

To: Cate Cooney[Cate.Cooney@Exova.com]
From: Clare Barker
Sent: Tue 07/08/2012 9:03:57 AM
Importance: Normal
Subject: FW: Grenfell Tower
Received: Tue 07/08/2012 9:04:04 AM
[Grenfell Tower Specification Tender Issue_19-10-11_.pdf](#)
[Y03 - Grenfell Tower.pdf](#)
[60190925-GT-001.pdf](#)
[60190925-GT-002.pdf](#)
[Grenfell Tower - Document Issue Sheet.pdf](#)

[See below](#)

Dr Clare Barker: Principal Consultant, Fire Engineering (Europe), Warrington
T: [REDACTED]
Exova Warringtonfire

From: Bruce Sounes [mailto:bruce@studioe.co.uk]
Sent: 30 July 2012 10:57
To: Clare Barker
Cc: Terry Ashton; Grenfell
Subject: Grenfell Tower

Dear Clare,

I wanted to thank you for coming to the Project Meeting last Thursday. I appreciate it can seem like you occupy a very small part of the agenda and therefore an expensive use of your time but Thursday was the first time since May that we've managed to assemble the whole team, including the client and the contractor and it was an invaluable briefing for everyone. I would not expect to need another meeting with Exova before we submit for Planning, and possibly not again until we're in negotiation with Building Control.

Please see attached the specification for the smoke exhaust/ventilation to the residential lobbies.

We are more than happy to continue working with you in Warrington, but if someone else in London is going to pick it up we would like to know as soon as possible. Please could you get back to me?

Regards

Bruce Sounes

For and on behalf of
STUDIO E LLP
Palace Wharf, Rainville Road, London W6 9HN
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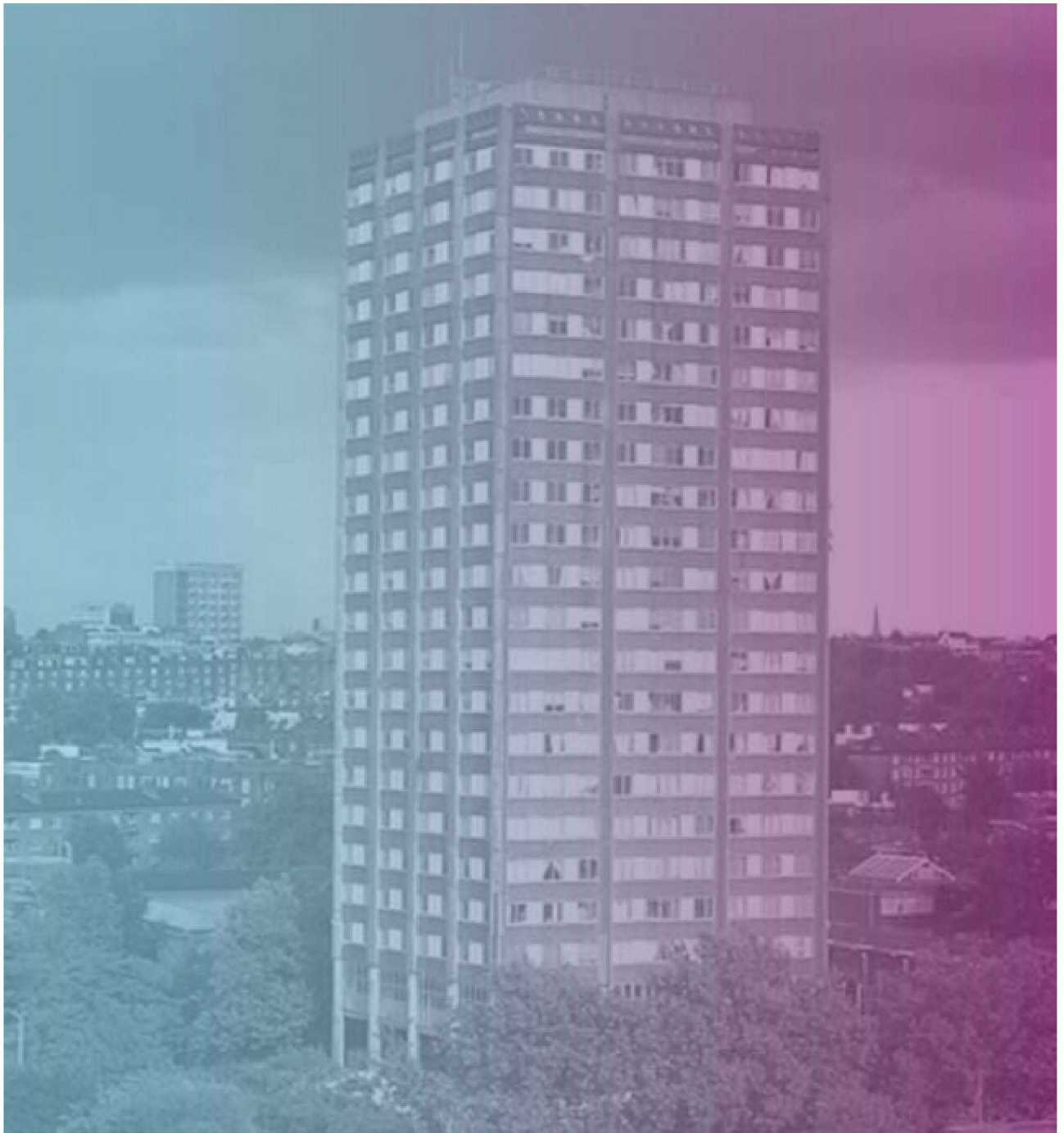
Queen's Award for Enterprise: Sustainable Development 2010
BCSE Award School Architect of the Year 2008 & 2010
BCSE Award Inspiring Design Primary School 2008 & Academy 2010
BSF Award Excellence in Student Engagement 2009
Sustainable City Award 2009



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Grenfell Tower

Upgrade to Fire Alarm and Smoke Extract System

Kensington & Chelsea TMO

October 2011

Royal Borough of Kensington and Chelsea

Grenfell Tower
Upgrade to Fire Alarm and Smoke Extract System

Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP

October 2011

Prepared by:

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Andrew Pearson
Project Engineer


Checked by:

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Approved by:

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Graham Bonnett
Project Director


Revision	Date	Description	Made	Checked	Approved
T1	Oct 11	Tender Issue	AP	MB	GB

Job No:	Services - Kensington & Chelsea Electrical Upgrades		 Website: www.aecom.com
Reference:	Services - Kensington & Chelsea Electrical		
Date:	Upgrades/Grenfell Tower/GB/AP rev T1		
Filename:	October 2011 f:\projects\services - kensington & chelsea electrical upgrades\grenfell tower - fire alarm & smoke extract\7-0 reports and specifications\7-5 tender\grenfell tower specification tender issue (19-10-11).doc		

Client: Royal Borough of Kensington and Chelsea
Tenant Management Organisation Limited
292A Kensal Road
London, W10 5BE

M & E Engineer: AECOM
AECOM House
63-77 Victoria Street
St Albans, AL1 3ER

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Job No:	Services - Kensington & Chelsea Electrical Upgrades		<div> Website: www.aecom.com</div>
Reference:	Services - Kensington & Chelsea Electrical		
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NOTES FOR TENDERERS

This document has been compiled using text from the National Engineering Specification (NES) / Specification Expert, which is copyright to the Amtech Group. The format of the specification has, however being considerably re-arranged from that provided by Amtech.

The technical content of this specification has been prepared using the Common Arrangement of Work Sections for Building Works and is in four sections.

For reference each work section ends with clause 10000. Here is stated the latest revision of the raw NES / "Specification Expert" on which the AECOM specification work section is based.

SECTION 1 – SCOPE OF WORKS

A summary description of the Works by Work Section.

SECTION 2 – WORK SECTIONS

The specification for each Work Section is generally sub-divided into two parts:

Part 1 System objectives

The system objectives are clauses giving details of the performance and/or design parameters.

Part 3 Clauses specific to the system

These clauses are specific to the Work Section concerned.

Where clauses contain "type" references, these are for cross referencing within the specification and do not necessarily relate to manufacturers types.

NB: (Part 2 relates to the format used in the raw NES "Specification Expert" and selection schedules for the Y clauses. Part 2's are not used in AECOM specifications and are replaced by schedules in section4)

SECTION 3 – REFERENCE (WORKMANSHIP) SPECIFICATIONS – Y clauses

These clauses specify items that are common to several systems (for example pipework, ductwork and cabling). The individual clauses are generally arranged in the order of the Common Arrangement "Y" sections from which they originated.

Generally these specifications represent AECOM's standards, contain all contain clauses applicable to each particular category and are not project specific.

Where choices are required, they are made in the Schedules or Scope of Works; otherwise all of the clauses are applicable.

SECTION 4 – SCHEDULES


This section contains schedules of drawings, manufacturers, equipment duties and selections for plant, ancillaries and system components, specific to this project.

ENQUIRIES TO MANUFACTURERS

Enquiries to manufacturers should include all relevant sections as well as any related contractual information. ie the relevant work section and Y clauses pertinent to the plant item in addition to the plant schedule.

NON-NES CLAUSES

Clauses which are structurally different from NES Specification Expert from which they originated, or are AECOM originated clauses, are generally identified by the clause reference being underlined and/or the last digit of the clause number being increased e.g. 300.010 becomes 300.011.

Job No:	Services - Kensington & Chelsea Electrical Upgrades	 Website: www.aecom.com
Reference:	Services - Kensington & Chelsea Electrical	
Date:	Upgrades/Grenfell Tower/GB/AP rev T1	
Filename:	October 2011	
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Content

Front Pages	1
Section 1 - Scope of Works	6
General.....	6
U14 - Smoke Extract / Control	6
V22 - General Power.....	8
W50 - Fire Detection & Alarm	8
Section 2 - Work Sections	10
A12 - The Site/Existing Buildings	10
A64 - Preliminaries/General Conditions for Building Services Contract	11
U14 - Smoke Extract / Control	23
V22 - General Power.....	24
W50 - Fire Detection & Alarm	26
Section 3 - Reference (Workmanship) Clauses	30
Y03 – Standard Mechanical & Electrical Y Reference (workmanship) clauses.....	30
Y82 - Identification - Electrical Services.....	31
Y90 - Fixing to Building Fabric	35
Section 4 - Schedules	37
A11sch1 – Schedule of Drawings (A11)	37
A11sch4 – Analysis of Engineering Services Tender Sum(A11)	38
A11sch6 – Alternative Manufacturers / Installers (A11)	41
A11sch7 – Works to be Sublet (A11)	42
A11sch8 – Rates for Additional Work (A11)	43
W50sch1 - Schedule of Fire Alarm Equipment (W50)	45

Scope of the Works

General

Project Description

Grenfell Tower is a 24 storey tower block in Kensington, West London, built in the 1970's. There are 120 flats in the tower with 6 flats on each floor and office space on the first 4 stories.

A basic fire detection system has been installed with zone monitoring provided in the ground floor lift lobby. All fire alarm systems have dedicated electrical supplies off the mains within the ground floor switch room. One smoke detector has been installed on each communal floor level and in itself acts as one fire zone.

Brick ventilation risers have been constructed in the original tower design. One allows fresh air to rise up the building to each floor; the other allows smoke to exit from each floor. In the event of a smoke detector operating, the solenoid spring loaded smoke vents release to allow a natural ventilation path through the lobby to remove the smoke.

Mechanical fans are also available for the fire brigade to operate to increase the supply and extract rates of the ventilations. These fans are located at the bottom of the supply riser and within the roof plant room for the extract system. The fans are currently totally manually controlled – part of this project is to ensure these start automatically.

The scope of this specification is for the renewal and/or upgrade of the existing fire alarm and smoke extract system to ensure the system operates effectively, is easier to monitor and maintain and bring the system up to current Statutory Legislation, Approved Codes of Practice and Health and Safety Regulations.

Building Services

This specification is for the supply/refurbishment, installation, testing and commissioning of the following building services systems:-

- Smoke extract dampers and monitoring system
- Damper controls
- Fire alarm panel
- Smoke detectors
- New BT GSM Redcare fire alarm monitoring

Builders Work

It is not anticipated that large builders work holes are required for this project, only builders work holes for cable penetrations together with making good smoke vent openings as required.

The demarcation of responsibilities for builders work in connection with the engineering services as defined in the Main Contract Preliminaries shall be agreed with the Main Contractor during the tender period and clearly identified in the tender submission.

U14 - Smoke Extract/Control

System Description

Smoke Dampers

The smoke dampers are present open in the event of a fire and the smoke extract system operates in natural stack mode. On the assumption that only one set of dampers are likely to open at any one time and that the dampers are air-tight, this would be a viable solution. However, some of the existing dampers leak slightly – this has been demonstrated by smoke testing. In natural ventilation mode, it is therefore possible that smoke from fire on a lower floor could leak through the closed dampers on an upper floor into the lift lobby. In addition to the

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

6/47

EXO000001613/8
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Scope of the Works

possible leakage, it is also possible that more than one set of dampers would open at any one time – there is no way of establishing whether dampers are open or not other than visually inspecting each one. Once the extract fans are started, the negative pressure caused by the extract fans overcomes all these issues. At present, however, the extract fans must be started manually by the fire brigade.

In order to overcome these issues, the following works are required:

- Renovation of the dampers such that work correctly and are aesthetically acceptable
- Conversion of the control system such that the fans start automatically
- The addition of micro-switches and a monitoring system to detect when damper fail open.

Renovation of the dampers

The face grilles of the dampers are noted to have missing screws and loose frames. The following works are required.

- Each grille is removed
- The grille is cleaned and re-sprayed.
- The damper operating mechanism is checked for operation and serviced with any new parts required.
- Monitoring device is fitted (see below)
- Fixing frames are checked and re-fixed as required
- Grilles replaced with new fixing screwed (tamper-proof) in all fixing holes.

Conversion to automatic control of the extract fans

At present, the fans remain off until the Fire Brigade arrive and decide to switch on the fans via the manual switch at Ground floor level. This is to be converted to automatic operation as follows:

- The 3 position manual switch located at Ground floor level is to be retained (only 2 positions are currently used)
- Install a new fire alarm interface (FAI) unit next to the 3 position switch – this is to be controlled from the existing fire alarm panel and configured to make the contact / circuit when the fire alarm operates.
- Re-configure the wiring of the switch such that it has 3 positions:
 - Off – fans don't run irrespective of fire alarm status
 - Auto – fans run when fire alarm operates
 - Override – fans run irrespective of fire alarm status

Damper Monitoring

As noted above, other than visually checking each damper, there is no indication that a damper has opened, which represents a significant smoke transfer risk.

To overcome this, a new micro-switch is to be provided for each damper (both intake and extract). Each group of 4 dampers will be wired in series and connected to a display unit mounted next to the Ground floor fire alarm panel – each floor would have 2 LED's, one green for normal (all dampers closed) and one red (one or more dampers open). An integral buzzer would sound when any red LED is lit with mute button – the mute button will silence the alarm for 1 hour (adjustable up to 24 hours), then re-activate.

Commissioning

Contractor to allow for full commissioning, then cause and effect demonstration of the system to the Engineer and Client for approval. **PC will not be granted until all parties are satisfied that the system operates as designed**

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

7/47

EXO000001613/9
EXO000001613_0000

Scope of the Works

V22 – General Power

System Description

The provision of power supplies shall be in accordance with manufacturer's requirements and supplied from dedicated circuits from the local distribution board.

The contractor shall be responsible for installation of all power requirements to panels.

Small power cabling shall be in single core double insulated PVC wiring unless otherwise specified. Fire alarm/fire resistant cabling shall be in FP200 Gold.

All circuits shall be installed using existing containment or in suitable trunking and conduit. Select the MCB type based on application, earth loop impedance and disconnection time.

Ensure all equipment has local isolation.

The contractor shall be responsible for supply, installation and commissioning of all installed systems and equipment

W50 - Fire Detection and Alarm

System Description

The existing Kentec fire alarm panel is located within the lift lobby on ground floor. Smoke detectors within the residential floors each have a smoke detector which is connected to this panel with each floor set a different zone.

Fire alarm repeater panel

The contractor shall install a fire alarm repeater panel in ground floor reception. This panel shall be connected into the existing panel to mimic all controls. A Kentec K3000S panel shall be used. FP200 Gold fire cable shall be used to connect the two panels together, installed in tamperproof trunking.

Kentec Electronics Ltd.
Units 25-27 Fawkes Avenue,
Questor, Dartford,
Kent. DA1 1JQ
United Kingdom
Tel: 01322 222121

A fire alarm interface (FAI) shall be installed next to the 3-position firemans switch the smoke extract control – this operate on activate of any lift lobby fire detector and will start the smoke extract fans

Smoke detectors and vandal resistant guards

The contractor shall remove all the old smoke detectors and install new detectors in the same location. These detectors shall be the Apollo Series 65A range. New smoke detector vandal resistant wire mesh guards shall be provided over all smoke detectors.

Apollo (UK)
36 Brookside Road
Havant
Hampshire

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

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Scope of the Works

PO9 1JR

UK

t: [REDACTED]

e: sales@apollo-fire.co.uk

Autodialer to care centre

The contractor shall install a BT GSM Redcare fire alarm monitoring system. This shall provide a direct, 24hr link with the Alarm Receiving Centre who would then contact the emergency services in the event of an emergency.

An existing BT line into the reception area shall be used for this service.

The contractor shall advise the client and design team of the monthly service charge before placing any orders.

The contractor shall be responsible for supply, installation and commissioning of all installed systems and equipment

**** End of Scope Sections ****

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

9/47

EX000001613/11
EX000001613_0011

A12 – The site / Existing Buildings

110.000 THE SITE / EXISTING BUILDINGS:

The site/existing buildings are described in the Main Contract Preliminaries.

120.000 SITE LOCATION

Grenfell Tower
Lancaster West Estate
Bramley Road
W10

Project work in circulations and plant areas serving the residential portion of the building.

130.000 EXISTING MAINS / SERVICES:

The existing fire alarm and smoke clearance system on each floor is old and requires maintenance and modifications to suit specification requirements. Refer to scope sections of this specification.

The Contractor shall be responsible for determining final routes within risers or ductwork, especially for control cables to all floors.

140.001 RISKS TO HEALTH AND SAFETY

The nature and condition of the site/building(s) cannot be fully and certainly ascertained before opening up. The accuracy and sufficiency of any information provided by the employer or CA is not guaranteed and the Subcontractor must ascertain for himself any information he may require to ensure the safety of all persons and the Works.

Comply with the requirements of the CDM Regulations 2007 by:

- compiling risk assessments for the sub-contract works.

- providing information on the sub-contract works which might affect the health or safety of any person.
- providing appropriate input to the Pre-construction Information, Construction Phase Plan and Health and Safety file for the works

The following significant risks are, or may be present

1. Asbestos

150.001 SURVEY

Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works. Before commencing work, carry out a survey and examination of buildings, structure and engineering services affected by the works.

Examine all available drawings of the engineering services and report any discrepancies to the CA.

170.001 SITE VISIT

Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Subcontract Works.

10000 Based on NES VERSION A12 Jul 05

A64 – Preliminaries/General Conditions for Building Services Contract

240.001 RISKS TO HEALTH AND SAFETY

The accuracy and sufficiency of any information provided by the Employer or CA is not guaranteed and the Contractor must ascertain for himself any information he may require to ensure the safety of all persons and the Works.

Comply with the requirements of the CDM Regulations by

- Compiling risk assessments for the contract works.
- Providing information on the contract works which might affect the health or safety of any person.
- Providing appropriate input to the Pre-Construction Information and Construction phase plan and file for the works.

270.000 SITE VISIT

Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Contract Works.

300.000 DESCRIPTION OF THE WORK

310.000 THE CONTRACT WORK

Supply and installed building services equipment defined in this specification, schedule and drawings.

Test and commission the building services installations defined in this specification, schedules and drawings.

320.000 THE CONTRACT:

This document has been prepared using the Common Arrangement of Sections and this Contract comprises the following, including all necessary builders works:-

Mechanical Services Installations
Electrical Services Installations
Automatic Controls Installations
Building Management System Installations

330.000 WORK BY OTHERS AND CO-ORDINATION OF TRADES

Allow for co-ordinating the contract works with the works of other trades and installations which may be on site during the period of the contract.

600.000 PRICING/SUBMISSION OF DOCUMENTS

640.001 A SCHEDULE OF RATES

A schedule of rates must be submitted within one week of request.

The Schedule must include rates for all significant items of work.

650.001 PROGRAMME

Submit a detailed programme showing the sequence and timing of the principal parts of the Works, periods for planning and design, and itemising any work which is excluded.

Include for the preparation and comment on drawings, Operating Manuals and Record Documents.

660.001 TENDER STAGE METHOD STATEMENTS

Method statements must be submitted prior to commencing work describing health and safety considerations and how and when the contractor proposes and undertakes to carry out the works.

670.001 HEALTH AND SAFETY INFORMATION

Submit a statement with the tender describing the organisation and resources which the Contractor proposes and undertakes to provide to safeguard the health and safety of operatives, and of any person who may be affected by the Contract works, including:

A copy of the Contractors health and safety policy document, including risk assessment procedures.

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

11/47

EX000001613/13
EX000001613_0013

A64 – Preliminaries/General Conditions for Building Services Contract

The number and type of staff responsible for health and safety on this project with details of their qualifications and duties.

680.000 RISKS TO HEALTH AND SAFETY

Submit a statement with the tender describing any significant and unavoidable risks which may arise as a result of carrying out the contract works and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the Contract/works.

683.001 PROPOSALS FOR ANNUAL MAINTENANCE CONTRACT

Undertake PPM and reactive attendance during the defects liability period as scheduled (refer to schedule A37sch1).

700.000 GENERAL QUALITY STANDARDS/CONTROL

700.001 STANDARDS AND REGULATIONS

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice current at the time of tender. Where no BS or CP is applicable the Agreement Certificate for the particular item comply with all statutory instruments and regulations, and local bylaws relating to the area of the site current at the date of tender.

With regard to Gas Act 1986 and the Electricity Act 1989 (consolidated under the Utilities Act 2000) and supporting regulations. Under this legislation where a meter is used to measure the amount of energy supplied for billing purposes, the meters must be of a type verified and approved by OFGEM. In addition, for electricity supplies to domestic customers by licensed suppliers, a certified meter must be used.

With regard to the needs of disabled people comply with the requirements of the Disability Discrimination Act 1995, Code of Practice "Rights of Access Goods, Facilities, Services and Premises"
BS 8300: 2001 and Approved Document M of the Building Regulations.

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be designed, manufactured and tested by the manufacturers, and be certified as compliant with the Directive. The manufacturers shall provide a "Written Scheme of Examination" to comply with the requirements of the Pressure Systems Safety Regulations 2000. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

All systems which are classified as "Pressure Systems" in accordance with The Pressure Systems Safety Regulations 2000 shall comply with the Approved Code of Practice (ACOP) L 122 "Safety of Pressure Systems". A "Written Scheme of Examination" shall be provided for all "Pressure Systems"

All "*equipment*" (mechanical and electrical) that could represent a potential ignition source intended for use in potentially explosive atmospheres must comply with the ATEX Directive 94/9/EC, which is enacted by "The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations, 1996" and "The Dangerous Substances and Explosive Atmospheres Regulations 2002"

The term "*equipment*" (with reference to the ATEX directive) is defined 'any item which contains or constitutes a potential ignition source and which requires special measures to be incorporated in its design and/or its installation in order to prevent the ignition source from initiating an explosion in the surrounding atmosphere.' Also included in the term "equipment" are safety or control devices installed outside the hazardous area but having an explosion protection function. "Protective Systems" are defined as items that prevent an explosion that has been initiated from spreading or causing damage. They include flame arresters, quenching systems, pressure relief panels and fast-acting shut-off valves.

Comply with the requirements of the Local Authority Building Inspector. Comply with the requirements of the latest version of Approved Document L2 of The Building Regulations. (Conservation of Fuel and Power) or Part J of the Technical Standards in Scotland.

Comply with all relevant requirements included in the Main Contract Preliminaries

Notify all authorities in accordance with their regulations and obtain any required approvals for the installation.

Where no specific design, performance or installation standards are quoted the following shall apply:

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

12/47

EX000001613/14
EX000001613_0014

A64 – Preliminaries/General Conditions for Building Services Contract

C.I.B.S.E / BSRIA Guides .
C.I.B.S.E Codes of Practice.
Institute of Plumbing Guide.
C.I.B.S.E Code for Interior Lighting.
C.I.B.S.E Technical Reports.
C.I.B.S.E Technical Memoranda.

Ensure all equipment and systems are designed and installed in accordance with the relevant standards and that operational compatibility exists between the systems and any other system installed at the same location.

Supply plant and equipment to achieve the specified design conditions and to provide stable control.

In the absence of specific design, performance or installation standards being stated seek the instructions of the CA prior to commencement of the Works and with adequate time so as not to cause delay.

When new editions, versions and amendments are published during the construction, seek the instructions of the CA with respect to any modifications or changes necessary.

700.002 SUITABILITY OF MATERIAL AND PRODUCTS:

Use materials and products which:

- Are new unless specified otherwise
- Are suitable for the services and conditions of use normally expected to apply after the installation is complete.
- Are able to withstand the testing and commissioning conditions specified.
- Do not initiate mould growth, support vermin, contain animal hair, contain crocidolite or support bacterial life.
- Do not involve the use of CFC's at any stage of manufacture, installation or subsequent operation except where specified.
- Are free from objectionable odours of the maximum or normal working conditions of operation.
- Do not suffer deterioration at the maximum or specified conditions of operation.
- Are capable of being applied to a base surface without causing damage or deterioration of the base.
- Are not a fire hazard, and do not evolve dense or toxic fumes when subjected to excessive heat, such as a fire.
- When of similar type, are made by the same manufacturer.

Whenever possible ensure products are manufactured and/or stocked under one of the following:

BSI Kitemark Scheme
BSI Safety Mark Scheme
from Firms of Assessed Capability to BS ISO 9000
from Stockists of Assessed Capability to BS ISO 9000

700.003 DELETERIOUS MATERIALS

No material generally known to be deleterious are to be used in, or incorporated into, any temporary or permanent Works forming part of the Project.

In particular none of the following items are to be used

- : Asbestos or asbestos based products
- : Urea formaldehyde or materials which may release formaldehyde in quantities which may be hazardous with reference to the limits set by the HSE
- : Material containing fibres less than three microns diameter or 200 microns long
- : Lead or any material or product containing lead which may be ingested, inhaled or absorbed
- : Polychlorinated biphenyl
- : Fibres not sealed or otherwise stabilised to ensure that migration is prevented
- : Vermiculite containing fibrous dust
- : Polytetrafluoroethylene (PTFE) except for pipework jointing
- : Calcium silicate bricks or materials

Any other products or materials which are generally known within the Building Industry to be deleterious or hazardous to health or safety or to the durability of the property in the circumstances in which they are used.

- : High alumina cement and/or concrete
- : Woodwool slabs used as permanent shuttering
- : Calcium chloride in admixtures for use in reinforced concrete

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

13/47

EX000001613/15
EX000001613_0015

A64 – Preliminaries/General Conditions for Building Services Contract

- : Sea-dredged aggregates for use in reinforced concrete which do not comply with current British Standards
- : Aggregates for use in concrete which do not comply with current British Standards
- : Alkali reactive aggregates

The Contractor shall check with the manufacturers and/or suppliers of products and materials that any specified product contains such material. If any specified product contains such material, the Contractor shall request and alternative specification of product or manufacturer.

700.004 USE OR DISPOSAL OF MATERIALS:

Remove from the site any rubbish and debris arising out of the execution of the contract works
Do not discharge any oil, noxious liquids or gases and all water discharged shall be reasonably free from impurities.

700.005 STORAGE:

Weatherproof, safe and secure storage shall be provided for all materials and equipment.
All materials and equipment and materials shall be offloaded, stored and transported in accordance with manufacturer's recommendations.
All electrical equipment and components shall be kept dry and free from dust.
Plug, cap or seal open ends on all ductwork, tubes, conduit, trunking and associated equipment whilst in storage and during transportation to site.
Provide racks to prevent distortion of pipes, conduit and similar materials.

700.006 SAMPLES

Submit samples as detailed elsewhere to the Contract Administrator. Retain on site until the completion of the contract.

The samples shall not be used in the final installation.

701.000 DEFINITIONS

The definitions of technical terms associated with the engineering services installations are those included in:

CIBSE, IOP and BSRIA Technical Publications
Loss Prevention Council – Rules for Automatic Sprinkler Installations
BS 7671 – Requirements for Electrical Installations (IEE Wiring Regulations).
British Standards, including Codes of Practice.
Associated Statutory Acts.

Where used in the documentation the following definitions shall apply:

Duct – An enclosed space specifically intended for the distribution of services, with direct access for personnel.

Trench – A covered horizontal service space in the floor or ground with access from above.

Cavity – A space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations.

Service Areas – Includes areas within a building with limited finishes such as loading bays, car parks etc.

Concealed Services – Includes installations within ducts, trenches or cavities.

Exposed Services – Includes installations within plant rooms, outdoors or unprotected within "service" or occupied areas.

System – System means all equipment, accessories, controls, supports and ancillary items, including supply, installation, connection, testing, commissioning and setting to work necessary for that section of the Works to function.

Services – Services means the inclusion of one or more system.

702.001 COMMON DESIGN CRITERIA

The criteria listed in the Schedule of Common Design Criteria apply to all Work Sections included in the Contract unless specified otherwise.

706.001 PLANT OPERATING CONDITIONS

Ensure all plant items are suitable for operation in the environment in which they are to be located.

Ensure all plant, motors, starters and ancillary equipment etc. are suitable for operation at full capacity under the specified conditions.

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

14/47

EX000001613/16
EX000001613_0010

707.001 ROOM TERMINAL LOCATIONS

The positions of all connection points, apparatus, equipment and other room terminals shown on the tender drawings are approximate and for guidance in the preparation of the tender.

Agree with the CA which terminals are subject to final positioning on site.

Allow for the movement of such terminals up to a radius of 2 metres from the position shown on the drawings.

709.001 ELECTROMAGNETIC COMPATIBILITY

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same area.

Ensure all systems and buildings are assessed for protection to, and that such protection meets the requirements of, BS EN 62305. Ensure all equipment meets the requirements of the appropriate electromagnetic compatibility standard.

Ensure that all cable installations meet the minimum guidance separation in Recommended Cable Separations to Achieve Electromagnetic Compatibility (EMC) in Buildings, current editions, published by the ECA.

Certification and details of compliance shall be included in Record documentation and shall be provided within four working weeks during the contract if requested.

Certification shall comply with the Electromagnetic Compatibility Regulations 1992 (S.I. No. 2372)

Standard

Particular equipment

Industrial, Scientific and Medical

BS EN 61000-6-4.

BS EN 55011.

Household electrical appliances, portable tools and similar apparatus.

BS EN 55014.

Fluorescent lamps and Luminaires

BS EN 55015.

Information technology equipment

BS EN 55022.

Mains signalling

BS EN 50065.

Broadcast receivers and associated equipment

BS EN 55013 and BS EN 55020.

Industrial process measurement and control

BS EN 60801-2.

Other equipment to generic standards

Emissions

Domestic, commercial and light industrial

BS EN 61000-6-3.

BS EN 55014-1.

Heavy industrial

BS EN 61000-6-4.

Immunity

Domestic, commercial and light industrial

BS EN 61000-6-1.

BS EN 55014-2.

Heavy industrial

BS EN 61000-6-2.

Ensure all apparatus covered by the Wireless Telegraphy Act meets regulations issued by the Radiocommunications Agency.

Ensure all equipment and systems meet the requirements of BS 6701 and BS EN 41003.

Ensure that all cable installations meet the minimum separation in BS 7671 and BS EN 50174

711.000 SOFTWARE

Obtain on behalf of the end user all appropriate licences, permissions, copyright waivers, rights of use and the like from the owners of the software rights. Ensure that the end user is properly registered with the software supplier for support and appropriate updating. Ensure that application software is written in compliance with BS 7649.

Job No: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower

Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1

Date: October 2011

Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

15/47

EX000001613/17
EX000001613_0017

A64 – Preliminaries/General Conditions for Building Services Contract

800.000 DRAWINGS

802.000 SKETCH DRAWINGS

Line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the Engineering Services within the Project as a whole.

803.001 SCHEMATIC DRAWING

A line diagram describing the interconnection of components in a complex system. The main features of a schematic drawing are as follows.

A two dimensional layout drawing with divisions to show the distribution of the system between building levels. The drawing is not necessarily constructed to scale, but includes functional components which make up the system, i.e. plant items, pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components.

804.001 DETAILED DESIGN DRAWING

A drawing showing the intended locations of plant items and service routes in such detail as to indicate the design intent to be developed into co-ordinated and/or installation drawings. The drawing will not indicate the precise position of services, but it should be feasible to install the engineering services within the general routes indicated.

805.001 CO-ORDINATION DRAWING

A drawing showing the inter-relationship of two or more engineering services and their relation to the structure and architectural details. Co-ordination drawings shall be to a scale of at least 1:50 unless otherwise agreed and be prepared in such detail as to demonstrate that the engineering services will be properly separated from one another and can be satisfactorily installed and maintained.

806.001 INSTALLATION DRAWING

A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesmen on site to install the works. Ensure such drawings relate where relevant to builder's work, architectural, structural and other drawings and site surveys where tolerances require. Make due allowance for all building elements, structure and other services.

