2. Fire Services Part 2

2.2 Testing, operation and maintenance

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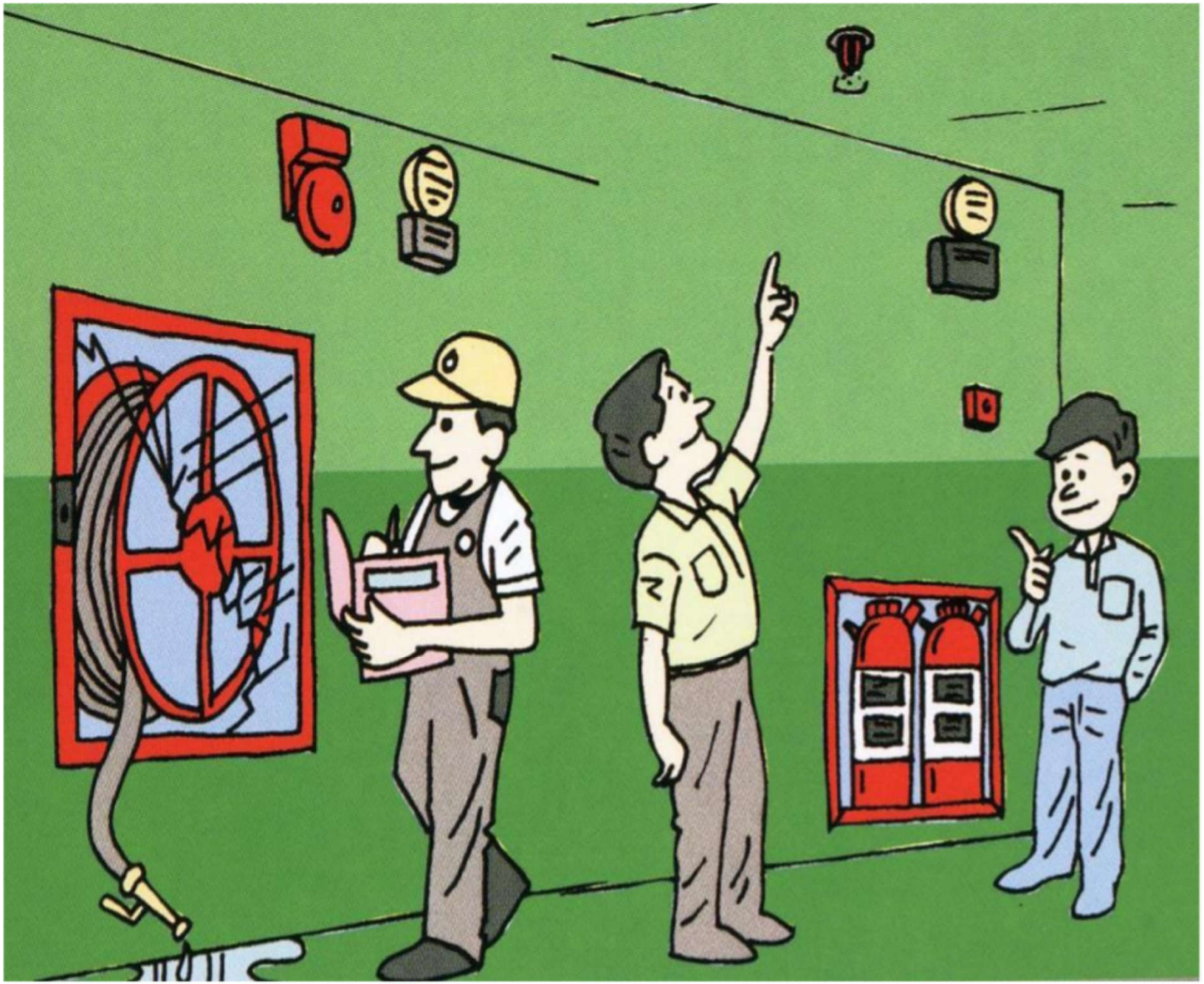
Contents

- Testing of FSI & equipment
- Acceptance test & inspection
- Maintenance of FSI
- False alarm management

Fire Safety Checklist

https://www.hkfsd.gov.hk/eng/source/safety/efschlst.pdf



Testing of FSI & equipment

- Code of Practice for Inspection and Testing of Installation and Equipment [with CoP-FSI]
  - Carried out by a Fire Services Inspecting Officer by arrangement with the Authorized Person (AP) and the registered fire service installation contractor (RFSIC)
  - Acceptance testing & maintenance requirements
  - Fire Services Certificate (F.S. 172)
  - Certificate of FSI & Equipment (F.S. 251)

Testing of FSI & equipment

- Checklists are provided in appendix of CoP
  - Actuating devices & operation of fire shutter
  - CO_2/Clean agent extinguishing system
  - Emergency generator installation
  - Fire detection & fire alarm system
  - Fire hydrant & hose reel installation
  - Staircase pressurization system
  - Street fire hydrant system

Testing of FSI & equipment

- Other appendices in CoP
  - Minimum fire resisting cable requirements
  - Shutdown of FSI for inspection, maintenance, modification or repair
  - Statutory requirements for maintenance, inspection & repair of FSI & examination, testing & certification of gas cylinders used as FSI
  - Fire extinguishers, fire blankets & sand buckets (suitability & maintenance)

Testing of FSI & equipment

- Typical tests for fire service installations
  - Water system tests
  - Electrical and alarm system
  - Gaseous extinguishing system
  - Emergency lighting and exit sign
  - Emergency generators
  - Hot smoke tests

- Statutory inspection/commissioning and inspection by the Authority

Testing of FSI & equipment

- Licensing & certification
  - Types of licensed/registered premises
    - Food premises
    - Places of public entertainment
    - School premises/child care centre
    - Dangerous goods premises
    - Private columbaria
    - E-waste disposal
  - https://www.hkfsd.gov.hk/eng/fire_protection/licensing/premise_type.html

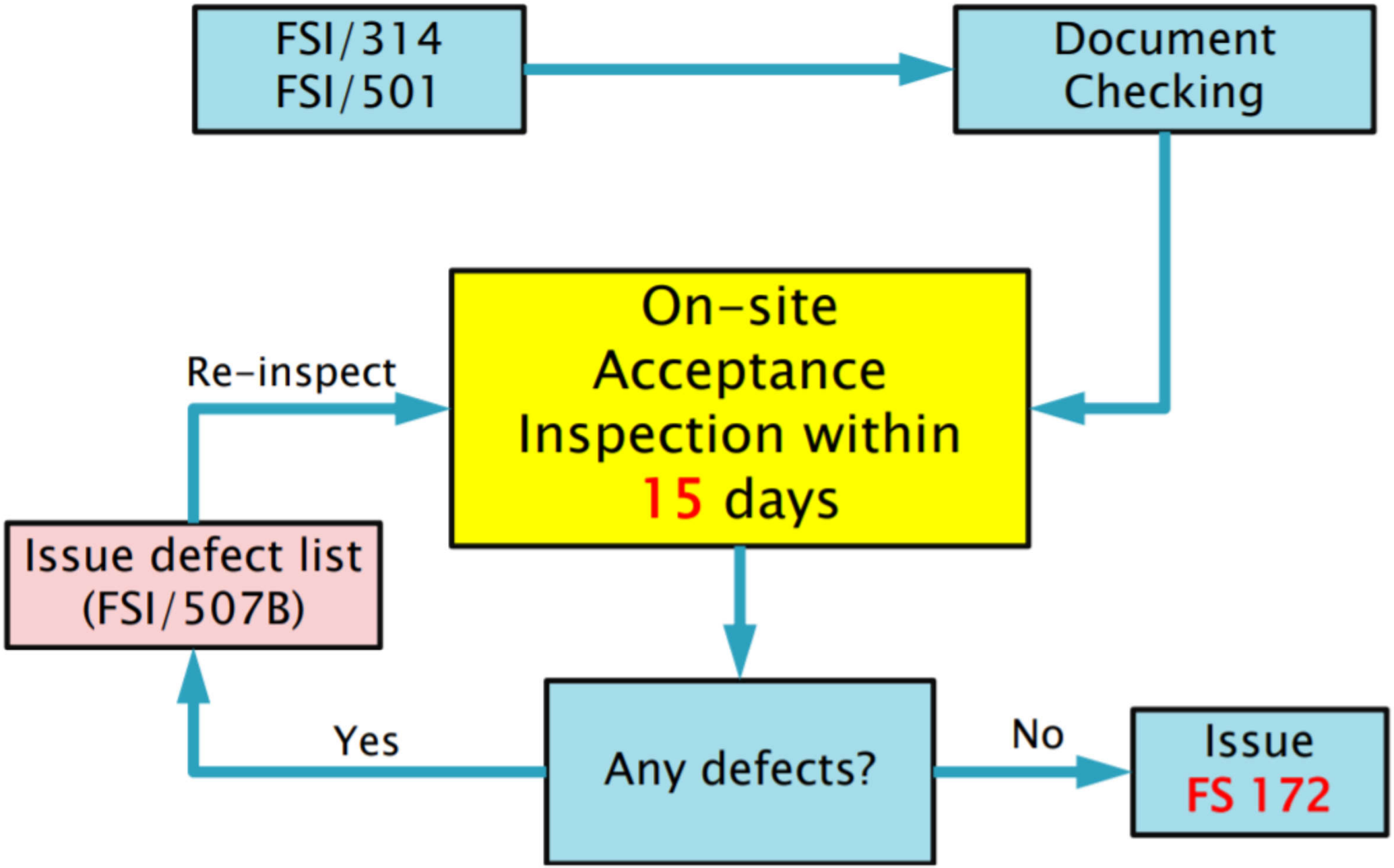
Testing of FSI & equipment

- New construction
  - Approval/Acceptance of FSI & equipment
- Existing buildings
  - Annual Inspection of Building Fire Service Installation or Equipment 樓宇消防裝置或設備周年檢查
- Flow Chart for FSI Acceptance Inspection and Issuance of Certificate
  - https://www.hkfsd.gov.hk/eng/source/flowchart.pdf

Testing of FSI & equipment

- Procedures for acceptance inspection of FSIs (under FSD Circular Letter No. 1/2015)
  - Form FSI/501: application form
  - Form FSI/314 with two sets of as-fitted FSI layout plans (* smoke control systems required prior approval)
  - Testing and commissioning (T&C) checklists
  - FSI equipment list & relevant supporting document

Workflow for FSI acceptance inspection



[Source: HKFSD]

Form FSI/501 – Part A sign by RFSIC

Part A :

The above installations / equipment have been installed at (address of premises)

Sample

Peace Commercial Building, No. 28 Happy Lane, Lamma Island

have been installed

and the installation work was completed on 20/09/2017. I hereby certify that such installations / equipment in accordance with the FSI plans submitted under the cover of FSI/314 (Rev. 08) dated 07/10/2017 have been inspected and are in efficient working order.

