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Our Ref: OM-SC/022

9 September 2004

MEMORANDUM

To: All Staff

From: Andrew Loh

**REVISION TO MASTER SPECIFICATIONS FOR
AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION**

Please note that the following Schedules for Air Conditioning & Mechanical Ventilation Installation (DSC & NSC) have been updated:

Schedule 6 – Schedule of Servicing & Maintenance

Schedule 7 – Schedule of Technical Particulars

The changes are overmarked in the attached Schedules 6 & 7.

Andrew Loh

cc TLS/RT
cc Memo File

enc

/na

BCA
ISO 9000
CERT. NO.: 236
SS ISO 9001 : 2000

FEEDBACK REPORT FORM

Alpha Engineering Consultant

Ref No: B1-300804(CS)

To: LCT From: CLM 30/8/04

Job No./Project: _____ *(where applicable)*

Source of feedback: Master Spec For ACWI

Scope of Feedback: *Quality System/Administrative/Contractual/Technical/Specification/Others

Section A : Problem & Cause

Specs need updating & improvement.

Section B : Suggested Corrective Action

See attached Sch. 6 & Sch 7 with comments/suggestions overmarked.

Section C: Approved Corrective Action

Approved By : _____ Date: 1/9

Section D : Action

Action By: NA

Targeted Completion: Sept '04

Actual Completion: 09/09/04 Verified By: _____

* *Delete as appropriate*

Distribution:

AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION

SCHEDULE 6 - SCHEDULE OF SERVICING & MAINTENANCE

30/11/95

S6.1 Servicing & Maintenance After Maintenance Period

We will undertake to carry out the servicing and maintenance of the whole of the Works in accordance with the requirements as specified in the Section entitled Specification Section - "Servicing & Maintenance" after the expiry of the Maintenance Period for the following **monthly** costs for three (3) years or shorter period at a pro-rata costs. Payment for each monthly servicing will be made by the Employer at the end of each month.

1st Year	S$ ..... per month
2nd Year	S$ ..... per month
3rd Year	S$ ..... per month

~~Total~~ ~~S$ ..... per month~~ Delete — Not relevant.

30/11/95

S6.2 Schedule of Servicing & Maintenance

We confirm that our prices for servicing and maintenance also include the service of the appropriate grade of Licensed Electrical Worker and or Service Personnel to take charge of the whole of the Installation. The prices offered include the updating or preparation of record or 'as installed' drawings and submission of same to the other relevant authorities (if applicable) and payment of all fees necessary for servicing, maintenance & operation of the whole of the Works.

We agree that the Employer shall have the option to accept the above prices before the expiry of the Maintenance Period.

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AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION

SCHEDULE 7 - SCHEDULE OF TECHNICAL PARTICULARS

Prior approval must be obtained from the Project Director before any alterations are made to this preamble. This preamble is common for all the M&E Services and any alterations to this preamble for one service shall be applicable to all the other M&E Services.
30/11/95

Preamble

Particulars given in this Schedule will be binding upon the Sub-Contractor, and may not be varied except on the written instruction of the Architect. The approval or otherwise of these particulars given shall in no way be deemed to relieve the Sub-Contractor of any of his obligations under the Sub-Contract.

Tenderers are requested not to repeat the details called for in any separate Specification of their own. The words "As Specified" or "To Suit" of "Equal and Approved" will not be accepted as a sufficient description of any item.

Tenderers wishing to offer alternative equipment shall submit full technical details as indicated hereafter on separate sheets and **not in this document**. Alternative offers shall also be accompanied by summarised cost adjustments relating to the price entered in the Form of Tender. **Failure to comply with this requirement may lead to the alternative offer not being considered.**

SCHEDULE 7 - SCHEDULE OF TECHNICAL PARTICULARS (Cont'd)

30/11/95 chillers

S7.1 ~~**Centrifugal Water Chilling Units**~~

Particulars / Equipment	Water-cooled chillers	Air-cooled chillers
Brand		
Manufacturer		
Country of Origin		
Type of Compressor		
Input kW/kW		
Type of refrigerant		

30/11/95

S7.2 **Cooling Towers**

Particulars / Equipment	
Brand	
Manufacturer	
Country of Origin	
Fans:	
Manufacturer	
Country of Origin	
Motor:	
Manufacturer	
Country of Origin	

