



SUBHOLDING
REFINING & PETROCHEMICAL






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GENERAL SPECIFICATION

FIRE ALARM CONTROL PANEL (FACP)

ENGINEERING TECHNICAL STANDARDS & PROCEDURES PT KILANG PERTAMINA INTERNASIONAL DIREKTORAT PROYEK INFRASTRUKTUR

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1. INTRODUCTION

1.1 This document specification is to provide a safe and reliable Building Fire Alarm Control Panel (FACP) that meets the needs of the Project.

2. SCOPE

2.1 This specification, together with its attachments, defines the minimum technical requirements for engineering, selection, inspection, testing, supply, and installation of Building Fire Alarm Control Panel (FACP) for the Project..

3. CONFLICTS AND DEVIATIONS

3.1 Any conflicts between this standard and other applicable Engineering Technical Standards & Procedures (ETSP), or OWNER standard, codes, and forms shall be resolved in writing by OWNER.

3.2 All direct requests to deviate from this standard (ETSP) in writing to OWNER, who shall follow internal OWNER procedure and forward such requests to OWNER for approval.

4. ABBREVIATIONS

4.1 Abbreviations used for this specification shall have the following definitions:

BPCS	Basic Process Control System
CPU	Central Processing Unit
FGS	Fire & Gas System
FACP	Fire Alarm Control Panel
FAT	Factory Acceptance Test
FM	Factory Manual

1. PENGANTAR

1.1 Tujuan dari spesifikasi ini adalah untuk menyediakan *Building Fire Alarm Control Panel* (FACP) yang aman dan andal yang memenuhi kebutuhan Proyek.

2. LINGKUP

2.1 Spesifikasi ini, beserta lampirannya, menetapkan persyaratan teknis *minimum* untuk *engineering*, seleksi, inspeksi, pengujian, suplai, dan instalasi dari *Building Fire Alarm Control Panel* (FACP) untuk kebutuhan Proyek.

3. KONFLIK DAN DEVIASI


3.1 Apabila terdapat konflik antara standar ini dengan *Engineering Technical Standards & Procedures* (ETSP) yang berlaku lainnya, atau standar PEMILIK, *codes* dan formulir, maka harus diselesaikan secara tertulis oleh PEMILIK.

3.2 Semua permintaan penggunaan standar yang berbeda dari standar ini (ETSP), harus diajukan kepada PEMILIK secara tertulis dengan mengikuti prosedur *internal* PEMILIK untuk mendapatkan persetujuan.

4. SINGKATAN

4.1 Singkatan yang digunakan untuk spesifikasi ini harus memiliki definisi sebagai berikut:

BPCS	<i>Basic Process Control System</i>
CPU	<i>Central Processing Unit</i>
FGS	<i>Fire & Gas System</i>
FACP	<i>Fire Alarm Control Panel</i>
FAT	<i>Factory Acceptance Test</i>
FM	<i>Factory Manual</i>

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HMI	Human Machine Interface	HMI	<i>Human Machine Interface</i>
HSE	Health, Safety, and Environment	HSE	<i>Health, Safety, and Environment</i>
HVAC	Heating, Ventilation, and Air Conditioning	HVAC	<i>Heating, Ventilation, and Air Conditioning</i>
ISH	Instrument Satellite House	ISH	<i>Instrument Satellite House</i>
LCD	Liquid Crystal Display	LCD	<i>Liquid Crystal Display</i>
LED	Light Emitting Diode	LED	<i>Light Emitting Diode</i>
MAC	Manual Alarm Call Point	MAC	<i>Manual Alarm Call Point</i>
MCC	Motor Control Center	MCC	<i>Motor Control Center</i>
MCR	Main Control room	MCR	<i>Main Control room</i>
PLC	Programmable Logic Controller	PLC	<i>Programmable Logic Controller</i>
SAT	Site Acceptance Test	SAT	<i>Site Acceptance Test</i>
TCP/IP	Transmission Control Protocol/ Internet Protocol	TCP/IP	<i>Transmission Control Protocol/ Internet Protocol</i>
UL	Underwriters Laboratories	UL	<i>Underwriters Laboratories</i>
VAC	Voltage Alternating Current	VAC	<i>Voltage Alternating Current</i>

5. DEFINITIONS

5.1 The following words shall have these special meanings when used herein:

OWNER	Owner of the Plant is defined as PT Kilang Pertamina Internasional
CONTRACTOR/ CONSULTANT	Defined as the Organization to which PT Kilang Pertamina Internasional assign the work
shall	Indicates that the statement is mandatory
should	Indicates a


5. DEFINISI

5.1 Penggunaan kata-kata berikut harus memiliki arti khusus sebagai berikut:

PEMILIK	Pemilik Kilang didefinisikan sebagai PT Kilang Pertamina Internasional
KONTRAKTOR/ KONSULTAN	Didefinisikan sebagai Organisasi yang ditunjuk oleh PT Kilang Pertamina Internasional untuk melakukan suatu pekerjaan
shall	Menunjukkan bahwa pernyataan itu wajib
should	Menunjukkan

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 Engineering Technical Standards & Procedures	SUBHOLDING REFINING & PETROCHEMICAL	Doc. No. : RP-ETS-INS-GS-0032-01-2021
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	recommendation		rekomendasi
VENDOR	Defined as the company selected to supply the equipment and service detailed in this specification.	<i>VENDOR</i>	Didefinisikan sebagai perusahaan yang dipilih untuk memasok peralatan dan <i>service</i> yang dirinci dalam spesifikasi ini.
SUB CONTRACTOR	Any person or persons, firm, partnership, corporation or combination thereof engaged by Contractor for supplying services to Contractor for the performance of services.	SUB KONTRAKTOR	Setiap orang atau beberapa orang, firma, kemitraan, korporasi atau kombinasi daripadanya yang dipekerjakan oleh Kontraktor untuk memasok servis kepada Kontraktor untuk pelaksanaan servis.
SUB VENDOR	Any supplier of equipment and support services for a particular piece of equipment/package to a VENDOR.	SUB <i>VENDOR</i>	Setiap pemasok peralatan dan servis penyangga untuk peralatan/ paket tertentu ke <i>VENDOR</i> .
May	The word 'may' is to be understood as indicating a possible course of action.	Mungkin	Kata 'mungkin' harus dipahami sebagai indikasi kemungkinan tindakan.