807.001 INSTALLATION WIRING DIAGRAM

Drawing showing the interconnection of electric components, panels etc in accordance with the design intent indicated in the schematic drawings and incorporating the details provided on manufacturer's certified drawings.

808.000 SHOP DRAWINGS

Drawing prepared by a fabricator or supplier unique to the project. Including supplier's drawings for ductwork, pre-fabricated pipework, sprinkler systems, control and switchgear panels and associated internal wiring.

809.000 MANUFACTURER'S DRAWING

Drawing provided by a manufacturer or supplier to indicate a typical representation of the product, components or plant items to be supplied for a particular project.

810.000 MANUFACTURER'S CERTIFIED DRAWING

Drawing provided by a manufacturer or supplier to indicate details of the product, components or plant items and which the manufacturer or supplier guarantees the supplied equipment will comply with.

811.001 RECORD DRAWING

Drawing showing the building and services installations as installed at the date of practical completion. Record drawings shall provide a record of the locations of all the systems and components installed including pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components. Use a scale not less than that of the installation drawings. The drawings shall indicate the positions of access points for operating and maintenance purposes.

A64 – Preliminaries/General Conditions for Building Services Contract

812.001 BUILDER'S WORK DRAWING

Builder's work drawings shall be prepared at a scale of 1:50 or otherwise agreed to show requirements for building works necessary to facilitate the installation, maintenance and where appropriate the future replacement of the engineering services (other than where it is appropriate to mark out on site).

Drawings shall include for any temporary works to allow installation of the services to the programme.

813.000 CONTROLS LOGIC DIAGRAMS

Diagrams, drawings and/or schematic details of all control components and instruments showing the layout with each item uniquely identified together with a description of the controls operation and details of the associated interlocking.

813.001 CONTROLS DRAWINGS

Tender drawings and/or schematic details of all main plant items and associated control components showing the conceptual arrangement of the plant with each item identified together with a description of the controls operation and details of the associated interlocking. Where terminal units are included on the controls diagrams they show the "typical" control requirements for each unit. The Controls Specialist shall establish actual quantities of terminal units and associated control components from the detail design drawings and/or equipment schedules.

814.000 SWITCHGEAR, STARTER AND CONTROL INSTRUMENTATION PANEL DRAWINGS

Drawings showing the construction and internal wiring diagrams of the starters, panels and/or other devices.

815.000 AS-INSTALLED DRAWINGS

Drawings/records retained on site to record the progress of and any site modifications to the Works including any changes to software.

816.001 PLANTROOM SCHEDULES AND SCHEMATICS

A framed drawing under glass or a non-hygroscopic laminate showing the following: The drawings shall be hung in each plant room and any other appropriate location.

Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.

Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.

First aid instructions for treatment of persons after electric shock.

Location of isolating switch for electricity supply.

Location of main incoming gas valve serving gas meter.

Location of sprinkler fire main control valve.

Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.

All other items required under Statutory or other regulations.

818.001 DRAWN AND OTHER INFORMATION TO BE PROVIDED BY CONTRACTOR

Provide drawn information for the Client/design team as scheduled below;

- TMO – Email (PDF & DWG), 2 paper copies, CD
- AECOM – Email (PDF & DWG)

Type of drawing	Initial comment	Construct/ Final	Commiss'g	Record (Paper)	Record (Electronic)
Prelim Sketches	-	-	-	-	?
Schematics	Y	Y	Y	Y	1
Detail Design	Y	Y	Y	Y	?
Co-ordination	Y	Y	Y	Y	?
Installation	Y	Y	Y	Y	1
Wiring Diagrams	Y	Y	Y	Y	1
Builderswork	Y	Y	Y	Y	1

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

17/47

EX000001613/19
EX000001613_0019

A64 – Preliminaries/General Conditions for Building Services Contract

Shop Drawings	-	-	-	-	?
Manufr Plant	Y	Y	Y	Y	1
Control Logic	Y	Y	Y	Y	1
Electric Panels	Y	Y	Y	Y	1
As Installed	Y	Y	Y	Y	1
Plantroom Schedules	Y	Y	Y	Y	1
Schematics	Y	Y	Y	Y	1

Where Record Drawings are to be CAD agree format with CA.

819.000 INSPECTION AND TESTS – ON OR OFF-SITE

Submit schedules showing those parts of the Works for which inspections and tests are required in the specifications, to substantiate conformity with the Specification and for which records are required to be maintained.

Should any alternative item be proposed which does not carry appropriate certification, ensure independent testing is carried out at no expense to the Employer to confirm compliance.

Where required, provide formal method statements supported by risk assessments detailing the procedures for carrying-out on site tests.

Agree in advance with all parties procedures for inspections and tests including periods of notice.

Where a test indicates non-compliance with the Specification submit immediately details of the non-compliance and proposals for corrective action.

Arrange access for personnel who require to be in attendance, to manufacturer's or other off site premises when any inspections and tests carried out.

Attendance or otherwise of the supervisory personnel during specified inspections or tests will not reduce the obligations or restrictions of the Contract.

Carry out all tests required by legislation under the direction of a "competent person".

820.000 INSPECTIONS AND TEST RECORDS

Prepare a set of drawings and/or report sheets to record accurately the test and inspection information including the following.

Plant identification, section and installation under test.

Manufacturer's reference number.

Date, time, duration of test, weather conditions.

Test results with itemised readings including records of all other checks and tests.

Maintain records of all specified inspections and tests performed including third party and works test certificates.

Include in records, as appropriate, details of the element, item, batch or lot, the nature, number and date of the inspections and tests, the number and type of deficiencies found, any corrective action taken and other relevant particulars.

Maintain all records on site for inspection. On completion of the Works, include copies in the operating and maintenance manuals.

Comply with the requirements of latest version of section 2 of Approved Document L2 of The Building Regulations.

Submit copies of records within one week of request.

821.001 TESTING AND COMMISSIONING OF SERVICES

Use commissioning specialists who are members of The Commissioning Specialist Association (CSA).

Agree a programme for pre-commissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred.

Comply with the requirements of latest version of section 2 of Approved Document L2 of The Building Regulations.

Where required, provide formal method statements supported by risk assessments detailing all commissioning procedures.

Give not less than twenty working days' notice and state any requirements for the attendance and co-operation of others.

Provide all necessary facilities to enable tests to be witnessed and inspections carried out either on site or at manufacturer's works.

The CA will only witness test proceedings, confirm recorded results and determine if the specified requirements have been satisfied. If following test or inspection of any plant or part thereof is shown to be defective or not

Job No: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower

Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1

Date: October 2011

Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

18/47

EX000001613/20
EX000001613_0020

A64 – Preliminaries/General Conditions for Building Services Contract

conforming to the specification the CA will reject such defective parts by written notice, within reasonable time, indicating area of dispute.

Appoint an "approved" engineer, to supervise the whole of the testing, commissioning, performance testing and instruction of client's staff.

Provide all specialised personnel (including manufacturer's representatives) and co-ordinate their activities.

Test all equipment, material and systems as detailed in Work Sections, Reference Sections and Schedules. If an inspection or test fails, repeat the procedure, until satisfactory results are obtained.

Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.

Ensure all requirements such as cleanliness, protection from harmful external and internal elements etc. are provided prior to commencement of commissioning.

Following satisfactory completion of testing and when the installations are in a safe and satisfactory condition, set to work, regulate and adjust, as necessary, to meet the specified design requirements.

Provide all necessary instruments and recorders to monitor systems during commissioning and performance testing.

Provide test equipment subject to a quality assurance procedure complying with BS 5781 Part 1 1992 and BS ISO 10012-2 1997.

Do not start performance testing, including system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the CA.

Maintain on site full records of all commissioning and performance testing, cross referenced to system components and on completion of the Works include a copy in each Operating and Maintenance Manual.

Provide all certification documents for approval by the CA before any system is offered for final acceptance.

Gas, fuel oil, electricity and water for testing and commissioning will be provided by the main contractor.

Upon successful completion of performance tests the works shall be thoroughly cleaned and returned to as new condition.

822.000 COMMISSIONING PROCEDURES

Observe the following requirements when commissioning the Engineering Services.

Progressive static testing will be witnessed by the CA when work is presented for testing. This will include

Insulation resistance tests.

Earth fault loop impedance tests.

Earth continuity tests.

Pipeline pressure tests.

Air Ductline Pressure Test

Carry out pre-commissioning examination and testing to ensure that each system or item of equipment is complete, in a safe condition and all notices are displayed. "Completion" for operational purposes implies the bulk of snagging has been offered to the CA and that remedial work has been completed. All fans, pumps etc. tested for operation, polarity, phase sequence and impedance etc.

Prepare commissioning programme, taking into account site progress and availability of related services, and agree access required for controls etc.

823.000 OPERATIONAL DEMONSTRATION

Provide a written statement to the CA confirming that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.

Demonstrate to the CA that all system components are operating correctly, and the completely integrated installation will function in accordance with the specified performance requirements.

Carry out performance testing of air-conditioning systems in both summer and winter conditions. If a BMS is installed this shall comprise setting the BMS to provide a 7 day log of the following parameters:

Air intake and discharge temperature and humidity at all plant.

Ambient air temperature

Space temperatures in all areas.

Heating and chilled water flow and return temperature

Terminal unit heating and chilled water demand

The log shall be triggered when the ambient air temperature reached design condition.

If a BMS is not installed the Contractor shall submit alternative proposals to achieve this requirement. Provide a log-book and record all hours run.

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower

Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1

Date: October 2011

Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

19/47

EX000001613/21
EX000001613_0021

A64 – Preliminaries/General Conditions for Building Services Contract

900.000 OPERATION/MAINTENANCE OF THE FINISHED BUILDING

901.001 RECORD DOCUMENTS

Provide:

Record Drawings and Schedules.

Plant room and switch room drawings, schedules and schematics including gas supply line diagram.

Operating and Maintenance Manuals.

A notice to the Local authority confirming that the building services have been commissioned in accordance with requirements of Building Regulations Approved Documents ADL1 & ADL2 2006

A "Written Scheme of Examination" for all "Pressure Systems" in accordance with The Pressure Systems Safety Regulations 2000

Building log book as defined in Section 3 of Approved Document L2A (2006 edition) or Section 4 of Approved Document L2B (2006 edition) of The Building Regulations Conservation of Fuel and Power 2000. The Log book shall be produced using the CIBSE TM 31 main template. The content shall be in accordance with the guidance given in the template. The log book shall include details of the metering strategy in accordance paragraph 43 of ADL2A or paragraph 67 of ADL2B and with CIBSE TM39.

Provide the system records and full documentation for all systems as required in the appropriate British Standard standard, including the following:

BS 4737 and BS EN 50131-1 - Intruder alarm systems.

BS 6701 Telecommunications equipment and telecommunications cabling

BS 5839 - Fire detection and alarms in buildings.

BS EN 62305 - Protection of structures against lightning.

BS 7671 - Requirements for electrical installations (IEE Wiring regulations).

For required number of copies of the record documents refer to the main contract preliminaries.

Provide an electronic copy on CD of the record documents. Final scope and format of the electronic copy shall be agreed with the CA.

Ensure Record Documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.

Ensure Record Documents make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.

Ensure Record Documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.

Ensure Record Documents provide sufficient, readily accessible and proper information to enable spares and replacements to be ordered.

Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.

Demonstrate as required throughout the execution of the Works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.

903.000 RECORD DRAWINGS AND SCHEDULES

Prepare Record Drawings and Schedules to a scale not less than 1:50 from the "As Installed Drawings" maintained on site as the Works progress. Endorse all such documents "RECORD DRAWINGS". Where agreed with the CA certain detailed information may be provided in schedule form. Prepare electrical drawings in accordance with BS EN 61082.

Provide reduced scale copies for inclusion in the operating and maintenance manuals.

904.000 OPERATING AND MAINTENANCE MANUAL FORMAT:

The operating and maintenance manuals shall be prepared in the following format:

PC based word processing software tool.

905.000 OPERATING AND MAINTENANCE MANUAL SPECIALIST

Employ a specialist to prepare manuals.

906.000 OPERATING AND MAINTENANCE MANUALS

The O&M manuals content and presentation shall generally be in accordance with the Model Specification for O&M manuals as defined in Parts 2 and 3 of BSRIA BG 1/2007 (Handover, O&M manuals and Project Feedback).

The operating and maintenance manuals must include as a minimum:

- A list of contents and overall guidance of the scope and purpose of the manual.
- A full description of each of the systems installed, written to ensure that the Employer's staff fully understand the scope and facilities provided.
- A description of the mode of operation of all systems including services capacity and restrictions.
- Details of how an engineer may re-commission complex plant services within the building without historic knowledge of the systems.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- A photo-reduction of all record drawings together with an index.
- Legend of all colour-coded services.
- Schedules (system by system of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, electrical circuit tests, new gas installation commissioning check list and record of new gas installation [in accordance with IGEM/UP/2 edition2] corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturers' guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturers.
- Copies of Insurance & Inspecting Authority Certificates and Reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication systems and lubrication schedules for all lubricated items.
- Details of regular tests to be carried out
- Details of procedures to maintain plant in safe working conditions.
- Scheme for inspection, testing and maintenance of the gas installation [in accordance with IGEM/UP/2 edition2]
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.
- A list of any special tools needed for maintenance cross referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.

908.001 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS

Encase the Manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover-titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.

Prepare the Manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

Job No: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

21/47

EX000001613/23
EX000001613_0023

A64 – Preliminaries/General Conditions for Building Services Contract

Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employer's staff to familiarise themselves with the installation. These should be of the same format as the final Manuals with temporary insertions for items which cannot be finalised until the Works are commissioned and performance tested.

Provide three copies of the final Manual no later than two weeks prior to Practical Completion.

909.001 RECOMMENDED SPARE PARTS

Before Practical Completion submit a schedule of spare parts. The schedule shall typically include all consumable items that the Subcontractor / Specialist Contractors / Equipment Manufacturers recommend, plus any items specifically called for in the individual Work Sections / schedules. .

State against each item the manufacturer's current price, including packaging and delivery to site.

Identify those items which are additional to those specified for inclusion in individual Work Sections

Submit Schedule 2 weeks before practical completion.

911.002 RECOMMENDED TOOLS

Before Practical Completion submit a schedule of Special Tools and portable instruments. The schedule shall typically include all items that the Subcontractor / Specialist Contractors / Equipment Manufacturers recommend for maintenance of the services installation included in the contract Any items specifically called for in the individual Work Sections / schedules shall be incorporated in this schedule.

State against each item the manufacturer's current price, including packaging and delivery to site.

Identify those items which are additional to those specified for inclusion in individual Work Sections

Submit Schedule (2) weeks before practical completion.

913.001 TRAINING OF EMPLOYER'S STAFF

Before Practical Completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual and Building Log Book to the Employer's maintenance staff.

General Training

Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment.

Include for training (2) operating / maintenance staff for a minimum of (1) day

Ensure that each trained operator signs a training acceptance certificate(s).

914.000 READING OF METERS

Record readings of all water, gas, and electricity meters immediately on completion of the Works and forward to the CA.

915.000 OBLIGATIONS DURING DEFECTS LIABILITY PERIOD

Prepare and submit records of failures or malfunctions of any part of the Contract Works during the Defects Liability Period, together with details of remedial action taken, subsequent re-testing and the results.

Notify the CA of damage, failures or malfunctions to the Contract Works demonstrably caused by incorrect operation of the installations, vandalism or other actions by a third party.

Inform the CA in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

Undertake all works detailed in schedule A31sch1 or A31sch2 under Post Completion Stage.

10000 Based on NES - SPEX A64TEXT July 07

U14 – Smoke Extract / Control

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

To provide an air system for removing and controlling the build-up of smoke arising from a fire, and to assist in securing the safety of personnel and in maintaining safe escape routes.

Comply with the requirements of BS EN 13779:2007.

100.020 DESIGN PARAMETERS

See Schedule of Common Design Criteria.

BS 7346 part 4: 2003

PART 3 SPECIFICATION CLAUSES SPECIFIC TO U14

300.000 GENERAL

300.010 ELECTRICAL SUPPLY:

Ensure wiring is suitable for high temperatures to provide a maintained supply.

300.021 CONSTRUCTION OF SMOKE EXTRACT FANS AND NATURAL VENTILATORS:

Ensure smoke extract fans and ventilators are constructed so that when in use no flames or hot gases are deflected directly onto an adjacent structure.

Ensure materials used in the construction of the smoke extract fans and ventilators do not add to the fire risk of the building, nor contribute to a fire during use.

Construct smoke extract fans and ventilators from material defined in BS 476 Part 4 as non combustible. Ensure smoke extract fans and ventilators with insulation material, plastic louvres, flaps, sheets or slopes have a Class 1 spread of flame rating when tested in accordance with BS 476 Part 7 and are classified as 'does not readily sustain ignition' to BS 476 Part 12.

Facilities shall comply with BS7346 Part 2 and BS EN 12101-3 or BS EN 12101-2.

300.030 QUALITY ASSURANCE:

Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce equipment to relevant Quality Assessment schedule.

310.000 PRODUCTS/MATERIALS

310.000 GENERAL

Equipment shall be supplied complete with all necessary ancillary items.

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install smoke control equipment in accordance with manufacturer's instructions.

10000 Based on SPEX U14 Text March 04

V22 – General Power

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

To provide sub-circuit power installations from the sub-distribution boards terminating with socket outlets, fuse connection units and other outlet accessories.

100.020 DESIGN PARAMETERS

Unless otherwise indicated all final circuits for general LV power circuits shall comprise:

Circuit type	MCB	Protective device and rating (A)						
		20A		32A		20A		
		Ring				Radial		
Cable size (mm ²)		2.5	4.0	2.5	4.0	2.5	4.0	6.0
Maximum circuit length (metres)		35	60	20	35	25	40	60

(Cable sizes are based upon a maximum volt drop of 2% with the circuit loaded to 50% of the cpd rating. For ring circuits a 0.67 current diversity has been used.)

Circuit lengths are taken to the furthest point of utilisation of the circuit for radial circuits or for the route length of the circuit for ring circuits.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V22

300.000 GENERAL

300.010 SYSTEM REQUIREMENTS

Select equipment suitable to meet system objectives and as indicated on the drawings and schedules.

300.030 ELECTROMAGNETIC COMPATIBILITY

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the systems and with any other systems installed in the same location.

310.000 PRODUCTS/MATERIALS

310.005 WIRING AND CONTAINMENT SYSTEM

Wiring to be carried out in single core insulated cable enclosed in conduit and or trunking as scheduled.

Trunking routes shown on drawings are primary routes only and all subsidiary trunking and conduits to be provided to form a complete containment system.

310.006 POWER USING EQUIPMENT AND FIXTURES

Provide equipment as scheduled complete with means of fixing or supporting.

310.007 POWER TO MECHANICAL PLANT

Provide fused connection unit adjacent to each item of local plant that is not fed from an MCC, final connection to be by the Controls Specialist.

Provide power to all MCC's, distribution boards etc supplied by the Controls Specialist.

320.000 WORKMANSHIP

320.010 WORK ON SITE:

Ensure all building works are complete and service connections provided.

320.021 INSTALLATION:

Install, commission and to set to work equipment in accordance with manufacturer's recommendations and BS 7671.

320.031 QUALITY CONTROL:

Handle ,store and install equipment and components in accordance with manufacturers recommendations. Obtain all equipment and components from a single source.

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

24/47

EX000001613/26
EX000001613_0020

V22 – General Power

Inspect all equipment and components on delivery, before fixing and after installation, and reject and replace any that are defective. Record all commissioning, measurements and tests.

10000 Specification Expert VERSION V22 Text March 07.

W50 – Fire Detection & Alarm

PART 1 SYSTEM OBJECTIVES

100.011 PERFORMANCE OBJECTIVES

To provide detection and alarm systems serving to enhance safety and reduce loss by the detection of fire, enabling an audio/visual alarm to be given so that emergency actions may be taken.

100.020 DESIGN PARAMETERS

BS 5839-1
BS 5839-6
BS 5839-8
BS 6266
BS 7827
BS EN 60849

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W50.

300.000 GENERAL

300.011 TYPE OF SYSTEM:

See scope of works for Detection Category and Voice Alarm Type

Provide means of testing wiring of each zone, detection loop or alarm circuit of system.
Provide means of disabling zones or individual detectors as specified.

300.041 CONTROL SYSTEM:

Standard

BS 5839-6 Annex B.
BS EN 54-2
BS EN 54-4

See Scope of Works and Schedules for type of control system.

300.046 EMERGENCY VOICE COMMUNICATION (EVC) SYSTEM

Standard

BS 5839-9

300.061 MONITORING:

Provide all end of line and other circuit elements to ensure the system is fully monitored to comply with BS 5839.

Unless specified otherwise the voice alarm system shall transmit a common 'Voice alarm system fault', particular to each voice alarm rack, for any fault condition, which may occur within each voice alarm system.

300.081 REMOVAL OF TRIGGER DEVICE:

Provide precautions against removal of trigger devices.

Use trigger devices that are removed only by a special tool.

Use trigger devices with bases that provide circuit continuity with trigger device removed.

Ensure that, where alarm sounders use same wiring as trigger device, removal of trigger device does not affect operation of alarm sounder.

300.090 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and systems are designed and installed to provide electromagnetic compatibility within the system and with any other systems installed in the same locations.

W50 – Fire Detection & Alarm

300.100 REMOTE CENTRE:

Make provision to send signal to remote centre where specified.

300.110 FIRE ALARM SPECIALIST:

Engage a specialist to develop the design, supply, install, commission and set to work the fire alarm system.

300.120 INTEGRATED SYSTEM

Where specified on the Drawings or Schedules, combine with other systems to provide an integrated system.

310.000 PRODUCTS/MATERIALS

310.021 AUTOMATIC DETECTORS

Provide automatic fire detectors from the same manufacturers and with common facilities.

Plug in bases.

Common base for all detector types.

Visible activation indicator.

Visible remote indication for detectors concealed in roof spaces etc.

Label detector bases with address number (where static addressing is used)

Mount detectors in floor voids on brackets to facilitate proper functioning of these detectors.

Position detectors in accordance with BS 5839 to take account of air movement

For combined sounder/sensors, removal of sensor not to inhibit sounder.

310.041 SMOKE DETECTORS:

Standard

Point type

BS 5446-3 (Residential applications)

BS EN 14604 (Residential applications)

BS EN 54-7

BS ISO 7240-15

310.071 SOUNDERS:

Standard

BS 8456

BS EN 54-3

310.081 FIRE ALARM CONTROL AND INDICATING EQUIPMENT:

Standard

BS 5839-1 and BS EN 54-4

BS 5839-6 Annex B (Residential applications).

BS EN 54-2

BS EN 50130-4

Functional requirements

Standard functions and additional functions as scheduled.

W50 – Fire Detection & Alarm

310.091 REPEATER PANEL:

Standard
BS EN 54-2
BS EN 54-4
BS EN 50130-4

310.101 MIMIC PANEL:

Standard
BS EN 54-2
BS EN 50130-4

310.110 ANCILLARY SERVICES:

Make provision to open or close circuits of ancillary services by means of relay or similar device as scheduled.
Standard

BS EN 54-2
BS EN 50130-4

310.115 INPUT/OUTPUT DEVICES

Standard
BS EN 54-18

310.121 POWER SUPPLIES:

Standard
BS 5839-1
BS EN 54-4
BS EN 50130-4

310.145 SHORT CIRCUIT ISOLATORS

Standard
BS EN 54-17

310.151 VISIBLE ALARMS:

Standard
BS EN 54-2
BS EN 50130-4

310.161 ZONE MONITORING UNIT:

Standard
BS EN 54-2
BS EN 50130-4

310.171 AUTOMATIC RELEASE MECHANISM:

Standard
BS 5839-3
BS 7273-4
BS EN 14637
BS EN 50130-4

W50 – Fire Detection & Alarm

310.181 FIRE ALARM SYSTEM ANCILLARIES:

As scheduled

320.000 WORKMANSHIP

320.010 QUALITY CONTROL:

Handle, store and install equipment and components of the fire detection and alarm system in accordance with BS 5839 and the manufacturer's recommendations.

Obtain all equipment and components from a single source.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.

Record all commissioning tests and provide the certification required by BS 5839 Part 1.

Provide manufacturers certificates of equipment design to an approved quality management system and CIE component selection.

320.020 SMOKE DETECTOR INDICATORS:

Fit smoke detector indicators external to doors, where zone is divided into rooms.

320.041 RECORD DRAWINGS AND OPERATING INSTRUCTIONS:

Provide instructions on use of installation to person responsible for use of premises. Supply the user with a logbook and certificate of installation and commissioning in accordance with BS 5839-1, Appendix F and G.

Provide record drawings to user for maintenance and record purposes. Show position of various items of equipment, junction boxes, etc. and sizes and routes of cables and wires. Include wiring diagrams of junction boxes and distribution cases.

Provide circuit diagrams of fire alarm system and its components.

A suitably completed System log book (in accordance with BS EN 60849 Clause 7.2 (b)) shall be handed over to the Employer upon Completion.

320.050 CABLE INSTALLATION:

Plan and install all fire detection and alarm system cables in accordance with BS 5839 Part 1 and the cable manufacturer's recommendations.

Run cables point to point without tees or spurs.

Design loop load (current and device count) not to exceed 80% of cable / loop capacity.

Mark all terminals with polarity and loop / circuit reference.

10000 Specification Expert VERSION W50 TEXT Sept 08

Standard Mechanical & Electrical “Y” Reference (Workmanship) clauses

Section 3 Y03–M&E: Reference (Workmanship) clauses – Mechanical & Electrical

Refer to issue 02 of AECOM standard Mechanical & Electrical “Y” reference (workmanship) clauses dated February 09.

These clauses have been issued electronically.

Contents

Y10 - Pipelines
Y11 - Pipeline Ancillaries
Y20 - Pumps
Y21 - Water Tanks/ Cisterns
Y22 - Heat Exchangers
Y23 - Storage Cylinders & Calorifiers
Y24 - Trace Heating
Y25 - Cleaning & Chemical Treatment
Y30 - Air Ductlines
Y40 - Air Handling Units
Y41 - Fans
Y42 - Air Filtration
Y43 - Heating/ Cooling Coils
Y44 - Air Treatment
Y45 - Silencers and Acoustic Treatment
Y46 - Grilles/ Diffusers/ Louvres
Y50 - Thermal Insulation
Y51 - Testing & Commissioning of Mechanical Services
Y52 - Vibration Isolation Mountings
Y54 - Identification (Mechanical)
Y60 - Conduit & Cable Trunking
Y61 - HV/LV Cables & Wiring
Y62 - Busbar Trunking
Y63 - Support Components - Cables
Y71 - LV Switchgear & Distribution Boards
Y72 - Contactors & Starters
Y73 - Luminaires & Lamps
Y74 - Accessories for Electrical Services
Y81 - Testing & Commissioning for Electrical Services
Y82 - Identification - Electrical Services
Y90 - Fixing to Building Fabric
Y91 - Offsite Painting & Anticorrosion Treatments
Y92 - Motor Drives - Electric

The clauses are based on NES – SPECIFICATION EXPERT TEXT, Sept '08.

Y82 – Identification – Electrical Services

1000 GENERAL

2000 PRODUCTS/MATERIALS

2011 LABELS AND NOTICES:

Apply identification labels and notices in accordance with BS 7671 (IEE Wiring Regulations), Section 514 to all electrical cables plant and equipment including components of mechanical systems. Fit labels and notices as shown on drawings or specified in the Work Sections.

BS 7671 Labels and Notices

- Identification of protective devices.
- Diagrams, charts or tables to comply with Clause 514.9, 560.7.9 and as indicated.
- Warning notices, voltages in excess of 230 volts.
- Isolation notices
- Periodic inspection and test notices.
- Residual current device notices.
- Earth electrode safety electrical connection label.
- Bonding conductor connector point to extraneous conductive parts label.
- Earth free local equipotential bonding areas warning notice.
- Electrical separation areas warning notice.
- Outdoor equipment socket outlet notice.
- Circuits with high protective conductor current (Regulation 607-03-02).
- Wiring complying with previous versions of Section 514 (Regulation 514-14-01)

2021 MATERIALS:

Use materials for labels and notices with a predicted life equal to or greater than the design life of the electrical cables, plant, equipment or installation to which it refers.

- External- Engraved thermosetting plastic laminate.
- Internal - Engraved thermosetting plastic laminate.

Labels shall be coloured in accordance with The Health and Safety (Safety Signs and Signals) Regulations 1996, generally as follows:

Application	Background Colour	Colour of Lettering / Symbols
Danger notices	RED	WHITE
Warning notices	YELLOW	BLACK
Identification or descriptive notices	WHITE	BLACK
Mandatory notices	BLUE	WHITE
Emergency escape / First Aid notices	GREEN	WHITE

2031 FIXING:

Fix labels and notices using materials compatible with label or notice and surface to which it is fixed using fixing screwed into tapped hole. Use adhesives only with written consent from the Engineer.

2041 ARRANGEMENT:

Obtain approval prior to manufacture, with regard to style, colour, lettering, size and position of all labels and notices. Provide sample showing style, colour, lettering and size, for approval.

2051 LETTERING AND SIZE OF LABELS AND NOTICES:

Ensure that all lettering and symbols comply with the requirements laid out in BS 7671 (IEE Wiring Regulations), Section 514 and BS 5499-1. Use BS 5499-1 for height of lettering where not otherwise indicated. Ensure labels and notices of adequate size for the lettering required, and allow a minimum margin around all lettering of one line space vertically and two letter spacing horizontally.

Font - Helvetica Medium unless otherwise indicated.

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

31/47

Y82 – Identification – Electrical Services

2060 CONDUCTOR ARRANGEMENT:

Arrange circuit polarity so that phases read in phase rotation order followed by the neutral, if any, from top to bottom in horizontal conductor layouts and left to right in vertical conductor layouts. Ensure flat horizontal arrays have leading phase to the left and neutral to the right from left to right when viewed from supply point. Arrange phase or live pole of two wire apparatus at top or left hand and neutral and earth both at bottom or right hand side. In all cases, ensure conductor arrangements defined are when viewed from front face of all equipment and terminating facilities. Apply identification markers in accordance with BS 7671 (IEE Wiring Regulations), Table 51 to all conductor termination points.

2070 SAFETY SIGNS:

Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5 where voltages above ELV exist. Provide with each safety sign 8.A.0044 supplementary or text signs complying with BS 5499-5 unless otherwise indicated.

Label all electrical plant and equipment with the labels specified in the appropriate British Standards for that plant or equipment. Identify each substation and main switchroom with safety sign, 8.A.0044 of BS 5499-5 with supplementary signs to BS 5499-5 notices and signs required by BS 5499 for any fire extinguishing system and notice giving details of:-

- Name of the Substation or switchroom.
- The presence of High and Low Voltages.
- Administrative instructions for access.
- Location and method of contacting controlling authority.
- Actions to be taken in an emergency.

2080 PLANT AND EQUIPMENT LABELS:

Fit labels on all items of plant, equipment, switches, etc., include the following information:-

- service controlled.
- circuit reference.
- voltage, type of supply and phase etc.
- circuit protection type and rating.

2085 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Graphical symbols for use on equipment to be created and applied in accordance with BS EN 80416-1, BS EN 80416-2, BS EN 80416-3.

2090 MAINTENANCE NOTICES:

Fix notices giving warning of and instructions on, any special maintenance procedures to plant and equipment.

2100 COLOUR CORRECTED LIGHT FITTINGS:

Fix a warning or identification disc to light fittings containing colour corrected fluorescent tubes or other colour corrected light sources to ensure that maintenance staff install the correct lamps.

2110 MOTORS AND STARTERS LABELS:

Fit identification labels to all motors, starters and starter panels. Ensure positive identification of respective motors and starters. Provide motors with non-corrodible labels attached adjacent to each bearing giving details of the lubricant to be used. Mark direction of normal rotation on motor casing. Provide labels to identify motor equipment fitted with surge suppressors and thermistors stating that insulation test voltages must not be applied to thermistors and thermistor control units. Ensure labelling is compatible with schematic and wiring diagrams, and complies with BS 4999, Part 108. Labels fitted at manufacturers Works or, if indicated otherwise, labels fitted at site.

2120 ENGRAVED ACCESSORY PLATES:

Engrave switchplates, spur units, pushes and special plates for bedhead units, call systems, fire alarms, etc. as indicated. Use 6mm high letters with engraving coloured red, except where otherwise indicated.

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

32/47

EX000001613/34
EX000001013_0034

Y82 – Identification – Electrical Services

2131 SWITCHGEAR:

Fit labels on switchgear as required by BS 7671 and BS EN 60439 to indicate duty of unit, its voltage, phase and current rating, protective device rating size of conductor involved, and all other necessary details. Use an agreed serial coding system, provide at the switch a key to the coding system, as required.

Any identification of a switchboard busbar or conductor shall comply with the requirements of BS 7671 Table 51, so far as these are applicable.

2191 SCHEMATIC DIAGRAMS:

Provide a purpose made schematic diagram permanently fixed showing the connections of the equipment and plant.

- Locations - At main switchgear, (fixed to structure).
- Materials - Printed paper, transparent cover and framing, or printed paper, encapsulated.

2171 INDICATOR LAMPS AND PUSH BUTTONS FOR POWER SYSTEMS:

Use indicator lamp and push button colours in accordance with BS EN 60073.