To delete - all these are determined by CT supplier

30/11/95

S7.3 **Water Pumps**

Particulars / Equipment	Brand	Pump Manufacturer	Country of Origin	Motor Manufacturer	Country of Origin
(a) Chilled Water Pumps					
(b) Condenser Water Pumps					
(c) Cooling Towers Make-up Water Pumps					

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S7.4 Water Tanks

Equipment / Particulars	Chilled Water Expansion Tank	Hydronic Tanks
Name and Address of Fabricator/Manufacture		
Manufacturer of Internal Lining		

30/11/95

S7.5 Air Handling Units & Fan Coil Units

Air-cooled split unit VRV system Packaged units

Equipment / Particulars	Air Handling Units	Fan Coil Units
Brand		
Manufacturer		
Country of Origin		
Cooling Coil Manufacturer		
Country of Origin		
Fan Manufacturer		
Country of Origin		
Fan Shaft Bearing Manufacturer		
Country of Origin		
Type		
Recommended Operating Hours		
Fan Motor Manufacturer		
Country of Origin		
Motor Starter Manufacturer		
Country of Origin		

To delete - all these are determined by ATU supplier

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S7.6 Ventilation Fans

Type of Fan / Particulars	Centrifugal Fan	Axial Fan	Kitchen Exhaust Fan
Brand			
Manufacturer			
Country of Origin			
~~Motor Starter:~~ / ~~Manufacturer~~ / ~~Country of Origin~~			

To delete

30/11/95

S7.7 Water Treatment System

Equipment / Particulars	Condenser Water System	Chilled Water System
Chemical Treatment: / Brand / Manufacturer / Country of Origin		
Metering Pumps: / Manufacturer / Country of Origin		
Pump Motors: / Manufacturer / Country of Origin / Local Agent		

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S7.8 Sound Attenuators

Equipment / Particulars	Rectangular Attenuator	Cylindrical Attenuator
Brand		
Manufacturer		
Country of Origin		

30/11/95

S7.9 Vibration Isolators

Type of Fan / Particulars	Brand	Manufacturer	Country of Origin
Chiller			
Cooling Tower			
Pump			
Air Compressor			
Air Handling Unit			
Fan Coil Unit			
Centrifugal Fan			
Axial Fan			
Propellor Fan			
Pipe			
Duct			

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S7.10 Thermal and Acoustic Insulation

Particulars / Equipment	Insulation Material			Vapour Seal Material		Sheath Material	
	Brand	Manufacturer	Country of Origin	Manufacturer	Country of Origin	Manufacturer	Country of Origin
Chilled Water Pipework							
Drain & Condensate Pipework							
Galvanised Sheet Steel Duct - External Insulation							
Galvanised Sheet Steel Duct - Internal Acoustic/ Thermal Insulation							
Chilled Water Expansion Tank							
Refrigeration Machines							
Pump Volutes							
Flanges Boxes							
Fan Room Wall & Ceiling Acoustic Lining							

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changes to tie in with specs

30/11/95

S7.11 Pipework

Particulars / Equipment	Copper Pipe to BS ~~659~~ EN1057	Black Mild Steel Pipe to BS 1387 ~~Medium Gauge~~	Black Mild Steel Pipe to ~~BS 3601 Medium Gauge~~	Galvanised Steel Pipe to BS 1387 ~~Medium Gauge~~	~~Galvanised Steel Pipe to BS 3601 Medium Gauge~~	UPVC Pipe	~~Fire-retarding Polyethylene Pipe~~
Brand of pipe		class B	API 5L	class B			
Manufacturer of pipe							
Country of Origin of pipe							
Manufacturer of Pipe Fittings							
Country of Origin of Pipe Fittings							

Brand of pipe fittings

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S7.12 Valves, Strainers, Gauges, Anti-Vibration Couplings

Particulars	Brand	Manufacturer	Country of Origin
Gate Valve			
Ball Valve			
Globe Valve			
Check Valve			
Strainer			
Drain Cocks			
Automatic Air Vents			
Anti-Vibration Coupling			
Variable Pressure Constant Flow Valve			

30/11/95

S7.13 Ductwork & Air Diffusion Equipment

	Brand	Manufacturer	Country of origin
Galvanised sheet steel ductwork			
Diffusers & Grilles			

(a) Galvanised Sheet Steel: Ductwork

Brand .....