6. CODES AND STANDARDS

The following Codes, Standard and Specifications apply to this specification. When an edition date is not indicated for a code or standard or any update in codes and standards in this specification document, the latest edition and addendum in force at the time of purchase shall apply. Material & equipment shall be as a specification or an equal approved by OWNER.

6. CODE DAN STANDAR

Code, standar, dan spesifikasi berikut berlaku untuk spesifikasi ini. *Code* dan standar harus menggunakan edisi yang terbaru atau edisi yang berlaku pada saat pembelian. *Material* & peralatan harus sesuai spesifikasi atau setara dengan yang disetujui oleh PEMILIK.

6.1 American Petroleum Institute (API)

API RP 505 Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2

API RP 752 Management of Hazards Associated with Location of Process Plant Buildings

API RP554 Process Instrumentation and Control

API 552 Transmission Systems

6.2 Instrument Society of Automation (ISA)

ISA S5.1 Instruments Symbols and Terminology

ISA S5.2 Binary Logic Diagrams for Process operation

ISA S5.3 Graphic Symbols for Distributed Control/ Shared Display Instrumentation, Logic and Computer Systems

ISA S5.4 Instrument Loop Diagrams

ISA S5.5 Graphic Symbol for Process Display

ISA S51.1 Process Instrumentation Terminology

ISA S12.01.0 1 Definitions and Information Pertaining to Electrical Instruments in Hazardous (Classified) Locations

ISA S18.1 Alarm Sequence Specification

ISA S50.00.0 1 Compatibility of Analog Signals for Electronic Process Instruments

ISA Environmental Conditions for

6.1 American Petroleum Institute (API)

API RP 505 *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2*

API RP 752 *Management of Hazards Associated with Location of Process Plant Buildings*

API RP554 *Process Instrumentation and Control*

API 552 *Transmission Systems*

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ISA S5.3 *Graphic Symbols for Distributed Control/ Shared Display Instrumentation, Logic and Computer Systems*

ISA S5.4 *Instrument Loop Diagrams*

ISA S5.5 *Graphic Symbol for Process Display*

ISA S51.1 *Process Instrumentation Terminology*

ISA S12.01.0 1 *Definitions and Information Pertaining to Electrical Instruments in Hazardous (Classified) Locations*

ISA S18.1 *Alarm Sequence Specification*

ISA S50.00.0 1 *Compatibility of Analog Signals for Electronic Process Instruments*

ISA *Environmental Conditions for*

S71.01	Process Measurement and Control System, Temperature and Humidity	S71.01	<i>Process Measurement and Control System, Temperature and Humidity</i>
6.3	International Electrotechnical Commission (IEC)	6.3	<i>International Electrotechnical Commission (IEC)</i>
IEC 60068	Environmental Testing	IEC 60068	<i>Environmental Testing</i>
IEC 60227-1	Conductors and Cables Insulated with Polyvinyl Chloride of Nominal Voltage to 5	IEC 60227-1	<i>Conductors and Cables Insulated with Polyvinyl Chloride of Nominal Voltage to 5</i>
IEC 60331	Tests for Electric Cables under Fire Conditions (Fire Resistant Cables)	IEC 60331	<i>Tests for Electric Cables under Fire Conditions (Fire Resistant Cables)</i>
IEC 60529	Classification of Degrees of Protection Provided by Enclosures (IP Code)	IEC 60529	<i>Classification of Degrees of Protection Provided by Enclosures (IP Code)</i>
IECEX 02	Certification to Standards relating to Equipment for use in Explosive Atmospheres	IECEX 02	<i>Certification to Standards relating to Equipment for use in Explosive Atmospheres</i>
6.4	National Fire Protection Association (NFPA)	6.4	<i>National Fire Protection Association (NFPA)</i>
NFPA 72	National Fire Alarm Signaling Code	NFPA 72	<i>National Fire Alarm Signaling Code</i>
NFPA 75	Protection of Electronic/Computer Data Processing Equipment	NFPA 75	<i>Protection of Electronic/Computer Data Processing Equipment</i>
NFPA 92	Smoke Control System	NFPA 92	<i>Smoke Control System</i>
NFPA 13	Standard for the Installation of Sprinkler System	NFPA 13	<i>Standard for the Installation of Sprinkler System</i>
NFPA 5000	Building Construction and Safety Code	NFPA 5000	<i>Building Construction and Safety Code</i>
6.5	National Electrical Manufacturers Association (NEMA)	6.5	<i>National Electrical Manufacturers Association (NEMA)</i>
NEMA 250	Enclosure for Electrical Equipment (1000 Volts maximum)	NEMA 250	<i>Enclosure for Electrical Equipment (1000 Volts maximum)</i>
6.6	Underwriters Laboratory (UL)	6.6	<i>Underwriters Laboratory (UL)</i>

UL 38	Manually Actuated Signaling Boxes	UL 38	<i>Manually Actuated Signaling Boxes</i>
UL 268	Smoke Detectors for Fire Protective Signaling Systems	UL 268	<i>Smoke Detectors for Fire Protective Signaling Systems</i>
UL 464	Audible Signaling Appliances	UL 464	<i>Audible Signaling Appliances</i>
UL 521	Heat Detectors for Fire Protective Signaling Systems	UL 521	<i>Heat Detectors for Fire Protective Signaling Systems</i>
UL 864	Control Units for Fire Protective Signaling Systems	UL 864	<i>Control Units for Fire Protective Signaling Systems</i>
UL 1481	Visual Signaling Appliances	UL 1481	<i>Visual Signaling Appliances</i>
6.7	Factory Manual (FM)	6.7	<i>Factory Manual (FM)</i>
FM 3010	Fire Alarm Control Panel	FM 3010	<i>Fire Alarm Control Panel</i>
FM 3210	Heat Detector	FM 3210	<i>Heat Detector</i>
FM 3230	Smoke Detector	FM 3230	<i>Smoke Detector</i>
6.8	Reference Documents	6.8	<i>Dokumen Referensi</i>
RP-ETS-INS-DC-0001	Control System Design Criteria	RP-ETS-INS-DC-0001	<i>Control System Design Criteria</i>
RP-ETS-HSE-DP-0014	Design Basis & Philosophy Fire and Gas Detection System	RP-ETS-HSE-DP-0014	<i>Design Basis & Philosophy Fire and Gas Detection System</i>
RP-ETS-INS-GS-0020	General Instrumentation & Installation	RP-ETS-INS-GS-0020	<i>General Instrumentation & Installation</i>
RP-ETS-INS-GS-0004	Programmable Logic Controller	RP-ETS-INS-GS-0004	<i>Programmable Logic Controller</i>
RP-ETS-INS-GS-0031	Fire and Gas Detector	RP-ETS-INS-GS-0031	<i>Fire and Gas Detector</i>
6.9	Indonesian Regulations	6.9	<i>Peraturan Pemerintah</i>
UU. No. 1 1970	Keselamatan Kerja	UU. No. 1 1970	<i>Keselamatan Kerja</i>
UU. No. 23 1997	Pengelolaan Lingkungan Hidup	UU. No. 23 1997	<i>Pengelolaan Lingkungan Hidup</i>
UU. No. 28 2002	Bangunan Gedung	UU. No. 28 2002	<i>Bangunan Gedung</i>
PP. No. 19 1973	Pengaturan Dan Pengawasan Keselamatan Kerja	PP. No. 19 1973	<i>Pengaturan Dan Pengawasan Keselamatan Kerja</i>