- Indicator lamp Red - danger or alarm.
- Yellow - caution.
- Green - safety.

Where not defined submit details of proposed colours for other lamps.

- Push buttons Red - emergency action.
- Red - stop or off.
- Yellow - intervention.
- Green - start or on.

Where not defined submit details of proposed colours for other lamps.

2191 CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring enclosed in conduits or trunking, with labels fixed at each end of cable, either side of wall and floor penetrations, at approximately 12m intervals on route or at convenient inspection points by means of non-releasable plastic straps unless otherwise stated.

Ensure labels show the following information:-
Reference number of cable.
Size and number of conductors.

2201 TERMINAL MARKING AND CONDUCTOR IDENTIFICATION:

Provide for switchgear and control gear elements whose terminals are marked in accordance with BS 5472 (EN 50005) and BS 6272 (EN 50042). Use a unique reference to identify each element in the switchgear or control gear. Mark on or adjacent to each element its reference. Identify each terminal for connection to external wiring or cabling using a reference system complying with BS EN 60445 based on the element reference and the appropriate element terminal reference and BS 7671, where applicable.

On terminals use lettered or numbered ferrules or sleeves to BS 3858 to mark each auxiliary conductor or control cable core with the identity of the terminal to which it is connected and the reference of plant or equipment to which it is connected and the identity of the terminal at the remote end. Ensure that main circuit conductors are identified in accordance with BS 7671 (IEE Wiring Regulations) Table 51. Ensure that all identification of terminals and conductors is recorded and included on record drawings and in operation and maintenance documentation.

At each interface between conductors identified using colours or markings complying with versions of BS 7671 prior to Amendment No2:2004, identification ferrules shall be fitted to the existing conductors marked in accordance with BS 7671 Appendix 7 Table 7A or Table 7E, as appropriate.

2231 CABLE JOINTING AND TERMINATION:

Connect all cables in the installation so that the correct sequence of phase rotation is maintained throughout. Where straight through joints are approved joint high voltage conductors as they lie, ensuring

Y82 – Identification – Electrical Services

their complete length is phased out on completion. Ensure connections at terminations of HV cables are made in the correct phase rotation and ensure cable conductor termination marking if any, complies with this phase sequence. Where straight through joints are approved on low voltage cables, whether power cables, control or auxiliary cables, joint conductors strictly in accordance with their colour or numeric coding. Where such joints are approved on mineral insulated or other non-coded conducted cables, identify each core at the joint and make the joint core to core.

2241 CABLE SHEATH IDENTIFICATION - INTERNAL:

Use the following coloured cables sheaths and cable codes for various services as follows:

Service	Sheath Colour	Cable Code
Fire alarm	Red	FA
Clock circuits	Brown	CL
Telecommunications	Grey	T
Data	As system suppliers requirements or as indicated	D
Control	Black	C
Radio frequency	Black	RF
Low voltage	Black	LV
Low voltage mineral insulated	Orange, unless otherwise indicated on the drawings	
Low voltage essential circuits	Blue	
Extra low voltage control	Brown	ELV
High voltage	Red	HV

2261 ADDITIONAL SAFETY SIGNS:

Provide at locations shown or as appropriate safety signs to BS 5499-5 with dimensions as Tables 5 and 6 of Part 2. modular height (a), 75mm.

For main switch and electrical plant room access doors. BS 5499-5, complete with supplementary signs as shown.

6.C.0019. 6.A.002, with supplementary sign "Authorised persons only".
7.A.022

For use with permit to work systems, BS 5499-5, complete with supplementary signs as shown.

6.C.0021. Printed on rigid plastic, with hanging loop, with supplementary wording "Do not operate. Work in progress".

For use at each emergency stop. BS 5499-5, complete with supplementary signs as shown.

9.B.0097. With supplementary sign "Emergency stop push-button".

10000 Specification Expert VERSION Y82 TEXT September 2008.

Y90 – Fixing to Building Fabric

1000 GENERAL

1010 PREPARATION:

Mark-out, set-out and firmly fix all equipment, components and necessary brackets and supports.

1020 MANUFACTURER'S DRAWINGS:

Use manufacturer's drawings and templates for purposes of marking and setting out.

1030 FIXINGS:

Ensure structure and fixings are suitable for items to be fixed.

1040 LOADING DETAILS:

Provide loading details for all fixing types.

1050 BUILDING-IN BY OTHERS:

Provide all necessary assistance to enable any item of building-in type to be built in by others.

1060 SIZE OF FIXING:

Use largest size of bolt, screw or other fixing permitted by diameter of hole in item to be fixed.

1070 GREASING OF FIXINGS:

Ensure all bolts, screws or other fixings used are greased or lubricated in accordance with manufacturer's instructions.

2000 PRODUCTS/MATERIALS

2010 STANDARDS:

Comply with BS 3974 Part 1 for fixings. Ensure that fixings such as expanding anchors are tested for tensile loading in accordance with BS 5080.

2020 PLUGS:

Use plugs of suitable size and length for fixings. Use plastic, fibrous or soft metal non-deteriorating plugs to suit application. Do not use wood plugs.

Ensure that when screw is in place, threaded length is in plug. Ensure plugs used for screw fixing are set-in to correct depth prior to final tightening.

2030 SCREWS:

Use screws to BS 1210. Generally use sheradized steel wood screws for fixing to concrete, brickwork or blockwork.

In damp or exposed situations use greased brass wood screws.

2040 CAST-IN FIXINGS:

Where cast-in fixings are permitted, mark out and set fixings in accordance with manufacturer's instructions.

2050 SHOT FIRED FIXINGS:

Obtain approval prior to using shot fired type fixings.

2060 SELF ADHESIVE FIXINGS:

Obtain approval prior to using self adhesive type fixings.

2070 PROPRIETARY CHANNEL INSERTS:

Provide proprietary channel inserts for casting in where indicated.

3000 WORKMANSHIP

Job No: Services - Kensington & Chelsea Electrical Upgrades Grenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

35/47

EX000001613/37
EX000001613_0001

Y90 – Fixing to Building Fabric

3010 DRILLING:

Drill holes squarely. Use drills of requisite size and depth, and appropriate to fabric. Do not flame-cut holes in metal work.

3020 PROPRIETARY FIXINGS:

Comply with manufacturer's instructions for all fixings.

3031 FIXING TO REINFORCED CONCRETE:

Take precautions to avoid fixing through reinforcement. Unless otherwise indicated do not fix to the bottom, or within 100mm of the bottom, on the sides of concrete beams.

3040 FIXING TO BRICKWORK:

Do not fix to unsound material or mortar between brickwork courses.

3050 FIXING TO TIMBER RAILS:

Fix equipment, brackets and supports by drilling hole through timber rail and fixing with bolt, back plate, washer and loose nut.

3061 FIXING TO HOLLOW STUD/TILE/BLOCK WALLS:

Fix equipment, brackets and supports where there is access at rear of wall, by drilling hole through wall and fixing with bolt, back-plate, washer and loose nut.

Fix equipment, brackets and supports where there is no access at rear of wall, drill hole and use, screw anchor type fixing, or gravity type toggle fixing or spring type toggle fixing.

3071 FIXING TO CONCRETE, BRICKWORK OR BLOCKWORK

Fix equipment, brackets and supports using wood screws in plugs or drill holes and fix using steel bolts of grouted bolt type or expanding bolt type fixing, as required.

3081 FIXING TO METALWORK:

Fix equipment, brackets and supports by drilling holes and fixing using either self-tapping screws or gravity type toggle fixing or spring type toggle fixing or set screws or bolts complete with washers, shakeproof washers and loose nuts as recommended by the manufacturer

3091 FIXING TO STRUCTURAL STEELWORK AND CONCRETE STRUCTURES:

Provide manufacturer's information on recommended fixing. Obtain approval for any fixing to structure steel work and concrete structures.

Generally use proprietary fixings to structural steelwork and concrete structures.

Obtain approval to cut holes in structural steelwork or concrete structures or weld to structural steelwork.

10000 NES VERSION Y90 TEXT 03-04/95

A11sch1 – Schedule of Drawings

Drawing No	Description	Scale
60190925/GT/001	Typical Floor Layout	1:50
60190925/GT/002	Ground Floor Layout	1:50

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)



A11sch6 – Alternative Manufacturers / Installers

We wish to offer the following alternatives to the suppliers, installers and manufacturers of materials or equipment listed in schedules A30E and A30M or the specification.

item	Suggested Alternative	Effect on Tender (State increase or reduction) £

Signed:

Position:

For and on behalf of:
.....
.....

Date:

Individually signed continuation sheets to be provided if required.

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10.08

A11sch7 – Works to be Sublet

We would wish, subject to consent, to sub-let the following sections of the contract works and detail below the companies we propose as specialist contractors.

Section of Contract Works	Proposed Specialist

Signed:

Position:

For and on behalf of:
.....
.....

Date:

Individually signed continuation sheets to be provided if required.

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)



10/08

A11sch8 – Rates for Additional Work

The contractor shall provide with his tender a schedule of rates for each individual element of the installation on which the tender has been based. Please note that these rates may be used in extending the scope of the project.

The net labour rates set out below shall form the basis for payment for additional works where such is chargeable.

	Net Rate £/Hours (Normal Hours)	Net Rate £/Hour (Out of Normal Hours)
Electrical		
Technician		
Approved Electrician acting as charge hand		
Approved Electrician		
Electrician		
Labourer		
Apprentices		
Mechanical		
Foreman		
Chargehand		
Advanced Fitter/Welder (gas\arc)		
Advanced Fitter		
Fitter Welder (gas\arc)		
Fitter		
Improver		
Assistant		
Mate		
Apprentices		

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

A11sch8 – Rates for Additional Work

	Net Rate £/Hours (Normal Hours)	Net Rate £/Hour (Out of Normal Hours)
Prime Cost of Labour, Materials and Plant Provide percentage to be added for the prime cost of labour for all incidental costs, overheads, profit etc	%
Provide percentage to be added for the prime cost of materials and goods for all incidental costs, overheads, profit etc	%
The prime cost of plant is to be charged in accordance with the Conditions and at the rates contained in the "Schedule of Basic Plant Charges (fourth Revision - 1 January 1990)" published by the Royal Institution of Chartered Surveyors. Rates for plant not included in the Schedule shall be reasonably related to the rates in the Schedule.		
Provide percentage to be added for the prime cost of plant for all incidental costs overheads profit etc	%

Signed:

For and on behalf of:

.....

.....

Date:

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical UpgradesGrenfell Tower
Reference: Services - Kensington & Chelsea Electrical Upgrades/Grenfell Tower/GB/AP rev T1
Date: October 2011
Filename: grenfell tower specification tender issue (19-10-11)

AECOM

10/08

BS5839 Part 1, BS EN 54
As existing

Yes – BT Redcare System

BT Line
Fire alarm panel
Analogue addressable

LED
White
To match existing

To match existing
BS EN 54-2, BS EN 54-4, BS EN 50130-4

Repeat indication within 2 seconds of CIE indications
Alarm
Faults
Zone alarms
Zone faults
Transmission to fire alarm routing equipment.
Disablement
- Sounder.
- Fire alarm routing equipment.
Sound Alarm.
Silence audible indication
Disable/re-enable sounders
Disable/re-enable signals to fire alarm routing equipment.
Silence Alarm.
Reset fire.
Flush / Surface / Semi Flush

Manufacturers standard
Mounted on hinged front cover / Behind hinged front panel

Fire Alarm System

Standards
System Category (area by area)

Connection to Brigade or Central Monitoring Station

Form of Communication
Interface for communication
Type of control system

Automatic Detectors:
Smoke Detectors (W50/310.041)
Mechanical device to restrict detector type
Detector locking device
Visible fault indication
Colour of devices
Separate address

Panel (W50/310.091)
Standards
Functional Requirements

Visual display

Controls

Mounting
Assembly Construction
Material of Enclosure
Display components

Rev:	Date:	Description:	Made:	Chk: App:

ddt/ldt: Services - Kensington & Chelsea EI Upgrades/Grenf Tower/ rev T1
Reference: Servi - Kensington & Chelsea EI Grenf Upgrades/Gre
Date: October 2011
Filename: grenfell tower spec e tender issu (19-10-11)

AECOM

W50sch1 - Schedule of Fire Alarm Equipment

IP43
By a special tool / Key lock
Manufacturers standard
Manufacturers standard
Integral Power Supply
230V ac 50Hz
MCB 20 Amps
Integral
24 hours, (measured at the end of cell life)

Degree of Protection to BS EN 60529
Accessibility
Enclosure material / finish / Legend Types
Colour
Power Supply
Mains Supply Characteristics
Protective Device
Power Supply (Charger and Batteries)
Backup duration (24 hours is BS requirement)

1. Refer to U14 Section within this specification for controls requirements.

Rev:	Date:	Description:	Made:	App:

Author: Services - Kensington & Chelsea EI Upgrades/Gre Tower
Reference: Serv - Kensington & Chelsea EI Upgrades/Gre Tower/
Date: October 2011
Filename: grenfell tower spec e tender issu (19-10-11) rev T1



End of Specification

This is the final page of the specification.

Rev:	Date:	Description:	Made	chk	App

Job No: Services - Kensington & Chelsea Electrical Upgrades
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Standard Mechanical & Electrical
Y Reference Clauses
Section 3 Y03-M&E
Services technical standards/Section 3 Y03-
M&E/RM/MC
Issue 02 February 2009

Standard Mechanical & Electrical Y Reference Clauses
Section 3 Y03-M&E
Services technical standards/Section 3 Y03-M&E/RM/MC
Issue 02 February 2009

Revision	Date	Description	Made	Approved
02	February 2009	Updated to NES September 08 & AECOM user feedback	MHC/PM	RM
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Job No: Services technical standards
Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC
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f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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NOTES FOR TENDERERS

This document has been compiled using text from the National Engineering Specification (now re-named "**Specification Expert**" or "**SPEX**"), which is copyright to Amtech. The format of the specification has, however being considerably re-arranged from that provided by Amtech.

This is section 3 of the specification as described below. Sections 1, 2 & 4 are issued separately in the project particular specification.

The technical content of this specification has been prepared using the Common Arrangement of Work Sections for Building Works and is in four sections.

SECTION 1 – SCOPE OF WORKS (Refer to the project particular specification)

A summary description of the Works by Work Section.

SECTION 2 – WORK SECTIONS (Refer to the project particular specification)

The specification for each Work Section is generally sub-divided into two parts:

Part 1 System objectives

The system objectives are clauses giving details of the performance and/or design parameters.

Part 3 Clauses specific to the system

These clauses are specific to the Work Section concerned.

Where clauses contain "type" references, these are for cross referencing within the specification and do not necessarily relate to manufacturers types.

NB (Part 2 relates to the format used in the raw NES "Specification Expert" and are selection schedules for the Y clauses. Part 2's are not used in AECOM specifications and are replaced by schedules)

SECTION 3 – REFERENCE (WORKMANSHIP) SPECIFICATIONS – Y clauses

These clauses specify items that are common to several systems (for example pipework, ductwork and cabling). The individual clauses are generally arranged in the order of the Common Arrangement "Y" sections from which they originated.

Generally these specifications represent AECOM standards, contain all contain clauses applicable to each particular category and are not project specific.

Where choices are required, they are made in the Schedules or Scope of Works, otherwise all of the clauses are applicable.

SECTION 4 – SCHEDULES (Refer to the project particular specification)

This section contains schedules of drawings, manufacturers, equipment duties and selections for plant, ancillaries and system components, specific to this project.

ENQUIRIES TO MANUFACTURERS

Enquiries to manufacturers should include all relevant sections as well as any related contractual information. i.e. the relevant work section and Y clauses pertinent to the plant item in addition to the plant schedule.

NON-NES CLAUSES

Clauses which are structurally different from "Specification Expert" from which they originated, or are AECOM originated clauses are generally identified by the clause reference being underlined and/or the last digit of the clause number being increased e.g. 300.010 becomes 300.011.

Job No: Services technical standards
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f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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EX000001613/52
EX000001613_0002

Content

Front Pages.....	1
------------------	---

Section 3 - Reference (Workmanship) Clauses.....	5
--	---

Y10 - Pipelines.....	5
Y11 - Pipeline Ancillaries.....	31
Y20 - Pumps	51
Y21 - Water Tanks/ Cisterns.....	58
Y22 - Heat Exchangers.....	61
Y23 - Storage Cylinders & Calorifiers.....	63
Y24 - Trace Heating.....	66
Y25 - Cleaning & Chemical Treatment	68
Y30 - Air Ductlines	75
Y40 - Air Handling Units.....	94
Y41 - Fans.....	101
Y42 - Air Filtration	106
Y43 - Heating/ Cooling Coils.....	109
Y44 - Air Treatment.....	117
Y45 - Silencers and Acooustic Treatment.....	123
Y46 - Grilles/ Diffusers/ Louvres.....	126
Y50 - Thermal Insulation.....	133
Y51 - Testing & Commissioning of Mechanical Services	156
Y52 - Vibration Isolation Mountings.....	167
Y54 - Identification (Mechanical).....	170
Y60 - Conduit & Cable Trunking.....	173
Y61 - HV/LV Cables & Wiring.....	184
Y62 - Busbar Trunking.....	195
Y63 - Support Components - Cables.....	197
Y71 - LV Switchgear & Distribution Boards.....	200
Y72 - Contactors & Starters.....	211
Y73 - Luminaires & Lamps.....	217
Y74 - Accessories for Electrical Services	224
Y81 - Testing & Commissioning for Electrical Services.....	229
Y82 - Identification - Electrical Services.....	232
Y90 - Fixing to Building Fabric.....	238
Y91 - Offsite Painting & Anticorrosion Treatments	240
Y92 - Motor Drives - Electric.....	242

** End of Scope Sections **

Y10 – Pipelines

1000 GENERAL

1010 PRE-FABRICATED PIPEWORK:

Supply pre-fabricated pipework in accordance with relevant materials and workmanship clauses.

1012 PIPEWORK LAYOUT

Set out pipework as indicated on the installation drawings, making due allowance for any diagrammatic presentation. The installation shall be in accordance with BSRIA Application Guide 1/2001 "Pre-commissioning cleaning of pipework systems."

Provide all necessary offsets, bends, tapers, transformation pieces, anchors and guides etc. required whether or not these are detailed.

Make due allowance for any thermal movement on long runs. Any provisions for expansion, anchors and guides shown on the drawings are for guidance, the actual requirements shall be determined by the Contractor.

The contractor shall utilise one of the named specialists and confirm in his tender submission that all provisions for pipework expansion have been included.

The tender drawings do not show all facilities for flushing, cleaning, draining and chemical cleaning of the water systems. The Contractor shall include all necessary facilities, including sample coolers, to enable a Specialist to successfully flush, clean, and chemically treat the systems listed in schedule Y25. in accordance with BSRIA Application Guide 1/2001 "Pre-commissioning cleaning of pipework systems."

1020 FITTINGS:

For changes in direction use centreline radius/nominal bore of not less than 1.5 unless otherwise directed. For reductions and enlargements use easy transition type with inclined angle not exceeding 30 degrees.

1030 FABRICATED FITTINGS:

Use only with approval, if manufacturer's standard fittings are not available.

1041 PIPE JOINTS:

Obtain approval from Local Water Authority or Water Research Centre for materials used in water supplies. Ensure pipe joints do not occur within elements of the building (walls, floors, partitions etc).

1042 CARBON STEEL PIPES TO BS EN 10255 AND BS 3601

Where welding of carbon steel to BS EN 10255 and BS 3601, Grades 320 and 360, is indicated, steel shall be produced by the open hearth electric or one of the basic oxygen processes and shall be fully killed, or semi-killed. The manufacturer shall

Provide a certificate to certify compliance with this requirement.

1100 PIPEWORK, FITTINGS AND VALVES FOR GAS

The selection of materials to be used for Gas Installation shall be in accordance with IGE/UP/2 Section 5.

1105 JOINTING OF GAS PIPEWORK

Jointing methods and materials shall comply with IGE/UP/2, Section 6. The particular jointing methods for steel pipework in relation to pressure, location and building type are scheduled in IGE/UP/2, Section 6, table 5.

Steel pipework, where applicable, shall be welded in accordance with IGE/UP/2, Section 6.1. Minimum standard shall be BS 2640 (gas welding) or BS 2971 (arc welding).

P.E. pipework jointing shall be in accordance with IGE/UP/2, Section 6.2. Fusion welding and Electrofusion welding may be used. Solvent welding is not permitted. Compression fittings may be used where specified.

2000 PRODUCTS/MATERIALS PIPELINES

2011 STEEL TO BS EN 10255:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

5/245

07/07

EX000001613/54
EX000001613_0004

Y10 – Pipelines

Material : Carbon steel.
Standard : BS EN 10255.
Dimensions : Light, Medium, or Heavy as scheduled
: Random single lengths, 4m to 7m.
Ends : Screwed to BS 21 and BS EN 10226, taper thread, or plain as required.
Finish : Varnished

2012 GALVANIZED STEEL PIPES TO BS EN 10255:

Material - Carbon steel
Standard - BS EN 10255
Dimensions - Medium. Random single lengths, 4m to 7m.
Ends - Screwed to BS 21 and BS EN 10226 taper thread, or G.A.M. Flanged as required.
Finish - Galvanized.

2021 STEEL FITTINGS, SCREWED BENDS AND SPRINGS TO BS EN 10255:

Material : Carbon steel grade, welded.

2031 CARBON STEEL TO BS EN 10216 -1:

Material - Carbon steel, grade P195 TR1
Standard - BS EN 10216-1
Dimensions – BS EN 10216 TR1
Ends - Plain
Finish - Standard mill protective coating.

2061 CARBON STEEL FITTINGS, BUTT WELDED TO BS 1965 PART 1:

Material : Carbon steel, grade 430.
: Electric resistance welded.
Standard : BS 1965 Part 1.
Dimensions : BS 1965 Part 1 Heavy.
: BS 1965 Part 1 Medium.
Ends and Finish to suit pipework.

2070 MALLEABLE CAST IRON FITTINGS, SCREWED :

Material : Malleable cast iron to BS EN 1562.
Standard : BS 143/1256 or BS EN 10242
Size range : 10mm to 164mm.
Dimensions : As standard.
Ends : Screwed to BS 21 and BS EN 10226
Finish : To match pipework.

2081 CAST IRON and STEEL FITTINGS, GROOVED FOR MECHANICAL JOINTS:

Material : Ductile cast iron to ASTM A-536, grade 54-45-12.
Or : Steel fittings to ASTM A-53
Standard : Manufacturer's.
Size range : 20mm to 600mm.
Dimensions : Manufacturer's standard.
Ends : Grooved for mechanical joints.
Finish : To suit pipework.

2091 WROUGHT STEEL FITTINGS, SCREWED TO BS EN 10241

Material : Wrought steel, welded.
Standard : BS EN 10241.
Size range : 6mm to 150mm.
Dimensions : BS EN 10241.
Ends : Screwed to BS 21 and BS EN 10226
Finish : To match pipework

Y10 – Pipelines

2101 WROUGHT CARBON AND FERRITIC ALLOY STEEL FITTINGS TO BS 1640 PART 3:

Material : Steel to BS 1640 Part 3, table 1.
Standard : BS 1640 Part 3.
Wrought seamless.
Size range : 20mm to 600mm.
Dimensions : BS 1640 Part 3.
Ends : Plain or Bevelled as BS 1640 Part 3.
Finish : To match pipework.

2220 STAINLESS STEEL TO BS EN 10312:

Material - Stainless steel, as table A1 - grade 316 (steel number - 1.4401)
Standard - BS EN 10312.
Dimensions - BS EN 10312 as per tables 1 and 2.
Ends - Plain.
Finish - Uncoated.

2258 STAINLESS STEEL PUSH-FIT FITTINGS

Material - Stainless steel grade 316
Standard - Manufacturer's standard, electrically continuous.
Size range - 15mm to 54mm.
Dimensions - to suit stainless steel pipe to BS EN 10312
Ends - push-fit with EPDM O ring.
Finish - Natural.

2271 COPPER, HALF HARD:

Kitemarked.
Material - Copper
Standard BS EN 1057, R250 (class X)
Dimensions - as BS EN 1057 table 3
Ends - Plain
Finish - Uncoated or Chromium plated as scheduled.

On medical and special gases, use phosphorus free de-oxidised, non arsenical copper to BS EN 1976

2281 COPPER, SOFT:

Material - Copper.
Standard - BS EN 1057, R220, (Class Y).
Dimensions
BS EN 1057 table 3.
Ends - Plain.
Finish
Sheathed in white polyethylene or sheathed in profiled white polyethylene., as scheduled

2311 CAPILLARY FITTINGS FOR COPPER TUBING GENERAL POTABLE RANGE

Material : Copper or Copper alloy (non-dezincifiable).
Standard : BS EN 1254-1.
Size range : 6mm to 67mm
Dimensions : BS EN 1254-1.
Ends : Socket - pre-soldered or plain.
Finish : Natural cast.

2316 PRESS FITTINGS FOR COPPER TUBING:

Material
Copper or dezincifiable resistant copper alloy or gunmetal
Gunmetal.
Standard - Manufacturer's standard, electrically continuous.
Size range - 15mm to 108mm.
Dimensions - to suit copper tube to BS EN 1057.
Ends - with EPDM or Butyl rubber O ring for use with water, Acrylonitrile butadiene rubber for use with natural gas

Y10 – Pipelines

Finish - Natural.

2321 COMPRESSION FITTINGS FOR COPPER TUBING

Material : Copper or Copper alloy (dezincification resistant).
Standard : BS EN 1254 -2 Type A non manipulative
Size range : 6mm to 67mm
Dimensions : BS EN 1254-2.
Ends : Socket
Finish : Natural

2322 SOLDER

All Fittings used on Water services shall have lead free solder.

2325 PUSH-FIT FITTINGS FOR COPPER TUBING:

Material – Dezincification resistant copper alloy and brass.
Standard - Manufacturer's standard, electrically continuous.
Size range - 15mm to 54mm.
Dimensions - to suit copper tube to BS EN 1057.
Ends - push-fit with EPDM O ring.
Finish - Natural.

2351 CAST IRON PIPES AND FITTINGS TO BS 416 PART 1:

Material - Cast grey or ductile iron.
Standard - BS 416, spun.

Dimensions - BS 416.
Ends - Socket type A or B.
Finish - Hot dipped to BS 416.

2391 GREY CAST IRON PIPES AND FITTINGS TO BS EN 877:

Material - Cast iron.
Standard - BS EN 877.
Dimensions - BS EN 877, table 1.
Ends - Plain.
Finish - Grey epoxy.

2430 LAYERED PIPE AND FITTINGS FOR HOT AND COLD WATER HEATING AND CHILLED WATER:

Design Parameters

The pipe shall have a continuous temperature rating of 95 °C (and be capable of withstanding short durations at temperatures of up to 110°C.)

The pipe shall have a maximum working pressure rating of 10 Bar and useful life expectancy of 50 years.

Standards

Manufactured BS EN ISO 21003 to under a certified quality assurance scheme which meets the BS EN ISO 9001 standard. The pipe and fittings shall be tested and approved by WRAS and carry a current WRAS certificate.

Pipe Construction

The pipe shall have details of manufacturer, materials, maximum pressure and maximum temperature printed on the outer wall.

The multilayer pipe shall be a composite pipe comprising a continuous aluminium oxygen barrier sandwiched between an inner and outer layer of cross linked polyethylene PE-X.

The aluminium oxygen barrier shall be a minimum of 0.4mm thick and continuously butt welded.

Y10 – Pipelines

Joining / workmanship

DZR brass compression, DZR brass press fit or PVDF press fit joining systems. The joining systems shall have the same design parameters as the pipe.

The cutting and joining of the pipe shall be undertaken using only those tools recommended by the manufacturer.

All pipes shall be calibrated and chamfered using the appropriate tool prior to joining.
Brass or metal fittings shall incorporate a captive Teflon seating ring to prevent electrolytic action between the oxygen barrier and fitting.
The outer shroud of any press fittings shall have an inspection hole which shall allow the installer to determine whether the pipe has been pushed fully into the fitting.
The leading edge of any inserts shall be tapered to reduce the risk of debris building up at the fitting.
Final connections to sanitary ware, appliances or equipment shall be achieved using WRAS approved flexible connections with integral servicing valves.
For all sizes up to 32mm long radius bends shall be formed by hand. Short Radius bends shall be formed using a bending spring or proprietary bending machine. For details contact manufacturer.
Multilayer Pipes shall be cut with a guillotine or ratchet type blade cutter of a design approved by the manufacturer.

Support spacing

Multilayer pipe shall be fixed in accordance with the maximum spacing details as follows:-

Pipe	Size	Maximum Spacing
	14 x 2mm pipe	1.0m
	16 x 2mm pipe	1.0m
	18 x 2mm pipe	1.25m
	20 x 2mm pipe	1.25m
	26 x 3mm pipe	1.5m
	32 x 3mm pipe	2.0m
	40 x 3.5mm pipe	2.0m
	50 x 4mm pipe	2.0m
	63 x 4.5mm pipe	2.0m

Where a branch or bend is installed brackets shall be installed within 300mm of the fitting.

2440 MULTILAYERED PLASTICS PIPE SYSTEMS FOR INDOOR GAS INSTALLATIONS TO BS ISO 17484-1:

Material - Stress bearing polymeric materials, with or without a metallic layer.
Size range - 16mm to 63mm.
Dimension - Manufacturer's standard.
Fittings - Mechanical, electrofusion.
Finish - Manufacturer's standard.

2442 PLASTIC PIPING SYSTEMS TO BS EN 15014:

Standard - BS EN 15014.
Application - Buried and above ground systems for water (not potable) and other fluids under pressure.
Performance characteristics for pipes, fittings and their joints.
Performance characteristics - reaction to fire; external pressure strength; internal pressure strength; dimensional tolerance; tightness (air and water); durability; dangerous substances.

2455 PLASTICS PIPING SYSTEMS FOR WATER SUPPLY – PIPES TO BS EN 1452:

Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1452-2.
Dimensions
Length - manufacturer's standard range.

Y10 – Pipelines

BS EN 1452-2 tables 1, 2, 3, 4 and 5.
Ends
Plain or socket and spigot for solvent cement.
Finish
Blue or grey.

2475 PLASTICS PIPING SYSTEMS FOR WATER SUPPLY –FITTINGS TO BS EN 1452:

Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1452-3.
Size range - 12mm 315mm
Dimensions
Length - manufacturer's standard range.
BS EN 1452-2 tables 1, 2, 3, 4 and 5.
Ends
Plain.
Socket and spigot for solvent cement.
Finish - Grey..

2480 UNPLASTICIZED PVC TO BS 4514:

Material - Unplasticized PVC.
Standard - BS 4514.
Dimensions - BS 4514.
Ends
Plain.
Socket to BS 4514, solvent cement.
Finish
Grey.

2490 UNPLASTICIZED PVC FITTINGS, SOLVENT WELDING TO BS 4514:

Material - Unplasticized PVC.
Standard - BS 4514, table 2.
Size range - 82mm, 110mm or 160mm.
Dimensions - BS 4514, tables 3 and 5.
Ends - Spigot/plain.
Finish - grey

2495 PLASTICS PIPING SYSTEMS TO BS EN 1453:

Plastics piping system with structured-wall pipes for soil and waste discharge (low and high temperature) within building structure.
Material - Unplasticised polyvinyl chloride (PVC-U).
Standard - BS EN 1453.
Dimensions
Length - manufacturer's standard range.
BS EN 1453 tables 1, 2 and 3.
Ends
Plain.
Elastomeric ring seal socket and spigot.
Socket and spigot for solvent cement.
Finish
Grey or white as indicated.

2496 PLASTICS PIPING SYSTEMS TO BS EN 1329:

Plastics piping system for soil and waste discharge (low and high temperature) within building structure.)
Material - Unplasticised polyvinyl chloride (PVC-U).

Standard - BS EN 1329.
Size range - 32mm to 315mm.
Dimensions - BS EN 1329 tables 5 - 14.
Ends
Elastomeric ring seal socket and spigot.
Socket and spigot for solvent cement.
Finish - Grey.

Y10 – Pipelines

2520 POLYETHYLENE TO BRITISH GAS STANDARD BGC/PS/PL2 PART 1 AND BS 3412:

Material - Polyethylene.
Standard - To BGC/PS/PL2 Part 1, table 2.
Dimensions - To BGC/PS/PL2 Part 1, table 2.
Lengths -straight pipe 6m or 12m.
 : Lengths - coiled pipe multiples of 50m.
Ends- Plain.
Finish Natural self colour.

2525A BURIED POLYETHYLENE PIPES FOR GASEOUS FUELS TO BS ISO 4437:

PE Pipes, including any identification tapes.
Material - Polyethylene (PE).
Standard - BS ISO 4437.
Dimensions - BS ISO 4437, Table 5.
Ends - Plain for butt fused joints.
Finish - yellow.

2528 POLYETHYLENE PIPES TO BS EN 1555:

Material - Polyethylene.
Standard - BS EN 1555-1, BS EN 1555-2 and BS EN 1555-5.
Dimensions - BS EN 1555-2, table 1.
Lengths - straight pipe 6m or 12m.
Lengths - coiled pipe multiples of 50m.
Marking - BS EN 1555-2, table 7.
Ends – Plain.
Finish
Yellow

2530 POLYETHYLENE FITTINGS, FUSION TO BGC/PS/PL2 PART 2:

Material : Polyethylene.
Standard : To BGC/PS/PL2 Part 2.
Size range : Socket type up to 125mm.
 : Butt type up to 500mm.
 : Saddle type up to 180mm.
Dimensions : To BGC/PS/PL2 Part 2.
Ends : Plain.
Finish : Natural self colour.