* *Copies of completed checklist, equipment test reports and catalogue/data sheets* are attached

certify that such installations / equipment

Office address : 18/F, ABC Building, No. 38 Hong Chong Road, Tsim Sha Tsui, Kowloon

Name in Full: Char
(Class 1 & 2)

have been inspected and
are in efficient working order

Signature :

Registration no. : RC1/ 8899 RC2/ 8899 RC3/ 7788

Date : 07/10/2017 Office Chop :

40

[Source: HKFSD]

Form FSI/501 – Part B sign by AP

Sample

Part B :

I, Lee Mei Lai , Authorized Person, certify that the above installations have been installed in accordance with the approved building plans stamped by FSD on 1/8/2017 & 2/10/2017 and, in my opinion they are ready for inspection.

The Fire Service Completion Advice from Water Supplies Department in respect of Fire Service Installations *(*copy attached)* requiring Government water mains connection has

certify that installations have been installed

service with normal telephone provision pending the connection of direct telephone link for the fire service installation(s) is attached herewith.

in accordance with the approved building plans

telephone no. 33445566 for collection.

I also certify that the building gross floor area as defined under the Buildings Ordinance is 12,340 m² and the type of building is ~~*domestic*~~ / *non-domestic*.*

ready for inspection

Office name : Lee . : 33445566

Office address : 38/ , Hong Kong Island

Signature of Authorized Person :

Full Name of Authorized Person : Lee Mei Lai Date :07/10/2017

(Rev. 01/2012)

[Source: HKFSD]

Form FSI/314 – Part I sign by AP

FSI/314

Sample

Appendix A

To : Director of Fire Services

Fire Service Installation Plans for Building at

certify that the fire service installation plans

Part I

This is to certify that the attached fire service installation plans are identical to the building plans approved by you on 01/08/2017 . Your file reference is *FP 8 / ~~43~~ / 12345 .

identical to the building plans approved

Part II

This is to certify that the details and specifications of all installations shown on the attached fire service installation

[Source: HKFSD]

Form FSI/314 – Part II sign by RFSIC

Part II

This is to certify that the details and specifications of all installations shown on the attached fire service installation plans are as prescribed by the Fire Services Department and in accordance with the relevant Rules and Codes of Practice as listed below :-

☐ **Rules of Fire Offices' Committee for :**

☐ Automatic Sprinkler Installations (29th Edition)

certify that the details and specifications of all installations

☐ **Codes of National Fire Protection Association for :**

☐ Carbon Dioxide Extinguishing Systems (Standard 12)

☐ Clean Agent Fire Extinguishing Systems (Standard 2001)

☐ Water Spray Fixed Systems for Fire Protection (Standard 15)

☒ **Codes of Practice for Minimum Fire Service Installations and Equipment, Fire Services**

are as prescribed by FSD Relevant Rules and Codes of Practice

☐ Smoke Extraction Systems ☐ Staircase Pressurization Installations

☒ **Others**

Visual Fire Alarm System, Street Fire Hydrant System

Signed Chan Date 07/10/2017

Full Name of FSI Contractor/Consultant ABC Engineering Company Limited

Correspondence Address 18/F, ABC Building, No. 38 Hong Chong Road, Tsim Sha Tsui, Kowloon

[Source: HKFSD]

Acceptance test & inspection

- Fire service installation (FSI) being tested:
  - 1. Automatic sprinkler system
  - 2. Manual fire alarm (MFA) system
  - 3. Fire hydrant & hose reel (FH/HR) system
  - 4. Emergency light
  - 5. Automatic cut-off device for mechanical ventilating system (ventilation/air conditioning control system)
  - 6. Portable fire extinguisher

Acceptance test under Cap 572: document list for inspection

1. Delegation letter from Owner / Occupier
2. Water Authority - Fire Service Completion Advice
3. Water tank calculation (effective volume)
4. Checklist for FH/HR System
5. Checklist for Fire Detection and Fire Alarm System
6. Calculation for battery capacity
7. Equipment list and equipment approval letters, technical specification and catalogues etc. for FSIs
8. Connection of direct telephone line (DTL)
9. Consent from BD for the associated building works related to FSIs

[Source: https://www.hkfsd.gov.hk/eng//source/safety/Cap_572_Process_procedure_Acceptance_Test_PPT_eng.pdf]

Sprinkler system pump (system pressure & flow proving test)

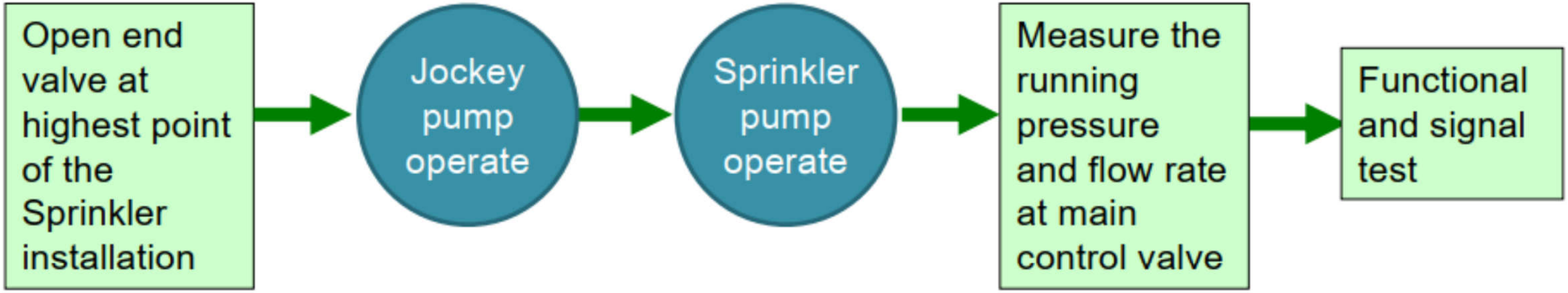


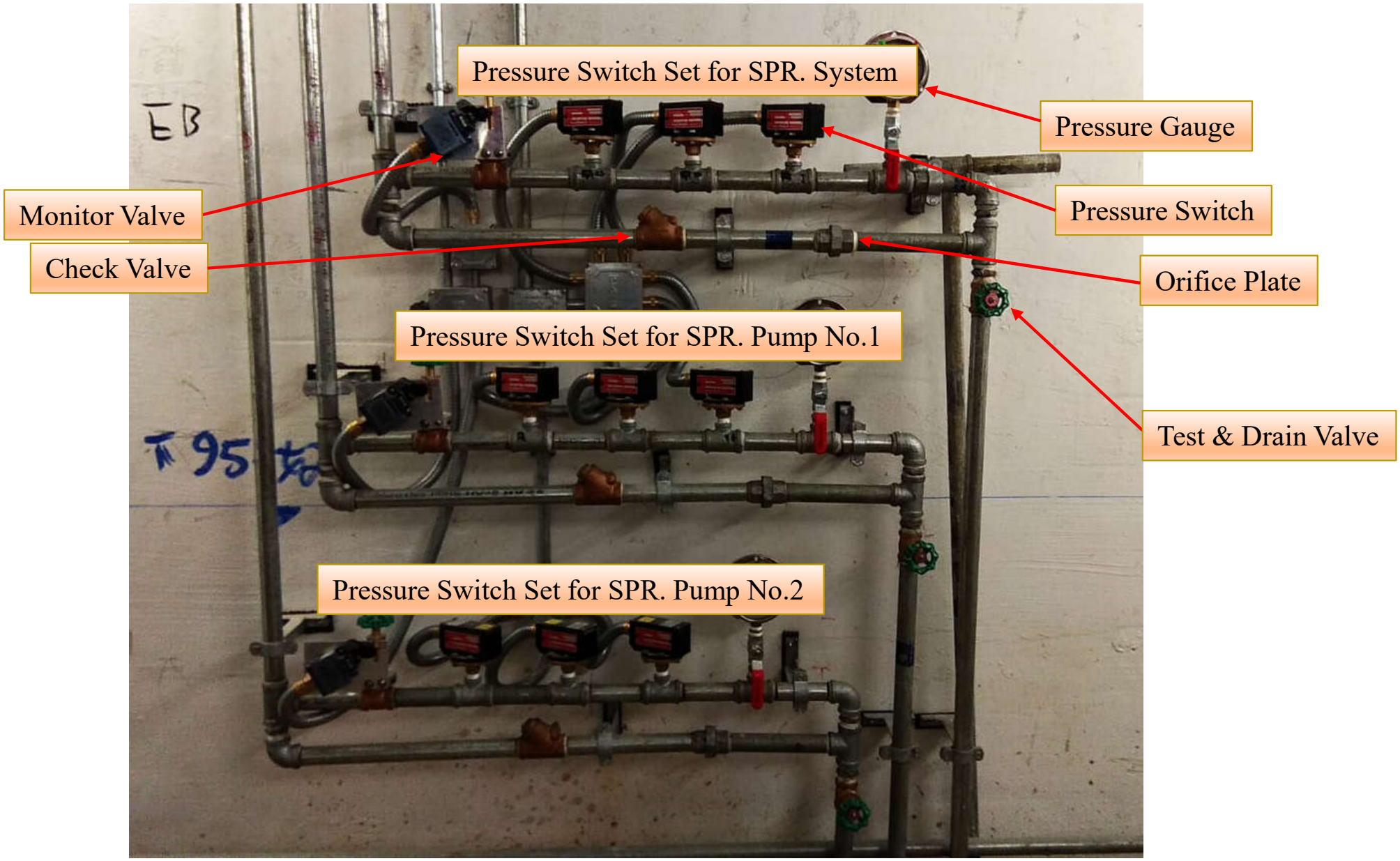
Table 15 — Pressure and flow requirements for ordinary-hazard installations