	Dibidang Pertambangan		Dibidang Pertambangan
PP. No. 11 1979	Keselamatan Kerja Pada Pemurnian Dan Pengolahan Minyak Dan Gas Bumi	PP. No. 11 1979	Keselamatan Kerja Pada Pemurnian Dan Pengolahan Minyak Dan Gas Bumi
KEPMENPU No.10//2002	Decree of Minister of Public Works - Technical Guidance on Fire Safety of Building and Environment	KEPMENPU No.10//2002	Keputusan Menteri Pekerjaan Umum - Bimbingan Teknis Keselamatan Kebakaran Gedung dan Lingkungan
SNI 03-3985- 2000	Tata cara perencanaan, pemasangan dan pengujian sistem deteksi dan alarm kebakaran untuk pencegahan bahaya kebakaran pada bangunan gedung	SNI 03-3985- 2000	Tata cara perencanaan, pemasangan dan pengujian sistem deteksi dan alarm kebakaran untuk pencegahan bahaya kebakaran pada bangunan gedung

7. SYSTEM REQUIREMENT

7.1 System Overview

- a. Fire detection and alarm systems shall be provided inside the control rooms, substations, switchgear rooms, ISH, office buildings, maintenance/warehouse buildings and similar buildings with possibility of fire.
- b. Each building shall have an independent fire detection and alarm system that consists of smoke detectors, heat detectors, manual alarm call points, audible alarm bells, visible strobe light/ beacon lamp, and Fire Alarm Control Panel (FACP).
- c. The building fire detection and alarm system shall be addressable type. The system shall provide identification of

7. PERSYARATAN SISTEM

7.1 System Overview

- a. *Fire detection dan alarm system* harus disediakan di dalam *control room, substation, switchgear room, ISH, office building, maintenance/ warehouse building* dan bangunan-bangunan sejenis yang kemungkinan mengalami kebakaran.
- b. Setiap bangunan harus memiliki *fire detection dan alarm system* independen yang terdiri dari *smoke detector, heat detector, manual alarm call point, audible alarm bell, strobe light/ beacon lamp* yang terlihat, serta *Fire Alarm Control Panel (FACP)*.
- c. *Fire detection dan alarm system* bangunan harus tipe yang *addressable*. Sistem harus menyediakan identifikasi

point type, location, and status. Alarm, trouble, location, and status signal from all addressable initiating devices (manual call point and detectors) shall be monitored from FACP.

- d. The office and administrative buildings shall be provided with water sprinklers, which shall be activated by frangible bulbs located in the building.
- e. Fire alarm information from the initiating device shall be displayed on FGS HMI in MCR, utilities control room, and HSE building. Fire alarm information from the initiating device shall also be displayed on the BPCS console through the FGS control panel.
- f. The failure of initiating devices (manual call points and detectors) and FACP internal system failure alarm shall be displayed on FGS HMI console in the MCR, utilities control room, and in HSE building.
- g. The system shall ignore signals from input devices when isolated. The system shall annunciate and remain in a trouble state while any fire alarm device is isolated.
- h. All fire panels shall be integrated together and report building alarms to the Main Fire Alarm Panel in the HSE building.

7.2 Detector

- a. The fire detectors which are utilized inside the buildings for this project are smoke detectors and heat detectors. Smoke detectors and heat detectors shall be placed so as to cover the whole space of the buildings including the space above ceilings and double floor

jenis titik, lokasi, serta status. *Alarm*, masalah, lokasi, dan sinyal status dari semua perangkat inisiasi yang dapat dialamatkan/ *addressable* (*manual call point* maupun detektor) harus di-*monitor* dari FACP.

- d. Kantor dan gedung administrasi harus dilengkapi dengan *water sprinkler*, yang harus diaktifkan oleh lampu yang mudah pecah (*frangible bulb*) yang terletak di dalam gedung.
- e. Informasi *fire alarm*/ *alarm* kebakaran dari perangkat inisiasi harus ditampilkan pada FGS HMI di MCR, *control room* utilitas, dan gedung HSE. Informasi *alarm* kebakaran dari perangkat inisiasi juga harus ditampilkan pada BPCS *Console* melalui *control panel* FGS.
- f. Kegagalan perangkat inisiasi (*manual call point* maupun detektor) dan kegagalan *alarm* sistem *internal* FACP harus ditampilkan pada FGS HMI *Console* di MCR, *control room* utilitas, dan di gedung HSE.
- g. Sistem harus mengabaikan sinyal dari perangkat *input* saat diisolasi. Sistem harus mengumumkan dan tetap dalam keadaan bermasalah saat perangkat *fire alarm* diisolasi.
- h. Semua *fire panel* harus terintegrasi bersama dan melaporkan *alarm* gedung ke *fire alarm panel* utama di gedung HSE.

7.2 Detektor

- a. *Fire detector* yang digunakan di dalam gedung untuk proyek ini adalah *smoke detector* dan *heat detector*. *Smoke detector* serta *heat detector* harus ditempatkan sedemikian rupa sehingga menutupi seluruh ruang bangunan termasuk ruang di atas *ceiling* dan ruang

space.

- b. Initiating devices inside buildings including detectors and manual call points shall have the capabilities to send fire alarm signals and device failure signals to FACP.

7.2.1. Smoke Detectors

- a. Smoke detectors shall be provided in the following locations:

1. Control room
2. Switchgear room
3. MCC
4. Battery room
5. Workshop & storage handling solid materials and flammable liquids
6. Office building specifically for archive rooms and libraries
7. Conference room and auditorium
8. Server rooms

Smoke detector shall be:

1. Sensitive photoelectric type.
2. Addressable type.
3. Designed for continuous detection of smoke.
4. Automatic self-resetting type.
5. Equipped with lock-on base and integrated light status for normal, alarm, and trouble indicator.
6. Provided with a remote light status indicator for

lantai ganda.

