Section 3.2.1 Optimisers and Compensators

- **General Checks for Optimisers**
- **General Checks for Compensators**

OPTIMISER

ITEM	FREQ.	ACTION	NOTES
1. Outside air temperature sensor.	12m	Check outside sensor for calibration and display accuracy.	
2. Inside air temperature sensor.	12m	Check inside sensor for calibration and display accuracy.	
3. Programme setting.	12m	Check programme setting is correct.	
4. Optimum stop/start operation.	12m	Check operation by simulation.	Refer to manufacturer's simulation procedures. Any on going problems can be highlighted by the use of a thermograph.
5. Battery.	12m	Check condition.	Note life expectancy (use by date) and change at manufacturer's recommendation. All batteries should be disposed of **only in accordance with COSHH recommendations.**
6. Output devices.	12m	Check that output devices respond to command signals.	
7. Energy savings.	12m	Agree any changes with system operator that may enhance energy savings.	

HEATING COMPENSATOR

ITEM	FREQ.	ACTION	NOTES
1. Flow temperature sensor.	12m	Check.	Refer to sensor checking procedure.
2. Outside air temperature sensor	12m	Check.	Refer to sensor checking procedure.
3. Settings.	12m	Check that settings are correct.	
4. Output signal.	12m	Check output signal and output device operation.	
5. Controllers.	12m	Check and calibrate for correct relationship between outside and flow temperatures.	Refer to manufacturer's recommended simulation procedures.
6. System operation.	12m	Check system under control for proper operation.	

Section 3.2.2 Timers and Timeswitches

- **General maintenance procedures for electro-mechanical and electronic timers**

- **General maintenance procedures for electro-mechanical and electronic timeswitches**

CONTROLLER TIMERS

Note: Timers are often built into the control panel. They can take the form of delay, run on, interval or combinations of all three. The timer should be checked with reference to the control strategy.
Before commencing maintenance schedule carry out an operational check.

ITEM	FREQ.	ACTION	NOTES
Electromechanical			
1.Time settings.	12m	Check time taken to complete operation against setting and adjust if required.	
2. Operation.	12m	Inspect and check operation.	Adjust time to the required time setting for the particular application and put into operation.
Electronic			
1. Time settings.	12m	Check time taken to complete operation against setting and adjust if required.	
2. Operation.	12m	Inspect and check operation.	Adjust time to the required time setting for the particular application and put into operation.
3. Battery.	12m	Check condition.	Note life expectancy (use by date) and change at manufacturer's recommendation. All batteries should be disposed of **only in accordance with COSHH recommendations.**

TIMESWITCHES

ITEM	FREQ.	ACTION	NOTES
Electromechanical			
1. Clocks.	12m	Check for satisfactory operation and correct time.	Adjust for British Summer Time/Greenwich Mean Time as necessary.
2. Operation.	12m	Inspect and check both mechanical and electrical operation.	
3. Tappets.	12m	Inspect and adjust to required on/off operations.	
4. Dial.	12m	Rotate through one revolution and check for free operation of the levers at the correct time.	Reset to correct day.
5. Monthly dial settings e.g. for solar time switches.	12m	Inspect and check.	
6. Reserve time facility (battery if fitted).	12m	Inspect and check.	Replace battery at manufacturer's recommendations. **Batteries should be disposed of only in accordance with COSHH recommendations.**
Electronic			
1. Time clocks.	12m	Check for satisfactory operation and correct time.	Adjust for British Summer Time and Greenwich Mean Time as necessary.
2. Electrical operation.	12m	Inspect and check.	

TIMESWITCHES – continued

ITEM	FREQ.	ACTION	NOTES
Electronic – continued			
3. Time settings in unit memory.	12m	Check settings and adjust if necessary.	Settings could be time of day, month or year.
4. Time switch settings.	12m	Check for correct installation within the memory for particular application. Add, delete or adjust if necessary.	
5. Battery back up (if fitted).	12m	Check condition.	Replace battery according to manufacturer's recommendations. All batteries should be disposed of only in accordance with COSHH requirements.

Section 3.2.3 Control Panels

- **General Maintenance Procedures for Control Panels**
- **Operating Sequence Checks**
- **Control Relays**
- **Switches**
- **Lamps**

CONTROL PANELS

Introduction

When working on or testing Control panels, it is essential that all local and national statutory regulations should be observed at all times. In the United Kingdom, the Health and Safety at Work etc. Act 1974 and the Electricity at Work Regulations 1989 are particularly relevant. It should be noted that control panels having equipment operating above a nominal 415 Volts are excluded from this Specification. This does not imply that safety precautions should not be taken when working on equipment above 415 volts.

Care should be taken to make sure that all remote circuits associated with the switchgear are positively isolated before any work is carried out. The isolation should be 'secure', that is it should either be at the point of work or precautions should be taken to prevent anyone else switching on again when work is in progress. A circuit, whether power or control should never be assumed to be "dead". Voltage tests should always be carried out with proven test equipment, i.e. a voltage tester should first be checked on a known live source immediately before use and again after use.