2538 POLYETHYLENE FUSION FITTINGS TO BS EN 1555:

Material - Polyethylene.
Standard - BS EN 1555-1, BS EN 1555-3 and BS EN 1555-5.
Dimensions - BS EN 1555-3, Section 6, to suit pipes to BS EN 1555-2.
Marking - BS EN 1555-3, table 7.
Ends - Sockets with heating elements for fusion jointing.
Finish
Yellow.

2545 PLASTICS PIPING SYSTEMS BS EN 1451 - PIPES:

Plastics piping system for soil and waste discharge (low and high temperature) within building structure.)
Material - Polypropylene (PP).
Standard - BS EN 1451-1 and BS EN 15012.
Dimensions
Length - manufacturer's standard range.
BS EN 1451 tables 1, 2, 3 and 4.
Ends
Socket and spigot for solvent cement.
Finish
Black.

Y10 – Pipelines

2553 PLASTICS PIPING SYSTEMS FOR NON-PRESSURE UNDERGROUND DRAINAGE AND SEWERAGE - STRUCTURED WALL PIPING SYSTEMS OF PVC-U, PP AND PE TO BS EN 13476:

Material

Poly (vinyl chloride) (PVC-U).

Polypropylene (PP).

Polyethylene (PE).

Type A - Pipes and fittings with smooth internal and external surface.

Type B - Pipes and fittings with smooth internal and profiled external surface.

2555 PLASTICS PIPING SYSTEMS TO BS EN 1451 - FITTINGS:

Plastics piping system for soil and waste discharge (low and high temperature) within building structure.)

Material - Polypropylene (PP).

Standard - BS EN 1451-1 and BS EN 15012

Size range - 32mm to 315mm.

Dimensions - BS EN 1451 tables 5 - 8.

Ends

Plain.

Elastomeric ring seal socket and spigot.

Socket and spigot for solvent cement.

Finish

Black.

2580C PE PIPING SYSTEMS - PIPES:

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure.

Material - Polyethylene (PE).

Standard - PE to BS EN 1519-1.

Dimensions - Length - manufacturer's standard range. BS EN 1519-1 tables 1, 2, 3 and 4.

Ends - Plain; elastomeric ring seal socket and spigot; or socket and spigot for solvent cement.

Finish - Grey, black, or white.

2599A PLASTICS PIPING SYSTEMS TO BS EN ISO 15876 - PIPES:

Plastics piping systems for hot and cold water systems, including heating, within buildings.

Material - polybutylene (PB).

Standard - BS EN ISO 15876-1 BS EN ISO 15876-2, BS EN ISO 15876_5.

Dimensions - Length - manufacturer's standard range. BS EN ISO 15876-2 - tables 2 to 6.

Ends - Plain, sockets for fusion fittings, suitable for electrofusion fittings, mechanical fittings, or fittings with incorporated inserts.

Finish - Natural or coloured

2600A PLASTICS PIPING SYSTEMS TO BS EN ISO 15876 - FITTINGS:

Plastics piping systems for hot and cold water systems, including heating, within buildings. Material - polybutylene (PB). Standard - BS EN ISO 15876-1, BS EN ISO 15876-3, BS EN ISO 15876-5. Size range

- 16mm to 160mm. Dimensions - BS EN ISO 15876-3 - tables 3 to 5, and clause 6.3. Ends - Plain, sockets for fusion fittings, suitable for electrofusion fittings, mechanical fittings, or fittings with incorporated inserts.

Finish - Natural or coloured.

2630 ABS TO BS 5391 PART 1:

Material - ABS (Acrylonitrile-butadiene-styrene).

Standard

BS 5391 Part 1, class B, C, D, or E to match system working pressure.

Dimensions

BS 5391 Part 1, table 1 - lengths 3m, 6m and 9m.

Ends

Plain.

Finish - Natural.

2640 ABS FITTINGS, SOLVENT WELDING TO BS 5392 PART 1:

Material - ABS (Acrylonitrile-butadiene-styrene).

Standard

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

12/245

07/07

EX000001613/61
EX000001613_0001

Y10 – Pipelines

BS 5392 Part 1, class B,C,D,or E to match system working pressure
Size range - 10mm to 200mm.
Dimensions - BS 5392 Part 1, table 1.
Ends - Spigot/socket.
Finish - Natural.

2665A POLYETHYLENE TO WIS 4-32-17:

Material - Polyethylene.
Standard - WIS 4-32-17.
Dimensions - WIS 4-32-17 table 6.
Lengths - straight pipe 6m, 12m or 18m; coils, 25m, 50m, 100m or 150m.
Ends - Plain.

2668 POLYETHYLENE PIPES TO BS EN 12201:

Material - Polyethylene.
Standard - BS EN 12201-1, BS EN 12201-2, BS EN 12201-5
Dimensions
BS EN 12201-2, table 1
Lengths
Straight pipe 6m, 9m or 12m.
Coils 50m, 100m or 150m.
Manufacturer's standard.
Marking
BS EN 12201-2, table 6
Ends
Plain.
Finish
Blue.

2669 POLYETHYLENE FITTINGS TO BS EN 12201:

Material - Polyethylene.
Standard - BS EN 12201-3.
Type
Electrofusion.
Dimensions
BS EN 12201-3, section 6 and Annex A.
Marking
BS EN 12201-3, table 7.
Ends - Plain.
Finish
Blue.

2705A PLASTICS PIPES TO BS 7291-2 AND -3:

Material - Polybutylene (PB) BS 7291-2; or crosslinked polyethylene (PE-X) BS 7291-3.
Standard - BS 7291. Classification H unless otherwise indicated.
Dimensions - BS 7291-2 (PB) or BS 7291-3 (PE-X); Table 1 (CU) or Table 2 in accordance with BS ISO 11922-1, BS ISO 4065 or to BS 2782-11: Method 1121B.
Ends - Plain.flanged or screwed to suit method of jointing
Finish - Natural.

2707 PUSH-FIT FITTINGS FOR PE-X AND PB TUBING:

Material - Dezincifiable resistant copper, copper alloy and brass.
Standard - Manufacturer's standard.
Size range - 10mm to 28mm.
Dimensions - to suit PE-x and PB tube.
Ends - push-fit.
Finish - Natural.

2710 VULCATHENE:

Material
Polypropylene suitable for laboratory drainage.
Standard - To manufacturer's standard (No BS available).
Dimensions

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Serv ices Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\proje cts\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

13/245

07/07

EX000001613/62
EX000001613_0002

Y10 – Pipelines

Nominal diameter 38mm to 152mm available, standard length 4m.
Ends - Plain.
Finish - Black.

Joins
Electro fusion welded

2720 VULCATHENE FITTINGS:
Material
Polypropylene.
Standard - To manufacturer's standard (No BS available).
Size range - Nominal diameter 38mm to 152mm.
Dimensions - Nominal diameter 38mm to 152mm available.
Ends
Socket for heat fusion jointing.
Finish - Black.

2741 GLASS PIPELINE
Material : Borosilicate glass 3.3.
Standard : BS EN 1595.
Dimensions : BS EN 12585
Ends : Spherical or flat buttress.
Finish : Natural self finish.

2742 STAINLESS STEEL PLIABLE CORRUGATED TUBING KIT FOR GAS UP TO 0.5 BAR:
Standards

BS 7838

BS EN 15266:2007 Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0.5 bar.

The tubing shall be complete with a non metallic yellow ochre cover which shall be fire and smoke retardant and marked "GAS".

Fittings

Must be provided by the tubing kit manufacturers

Installation

In accordance with the tubing kit manufacturer's recommendations and BS 8691 or IGE/UP/2, IGE/UP/1 .
Movable appliances must not be connected to corrugated tubing. Install the tubing in a purpose designed sleeve where it passes through an unventilated void.

2881 THERMALLY INSULATED UNDERGROUND PIPELINES - STEEL
Supply pre-insulated bonded pipe systems for underground networks, designed and installed in accordance with BS EN 13941 and BS 7572. Assembly, mild steel service pipes, polyurethane thermal insulation and high density polyethylene outer casing to BS EN 253. Provide fitting assemblies in accordance with BS EN 448, steel valve assemblies in accordance with BS EN 488 and joint assemblies in accordance with BS EN 489. Installation to be in accordance with manufacturers instructions. Provide leak detection and location equipment.

Y10 – Pipelines

Supply surveillance systems for preinsulated bonded pipe systems in accordance with BS EN 14419 as detailed in the scope of works.

2882 THERMALLY INSULATED UNDERGROUND PIPELINES - PLASTIC

Supply pre-insulated pipe systems for underground networks. The detail design and installation of the system shall be in accordance with the manufacturers recommendations. This shall include all trenching details, wall entry details and all provisions for thermal expansion. Manufacturers proprietary fittings shall be used for tee pieces, elbows, branches, wall entry kits etc. Whenever possible these should be pre-fabricated / pre-insulated fittings to minimize on site work.

The internal carrier pipe system shall be of Polybutene material (PB1)

Joining Method ---- Electrofusion Welding / butt fusion welding

PE-Xa may be offered as an alternative to PB on systems with operating temperature up to 70 - 80°C and pipe sizes up to DN 150 (130mm ID). However this pipe system uses mechanical compression type joints and therefore joint inspection pits must be provided at all pipe joints / branches.

For carrier pipe sizes up to DN 100 (110mm OD plastic) use coiled pipe. The insulation shall be continuous in line extruded PE (polyethylene) foam surround, fusion bonded to the outer casing. The outer casing shall be made of corrugated black PE.

For carrier pipe sizes from DN 125 to DN 200, (222mm OD plastic) use straight lengths> The insulation shall be continuous PU (polyurethane) foam in 6 or 12 m lengths. The outer casing shall be made from smooth outer PE pipe Carrier pipes and shall be jointed by butt fusion method.

Full material damage resistance - No loss of insulation integrity allowed where surface damage may occur.

Max temperature / pressure rating 95°C @ 8bar

Thermal conductivity: 0.031W/mK @40°C

The specialist contractor shall confirm the life expectancy of the proposed system based on the project specific operating temperature / pressure and estimated annual operating time as defined elsewhere in this specification.

The service life expectancy shall be greater than 50 years when operating at 80°C for a minimum of 12 hrs, 365 days/year.

3012 CIRCULAR FLANGES FOR PIPES AND FITTINGS:

Material : Ferritic steel, BS EN 1092-1
Cast iron, BS EN 1092-2
Aluminium alloy BS EN 1092-4

Flange type : Hubbed slip-on flange for welding.

Associated bolts, nuts and washers:

For ferrous and composite flanges

: Interior use - Black mild steel

: Exterior use - Cadmium plated to BS 3382 Part 1.

For copper alloy flanges use high tensile brass.

Bolts to be of suitable length so as to show no more than three threads past the nut

Flange facings : Raised face.

3021 FLANGE JOINTING RINGS:

Non metallic flat gaskets for flanges to BS EN 1092-1, or BS EN 1092-2 or BS EN 1092-2 or BS EN 1092-4

Standard – BS EN 1514-1

Full face.

Supply joint rings manufactured from:-

Asbestos free compressed synthetic fibre with suitable binder for the operating conditions.

3031 SCREWED JOINT TO BS 21 and BS EN 10226:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

15/245

07/07

EX000001613/64
EX000001613_0004

Y10 – Pipelines

Use PTFE tape to BS 7786 or use hemp and jointing compound to BS 6956 Part 5 or BS EN 751-2 6956 Part 6, prior to chemical treatment and use PTFE tape to BS 7786 after chemical treatment.

3041 UNION CONNECTIONS:

Seating:

Spherical seating:- bronze to bronze, navy pattern.

3051 WELDED JOINTS:

For steel pipes use welding rods as follows:

Gas welding, BS 1453 type A2 or A3; electric arc welding BS 2633; or electric arc welding BS 2971.

For copper pipes use bronze welding to BS 1453.

3061 BRAZED JOINTS:

Use filler metals to BS EN 1044.

For zinc free brazed joints use nickel bearing zinc free grades of filler metals to BS En 1044.

3071 CAPILLARY JOINTS:

Solder

BS EN 29453 alloy N°s 5, 23, 28, or 29

Use fittings in accordance with BS EN 1254 – 1 on potable water systems

Flux - Copper pipe - BS EN 29454 – 1

Do not use grease-based fluxes. Use partially water-soluble flux approved by WRAS.

Stainless steel pipe - BS 5245

3080 JOINTING EQUIPMENT FOR MULTI-LAYER PIPE SYSTEM:

Provide the Manufacturer's recommended compression tool for making connections in the multi-layer pipe system.

3095A JOINTING MATERIALS FOR PLASTICS PIPES TO BS 7291:

Plastics fittings to BS 7291.

Method of jointing to BS 5955 Part 8

Compression with fittings to BS EN 1254-3 or BS 864 Part 5.

3091 FLEXIBLE JOINTS, CAST IRON PIPES:

Use half housings of cast iron in accordance with BS 877, together with coupling gaskets of nitrile rubber in accordance with BS 2494, BS 7874 and BS EN 681-1 and . Bolt joints using stainless steel bolts and nuts to BS 970 Part IV.

3102 JOINTING EQUIPMENT FOR PUSH-FIT SYSTEM:

Provide manufacturer's recommended tool for releasing push-fit fittings in push-fit jointing systems for copper and plastic pipe.

3125 JOINTING EQUIPMENT FOR PRESS FITTING SYSTEM:

Provide the manufacturer's recommended pressfitting tools including pressing tool, de-burring tool and insertion depth marker for use with press fitting system, these must be used for all joints.

3131 PRESS FITTING JOINTING SYSTEM ON STAINLESS STEEL PIPE:

Material

Stainless Steel.

Standard

To BS 3605.or To BS EN 10088.

Size range

15mm to 108mm for water.

15mm to 108mm for gas.

Dimensions - to suit stainless steel pipe to BS 3605.

Ends

With O ring seal for use with water or gas to suit application to manufacturer's standard.

Finish - Natural.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

16/245

07/07

EX000001613/65
EX000001613_0000

Y10 – Pipelines

3132 PRESS FITTING JOINTING SYSTEM ON THIN WALL STEEL PIPE:

Material -Thin wall carbon steel pipe.
Standard - To Manufacturers standard and DIN EN 10305-3
Size range - 12mm to 108mm.
Dimensions - to suit thin wall carbon steel pipe to DIN EN 10305.
Ends - With EPDM O ring seal to manufacturer's standard.
Finish - Galvanised.

3135 PRESS FITTING JOINTING SYSTEM ON COPPER PIPE:

Material - Copper pipe.
Standard - To Manufacturers standard. Tube to BS EN 1057, fittings to BS EN 1254
Size range - 15mm to 108mm
Dimensions - to suit copper pipe to BS EN 1057.
Ends - with EPDM or Butyl rubber O ring for use with water, Acrylonitrile butadiene rubber for use with natural gas, all to manufacturer's standard.
Finish - To manufacturers standard
Comply with IGEM/UP/2 edition 2 Appendix 13 pressed fittings jointing procedure when used on natural gas pipework.

3141 MECHANICAL JOINTS, GROOVED STEEL PIPES:

Materials
Ductile cast iron to ASTM A-536, grade 54-45-12 or Carbon steel to BS EN 10025-1:2004.
Joint : Flexible straight
or Flexible reducing.
or Branch connection.
Material : To be compatible with the pipework.
Finish : To be compatible with the pipework.
Gaskets : To meet pressure and temperature requirements.
Accessories : Electrical continuity clip (to meet B.S. 7671).

3190 WALL, FLOOR AND CEILING MASKING PLATES:

Materials : Copper alloy, chromium plated.
Type : Heavy, split on the diameter, close fitting to the outside wall of the pipe.
Fixing : Chrome raised head fixing screws.

3200 PIPE RINGS AND CLIPS

Steel pipes
Use suitable pipe clips take into account the pipe load, material and pipe/insulation surface details.
Copper pipes
Use brass pipe clips

4000 WORKMANSHIP, GENERAL

4010 APPEARANCE:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting.
Ensure all vertical pipes are plumb or follow building line.

4020 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for specified thickness of thermal insulation and ensure adequate space for access to pipe joints, etc.
The following are recommended as minimum clearances in spacing of pipe runs:-

Between and		Clearance (mm)
Pipeline, insulated or uninsulated	wall finish	25

Y10 – Pipelines

floor	ceiling finish or soffit	50
	finish	150
Insulated pipeline	adjacent service runs	25
uninsulated pipelines		50
adjacent pipelines	both uninsulated	150
one	uninsulated	75
both	insulated	25

4030 GRADIENTS:

Install pipework with gradients to allow drainage and/or air release,

4035 STEAM AND CONDENSE MAINS:

Install steam mains to a minimum fall of 1 in 250.

Take steam connections to plant and Equipment from the top of the steam main.

Connect condense discharge from trap sets into the top of the condense main.

Install strainers on their sides when they are part of a steam line to avoid waterhammer.

Do not use trap sets to lift condense on equipment with automatic control valves.

On steam mains

Install trap sets discharging into condense main at all low points on steam distribution pipe work and immediately before all automatic control valves on steam mains and elsewhere where indicated.

Install trap sets at all low points in the distribution system and at minimum intervals of 40m along distribution mains. The traps shall be fitted to collecting legs of the same diameter as the main up to 100mm. Larger pipes shall have collecting legs 2 sizes smaller than the main but not less than 100mm. The collecting legs shall be a minimum of 300mm long.

Use thermodynamic traps on pipelines which may be subject to freezing conditions

4041 AIR VENT REQUIREMENTS:

Air Vent Assembly to be either

An air bottle i.e.

A vertical extension from the pipe approximately 100mm long, at the bore of the pipe with a copper extension pipe with a manual vent cock located in an easily accessible position.

or

An automatic air vent valve with a copper outlet pipe from the valve to a tundish in an adjacent drain line or to another suitable location.

Provide vents at all high points. Vent to be manual unless otherwise indicated.

4050 DRAIN REQUIREMENTS:

Grade pipework to allow system to be drained. Provide a means of draining the system at all low points.

On all cooling coils in AHU's provide drain trap of at least twice working air pressure in depth.

Provide an air break between trap outlet and drainage system. Pipe each trap to drain via a tundish or pipe each trap separately to discharge over a gully to prevent the potential of cross contamination between AHU's.

4061 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes, generally allow the flexure at changes in direction. Allow for movement at branch connections.

On drainage pipework use purpose designed fittings at changes of direction to accommodate movement, and to avoid stresses on connections to stacks.

Where possible provision for movement due to thermal expansion and contraction shall be made

Y10 – Pipelines

by natural changes in the direction of pipework.

Anchors and guides shall be positioned to contain all movement and resist the maximum loads imposed.

Anchors and guides are to be located at points which prevent excess stresses on pipework,

joints and equipment connections. Similar provisions shall be made for building movement or

build ing settlement.

Any provision s for ex pansion, anchors and guides shown on the draw ings ar e for guidance, the actual requirements shall be determined by the Contractor.

The contractor shall utilize one of the named specialists and confirm in his tender submission that all provisions for pipework expansion have been included.

4065 CONNECTIONS BETWEEN PIPES OF DIFFERENT MATERIALS:

Plastic

Connect pla stics pipe work to pipe work of other ma terials using approved con nectors and methods in accordance with plastics pip ework manuf acturer's recommendations, to form a watertight joint.

Copper

Connect copper pipework to cast iron sockets using a caulking bush (brazed on), bitumenized yarn and an approved caulking compound neatly finished, to form a watertight joint, or connect copper pipework to cast iron using purpose made copper to iron connectors.

Galvanized steel

Connect galvanized steel pipework to cast iron sockets w ith bitumenized yarn and molten lead, lead wool or an approved cold caulking compound.

4071 PIPE FITTINGS:

Use eccentric type reductio ns and enlarg ements on ho rizontal pipe r uns to allo w draining and venting, concentric on vertical pipes, with easy transition and an included angle not exceeding 30 degree. Do not use bushes, except at radiators and at fittings where required size is not of standard manufacture. Where required, use eccentric bushes to allow draining or venting; maximum aspect ratio not to exceed two pipe sizes; above this ratio use reducing fittings. Use square tees at v enting and dr aining points. Square elbows are not acceptable. Use bends and swept tees where practical, otherwise use elbows and square tees

4080 FABRICATED JUNCTIONS:

Form by inserting a branch section of a pulled bend into the main pi pe. Develop the profiles of both the branch section and the hole in the main pipe, to ensure minimum protrusion into the main pipe. Weld or braze into position.

4090 FABRICATED FITTINGS - FERROUS:

Supply pipe material and end connections to the specification of the associated straight pipe runs.
Pattern

Bends, springs, offsets and branches.

Technique

Pipe bore 50mm or less - machine cold bend.

Pipe bore greater than 50mm - machine hot bend.

Ensure that fabricated branch bends of welding saddles are to the fitting proportions in BS 1965, Part 1.

4105 ACOUSTIC INSULATION OF PIPEWORK

Material

Polymeric mass layer 10 kg/m²

Standard -To manufacturer's standard.

Thickness -20mm to 100mm

Lengths -1m

Finish -Reinforced aluminium foil (outer)

Installation -To manufacturer's standard.

4100 FABRICATED FITTINGS - NON-FERROUS:

Provide pipe material and end connections to the specification of the associated straight pipe runs.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Serv ices Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\proje cts\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

19/245

07/07

EX000001613/68
EX000001613_0000

Y10 – Pipelines

Pattern

Bends, springs, offsets and branches.

Technique

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends will not be accepted.

Fabricate branch from a section of pulled bend, profiled to match the contour of the main to avoid overlap and protrusion into the main. Cut and swage the main to form a raised cup to accept the spigot end of the branch. Limit angle of the branch to 60°. Join by bronze welding on site. Apply reinforcement by plates, collars or shoes.

4110 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves. Fit masking plates where visible pipes pass through building elements, including false ceilings of occupied rooms.

Piped services (excluding gas pipes) that penetrate a floor separating habitable rooms in different flats within residential buildings shall be enclosed for their full height and full horizontal run in each flat and surrounded with sound absorbent material above and below the floor. The installation shall comply with the requirements of Approved Document E of the Building regulations. "Resistance to the passage of sound".

4120 PIPE SLEEVES THROUGH NON FIRE RATED PARTITIONS / FLOORS :

Where pipe insulation is not carried through pipe sleeve, cut sleeves from material same as pipe one or two sizes larger than the pipe to allow clearance. Do not use sleeves as pipe supports.

Where pipe insulation is carried through pipe sleeve, cut sleeves from material same as pipe one or two sizes larger than pipe and insulation to allow clearance. Do not use sleeves as pipe supports.

Install sleeves flush with building finish. In areas where floors are washed down install with a 100mm protrusion above floor finish.

4125 PROPRIETARY PIPE SLEEVES THROUGH FIRE RATED PARTITIONS / FLOORS:

Where the insulation is to be carried through the partition - thermally insulated proprietary fire sleeves shall be used tested in accordance with BS 476 to meet the fire rating of the partition. The sleeves shall be either:

"Rockwool" Insulated fire sleeves comprising a combination of mineral wool and graphite intumescent or "Pacifyer" one piece stainless steel sleeve with an intumescent lining the full length and 3 bands of acoustic foam adhered to the bore of the sleeve. Where the insulation is required to carry through the wall or partition / vapour seal is required oversized mineral wool shall be fitted to the pipe work with an oversized Pacifyer fitted over the mineral wool

Installation – In accordance with the manufacturer's requirements.

4131 CONNECTIONS TO EQUIPMENT:

Make final connections to equipment in accordance with manufacturer's instructions and as indicated. Provide flanges or unions to enable removal of equipment with minimum disassembly of pipework.

4141 DISTRIBUTION HEADERS:

Terminate ends with a cap, a blank flange or as otherwise indicated.

4151 TEMPORARY PLUGS, CAPS AND FLANGES:

Seal all open ends as installation proceeds by plugs, caps or blank flanges, to prevent ingress of foreign matter.

Plug material

Metal.

or Plastic.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

20/245

07/07

EX000001613/69
EX000001613_0009

Y10 – Pipelines

or Wooden.

In the event of such precautions not being taken, strip out pipework adjacent to open ends to demonstrate that fouling of bores has not occurred.

4160 FLANGED JOINTS GENERAL:

Use number and diameters of bolts to standard. Fit bolts of length to give not less than one thread, or more than 3mm protrusion beyond nut when joint is pulled up.

Fit washers under each nut.

4170 DISSIMILAR METALS:

Take appropriate means to prevent galvanic action where dissimilar metals are connected together.

4175 ELECTRICAL BONDING TERMINAL:

Provide site made electrical bonding connection of 6-mm² conductor, or purpose made fitting across all non conducting joints in any pipework systems.

4180 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility, give particular attention where pipes are subject to axial movement due to expansion or contraction.

4191 ANCHORS:

Construct to resist axial stress transmitted by flexure of horizontal and vertical pipe runs or loading on vertical pipes assuming that unbalanced forces exist at all anchor points, even when these are situated in intermediate positions between two expansion loops or bellows. Use similar or compatible materials to the attached pipe.

Provide and fix all associated backing plates, nuts, washers and bolts for attachment to or building into building structure; ensure structure is suitable for transmitted stress. Set out and line up anchors accurately in position. Inspect final grouting into building structure.

Steel Pipes

Construct using mild steel overstraps or heavy U-bolts. Secure to channel section, adequately attached to or grouted into building structure; weld longitudinal edges of strap to pipe.

or Pass two slip-on flanges over pipe to anchor point. Bolt together through an interposed mild steel channel section attached to or grouted into building structure, and finally weld flanges to pipe.

or Provide purpose designed anchors.

Copper Pipes

Fit two flanges to copper female adaptors in pipe run at anchor point. Bolt together through an interposed mild steel channel section attached to or grouted into building structure.

or Fit saddle clamps in pipe run at anchor point.

or Provide purpose designed anchors.

PVC Pipes

Clamp pipework to mild steel channel section attached to or grouted into building structure, using PVC coated overstraps, or clamps and with a polypropylene strip between pipe and mild steel section.

4201 SLIDE GUIDES:

Direct movement of expansion and contraction from pipe anchor points towards loops, bellows or flexible inserts. Ensure that thrust is linear relative to the axis of pipe.

Apply a friction reducing material between metal faces subjected to movement.

4211 PIPE SUPPORTS:

Y10 – Pipelines

Arrange supports and accessories for equipment, appliances or ancillary fittings in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials. Unless otherwise indicated support DX pipes on galvanised cable tray suitably sized (both width and depth) for the pipes to be carried (to be able to support the pipes without sagging). Guss eted bends shall be used where required to match the radius of the pipe bends.

4210 SUPPORT SYSTEM - WIRE ROPE:

4215 WIRE ROPE SUSPENSION SYSTEM:

Where used as an alternative to traditional drop rods.

Standards

BS EN 12385-1.

BS EN 13411-3.

BS EN 13411-4.

DIN 3093

BSRIA COP 22/2002.

Material

Stainless steel grade 316

Fastener

Springs - stainless steel grade 302

Adjustment

Tamperproof

Fixing

Loop

Accessories

Setting keys

Span/bearer supports

Ceiling clip fixings

Threaded adaptors

Anchor bolts

Anchor for stud fixings

Ceiling fixing kit

Corner saddle

Fastener décor cover

Provide wire rope support system. Confirm wire rope is suitable for supporting pipelines

4220 SUPPORT SPACING:

Space supports as tables.

PIPE BORE		MAXIMUM SUPPORT SPACING (M)					
(mm)		STEEL PIPE		COPPER PIPE		IRON PIPE	
nominal		horiz	vert horiz		vert horiz		vert
up to	15	1.8	2.4	1.2	1.8	-	-
	20	2.4	3.0	1.4	2.1	-	-
	25	2.4	3.0	1.8	2.4	-	-
	32	2.7	3.0	2.4	3.0	-	-
	40	3.0	3.6	2.4	3.0	-	-
	50	3.0	3.6	2.7	3.0	1.8	1.8
	65	3.7	4.6	3.0	3.6	-	-
	80	3.7	4.6	3.0	3.6	2.7	2.7
	100	3.7	4.6	3.0	3.6	2.7	2.7
	125	3.7	5.4	3.0	3.6	-	-
	150	4.5	5.4	3.6	4.2	3.7	3.7
	200	5.0	6.0	-	-	3.7	3.7
	250	5.0	6.0	-	-	4.5	5.4
	300	6.1	10.0	-	-	8.0	10.0
	350	10.0 12.0 -			-	-	-

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

22/245

07/07

Y10 – Pipelines

400	10.5 12.6 -			-	-	-
450	11.0 13.2 -			-	-	-
500	12.0 14.4 -			-	-	-
600	14.0 16.8 -			-	-	-

PIPE BORE		UPVC PIPE		PE PIPE		GLASS PIPE	
(mm)		Class O,B,C	Class D,E,6,7	Type 32	Type 50		
nominal horiz			horiz	horiz horiz horiz			horiz
up to	10	-	0.6	0.3	0.45	-	-
	15	-	0.6	0.4	0.6	-	-
	20	-	0.65	0.4	0.6	-	-
	25	-	0.75	0.4	0.6	-	-
	32	-	0.8	0.45	0.7	-	-
	40	-	0.9	0.45	0.7	0.9	1.7
	50	1.1	1.2	0.55	0.85	1.2	1.7
	65	1.2	1.4	0.55	0.85	-	-
	80	1.4	1.5	0.6	0.9	1.2	1.7
	100	1.5	1.7	0.7	1.1	1.2	1.7
	125	1.7	1.9	-	-	-	-
	150	1.8	2.1	-	1.3	1.2	1.7
	175	2.0	2.3	-	-	-	-
	200	2.1	2.5	-	-	-	-
	225	2.3	2.7	-	-	-	-
	250	2.4	2.9	-	-	-	-
	300	2.6	3.1	-	-	-	-
	350	2.9	3.4	-	-	-	-
	400	3.1	3.7	-	-	-	-
	450	3.4	3.7	-	-	-	-
above	450	3.7	3.7	-	-	-	-

Maximum horizontal support spacing for grooved steel pipe

6.0m when jointed with flexible type mechanical joints.

10m when using flexible couplings, sleeve type.

Vertical support spacing

Check total self-weight and pressure loading against manufacturer's recommendations when using mechanical joints or end load capable flexible couplings. Ensure adequate pipe support when using non-end load capable flexible couplings.

Space vertical support intervals for plastics pipe at not greater than twice horizontal intervals tabulated.

Where multiple pipe runs of differing bores are supported from a common point, use support spacing of pipe requiring closest spacing.

Spacings given for UPVC pipe to BS 3505 are for 20° C ambient or working temperature. Reduce spacing between supports for temperatures above 20°C. Support continuously for temperatures 60°C and above.

4231 ISOLATION AND REGULATION:

Provide valves, cocks and stop taps for isolation and/or regulation where indicated, and on:

Mains to isolate major sections of distribution.

Branch feeds to floors from risers.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

23/245

07/07

EX000001613/72
EX000001613_0072

Y10 – Pipelines

The base of all risers and drops except in cases where one item of apparatus only is served which has its own local valve or stop tap.

Points of pipe connection of all items of apparatus and equipment except where the item could conveniently be isolated or regulated by valves provided for other adjacent items.

At all terminal units.

Draw-off fittings except where ranges of fittings are served by a common float, the isolator then being fitted with the float.

4241 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents, demountable joints, supports, etc., for convenient routine maintenance and renewals. Ensure that the location of pipelines, wiring and wireways does not hinder or prevent the maintenance or removal of removable equipment such as cooling coils, filters etc.

Provide all runs with a regularly spaced pattern of demountable joints in the form of unions, flanges, etc., and also at items of equipment to facilitate disconnection.

Locate valves, drains, flanges etc. in groups.

4250 CLEANING:

Remove cement and clean off all pipework and brackets.

4260 NON-FERROUS COMPONENTS:

Thoroughly clean and degrease.

4401 PROTECTION OF UNDERGROUND PIPEWORK:

Protect buried gas pipework and other pipework where indicated, against corrosion by the application of a compatible anti-corrosive, non-cracking, non-hardening waterproof sealing tape.

Apply, after cleaning pipework, by wrapping contrawise with two layers spirally around the pipe, ensuring a 50% minimum overlap.

4411 PROTECTION OF BURIED PIPES:

Provide earth cover as follows

Water pipework

900 mm minimum; 1200 mm maximum where practicable.

Fuel oil and gas

500 mm minimum.

Under roadways

Provide minimum cover of 900 mm.

Provide a marker tape to identify buried pipe services.

4420 PROTECTION OF PIPES IN SCREEDS:

Wrap pipework with two protective tapes prior to laying.

or Sheath pipework with PVC.

4430 CORROSION PROTECTIVE TAPE:

Apply basic cotton carrier tape saturated with petroleum hydrocarbons with inert siliceous fillers. Wind tape spirally contrawise round pipework applied and overlapped to manufacturer's recommendations.

4440 MECHANICAL PROTECTIVE TAPE:

Apply Hessian based bitumenous tape over the corrosion protective tape. Wind tape spirally contrawise round pipework applied and overlapped to manufacturer's recommendations.