- b. Perangkat inisiasi di dalam gedung termasuk detektor dan *manual call point* harus memiliki kemampuan untuk mengirimkan sinyal *fire alarm* serta sinyal kegagalan perangkat ke FACP.

7.2.1. Smoke Detector

- a. *Smoke detector* harus dipasang pada lokasi sebagai berikut:

1. *Control room*
2. *Switchgear room*
3. MCC
4. *Battery room*
5. *Workshop* & tempat penyimpanan *material* padat dan cairan yang mudah terbakar
6. Gedung perkantoran khusus untuk ruang arsip dan perpustakaan
7. Ruang rapat dan *auditorium*
8. Ruang *server*

Smoke detector harus:

1. Tipe *sensitive photoelectric*.
2. Tipe *addressable*.
3. Didesain untuk *smoke detector* secara kontinu.
4. Tipe *automatic self-resetting*.
5. Dilengkapi dengan *lock-on base* dan *integrated light status* untuk indikator kondisi *normal, alarm, dan trouble*.
6. Dilengkapi dengan *remote light status indicator* untuk

detectors located in non-accessible spaces.

7. Suitable for easy on site (calibration) test. Detectors shall be mounted in location which provides easy access for calibration or maintenance.
 8. Supplied with all accessories for mounting and installation.
 9. Suitable for a maximum covered area = 320 sq.ft (30 sq.m).
 10. Suitable for a response time = 1 second for sensitive part response, with additional time delay (field adjustable) against spurious detection (require field adjustable sensitivity).
 11. Intrinsically safe certification shall be required only where applicable.
 12. UL or FM approved.
 13. Comply with NFPA 72.
- b. The electrical requirement for smoke detector are as follows:
1. Detector output shall be addressable type with line monitoring facility supplied with end of line resistor for each loop to allow detection of circuit short or an open condition. This connection shall provide supervision of the circuit to distinguish between a sensor change condition and a circuit fault.

detektor yang terletak di ruang yang tidak dapat diakses.

7. Cocok untuk pengujian *on site* (kalibrasi) yang mudah. Detektor harus dipasang di lokasi yang menyediakan akses mudah untuk kalibrasi atau pemeliharaan.
 8. Lengkap dengan semua aksesoris untuk *mounting* dan instalasi.
 9. Cocok untuk *area* tertutup maksimum = 320 sq.ft (30 sq.m).
 10. Cocok untuk waktu respons = 1 detik untuk respons bagian sensitif, dengan tambahan waktu tunda (penyesuaian lapangan) terhadap deteksi palsu (memerlukan sensitivitas penyesuaian dilapangan)
 11. *Intrinsically safe certification* hanya diperlukan jika dapat diterapkan.
 12. UL atau FM disetujui.
 13. Mematuhi NFPA 72.
- b. Persyaratan listrik untuk *smoke detector* adalah sebagai berikut:
1. *Detector output* harus tipe *addressable* dengan fasilitas *line monitoring* yang disuplai dengan *resistor* pada ujung saluran untuk setiap *loop* sehingga memungkinkan pendeteksian *short circuit* atau kondisi terbuka. Koneksi ini harus memberikan pengawasan pada rangkaian listrik untuk membedakan antara kondisi perubahan

2. Smoke detectors shall include a malfunction detector circuit and local malfunction indicator light on the unit.
 3. Output signal shall be composed of sensor alarm signal and malfunction signal due to circuit fault or power loss.
- c. Smoke detectors shall be connected to FACP.

7.2.2. Heat Detectors

- a. Heat detectors shall be applied to the following locations:
1. Switchgear rooms
 2. MCC
 3. Battery room
 4. Workshop & storage handling solid materials and flammable liquids
 5. Kitchen in occupied buildings
 6. Rooms for equipment and pipelines transferring flammable liquids
- b. The installation of heat detectors shall comply with requirements of NFPA 72 Standard.
- c. Detector shall be:
1. Designed for continuous detection heat
 2. Addressable type
 3. Automatic self-resetting type
- a. Equipped with an integral

sensor dan gangguan circuit.

2. *Smoke detector* harus mencakup *detector circuit* malfungsi dan lampu indikator malfungsi lokal pada *unit*.
 3. Sinyal keluaran harus terdiri dari sinyal *alarm sensor* dan sinyal malfungsi karena gangguan *circuit* atau *loss power*.
- c. *Smoke detector* harus terkoneksi ke FACP.

7.2.2. Heat Detector

- a. *Heat detector* harus digunakan pada lokasi sebagai berikut :
1. *Switchgear room*
 2. MCC
 3. *Battery room*
 4. *Workshop* & tempat penyimpanan *material* padat dan cairan yang mudah terbakar
 5. Dapur didalam gedung yang ditempati
 6. Ruangan untuk peralatan dan perpipaan yang mentransfer cairan yang mudah terbakar
- b. Instalasi *heat detector* harus memenuhi persyaratan Standar NFPA 72.
- c. Detektor harus:
1. Didesain untuk *heat detector* secara terus menerus
 2. Tipe *addressable*
 3. Tipe *automatic self-resetting*
- a. Dilengkapi dengan status

light status for normal, alarm, and trouble indicator.

- b. The detectors shall be capable of driving a remote light status indication for detectors located in non-accessible spaces.
 - c. Suitable for easy on site (calibration) test. Detectors shall be mounted in location which provides ready access for calibration or maintenance.
 - d. Supplied with all accessories for mounting and installation.
 - e. UL or FM approved.
 - f. Comply with NFPA 72.
- d. The selection of heat detector type shall be established based on risk assessment and is subjected to OWNER's approval.
- e. The electrical requirement for heat detector are as follows:
1. Detector output shall be 2 wire addressable types. An end-of-line resistor shall be connected parallel to the sensor in order to allow detection of a circuit short or an open condition. This connection shall provide supervision of the circuit to distinguish between a sensor change condition and a circuit fault.

2. Heat detectors shall include malfunction detector circuit,

lampu *integral* untuk indikator *normal*, *alarm*, dan *trouble*.

