

**USB or Wi-Fi.** The system shall support **professional test reporting and documentation software** for certification, analysis, and project handover Manage at least 10,000 Cat 6A test results with full graphics.

2.8.6.4 Cable + Network Tester shall comply with Electromagnetic Compatibility (EMC) IEC 61326-1: Basic Electromagnetic Environment

### 3 TRAINING COURSE

- 1.1 The Tenderer shall provide VCCS and Recording training courses and the training courses shall be adequate to provide AEROTHAI's engineers with the following capabilities
  - 1.2.1 To install the System, operate, maintain and diagnose the fault parts down to card (or module) level;
  - 1.2.2 To maintain, update and operate the operational software according to the requirements stated in these specifications;
  - 1.2.3 To utilize the support computer program facility to operate, maintain and configure the VCCS (For VCCS Training course), Recording (For Recording Training course) and the Network Monitoring system;
  - 1.2.4 To operate the ATC Functions (For VCCS Training).
  - 1.2.5 To properly maintenance the system, including both preventive maintenance and corrective maintenance.
- 1.2 The instruction and language used in training documentation shall be in English.
- 1.3 Tenderer shall arrange VCCS training course of at least 10 working days for a different group of at least 6 (Six) AEROTHAI's engineers for technical training at the factory.
- 1.4 Tenderer shall arrange Recording training course of at least 10 working days for a different group of at least 6 (Six) AEROTHAI's engineers for technical training at a factory.
- 1.5 The Tenderer shall arrange on-the-job training for AEROTHAI's engineers and ATC Operational Training.
- 1.6 The AEROTHAI engineers shall participate in the hardware and software installation.



#### 4 LIST OF ABBREVIATIONS

For this document, the following abbreviations and acronyms shall apply:

Abbreviations	Full Name
AC	Alternating Current
ACC	Area Control Center
APP	Approach Control
ATS	Automatic Transfer Switch
CCMS	Central Control and Monitoring System
CON/TRA	Contingency/Training
COR	Coordinator
CWP	Control Working Position
DA	Direct Access
DC	Direct Current
DDOS	Distributed Denial of Service
DTMF	Dual Tone Multi-Frequency
EC	Executive Controller
ED-137	EUROCAE ED-137 Standard for VoIP in Air Traffic Management
EIGRP	Enhanced Interior Gateway Routing Protocol
EMC	Electromagnetic Compatibility
EO	Evaluation Operator
FAT	Factory Acceptance Test
FAT	Factory Acceptance Test
FDO	Flight Data Operator
FXO	Foreign Exchange Office
FXS	Foreign Exchange Subscriber
Gbps	Gigabits per second
GB	Gigabyte
GBE	Gigabits Ethernet
GND	Ground Controller
GPS	Global Positioning System
GUI	Graphical User Interface
HDD	Hard Disk Drive
HTTP	Hypertext Transfer Protocol
HTTPS	Secure Hypertext Transfer Protocol
IA	Instantaneous Access
ICD	International Classification of Diseases
IDA	Indirect Access
IEEE	Institute of Electrical and Electronics Engineers
IOPS	Input/Output Operations Per Second
kbps	kilobits per second
LACP	Link Aggregation Control Protocol
LB	Local Battery

Abbreviations	Full Name
LCL	Local Controller
LUN	Logical Unit Number
MAC	Media Access Control address
MD5	<i>Message-Digest Algorithm</i>
MDF	Main Distribution Frame
MK	Tungmahamek
MOPS	Main Operation System
MTN	Maintenance Engineer
MOPS	Main Operation System
MP3	MPEG-1 Audio Layer-3
MTBF	Mean Time Between Failures
MTRR	Mean Time to Repair
NAS	Network Access Storage
NTP	Network Time Protocol
PABX	Private Automatic Branch Exchange
PC	Planner Controller
PoE	Power over Ethernet
PSP	Pseudo Pilot
PSTN	Public Switched Telephone Network
PTT	Push to Talk
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Independent Disks
RMON	Remote Monitoring
RSSI	Receiver Signal Strength Indicator
RTCP	Real-Time Control Protocol
RTP	Real-Time Protocol
RX	Receiver
SAN	Storage Area Network
SAS	Serial Attached SCSI
SATA	Serial AT Attachment
SCP	Secure Copy
SCT	Simultaneous call transmission
SDN	Software-Defined Networking
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SSD	Solid State Drive
SSH	Secure Shell
TB	<i>Terabyte</i>
TCP	Transmission Control Protocol
TID	Touch Input Device
TMCS	Technical Monitoring and Control System

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Abbreviations	Full Name
TRN	Trainee
TS	Traffic Synchronization
TWR	Tower Control
TX	Transmitter
VCCS	Voice Communication Control System
VDC	Virtual Data Center
VGA	Video Graphics Array
VLAN	Virtual LAN
VoIP	Voice over Internet Protocol
VOX	voice-operated exchange
VPC	Virtual Port Channel
VPN	Virtual Private Network
VTBS	Suvarnabhumi Airport
WAV	Waveform Audio File Format

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## APPENDIX 1: Capacity for Fallback and CONTRA System