4480 STEELWORK GALVANIZED AFTER MANUFACTURE:

Where indicated galvanize steelwork after manufacture.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

24/245

07/07

EX000001613/73
EX000001613_0073

Y10 – Pipelines

4490 NON-FERROUS COMPONENTS:

Thoroughly clean and degrease.

5000 WORKMANSHIP, STEEL PIPEWORK:

5011 WELDING GENERAL, CLASS 1:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority. Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding, for each craftsman. Test non-destructively, approximately 10% of butt weld joints and 5% of all other joints, including prefabricated works as scheduled.

Weld pipeline joints to BS 2633.

Undertake non destructive testing in accordance with BS EN 1435 or BS EN 1714 and HVCA TR/5

5012 WELDING GENERAL, CLASS 2:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority. Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding, for each craftsman. Test non-destructively, approximately 10% of butt weld joints and 5% of all other joints, including prefabricated works as scheduled.

Weld pipeline joints to BS 2971 and to HVCA Code of Practice TR/5, Welding of Carbon Steel Pipework, as appropriate.

Undertake non destructive testing in accordance with BS EN 1435 or BS EN 1714 and HVCA TR/5

5020 WELDED JOINTS, STEEL PIPES:

Preparation, Making and Sealing.

Unless scheduled otherwise - arc welding, conforming to BS 2633 (Class I) or BS 2971 (Class II) appropriate to system temperature and pressure. Use arc welding process on piping greater than 100mm.

5030 PAINTING WELDED JOINTS, STEEL PIPES:

Unless pipework is being prepared for galvanizing after manufacture, wire brush and paint all welds with red oxide paint when welds are complete.

5040 FLANGED JOINTS, STEEL PIPES:

Welded Flanges

Weld neck and bore of 'slip on' flange.

Butt weld neck of welding neck flange.

Screwed Flanges

Apply jointing materials. Screw on flange and expand tube into flange with roller expander where necessary.

Preparation

Ensure that flange mating faces are parallel; flange peripheries are flush with each other; and bolt holes are correctly aligned.

Making and Sealing

Insert jointing between flange mating faces. Pull up joint equally all round.

5050 SCREWED JOINTS, STEEL PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends. Screw plain ends, taper thread.

Making and Sealing

Coat male pipe threads with jointing compound and hemp, or PTFE tape on small sizes. Immediately after applying coating, connect with female end of socket or fitting, and tighten ensuring that coating does not intrude into pipe. Leave joint clean.

Y10 – Pipelines

5060 MECHANICAL JOINTS, GROVED STEEL AND STAINLESS STEEL PIPES:

Preparation

Ensure that cut ends are square, free of bumps, dents and score marks and are within manufacturer's tolerances. Form groove to manufacturer's detail. Assemble joint in accordance with manufacturer's instructions.

Making and Sealing

Ensure gasket is suitable for service. Thoroughly lubricate gasket using manufacturer's recommended lubricant. Slip gasket over pipe end and bring ends together. Slide gasket into central position over both pipe ends. Position metal half housings over gasket and insert bolts and nuts. Tighten bolts to manufacturer's instructions. Check alignment of joint and pipework.

Earth

continuity.

Use manufacturers earth continuity clips to ensure compliance with IEE regulations.

5081 PRESS FITTING AND PUSH FITTING JOINTS:

Make press fitting and push fitting joints in accordance with manufacturer's recommendations. Ensure all fittings are electrically continuous when the jointing process is complete. Ensure all on site operatives receive adequate training from the system manufacturers prior to commencing work on site and are issued with an appropriate ID card to validate this training

Debur inside and outside of pipe using the manufacturer's proprietary de-burrer where available. Using a manufacturer's insertion depth gauge / proprietary tool mark the insertion distance on the pipe before making a joint. On completion of a joint mark with a paint check mark.

Comply with IGEM/UP/2 edition 2 Appendix 13 pressed fittings jointing procedure when used on natural gas pipework.

5090 STEEL PIPEWORK PAINTING:

Remove scale, rust or temporary protective coating by chipping, wire brushing or use of approved solvents and paint with one coat of red oxide primer, as work proceeds.

5091 STEELWORK PAINTING:

Prepare supports, bearers and other uncovered steelwork as steel pipework.

Where not exposed, paint with one coat zinc chromate or red oxide primer.

5100 COMPRESSION JOINTS, STAINLESS STEEL PIPES:

Use BS EN 1254 – 2 Type 'A' fittings.

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and Sealing

In accordance with fitting manufacturer's instructions.

5110 CAPILLARY JOINTS, STAINLESS STEEL PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size and clean plain ends.

Making and sealing

Use a suitable phosphoric acid based flux to BS 5245. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed. Use end fed fittings only where indicated, using silver brazing alloy and flux to manufacturer's recommendations.

5120 BRAZED JOINTS, STAINLESS STEEL JOINTS:

Preparation

Prepare for brazing in accordance with BS EN 14324

Making and Sealing

Use flame heat and make in accordance with BS EN 14324 Use nickel bearing zinc free filler metals.

6000 WORKMANSHIP, COPPER PIPEWORK:

Y10 – Pipelines

6010 WELDING GENERAL:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority. Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding, for each craftsman, test non-destructively, approximately 10% of butt weld joints and 5% of all other joints.

6020 BRONZE WELDED JOINTS, COPPER PIPES:

Preparation

Prepare for bronze welding in accordance with BS 1724.

Making and Sealing

In accordance with BS 1724. Use filler rod not subject to dezincification and suitable for application.

6030 COMPRESSION JOINTS, COPPER PIPES, LIGHT GAUGE:

Preparation for fittings to BS EN 1254 – 2

Type "A" fitting

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper

Type 'B' fitting

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper, then comply with manufacturer's instructions.

Making and Sealing

In accordance with fitting manufacturer's instructions.

6040 CAPILLARY JOINTS, COPPER PIPES, LIGHT GAUGE:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and sealing

Use specified flux ensuring no excess material used. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed.

6050 BRAZED JOINTS, COPPER / COPPER ALLOY PIPES:

Preparation

Prepare for brazing in accordance with BS EN 14324 Use manufactured fittings not subject to dezincification and suitable for application.

Making and Sealing

Use flame heat and make in accordance with BS EN 14324 Use silver brazing filler alloy suitable for application.

6060 ANCHORS, COPPER PIPES, FLANGES:

Provide anchors constructed by fitting two flanges to copper female adapters in pipe run at anchor point. Bolt together through an interposed mild steel channel section attached to or grouted into building structure.

or

Anchor pipework using saddle clamps to mild steel channel section attached to or built into building structure.

6070 MECHANICAL JOINTS, GROVED COPPER PIPES:

Preparation

Ensure that cut ends are square, free of bumps, dents and score marks and are within manufacturer's tolerances. Form groove to manufacturer's detail. Assemble joint in accordance with manufacturer's instructions.

Making and Sealing

Ensure gasket is suitable for service. Thoroughly lubricate gasket using manufacturer's recommended lubricant. Slip gasket over pipe end and bring ends together. Slide gasket into central position over both pipe ends. Position metal half housings over gasket and insert bolts and nuts. Tighten bolts to manufacturer's instructions. Check alignment of joint and pipework.

Y10 – Pipelines

Earth continuity.
Use manufacturers earth continuity clips to ensure compliance with IEE regulations.

6081 PRESS FITTING AND PUSH FITTING SYSTEMS:

Make press fitting and push fitting joints in accordance with manufacturer's recommendations. Ensure all fittings are electrically continuous when the jointing process is complete. Ensure all on site operatives receive adequate training from the system manufacturers prior to commencing work on site and are issued with an appropriate ID card to validate this training
Debur inside and outside of pipe using the manufacturer's proprietary de-burer where available. Using a manufacturer's insertion depth gauge / proprietary tool mark the insertion distance on the pipe before making a joint. On completion of a joint mark with a paint check mark.
Comply with IGEM/UP/2 edition 2 Appendix 13 pressed fittings jointing procedure when used on natural gas pipework.

7000 WORKMANSHIP, CAST/DUCTILE IRON:

7010 FLANGED JOINTS, CAST IRON/DUCTILE IRON PIPES:

Preparation

Ensure that flange mating faces are parallel, flange peripheries are flush with each other and bolt holes are correctly aligned.

Making and Sealing

Coat both sides of joint ring with jointing compound to BS 6956 Part 5 or BS EN 751 - 2. Insert joint ring between flange mating faces. Pull up joint with bolts, nuts and washers, ensuring that excess compound does not intrude into the pipe. Leave joint clean.

7020 CAULKED JOINTS, CAST IRON/SPUN CAST IRON PIPES:

Preparation

Ensure plain ends are cut square.

Making and sealing

Caulk socket with yarn, fill socket with molten lead, allow to cool and caulk home. Ensure bore of pipe is not obstructed.

Finish off lead joint to a neat fillet at the mouth of the socket.

7030 FLEXIBLE JOINTS, CAST IRON PIPES:

Preparation

Ensure that cut ends are square. Form groove to manufacturer's detail. Assemble joint in accordance with manufacturer's instructions.

Making and Sealing

Ensure joint ring is suitable for service. Thoroughly lubricate joint ring. Slip ring over pipe end and bring ends together. Slide ring into central position over both pipe ends. Position metal half housings over joint ring and insert bolts and nuts. Tighten bolts to manufacturer's instructions. Check alignment of joint and pipework.

8000 WORKMANSHIP, PLASTICS PIPES:

Comply with the requirements of HVCA TR11 2006.

8010 SOLVENT WELDED JOINTS, PVC PIPES:

Use solvent welded joints generally, ring seal joints at expansion joints and elsewhere as necessary.

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends. Clean plain ends with solvent cleaner.

Making and Sealing

In accordance with fitting manufacturer's instructions.

8020 FUSION JOINTS, POLYETHYLENE PIPES:

Preparation

Square cut plain ends. Form pipe ends for socket type joints.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

28/245

07/07

EX000001613/77
EX000001613_0011

Y10 – Pipelines

Making and Sealing

In accordance with fitting manufacturer's instructions.

8030 MECHANICAL FITTINGS FOR POLYETHYLENE PIPE:

Preparation

Ensure that cut ends are square. Check wall thickness/pressure rating of fitting.

Making and sealing

Ensure correct gasket type is used for service (e.g. water or gas). Assemble fitting in accordance with manufacturer's instructions.

8040 ANCHORS, PVC PIPES

Clamp pipework to mild steel channel section attached to or grouted into building structure, using PVC coated overstraps, or clamps and with a polypropylene strip between pipe and mild steel section.

8060 COMPRESSION FITTINGS ON MULTI-LAYER PIPES:

Carry out the installation of compression fittings on multi-layer pipe in accordance with manufacturer's recommendations.

9000 WORKMANSHIP

9010 FLEXIBLE COUPLINGS AND FLANGE ADAPTERS, SLEEVE TYPE:

Preparation

Ensure that cut ends are square and free of bumps, dents and score marks and are within manufacturer's tolerances.

Making and sealing

Ensure gasket is suitable for service. Thoroughly lubricate gasket using manufacturer's recommended lubricant. Assemble coupling in accordance with manufacturer's instructions.

For non-end load capable couplings, ensure that adequate pipe anchorage is

Provided to prevent pipe disengagement.

9030 PROTECTION OF UNDERGROUND PIPEWORK:

Protect against corrosion by the application of a compatible anti-corrosive, non-cracking, non-hardening waterproof sealing tape.

Apply, after cleaning pipework, by wrapping contrawise with two layers spirally around the pipe, ensuring a 50% minimum overlap.

9040 PROTECTION OF BURIED PIPES:

Provide earth cover as follows

Water pipework - 900 mm minimum; 1200 mm maximum where practicable.

Fuel oil and gas - 500 mm minimum.

Under roadways

Provide minimum cover of 900 mm.

Provide a marker tape to identify buried pipe services as indicated.

9050 PROTECTION OF PIPES IN SCREEDS:

Wrap pipework with two protective tapes prior to laying or

Sheath pipework with PVC.

9060 INSTALLATION OF THERMALLY INSULATED UNDERGROUND PIPELINES:

Install preinsulated bonded pipelines to [BS EN 253](#), [BS EN 448](#), [BS EN 488](#) and [BS EN 489](#) in accordance with manufacturer's instructions.

Install thermally insulated underground pipelines comprising steel casing with air gap in accordance with [BS 4508-1](#).

Install preinsulated bonded pipelines, with plastic service pipes, in accordance with manufacturer's instructions.

Y10 – Pipelines

9100 CORROSION PROTECTIVE TAPE:

Apply basic cotton carrier tape saturated with petroleum hydrocarbons with inert siliceous fillers. Wind tape spirally contra wise round pipework applied and overlapped to manufacturer's recommendations.

9110 MECHANICAL PROTECTIVE TAPE:

Apply Hessian based bituminous tape over the corrosion protective tape. Wind tape spirally contra wise round pipework applied and overlapped to manufacturer's recommendations.

9120A STEELWORK PAINTING:

Prepare supports, bearers and other uncovered steelwork as steel pipework.

Where not exposed, paint with one coat zinc chromate red oxide primer.

Where exposed, paint all cut ends of hangars, etc with two coats of zinc rich primer. Cut all hangar rods close to backnuts and paint as hangars.

10000 Based on NES – SPEX Y10 TEXT March 08

Y11 – Pipeline Ancillaries

1001 GENERAL

The tender drawings do not show all facilities for filling, flushing, cleaning, draining and chemical cleaning of the water systems. The Contractor shall include all necessary facilities, including sample coolers, to enable a Specialist to successfully fill, flush, clean, and chemically treat the systems listed in schedule Y25. in accordance with BSRIA Application Guide 1/2001.1 "Pre-commissioning cleaning of pipework systems.

The Contractor shall review all designs to ensure that systems are commissionable in accordance with the codes of practice detailed in Y51. If additional facilities are required the Contractor shall advise the designer prior to commencing work on site.

All pressure equipment shall be designed, manufactured and certified in accordance with the Pressure Equipment Regulations 1999 and The Approved code of practice (ACOP) L 122 "Safety of Pressure Systems"

1010 SAFETY AND RELIEF VALVES - SELF OPERATED - APPLICATION:

Safety

To discharge with rapid opening action to prevent predetermined safe pressure being exceeded.

Relief

To discharge with opening action proportional to increase in pressure above set pressure.

1020 EXPOSED VALVES:

Fit easy-clean covers over glands and bonnets to small copper alloy valves exposed in areas other than plant rooms. Fit thermoplastic valve wheels. Fit dust caps to lockshield valves.

1030 TESTING:

Ensure that valves and cocks are pressure tested at manufacturer's works, in accordance with appropriate British Standards specification. Test valves in accordance with BS EN 12266-1 and BS EN 12266-2.

1040 VALVE REMOVAL

All valves used on water services installations shall be provided with means of disconnection. Screwed or capillary valves shall be fitted with unions either side. Compression ended valves shall only be used for final isolation or where easily accessible.

2000 PRODUCTS/MATERIALS

2005 VALVE ENDS

Ends of valves shall suit the pipelines into which they are installed.

2007 STOP VALVES - SLUICE TYPE TO BS 5163:

Valve type (as BS) - A

Ends

Flanged to BS EN 1092

Seat

Metal seated.

Stem seal

Stuffing box and gland.

Operation

Handwheel.

Materials

Manufacturer's standard.

or As otherwise indicated.

Options

Stem cap.

2011z STOP VALVES TO BS 1010 PART 2.

Material

Bronze or DZR copper alloy body.

or As otherwise indicated.

Y11 – Pipeline Ancillaries

Washer material suitable for service fluid and operating temperature.
Ends
Union connections both ends

2015 STOP VALVES TO BS EN 1213 FOR POTABLE WATER SUPPLIES:

Material - copper alloy.
Flow rate class
VA (straight and angle pattern stopvalves).
VB (oblique pattern stopvalves).
End connections
Compression to BS EN 1254-2. or Compression to BS EN 1254-3 or Capillary to BS EN 1254-1.
or Threaded to BS 21 and BS EN 10226-1.

2016 MANUALLY OPERATED VALVES FOR GAS:

Standards
BS EN 331.
BS EN 13774

2020# STOP VALVES – COPPER ALLOY GATE TYPE TO BS 5154:

Gate valve type
Solid or split wedge
Ends
Threaded to BS 21 and BS EN 10226-1 and BS EN 10226 or Flanged to BS EN 1092
Stem
Inside screw non rising stem or Outside screw non rising stem.
Trim material
Suitable for potable water supply.
Operation
Handwheel
Options
Position indicator.
Locking device.

2030# STOP VALVES – CAST IRON GATE TYPE TO BS EN 1171:

Valve type
Solid or split wedge.
Inside screw stem (non-rising).
Stem sealing
Stuffing box and gland.
Ends
Flanged to BS EN 1092-2. PN as indicated
Body and bonnet material
Grey cast iron.
Trim category
Copper alloy faced.
Operation
Handwheel.
Suitable for use with potable water.
Options
Position Indicator.
Locking device.

2081 THREADED END BALL TYPE VALVES TO BS EN 13828:

Materials - Bronze or DZR copper alloy body.
Ends - Threaded to BS 21 and BS EN 10226-1.
Chrome or nickel plated DZR sphere with full bore flow aperture. PTFE seats and stem seals. Anti-blowout stem.
Operation - lever operated or screw driver operated or key operated.
For hot and cold water applications, incorporate a flow regulator within the isolation valve where the static pressure exceeds 1 bar.

2085z SERVICING VALVES TO BS 6675

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

32/245

07/07

EX000001613/81
EX000001613_0001

Y11 – Pipeline Ancillaries

Material - copper alloy.

End connections

Compression to BS EN 1254-2. or Compression to BS EN 1254-3 or Capillary to BS EN 1254-1.
or Threaded to BS 21 and BS EN 10226-1.

Operation – as indicated on drawings.

2090z STOP VALVES - BUTTERFLY TYPE TO BS EN 593:

Construction

Provide controlled elastomer compression on flange faces.

Semi-lugged wafer type design.

For installation between flanged pipework connections, body to suit BS EN 1092.

Provide lever-operated valves with long body neck for lagging clearance.

Seat

Bonded.

Materials

Cast iron body or Carbon Steel body.

Stainless steel shaft.

Disc material suitable for service fluid and operating temperature.

EPDM seat

Body lining material suitable for service fluid and operating temperature. For potable services the linings shall be arranged such that the fluid is not in contact with any ferrous parts.

Operation

Lever and graduated notch plate up to 200mm. Gear box operated or above 200mm. Unless otherwise indicated.

2091 STOP VALVES - LUBRICATED PLUG COCK TYPE TO BS 5158:

Materials

Cast Iron

Pattern

Short or regular.

Ends

Flanged to BS EN 1092-1 PN or BS EN 1092-2 as indicated or screwed to BS 21 and BS EN 10226-1

Body seat

Tapered or Parallel, or Plug fitted with injection facility for lubrication or sealing compound.

Operation

Wrench, but with wheel and gearbox where indicated.

Options

Provide manufacturer's charge of lubrication/ sealant suitable for service fluid and operating temperature.

2121 STOP VALVES TO BS 5433

Application

Underground stop valves for water services

Material

Bronze or DZR copper alloy body threaded to BS 21 and BS EN 10226-1

Washer material suitable for service fluid and operating temperature Material

2151 DOUBLE REGULATING VALVES - GLOBE TYPE TO BS 7350:

Series (as BS) - B.

Material

Copper Alloy to BS 5154

or cast iron to BS 5152

Pattern

Oblique or Y. Flanged to BS EN 1092 – 2 or BS EN 1092-3 or screwed to BS 21 and BS EN 10226-1

Stem

Inside screw rising stem.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

33/245

07/07

EX000001613/82
EX000001613_0002

Y11 – Pipeline Ancillaries

or Outside screw rising stem.
Trim material
Suitable for potable water supply.
Operation
Lockshield.
Options
Regulating locking device to
Provide double regulating facility.

2161 STOP VALVES - BALL TYPE TO BS 5159:

Material
Cast Iron or Steel
Pattern
Full bore.
Operation
Wrench.
Trim material
Manufacturer's standard.
Options
Wrench.

2170 STOP VALVES - DIAPHRAGM TYPE TO BS EN 13397:

Pattern
Weir.
Ends
Flanged to BS EN 1092-1 or BS EN 1092-2 or BS EN 1092-4 PN as indicated or Threaded to BS 21 and BS EN 10226-1
Materials
Suitable for service fluid and operating temperature.
Operation
Hand wheel.
Options
Sealed bonnet.

2210 REGULATING VALVES - BUTTERFLY TYPE:

Standard - BS EN 593.
Construction
Provide controlled elastomer compression on flange faces.
Fully lugged wafer type design.
For installation between flanged pipework
Body flanged to suit BS EN 1092
Provide lever and gear operated valves with long body neck for lagging clearance.
Seat
Bonded.
Materials
Cast iron body.
Stainless steel shaft.
Aluminium bronze disc.
Disc material suitable for service fluid and operating temperature.
EPDM seat.
Body lining material suitable for service fluid and operating temperature.
Operation
Infinitely variable setting with travel stops and position indicator.
Gear box operation.

2230A FLOW MEASUREMENT DEVICES TO BS 7350 TYPE 3, COPPER ALLOY:

BS 7350, section 3.2 - type 3
A fixed orifice either integral with or as a fixed orifice fitting close coupled to a double regulating globe valve.
Ends

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

34/245

07/07

EX000001613/83
EX000001613_0003

Y11 – Pipeline Ancillaries

Threaded to BS 21 and BS EN 10226-1 or flanged to BS EN 1092-2 to match pipe work as indicated.

Material

Double regulating globe valve, bronze or DZR copper alloy to BS 5154 series B and close coupled fixed orifice fitting to BS 7350 table 6.

Options

Independent means for positive isolation on pressure tapping or adapter.

2230C FLOW MEASUREMENT DEVICE TO BS 7350 CAST IRON, TYPE 3:

BS 7350, section 3.2 - type 3

A fixed orifice either integral with or as a fixed orifice fitting close coupled to a double regulating globe or butterfly valve.

Ends - Flanged to BS EN 1092-2.

Material

Double regulating globe valve, cast iron to BS EN 13789 and close coupled fixed orifice fitting to BS 7350, table 6.

Options

Independent means for positive isolation on pressure tapping or adapter.

2240 ORIFICE PLATE:

Material

Stainless steel.

Carrier ring to fit inside bolt circle of flange.

or Carrier ring full faced for installation between copper alloy flanges.

Pressure tap pins with self-sealing test plugs, suitable for operating conditions, for connection to manometer to provide measuring facility

2241 TERMINAL UNIT MANIFOLD COMMISSIONING MODULES:

A multi terminal commissioning system for controlling up to 6 terminal units served by either 15mm or 20mm flow measuring stations / pipework. For duties refer to drawings and terminal unit schedules. All components to be assembled and installed in an insulated painted galvanised sheet steel box having a minimum thickness of 1.2mm incorporating handles, a clamped lid for access and external hanging points. Insulation to be a minimum thickness of 20mm and ensure the box is complexly vapour sealed. Modules are to incorporate a flushing bypass, isolation valves, and strainer with integral drain cock, pressure test points, flow isolating valves and return flow measuring / regulation valves as clause 2230A. When used on variable volume systems a differential pressure control valve shall also be installed within the box.

Connections to flow & return pipes are to be BSP Threaded Female and accessible on the outside of the box to prevent disturbing the insulation.

Each module to be supplied with an identification label, identifying each manifold with flow/return designation, terminal number and flow rate.

2260A RADIATOR VALVES TO BS 2767

Type - Use type 4 or type 10 as required to meet system temperature and pressure

Material - Bronze or DZR copper alloy body.

Pattern - Angle or straight to suit application.

Pipework Connections - Straight

Threaded to BS 21 and BS EN 10226-1

or compression to BS EN 1254-2 to suit pipework as indicated.

Angle

Threaded to BS 21 and BS EN 10226-1 with one end internal and other end external with union nut and tail pipe; or compression joint to BS EN 1254-2 one end and other end externally threaded to BS 21 with union nut and tail pipe to suit pipework as indicated.

Connections

Fit wheel valves on flow connections to radiators, and other heat emitters, without thermostatic radiator valves. Fit lockshield valves on return connections.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

35/245

07/07

EX000001613/84
EX000001613_0004

Y11 – Pipeline Ancillaries

2270 THERMOSTATIC RADIATOR VALVES to BS EN 215:

Materials and connections as radiator valves.

Pattern - Angle or straight to suit application, valves to be tamper proof.

Ancillaries

Position indicator.

Locking device.

Temperature sensor

Integral sensor with an alpha/numeric set-point indicator and locking facility,

or Remote sensor with an integral alpha/numeric/temperature set-point indicator; integral locking facility, and capillary connections between sensor and valve, or remote sensor incorporating the selector.

2290A FLOAT OPERATED VALVES, BALANCED EQUILIBRIUM:

Bronze or DZR copper alloy body.

Inlet

Threaded to BS 21 and BS EN 10226-1 or flanged to BS EN 1092 as indicated.

Spindle and head effectively guided and arranged with stops to engage with valve body and prevent over travel. Linkage fulcrum adjustable relative to vertical plane, securely locked to body tapping when set.

Screwed plug from access cover.

Float and lever arm.

Spun copper float, halves brazed or welded together, with centre sleeve connecting to lever arm.

For feed and expansion application use long arm type arranged to close when tank contains 150mm depth.

WRAS approved.

2290z FLOAT OPERATED VALVES - DELAYED ACTION TYPE:

Incorporating

: Float operated valve.

: Canister - copper.

: Secondary float - gunmetal.

: Support bracket - galvanized steel.

2320z SWING CHECK VALVES TO BS 5154 1991:

Material

Copper Alloy

Series B; horizontal pattern.

Ends

Threaded to BS 21 and BS EN 10226-1 or flanged to BS EN 1092 to suit pipework as indicated.

Trim material - Manufacturer's standard.

To be suitable for potable water where required

2330z SWING CHECK VALVES TO BS EN 12334:2001

Type – As defined in BS EN 736-1

Material

Cast iron

Pattern - Straight pattern, horizontal.

Valve face - Copper or nickel alloy.

Ends - Flanged to BS EN 1092-2.

Material - Manufacturer's standard.

To be suitable for potable water where required.

2350 PRESSURE REDUCING VALVES - INTEGRAL SENSOR TYPE:

Material

Bronze or DZR copper alloy body threaded to BS 21 and BS EN 10226-1

Stainless steel valve and seat and return spring.

Phosphor bronze bellows.

unless otherwise indicated

Y11 – Pipeline Ancillaries

Components

Control spring and handwheel.

Integral sensor with an alpha/numeric pressure set-point indicator and locking facility.

2385 DEVICES TO PREVENT CONTAMINATION OF WATER BY BACKFLOW TO BS 6282:

Part 1 check valves.

Part 2 terminal anti-vacuum valves.

Part 3 in-line anti-vacuum valves.

Part 4 combined check and anti-vacuum valves.

WRAS approval.

Ends

Compression connections to BS EN 1254-2, or Threaded to BS 21 and BS EN 10226-1

2390A COMBINED CHECK AND ANTI-VACUUM TYPE ANTI BACK SYPHONAGE VALVES:

Bronze or DZR copper alloy body assembly with compression connections to BS 864 Part 2. or threaded to BS 21 and BS EN 10226-1 (horizontal or vertical)

WRAS approval

Pattern : In-line pattern or side inlet bottom outlet or bottom inlet side outlet as indicated.

Components

Stainless steel domed air inlet. Non-return valve with plastic body, rubber actuator and stainless steel to plastic seal.

2395A VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE GENERAL REQUIREMENTS:

Provide an application to the local water supplier using the WRAS "RPZ Valve Assembly - Application for Installation" form.

Obtain Water Supplier agreement that a Type BA device is a suitable means of backflow protection in the water supply system under consideration.

Test methods and maintenance regimes shall be in accordance with the Water Suppliers requirements and any failure to comply may result in termination of supply or removal of the device. These maintenance requirements must be detailed within the project Operation & Maintenance documentation. The fitting must be included in the WRAS "Water Fittings and Materials Directory" and satisfy the requirements of the Regulations.

The installer must obtain formal Water Supplier agreement that a Type BA device is a suitable means of backflow protection in the plumbing system under consideration before installation.

Confirm that any Type BA device installed provides protection against back pressure and back siphonage at the point of use from fluids up to and including Category 4 as defined in the Water Supply (Water Fittings) Regulations 1999.

Comply with the stipulations and requirements set out in WRAS Guidance Note No. 9-03-02.

2395B VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE INSTALLATION:

The Type BA device shall not be installed in a place or position which is:

Liable to flooding

Above electrical equipment

Exposed to freezing - unless measures are taken to prevent the assembly from freezing

The assembly shall be:

Installed horizontally with the relief valve discharging downwards. Inline strainers shall be fitted downstream of the inlet isolating valve and immediately upstream of the device - to prevent fouling of elements of the assembly.

The valve shall be Installed not less than 300mm above ground or floor level or the base of any cabinet to the underside of the exit port of the relief valve and no more than 1500mm above ground or floor level. An air break shall be provided between the relief outlet port and the top of the allied tundish

Following installation the assembly shall be flushed and disinfected in accordance with BS 6700.

Following flushing and prior to commissioning and site test, the assembly shall be checked by the installer to ensure that the relief valve functions correctly - in accordance with the guidelines in WRAS Information and Guidance Note No. 9-03-02.

Y11 – Pipeline Ancillaries

2395C VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE ON SITE INSPECTION AND TESTING:

Site testing must only be carried out by an accredited tester approved by the Water Supplier.
Testing shall be carried out at intervals not exceeding 12 months.
Test data during the commissioning of the assembly and at subsequent intervals shall be entered on the “RPZ Valve Test Report Form” produced by the WRAS.

The inspections and testing shall be in accordance with WRAS Guidance Note No. 9-03-02.

On completion of site tests, a certificate must be completed by the tester in accordance with WRAS Guidance Note and copies submitted to the water supplier and the person responsible for the device. Copies shall be included in the Operation and Maintenance Manuals, including interval periods for subsequent testing.

2395D VERIFIABLE BACKFLOW PREVENTER WITH REDUCED PRESSURE ZONE (RPZ) VALVE RECORD OF INSTALLATION AND TEST DATA:

Provide records for each assembly.
In general, the record shall indicate the following:
Precise location of the assembly
Purpose of the assembly
Data pertaining to prescribed tests
Frequency of tests
Defects found and measures taken to remedy these defects
Details of the person who carried out the test

The installation, commissioning and subsequent test data shall be forwarded to the Water Supplier and copies retained by the Tester and the Water Supplier’s customer for a period of at least five years.

2422 IN LINE DIFFERENTIAL PRESSURE CONTROL VALVES - DIRECT ACTING TYPE:

Provide valves to maintain a constant differential pressure upstream of the valve.

Material	Cast iron Malleable iron body, brass or bronzebody. Stainless steel seat, cone and return spring.
Phosphor Components	bronze bellows.
Valve	Control spring and actuator. body and bellows.
Connections	Threaded to BS 21 and BS EN 10226-1. Or Flanged to BS EN 1092 parts 1,2 or as appropriate

2424 BYPASS DIFFERENTIAL PRESSURE CONTROL VALVES - DIRECT ACTING TYPE:

Provide valves to maintain a minimum circuit flow rate as system loads change.

Material	Cast iron Malleable iron body, brass or bronzebody. Stainless steel seat, cone and return spring.
Phosphor Components	bronze bellows.
Valve	Control spring and actuator. body and bellows.
Connections	Threaded to BS 21 and BS EN 10226-1. Or Flanged to BS EN 1092 parts 1,2 or as appropriate

2425A STEAM TRAPS - THERMOSTATIC TYPE, BALANCED PRESSURE:

Bronze or DZR copper alloy body with threaded ends to BS 21 and BS EN 10226-1
Seamless stainless steel capsular element.
Stainless steel internal components with renewable seat.

2425B STEAM TRAPS - THERMOSTATIC TYPE, BI-METALLIC:

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Steel body and cover with threaded ends to BS 21 and BS EN 10226-1 suitable for horizontal in-line mounting.

Thermostatic element in corrosion resistant multiple cross disc type bimetal stainless steel.

Integral stainless steel strainer.

2425C STEAM TRAPS - INVERTED BUCKET TYPE:

Cast iron body with threaded ends to BS 21 and BS EN 10226-1

Stainless steel bucket and internal components.

Integral strainer with access plug and stainless steel element.

Bolted cover with gasket.

2425D STEAM TRAPS - FLOAT TYPE:

Material

SG iron body.

Stainless steel float, air vent and internal components.

Ends - Threaded ends to BS 21 and BS EN 10226-1

Mounting

Horizontal in-line.

Options as indicated

Steam lock release facility.

Combined thermostatic air vent and steam lock release facilities.

2425E STEAM TRAPS - THERMODYNAMIC TYPE:

Material

Stainless steel body.

Stainless steel disc with screwed cap.

Ends

Threaded ends to BS 21 and BS EN 10226-1

Integral strainer with access plug and stainless steel screw.

Options as indicated.

Blowdown cock fitted to strainer cap.

Air venting disc.

2426 SIGHT GLASSES:

Bronze or DZR copper alloy body threaded female to BS 21 and BS EN 10226-1

Glass window.

Double window type.

Locate remote from fluid discharges to avoid damage by thermal or pressure shock conditions.

2428 STEAM TRAP FAILURE INDICATORS:

Materials

Cast iron sensing chamber body.

or Cast steel sensing chamber body.