Hazard group	Lower flow rate		Higher flow rate	
	Pressure at "C" gauge or section stop valve	Flow rate through installation test valve	Pressure at "C" gauge or section stop valve	Flow rate through installation test valve
	bar	L/min	bar	L/min
I	1.0 + S[a]	375	0.7 + S[a]	540
II	1.4 + S[a]	725	1.0 + S[a]	1 000
III	1.7 + S[a]	1 100	1.4 + S[a]	1 350
IIIS	2.0 + S[a]	1 800	1.5 + S[a]	2 100

[a] S is the static pressure difference between the "C" gauge and the highest sprinkler in the installation.

[Source: HKFSD]

Pressure switch assembly for sprinkler system



Acceptance test & inspection

- Sprinkler pump functional test
  - Pump changeover (electrical fault)
  - Pump changeover (mechanical fault)
  - Control circuit “fail safe” test
  - Pump output (nominal flow)
- Sprinkler system functional test
  - Water alarm gong, direct telephone line, micro switch, flow switch, equipment & materials, sprinkler layout

Annual inspection checklists for sprinkler system (1 of 3)

Type of Water Supply

Sprinkler Pump Installation

Sprinkler Intermediate Booster Pump Installation

Sprinkler Inlet

Pressure Reducing Valve (PRV)

[Source: HKFSD]

Annual inspection checklists for sprinkler system (2 of 3)

Sprinkler Control Valve

Water Columning Prevention Device(s)

Flow Switch

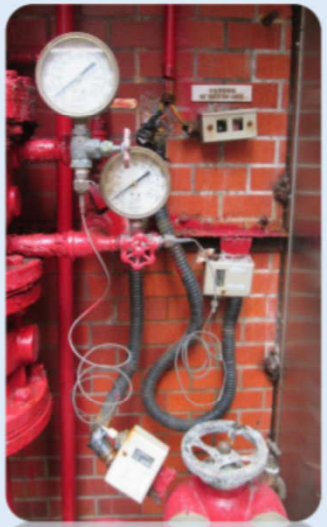
Subsidiary Stop Valve

Sprinkler and Multiple Jet Control (MJC)

[Source: HKFSD]

Annual inspection checklists for sprinkler system (3 of 3)

Other Observations

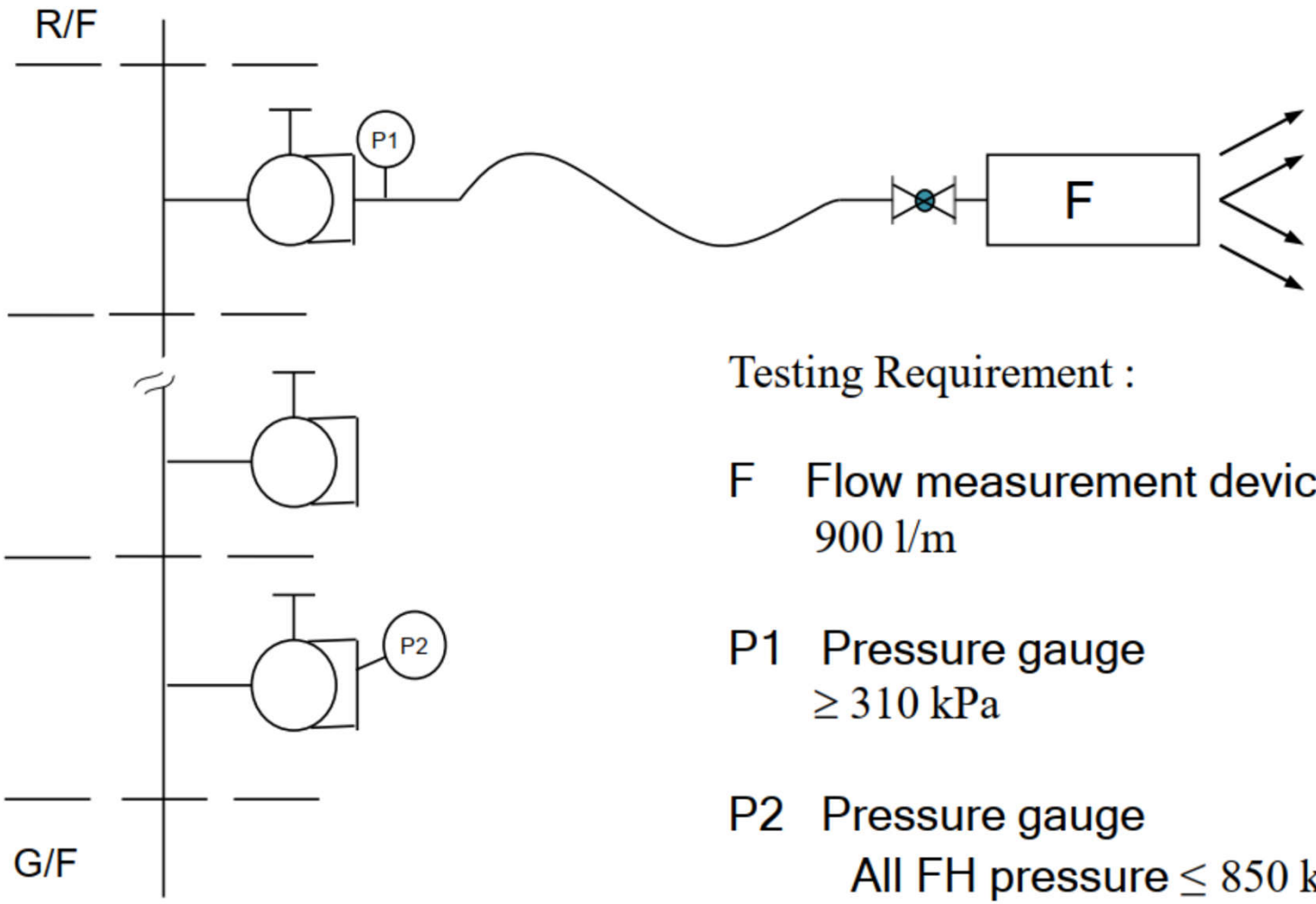


[Source: HKFSD]

Acceptance test & inspection

- FH/HR acceptance test
  - (a) Fixed fire pump
    - Flow & pressure test
    - Functional test (automatic changeover)
  - (b) Manual fire alarm & hose reel
    - Activate the manual fire alarm call point (break glass)
    - Projection of hose reel jet not less than 6 m
  - (c) Fire hydrant intermediate booster pump
  - (d) Fire control panel & equipment compliance check

Equipment arrangement for testing of fire pumps

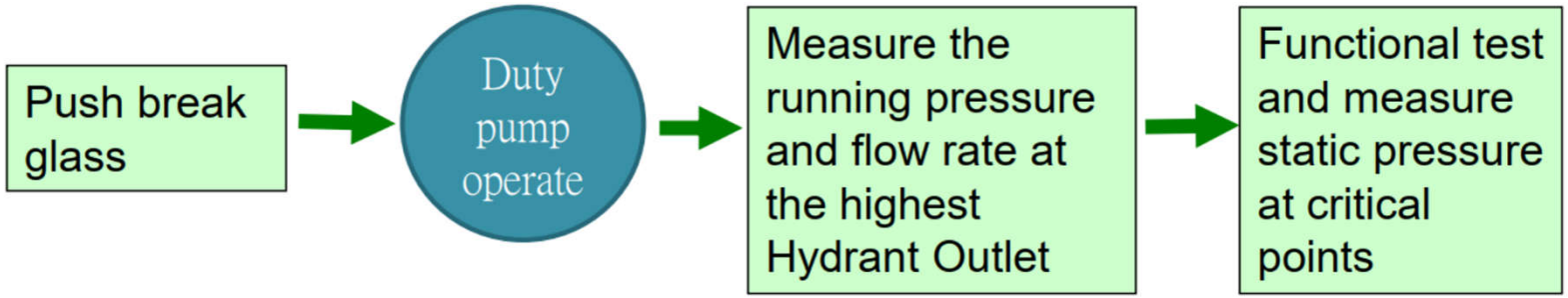


Testing Requirement :

F Flow measurement device
900 l/m

P1 Pressure gauge
≥ 310 kPa

P2 Pressure gauge
All FH pressure ≤ 850 kPa



[Source: HKFSD]

Testing of fire hydrant intermediate booster pump

Connect fire engine to FS inlet at a pressure 8 bars → Remote "start" at FS inlet → Duty pump operate → Measure the running pressure and flow rate at the highest point of HR outlet → Functional test and measure static pressure at critical points





[Source: HKFSD]

