Condensed Aerosol Fire Fighting System Design

Project: BODEGAS ARCHIVO 2 - MINISTERIO TRANSPORTE - FONTIBÓN

December 2025

Reference number: Ministerio de Transporte-11582-2025



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1. Notes and assumptions

1. Design calculations of FirePro fire extinguishing systems are in accordance with the UL/NFPA standards (UL 2775 and NFPA 2010).
2. The system design and calculations are solely based on the information communicated by <name>, of <company name>, by email <email address> to <name>, FirePro Systems <position> and should be treated as indicative for the ultimate purpose of defining a BOM (see Disclaimer below). The system design and BOM may be subject to change(s) depending on updated information and clarifications provided during the detailed design stage.
3. The calculations, for the determination of FirePro extinguishing agent quantities, are made by assuming the existence of Class of Fire A.
4. It is assumed that all the protected areas are adequately sealed for Total Flooding action. In projects where openings exist, in order to prevent the loss of agent to adjacent hazards or work areas, openings shall be permanently sealed or equipped with automatic closures, in accordance with FirePro Guidelines "Technical Guidelines Condensed Aerosol - Fire Extinguishing System Solutions".
5. An Emergency Power-Off System should be implemented and activated prior to the release of the fire extinguishing agent in order to switch off any ventilation systems installed within the protected compartments/areas and/or power off all electrical and electronic equipment within the protected compartment/area.
6. The location of installation of the Condensed Aerosol Generators shall be in accordance and compliance with the applicable standards. The Condensed Aerosol Generators should be installed in such a way, by considering the minimum safe distances from the escape routes, combustible materials, and other areas where personnel may be present. During detailed / final design and installation it is strongly advised to consider the minimum clearance distances L2 (< 200ºC, safe distance from equipment or combustible material) and L3 (< 75ºC, safe distance from persons). For further information, please refer to chapter 8 of the UL FirePro Installation and User Manual.
7. The positioning and direction of discharge of each Condensed Aerosol Unit shall always take into consideration the safety distances, height restrictions and follow the guidelines included in the UL FirePro Installation and User Manual.
8. It is assumed that the protected areas are normally unoccupied and therefore the System is preconfigured to "Auto/Manual" mode. In case the protected area becomes occupied (e.g. personnel may enter for work/maintenance) the system shall be set from "Auto/Manual" to "Manual Only" mode, during the occupancy.

DISCLAIMER:

a. Any information provided by FirePro Systems, relevant to the system engineering of the project is indicative and for guidance purposes only.

b. It is the contractor's responsibility to verify whether any circuit design is compatible with the equipment used in the system. Furthermore, the responsibility for the preparation and/ or approval of a project, subject to its specifications/ technical features and its related documentation, designs or drawings adherence (e.g. design documentation, construction, as-built drawings, circuit diagram, cable lengths, and voltage drop calculations, etc.) to local, national and international laws and regulations, falls entirely within the scope of the contractor/ consultant assigned for the installation and commissioning.

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2. Project specific - additional notes