### Voice Communication Control System

Item	Description	Fallback		CONTRA		Parallel Telephone	Radio Station					Total	Unit	
		Tower 17, 15A	Approach	Pilot	ATC	Support Building	IX	12	11	Apron West	Apron East			SMR
<b>1 Controller Working Position</b>														
1.1	Touch Screen 12.1"	27	33	10	26							96	EA	
1.2	Foot PTT	27	33	10	26							96	EA	
1.3	Headset/Handset Access	27	33	10	26							96	EA	
1.4	Headset	54	66	20	52							192	EA	
1.5	Handset	54	66	20	52							192	EA	
1.6	Loadspeakers	54	66	20	52							192	EA	
<b>2 VCCS System</b>														
2.1	Database Server	2	2	2								6	EA	
2.2	Radio Server	2	2	2								6	EA	
2.3	Telephone Server	2	2	2		2						8	EA	
2.4	Master Clock	2	2	2								6	EA	
2.5	GPS Antenna	2	2	2								6	EA	
2.6	Slave Clock	27	33	36								96	EA	
2.7	Management Client Desktop PC and Monitor, Software License	1	1	1								3	EA	
2.8	Management Client Laptop, Software License	1	1	1								3	EA	
2.9	Network Monitoring (Management Desktop PC and Monitor, Software License)		1	1								2	EA	
2.10	Network Monitoring (Physical server Software License)		1	1								2	Systems	
2.11	VoIP Radio Channel	120	120	200								440	Channels	
2.12	VoIP Telephone Channel	40	90	150								280	Channels	
2.13	IP Phone (SIP Protocol)	27	33	36								96	EA	
<b>3 Gateways</b>														
3.1	Radio Gateway						70	80	40	20	20	10	240	Interfaces
3.2	Telephone Gateway (FXO)					174							174	Interfaces
3.3	Telephone Gateway (FXS)					6							6	Interfaces
3.4	Telephone Gateway (Local Battery)					20							20	Interfaces
<b>4 Ethernet Switch</b>														
4.1	Ethernet Switch 48 Port for Interface VCCS	4	4	4		2							14	EA
4.2	Ethernet Switch 48 Port for CWP Controller	4	2	2									8	EA
4.3	Ethernet Switch 48 Port for CWP MTN	1	1										2	EA
4.4	Ethernet Switch 48 Port for CWP EO	1	1										2	EA
4.5	Ethernet Switch 48 Port for Slave Clock (Pol. Switch)	6	4	2									12	EA
4.6	Ethernet Switch 48 Port for Radio Station						2	2	2	2	2	2	12	EA
4.7	SIP Module	64	48	32		8	8	8	8	8	8	8	200	EA
<b>5 Power Backup System</b>														
5.1	Power Backup for Central Equipment	1	1	1		1							4	Systems
5.2	Power Backup for CWP	2	2	1									5	Systems
5.3	Battery for A-side	12	12	8		4							36	EA
5.4	Battery for B-side	12	12	8		4							36	EA
5.5	Charger for system A-side	3	3	2		1							9	EA
5.6	Charger for system B-side	3	3	2		1							9	EA
5.7	Inverter for system A-side	3	3	2		1							9	EA
5.8	Inverter for system B-side	3	3	2		1							9	EA
5.9	STS static transfer switch system for A-side 32A	3	3	2		1							9	EA
5.10	STS static transfer switch system for B-side 32A	3	3	2		1							9	EA

## APPENDIX 2: Capacity for Spare System

### ALL SPARE

Item	Description	Quantity	Unit
<b>1</b>	<b>Controller Working Position</b>		
1.1	Touch Screen 12.1"	10	EA
1.2	Foot PTT	10	EA
1.3	Headset/Handset Access	10	EA
1.4	Headset	20	EA
1.5	Handset	20	EA
1.6	Loudspeakers	20	EA
<b>1.6</b>	<b>VCCS System</b>		
2.1	Standard Rack 19" 42U	1	EA
2.2	Database Server	2	EA
2.3	Radio Server	2	EA
2.4	Telephone Server	2	EA
2.5	Master Clock	2	EA
2.6	GPS Antenna	2	EA
2.7	Slave Clock	10	EA
2.8	Management Client Desktop PC and Monitor, Software License	1	EA
2.9	Management Client Laptop, Software License	1	EA
2.10	Network Monitoring (Management Desktop PC and Monitor, Software License)	1	EA
2.11	Network Monitoring (Physical server+Software License)	1	System
2.12	VoIP Radio Channel	30	Channels
2.13	VoIP Telephone Channel	30	Channels
2.14	IP Phone (SIP Protocol)	10	EA
<b>3</b>	<b>Gateways</b>		
3.1	Radio Gateway	30	Interfaces
3.2	Telephone Gateway (FXO)	20	Interfaces
3.3	Telephone Gateway (FXS)	4	Interfaces
3.4	Telephone Gateway (Local Battery)	6	Interfaces
<b>4</b>	<b>Ethernet Switch</b>		
4.1	Ethernet Switch 48 Port Interface VCCS	4	EA
4.2	Ethernet Switch 48 Port for Slave Clock (PoE Switch)	2	EA
4.3	SFP Module	24	EA
<b>5</b>	<b>Fiber Optic</b>		
5.1	Fiber Patch Cables SC-SC (UPC) Duplex 5m	30	EA
5.2	Fiber Patch Cables SC-SC (UPC) Duplex 10m	30	EA
5.3	Fiber Patch Cables SC-SC (UPC) Duplex 20m	30	EA
<b>6</b>	<b>Power Backup System</b>		
6.1	Standard Rack 19" 42U	1	EA
6.2	Battery for A-side	4	EA
6.3	Battery for B-side	4	EA
6.4	Charger for system A-side	1	EA
6.5	Charger for system B-side	1	EA
6.6	Inverter for system A-side	1	EA
6.7	Inverter for system B-side	1	EA
6.8	STS static transfer switch system for A-side 32A	1	EA