Testing of fire hydrant intermediate booster pump

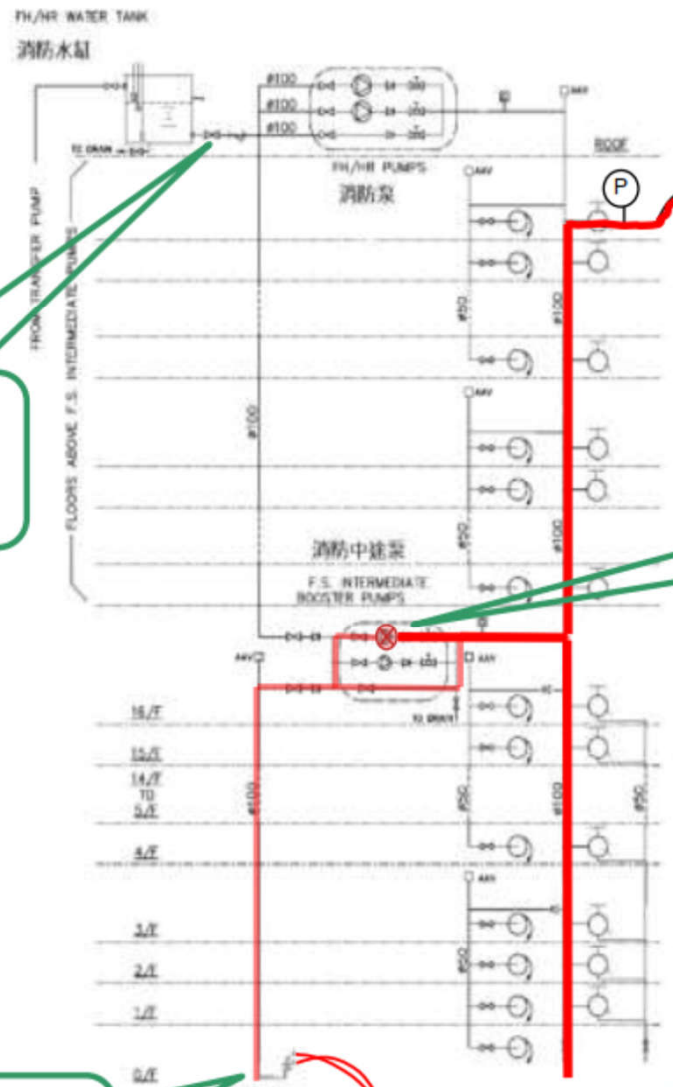
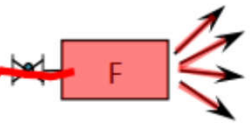


Figure for typical arrangement for testing of intermediate booster pumps



F 900 l/m/
P ≥ 310 (kPa)

a. Testing of bypass pipe

Turn off the water tank outlet valve

b. Testing of Intermediate pump

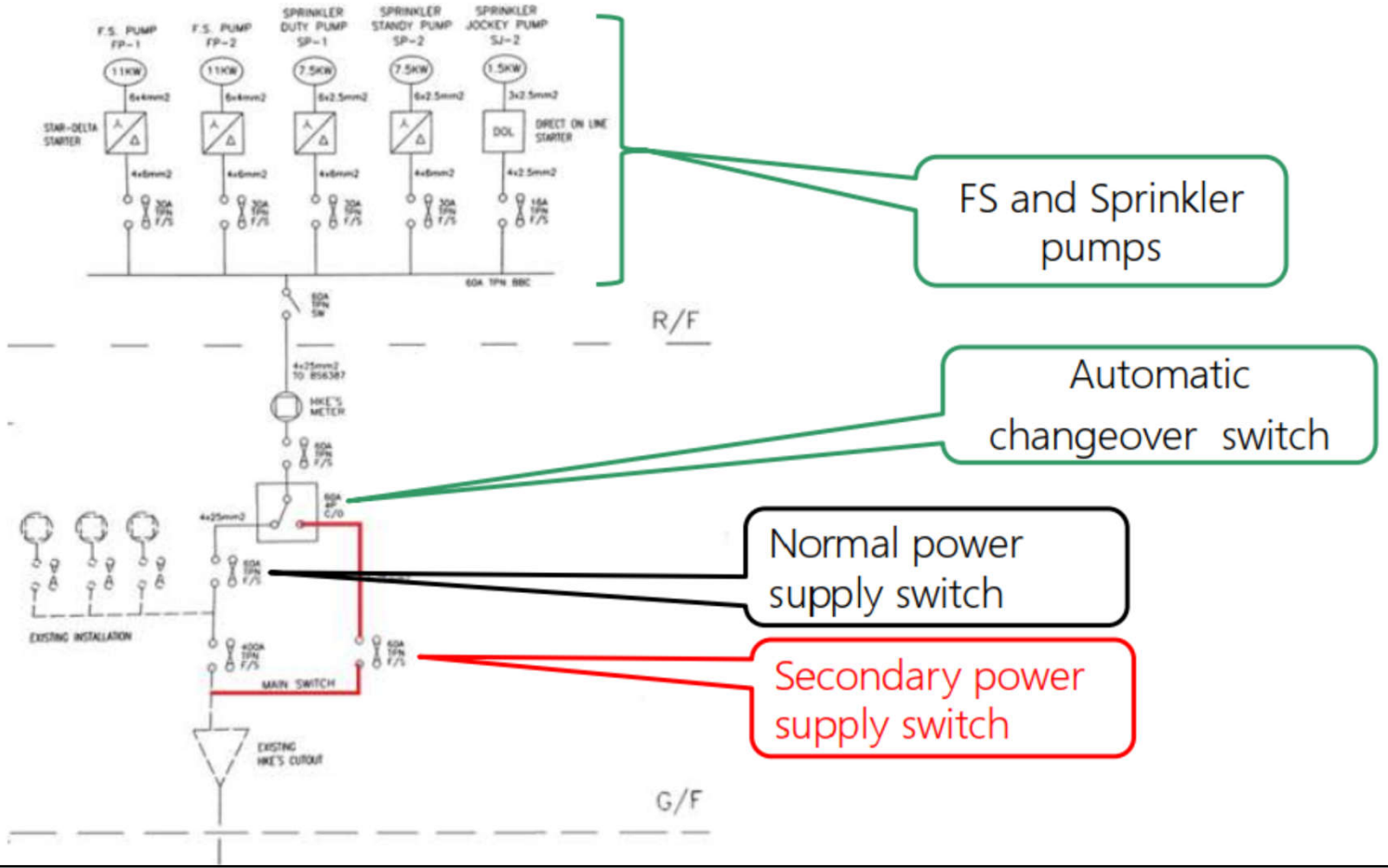
Fire Engine maintain pressure 800kPa

[Source: HKFSD]

Secondary power supply test

Operate all Systems in full load condition → Switch off "normal" power supply → Automatic changeover to "Secondary supply" within 15 sec. → Equipment status maintained without interruption as before

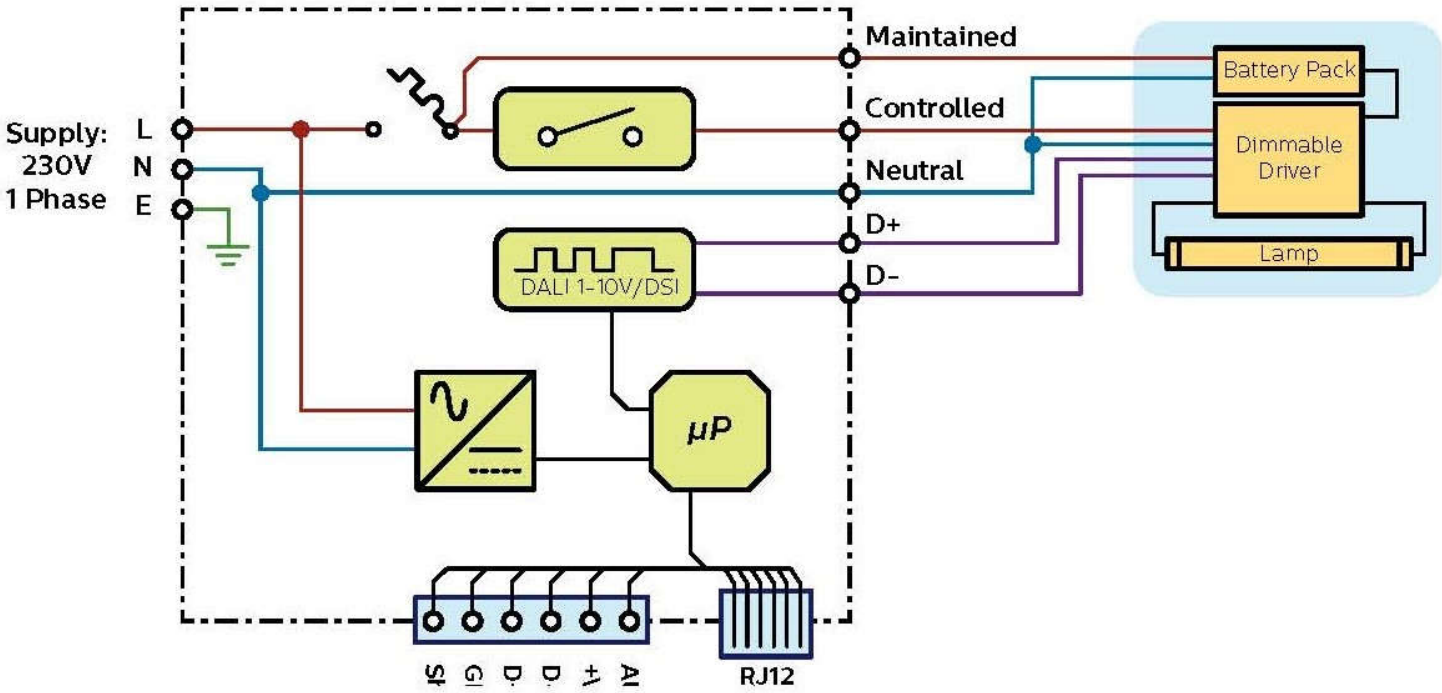
Electrical Schematic Diagram for FSIs



[Source: HKFSD]

Acceptance test & inspection

- Emergency lighting test
  - Self-contained type emergency luminaries (surface-mounted or recessed)