- b. Detektor harus mampu menggerakkan indikasi status lampu jarak jauh untuk detektor yang terletak di ruang yang tidak dapat diakses.
- c. Cocok untuk pengujian *on site* (kalibrasi) yang mudah. Detektor harus dipasang di lokasi yang menyediakan akses siap untuk kalibrasi atau pemeliharaan.
- d. Disuplai dengan semua aksesori untuk *mounting* dan instalasi.
- e. UL atau FM disetujui
- f. Mematuhi NFPA 72.

d. Pemilihan jenis *heat detector* harus ditetapkan berdasarkan *risk assessment* dan tunduk pada persetujuan PEMILIK.

e. Persyaratan listrik untuk *heat detector* adalah sebagai berikut:

1. *Detector output* harus tipe 2 *wire addressable*. *Resistor* pada ujung saluran harus disambungkan paralel ke *sensor* sehingga memungkinkan pendeteksian *short circuit* atau kondisi terbuka. Koneksi ini harus memberikan pengawasan pada rangkaian listrik untuk membedakan antara kondisi perubahan *sensor* dan gangguan *circuit*.

2. *Heat detector* harus mencakup *detector circuit* malfungsi dan

and local malfunction indicator light on the unit.

3. Output signal shall be sensor alarm signal, and malfunction signal due to circuit fault or power loss.

f. Heat detectors shall be connected to FACP.

g. Detector temperature setting shall consider the ambient temperature.

h. The selection of heat detectors type is subject to OWNER's approval.

7.3 Manual Alarm Call Points

a. Manual alarm call point shall be located at the normal exit path for each floor, and additional manual alarm call point shall be provided so that the travel distance to the nearest manual alarm call point does not exceed 61 m measured horizontally on the same floor.

b. The manual alarm call points shall be break glass type. Audible alarm shall be provided in the building where Manual Alarm Call Points are provided.

c. The Manual Alarm Call points shall be individually wired to FACP.

d. The Manual Alarm Call points shall be UL or FM approved.

7.4 Audible and Visible Alarm

a. Audible fire alarms in the building shall be provided where automatic smoke detectors, heat detectors, or manual alarm call points are provided. The audible alarm bell shall be located so that the distance from any portion of the building to the bell does not exceed 25

lampu indikator malfungsi lokal pada *unit*.

3. Sinyal keluaran harus terdiri dari sinyal *alarm sensor* dan sinyal malfungsi karena gangguan *circuit* atau *loss power*.

f. *Heat detector* harus terkoneksi ke FACP.

g. Pengaturan suhu detektor harus mempertimbangkan suhu *ambient*.

h. Pemilihan jenis *heat detector* harus mendapat persetujuan PEMILIK.

7.3 Manual Alarm Call Point

a. *Manual alarm call point* harus ditempatkan pada jalur keluar *normal* untuk setiap lantai, dan *manual alarm call point* tambahan harus disediakan sehingga jarak tempuh ke *manual alarm call point* terdekat tidak melebihi 61 m yang diukur secara *horizontal* pada lantai yang sama.

b. *Manual alarm call point* harus tipe *break glass*. *Audible alarm* harus disediakan di gedung tempat *manual alarm call point* disediakan.

c. *Manual alarm call point* harus *individually wired* ke FACP.

d. *Manual alarm call point* harus disetujui oleh UL atau FM.

7.4 Audible dan Visible Alarm

a. *Audible fire alarm* di gedung harus disediakan di mana *smoke detector* otomatis, *heat detector*, atau *manual alarm call point* disediakan. *Audible alarm bell* harus ditempatkan sedemikian rupa sehingga jarak dari setiap bagian bangunan ke *bell* tidak melebihi 25 m

m measured horizontally on the same floor.

- b. Sound pressure level performance of the audible alarm bell shall not be less than 90 dBA measured at 1 m distance.
- c. Where ambient noise level is greater than 105 dBA in the building, the visible alarm sign, e.g., strobe light or beacon lamp, shall be provided in addition to audible alarm bells.
- d. Combination strobe and horn units may be used where indicated by location.

7.5 Fire Alarm Control Panel (FACP)

7.5.1. General

- a. FACP shall comply with requirements of NFPA Standard 72 for Protected Premises.
- b. FACP shall accept, process, and evaluate alarm signals and failure signals from addressable initiating devices such as smoke detectors, heat detectors, and Manual Alarm Call Points.
- c. FACP shall be utilized as the interface of detectors installed at the buildings. The FACP shall detect the activation of any detectors and the location of the alarm. Once a smoke detector, heat detector, or MAC is initiated, the alarm, status and location shall be displayed on FACP.
- d. FACP shall have the capability to send fire alarm signals and failure signals from initiating devices to the FGS control panel.

yang diukur secara *horizontal* di lantai yang sama.

- b. Performa *Sound Pressure Level* (SPL) dari *audible alarm bell* harus tidak boleh kurang dari 90 dBA yang diukur pada jarak 1 m.
- c. Bila *level* kebisingan *ambient* lebih besar dari 105 dBA di dalam gedung, *visible alarm sign*, misalnya *strobe light* atau *beacon lamp*, harus disediakan sebagai tambahan *audible alarm bell*.
- d. Kombinasi unit *strobe light* dan horn/klakson dapat digunakan pada lokasi yang ditunjuk/ ditentukan.

7.5 Fire Alarm Control Panel (FACP)

7.5.1. Umum

- a. FACP harus mematuhi persyaratan standar NFPA 72 untuk tempat yang diproteksi.
- b. FACP harus menerima, memproses, dan mengevaluasi sinyal *alarm* serta sinyal kegagalan dari perangkat inisiasi *addressable* seperti *smoke detector*, *heat detector* dan *manual alarm call point*.
- c. FACP harus digunakan sebagai *interface* detektor yang dipasang di gedung. FACP harus mendeteksi aktivasi setiap detektor dan lokasi *alarm*. Setelah *smoke detector*, *heat detector* atau MAC diaktifkan, *alarm*, status, dan lokasi harus ditampilkan di FACP.
- d. FACP harus memiliki kemampuan untuk mengirim sinyal *fire alarm* dan sinyal kegagalan dari perangkat inisiasi ke *control panel* FGS.