THE ADDITIONAL NOTES BELOW MUST BE MODIFIED ACCORDING TO PROJECT SPECIFICATIONS

1. In case of Electrical Cabinet protection, it is assumed that each cabinet is fully enclosed and separated from any surrounding compartments.
2. In case of Electrical Cabinet protection, special attention to Chapter 14 of FirePro Installation and User Manual (UL) shall be given.
3. In case of Electrical Cabinet protection, it is assumed that any panel louvers have outlet filters that are thick enough to prevent or at least minimize (significantly slow down) potential agent loss/dissipation outside the panel enclosure, in the event of extinguishing agent discharge.
4. In case any of the permanent openings contributing/resulting in a leakage area larger than 0.17% of the protected volume (Area m^2 to Volume m^3 ratio to be greater than 0.17%), then the extinguishing agent calculations need to be re-checked and re-adjusted to account for leakages by compensating with additional aerosol mass (if this is feasible).
5. For High Voltage applications (>1000 Volts), special attention should be taken for maintaining the minimum electrical clearance distances, as per relevant standards (e.g. NFPA 70:2017, EN 50110-1:2013), of any object which could be in close proximity with High Voltage equipment.
6. In the case of Room protection, in the occasion of the existence of a slightly sloped roof, an average individual height for each room has been assumed while preparing the indicative system design.
7. In the case of Room protection, on the occasion where there are any additional compartments to consider, either a false ceiling or raised floor (or both) in the two rooms to be protected, then the system design needs to be re-evaluated and adjusted accordingly. Such compartments can be ignored and remain unprotected only in case the material, separating those unprotected compartments from the protected areas, is made of fire-resistant material.
8. In the case where the compartment(s) / areas to be protected are comprised of a Room (main area) along with either a False Ceiling or a Raised Floor or both, these have been considered as a single total enclosure for Total Flooding Fire Extinguishing Application and are therefore part of one single Conventional Fire Alarm and Extinguishing System. This implies that for calculation purposes, these compartments have been treated as separate volumes, but for the purpose of fire detection, at any location of either of these protected compartments (**double knock - smoke and heat detection**), the Fire Alarm and Extinguishing System is designed to release the extinguishing agent simultaneously in the entire protected volume.
9. In relation to fire detection, with reference to BS 5839-1:2017 or equivalent, in the case when the room height is greater than the maximum height limit, 9.0m for Heat (RoR) and 10.5m for Smoke Detectors respectively, Conventional Smoke and Conventional Heat detection become unreliable for providing early detection. Some other national standards could have different height limitations, which could allow the installation of conventional detection systems at higher heights, however, those are requiring further attention and detailed study by the consultant/installer of the project.
10. The automatically calculated number of Conventional Smoke and Heat Detectors for the Consolidated BOM is according to BS 5839-1:2017. Please note that the selection of the Conventional Detectors is only indicative and based on the dimensions of the protected space. In case that the room structure requires more Detectors (e.g. number of concrete beams, irregular shape) then the quantity must be recalculated and adjusted accordingly.
11. In case when, due to excessive room height, the use of conventional fire detection is not feasible an Aspirating Smoke System is normally suggested in conjunction with a second Intelligent Fire Detection System which deemed

suitable for the specific case. Anyhow, it is strongly advised that a double-knock detection feature be implemented, by using two different detection technologies/systems, and this to be interfaced accordingly with the Master Fire Extinguishing Panel (detection zone 1, detection zone 2).

12. In case where the room height of the protected areas is excessive (greater than the maximum stream length of the Condensed Aerosol Generators), the positioning of the Condensed Aerosol Generators shall be such that the direction of each unit to be facing the floor at various angles. Also, the installation of the units shall be implemented at two levels, where at the lower level (level 1) 2/3 of the required units are being installed and on the upper level (level 2) 1/3 of the required units are being installed. See the diagram below for an illustrating example:

3. Indicative calculations

m = V * da

m = V * DAD

m = V * (EAD * SF * fa)

where:

m: Solid Mass of FirePro Compound (FPC) Required (g)

V: Protected Volume (m3)

da: Design Application Density (g/m3)

EAD: Extinguishing Application Density (g/m3)

SF: Safety factor (30%) = 1.3

fa: Additional Design Factors (%)

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4. BODEGAS ARCHIVO 2 - MINISTERIO TRANSPORTE - FONTIBÓN - project rooms

3.1. Room: ARCHIVO A

3.1.1. ARCHIVO A - Main room calculations

- **Space type:** Archives and Storage Areas
- **Number of doors:** 1
- **Shape:** rectangular
- **Width:** 4.6 m
- **Height:** 4 m
- **Length:** 4.3 m
- **Calculated volume:** 79.1200 m³
- **Class of fire:** Class A Fire - Combustible Solids - EAD: 84.0g/m³
- **Stream required:** 3.51m < 4 m (11 ft 11 in < 13 ft 1 in)
- **Safety factor:** 30%

Effective mass of FirePro discharged aerosol required:

8639.90g

Effective mass of FirePro discharged aerosol selected:

8700.00g

60.10g excess **(+0.70%)**

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Sufficient concentration.