Ventilation/Air conditioning control (VAC) systems

Method	Activated by	Ventilating System to be shut down
A	Smoke Detector (AFA System)	Affected Compartment
B	Probe Type Smoke Detector	Affected Compartment
C	Building Fire Alarm	Whole Building

- Method A: VAC control activated by smoke detector (AFA System)
- Method B: VAC control activated by probe type smoke detector
- Method C: VAC control activated by building fire alarm system
- Manual override switch

[Source: HKFSD]

Acceptance test & inspection

- Portable fire extinguisher
  - Visual inspection
  - Labelling of fire extinguisher
    - Maintenance label

Contractor Name
承建商名稱 : _____

Registration No.
註冊編號 : RC3/_____

Maintenance Date
保養日期 : _____

Valid until
有效日期至 : _____

Date of Hydraulic
Pressure test
壓力試日期 : _____

FS251 Serial No.
保養證書編號 : _____

Common defects during FSI compliance check (1 of 2)

- Labelling for FS/sprinkler water tank & capacity are not provided
- Labelling for FS/sprinkler tank & capacity are not clear
- FS pumps housed in not suitable enclosures (intermediate booster pump should be enclosed by FRP material)
- Labels of FS pumps are not provided
- Static pressure of fire hydrant exceeds 850kPa (8.5 bar) limit
- Hand wheel of fire hydrant not ease for operation
- Fire hydrant with missing hand wheel

- Hose reel operation instruction plate missing
- Incorrect hose reel operation instruction plate
- Hose reel cabinet door obstructing means of escape
- Non-combustible material shall be used in common area
- Hose reel nozzle installed not higher than 1350 mm
- Hose reel cabinet signage & operation plate are not provided

[Source: HKFSD]

Common defects during FSI compliance check (2 of 2)

- Label, operation & instruction plate of fire hose reel is not provided
- No identification plates for FS & sprinkler inlet
- Enclosure for FS inlet is not provided
- FS inlet is not readily accessible (enclosure too small)
- FS inlet cabinet door obstructs or interferes with the main exit
- FS inlet should be installed outside the main gate
- Direct telephone line (DTL) not connected
- Permanent label of switch for FS pump should be provided
- Socket outlet/plug shall not be used for emergency light
- Insufficient sprinkler coverage
- Spare sprinkler head should be provided adjacent to sprinkler control valve
- Sprinkler inlet & control valve should be enclosed and locked to prevent unauthorized tampering
- VAC manual override switch label is not provided
- VAC manual override switch should not be installed inside the main entrance gate

[Source: HKFSD]

Acceptance test & inspection

- Points to note for new construction
  - All FSI systems (equipment) under construction/incomplete stage should be provided with proper labels/coverings such that the local residence would be alerted not to use these FSI equipment
  - Record of as-fitted drawings with FS251 shall be provided to Owner/Occupier for the identification of works completed

Acceptance test & inspection

- Factors making acceptance inspection/ functional test IMPOSSIBLE
  - Electricity power supply for FSIs unavailable
  - Water for water-based FSIs unavailable (* test continues if temporary water supply available)
  - Incomplete installation of FSIs
  - Numerous defects of FSIs
  - Incomplete building works (e.g. missing of fire doors for staircase pressurization system)
  - Temporary structures (e.g. blockage of sprinkler heads by working platform)

Incomplete pipework of sprinkler system

[Source: HKFSD]

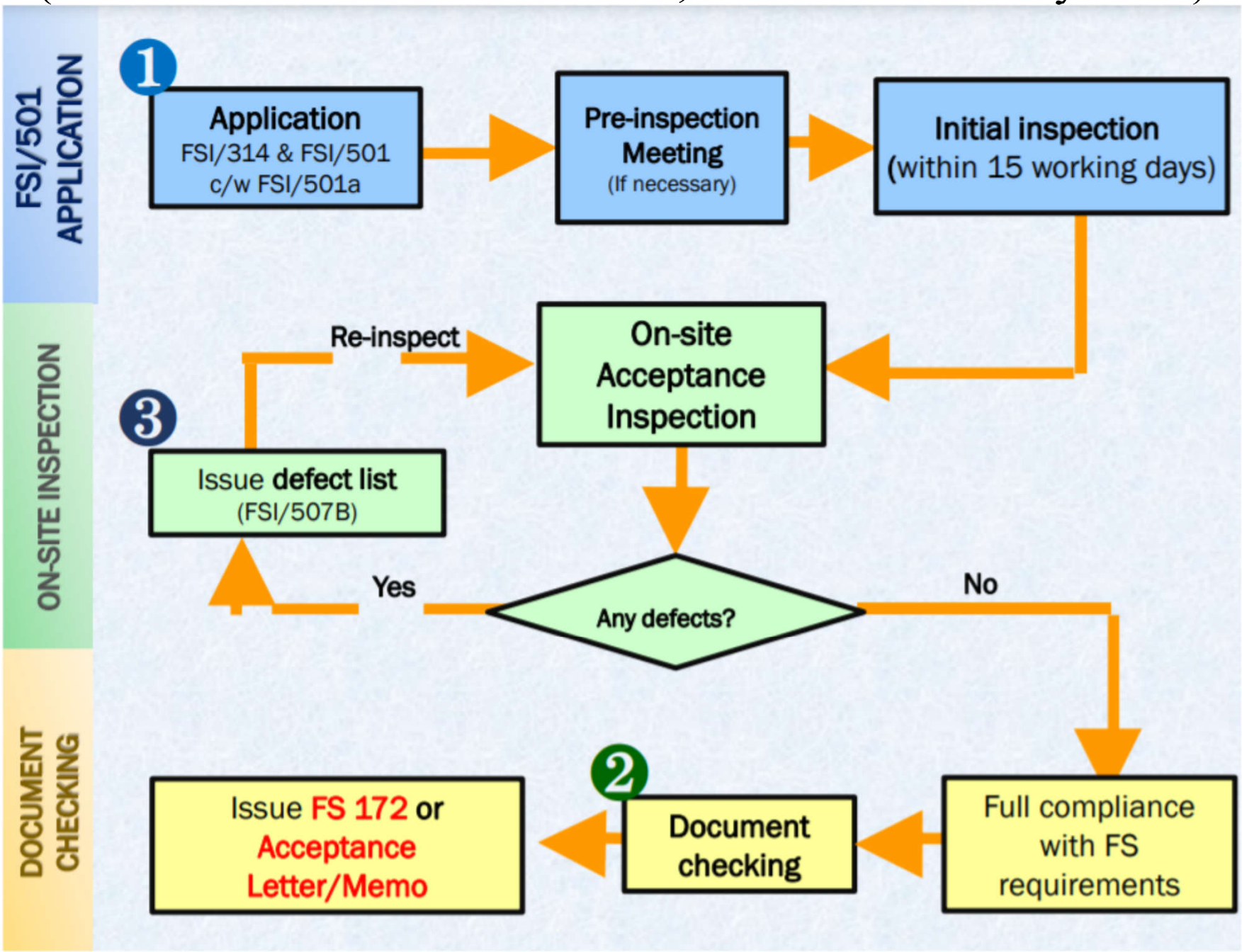
Unavailable secondary power supply for FSIs and incomplete installation of emergency generator

[Source: HKFSD]

Acceptance test & inspection

- Methods to streamline the process of acceptance inspection
  - Pre-inspection meeting with AP & RFSIC
  - Documents checking
  - Formulation of inspection schedule
  - Prepare inspection checklist for FSI acceptance
  - Ensure site readiness & safety
  - Provide early submission for fire engineering design

Revised workflow for FSI acceptance inspection (FSD Circular Letter No.1/2020, effective on 1 May 2020)



[Source: HKFSD]

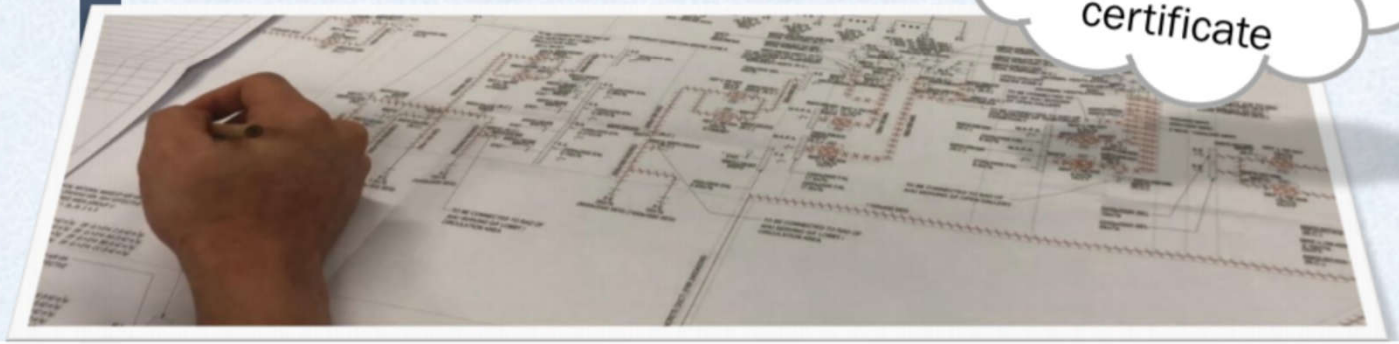
Temporary measure for FSI plans amendment

Temporary measure for FSI plans amendment

- Facilitation for the document checking process
- Option for RFSICs to amend FSI plans outside FSD's office
- With immediate effect

Maintain Social Distancing

Speed up the process of issuing FS certificate



消防處
牌照及審批總區
香港九龍尖沙咀東部麼near道1號5樓
消防總部大廈

FIRE SERVICES DEPARTMENT
LICENSING AND CERTIFICATION COMMAND
FIRE SERVICES HEADQUARTERS BUILDING,
No.1 Hong Cheung Road, 5/F,
Tsim Sha Tsui East, Kowloon,
Hong Kong

本處檔號 Our Ref.: (76) in FP 209/G/IX
來函檔號 Your Ref.:
傳真 Fax: (852) 2367 3631
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3 July 2020

To: Recipients of FSD Circular Letters

Dear Sir/Madam,

Temporary Measure for Making Minor Amendments to Fire Service Installations (FSI) Plans subsequent to FSI Acceptance Inspection of New Buildings

There are often cases where approved FSI plans of new buildings call for minor amendments after the completion of FSI acceptance inspection, and the usual practice is to have the amendments made by the Registered Fire Service Installation Contractors (RFSICs) in the office of the FSI Division of the Fire Services Department (FSD). To address the requirement for social distancing in the current pandemic situation and to speed up the process of issuing Fire Services Certificate or acceptance memo/letter, we have introduced a temporary measure **with immediate effect** for such cases.