Stainless steel internal sensor and sensor gasket.

Ends

Threaded ends to BS 21 and BS EN 10226-1 .

Connect into assembly upstream of steam trap, as indicated.

Provide plug-in solid state electronic indicators complete with batteries, number as indicated (minimum 2No).

Provide central indicator panels as indicated and all interface wiring.

2429 STEAM TRAPS AND ACCESSORIES:

Conform to BS EN 26553 and, where appropriate, BS EN 26554.

Components

Dirt pocket with removable end cap or flange.

Steam stop valve.

Union.

Strainer (if not integral with trap).

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Steam trap.
Steam trap indicators.
Union.
Sight glass.
Non-return valve.
Stop valve.

2430A DIRECT ACTING SAFETY VALVES TO BS 6759, COPPER ALLOY, SINGLE SPRING:

Material - Bronze or DZR copper alloy body.
Ends - Threaded to BS 21 and BS EN 10226-1.
Spring type - Single spring loaded, high lift type.
Protection from unauthorised adjustment
 Fit a ferrule under adjusting screw.
or Fit compression ring under adjusting screw.
or Lock adjusting screw.

2430B DIRECT ACTING SAFETY VALVES TO BS 6759, COPPER ALLOY, DOUBLE SPRING:

Material - Bronze or DZR copper alloy body.
Ends - Threaded to BS 21 and BS EN 10226-1.
Spring type - Double spring loaded, high lift type.
Protection from unauthorised adjustment
 Fit a ferrule under adjusting screw.
or Fit compression ring under adjusting screw.
or Lock adjusting screw.

2430C DIRECT ACTING SAFETY VALVES TO BS 6759, CAST IRON, SINGLE SPRING:

Material - Cast iron body.
Ends - Flanged to BS EN 1092-2
Spring type - Single spring loaded, high lift type.
Protection from unauthorised adjustment
 Fit a ferrule under adjusting screw.
or Fit compression ring under adjusting screw.
or Lock adjusting screw.

2430D DIRECT ACTING SAFETY VALVES TO BS 6759, CAST IRON, DOUBLE SPRING:

Material - Cast iron body.
Ends - Flanged to BS EN 1092-2
Spring type - Double spring loaded, high lift type.
Protection from unauthorised adjustment
 Fit a ferrule under adjusting screw.
or Fit compression ring under adjusting screw.
or Lock adjusting screw.

2440A DRAIN COCKS, THROUGHWAY GLAND COCK:

Standard – BS 2879

Bronze body with capillary ends. Tapered plug with square shank for loose lever; bolted gland; strap and blank cap screwed on hand tight. Outlet to accept hose union. Locate at all low points

2460 DRAIN COCKS, BALL TYPE

Bronze or DZR copper alloy body; chrome-plated DZR ball; PTFE seats and stem seals; blow-out proof stem; strap and blank cap screwed on

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hand tight; serrated outlet to accept hose pipe. Lockshield key operated.

2470 TWO WAY GLAND TYPE VENT COCK:

Bronze body threaded to BS 21. and BS EN 10226-1
Tapered plug with square shank for loose lever.
Plug position indicator.
Bolted gland.

2490 THREE WAY GLAND TYPE VENT COCK:

Components
Bronze body threaded to BS 21 and BS EN 10226-1.
Tapered plug with square shank for loose lever.
Plug position indicator.
Port markings to indicate inlet, vent, waste.
Bolted gland.
Port configuration, T port with stops.

2500A THREE WAY PLUG VALVE VENT COCKS:

Cast iron body, plug and bottom cover. PTFE thrust washer.
Ends - Flanged to BS EN 1092-2
T port configuration with stops. Wrench operation.

2511 AUTOMATIC AIR VENTS - FLOAT TYPE:

Construction
Bronze or DZR copper alloy body with threaded inlet to BS 21 and BS EN 10226-1.
Provide a solid polypropylene float and air release valve. Ensure valve is self closing.

Options
Provide connection to air vent for piping away released air.
Provide isolating valve.
Provide integral non-return valve.

Operating conditions
Maximum temperature, 130°C.
Maximum pressure 10 bar.

2516 DEAERATION UNITS - MICROBUBBLE TYPE:

For systems with less than 15m static head on heating and 5m on Chilled water

Type

Inline Temperature Differential Deaerator

Construction

Vertical mild steel housing, fitted with non-clogging helicoidal separation tubes and mesh / packing manufactured from copper tube, stainless steel or other proprietary material to create a the correct environment at the top of the unit to deaerate efficiently by separating the smallest microbubbles.

Maximum operating temperature and pressure of 110°C and 10 bar.g.

Units to be compliant with The Pressure Equipment Regulations 1999.

For Chilled Water systems, the Deaerator shall be suitably insulated to prevent condensation

Provide air release mechanism comprising a solid polypropylene float not rigidly coupled to the air release valve. The air release valve shall be self closing. The AAV shall incorporate a 3-way valve allowing positive shut off to the AAV for servicing and protection from dirt during filling / flushing.

Ends
Screwed or flanged to BS EN 1092- 1, PN to match pipework

All Deaeration equipment must be manufactured and supplied by companies complying with the requirements of "Lloyds register quality assurance ISO9001". A Certificate of Compliance must be issued by this company for approval prior to orders being placed.

2521 DEAERATION UNITS - PRESSURE –STEP or VACUUM DEGASSER TYPE

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Serv ices Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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Y11 – Pipeline Ancillaries

For systems with greater than 15m static head on heating and 5 m on Chilled water

Type

Packaged Pressure Step Differential Deaerator complete with pump, casing and all necessary electronic controls.

The unit shall incorporate the following controls: air monitoring - auto start/shutdown; re-start every day by time clock; pump “ant-stick” start every three days; volt-free contacts for connection to BMS for fault indication.

The Deaerator shall have a vessel, where a volume of water from the main system is exposed to a vacuum and an automatic air vent.

For Chilled Water systems, the Deaerator shall be suitably insulated to prevent condensation.

Maximum operating temperature - 90°C.

Operating pressure range shall be selected to suit the system requirements.

The Deaerator shall be commissioned by the manufacturers representative.

The Pressure Differential Deaerator shall be electronically controlled

All Deaeration equipment must be manufactured and supplied by companies complying with the requirements of “Lloyds register quality assurance ISO9001”. A Certificate of compliance must be issued for approval by the engineer prior to orders being placed.

2523 DIRT SEPARATOR UNITS:

Construction

Vertical mild steel housing. To ensure Deaeration and Dirt Separation are achieved the unit shall be fitted with a non-clogging cluster of spiral tubes manufactured from copper tube and wire to create an the correct environment at the bottom of the unit for dirt separation to occur.

The Dirt Separator unit shall have a standard maximum operating temperature and pressure of 110°C and 10 bar.g. respectively.

Units to be compliant with The Pressure Equipment Regulations 1999.

The pressure drop across the Dirt separator shall remain constant regardless of the amount of dirt trapped.

Ends

Screwed or flanged to BS EN 1092- 1, PN to match pipework

Dirt separation equipment must be manufactured and supplied by companies complying with the requirements of “Lloyds register quality assurance ISO9001”. A Certificate of compliance must be issued for approval by the engineer prior to orders being placed.

2524 COMBINED DEAERATOR & DIRT SEPARATOR:

For systems with less than 15 m static head on heating and 5 m on Chilled water

Type

Inline Combined Temperature Differential Deaerator & Dirt Separator .

Construction

Vertical mild steel housing, fitted with non-clogging helicoidal separation tubes and mesh / packing manufactured from copper tube, stainless steel or other proprietary material to create a the correct environment at the top of the unit to deaerate efficiently by separating the smallest microbubbles.

Maximum operating temperature and pressure of 110°C and 10 bar.g.

Units to be compliant with The Pressure Equipment Regulations 1999.

For Chilled Water systems, the Deaerator shall be suitably insulated to prevent condensation

Provide air release mechanism comprising a solid polypropylene float and air release valve. Ensure valve is self closing.

Provide dirt drain valve at its lowest point.

Ends

Line size with flanges to BS EN 1092-1, PN to match pipework

Y11 – Pipeline Ancillaries

All Deareation & Dirt s eparation equipment must be manufactured and supplied by companies complying with the requirements of "Lloyds register quality assurance ISO9001". A Certificate of compliance must be issued for approval by the engineer prior to orders being placed.

2611 EXPANSION LOOPS - STEEL:

Provide expansion loop in material and finish of a ssociated pipeline. Forge bend from a single length of pipe or join by welding fittings if expansion loops are too large to manufacture in one piece.
Loop sizes shall be calculated using the CIBSE guida nce. Calculations shall be un dertaken to establish stress contained in the loop
Finish – to match pipework system

2620 EXPANSION LOOPS - COPPER:

Provide expansion loop in material and finish of a ssociated pipeline. Forge bend from a single length of pipe.
Loop sizes shall be calculated using the CIBSE guida nce. Calculations shall be un dertaken to establish stress contained in the loop.

2631 EXPANSION COMPENSATORS:

Type

Unrestrained - Axial.

Restrained – Lateral, Angular gimbal

Ends

Threaded to BS 21 and BS EN 10226-1.

or

Flanged to BS EN 1092-1 PN to match pipework.

Standards

Joints shall comply with the requirements of the Expansion Joints Manufacturers Association standard 1998 (EMJA). Expansion joints may be of the restrained or unrestrained type.

General

Expansion joint convolutions shall be of a thick wall spirally wound, multi-ply construction with a corrosion resistant inner ply in AISI 316L stainless steel. Units shall be fitted with stainless steel inner sleeves.

For critical services such as MTHW, HTHW and steam, the bellows shall have a weep hole as a fail-safe device.

Expansion joints shall be capable of not less than 5000 complete reversals of movement at the given working conditions and the manufacturer shall be able to produce calculations to that effect.

Expansion joints shall be capable of withstanding a test pressure 1.5 times their design pressure without deformation.

The Contractor s hall ensure the expansion joints are installed in accordance with the manufacturer guidelines for selection and installation. The manufacturer shall issue a Certificate of Compliance issued as part of the handover documentation.

Unrestrained expansion joints

Axial expansion joints shall only be used in positions where pressure thrust can be contained by adequate anchor points contained by the building fabric. The expansion joint manufacturer shall submit calculations for anchor loadings for onward transmission to the Structural Engineer.

Restrained expansion joints

Y11 – Pipeline Ancillaries

Restrained expansion joints shall be used as an offset type either by using lateral or angular expansion joints to compensate for thermal expansion or building movement. The expansion joint restraints shall be designed to absorb the full pressure thrust of the expansion joint convolutions.

Lateral expansion joints shall be of the thick wall spirally wound multi-ply construction and fitted with threaded tie bars and low friction self-lubricating hemispherical nuts, allowing movement in two planes.

Angular expansion joints shall be of the thick wall spirally wound multi-ply construction and be used in pairs or threes. All hinge pins shall be PTFE coated to reduce friction and prevent corrosion.

For movement in two planes Gimbal Expansion joints shall be used in pairs or in combination with one Angular Expansion joint. All hinge pins shall be PTFE coated to reduce friction and prevent corrosion.

All expansion joints must be manufactured and supplied by companies complying with the requirements of Lloyds register quality assurance ISO9001. A Certificate of compliance must be issued for approval by the engineer prior to orders being placed.

2651 FLEXIBLE CONNECTIONS AND NOISE AND VIBRATION ABSORBERS

Generally

Flexible connections shall be fitted to all pump suction and discharge connections, chillers condensers and other centrifugal, reciprocating or vibrating plant

Flexible Connections must have certification to demonstrate they have been tested for Noise and Vibration reduction capabilities

Flexible Connections are to be fitted as close to the source of vibration as practicable. The pipework and flexible connections shall be installed to prevent any stresses in the pipework from being transmitted to the pump or vibrating equipment. To ensure correct alignment, a spool piece is to be employed during installation.

Rubber Flexible Connections shall be single convolution of hand laid multi ply reinforced EPDM rubber with wire reinforced cuffs. Flanges shall be removable and suitably profiled to control the convolution shape; plate flanges must not be used under any circumstances.

Threaded and adjustable tie bars with rubber top hat washers shall be used where the working pressure exceeds 1.5 bar.g. When untied Flexible connections are used, the manufacturers recommendations for anchors and guides shall be followed to prevent forces being exerted on to the pump casing and AV mounts.

All flexible connections must be manufactured and supplied by companies complying with the requirements of "Lloyds register quality assurance ISO9001". A Certificate of compliance must be issued for approval by the engineer prior to orders being placed.

Comply with the requirements of DIN 4809

Marking

The flexible Connections must be fully traceable: and moulded into the Flexible carcass shall be the manufacturer, country of origin, type and batch number, serial number, easily recognisable colour flashes and the date of manufacture.

Ends

Y11 – Pipeline Ancillaries

Flanges to BS EN 1092 - 1 that can swivel and are removable; or threaded to BS 21 and BS EN 10226-1 with one union end to suit pipework as indicated.

Working temperatures up to 70°C

Flexible carcass can be reinforced using high tensile synthetic fibre reinforcement.

Working temperatures between 70°C and 100°C

Flexible carcass must be steel wire mesh reinforced throughout. Connections are to have a minimum design life of 10 years, continuously operating at 100°C and a minimum burst pressure of 30 bar.g, in compliance with the minimum requirements of DIN4809: Part 1.

Working temperatures above 100°C

Flexible Connections must be of thick wall spirally wound multi-ply construction stainless steel, all welded construction with tie rods.

Ends Flanges to BS EN 1092 - 1

2661 FLEXIBLE HOSES / TERMINAL UNIT CONNECTIONS

Standards

Flexible hose assemblies (up to 25mm nominal bore) for use in closed circuit heating and cooling systems shall be manufactured in accordance with BSRIA Guide BG 4/2004

Flexible hoses shall be installed in accordance with BSRIA Code of Practice 11/2002. (Flexible hoses a code of practice for services installers)

Material

EPDM inner liner with stainless steel wire braid. Nickel plated brass fittings with stainless steel ferrules.

Operation

Minimum length 300mm.

Ensure hose is capable of resisting kinking when bent through 180 deg.

Working pressure 15 - 20 bar and temperature 110 °C or as otherwise indicated.

Other

features

Supply chilled water connections fully insulated with end caps. The insulation shall form a vapour tight seal on the hose ferrules.

The hoses shall be colour-coded red and blue to indicate its suitability for LTHW and Chilled water.

Chilled water hoses shall be fully insulated and the insulation fitted with end caps.

The hoses shall have been thermal cyclic tested from 6°C to 90°C for at least 5000 cycles, carried out by an independent test authority.

All Hoses shall have a minimum 10 year warranty..

High temperature and critical applications

Where the operating temperature exceeds 100°C, flexible connections shall be constructed from convoluted stainless steel flexible hose, with a stainless steel wire braid, all welded construction. The hoses shall be of annular corrugated construction and manufactured from AISI 321 Stainless Steel.

The hose shall be braided or unbraided to suit the temperatures and pressures.

Fitting shall be welded or brazed to suit the application. All hoses shall be 100 % leak tested by the manufacturer.

Y11 – Pipeline Ancillaries

The manufacturer shall be consulted to determine minimum flexible length and installation configuration.

All terminal connections must be manufactured and supplied by companies complying with the requirements of Lloyds register quality assurance ISO9001.

2670A TEST PLUGS, SELF SEALING:

Provide self sealing test plugs with integral means of isolation, for measurement of temperature and pressure, complete with captive cap for sealing when not in use. Ensure test plugs are suitable for system operating temperature and pressure.

Provide one thermometer and pressure gauge for each range of conditions, for use with test plugs.

Install test plugs:

Either side of each strainer (unless integral with strainer)

Either side of each pump set

On the flow and return connection to each calorifier/heat exchanger/boiler/chiller/condenser

On the flow and return connection to each coil

Across the ports of each control valve

Elsewhere as necessary to allow the system to be commissioned in accordance with the CIBSE

Commissioning Codes

Elsewhere as indicated

2671z TEST PLUGS, VALVE CONTROLLED:

On MTHW and HTHW provide self valve controlled test plugs for measurement of temperature and pressure, complete with captive cap for sealing when not in use. Ensure test plugs are suitable for system operating temperature and pressure.

Provide one thermometer and pressure gauge for each range of conditions, for use with test plugs. Install as 2670A.

2681 PIPELINE STRAINERS:

Ends

To match pipework. Screwed to BS 21 and BS EN 10226-1 or flanged to BS EN 1092-1 or BS EN 1092 – 2 or BS EN 1092 – 4.

Pattern

Simplex basket, Duplex basket or Y pattern as indicated on schematic drawings or as scheduled

Screen free area

Not less than 250% of pipe bore or as indicated.

Screen perforations

15 - 50mm, within range 0.7 - 0.9mm diameter.

65mm and above, within range 1.5 - 1.8mm diameter.

unless otherwise indicated.

Internal to external flow through screen.

Provide plugged connections for drain, air vent and differential pressure monitoring, threaded to BS 21.

At commissioning allow for the installation of temporary fine mesh screens in main system strainers.

2690C TUNDISHES:

Provide tundishes for all drains from equipment, located adjacent to equipment, or as indicated, in material to suit piping.

Material

Copper sheet nominally minimum 3mm thick.

or Mild steel galvanized after manufacture.

Construction

Form sheet into a tapered reducing cone with a minor diameter to suit drain line.

Major diameter nominally 50 mm larger than minor diameter, tapering at approximately 30 degrees.

Y11 – Pipeline Ancillaries

2700z GAUGES:

Use dial type gauges of robust construction, enclosed in dust tight metal cases. Retain dial glasses with bezels screwed to case. Finish with chromium plating.

Dial cases

In plant rooms

150mm diameter, heavy pattern, finished in black stove enamel.

In other areas

100mm diameter, finish chrome plated unless otherwise indicated

Use white dial scales indelibly and clearly marked with black lettering to indicate measured values. Select scale ranges which indicate 'Normal' when pointer is vertical or central on scale.

Mount gauges with dial face in vertical plane and locate as follows

Direct

Support casing by connection to instrument, unless otherwise indicated.

2710z TEMPERATURE GAUGES:

Use temperature gauges with pocket and provided with gland attachment on thermometer stem.

Type

Mercury in steel, mounted direct in pocket.

or Vapour pressure to BS 5235, mounted direct in pocket with horizontal or vertical stem as appropriate.

or Vapour pressure to BS 5235, for remote mounting with capillary tube of sufficient length to allow slack run to immersion bulb. Protect capillary along full length by a flexible sheath jointed to dial case and bulb.

Use separable type pockets, threaded 1 5/19mm BSP and manufactured from stainless steel unless otherwise indicated.

Screw pockets into tapped bosses or stools set in pipelines or vessels. Fill pockets with oil to BS 7207 to ensure contact with thermometer bulb.

Provide gauges with dial graduation in degrees celsius marked on a logarithmic scale. Ensure pointer movement is clockwise for increase in temperature.

Provide sensing elements for air and gas systems, where indicated, and fix to provide airtight joints.

Provide with metal shielding around sensing element to prevent effects of local radiation from equipment.

2720 PRESSURE AND ALTITUDE GAUGES:

Use vapour pressure type gauges to BS EN 837-1. Connect to pipeline systems via matched gauge cocks and cock connectors.

Ensure dial graduation is from zero to between 1.5 and 3.0 times normal working pressure. Graduate in bar (gauge) on gauges reading head or working pressure, or in Pascals where pressure differences across plant items are to be established. Where fitted on boilers and pressure vessels, clearly mark with operating and maximum permissible working heads in accordance BS 759. Elsewhere provide gauges with normal working pressure. Ensure dial movement is clockwise for an increasing in head.

Fit pig tail siphons and double isolation valves on steam, MTHW and HTHW systems. Use "U" siphons on all other services.

Provide flexible piping where gauge is subject to noticeable vibration.

Fit gauge cocks preceding all connections to altitude and pressure gauges. Copper alloy, tapered ground plug, with ebonite lever. Unless flanged joints are required, screw inlet ends female and fit out let ends with union connections allowing removal of gauges.

2730 VACUUM GAUGES:

Use vacuum gauges complying with BS EN 837-1. Calibrate in mm of mercury.

2735 DIFFERENTIAL PRESSURE GAUGES:

Supply where indicated.

2740z GAUGE MOUNTING BOARDS:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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Y11 – Pipeline Ancillaries

Mount on walls or purpose made steel frames at a height approximately 1.3m above floor level as indicated

- Manufacture from 12mm thick hardwood, and polish.
- or Manufacture from 3mm mild steel plate, finished black stove enamel and trimmed with chromium plated strips approximately 10mm wide.

3000 ACCESSORIES

3010z LOOSE ITEMS:

- Provide 5 no. tee handled short shank keys suitable for each size of valve spindle shank.
- Provide one lever pattern key suitable for each drain cock.
- Provide loose hose unions each for drain cock.

3020z VALVE SEAT REPLACEMENT

- Provide a seat replacement tool for the TRV's, where fitted.

4000 WORKMANSHIP

4005 WRC APPROVAL

- Ensure all valves used on potable services have WRC approval, and are so marked.

4010 INSTALLATION:

- Install pipeline ancillaries in accordance with manufacturer's recommendations and BS 6683.

4021 LOCATION OF VALVES AND ANCILLARIES:

- Install valves, cocks, traps, strainers, test plugs, tundishes and other ancillary equipment in positions indicated and as a minimum as follows:

- Mains to isolate major sections of distribution.

- The base of all risers and drops except in cases where one item of apparatus only is served which has its own local valve or stop tap.

- Points of pipe connection of all items of apparatus and equipment except where the item could conveniently be isolated or regulated by valves provided for other adjacent items.

- At all terminal units. (For hot and cold water services incorporate a flow regulator within the fitting isolation valve where the static pressure exceeds 1 bar).

- Draw-off fittings except where ranges of fittings are served by a common float, the isolator then being fitted with the float.

- At all sanitary fittings.

- At all main branch connections

- Locate drain valves at all low points

4025 LOCATION OF THERMOSTATIC RADIATOR VALVES:

- Install thermostatic radiator valves in an area which reflects the space temperature. Ensure that they are not behind curtains or enclosed in heating or radiator panels.

4030 POSITIONING OF COMPONENTS:

- Locate flow and pressure measurement valves to ensure manufacturer's recommended straight length of pipe upstream and downstream of valve is provided.

4040 POSITIONING OF DOUBLE REGULATING VARIABLE ORIFICE VALVE:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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48/245

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Y11 – Pipeline Ancillaries

Install double regulating variable orifice valve to ensure equivalent of 10 diameters of straight pipe upstream and 5 diameters downstream of double regulating valve.

4041 POSITIONING OF MEASURING STATION/COMMISSIONING SETS:

Install station to ensure equivalent of 10 diameters of straight pipe upstream of metering station and 5 diameters downstream of double regulating valve.

4050 POSITIONING OF CONTROL COMPONENTS:

Install pipeline control components in accordance with manufacturer's instructions and in positions indicated.

Insulation

Where control components are incorporated in insulated pipelines

Provide details for approval of method proposed to insulate component.

Supports

Arrange supports for control components to ensure no strain is imposed on components.

Access

Arrange control components to ensure adequate access for operation and maintenance.

4060 VENT COCKS:

Provide outlets of vent cocks with discharge pipes.

4070 VALVE STUFFING BOXES:

Adjust glands of all stuffing boxes at normal plant operating temperature and pressure in accordance with manufacturer's instructions. Ensure that valve action is not impaired by over tightening.

4080z DISCHARGE CONNECTIONS:

Fit pipework connections, where indicated, to

Provide

Discharge connection to Safety and Relief valves terminating at a safe discharge point.

Discharge connection to vent cocks terminating 150mm above floor level.

Bleed connection from air bottles terminating with air cock or needle valve in a convenient position.

Discharge pipe to automatic air vents terminating over a suitable gully or drain line in a visible location.

4090 EXPANSION DEVICES:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes, generally allow the flexure at changes in direction. Allow for movement at branch connections. On drainage pipework use purpose designed fittings at changes of direction to accommodate movement, and to avoid stresses on connections to stacks.

Where possible provision for movement due to thermal expansion and contraction shall be made by natural changes in the direction of pipework.

Anchors and guides shall be positioned to contain all movement and resist the maximum loads imposed.

Anchors and guides are to be located at points which prevent excess stresses on pipework,

joints and equipment connections. Similar provisions shall be made for building movement or

building settlement.

Any provisions for expansion, anchors and guides shown on the drawings are for guidance, the actual requirements shall be determined by the Contractor.

The contractor shall utilize one of the named specialists and confirm in his tender submission that all provisions for pipework expansion have been included.

All loads on the building structure shall be advised to the Structural Engineer prior to the installation commencing.

4100 EXPANSION COMPENSATORS INSTALLATION:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

49/245

07/07

EX000001613/98
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Y11 – Pipeline Ancillaries

Provide anchors and guides to contain all movement and resist maximum loads imposed. Install expansion compensators strictly in accordance with manufacturer's instructions.

4110 FLEXIBLE CONNECTIONS INSTALLATION:

Fit rubber bellows as close to source of vibration as practicable. Ensure the pipe at other end of bellows is a fixed point. Install flexible connections strictly in accordance with manufacturer's instructions. Ensure flexible connections are tied when the plant is on vibration isolation mountings.

4120 TERMINAL UNIT CONNECTIONS INSTALLATION:

Install hose connections strictly in accordance with manufacturer's instructions.

4132 GAUGE MOUNTING LOCATIONS:

Mount gauges in the following locations:-

- : Primary heating and cooling source - inlet and outlet pipeline temperature gauges.
- : Pipelines leaving and entering plantrooms - temperature gauges.
- : Main system pipeline headers - temperature gauge.
- : Heat exchangers - primary and secondary pipelines inlet and outlet temperature gauges.
- : Air handling plant - supply air temperature gauge.
- : Pumps - suction and discharge connections pressure gauges mounted on a gauge board.
- : Plant items - specified sensing points.
- : Packaged plant, control panel mounted, gauges as specified.
- : Elsewhere as indicated on the drawings.

10000 Based on NES - SPEX TEXT July 07

Y20 – Pumps

1000 GENERAL

1010 PUMPS:

Provide pumps manufactured and tested in accordance with appropriate British Standard, in particular BS EN 809, BS EN 60335-2-41 and BS EN 60335-2-51 where applicable.

BS EN 1151:1999

1015 POTABLE WATER SERVICE PUMPS

To be WRAS approved.

1020 PUMP SELECTION

Select pump at or near most efficient part of performance curve for duty required. Whenever possible select single stage centrifugal pumps to achieve minimum pump efficiency (after correcting for pump head) equal to or better than defined by the upper efficiency line in figs 3 – 6 of the “European Guide to Pump Efficiency for Single Stage Centrifugal Pumps” as published by Europump 2003. (ie “Optimum efficiency selections”). Pumps with a corrected efficiency between the upper and lower efficiency lines in this guide (ie efficient selections) will only be considered if it can be shown that an “Optimum efficiency” pump is not available.

Do not select pumps on flat part of performance curve.

1022 DESIGN DUTIES:

Pump Volume : Ensure scheduled volume is provided when operating against resistance of system corrected for changes between specified and selected component resistances.

System Resistance: Quoted pump resistances are based on the following allowances:

3-port control valve		
	up to 25mm	10kPa
	35mm and above heating	15kPa
	35mm and above cooling	40kPa
2-port control valve*	25kPa	
TRV's		5kPa
IV's		1kPa
ORV's and DRV's		
	up to 50mm	4.5kPa
	65mm and above	10kPa
NRV's		10kPa
Venturis	1kPa	
Heating Coils		
	up to 15kW	10kPa
	above 15kW	15kPa
Cooling Coils		
	up to 15kW	10kPa
	above 15kW	40kPa
Strainers	10kPa	
Basket Filters	35kPa	
Combined Deaerator / Dirt separator		
Up to 50l/s	2.5kPa	
Above 50l/s	10kPa	
Radiant Panels	0.5kPa	
Radiator		2kPa
Fan Coil Units	10kPa	
In Duct Coils	25kPa	
Boilers		25kPa
Chillers	50kPa	
Plate Heat exchangers / calorifiers		50kPa

* based on maximum coil pressure loss of 40kPa with differential pressure control valves controlling total circuit loss to 80kPa (inc control valve) giving a valve authority of 0.3125.

Adjust scheduled resistance to compensate for actual resistance of selected components.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

51/245

07/07

EXO00001613/100
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Y20 – Pumps

Adjust pump heads if changes are made to pipework routing or arrangement in preparation of installation drawings or details.

Commissioning Allowance: Quoted pump duties include the following commissioning allowances:

Flow Rate 10%

Head 15%

These allowances are on top of the calculated design duty to allow for system regulation and additional fittings, unforeseen at the design stage and are not intended as “future spare capacity”.

Pump Speed: Refer to schedule for maximum pump operating speed.

1024 BELT DRIVEN PUMPS

For each belt driven pump provide a change of belts and drives (to be sized after balancing the system). Allow for changing belts and drives and recommissioning pump and then rechecking system as necessary to achieve the specified duty.

1025 DIRECT DRIVE PUMPS

For each direct driven pump (both single pumps and twin headed pumps) without inverter or other speed control, allow for a change of impeller (to be sized after balancing the system). Allow for changing impeller and recommissioning pump and then rechecking system as necessary to achieve the specified duty.

All inline direct drive pumps for floor mounting shall be supplied with a proprietary support foot.

1026 TWIN HEADED CENTRIFUGAL PUMPS

Pumps shall be selected as duty and standby. All twin headed pumps shall be supplied with a matching blanking plate to enable the pump to be operated with a single head fitted during maintenance or replacement of standby head / impeller.

All pumps for floor mounting shall be supplied with proprietary support foot.

1030 SAFETY GUARDS:

Fit safety guards around revolving parts on close coupled and belt drive pumps.

1040 PUMP TESTING:

Ensure pumps comply with BS EN ISO 5198 and BS EN ISO 9906 as appropriate.

Comply with reference section Y92 clauses.

Ensure all pumps do not have any distinguishable, discrete continuous noise or give rise to distinct impulses.

1045 PUMP MOTORS / STARTERS:

Incorporated in Control - reference W60.

Comply with reference section Y72 clauses for starters.

Comply with reference section Y92 clauses for motors.

Variable speed drives specified as integrated with the pump shall be isolated from any vibration from the pump / motor and have a life expectancy no shorter than the motor life expectancy.

2000 PRODUCTS/MATERIALS

2010 CASING:

Provide casing with drain connection fitted with plug.

Provide threaded connections in accordance with BS 21 and BS EN 10226-1 for drains, vents, water jackets, cooling lines, etc.

Provide pump with split casing to allow access to the impeller for service and maintenance.

2015 VARIABLE FLOW CONTROL:

For variable volume systems, pumps shall be selected with a steep curve in the anticipated range of the system. This will ensure that a significant change in differential pressure occurs at the sensor as the flow varies, resulting in a significant change in pump speed and subsequent energy saving. Do not select

Y20 – Pumps

pumps with flat curves, this will cause the pressure at the pump to stay roughly the same as the system resistance changes.

Where variable speed drives are fitted to direct drive pumps, ensure the drive meets the safety requirements of BS EN 61800-5-1. Comply with Y72 clauses.

2020 IMPELLER:

Ensure impellers are accurately machined and finished smooth, free from blowholes and other defects and designed to be in dynamic balance at all speeds.

Provide open or semi-open type impellers for removal of sludge or other foreign material to prevent clogging.

Fix impellers to shafts to ensure that they remain firm if direction of rotation is reversed.

Indicate direction of rotation on pump casing.

2030 SHAFTS:

Ensure shaft is of adequate diameter to withstand all imposed loading and has a critical speed when assembled with its impeller at least 10% above normal operating speed.

2051 BEARINGS

Grease Points (where specified)

Provide bearings with lubrication line extended to grease nipple at convenient position with protection against over filling.

2075 SUCTION AND DELIVERY CONNECTIONS:

Flanged to BS EN 1092-2 or screwed to BS 21 to match pipework.