Manufacturer of Sheet Steel: .....

Country of Origin .....

Fabricator/Manufacturer of Ducts .....

.....

Fabricator/Manufacturer of Diffusers, Registers & Grilles .....

.....

Country of Origin of Diffusers, Registers & Grilles .....

.....

(b) Dampers

	Brand	Manufacturer	Country of Origin
Fire Damper			
Non-Return Dampers			
Manual Dampers			

Volume control

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Automatic Motorised Dampers			

30/11/95

S7.14 Electric/Electronic Control Components

	Brand	Manufacturer	Country of Origin
Damper Operator (ON/OFF)			
Damper Operator (Modulating)			
2-Way Valves (ON/OFF)			
2-Way Valves (Modulating)			
3-Way Valves (ON/OFF)			
3-Way Valves (Modulating)			
Sensors/Controllers Temperature - air duct Temperature - space Flow Measuring Station			
Indicators Temperature - space Humidity - space			
Air Solenoid Valves			
Pressure Reducing Valves			
Other Components:- (Tenderers to State)			

30/11/95

S7.15 Electrical Panels

	Brand	Manufacturer	Country of Origin
Main A/C Control Panels			
Main Supervisory			

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Control Panels			
Building Automation System			
Subsidiary Control Panels			

30/11/95

S7.16 Moulded Case Circuit Breakers (MCCBs)

To include in S7.17

	Brand	Manufacturer	Country of Origin
40 Amp. TPN			
60 Amp. TPN			
80 Amp. TPN			
100 Amp. TPN			
150 Amp. TPN			
180 Amp. TPN			
200 Amp. TPN			
250 Amp. TPN			
300 Amp. TPN			
400 Amp. TPN			
500 Amp. TPN			
600 Amp. TPN			
700 Amp. TPN			
1400 Amp. TPN			
1600 Amp. TPN			
Auxiliary Device (if any)			

PowerGrid's letter or certificates approving the use of the types of MCCBs offered to be submitted together with the tender.

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30/11/95

S7.17 Electrical Ancillary Equipment and Components

Moulded Case Circuit Breakers

Item	Brand	Manufacturer	Country of Origin
Service Contactors			
Overcurrent Relays			
Earth Fault Relays			
Current Transformers			
Anti-Condensation Heaters			
Time Clocks			
Time Switches			
Start/Stop Push Button Switches			
Indicating Lamps			
Ammeters			
Voltmeters			
Selector Switches			
Isolators			
Fuse Switches			
Auto Transformers			
Star/Delta Starters			
D.O.L. Starters			
Flow Switches			
Step Controller			
Time Delay Relay			
Alarm Bells			
Alarm Buzzers			
Low Level Flow Switches			
H.R.C. Fuses			
Smoke Detector			

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30/11/95

S7.18 Electrical Sub-Mains & Wiring

Item	Brand	Manufacturer	Country of Origin
PVC Cables			
PVC Armoured Cables			
~~PLYSWS Cables~~ ?			
FR ~~MI~~ Cables			
~~Sealing End Boxes for PLYS & PLYSWS Cables~~ ?			
~~Joint Boxes for PVC Armoured Cables~~			
~~Compression type Glands for MI Cables~~			
Cable Trays			
Cable Trunkings			
Conduits			
Flexible Conduits			

No such cable specified in spec.

Cable Ladders

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30/11/95

S7.19 Painting ← Actually painting not really necessary Can we delete ?

Note: ~~(a) Prime Coat~~
~~(b) Under Coat~~
~~(c) Top Coat~~

(OK)

	Brand	Manufacturer	Country of Origin
Unlagged/Sheathed Ductwork ~~(i)~~ ~~(ii)~~ ~~(iii)~~			
Diffusers & Grilles ~~(i)~~ ~~(ii)~~ ~~(iii)~~			
Machinery & Motors ~~(i)~~ ~~(ii)~~ ~~(iii)~~			
Black Steel Pipework ~~(i)~~ ~~(ii)~~ ~~(iii)~~			
Galvanised Steel Pipework ~~(i)~~ ~~(ii)~~ ~~(iii)~~			
Zinc Chromate Paint for cut-ends of Galvanised Steel Sheet & Pipe ~~(i)~~ ~~(ii)~~ ~~(iii)~~			