Instead of doing the amendment work in the FSI Division office, the RFSICs may now opt to make arrangements with the case officer of the FSI Division, under which they can collect the approved FSI plans from the officer and have the minor amendments made outside FSI Division Office. A flowchart of the temporary arrangement is shown in the Appendix for easy reference.

Notwithstanding the above temporary measure, your attention is particularly drawn to the following:

(a) The RFSICs shall be responsible for the safe custody of the collected copies of approved FSI plans. Loss of and damage to the plans may render the completed FSI acceptance inspection invalid. As a consequence of which, a fresh submission of plans for approval and a fresh submission of forms FSI/501 and FSI/501a for FSI acceptance inspection may be required; and

Ref. Number and date should be quoted in reference to this letter
凡提及本信時請引述編號及日期

[Source: HKFSD]

Hints for successful FSI acceptance inspection

HINTS FOR SUCCESSFUL INSPECTION

1 | Assure Collaborative Involvement

- Liaisons among RPE, owner, AP, consultant, RFSIC and etc.

2 | Familiar with acceptance criteria

- Submit Accurate T&C Report and doc.
- Possess good understanding of project specific FS provision

3 | Perform High quality of works

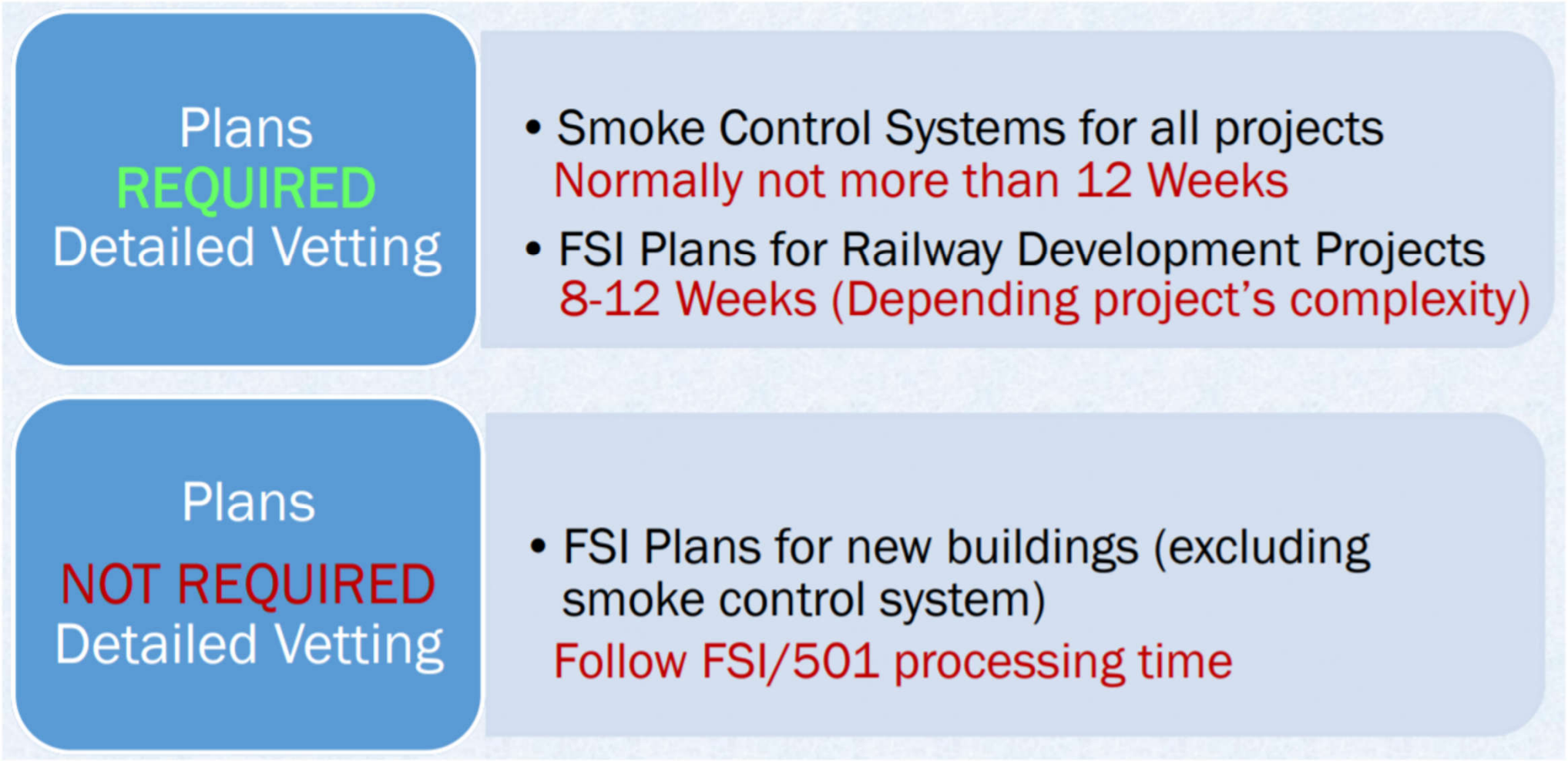
- Confirm Site Readiness and Safety
- Prepare Smooth Rundown

4 | Avoid Alternation to Prescribed F.S. Requirements

- Ensure consistence among site condition and design
- Strictly follow approved condition

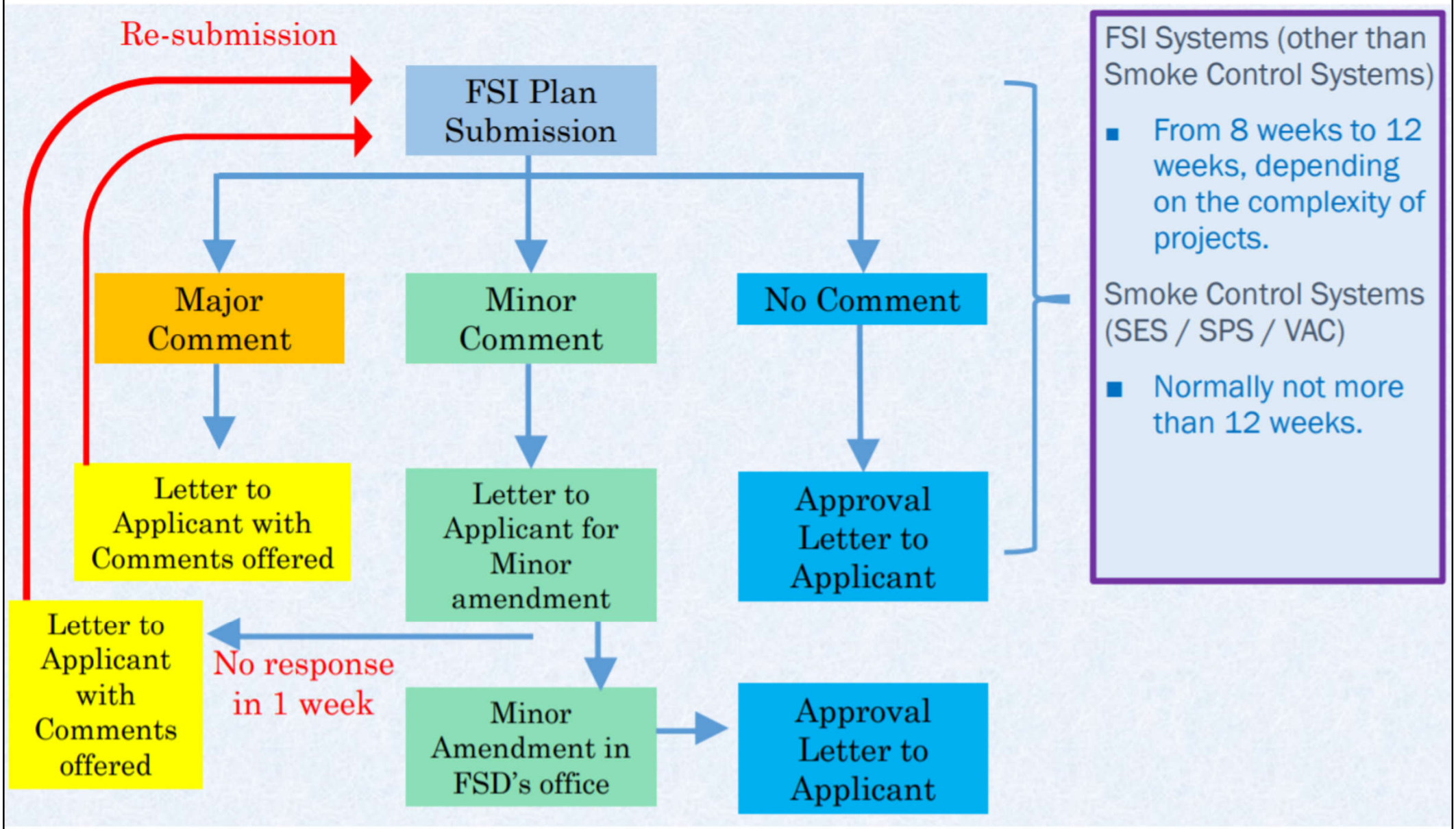
[Source: HKFSD]