- e. FACP shall communicate with the FGS control panel through a redundant Modbus TCP/IP connection.
- f. FACP shall also have the capability to send the internal system failure such as CPU failure and system trouble to the FGS control panel through redundant Modbus TCP/IP.
- g. The main Fire Panel in the HSE building shall communicate with the fire panel of all other stations via fiber optic link. The Main Fire Panel shall have a display for all buildings.
- h. FACP shall also have the following capabilities:
1. Activate audible alarm and visible alarm strobe light/ beacon lamp upon receipt of fire detection signal from any of the fire detectors or initiation of manual alarm call points.
 2. Initiate automatic signal to shutdown HVAC system upon receipt of fire detection signal from any of fire detector or manual alarm call points.
 3. Initiate automatic signal to close the dampers in HVAC system ducts upon receipt of fire detection signal of gaseous fire extinguishing system.
 4. Reset the audible alarm bells/ strobe light/ beacon lamp by means of a button, provided that all initiators (automatic fire detectors and manual alarm
- e. FACP harus berkomunikasi dengan *control panel* FGS melalui koneksi *redundant Modbus TCP/IP*.
- f. FACP juga harus memiliki kemampuan untuk mengirimkan kegagalan sistem *internal* seperti kegagalan CPU dan masalah sistem ke *control panel* FGS melalui *redundant Modbus TCP/IP*.
- g. *Fire panel* utama di gedung HSE harus berkomunikasi dengan *fire panel* dari semua *station* lain melalui sambungan fiber optik. *Fire panel* utama harus memiliki tampilan untuk semua bangunan.
- h. FACP juga harus memiliki kemampuan sebagai berikut:
1. Mengaktifkan *audible alarm* dan *visible alarm strobe light/ beacon lamp* setelah menerima sinyal deteksi kebakaran dari salah satu *fire detector* atau inisiasi *manual alarm call point*.
 2. Memulai sinyal otomatis untuk *shutdown* sistem HVAC setelah menerima sinyal deteksi kebakaran dari *fire detector* atau *manual alarm call point*.
 3. Memulai sinyal otomatis untuk menutup peredam di saluran sistem HVAC setelah menerima sinyal deteksi kebakaran dari sistem pemadam kebakaran gas.
 4. Setel ulang *audible alarm bell/ strobe light/ beacon lamp* dengan menggunakan tombol, setelah semua inisiator (*fire detector* otomatis dan *manual*

call points) have returned to normal.

- i. FACP shall response any initiating device (e.g. manual call point, detectors) with the following visual and audible alarm:

1. Indicator lamp on the FACP. The indicator shall flash until the system is silenced. After the system is silenced, the alarm lamp shall change from flashing to steady and remain illuminated until the system is reset.
2. Continuous activation of an audible buzzer at the FACP that shall sound until the system is silenced. It shall be possible to silence the FACP audible buzzer without causing the building audible notification system tone to silence.

- j. System must be configured to operate such that no single component failure shall cause loss of availability or system function.

- k. FACP shall be designed to require minimum maintenance and routine calibration. System shall have comprehensive self-checking, calibration and self-diagnostic fault capabilities including self-test failure alarms.

alarm call point) telah kembali normal.


- i. FACP harus merespons setiap perangkat inisiasi (misalnya *manual call point*, detektor) dengan *visual* dan *audible alarm* berikut:

1. Lampu indikator pada FACP. Indikator harus *flash*/ berkedip sampai sistem dimatikan. Setelah sistem dimatikan, lampu *alarm* harus berubah dari *flash* menjadi stabil dan tetap menyala sampai sistem direset.

2. Aktivasi secara kontinu dari *audible buzzer* di FACP yang harus berbunyi sampai sistem dibungkam. *Audible buzzer* di FACP harus dibungkam tanpa menyebabkan nada sistem pemberitahuan yang dapat didengar gedung menjadi senyap.

- j. Sistem harus dikonfigurasi untuk beroperasi sedemikian rupa sehingga tidak ada kegagalan komponen tunggal yang menyebabkan hilangnya ketersediaan atau fungsi sistem.

- k. FACP harus didesain untuk pemeliharaan yang *minimum* dan kalibrasi rutin. Sistem harus memiliki kemampuan yang komprehensif dalam hal pemeriksaan mandiri (*self-checking*), kalibrasi, serta diagnosa kegagalan mandiri (*self-diagnostic fault*), termasuk *self-test failure alarm*.

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7.5.2. Panel

- a. FACP shall be housed in a common enclosure, containing its own dedicated power supply and all electronics module required to meet all functional requirements.
- b. Panel shall have the key lock door and transparent window to view all the indicators.
- c. FACP and its components shall be Underwriters Laboratories (UL) listed under the appropriate UL testing standard for fire alarm applications, shall be suitable for surface mounting otherwise they shall be free standing cabinets.
- d. FACP shall contain a microprocessor based Central Processing Unit (CPU) fully addressable system and control unit. The CPU and control unit shall be modular in structure.
- e. All wires and cables shall be labeled at both ends using the tags.
- f. FACP shall be provided with backlit Liquid Crystal Display (LCD). It shall also be provided with Light-Emitting-Diodes (LEDs), which indicate as minimum the status of the following system parameters: system power, fire alarm, system trouble, events and CPU failure.
- g. A compatible port shall be available on FACP to connect to a laptop computer supplied by VENDOR together with the cable to connect the laptop to the port.

7.5.2. Panel

- a. FACP harus ditempatkan di *common enclosure*, yang berisi *power supply* tersendiri/ khusus dan semua modul elektronik yang diperlukan untuk memenuhi semua persyaratan fungsional.
- b. *Panel* harus memiliki *key lock door* dan jendela transparan untuk melihat semua indikator.
- c. FACP dan komponennya harus *Underwriters Laboratories (UL)* yang terdaftar di bawah standar pengujian UL yang sesuai untuk aplikasi *fire alarm*, harus cocok untuk pemasangan di permukaan, atau dapat sebagai *free standing cabinet*.
- d. FACP harus berisi *Central Processing Unit (CPU)* berbasis *microprocessor* dengan sistem *fully addressable* dan *unit kontrol*. CPU dan *unit kontrol* harus memiliki struktur *modular*.
- e. Semua *wire* dan kabel harus diberi *label* di kedua ujungnya menggunakan *tag*.
- f. FACP harus dilengkapi dengan *Liquid Crystal Display (LCD)*. Itu juga harus dilengkapi dengan *Light-Emitting-Diode (LED)*, yang menunjukkan status *minimum parameter* sistem berikut: *power sistem*, *fire alarm*, masalah sistem, kejadian dan kegagalan CPU.
- g. Port yang kompatibel harus tersedia di FACP untuk menghubungkan ke komputer *laptop* yang disediakan oleh *VENDOR* beserta kabel untuk

menghubungkan *laptop* ke *port* tersebut.