Whenever cables are disconnected from switchgear in the course of maintenance or replacement, ensure that the cables are suitably insulated and marked for identification for reconnection.

Visually inspect to ensure plant is operating as expected. Check that any meters fitted show a correct reading, and any timers are set at the correct times for operation. Check readings against a known source.

Controllers, Electrical and Pneumatic Control Equipment

Electronic controllers and pneumatic equipment may be found in control panels and details regarding maintenance schedules can be found in the appropriate sections of this schedule.

Appropriate safety guides are as follows:-

HSE Guidance Note GS 38 - Electrical test equipment for use by electricians.
HS(G) 13 - Safety in Electrical Testing
HS(R) 25 - Memorandum on Guidance on the Electricity at Work Regulations 1989.

Trend BMS Controls

The contractor shall ensure that all electronic Trend and other manufacturer's equipment (IQ Controllers and timers) are maintained as per manufacturers specifications and recommendations.

CONTROL PANELS – **electrical services** (excluding electrical controllers and pneumatic relays)

Before commencing any maintenance work on control panels read the notes in the introduction very carefully and follow all the safety procedures.

ITEM	FREQ.	ACTION	NOTES
1. Panel exterior.	3m	Check for physical or mechanical damage. Door locks should be checked.	Any damaged equipment mounted on the front should be made safe and replaced as soon as possible. Locks should be checked for correct security and locking arrangements.
2. Mains isolator (also cubicle isolator).	6m	Inspect for correct mechanical and electrical operation. Lubricate any moving parts as required. Check correct operation of the door interlock mechanism and adjust if necessary. Clean out interior.	Physically check for security all mains connections. Examine both fixed and moving contacts for wear or "pitting". Use only Manufacturer's recommended lubricants. Redress or replace contacts according to the manufacturer's instructions. Ensure that any mains "shrouding" is refitted after the completion of the work.
3. Fuses. **Ensure circuits are dead before carrying out actions.**	6m	Inspect fuse carrier/fuse holder for signs of over-heating. Check fuse rating and terminations for tightness. Apply grease to fuse holder if required.	Replace if necessary and establish cause of over-heating and rectify. Value of fuse should be checked against the circuit application and electrical load.
4. Circuit breakers.	6m	Inspect for signs of over-heating and replace if necessary. Inspect connections and tighten if necessary. Check operation by tripping or 'test' facility, if fitted.	Establish cause of overheating and rectify. Ensure value of breaker corresponds with circuit application and electrical load.

CONTROL PANELS – electrical services – continued

ITEM	FREQ.	ACTION	NOTES
5. Residual current devices. (RCDs)	6m 12m	Test operation using test facility. Carry out electrical test procedures per IEE Regs.	
6. Power contactors.	12m	a) Check contact for correct mechanical and electrical operation. b) Strip and clean interior. c) Inspect and clean magnetic pole faces. Inspect shaded ring for damage and fixed and moving contacts for wear or 'pitting'. d) Inspect coil for over-heating or insulation breakdown. e) Clean out arc shutes On re-assembly: avoid damage or loosening of springs or contacts, ensure correct mechanical operation and check all electrical connections for tightness and security.	Damage contacts should be redressed or replaced as necessary. Use approved contact lubricant if recommended by the manufacturer. (where fitted) Spring and contacts should be correctly positioned and seated.

CONTROL PANELS – electrical services – continued

ITEM	FREQ.	ACTION	NOTES
7. Starters. – direct on line. – star delta	12m	Carry out maintenance as for power contactors.	See following pages.
8. Thermal overloads.	12m	a) Inspect for signs of overheating. b) Check electrical connections for tightness and security. c) Inspect trip settings. d) Operate the trip/test facility ensuring that the switchgear de-energises in a clean and positive operation.	Replace if necessary after having established the cause and rectified it. Adjust if necessary to give correct protection for the connected load. Record settings. Check for single phasing protection by operating the starter with one of the power fuses removed.

CONTROL PANELS – electrical services – continued

ITEM	FREQ.	ACTION	NOTES
9. Magnetic overloads.	12m	a) Inspect for signs of overheating b) Check electrical connections for tightness and security. C) Check oil levels in dashpots and replenish to correct levels if needed. d) Check "time" mechanism. e) Operate "test" facility ensure switchgear de-energises in a clean and positive operation. f) Inspect trip settings. g) Check single phase protection.	Completely replace dashpot oil at intervals recommended by the manufacturer. Select correct dashpot drain hole if necessary. Adjust if necessary to give correct protection for connected load. This is done by operating starter with one of the power fuses removed.
10. Busbar systems.	12m	Isolate supplies, inspect for signs or overheating, damage or burnt out cables Inspect mechanical support systems and adjust fixings if necessary.	Check all cable crimps for security and fraying. Inspect crimp fasteners for correct torque rating.
11. Incoming power supplies.	12m	Measure each line to earth and each line to neutral.	Record readings and check that measured values are within electricity supplier's specification.