Vetting time of FSI plan submission



[Source: HKFSD]

Workflow & vetting time of FSI plan submission



[Source: HKFSD]

Maintenance of FSI

- Fire safety management
  - Maintenance requirements of FSI & equipment
  - Inspection, maintenance, modification & repair
- New buildings
  - Maintenance planning/provisions
- Existing buildings
  - Building improvement works
  - A&A (alternation & addition) works

Information of fire safety records

1. Incident reports (including “near misses”)
2. Fire risk assessments
3. Fire safety control measures taken
4. The maintenance, inspection and test of all equipment provided for fire safety including smoke detectors and sensors, fire alarms, emergency lighting, fire extinguishers and sprinklers
5. Documents from insurers or enforcing authorities
6. Staff training
7. Fire drills, including dates of drills, evacuation times, learning points, etc.
8. Information on fire precautions provided to employees and contractors
9. Fire incident investigations

[Source: https://app.croneri.co.uk/topics/fire-safety-risk-assessment-and-prevention/indepth?topic=3419]

Maintenance of FSI

- Guidelines on the Formulation of Fire Safety Improvement Plans (FSD Circular Letter No. 2/2018)
  - Detailed planning in advance is a prerequisite for the timely completion of works projects
  - Major components should be installed at the initial stage
  - RFSICs are advised to stick a BLUE label tape to the newly installed FSIs
  - FSIs should be shut down at the conversion stage ONLY
- Best Practice for Design, Installation, Acceptance and Maintenance of Fire Service Installations and Equipment (coming in late 2020)

FSI inspection, maintenance, modification and repair

Maintenance

Inspection, Maintenance, Modification and Repair FSI with Moving Parts(Letters to RFSIC dated 19.3.2019 & 22.11.2019)

- RFSICs are strongly requested to inspect, clean, test, recalibrate and lubricate (where appropriate) the moving parts of FSI systems(for example, FS/Sprinkler inlets)

[Source: HKFSD]

Recommended regular fire safety care & maintenance (from BS 5839 Part 1)

Daily	Faults recorded on the panel should be recorded and receive attention Any unmonitored remote link should be tested
Weekly	At least one call point or end-of-line test switch should be operated to test the system, and all zones should be tested over a 13-week period Check and top up batteries Check and top the fuel, oil and coolant levels of any standby generator as necessary
Monthly	• Start up any emergency generator • The entire installation should be subjected to a quarterly inspection and test by a competent person • Routine safety inspections should ensure that access to manual call points is not obstructed

[Source: https://app.croneri.co.uk/topics/fire-safety-risk-assessment-and-prevention/indepth?topic=3419]

Maintenance of FSI

- Maintenance plan should include:
  - (a) Approved general building plans with the exit routes highlighted
  - (b) Documents indicating the details/specifications of the fire safety provisions installed
  - (c) Period for regular maintenance of the fire safety provisions installed
  - (d) Method statements for maintenance
  - (e) Repair methods
  - (f) Records of maintenance or repair works carried out
  - (g) Housekeeping

Maintenance of fire service installations and equipment

Installation / Equipment	Type of Maintenance Work	Person Authorized by FSD for maintenance work
FSI (other than portable equipment)	Annual Inspection	RFSIC Class 1 *and/or* Class 2
	Maintenance / Repair	
Pressure cylinder* of an FSI *[*Required to be approved by FSD under r. 64 of the Dangerous Goods (General) Regulations, Cap. 295B]*	Hydraulic Pressure Test every 5 years	#Approved Person for examination, testing and certification of gas cylinders
	Charging	Person holding a licence for the manufacture of relevant dangerous goods
Portable Equipment *[Required to be approved under r. 3 of the Fire Service (Installations and Equipment) Regulations, Cap. 95B]*	Annual Inspection	RFSIC Class 3
	Hydraulic Pressure Test every 5 years	
	Refilling of extinguishing agent and/ or charging of fire extinguishers *other than* CO_2 gas and clean agent fire extinguishers	
	Charging of CO_2 gas and clean agent fire extinguishers	Supplier of portable equipment (Person holding a licence for the manufacture of relevant dangerous goods)

 # For list of Approved Persons for examination, testing and certification of gas cylinders, please refer to FSD webpage: http://www.hkfsd.gov.hk/home/eng/source/approved_person_66_67_DGO.pdf

[Source: https://www.hkfsd.gov.hk/eng/source/FSIC_reminder_eng.pdf]

不少於 30 cm

Appendix III

消防裝置維修工程通告

由　年　月　日至　年　月　日
將進行消防裝置維修／檢查工程，
下列消防裝置須暫停操作。

承辦商名稱：_____

緊急聯絡電話：_____

不少於 42 cm

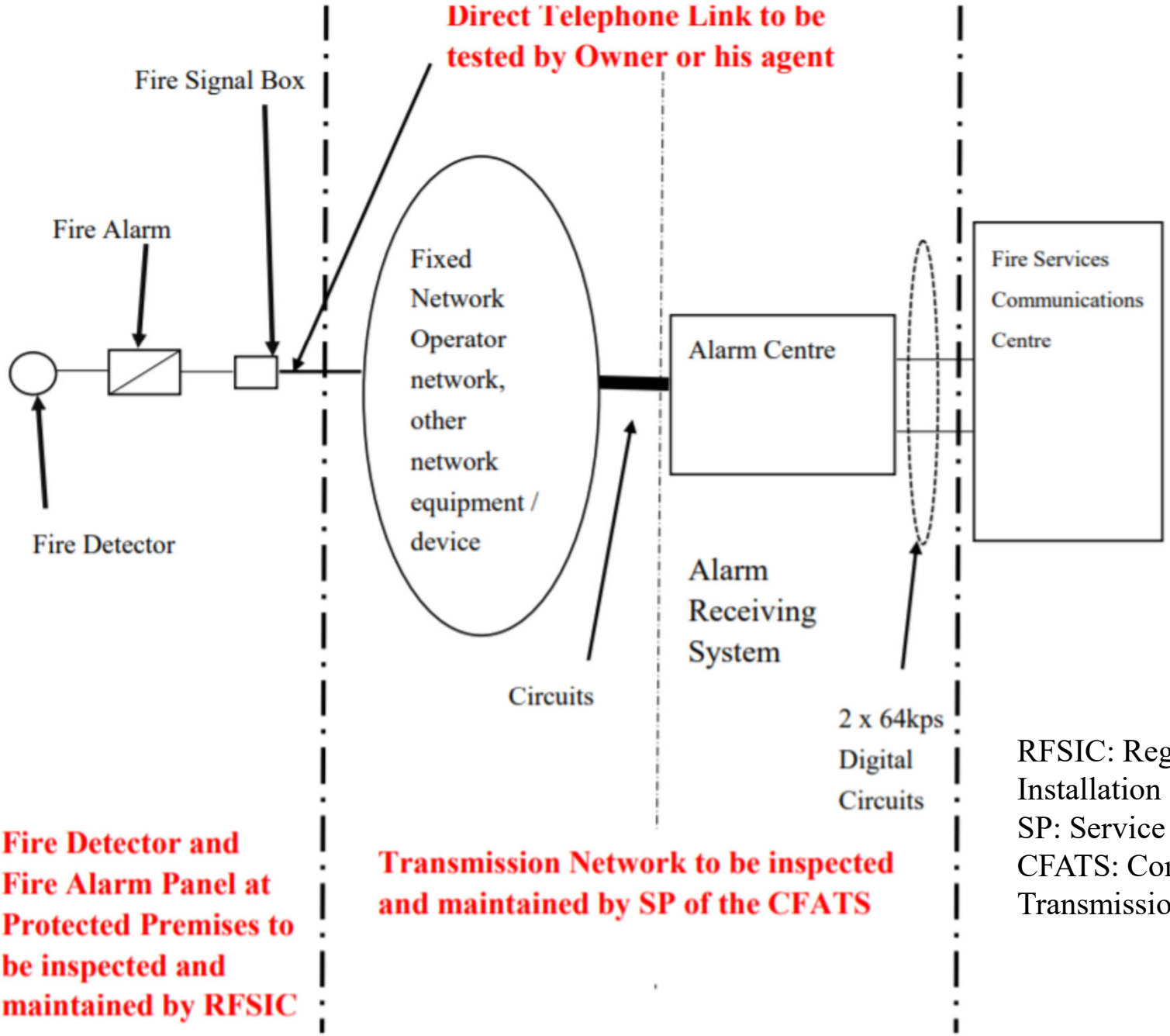
下列消防裝置將暫停操作（請刪除不適合項目）：

- 消防栓／喉轆系統  （涉及樓層／部份 _____）
- 花灑系統  （涉及樓層／部份 _____）
- 火警警報系統  （涉及樓層／部份 _____）
- 火警偵測系統  （涉及樓層／部份 _____）
- 應急照明系統  （涉及樓層／部份 _____）
- 其他（請註明）_____

如發生火警，請立即致電999及通知物業管理處職員

[Source: https://www.hkfsd.gov.hk/eng/source/circular/2008_03.pdf]

Demarcation of duties and responsibilities for maintenance and testing of fire detection system