7.5.3. Portable PC (Laptop)

- a. FACP shall be provided with industrial grade portable PC (Laptop) as FACP programming and configuration station. The laptop shall be provided with Windows Operating System including system software and compatible antivirus.
- b. Laptop shall provide a means of FACP to monitor program execution and overall system status. It is also capable to make forcing, data manipulation, and system initiation.
- c. Laptop shall be accessible through password/key-lock to prevent unauthorized programs or data changes.

7.5.4. System Software

- a. All hardware and software development tools including software licenses and necessary software packages for complete system generation shall be provided. All software shall be original with a valid license.

All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.


7.5.3. Portable PC (Laptop)

- a. FACP harus dilengkapi dengan *portable PC (Laptop) industrial grade* sebagai *station* pemrograman dan konfigurasi FACP. *Laptop* harus dilengkapi dengan sistem operasi *window* termasuk perangkat lunak sistem serta *antivirus* yang kompatibel.
- b. *Laptop* harus menyediakan sarana FACP untuk *monitor* pelaksanaan program dan status sistem secara keseluruhan. *Laptop* juga mampu melakukan pemaksaan, manipulasi data, dan inisiasi sistem.
- c. *Laptop* harus dapat diakses melalui *password/ key-lock* untuk mencegah program atau perubahan data yang tidak sah.

7.5.4. Software Sistem

- a. Semua *hardware* dan perkakas pengembangan *software* termasuk lisensi *software* serta *software package* yang diperlukan untuk pembuatan sistem yang lengkap harus disediakan. Semua *software* harus asli dengan lisensi yang *valid*.

Semua pemrograman atau pengeditan program yang ada dalam sistem harus dicapai tanpa peralatan khusus dan tanpa mengganggu fungsi *monitoring alarm* dari *Fire Alarm Control Panel (FACP)*.

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8. POWER SUPPLY REQUIREMENT

- a. All FACP equipment shall be powered from a dedicated UPS with an internal battery system. The UPS operates at an output voltage 220VAC, 50 Hz, single phase.
- b. All filters, transformers, rectifiers, etc. shall be provided to convert the above power supply to the level acceptable to the FACP equipment.
- c. The power supply shall provide the required power to the CPU and modules. FACP shall be equipped with a battery back-up system for maintaining normal standby operation for minimum 24 hours and 15 minutes active operation / full load included (Refer to NFPA 72) for each panel.
- d. Loss of primary and secondary power shall not erase the information stored in memory.
- e. The power supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
- f. The power supply shall be power-limited per UL1481 requirements.
- g. Power demand of the FACP equipment shall be minimized, by the use of low power consumption electronics throughout. VENDOR shall furnish the total power consumption figures with a detailed break up.

9. TESTING AND INSPECTION

9.1 Internal Test and Inspection by Vendor

- a. VENDOR shall carry out internal tests and inspections in accordance with VENDOR's requisition and this

8. PERSYARATAN POWER SUPPLY

- a. Semua peralatan FACP harus diberi *power* dari UPS tersendiri/ khusus dengan sistem baterai *internal*. UPS beroperasi pada tegangan keluaran 220VAC, 50 Hz, fase tunggal.
- b. Semua *filter*, transformator, *rectifier*, dan lain-lain harus disediakan untuk mengubah *power supply* di atas ke *level* yang dapat diterima oleh peralatan FACP.
- c. *Power supply* harus menyediakan kebutuhan *power* untuk CPU dan modul. FACP harus dilengkapi dengan sistem cadangan baterai untuk mempertahankan operasi siaga *normal* selama minimal 24 jam dan 15 menit operasi aktif/ termasuk beban penuh (Lihat NFPA 72) untuk setiap *panel*.
- d. Hilangnya *power* primer dan sekunder harus tidak boleh menghapus informasi yang tersimpan dalam memori.
- e. *Power supply* harus menyediakan *circuit* pendeteksi *very low frequency sweep earth*, yang mampu mendeteksi gangguan *earth*.
- f. *Power supply* harus membatasi *power* sesuai persyaratan UL1481.
- g. Permintaan *power* untuk peralatan FACP harus diminimalkan, dengan jalan menggunakan seluruh elektronik yang mengkonsumsi *power* rendah. VENDOR harus memberikan angka konsumsi *power total* dengan *detail* rinciannya.

9. PENGUJIAN DAN INSPEKSI

9.1 Pengujian dan Inspeksi *Internal* oleh Vendor

- a. VENDOR harus melakukan pengujian dan inspeksi *internal* sesuai dengan permintaan VENDOR serta spesifikasi

specification. The detectors shall be calibrated and tested according to *VENDOR*'s procedure. Any problems during the internal test shall be corrected by *VENDOR* and the test shall be completed prior to FAT.

- b. The internal performance test certificate & report shall be provided also to *OWNER/ CONTRACTOR* at least 10 (ten) working days prior to the FAT.

9.2 Factory Acceptance Test (FAT)

- a. *VENDOR* shall carry out Factory Acceptance Test with *CONTRACTOR* and *OWNER* at *VENDOR*'s factory. *VENDOR* shall demonstrate and confirm all functions working as per requirement.
- b. *VENDOR* shall provide the detailed procedure and shall be submitted to *OWNER*, 3 weeks before FAT, for review and approval.
- c. All the tools during the test shall be provided by *VENDOR*.
- d. Deficiencies and errors encountered during the test shall be corrected by *VENDOR/CONTRACTOR*. Any damaged component of the system (hardware and software) shall be repaired and/ or replaced by *VENDOR/ CONTRACTOR* and tested prior to shipment.

9.3 Site Acceptance Test (SAT)

- a. *VENDOR/ CONTRACTOR* shall assign qualified personnel to supervise and assist installation, testing, and commissioning of FACP equipment.
- b. *VENDOR* shall supply all consumables and spare parts for installation, commissioning, and start up of the

ini. Detektor harus dikalibrasi dan diuji sesuai dengan prosedur *VENDOR*. Setiap masalah selama pengujian *internal* harus diperbaiki oleh *VENDOR* serta pengujian harus diselesaikan sebelum FAT.

- b. Sertifikat & laporan uji performa *internal* harus diberikan juga kepada *PEMILIK/ KONTRAKTOR* selambat-lambatnya 10 (sepuluh) hari kerja sebelum FAT.