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3.1.5. ARCHIVO A - Bill of materials

Aerosol generators:

Code	Model	Discharge Temperature (m)	Effective mass	Quantity	Total concentration
10150	FP-3000	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	3000g	**1**	3000g
10151	FP-5700	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	5700g	**1**	5700g

Electronics:

Code	Electronic	Category	Quantity
10423	Delta Abort Switch FP-K1823-10, VF1923-10	Control Panels - Switches	1
10424	Fire Alarm Bell GB6-24	Bells & Sounders	1
10446	Horn Strobe GEC24-15/75WR	Bells & Sounders	1
10502	Delta FS Releasing Fire Control Panel 115V (FP-K1810-12) K1810-12	Control Panels - Releasing Panels	1
10515	Delta Manual Extinguishant Isolation Switch FP-K1832-10, VF1832-10	Control Panels - Switches	1
10639	Conventional Heat Detector [Without Base] VF2020-00	Detection Items - Conventional Detectors	1
10907	Conventional Base for Detector 4'' VF2050-00	Detection Items - Conventional Detectors	2
10961	Conventional Photo Electric Smoke Detector - Ivory [Without Base] VF2044-00	Detection Items - Conventional Detectors	1
11411	Gas Discharge Sign LF20W	Bells & Sounders	1

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3.2. Room: ARCHIVO B - PISO 2

3.2.1. ARCHIVO B - PISO 2 - Main room calculations

- **Space type:** **Archives and Storage Areas**
- **Number of doors:** **1**
- **Shape:** **rectangular**
- **Width:** **4.9 m**
- **Height:** **3 m**
- **Length:** **4.5 m**
- **Calculated volume:** **66.1500 m³**
- **Class of fire:** **Class A Fire - Combustible Solids - EAD: 84.0g/m³**
- **Stream required:** **2.01m < 3.5 m (6 ft 6 in < 11 ft 11 in)**
- **Safety factor:** **30%**

Effective mass of FirePro discharged aerosol required:

7223.58g

Effective mass of FirePro discharged aerosol selected:

7700.00g

476.42g excess **(+6.60%)**

APPROVED

Sufficient concentration.

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3.2.5. ARCHIVO B - PISO 2 - Bill of materials

Aerosol generators:

Code	Model	Discharge Temperature (m)	Effective mass	Quantity	Total concentration
10149	FP-2000	T1 T2 T3 400°C 200°C 75°C 0 0 1.5	2000g	**1**	2000g
10151	FP-5700	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	5700g	**1**	5700g

Electronics:

Code	Electronic	Category	Quantity
10173	FirePro - Kentec Sequential Activator - Standard Box FP-SA/GEN3.0	Control Panel Accessories	1
10332	Simulation Lamp B3441 / 24V, MES 1.2W	Various - Other	2
10423	Delta Abort Switch FP-K1823-10, VF1923-10	Control Panels - Switches	1
10424	Fire Alarm Bell GB6-24	Bells & Sounders	1
10446	Horn Strobe GEC24-15/75WR	Bells & Sounders	1
10502	Delta FS Releasing Fire Control Panel 115V (FP-K1810-12) K1810-12	Control Panels - Releasing Panels	1
10515	Delta Manual Extinguishant Isolation Switch FP-K1832-10, VF1832-10	Control Panels - Switches	1
10639	Conventional Heat Detector [Without Base] VF2020-00	Detection Items - Conventional Detectors	1
10907	Conventional Base for Detector 4'' VF2050-00	Detection Items - Conventional Detectors	2
10961	Conventional Photo Electric Smoke Detector - Ivory [Without Base] VF2044-00	Detection Items - Conventional Detectors	1

11411	Gas Discharge Sign LF20W	Bells & Sounders	1

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3.3. Room: ARCHIVO GRANDE

3.3.1. ARCHIVO GRANDE - Main room calculations

- **Space type:** **Archives and Storage Areas**
- **Number of doors:** **1**
- **Shape:** **rectangular**
- **Width:** **24.2 m**
- **Height:** **6.73 m**
- **Length:** **16.35 m**
- **Calculated volume:** **2662.8591 m³**
- **Class of fire:** **Class A Fire - Combustible Solids - EAD: 84.0g/m³**
- **Stream required:** **5.01m < 8.4 m (16 ft 4 in < 27 ft 3 in)**
- **Safety factor:** **30%**

Effective mass of FirePro discharged aerosol required:

290784.21g

Effective mass of FirePro discharged aerosol selected:

296400.00g

5615.79g excess **(+1.93%)**

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Sufficient concentration.