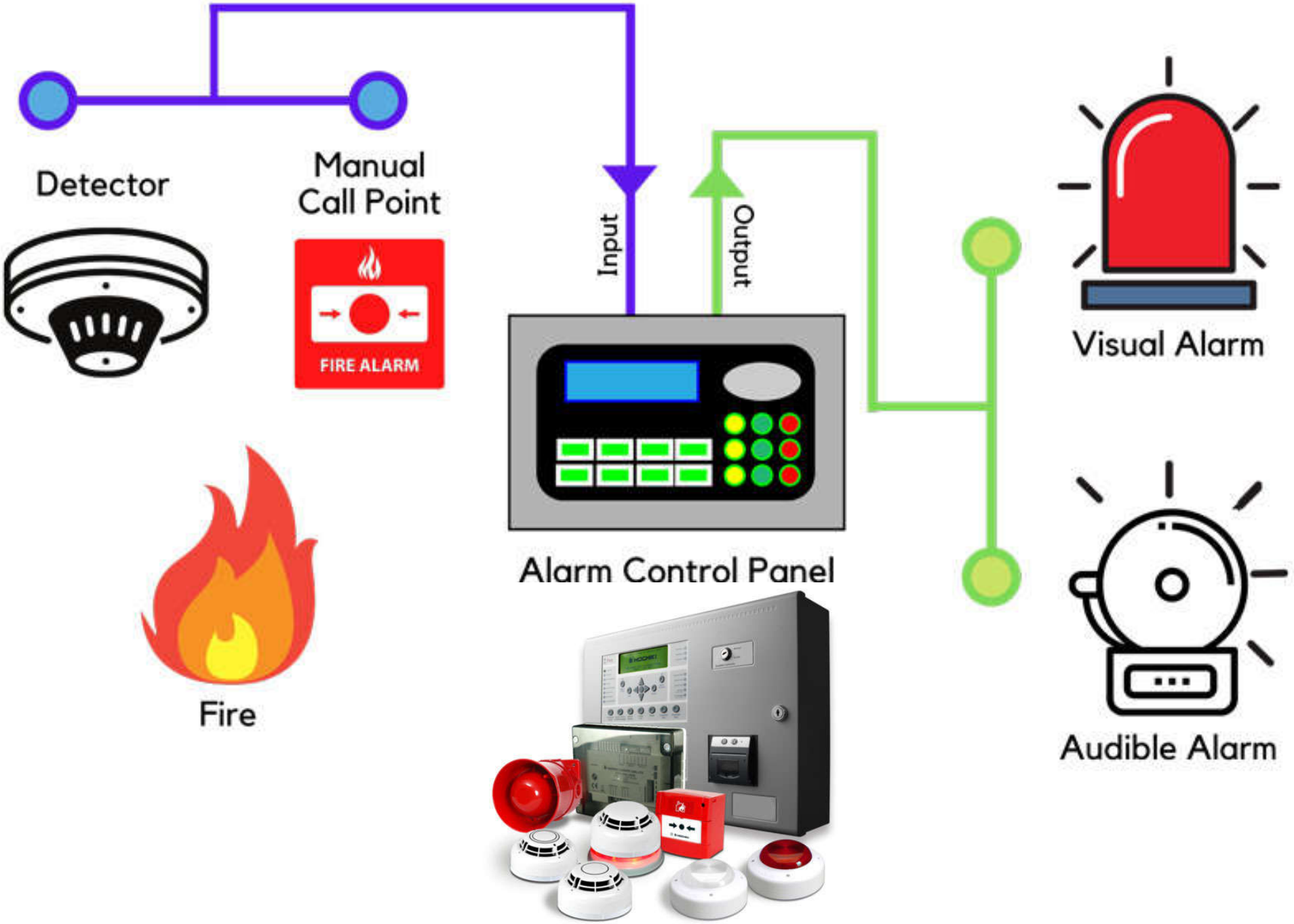
RFSIC: Registered Fire Service Installation Contractor
SP: Service Providers
CFATS: Computerized Fire Alarm Transmission System

[Source: https://www.hkfsd.gov.hk/eng/source/Letter_RFSIC_Testing_of_DTL_201411_eng.pdf]

False alarm management

- Fire detection & alarm systems
  - Periodic testing (service test)
    - To verify operational readiness, these tests should be performed at least yearly or whenever the system has undergone extensive repair or modification
    - Visual inspection & system tests
    - Recognize physical & environmental conditions that may negatively affect system operation or even render the system inoperative
    - Recognize conditions that may trigger an unwanted (nuisance) alarm

Periodic testing (service test) of fire detection & alarm systems



[Source: https://www.stanleysecurity.co.uk/services/fire-detection]

False alarm management

- Acceptance test
  - Preservice test on fire protection, detection, and/or suppression systems after installation to ensure that the system operates as intended
    - Inspect all wiring for proper support
    - Look for wear, damage, or any other defects that may render the insulation ineffective
    - Inspect conduit for solid connections & proper support wherever circuits are enclosed in conduit
    - Check batteries that are used as an emergency power source for clean contacts & proper charge

False alarm management

- Signals in fire detection & alarm systems:
  - 1. Alarm signal: given when there is a fire condition detected
  - 2. Supervisory signal: given when a monitored condition in the system is off-normal
  - 3. Trouble signal: given when a power failure or other system malfunction occurs
- Types of alarms: (a) local alert, (b) central supervising station, (c) public emergency

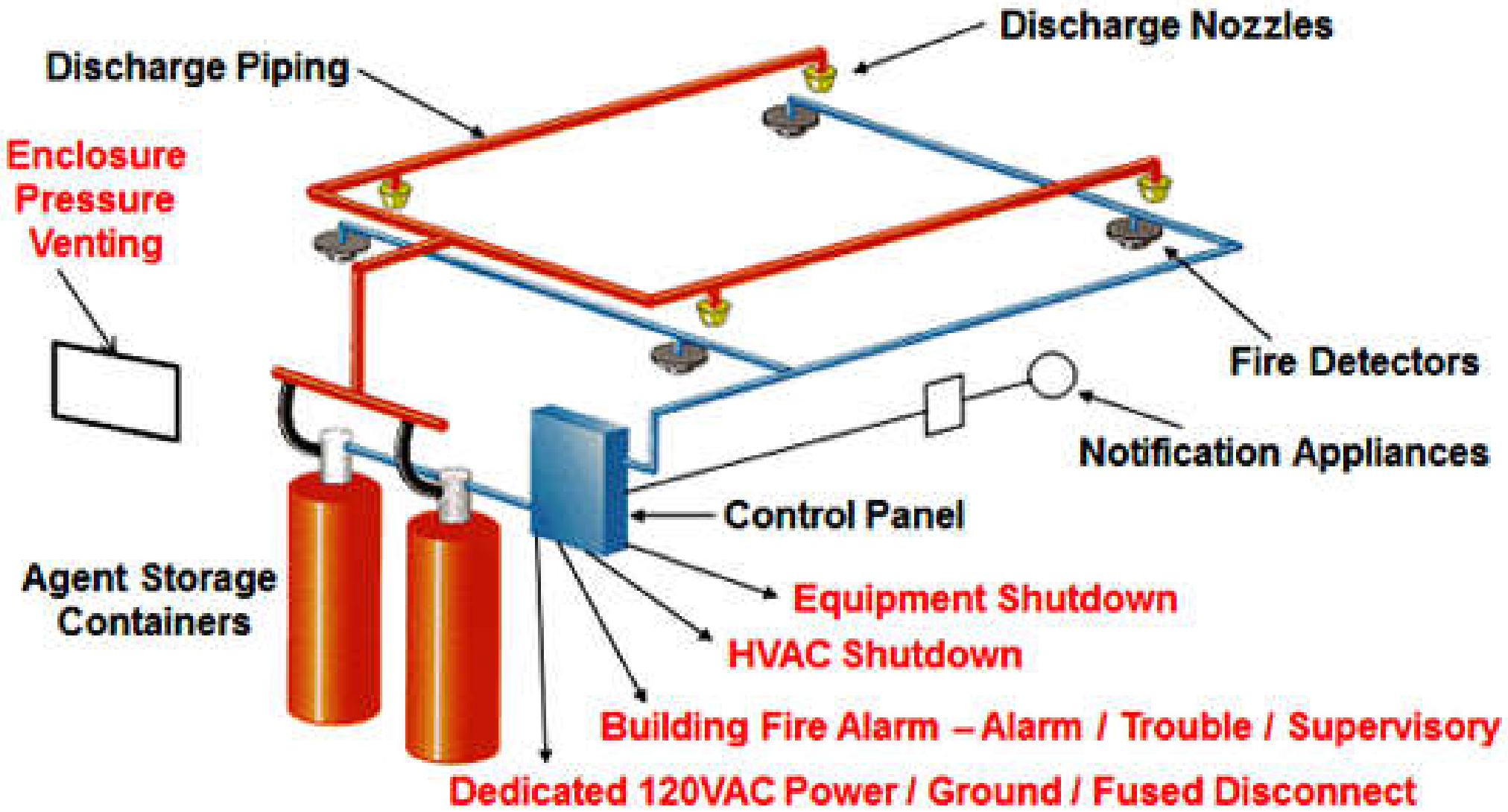
False alarm management

- Manage & reduce false fire alarms
  - Possible causes of false alarms:
    - Poor building management
    - Poor fire alarm system design
    - Poor maintenance
  - Classification of false alarms:
    - Unwanted alarms (e.g. burning toast, steam, insects)
    - Equipment being faulty
    - Malicious false alarms (deliberately by someone)
    - False alarms with good intent

False alarm management

- In situations where false alarms would cause significant disruption (e.g. hospitals, cinema)
  - May use "*alarm filtering/verification*"
    - Two detectors must operate independently to identify the presence of a fire before the system activates an audible alarm (also known as "coincidence detection")
    - Provide a local warning to building manager when the first detector identifies a fire
    - If the alarm is genuine, gives warning of an imminent building evacuation
    - Also can manage the risk of an accidental discharge

Two independent detectors used in coincidence detection for triggering a fire extinguishing system



[Source: http://bhadrafiresafety.blogspot.com/2015/03/guidance-for-coincidence-connection-of.html]

False alarm management

- Measures to reduce nuisance & false alarms
  - Disconnect the signal from the detector(s)
  - Re-arrange the location of detectors and/or remove those overprovided detectors as appropriate
  - Use technically more reliable detectors (e.g. multi-sensor detectors)
  - Select suitable type of detector
  - Install time related system (transmission delay)