9.2 Factory Acceptance Test (FAT)

- a. *VENDOR* harus melakukan *Factory Acceptance Test (FAT)* dengan *KONTRAKTOR* dan *PEMILIK* di pabrik *VENDOR*. *VENDOR* harus mendemonstrasikan serta mengkonfirmasi semua fungsi bekerja sesuai kebutuhan.
- b. *VENDOR* harus memberikan prosedur *detail* dan harus diserahkan kepada *PEMILIK*, 3 minggu sebelum FAT, untuk *direview* dan disetujui.
- c. Semua perkakas selama pengujian harus disediakan oleh *VENDOR*.
- d. Kekurangan dan kesalahan yang ditemui selama pengujian harus diperbaiki oleh *VENDOR/ KONTRAKTOR*. Setiap komponen sistem yang rusak (*hardware* dan *software*) harus diperbaiki dan/ atau diganti oleh *VENDOR/ KONTRAKTOR* serta diuji sebelum pengiriman.

9.3 Site Acceptance Test (SAT)

- a. *VENDOR/ KONTRAKTOR* harus menugaskan personil yang memenuhi syarat untuk mengawasi dan membantu instalasi, pengujian, serta *commissioning* peralatan FACP.
- b. *VENDOR* harus menyediakan semua *material* habis pakai dan *spare part* untuk instalasi, *commissioning*, serta *start up*

system.

- c. *VENDOR/ CONTRACTOR* shall carry out Site Acceptance Test with *OWNER* for all *FACP* equipment after installation.
- d. *VENDOR/ CONTRACTOR* shall support integration of all panels in all buildings to the main panel in HSE building as well as communications to FGS.
- e. *VENDOR* shall provide the detailed procedure and shall be submitted to *OWNER* for review and approval.
- f. All the tools during the test shall be provided by *VENDOR*.
- g. *VENDOR* shall supply any special tools required for the system operation, testing, calibration, maintenance or troubleshooting.
- h. Deficiencies and errors encountered during the test shall be corrected by *VENDOR/ CONTRACTOR*. Any damaged component of the system (hardware and software) shall be repaired and/ or replaced and tested.

10. WARRANTY

- a. The equipment, accessories and all materials supplied by the *VENDOR* shall be free from defects and shall perform in accordance with the requirements of this specification.
- b. *VENDOR* shall protect all the materials and equipment properly to avoid damage during shipment and storage.
- c. *VENDOR* shall specify the warranties for the system including hardware and system software. The system shall be warranted for all parts for a period of one (1) year from start- up or eighteen (18)

sistem.

- c. *VENDOR/ KONTRAKTOR* harus melakukan *Site Acceptance Test* dengan *PEMILIK* untuk semua peralatan *FACP* setelah instalasi.
- d. *VENDOR/ KONTRAKTOR* harus mendukung integrasi semua *panel* di semua bangunan ke *panel* utama di gedung HSE serta komunikasi ke FGS.
- e. *VENDOR* harus memberikan prosedur *detail* dan harus diserahkan kepada *PEMILIK* untuk *direview* serta disetujui.
- f. Semua perkakas pengujian harus disediakan oleh *VENDOR*.
- g. *VENDOR* harus menyuplai perkakas khusus yang diperlukan untuk operasi sistem, pengujian, kalibrasi, pemeliharaan atau pemecahan masalah.
- h. Kekurangan dan kesalahan yang ditemui selama pengujian harus diperbaiki oleh *VENDOR/ KONTRAKTOR*. Setiap komponen sistem yang rusak (*hardware* dan *software*) harus diperbaiki dan/ atau diganti serta diuji.

10. GARANSI

- a. Peralatan, aksesori dan semua *material* yang disuplai oleh *VENDOR* harus bebas dari cacat serta harus bekerja sesuai dengan persyaratan spesifikasi ini.
- b. *VENDOR* harus memproteksi semua *material* dan peralatan dengan benar untuk menghindari kerusakan selama pengiriman dan penyimpanan.
- c. *VENDOR* harus menetapkan garansi untuk sistem termasuk sistem *hardware* dan sistem *software*. Sistem harus di garansi untuk semua bagian untuk jangka waktu satu (1) tahun dari *start-up*

months after receipt, whichever occurs first. *VENDOR* shall provide consumable materials on the guarantee period.

atau delapan belas (18) bulan setelah penerimaan, mana yang lebih dulu. *VENDOR* harus menyediakan *material* habis pakai pada masa jaminan.

11. DOCUMENTATION


11.1 *VENDOR/ CONTRACTOR* shall provide a satisfactory and complete drawings and documents package of FACP hardware and software including as minimum, for *OWNER's* review and approval:

1. Technical specification,
2. Dimensional and arrangement drawing,
3. Architecture drawing,
4. List of device and accessories details including manufacturer's name, part number, together with drawing showing location of device,
5. Assembly and construction drawing,
6. List of software used,
7. Cabling interconnection diagram,
8. Loop diagrams,
9. Power supply line diagram,
10. Logic diagram,
11. Installation manual,
12. Commissioning and testing procedure including panel integration plan,
13. Material certification,
14. operation and maintenance manual,
15. Factory Acceptance Test (FAT) procedure and test record,
16. Site Acceptance Test (SAT) procedure and test record,
17. Spare parts requirements,

11. DOKUMENTASI

11.1 *VENDOR/ KONTRAKTOR* harus menyediakan gambar dan *package* dokumen yang memuaskan serta lengkap dari hardware maupun *software* FACP termasuk minimal, untuk *review* dan persetujuan *PEMILIK*:

1. Spesifikasi teknis,
2. *Dimensional* dan *arrangement drawing*,
3. Gambar arsitektur,
4. Daftar *detail* perangkat dan aksesoris termasuk nama pembuat, nomor bagian, bersama dengan gambar yang menunjukkan lokasi perangkat,
5. Gambar rakitan dan konstruksi,
6. Daftar *software* yang digunakan,
7. *Cabling interconnection diagram*,
8. *Loop diagram*,
9. *Power supply line diagram*,
10. Logic diagram,
11. Petunjuk instalasi,
12. Prosedur *commissioning* dan pengujian termasuk rencana integrasi *panel*,
13. Sertifikasi *material*,
14. Petunjuk operasi dan pemeliharaan,
15. Prosedur *Factory Acceptance Test* (FAT) dan rekaman/ catatan pengujian,
16. Prosedur *Site Acceptance Test* (SAT) dan rekaman pengujian,
17. Persyaratan *spare part*,

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18. Any other details supporting documents to support **VENDOR's** compliance statement.

18. *Detail* lainnya berupa dokumen pendukung untuk mendukung pernyataan kepatuhan (*compliance statement*) **VENDOR**.