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S7.19 Painting (Cont'd)

	Brand	Manufacturer	Country of Origin
PVC Based Paint for Expansion Tank & Condensate Water Tanks (i) (ii) (iii)			
Anti-Corrosion Weather-proof Paint for External Pipework & Ductwork (i) (ii) (iii)			
Plaster Finishes (i) (ii) (iii)			

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AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION

SCHEDULE 6 - SCHEDULE OF SERVICING & MAINTENANCE

09/09/04

S6.1 Servicing & Maintenance After Maintenance Period

We will undertake to carry out the servicing and maintenance of the whole of the Works in accordance with the requirements as specified in the Section entitled Specification Section - "Servicing & Maintenance" after the expiry of the Maintenance Period for the following **monthly** costs for three (3) years or shorter period at a pro-rata costs. Payment for each monthly servicing will be made by the Employer at the end of each month.

1st Year	S$ ..... per month
2nd Year	S$ ..... per month
3rd Year	S$ ..... per month

30/11/95

S6.2 Schedule of Servicing & Maintenance

We confirm that our prices for servicing and maintenance also include the service of the appropriate grade of Licensed Electrical Worker and or Service Personnel to take charge of the whole of the Installation. The prices offered include the updating or preparation of record or 'as installed' drawings and submission of same to the other relevant authorities (if applicable) and payment of all fees necessary for servicing, maintenance & operation of the whole of the Works.

We agree that the Employer shall have the option to accept the above prices before the expiry of the Maintenance Period.

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AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION

SCHEDULE 7 - SCHEDULE OF TECHNICAL PARTICULARS

Prior approval must be obtained from the Project Director before any alterations are made to this preamble. This preamble is common for all the M&E Services and any alterations to this preamble for one service shall be applicable to all the other M&E Services.
30/11/95

Preamble

Particulars given in this Schedule will be binding upon the Contractor, and may not be varied except on the written instruction of the Architect. The approval or otherwise of these particulars given shall in no way be deemed to relieve the Contractor of any of his obligations under the Contract.

Tenderers are requested not to repeat the details called for in any separate Specification of their own. The words "As Specified" or "To Suit" of "Equal and Approved" will not be accepted as a sufficient description of any item.

Tenderers wishing to offer alternative equipment shall submit full technical details as indicated hereafter on separate sheets and **not in this document.** Alternative offers shall also be accompanied by summarised cost adjustments relating to the price entered in the Form of Tender. **Failure to comply with this requirement may lead to the alternative offer not being considered.**

09/09/04

S7.1 Chillers

Equipment / Particulars	Water-Cooled Chillers	Air-cooled Chillers
Brand		
Manufacturer		
Country of Origin		
Type of Compressor		
Input kW/kW		
Type of Refrigerant		

09/09/04

S7.2 Cooling Towers

Equipment / Particulars	Cooling Towers
Brand	
Manufacturer	
Country of Origin	

09/09/04

S7.3 Water Pumps

Equipment / Particulars	Chilled Water Pumps	Condenser Water Pumps	Cooling Towers Make-up Water
Brand			
Pump Manufacturer			
Country of Origin			
Motor Manufacturer			
Country of Origin			

30/11/95

S7.4 Water Tanks

Equipment / Particulars	Chilled Water Expansion Tank	Hydronic Tanks
Name and Address of Fabricator/Manufacturer		
Manufacturer of Internal Lining		

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09/09/04

S7.5 Air Handling Units & Fan Coil Units

Particulars / Equipment	Brand	Manufacturer	Country of Origin
Air Handling Units			
Fan Coil Units			
Air-cooled Split Unit			
VRV System Packaged Units			

09/09/04

S7.6 Ventilation Fans

Particulars / Type of Fan	Brand	Manufacturer	Country of Origin
Centrifugal Fan			
Axial Fan			
Kitchen Exhaust Fan			

30/11/95

S7.7 Water Treatment System

Equipment / Particulars	Condenser Water System	Chilled Water System
<u>Chemical Treatment:</u> Brand		
Manufacturer		
Country of Origin		
<u>Metering Pumps:</u> Manufacturer		
Country of Origin		
<u>Pump Motors:</u> Manufacturer		
Country of Origin		
Local Agent		