2201 PUMPS

Type A		C	E	E 1	G
Description Centrifugal		Centrifugal	Centrifugal Centrifugal		Centrifugal Multistage
Configuration Motor		Motor mounted vertically above casing on a common bedplate (belt driven)	Pump casing and motor mounted on a bedplate in line (close coupled)	Direct driven unit with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework or floor mounted	Direct driven twin head unit with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework or floor mounted
Material	Casing	Cast Iron to BS EN 1561	Cast iron to BS EN 1562	Cast iron to BS EN 1561	Cast iron to BS EN 1561
	Impeller	Gunmetal to BS EN 1982	Cast iron to BS EN 1562	Cast iron to BS EN 1561	Cast iron to BS EN 1561
	Shaft	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088
Bearings Ball		Sealed-for-life	Sleeve Ball	Sealed-for-life	Ball Sealed-for-life
Glands Mechanical			Mechanical	Mechanical	Mechanical
Seal Housing		Cast Iron to BS EN 1561	Cast iron to BS EN1452	Cast iron to BS EN 1561	Cast iron to BS EN 1561
Drive		Belt	Close coupled	Direct coupled	Direct coupled

Type G1	I	I1	I2
Description Centrifugal	Centrifugal	Centrifugal Centrifugal	

Y20 – Pumps

Configuration Motor		mounted vertically above casing on a common pedestal (close coupled)	Sealed unit with immersed rotor with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework	Sealed unit with immersed rotor with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework	Sealed unit with immersed rotor with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework
Material	Casing	Cast iron to BS EN 1561 Stainless steel to BS 1449 Part 2	Cast gunmetal to BS EN 1982	Cast iron to BS EN 1561	Cast iron to BS EN 1561
	Impeller	Stainless steel to BS 970, BS EN 10088	Stainless steel to BS 970, BS EN 10088	Noryl Nor	yl
	Shaft	Stainless steel to BS 970 Part 1 and BS EN 10088	Ceramic	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088
Bearings Sleeve			Pre-packed type requiring no maintenance (in-line pumps)	Sleeve Sleeve	
Glands Mechanical					
Seal Housing		Cast iron to BS EN 1561	Gunmetal to BS EN 1982	Cast iron to BS EN 1561	Gunmetal to BS EN 1982
Drive		Direct coupled	Direct coupled	Direct coupled	Direct coupled

Y20 – Pumps

Type I3			K1	K	M
Description		Centrifugal	Centrifugal	Centrifugal Centrifugal	
Configuration		Sealed unit with immersed rotor with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework	Pump casing and motor in line (close coupled) sealed vertical assembly	Pump casing and motor in line (close coupled) sealed vertical assembly	Motor mounted vertically above casing on a common pedestal (close coupled)
Material	Casing	Cast iron to BS EN 1561	Stainless steel to BS 970 and BS EN 10088	Cast iron to BS EN 1561 or Cast gunmetal to BS EN 1982 or Cast steel to BS EN 10213 or SG iron to BS EN 1563 or Stainless steel to BS 970 or BS EN 10088	Cast iron to BS EN 1561
	Impeller	Stainless steel to BS 970 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088	Cast iron to BS 1452 or Gunmetal to BS 1400 or Stainless steel to BS 970 Part 1 and BS EN 10088 or Ni-resist to BS 3468	Maranyl
	Shaft	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088	Stainless steel to BS 970 Part 1 and BS EN 10088 or high tensile carbon steel	Stainless steel to BS 970 Part 1 and BS EN 10088
Bearings		Pre-packed type requiring no maintenance (in-line pumps)	Sleeve or Ball or Sealed-for-life or Spherical roller or Pre-packed type requiring no maintenance (in-line pumps) or Water lubricated (sealed unit in-line pump) or grease point	Sleeve or Ball or Sealed-for-life or Spherical roller or Pre-packed type requiring no maintenance (in-line pumps) or Water lubricated (sealed unit in-line pump) or grease point	Sleeve
Glands			Mechanical	Mechanical	Mechanical
Seal Housing		Cast iron to BS EN 1561		Cast iron to BS EN 1561 Gunmetal to BS EN 1982	
Drive		Direct coupled	Direct coupled	Direct coupled or Close coupled	Direct coupled

Type S		S1	V
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Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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55/245

07/07

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Y20 – Pumps

Description		Positive displacement	Positive displacement Positive	displacement
Pattern Helical			Helical	Rotary
Material	Casing	Cast iron to BS EN 1561 or S G iron to BS EN 1563 and BS E N 1564	Cast iron to BS 1452 o r S G iron to BS EN 1563	Cast iron to BS EN 1561
	Impeller			
	Shaft			High tensile carbon steel
Bearings		Spherical roller	Sleeve or Ball or Sealed-for-life or Spherical r oller or Pre- packed t ype requiring n o maintenance (in-line pumps) or Water lubricate d (sealed unit in-line pump) or Grease point	Sleeve
Glands Mechanical			Mechanical	Packed
Seal Housing		Cast iron to BS EN 1561	Cast iron to BS EN 1561	Cast iron to BS EN 1561
Drive Direct		coupled	Direct coupled	Direct coupled

3000 ACCESSORIES

3010 DRIVE BELTS:

Provide belt driven pumps with two or more belts.

3020z MATCHING FLANGES:

Provide flanged pumps with matching flanges to BS EN 1092, pressure/temperature to match pipework.

3031 DRAIN LINES FROM PACKED AND WATER-COOLED GLANDS:

Provide drain lines complete with tundish from glands to nearest drain. To facilitate c leaning use plugged tees instead of elbows.

4000 WORKMANSHIP

4010 GENERAL:

Comply with manufacturer's recommendations for installation of pu mps. For in-line pumps ensure that motor is positioned in accordance with manufacturer's requirements. Do not install glandless pu mps with the shaft in the vertical.

4020z PIPELINE CONNECTIONS:

On other than small in-line circulators, support pumps independently from connecting pipework to ensure no load is transmitted from pipework to pump casing on pump suction and discharge.

4030z MOUNTINGS:

Mount motors and pumps for belt drive pumps resiliently. Comply with reference section Y52 clauses.

4050 ALIGNMENT:

Align pump to prevent undue restraint and thrust on interconnecting pipework.

Align drives to prevent undue wear and restraint on pump shaft.

For belt drives, align pulleys and tension belts to prevent undue wear and out of balance forces.

4060 ACCESS:

Locate pump within the system with adequate space around it for service and maintenance.

4070 MAINTENANCE REQUIREMENTS FOR SEWAGE PUMPS:

For ease of service and maintenance, install submersible sew age pumps on guide rails or w ith lifting cables. Fit pumps with automatic discharge connections, which

Locate on to permanent pipework at low level in chamber.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Serv ices Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\proje cts\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

56/245

07/07

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Y20 – Pumps

10000 BASED ON NES / SPEX Y20TEXT July 06



Y21 – Water Tanks/ Cisterns

1000 GENERAL

1011 TANK DESIGN:

Design and fabricate tanks/cisterns in accordance with British Standards as indicated and Water Supply (water fittings) Regulations 1999. All split storage tanks shall be configured such that either section can be used while the other is being maintained.

1021 STORAGE WATER CISTERNS

Cisterns supplying water for domestic purposes (i.e. water supplied for drinking, washing, cooking and sanitary purposes) shall comply in all respects with The Water supply (water fittings) Regulations 1999, and shall be provided with a drain valve (50mm dia minimum) at their lowest point.

1022 DEFINITIONS:

Cistern: An open top rectangular vessel.
Tank: An open or closed top rectangular vessel as defined in particular BS.
Water line: Highest level of water at which a cistern or open top tank is designed to work.
Capacity: Capacity of an open topped vessel when filled to water line. Capacity of a closed top vessel when filled to top of vessel.
Working Pressure: Static head represented by maximum depth of tank or cistern. For closed tanks, vertical distance from bottom of tank to water level of cistern feeding it.

2000 PRODUCTS/MATERIALS

2005 CONNECTIONS

Outlet connections shall be at the opposite ends to inlets and in large cisterns and tanks, diagonally offset.

2011 SECTIONAL STEEL TANKS:

Standard

BS 1564. Type 1. Hot Pressed

Jointing

Strip to suit potable cold water & WRC approved or as scheduled.

Internal and external coating

One coat bitumous primer, suitable for potable water WRC approved applied before delivery and erection and two further coats after erection or as scheduled. On potable services the treatment shall comply with WRC requirements.

Connections and drillings

To manufacturer's standards. Welded socket connections for connections up to 25mm dia.
welded flange connections for connections greater than 25mm dia.

Supports

To manufacturer's guidelines.

Inspection

Allow for inspection at manufacturer's works.

Erection

Erection of tank on site to be undertaken by tank manufacturer

2021 GLASS REINFORCED PLASTICS SECTIONAL TANK TO BS EN 13280 CLASS A1 OR A2:

Class A1 or A2 for potable water.

Plate Flanges - External

Tank Top - Closed

Manhole - as indicated

Divisions - as indicated

Erection - by supplier

Ladder - Standard BS 4211

Supports - Provide transverse supporting bearers

Materials - As BS EN 13121-1.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

58/245

07/07

EX000001613/107
EX000001613_0107

Y21 – Water Tanks/ Cisterns

2022 GLASS REINFORCED PLASTICS SECTIONAL TANK TO BS EN 13280 CLASS B:

class B for non-potable water.

Plate flanges	-	External
Tank Top	-	Closed
Manhole	-	as indicated
Divisions	-	as indicated
Erection	-	by supplier
Ladder	-	Standard BS 4211
Supports	-	Provide transverse supporting bearers.
Materials	-	As BS EN 13121-1.

2041 PREFABRICATED STEEL CISTERNS:

Standard

BS 417 Part 2

Connections

As BS 417 Part 2 or as otherwise scheduled.

Internal and external coating

One coat primer , two further coats or as otherwise scheduled. On potable services the treatment shall comply with WRC requirements.

2051 MOULDED PLASTIC CISTERNS:

Standard

BS 4213.

2061 GLASS REINFORCED PLASTICS CISTERNS:

Standard

BS EN 13280 (500litre to 100,000litre)

Materials

As BS EN 13121-1.

3021 TANK ANCILLARIES

Unless otherwise indicated all tanks are to be

Provided with the following:

- Division plate as scheduled
- Manholes, to be provided over ball valve locations with separate manhole for access into tank.
- External galvanised access ladders to BS 4211 to be provided adjacent to each access manhole.
- Internal galvanised ladder to BS 4211 to be provided adjacent to each access manhole.
- Hand railing to be provided around top of each tank over 1.5m high.
- Contents gauges to be Hydro Static type ("cat and mouse" type indicators shall not be used due to their tendency to encourage algal growth).
- Boss connection to be provided for temperature probes. Probes to be positioned 300mm below top layer level and 300mm above bottom of tank.
- Boss connection to be provided for sample point 300mm above tank base.
- Boss connection to be provided on base of tank for draining down proposed minimum size 50mm dia.
- Float type high and low level alarms and necessary boss connections.

4000 WORKMANSHIP

4010 GENERAL:

Store, handle and erect all in accordance with manufacturer's recommendations, relevant British Standards and The Water Supply (Water Fittings) regulations 1999.

Make due allowance for valves, fittings, access, etc., to accommodate insulation and weathering where indicated.

Y21 – Water Tanks/ Cisterns

- 4020 PROTECTION AND CLEANING:**
Ensure adequate protection from damage and ingress of foreign matter to tanks and cisterns during storage, erection and commissioning.
Thoroughly clean out all tanks and cisterns prior to site testing and commissioning.
- 4030 INSPECTION AND ACCESS:**
Install tanks and cisterns to allow internal and external surfaces to be easily inspected and cleaned.
- 4040 INSTALL MOULDED PLASTIC CISTERNS:**
In accordance with Appendix R of BS 4213.
- 4050 INSTALL SECTIONAL STEEL TANKS:**
In accordance with manufacturer's recommendations.
- 4060 INSTALL GLASS REINFORCED PLASTICS CISTERNS:**
In accordance with instructions in BS EN 13280.

10000 NES
Based on Y21TEXT Nov 06

Y22 – Heat Exchangers

1000 GENERAL

1010 HEAT EXCHANGER DESIGN:

Supply heat exchangers designed in accordance with British Standards.

2000 PRODUCTS/MATERIALS

2010B CALORIFIER TO BS 853:

Method of heating - Hot water.

Inspection opening

Size and position as shown on drawings.

Horizontal or vertical as shown on drawings.

Fixed or bolted end as shown on drawings.

Type of heater

Fixed helical coil; withdrawable helical coil; or U-tube battery.

Shell material – copper or as indicated

Material test certificates to BS 853 clause 5.3.

Hydraulic test certificates to BS 853 clause 11.2.

Provide connections and supports as necessary.

Mountings to BS 853

Pressure relief devices as clause 10.2; stop valves as clause 10.3; pressure gauge as clause 10.4; thermometer as clause 10.5; draining taps as clause 10.6; and vacuum breaker valve as clause 10.7.

2020B HEAT EXCHANGER TO BS 3274 TYPE 2:

Standard - BS 3274

Type 2 - U-tube (removable tube bundle).

Materials

Construct heat exchangers from cast iron or carbon steel to BS 5500.

Fabricate heat exchanger tubes from materials in accordance with BS 3274, BS EN 12451 or BS EN 10216-2 or BS EN 10217-1

Connection type

Primary and secondary pipe connections up to and including 50 mm nominal diameter - screwed to BS 21 and BS EN 10226-1 or flanged to BS EN 10292-1 for carbon steel units or BS EN 1092-2 for cast iron units, to suit working pressure.

Primary and secondary pipe connections of 65 mm nominal diameter and above - flanged to BS EN 10292-1 for carbon steel units or BS EN 1092-2 for cast iron units or BS EN 1092-4 for aluminium alloy units to suit working pressure.

Mountings

Provide pads, blocks or pipe stools for acceptance of piping connections and mountings attached to shell. Make all connections to project clear of finished face of insulation.

Alignment

Make provision for easy removal of heating surface from shell.

Provide sufficient set bolts to enable tube bundle to be withdrawn without breaking joint between tube plate and chest cover plate.

Support tubes internally to relieve tube plate of any strain.

Fit eye bolts to tube frame for ease of lifting.

Testing and Marking

Inspection, testing, marking and certification to comply with BS 3274.

Test shell and battery of each heat exchanger.

Display duty of heat exchanger, identify rating, primary temperature and pressure, and secondary temperature and pressure.

Raise data plate indicating duty and other relevant information from surface of shell to project above insulation to remain visible.

2030z CONDENSE COOLER: (Where scheduled as a requirement of a heat exchanger).

Materials

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

61/245

07/07

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Y22 – Heat Exchangers

Fabricate condense cooler shells, chests, tubes and tube plates and baffles from same materials as heat exchanger.

Interconnections

Interconnect the non-storage heat exchanger and condense cooler by pipework complete with steam trap, sight glass, valves, unions and strainer.

2040z PLATE HEAT EXCHANGER:

Heat Transfer plates to be as scheduled.

Gaskets shall suit the application

Connections shall match the pipework.

Plates shall be gasketed such that with a failure of one gasket, leaks occur to external and mixing of the fluids is avoided.

Each unit shall be provided with a factory made insulating jacket or cover, finished as the schedule of insulation. On cold applications, the insulation shall be vapour sealed.

3000 ACCESSORIES

3010A THERMAL INSULATION:

Provide heat exchanger pre-insulated at manufacturer's works where scheduled.

3020A SPARES:

Provide spare jointing rings for chest and tube assembly.

4000 WORKMANSHIP

4010 GENERAL:

Store, handle and erect all

Equipment in accordance with manufacturer's recommendations and relevant British Standards. Make due allowance for valves, fittings, access etc., to accommodate insulation where specified. Support equipment such that all component parts, connections or insulation have clearance from supports.

4020 FLANGE DRILLINGS:

Ensure flange drillings are uniform to facilitate interchange of tube assemblies.

4030 PROTECTION AND CLEANING:

Provide protection from damage and ingress of foreign matter to heat exchangers and condense coolers during storage, installation and testing.

4040 INSPECTION:

Install heat exchangers and condense coolers such that internal and external surfaces can be readily inspected and cleaned.

4050 RUST PROTECTION:

Ensure heat exchanger and condense cooler shells are completely free of rust and corrosion and coated with factory applied primer.

10000 Based on SPEX Y22 Dec 04

Y23 – Storage Cylinders & Calorifiers

1000 GENERAL

1010 STANDARDS / REGULATIONS:

Comply with British Standards as indicated and The Water Supply (water fittings) Regulations 1999. Unvented units to be complete with “unvented kits” and pressure regulating valve to comply with Building Regulations safety requirements within Approved Document G3. Units shall be comply with BS EN 12897.

1020 DEFINITIONS:

Direct cylinder

A closed cylindrical vessel with domed ends.

Indirect cylinder

A closed cylindrical vessel with domed ends having separate integral means of heating contents by annular or coil type element.

Combination unit

An indirect/direct cylinder of double or single feed type with attached feed cistern.

Calorifier

A closed cylindrical vessel having separate integral means of heating contents by 'U' tube chest type element.

Primary heater

A heater mounted inside the cylinder or calorifier for transfer of heat to stored water from primary medium.

Capacity

The volume of water storage excluding contents of any primary heater.

Secondary Working head

The vertical distance between bottom of cylinder or calorifier and water line of cistern supplying cylinder or calorifier.

2000 PRODUCTS/MATERIALS

2010a HEATING SURFACE

In order to ensure that temperatures are maintained throughout the life of the plant, the primary heating surface shall be sized at 20% greater than the design duty.

2020A COPPER DIRECT CYLINDERS:

Standard BS 1566-1: 2002. type D, vertical arrangement

Connections as BS 1566-1:2002.

Provide screwed boss for drain tap.

Features

Drain cock (minimum size 50mm).

Manhole, 500mm dia min.

Supports

Purpose made feet or support frame.

Provide protective isolation material to prevent electrolytic action where mild steel is used.

2020B COPPER DIRECT CYLINDERS WITH IMMERSION HEATER:

Standard BS 1566-1:2002 type D vertical arrangement.

Connections as BS 1566-1.

Provide connections for combined immersion heater and thermostat; and screwed boss for drain tap.

Features

Combined immersion heater and thermostat

Drain cock (minimum size 50mm).

Manhole, 500mm dia min.

Supports

Purpose made feet or support frame.

Provide protective isolation material to prevent electrolytic action where mild steel is used.

Y23 – Storage Cylinders & Calorifiers

2030A COPPER DOUBLE FEED INDIRECT CYLINDERS:

Standard - BS 1566 Part 1; type G vertical arrangement.

Primary heater, coil type C.

Connections as BS 1566 Part 1.

Provide screwed boss for drain cock.

Features

Drain cock (50mm min)

Manhole, 500mm dia min.

Supports

Purpose made feet or support frame.

Provide protective isolation material to prevent electrolytic action where mild steel is used.

2030z COPPER DOUBLE FEED INDIRECT CYLINDERS: (PRESSURISED SYSTEM)

Standard - BS 1566 Part 1; type P vertical arrangement.

Primary heater, coil type C.

Connections as BS 1566 Part 1.

Provide screwed boss for drain cock.

Features

Drain cock (minimum size 50mm)

Expansion vessel, NRV and anti-vac valve

High limit stat directly wired or piped to a non resetting cut off valve on the heating return from the vessel

Manhole, 500mm dia min.

Supports

Purpose made feet or support frame.

Provide protective isolation material to prevent electrolytic action where mild steel is used.

To be manufactured as a factory built and tested arrangement to meet the requirements of the Building Regulations.

2045 STAINLESS STEEL INDIRECT CYLINDER:

Materials

Water container - stainless steel.

Casing - white plastic coated steel.

Thermal insulation

40-50mm thick CFC free fire retardant polyurethane.

Connections

Manufacturer's standard.

Features

Combined immersion heater and thermostat.

Temperature and pressure relief valve with discharge.

Drain cock.

Purpose made feet or support frame.

2060B COPPER CALORIFIER/STORAGE VESSELS TO BS 853:

Method of heating - Hot water.

Inspection opening

Manhole, 500mm dia min.

Horizontal or vertical as shown on drawings.

Bolted end unless otherwise indicated.

Type of heater

Fixed helical coil; withdrawable helical coil; or U-tube battery.

Shell material - copper.

Material test certificates to BS 853 clause 5.3.

Hydraulic test certificates to BS 853 clause 11.2.

Provide connections and supports as necessary. Drain cock to be 50mm minimum.

Mountings to BS 853

Y23 – Storage Cylinders & Calorifiers

Pressure relief devices as clause 10.2; stop valves as clause 10.3; pressure gauge as clause 10.4; thermometer as clause 10.5; draining taps as clause 10.6; and vacuum breaker valve as clause 10.7.

3000 WORKMANSHIP

3010 GENERAL:

Store, handle and erect all in accordance with manufacturer's recommendations and relevant British Standards. Make allowance for valves, fittings, access etc., to

accommodate insulation/weathering.

3020 FLANGE DRILLINGS:

Ensure flange drillings are uniform to facilitate interchange of tube assemblies.

3030 PROTECTION AND CLEANING:

Ensure protection from damage and ingress of foreign matter to cylinders and calorifiers during storage, installation and testing.

3040 INSPECTION AND CLEANING:

Install cylinders and calorifiers such that internal surfaces and external surfaces can be readily inspected and cleaned.

10000 NES

Based on VERSION Y23TEXT Oct 02

Y24 – Trace Heating

1000 GENERAL

1010 STANDARDS:

Comply with BS 7671 (I EE Wiring Regulations) and BS 6351, Part 1 and Part 2, for the design and specification of electric trace heating.

1015 SPECIALIST:

A trace heating specialist shall be responsible for the selection of the correct combination of thermal insulation (thermal conductivity / thickness) and heating cable (ie output / straight or double or spiral) to meet the design parameters scheduled.

1016 HWS TEMPERATURE MAINTENANCE:

Where thermal disinfection of HWS systems is required, the tape type / insulation thickness combination selected shall be capable of raising the water temperature to a minimum temperature of 60 °C for 1hr in accordance with HSE ACOP L8. The packaged trace heating controls shall incorporate a manual override facility for thermal disinfection.

2000 PRODUCTS/MATERIALS

2010Y ELECTRIC TRACE HEATING, CONSTANT POWER, RCD OR MCB PROTECTION:

Supply electric trace heating complete with fixing tape, shrink sleeves, crimps, junction boxes and controls.

Tape - Constant power heating cable.

Insulation - Silicone rubber.

Jacket - Silicone rubber with tinned copper overbraid.

Electrical protection - Provide RCD or MCB protection.

2010Z ELECTRIC TRACE HEATING, SELF REGULATING TAPE, RCD OR MCB PROTECTION: TEMPERATURE MAINTENANCE OR FROST PROTECTION:

Supply electric trace heating complete with fixing tape, interconnections, junction boxes and controls.

Tape – Energy efficient self regulating heating cable.

Insulation - Modified polyolefin with laminated foil wrap.

Jacket - Tinned copper braid, with modified polyolefin over jacket.

Electrical protection - Provide RCD or MCB protection.

2040 HEATING BLANKETS:

Provide low watt density electrical resistance heaters in blanket form for tanks and cylinders as indicated.

Ensure blanket is moisture proof.

Control by thermostat in traced pipework range.

3000 WORKMANSHIP

3010 INSTALLATION OF ELECTRIC TRACE HEATING:

Install electric surface heating in accordance with BS 6351, Part 3 and manufacturer's instructions.

Ensure pipe is cleaned of all abrasive material prior to application.

On services subject to freezing do not locate controllers on the pipeline to be protected. Any breaks into vapour sealing must be adequately made good on completion of the works.

3030 INSTALLATION OF HEATING BLANKETS:

Ensure vessel is cleaned of any abrasive material and remove any dirt and oil prior to application. Install blanket in accordance with manufacturer's instructions.

3040 THERMAL INSULATION:

Enclose pipework to be heated and trace heating elements in common thermal insulation. Use oversized insulation.

10000 NES

Based on VERSION Y24TEXT.March 03

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Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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66/245

07/07

EX000001613/115
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Y24 – Trace Heating



Y25 – Cleaning & Chemical Treatment

1000 GENERAL

The tender drawings do not show all facilities for filling, flushing, cleaning, draining and chemical cleaning of the water systems. The installation shall be in accordance with BSRIA Application Guide 1/2001.1 (2004) "Pre-commissioning cleaning of pipework systems (second edition)".

The Contractor shall include all necessary facilities, to enable a Specialist to successfully fill, flush, clean, and chemically treat the systems listed in schedule Y25. in accordance with BSRIA AG1/2001.1 (2004)

A specialist shall be employed for analysis and for design, supply, installation and operation of any system cleaning and chemical treatment process.

On all projects the Contractor shall be responsible for :

- Maintaining cleanliness of the site and pipe work on the site to minimise the bacterial contamination and debris that enters pipework on building sites.
- Ensuring that the mains water and water used to fill and flush the closed system is of satisfactory quality.
- Treating the initial fill and pressure test water with biocide and dispersant to avoid biofilm formation prior to cleaning.
- Ensuring the microbiological quality of the water in the systems prior to cleaning is acceptable.
- Undertaking, if appropriate, a biocide wash (3-7 days) during the cleaning programme
- Maintaining acceptable microbiological quality of the water one week after the clean and at regular intervals thereafter, until practical completion.
- Taking samples at several locations in the systems on each occasion. Table 4 in BSRIA AG1/2001.1 gives guidance on acceptance criteria when interpreting the results of water samples. This is only a guide and full interpretation of all the results is required. Samples should not be taken for microbiological analysis within a week of flushing or biocide addition.

The specialist shall submit proposals for undertaking the flushing and cleaning.

Standards

BS 6700

HSC Approved Code of Practice L8 The Control of Legionella Bacteria in Water Systems

CIBSE TM13 2000

On Hospital projects the relevant HTM's shall also be applicable

BSRIA AG 1/2001.1 - Recommendations for the pre-commission cleaning of closed systems.

1010 CONDITIONS FOR CLEANING AND CHEMICAL TREATMENT:

Provide cleaning and chemical treatment, as scheduled. Ensure treatment complies with statutory authority and health and safety regulations.

Notify manufacturer's and suppliers of equipment of proposed system cleaning and chemical treatment processes. Establish if any manufacturer or supplier of equipment requires any particular cleaning and chemical treatment process due to size of waterways or materials used.

All chemicals used are to be compatible with the metallurgy of the systems.

1015 METHOD STATEMENT

A method statement covering all flushing, cleaning, and water treatment shall be agreed with the CA a minimum of one month prior to the introduction of any water into any heating or chilled water system. The method statement shall detail the sequence of events, chemicals to be used etc.

2000 PRODUCTS/MATERIALS

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

68/245

07/07

EX000001613/117
EX000001613_0117

Y25 – Cleaning & Chemical Treatment

2010 CLEANING AND CHEMICAL TREATMENT SPECIALIST:

Use a specialist for analysis and for design, supply, installation and operation of any system cleaning and chemical treatment process.

2020Z MAINS WATER ANALYSIS:

Obtain an analysis of mains water taken from site supply point. Check with local water authority to ensure analysis results are typical for site area and report variances for instruction. A test should be made to establish total viable counts and Pseudomonas and sulphate reducing bacteria. Samples should be taken in suitable bottles and by experienced personnel.

2030A PRELIMINARY CHECKS:

Prior to carrying out cleaning or chemical treatment process, ensure that
All foreign matter is removed.

Certified pressure tests have been carried out in the parts of the system to be cleaned. Carry out further pressure tests on the isolated sections of the system independently.

All water used for pressure testing, flushing and system filling is treated to minimise the risk of microbiological growth and corrosion. Leave remaining pipework sections full after testing.

Where there is a risk of freezing, the use of inhibited glycol can be considered but draining of the pipework may be a preferable option.

Circulation has been demonstrated and acceptable flow rates obtained on all parts of the system. Manipulate and leave fully open all valves other than those used to isolate sections. Carry out balancing and certification after the flushing, cleaning and passivation operations.

No damage can occur to any item of plant or equipment due to cleaning and chemical processes.

Chemicals used are compatible with system materials.

All items of plant and equipment subject to damage or blockage due to flushing, cleaning and chemical treatment processes are isolated or removed until the main pipework is clean.

Permanent or temporary by-passes are provided, on all sensitive plant, as necessary or recommended by the specialist.

Dirt pockets are installed at low points to facilitate solids removal. Supply dirt pockets with drain valves sized to pipework size.

All drains provided have been tested and approved and that any pumping equipment associated with the drainage system is fully commissioned.

Dead legs, that are more than 3 pipe diameters in length are looped to allow effective cleaning and circulation on an ongoing basis

Temporary strainers and filters are installed as required for removal of solids during cleaning and chemical treatment processes

Strainers are clean prior to the start of the cleaning process, throughout the cleaning and on completion.

Suitable fill and drainage points are provided, on the system, with 50mm minimum connections, properly sited and installed, either valved or plugged.

All automatic/manual air vents are fully commissioned.

All requirements of COSHH regulations are complied with during the chemical cleaning and chemical treatment of the system.

Where required by local water authority, provide effluent tanks for storage of all waste products of cleaning and chemical treatment processes.

Following local water authority approval, either neutralize and dispose to drain of all waste products; ensure authorised disposal at registered sites.

Comply with Waste Management Duty of Care: A Code of Practice and Control of Pollution (Special Waste) Regulations 1980 where appropriate.

2040A PROCEDURAL PRECAUTIONS FOR CLEANING AND CHEMICAL TREATMENT:

Carry out tests (pH, TDS, Conductivity, inhibitor etc) to ensure that cleaning and chemical treatment processes are operating as required and outlined in the method statement.

Y25 – Cleaning & Chemical Treatment

Submit all test and sample results including flow measurements required by AG 1/2001.1 for certification and approval.

2040B PROCEDURAL PRECAUTIONS FOR CLEANING AND CHEMICAL TREATMENT INCLUDING TAKING SAMPLES:

Take representative samples during and following chemical treatment and/or cleaning. Submit samples to an independent analyst.

Use clean containers to take samples. Use sterile containers to take samples for microbiological analysis.

Carry out tests to ensure that cleaning and chemical treatment processes are operating as required.

Submit all test and sample results for certification and approval.

2061 DOSING - CLOSED SYSTEMS:

Chemical Feed

Provide feeder (Dosing pots) with a tundish for filling; separate air vent with discharge tube; drain and isolating valves.

Fabricate from mild steel tube to BS EN 10255 or BS EN 10216 / 7 to suit maximum working pressure of system.

Finish – Powder coated after fabrication

Sizing of Dosing pot:

Water content of system (l)	Minimum nominal capacity of dosing pot (l)
Up to 1000	3.5
1000-5000	6
5000-10000	11
10000-15000	15
15000-20000	18
30000-25000	20
Above 25000	25

Install in each water system a means of taking a sample as follows:-

- : Chilled water systems - Provide a gate valve and discharge.
- : Heating systems - Provide a sample cooler with a copper coil and cooling jacket with cooling water valve and drained to waste.

2063 DOSING - OPEN SYSTEMS:

Chemical Dosing

Provide an interface between water treatment plant and system pumps to allow the initiation of water circulation in addition to the requirements of the building services. Where control by-passes are used, set valves to allow reduced circulation but not complete isolation of the equipment.

Provide control of chemical inhibitors by linking the dosing pump control unit to operate on a signal from a water meter.

Provide skid mounted packaged equipment to feed chemical inhibitors including pre-wired controls and dosing pump, high density polyethylene tank, chemical diaphragm pump complete with all necessary valves and tubing.

Provide control of total dissolved solids by linking a solenoid purge valve to operate by a signal automatically from a conductivity sensor.

Biocide Dosing

Provide skid mounted packaged equipment to feed two types of biocides on an automatically alternating basis including pre-wired timer controls and twin biocide diaphragm pumps complete with all necessary valves and tubing. Draw biocide chemical direct from the chemical supply drums located on the skid.

Control

Provide low level alarms for all dosing units.

Provide BMS connections to monitor dosing and show run and alarm conditions.

Injection Manifold

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\specs\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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70/245

07/07

EX000001613/119
EX000001613_0119

Y25 – Cleaning & Chemical Treatment

Provide an injection manifold for use with the above water treatment equipment.
Connect the manifold across flow and return pipework and mount above the dosing plant modules, unless otherwise indicated.

2065 CHEMICALS - DOSING:

Provide biocides effective against Legionella pneumophila, algae, fungi, moulds and slime forming bacteria including pseudomonas and sulphate reducing bacteria.
Supply biocides as recommended by water treatment specialist.
Incorporate a bio dispersant in programme to break up and disperse any slime masses, where required.
The Water Treatment Specialist shall select the appropriate corrosion inhibitors, to minimise corrosion, and biocides to prevent any proliferation of bacteria that may be present in the systems. The inhibitors shall provide protection to mild steel, copper and copper alloys.
Provide a specific inhibitor to protect aluminium when it is present in system.
Cleaning agent
As required by the specialist.

2070z MONITORING AND SAMPLING:

On open systems provide monitoring system to enable on-line analyses, system alarms and chemical stock levels to be monitored by water treatment specialist.

Provide testing equipment to carry out tests for all inhibitors used in treatment programme.

Provide

- Boiler water test kit for steam boilers.
- Conductivity test kit.
- pH test kit.
- Inhibitor test kit.
- Hardness test kit where a softener is installed.
- Chloride level test kit.
- Until corrosion prevention regime is proven to be stable, install a corrosion test rig to enable corrosion rates to be monitored using corrosion coupons.
- Bacteriological monitoring with use of dipslides.
- Log sheets for recording of test results, bacteriological analysis and any actions required or taken.

2070B SAMPLING:

Provide testing equipment to carry out tests for all inhibitors used in treatment programme..

2080z CHEMICAL PROVISION:

Provide consumables for a period of 12 months.
Provide for supply of chemicals in containers.
Include for the supply of chemicals for all systems using the basis of

- open circuit systems operating at 100 % load for 2080 hours per annum.
- closed circuit systems make-up 1% system volume/month.
- unless otherwise indicated

3000 WORKMANSHIP

3010z FLUSHING

All water used for pressure testing, flushing and system filling is of good quality. Leave remaining pipework sections full and treated after pressure testing.

The Contractor shall install all necessary pipework ancillaries to enable a Specialist to carry out flushing, inspection and witnessing of water systems in accordance with BSRIA Application Guide 1/2001.1 Pre-commission Cleaning of Water Systems.

Y25 – Cleaning & Chemical Treatment

Temporary connection from mains must be in compliance with the Water Supply (Water fittings) regulations 1999 and amendment or by installation of temporary tank and pump arrangement.

Domestic water systems (i.e. HWS, CWS, mains water etc.) to be flushed and disinfected in accordance with the requirements of BS 6700 and to the satisfaction of the local water supply authority. Flush systems using mains water, until water is clear.