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3.3.4. ARCHIVO GRANDE - Leakage calculations

Scenario: A

Openings to remain completely clear without the use of either, FirePro "LPS" (Leakage Preventions System) or Louvers.

- **Total Leakage (openings) Area: 4.3**

Compensation-free ratio: **0.17**

Leakage area: **4.53**

Volume to leakage area ratio: **0.16148056801053**

Permitted leakage area without need of additional aerosol compensation: **4.53**

0% Additional Aerosol

Aerosol generators (leakage)**:**

Code	Model	Discharge Temperature (m)	Effective mass	Quantity	Total concentration

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3.3.5. ARCHIVO GRANDE - Bill of materials

Aerosol generators:

Code	Model	Discharge Temperature (m)	Effective mass	Quantity	Total concentration
10151	FP-5700	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	5700g	**52**	296400g

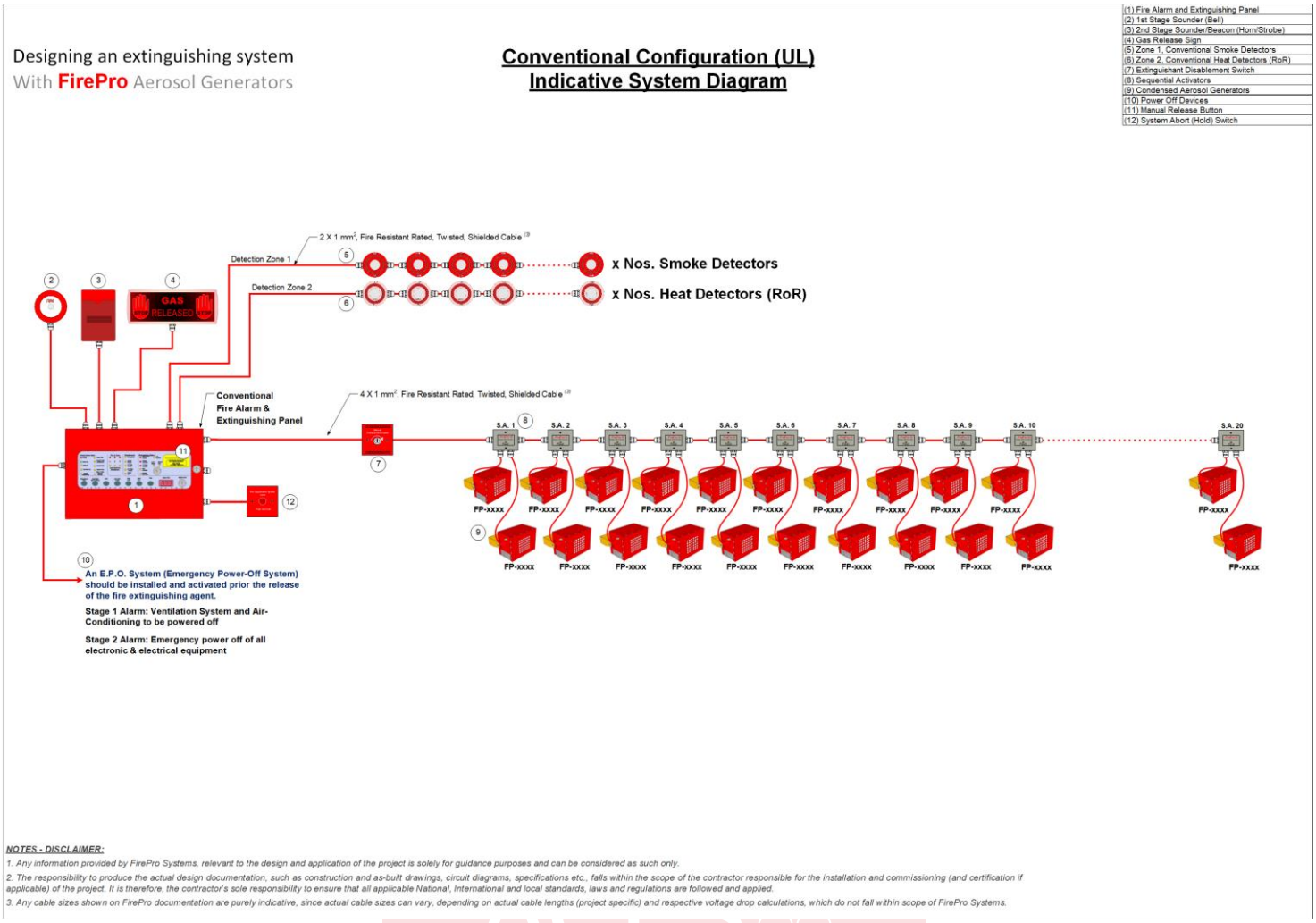
Electronics:

Code	Electronic	Category	Quantity
10173	FirePro - Kentec Sequential Activator - Standard Box FP-SA/GEN3.0	Control Panel Accessories	26
10175	FirePro Kentec Relay Box	Control Panel Accessories	1

	FP-RCB-8		
10332	Simulation Lamp B3441 / 24V, MES 1.2W	Various - Other	52
10423	Delta Abort Switch FP-K1823-10, VF1923-10	Control Panels - Switches	1
10424	Fire Alarm Bell GB6-24	Bells & Sounders	1
10446	Horn Strobe GEC24-15/75WR	Bells & Sounders	1
10502	Delta FS Releasing Fire Control Panel 115V (FP-K1810-12) K1810-12	Control Panels - Releasing Panels	2
10515	Delta Manual Extinguishant Isolation Switch FP-K1832-10, VF1832-10	Control Panels - Switches	1
10639	Conventional Heat Detector [Without Base] VF2020-00	Detection Items - Conventional Detectors	12
10907	Conventional Base for Detector 4'' VF2050-00	Detection Items - Conventional Detectors	18
10961	Conventional Photo Electric Smoke Detector - Ivory [Without Base] VF2044-00	Detection Items - Conventional Detectors	6
11411	Gas Discharge Sign LF20W	Bells & Sounders	1

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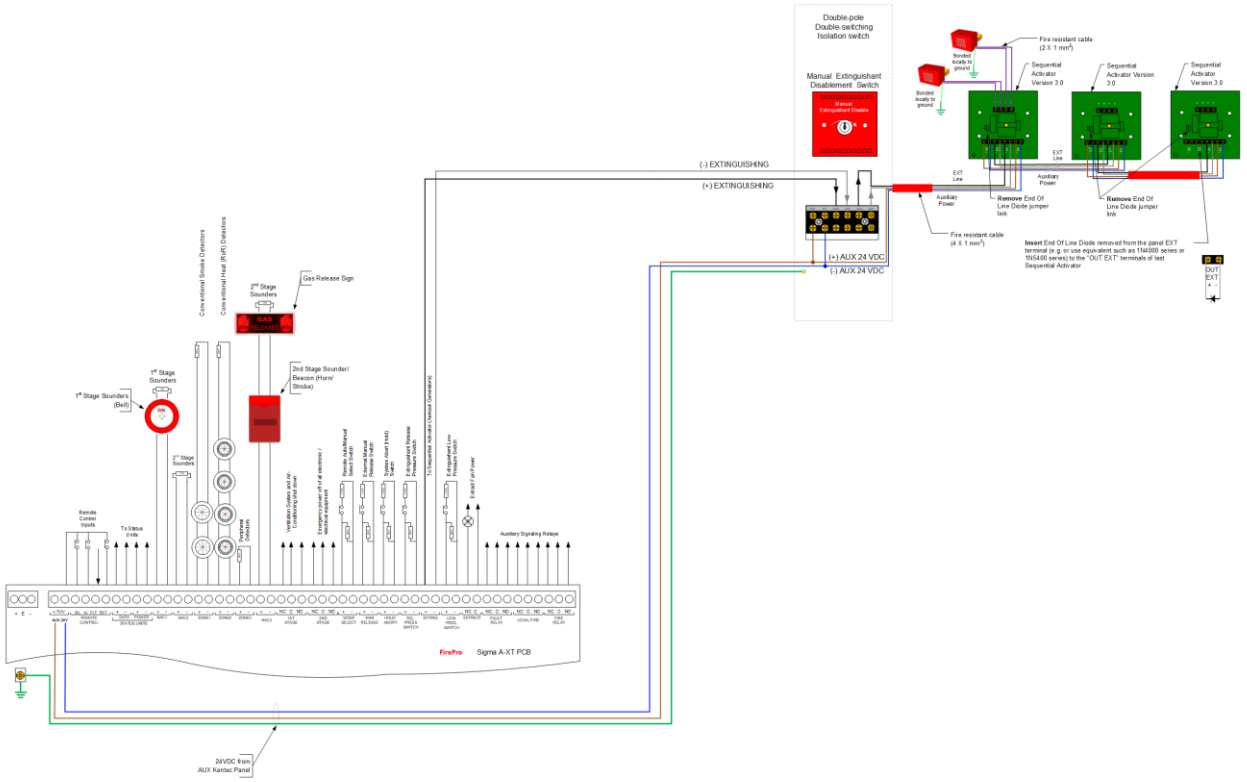
5. Indicative System Diagram (UL/ULC)



