS

- Qualities similar to Fire-Trol 931-L.
- Inhibits glowing and flaming combustion.
- Logistically convenient in tanker bulk form.
- In-line liquid gum mixing system available. Variable ratios produced on demand.
- Concentrate can be stored from season to season without significant loss of effectiveness.
- Liquid gum can be stored for extended periods with proper agitation and recirculation.
- Elasticity and cohesive properties improved with gum thickener.

Fire-Trol 934 and 936

- Qualities similar to Fire-Trol 931-L but no clay content; nonabrasive.
- Inhibits glowing and flaming combustion.
- Low viscosity for ease of pumping for ground application.
- Used in ground tanker and helicopter operations.
- Compact mixing system or liquid concentrate can be added directly to water in ground unit tank.
- Wetting agent added for fuel penetration.

Phos-Chek XB

- Viscous slurry.
- Inhibits glowing and flaming combustion.
- Readily mixed, with good quality control.
- Good cohesive properties, high elasticity.

Phos-Chek XB-H

- Lower viscosity for use with helicopters.
- Inhibits glowing and flaming combustion.
- Higher active salt content than Phos-Chek XB.
- Good cohesive and elastic properties.
- Compact portable mixing system.

Phos-Chek 259

- Low viscosity for ease of pumping for ground application.
- Formulated from industrial grade diammonium phosphate.
- Inhibits glowing and flaming combustion.

For further information contact:

Northern Forest Research Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5



Environnement
Canada
Environnement
Canada
Forestry
Service
Service
des Forêts

Minister of Supply and Services
Canada 1980