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30/11/95

S7.8 Sound Attenuators

Equipment / Particulars	Rectangular Attenuator	Cylindrical Attenuator
Brand		
Manufacturer		
Country of Origin		

30/11/95

S7.9 Vibration Isolators

Particulars	Brand	Manufacturer	Country of Origin
Chiller			
Cooling Tower			
Pump			
Air Compressor			
Air Handling Unit			
Fan Coil Unit			
Centrifugal Fan			
Axial Fan			
Propellor Fan			
Pipe			
Duct			

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30/11/95

S7.10 Thermal and Acoustic Insulation

Particulars / Equipment	Insulation Material			Vapour Seal Material		Sheath Material	
	Brand	Manufacturer	Country of Origin	Manufacturer	Country of Origin	Manufacturer	Country of Origin
Chilled Water Pipework							
Drain & Condensate Pipework							
Galvanised Sheet Steel Duct - External Insulation							
Galvanised Sheet Steel Duct - Internal Acoustic / Thermal Insulation							
Chilled Water Expansion Tank							
Refrigeration Machines							
Pump Volutes							
Flanges Boxes							
Fan Room Wall & Ceiling Acoustic Lining							

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09/09/04

S7.11 Pipework

Particulars / Equipment	Copper Pipe to BS EN 1057	Black Mild Steel Pipe to BS 1387 Class B	Black Mild Steel Pipe to API 5L	Galvanised Steel Pipe to BS 1387 Class B	UPVC Pipe
Brand of pipe					
Manufacturer of pipe					
Country of Origin of pipe					
Brand of Pipe fitting					
Manufacturer of Pipe Fittings					
Country of Origin of Pipe Fittings					

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30/11/95

S7.12 Valves, Strainers, Gauges, Anti-Vibration Couplings

Particulars	Brand	Manufacturer	Country of Origin
Gate Valve			
Ball Valve			
Globe Valve			
Check Valve			
Strainer			
Drain Cocks			
Automatic Air Vents			
Anti-Vibration Coupling			
Variable Pressure Constant Flow Valve			

09/09/04

S7.13 Ductwork & Air Diffusion Equipment

Particulars	Brand	Manufacturer	Country of Origin
Galvanised Sheet Steel Ductwork			
Diffusers & Grilles			
Fire Damper			
Non-Return Dampers			
Volume Control Dampers			
Motorised Dampers			

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S7.14 Electric/Electronic Control Components

Particulars	Brand	Manufacturer	Country of Origin
Damper Operator (ON/OFF)			
Damper Operator (Modulating)			
2-Way Valves (ON/OFF)			
2-Way Valves (Modulating)			
3-Way Valves (ON/OFF)			
3-Way Valves (Modulating)			
<u>Sensors/Controllers</u> Temperature - air duct			
Temperature - space			
Flow Measuring Station			
<u>Indicators</u> Temperature - space			
Humidity – space			
Air Solenoid Valves			
Pressure Reducing Valves			
<u>Other Components:-</u> (Tenderers to State)			

30/11/95

S7.15 Electrical Panels

Particulars	Brand	Manufacturer	Country of Origin
Main A/C Control Panels			
Main Supervisory Control Panels			
Building Automation System			
Subsidiary Control Panels			

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09/09/04

S7.16 Electrical Ancillary Equipment and Components

Item	Brand	Manufacturer	Country of Origin
Moulded Case Circuit Breakers			
Service Contactors			
Overcurrent Relays			
Earth Fault Relays			
Current Transformers			
Anti-Condensation Heaters			
Time Clocks			
Time Switches			
Start/Stop Push Button Switches			
Indicating Lamps			
Ammeters			
Voltmeters			
Selector Switches			
Isolators			
Fuse Switches			
Auto Transformers			
Star/Delta Starters			
D.O.L. Starters			
Flow Switches			
Step Controller			
Time Delay Relay			
Alarm Bells			
Alarm Buzzers			
Low Level Flow Switches			
H.R.C. Fuses			
Smoke Detector			

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09/09/04

S7.17 Electrical Sub-Mains & Wiring

Item	Brand	Manufacturer	Country of Origin
PVC Cables			
PVC Armoured Cables			
FR Cables			
Cable Ladders			
Cable Trays			
Cable Trunkings			
Conduits			
Flexible Conduits			

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