6. Indicative Wiring Diagram (UL/ULC)

Kentec Sigma A-XT Panel Wiring – Indicative Wiring Diagram

Designing an extinguishing system
With FirePro Aerosol Generators



NOTES - DISCLAIMER:

1. Any information provided by FirePro Systems, relevant to the design and application of the project is solely for guidance purposes and can be considered as such only.

2. The responsibility to produce the actual design documentation, such as construction and as-built drawings, circuit diagrams, specifications etc., falls within the scope of the contractor responsible for the installation and commissioning (and certification if applicable) of the project. It is therefore, the contractor's sole responsibility to ensure that all applicable National, International and local standards, laws and regulations are followed and applied.

3. Any cable sizes shown on FirePro documentation are purely indicative, since actual cable sizes can vary, depending on actual cable lengths (project specific) and respective voltage drop calculations, which do not fall within scope of FirePro Systems.

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7. Consolidated list of materials

Aerosol generators:

Code	Model	Discharge Temperature (m)	Effective mass	Quantity	Total concentration
10149	FP-2000	T1 T2 T3 400°C 200°C 75°C 0 0 1.5	2000g	**1**	2000g
10150	FP-3000	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	3000g	**1**	3000g
10151	FP-5700	T1 T2 T3 400°C 200°C 75°C 0 0.6 2	5700g	**54**	307800g

Electronics:

Code	Electronic	Category	Quantity
10173	FirePro - Kentec Sequential Activator - Standard Box FP-SA/GEN3.0	Control Panel Accessories	27
10175	FirePro Kentec Relay Box FP-RCB-8	Control Panel Accessories	1
10332	Simulation Lamp B3441 / 24V, MES 1.2W	Various - Other	54
10423	Delta Abort Switch FP-K1823-10, VF1923-10	Control Panels - Switches	3
10424	Fire Alarm Bell GB6-24	Bells & Sounders	3
10446	Horn Strobe GEC24-15/75WR	Bells & Sounders	3
10502	Delta FS Releasing Fire Control Panel 115V (FP-K1810-12) K1810-12	Control Panels - Releasing Panels	4
10515	Delta Manual Extinguishant Isolation Switch FP-K1832-10, VF1832-10	Control Panels - Switches	3
10639	Conventional Heat Detector [Without Base]	Detection Items - Conventional	14

	VF2020-00	Detectors	
10907	Conventional Base for Detector 4'' VF2050-00	Detection Items - Conventional Detectors	22
10961	Conventional Photo Electric Smoke Detector - Ivory [Without Base] VF2044-00	Detection Items - Conventional Detectors	8
11411	Gas Discharge Sign LF20W	Bells & Sounders	3

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