CONTROL PANELS – electrical services – continued

ITEM	FREQ.	ACTION	NOTES
12. Panel wiring.	12m	a) Inspect for signs of overheating or burn marks. b) Replace any suspect conductors. c) Check all connections, terminations, earth cables and links for security and tightness. d) Ensure cable connections are tight and correctly terminated. e) Check that panel is correctly bonded to earth.	Test continuity and record readings.
13. Flash test.	36m	Carry out within 1.5kV-3.0 kV range to detect potential deterioration of the system.	CAUTION – Care should be taken to isolate sensitive equipment.

STARTERS – Star delta

ITEM	FREQ.	ACTION	NOTES
1. Switchgear.	12m	Carry out maintenance procedures as per power contactors.	See previous instructions.
2. Interlocks.	12m	Inspect and check both electrical and mechanical interlocks between "Star" and "Delta" contactors.	
3. Start up sequence.	12m	Check for correct sequence from start up. Inspect, check and adjust setting of timer to match character of the connected load.	"Star" first then "Delta" mode.
4. Starter overload settings.	6m	Check.	If overload is connected into the "Delta" loop the overload should be set to 0.58 of the line current.

CONTROL RELAYS

ITEM	FREQ.	ACTION	NOTES
General			
1. Mechanical wear.	12m	Inspect for excessive wear.	
2. Contacts.	12m	Check for wear, redress or replace as required.	
3. Coil.	12m	Inspect for signs of over-heating and insulation breakdown.	
4. Electrical operation.	12m	Operate relay and check for clean operation of each set of operations.	
5. Pole faces.	12m	Clean if noisy operation of relay.	
Plug in type			
1. General maintenance.	12m	Carry out as per instructions given above.	
2. Relay connection pins.	12m	Inspect for signs of burning.	Replace relay if necessary.
3. Base unit.	12m	Inspect for signs of over-heating or arcing	Replace base unit if necessary.

SELECTOR SWITCHES and PUSH BUTTONS

ITEM	FREQ.	ACTION	NOTES
1. Operation.	12m	a) Inspect and check both mechanical and electrical operation, b) operate to ensure a free and clean movement in its action.	
2. Contacts.	12m	Inspect for any signs of overheating, pitting, or wear. Replace as necessary.	
3. Application.	12m	Check switch/push button for particular application.	

CONTROL PANELS – lamps, meters, alarms, etc.

ITEM	FREQ.	ACTION	NOTES
Indicator lamps			
1. Circuit.	m	Check and energise to ensure that the indicator is operational. Replace any blown or discoloured bulbs as required.	Replacement bulbs should be of the correct type and the voltage and power rating must be as per the manufacturer's specification. **A device of a higher power rating should not be used.**
2. Holder assembly.	6m	Inspect for signs of over-heating or electrical burn marks.	
3. Mains/low voltage transformer (if fitted).	6m	Examine for signs of over-heating or insulation breakdown.	
Low voltage power packs – ac or dc types.			
1. Condition.	12m	Inspect for signs of over-heating.	
2. Voltage input and output tests.	12m	Carry out and compare with manufacturer's tolerance and operational specifications.	Check polarity of outputs where necessary.
3. Load measurements.	12m	Carry out, record and ensure that the load taken from the unit is within the manufacturer's specification.	

CONTROL PANELS – lamps, meters, alarms, etc. – continued

ITEM	FREQ.	ACTION	NOTES
4. Associated safety or trip devices.	6m	Check for correct operation.	
Metering (Voltmeter)			
1. Instrument.	6m	Inspect and check for correct mechanical and electrical operation.	Check actual reading, record and compare with a reference voltmeter applied across the same circuit.
2. Needle (pointer).	6m	Check for free and correct movement.	
3. Zero setting.	6m	Check and adjust if necessary.	
Metering (Ammeter)			
1. Instrument.	6m	Inspect and check for correct mechanical and electrical operation.	Check actual reading, record and compare with a reference ammeter applied in series in same circuit.
2. Needle (pointer).	6m	Check for free and correct movement.	
3. Zero setting.	6m	Check and adjust if necessary.	

CONTROL PANELS – lamps, meters, alarms, etc. – continued

ITEM	FREQ.	ACTION	NOTES
Alarm integrator			
1. Operation.	12m	Inspect and check operation of each input channel.	
2. Audible and visual alarms.	12m	Check operation and indications including alarm circuits if fitted.	
Smoke alarm unit			
1. Unit.	12m	Inspect; check operation by adjusting or operating alarm test facility (if fitted).	
2. Alarm setting.	12m	Reduce setting and note operation of "smoke condition"	
3. Maintenance.		Carry out manufacturer's "testing and maintenance" procedures as required at stipulated frequencies.	
General			
1. Cleaning.	12m	The interior of the control panel should be cleaned.	