For steam and condensate systems comply with the requirements of HVA A TR/20 part 8. Where specified in work section S51 the systems shall be scoured using live steam or compressed air in accordance with a method statement that satisfies the HSE requirements.

3031z CHEMICAL CLEANING AND SOLIDS REMOVAL:

Carry out chemical cleaning procedure in accordance with BSRIA Application Guide 1/2001.1 Pre-commission cleaning of pipework systems.

The Specialist shall select the most appropriate chemicals.

Ensure the systems are fully and routinely circulated on completion, including all terminal units.

3032 CLEANING AND TREATMENT REGIME

The specialist shall submit a method statement prior to commencing work which fully prescribes the proposed regime and sequence for the flushing, cleaning and chemical treatment of all closed and condenser water systems. The following suggestions / sequence of work shall be considered in preparation of the method statement.

Delay filling the pipework for the first time for as long as possible

If any pipework is to be wet for more than 2 weeks prior to cleaning, treat the fill water with biocide and bio-dispersant.

Take samples for microbiological analysis 1 week prior to commencing the water treatment.

If sample results are poor undertake a biocide wash on all previously wetted areas after the initial flush. Biocide treated water should be drawn into any previously wetted terminal unit coils slowly (which have been isolated for the clean) to avoid the introduction of debris, after which the coils should be isolated again.

During the initial flush flows should be maximised, recorded and witnessed. Batch work on terminal unit by-passes should be carefully undertaken in accordance with BSRIA AG 1/2001 and the correct number of terminal unit by-passes opened at any one time in order to maximize flow along the horizontal runs.

Chemical clean.

Second dynamic flush using the same methodology as the initial flush

Dose with biocide and inhibitor

Circulate systems fully

Back flush all terminal units

Top up inhibitor as necessary and add another dose of biocide (use a biocide with longevity and broad spectrum base)

For steam and condensate systems the protection of the pipe work system from corrosion is a function of the treatment applied to the make up water to the boiler, this shall be in accordance with BS 2486 – Recommendations for treatment of Water for Steam Boilers and water Heaters,

3041 DISINFECTION– GENERAL (water services systems):

After flushing process, carry out disinfection of water services systems in accordance with BS 6700.

Prior to disinfection ensure each system is flushed, cleaned and drained.

Provide temporary connections to system terminal points suitable for introduction of disinfection chemicals and fluids and 22mm minimum valved drain connection on incoming main immediately downstream of mains isolating valve.

Fill system with clean, fresh water.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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72/245

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Y25 – Cleaning & Chemical Treatment

If the building is not occupied immediately after disinfection put in hand a system for flushing all outlets to ensure system remains suitable for use when required.

Immediately prior to occupation, retake samples and submit for analysis and report. Repeat disinfection of potable water system immediately prior to handover if required.

3050z DISINFECTION - MAINS WATER SYSTEM:

Provide a plugged valved connection to the incoming main to enable chlorine or similar to be injected. If underground provide a suitable enclosure such as a valve pit.

Carry out the following operations in accordance with BS 6700.

Flush system and introduce disinfection chemical.

Take samples to ensure correct chlorine concentration.

Leave system to stand for period of time indicated.

Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.

Submit samples to registered laboratory for microbiological analysis and report.

Certificate of conformity

Immediately prior to handover, retake samples and submit for analysis and report. This report will be a pre requisite to practical completion.

Repeat disinfection of potable water system immediately prior to handover.

3060 DISINFECTION - WATER STORAGE SYSTEMS:

Provide a plugged valved connection to the incoming main to enable chlorine or similar to be injected.

Carry out the following operations in accordance with BS 6700:1997 and Health and Safety Executive Approved Code of Practice L8 2000 "Legionnaires Disease, The Control of Legionella bacteria in water systems.

Carry out operations on all water storage tanks and cisterns, cold and hot.

Carry out procedures as for mains water systems.

3070 WATER TREATMENT FOR BOILERS:

Provide water treatment for steam boiler plant in accordance with BS 2486:1997.

Ensure water treatment plant changes the area raw water characteristics to those recommended within BS 2486:1997 for boiler plant installed.

3080z SERVICE VISITS:

Include for a minimum of 6 visits during the commissioning period.

Price the following as an option within the tender.

Provide monthly service visits for one full year by a fully qualified water treatment chemist, to carry out the following:-

Review water analysis records, correspondence and reports since previous visit.

Test water samples on site for hardness; all inhibitors; dissolved solids; pH; total alkalinity, chlorides.

Check performance of feeding equipment, softeners, and testing equipment on site.

Submit a written report.

Carry out micro-biological analysis using dipslides.

Special requirements

Four times per annum send samples to independent laboratory for differential micro-biological analysis.

At 6 monthly intervals carry out chlorination of any cooling tower circuits, and the cold and hot water domestic services. Adopt procedures as indicated in Health and Safety Executive Approved Code of Practice L8 2000 "Legionnaires Disease, The Control of Legionella bacteria in water systems.

Agree programme with client.

Y25 – Cleaning & Chemical Treatment

Include for carrying out all necessary maintenance and inspections during the first twelve months following the agreed date of practical completion

Provide one annual review of system

3090 DOCUMENTATION:

Provide number of copies as indicated elsewhere in the specification hard cover binders containing details of

- Programme outlines.

- Purpose of chemical treatment.

- Chemicals used and quantity.

- On site testing procedures.

- Control limits of tests.

- Equipment data and drawings.

- Product notes and material safety data sheets for all chemicals used.

Provide a complete training programme for site operatives covering

- Methods of basic water testing.

- Explanation of results obtained.

- Actions to be taken on test results.

10000 NES

Based on version NES Y25text Nov 06

Y30 – Air Ductlines

1000 GENERAL

1005 DEFINITION

The materials, apparatus and methods detailed throughout the ductwork component schedules and specification clauses apply to all enclosures for conveying air, and their ancillaries, whether as ducting runs or casings for equipment and accessories.

1007 DESIGN

Ensure that the design velocities and pressure conditions comply with the values and tests specified.

1010 DUCTWORK INSTALLATION STANDARDS:

Carry out construction and installation of ductwork in accordance with DW 144, DW 154, DW 172 and DW 191 and BS 5588 as appropriate.

Where builders work ducts are used they shall be thoroughly cleaned and sealed prior to plant operation.

Where ducts penetrate a floor separating habitable rooms in different flats within residential buildings they shall be enclosed for their full height and full horizontal run in each flat and surrounded with sound absorbent material above and below the floor. The installation shall comply with the requirements of Approved Document E of the Building regulations. "Resistance to the passage of sound".

1021 DUCTWORK DIMENSIONS:

Sizes of ductwork are internal airway dimensions. Where applicable make allowance for any internal lining.

1022 DUCTWORK LAYOUT

Set out ductwork as indicated on the drawings, making due allowance for any diagrammatic presentation. Provide all necessary offsets, bends, tapers, transformation pieces etc. required whether or not these are detailed. Make due allowance for any thermal movement on long runs.

1031 ELECTRICAL BONDING TERMINAL:

Ensure an electrical bonding terminal suitable for connection of 6mm² maximum conductor is provided where required by BS 7671 Requirements for Electrical Installations (the IEE Wiring Regulations, 16th Edition).

2000 DUCTWORK FABRICATION/MATERIALS

2011 DESIGN INFORMATION:

General

All ductwork and associated materials shall be manufactured, installed and tested, in accordance with the current editions of HVCA Specification DW/144 and DW 154 for sheet metal ductwork and plastic ductwork respectively, for low, medium and high pressure/velocity air systems, and as qualified in this specification.

Ductwork Classification

Ductwork to be used on this project shall be as the following classes.

Low Pressure	-	Class A	-	Positive
Low Pressure	-	Class A	-	Negative
Medium Pressure	- Class	B	-	Positive
Medium Pressure	- Class	B	-	Negative
High Pressure	-	Class C	-	Positive
High Pressure	-	Class C	-	Negative

The classes to be used on any system shall be as scheduled.

Y30 – Air Ductlines

Fabricate ductwork to meet pressure classification in accordance with DW 144 Table 1 and DW 154 table 1. Fabricate ductwork to meet leakage classification in accordance with DW 144 Table 1 and DW 154 table 1. Where indicated ensure ductwork is suitable for a variable air volume system. For special installations where contaminants are indicated, ensure materials and construction of ductwork are suitable for contaminants in the airstream.

2024 DUCTWORK AIR LEAKAGE TESTING - GENERAL:

Carry out ductwork air leakage testing on those sections of systems with a design flow rate greater than 1m³/s where the pressure class is such that DW143 recommends testing and where the BER calculation assumes a leakage rate lower than the standard in DW144.

Test to be in accordance with the requirements of Building Regulations ADL 2A&B 2006 and DW 144 or appendix A in DW154 as appropriate and DW 143. Use portable fan and test equipment and apply to erected sections of the ductwork complete with access doors at the test pressure and flow rates as scheduled.

Test before insulation is applied to ductwork.

Achieve leakage rates indicated or better.

Test ductwork components with the ductwork, where they are able to withstand the test pressure, otherwise isolate.

If the test fails, pressure test four further sections. If the further tests fail apply remedial action to the complete ductwork system.

The results to be recorded on test sheets based on DW 144 or DW154 and DW 143 examples and compared to acceptable leakage rate specified or better.

Sections, which need unacceptable levels of remedial work on seams or joints, shall be replaced by new sections. This requirement shall be identified during the preliminary test to DW 143, paragraphs 4.9 and 4.10.

Provide documented evidence of the calculations used to arrive at the allowable loss for the section to be tested and ensure the client or his representative witness and sign the results of the tests.

All "in duct" plant shall be factory tested to the same leakage classification by the Manufacturer.

Builders work ducts used as part of a ductwork supply system shall be sealed in accordance with the Architect's specification by the Contractor. The ducts / shafts shall be leakage tested to demonstrate that leakage is no greater than the requirements for sheet metal ductwork class A as defined in DW 143 at the design pressure at that part of the system.

2025z SPARK TESTING ON PLASTICS DUCTWORK:

Where specified in the scope of works or schedule of air ductlines carry out spark testing in accordance with DW 154 at landmarks identified in the contract programme.

2031A HIGH PRESSURE DUCTWORK AIR LEAKAGE TESTING:

Carry out ductwork air leakage testing on all high-pressure ductwork in accordance with DW 144 as procedures set out in DW 143.

Testing of plant items, as DW 144, Part 8, A.8.

2031B MEDIUM PRESSURE DUCTWORK AIR LEAKAGE TESTING:

Test medium pressure ductwork in accordance with DW 144 and DW143.

Test the specified proportion of sections of duct system for air leakage. Test at the pressure recommended in DW144 Table 17 for the classification of the selected ductwork. Carry out the tests as the work proceeds and prior to application of thermal insulation.

If the test on a section fails, pressure test four further sections (to be selected by the Designer). If the further tests fail, apply remedial action to the complete ductwork system.

Provide documented evidence of the calculations used to arrive at the allowable loss for the section to be tested and ensure the client or his agent witnesses and signs the results of the tests.

Testing of plant items as DW 144, Part 8, A.8.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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76/245

07/07

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Y30 – Air Ductlines

2031C LOW PRESSURE DUCTWORK AIR LEAKAGE TESTING:

Test low-pressure ductwork in accordance with DW 144 and DW143.

Test the specified proportion of sections of duct system for air leakage. Test at the pressure recommended in DW144 Table 17 for the classification of the selected ductwork. Carry out the tests as the work proceeds and prior to application of thermal insulation.

If the test on a section fails, pressure test two further sections (to be selected by the Designer). If the further tests fail, apply remedial action to the complete ductwork system.

Provide documented evidence of the calculations used to arrive at the allowable loss for the section to be tested and ensure the client or his agent witnesses and signs the results of the tests.

Testing of plant items as DW 144, Part 8, A.8.

2035 STRENGTH AND LEAKAGE TESTING OF CIRCULAR SHEET METAL DUCTWORK:

Where scheduled carry out ductwork strength and air leakage testing on circular sheet metal ductwork in accordance with BS EN 12237.

Test procedure shall be as detailed in BS EN 12237, Section 7.

Produce a test report as detailed in BS EN 12237, Section 8.

2036 STRENGTH AND LEAKAGE TESTING OF RECTANGULAR SHEET METAL DUCTWORK

Complete systems shall be leakage tested. Tests shall be carried out when the fan has been first set to work and a visual/audible inspection has been made of all connections from plant to ductwork. This shall include any untested joints between tested sections and all joints and seams not previously subjected to leakage pressure tests, including plant casings, grille joints, dampers etc.

Carry out ductwork strength and air leakage testing on circular sheet metal ductwork in accordance with BS EN 1507.

Test procedure shall be detailed in BS EN 1507, Section 5.

Produce a test report as detailed in BS EN 1507, Section 6.

2041 DUCTWORK MATERIALS

Ductwork shall be zinc-coated steel to DW144 Part 2 unless otherwise specified.

2061A STEEL DUCTWORK TO DW 144 - RECTANGULAR:

Duct

Comply with DW 144 Part 3 for construction of rectangular ductwork.

Additional requirements

Any duct with an aspect ratio greater than 4:1 shall be supplied complete with a central splitter.

Longitudinal seams: Fig Nos. 5, 6 and 7 shall be avoided. Fig No 8 may be used on large duct components with the Designer's approval.

For all side-on flange systems (mezzette) with bolted corners, joints on all systems shall be further secured with intermediate fastenings to the manufacturer's recommendation.

Full girth stiffeners shall be used in all instances.

Dimpling is not acceptable as a method of fastening.

Plant connection shall be constructed at Tables 2, 3 and 4, but one gauge thicker. Tie bars shall be provided on all plant connections with a side longer than 1500mm.

Turning vanes shall be fitted on square bends. Double skin vanes only shall be permitted, in accordance with DW 144 Fig No 30b.

Square branches (as Fig No 104) shall not be used.

Cross-joints

Use cross-joints in accordance with DW 144 or use cross-joints tested in accordance with DW/TM1, unless otherwise indicated.

Finish

Zinc coated steel - hot dipping galvanised, or Zinc coated steel - electroplated, or pre-coated steel in accordance with DW 144 Appendix H unless otherwise indicated.

2061B STEEL DUCTWORK TO DW 144 - CIRCULAR:

Duct

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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77/245

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Y30 – Air Ductlines

Comply with DW 144 Part 4 for construction of circular ductwork. Use spirally wound ducts unless otherwise indicated.

Additional requirements

Fig Nos. 34 and 41 in DW 144 will only be acceptable as a means of jointing provided the manufacturers of the proprietary system inspect a minimum of 25% of the joints after installation to verify the installation has been carried out in accordance with their instructions and size limitations.

Components

Square branches (as Fig Nos. 135 and 139) shall not be used. On high and medium pressure systems use only conical branches (as Fig No 137).

Fittings

Comply with DW 144 Part 4 for manufacture of fittings for circular ductwork.

Cross-joints

Use cross-joints in accordance with DW 144 or use cross-joints tested in accordance with DW/TM1, unless otherwise indicated.

Finish

Zinc coated steel - hot dip galvanised, or Zinc coated steel - electroplated, or pre-coated steel in accordance with DW 144 Appendix H unless otherwise indicated.

2061C STEEL DUCTWORK TO DW 144 - FLAT OVAL:

Duct

Comply with DW 144 Part 5 for construction of flat oval ducts. Use spirally wound ducts unless otherwise indicated.

Cross Joint

Submit for approval details of any cross-joints not in accordance with DW 144 Figs. 53, 54, 57 or 58.

Components

Square branches (as Fig No 166) shall not be used; on low-pressure systems use shoe branches in lieu. On high and medium pressure systems use only conical branches (as Fig No 167).

Fittings

Comply with DW 144 Part 5 for manufacture of fittings for flat oval ductwork.

Finish

Zinc coated steel - hot dip galvanised, or Zinc coated steel - electroplated, or pre-coated steel in accordance with DW 144 Appendix H unless otherwise indicated.

2062 HIGH PRESSURE SHEET METAL DUCTWORK

Where high-pressure ductwork is specified, the following shall apply otherwise stated in writing:

Bends and offsets shall have a minimum throat radius equal to the width or diameter of the duct. On rectangular duct over 1 metre wide or where space is restricted, splitters may be introduced with the prior written approval of the Designer. Locations for dampers for volume control shall be agreed with the Designer.

Requirements of the relevant Clauses in DW 144 must be adhered to.

Y30 – Air Ductlines

2065 KITCHEN EXTRACT SYSTEMS

Comply with HVCA "Specification for Kitchen Ventilation Systems DW172."

As a minimum, all duct work shall be constructed to Class "A" specification and tested to Class "B" requirements and be increased at least one size in metal thickness above the standard requirement. Access doors for cleaning (with grease tight gaskets) shall be installed at every bend and connection and at every 3m on straight lengths of ductwork. All joints shall be grease-tight. Horizontal ductwork shall be installed to provide a fall to a drain point. A drain connection shall be provided at all low points.

Comply with the requirements of the Building Control Officer for fully welded ductwork, fire cladding and minimum metal thickness.

The entire system installation shall comply with the requirements of the Building Control and Fire Officer.

2071 MAN ACCESS AND SAFETY BARS:

Where man access is provided, ensure that duct floor is of sufficient strength to comply with safety standards. Provide safety bars at the top of all risers unless alternative means of protection are provided.

2072 FLANGED CONNECTIONS:

Provide bolted flanged joints for connecting ductwork to flanged items of plant, builder's work frames and where removable sections of ductwork are required.

2074 PLANT CONNECTIONS:

Make connection between air handling assembly and ductwork system in accordance with DW 144 and manufacturers recommendations.

2110A FIRE PROTECTION WITH FIRE DAMPERS:

Ensure ductwork complies with the requirements of BS 476 Part 24 and BS 5588. Supply and install fire rated ductwork. Method of protection DW 144 Appendix D using fire dampers.

2110B FIRE PROTECTION WITH FIRE RESISTING ENCLOSURES:

Ensure ductwork complies with the requirements of BS 476 Part 24 and BS 5588. Supply and install fire rated ductwork. Method of Protection DW 144 Appendix D using fire resisting enclosures.

2110C FIRE RATED DUCTWORK GENERALLY:

The ductwork shall be constructed in accordance with the ASFP (Association of Specialist Fire Protection) Guide to Fire Rated and Smoke Extract Ductwork to provide the Fire Rating for "Stability", "Integrity" and "Insulation" as scheduled or indicated in the particular specification or on the drawings, when tested to the requirements of BS 476: Part 24 by a NAMAS approved laboratory. The ductwork shall be capable of providing either Duct Type A (fire outside) or Duct Type B (fire inside) and, under normal non-fire operating conditions, shall conform to the scheduled pressure classification of the current HVCA DW/144 specification for sheet metal ductwork.

All smoke clearance ductwork shall be capable of retaining cross sectional area of 75% of duct, 1 hour "Stability" and "Integrity" to BS 476 Pt 24 as a minimum.

2110D FIRE RATED AND SMOKE EXTRACT DUCTWORK WITH FIRE PROTECTION CLADDING:

Ensure complete ductwork system complies with the requirements of BS 476-24 and BS 5588.

Supply and install fire rated ductwork. Method of Protection DW 144 Appendix D using fire resisting ductwork. Ductwork to be in accordance with HVCA Specification DW 144. Ducts to be fire protected with the correct thickness of high density single layer mineral wool fire rated ductwork slab in accordance with manufacturers recommendations and instructions. Insulation system to be independently tested and carry

Y30 – Air Ductlines

current valid certification to provide fire protection fully in accordance with the requirements of duct 'Type A' and duct 'Type B' of BS 476-24 and BS 5588.

Fire classification of fire resisting ductwork to be in accordance with BS EN 13501-3

Drop rods and exposed bearers to be insulated in accordance with manufactures recommendations and instructions.

Where a vapour barrier is required, all exposed edges and penetrations through the foil should be sealed using soft self-adhesive aluminium foil tape.

Refer to Y50txt for further details of fire protection cladding.

2110E FIRE RATED DUCTWORK – FACTORY APPLIED FIRE RESISTING FINISH

The design manufacture, installation and testing of the complete fire rated duct work systems shall be undertaken by a specialist.

Ductwork must be capable of resisting the anticipated temperature generated during the development of a fire and must be tested to BS 476 Part 24: 1987, ISO 6944: 1985 Fire Rated Ductwork Systems shall be manufactured to provide the required degree of fire resistance (up to 4 hours for stability, integrity and insulation fire ratings) and the type of fire exposure, type A or B.

The fire rated ductwork shall be constructed from Galvanised Sheet Steel manufactured to an enhanced standard, then degreased and factory sprayed with the proprietary coating. The coating shall contain selected mineral fillers in a low permeability electromagnetic binder, to give a finished product which has been successfully tested for international use under Cellulosic Fire Conditions in excess of 4 hours duration.

The ductwork shall be composite fire rated ductwork manufactured to method 3 of BS 5588 Part 9.

The ductwork shall be factory produced in flanged sections and assembled on site utilising tested fireproof gaskets. All sealants, gaskets and flexible joints must be non flammable and tested and certified in accordance with BS 476 part 24.

After installation the ductwork shall be leakage tested in accordance with DW 143. (to suit pressure classification scheduled)

On kitchen extract systems access doors shall be installed at a minimum distance between doors of 3m.

Where the ductwork passes between fire compartments fire stopping shall be carried out by the specialist in accordance with the ductwork manufacturers recommendations and the ductwork shall be stiffened to prevent deformation of the duct in a fire to maintain the cross-sectional area of the duct and ensure that the fire rated penetration seal around the duct is not compromised.

The specialist ductwork contractor shall be responsible for the design and sizing of the drop rods and bearers (and their centres) for the fire rated ductwork to suit the fire duration scheduled.

The internal surface of the ductwork shall be smooth in order to impose no more pressure loss than DW 144 ductwork.

Test holes which are cut in after installation must be suitably sealed by the specialist to ensure that the system integrity is maintained.

The completed system shall be tested to British Standard 476 Part 24 (1987), ISO 6944 (1985)

At completion of the project a certificate of conformity shall be issued by the specialist confirming that the system has been manufactured and installed in accordance with the manufacturer's recommendations.

2121 INTERNAL THERMAL/ACOUSTIC LININGS:

Where indicated line internal surfaces of ducts. Internal lining to be as described in DW 144 paragraphs 29.2 and 29.4.

Lining

Provide lining that is inert, fire proof, inorganic, vermin proof, non-hygroscopic. Fire rated to Building Control Officers and Fire Officer approval

Material

Class "O" fire rated open cell acoustic foam (minimum 25mm thick required) which shall not emit toxic fumes in the event of a fire.

Performance

Minimum random incidence absorption coefficients in accordance with BS EN 20354, as follows:

Frequency (Hz)	125	250	500	1000	2000	4000	8000
	0.12	0.21	0.42	0.62	0.68	0.72	

Protection of Lining

Y30 – Air Ductlines

Protect lining against product migration and erosion.

2122 ACOUSTIC PLENUMS:

Where indicated

Provide plenums constructed using acoustic panels in positions indicated. Joint panels with seals to match performance of panels. The plenums shall be suitable for the relevant air pressures.

Infill

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic. Fire rated to Building Control Officers and Fire Officers approval.

Material

Class "O" fire rated open cell acoustic foam (25mm thick required minimum) which shall not give off toxic fumes in the event of fire, unless otherwise indicated.

Performance

Minimum random incidence absorption coefficients in accordance with BS EN 20354, as follows:

Frequency (Hz)	125	250	500	1000	2000	4000	8000
	0.12	0.21	0.42	0.62	0.68	0.72	

2130A PREINSULATED THERMAL DUCTWORK:

Material– CFC & HCFC free Phenolic foam

Standards

The insulation materials and facings shall be rated as Class 1 when tested to BS 476 Part 7

Class "O" finish

The boards shall be tested to BS 6401:1983

DW 144

Construction /Installation

CFC and HCFC free Phenolic foam panels bonded on both sides to a 28mm micron aluminium foil facing reinforced with a 5mm glass tissue mesh. Minimum density of foam shall be 55kg/m³

The system shall be manufactured and installed by a specialist contractor, in accordance with the panel manufacturer's recommendations. The specialist's operatives shall have successfully completed a training course with the manufacturers of the insulated panels. All materials used for the ductwork system shall be approved by the insulated panel manufacturer.

All access doors shall be insulated to the same standard as the ductwork and the vapour barrier must be maintained.

Connection to system components shall be by aluminium flanges.

Supports shall be provided at centre not exceeding 3 m and at all changes in direction and branch connections. All ductwork ancillaries shall be independently supported.

External Ductwork

All external ductwork shall be provided with a weatherproof finish comprising either 0.7mm thick "Aluzink sheet or a proprietary laminated foil / film introduced during the fabrication of the ductwork.

Supply pre-insulated ductwork where indicated.

2139 PIPEWORK / DUCTS FOR GROUND – AIR HEAT EXCHANGER

Material

Polypropylene to BS EN 1852 and DIN 16962 or HDPE to DIN 16961 or DIN 8074 and 8075 with ring stiffness to BS EN ISO 9969

Or Concrete to DIN 4032 and DIN 4035

All materials installed in the ground to be non-toxic and non-corroding in accordance with VDI 4640 Parts 1 and 4. The materials shall have a smooth – surface interior, not attract dust, be non-hygroscopic and air tight. Corrugated pipes are not acceptable.

2140A HANGERS AND SUPPORTS:

Provide hangers and supports throughout in accordance with DW 144 Part Six, Section 19; DW 154 Part 5 or DW 191, Section 7 as appropriate. See also clause 4021.

Comply with BS EN 12236.

Y30 – Air Ductlines

Where a wire rope suspension system is used an alternative to drop rods or strutting comply with the following standards

- BS EN 12385-1.
- BS EN 13411-3.
- BS EN 13411-4.
- BSRIA COP 22/2002

2151 SUPPORT OF AIR TERMINAL UNITS:

Support air terminal units and their plenums independently of the ceiling grids, unless otherwise indicated. Hangers shall be adjustable.

3000 ACCESSORIES AND COMPONENTS

3010 CONSTRUCTION AND FINISHES:

Ensure that materials of accessories are compatible with duct work and that finishes of accessories comply with any special requirements for ductwork. Ensure casing losses of components are compatible with ductwork in which they are incorporated.

3021 ACCESS/INSPECTION OPENINGS:

Provide access openings for inspection/servicing in accordance with DW 144 Part 7 Section 20 and Appendix M Table 25 Level 1; DW 154 Part 6, section 15 and appendix D table 14 or DW 191 Section 8 as appropriate, and:

- Adjacent to all fans
- Adjacent to all dampers
- As necessary for cleaning purposes

See also clause 3050.

3031 TEST HOLES

Provide test holes in ductwork systems to allow complete testing and balancing of each system in accordance with CIBSE Commissioning Code Series A and BSRIA AG3/89.3:2001. Drill test holes on site in accordance with DW144 Section 20.

Provide test holes on each side of all equipment in the system, at least 1.5 duct diameters upstream of all dampers and elsewhere as indicated/specified. Seal all test holes with blind grommets.

Provide at each location the number of test holes shown below:

Circular duct

	Duct diam (mm)	No of test holes
Up to	150	1
151 to	450	2
Over	450	4

Rectangular/flat oval ducts

	Longest side (mm)	No of test holes
Up to	200	1
201 to	400	2
401 to	600	3
601 to	800	4
801 to	1000	5
1001 to	1200	6
1201 to	1500	7
Over	1500	One per 250mm

3041 HOLES FOR CONTROLS/INSTRUMENTS:

Provide suitably sized and positioned holes in ductwork, in accordance with DW 144 part 7 or DW 154 to accommodate all necessary thermostats, humidistats and other control. Holes to be bossed and screwed or drilled as appropriate. Where holes are provided on insulated ductwork, extend to finish flush with insulation.

3042 INSTALLATION OF INSTRUMENTS AND CONTROLS:

Instruments and controls should be installed to manufacturers or specialist supplier's requirements. The installation must be checked by the manufacturer or specialist supplier, and rectified as necessary.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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82/245

07/07

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Y30 – Air Ductlines

3050 CLEANING ACCESS

Provide access openings for cleaning in accordance with DW144 Part 7, paragraph 20.8 / Appendix M, TR/19 or DW 154 appendix D as appropriate. In addition, provide access openings such that no point is greater than 5m from an opening. Provide access openings at the top and bottom of every riser. Refer to BSRIA TN 18/92 for minimum dimensions of access doors. See also clause 4091.

3055 ACCESS/INSPECTION/CLEANING OPENING COVERS

Provide purpose made covers to all access and inspection and cleaning openings. Fit covers with quick release catches. Provide restraining straps. Provide full-face soft neoprene gasket secured to ductwork with adhesive to ensure an airtight seal. Covers shall be capable of withstanding the respective system test pressures.

Any access openings cut in on site shall have the exposed cut edges covered with a protective band.

3056 HINGED ACCESS DOORS

Provide purpose made hinged access doors where indicated in accordance with DW 144 Section 20. Fit access doors with latch style fastenings. All doors shall be supplied with approved retaining device fixed to door and frame. Access doors shall be capable of withstanding the respective system test. Provide full-face soft neoprene gasket secured to ductwork with adhesive to ensure airtight seal. Provide handles on all access doors.

3058 PRE-INSULATED DOORS AND COVERS:

On all insulated ductwork, provide standard access, inspection and cleaning covers and doors with (minimum) 25 mm thickness of insulation. Doors and covers shall be constructed and installed in such a manner that the internal face of the duct and cover/door is maintained when fixed. On insulated services all access covers/doors shall be fitted with raised stools, which shall be equal to the depth of the insulation.

3061 CONTROL/BALANCING DAMPERS - GENERAL

Dampers shall be provided where indicated on the drawings or called for elsewhere in the specification. Additionally the Contractor shall provide sufficient dampers to regulate and balance the system. Dampers on grilles or diffusers shall be used only for fine and secondary control. All dampers shall be sufficiently rigid to prevent fluttering.

Dampers constructed by the ductwork fabricator shall not be acceptable unless specifically agreed with the Designer in advance.

Dampers shall incorporate a locking device and blade position indication. A sample shall be submitted of the proposed dampers prior to the commencement of the installation.

After final balancing the quadrant shall have a small "V" shaped notch filed in the quadrant indicating the centre line of the lever when in the operating position.

On insulated ducts, the damper actuator quadrant and linkage shall be located proud of the external face of the duct insulation.

As a minimum control / balancing dampers shall be provided at the following locations:

- At each fan
- At each main branch
- At each sub-branch
- At any branch serving 3 or more terminals
- At each terminal / grille

Where possible dampers on terminals / grilles shall be installed in duct connections rather than with the grille.

3062 CONTROL/BALANCING DAMPERS

Unless otherwise specified, provide extruded aerofoil section, plain opposed blade control and balancing dampers in accordance with DW 144 Section 21 or DW 154 Part 6 as appropriate.

Y30 – Air Ductlines

Provide locking device and position indicator on all dampers.

Dampers shall be single blade up to 200mm ducting height, elsewhere they shall be multi-blade, opposed blade type with each blade not exceeding 175mm in width and not longer than 1200mm.

Dampers shall be of the aerofoil blade (double skin) multi-leaf opposed blade type (unless otherwise specified) with the blades rigidly fixed to the horizontal spindles.

Each damper gear shall be suitable for operation over the pressure and temperature range of the medium being controlled.

Where dampers are required to operate to a fully closed position, dampers shall be of the low leakage type.

Remote blade operation

Where indicated, supply and install proprietary remote control unit (supplied by the damper manufacturer). Unit to be complete with all necessary brackets and linkage at the control unit. Control unit to provide indication of position of blades. Provide label at the control unit to indicate function.

3063 IRIS DAMPERS:

On final circular runs to and from terminals, provide iris pattern control dampers in accordance with DW 144 or DW 154 as appropriate. Provide each damper with locking device and position indicator.

3064 MOTORISED CONTROL DAMPERS:

Provide control dampers complete with motor, motor linkage and motor support. Motorised dampers shall generally be suitable for 24V on-off reversible motor and shall have a manual override facility.

The Contractor shall ensure they provide the controls specialist with full details of the damper selected and the total operating torque with damper in closed position, to enable the controls specialist to select a suitable actuator or actuators. The exact details of the actuator requirements shall be agreed with specialist controls supplier.

Damper motors, thrusters, positioners and remote operating gear (where required) shall be rigidly mounted on purpose-made brackets and carefully aligned.

Actuators shall have visual position indication and have the capability to provide positive feedback of position to the controls system.

3071 FIRE STOPS - PLASTICS DUCTWORK:

Supply and install fire dampers or intumescent sleeves in accordance with DW154 Part 6 section 17, in accordance with clause 4151

3075 FIRE DAMPERS:

Provide fire dampers in accordance with DW144 Section 22 and DW154 Part 6 paragraph 17 and clause 4151.

Types as indicated: -

- Multi-leaf fire dampers
- or Intumescent fire dampers
- or Stainless steel shutter fire dampers with shutter blades out of the air stream.
- or Multiple "Hit & Miss" steel plates fire damper
- or Intumescent sleeves on plastic ductwork up to 350mm dia

Fire dampers shall be supplied and fixed in accordance with the manufacturer's recommendations with installation mounting frames which conform to the prevailing Building Regulations and are acceptable to the District Surveyor/Building Control Officer and Fire Officer, in accordance with DW 144 Fig Nos. 78 and 79. Fire dampers shall be installed in accordance with manufacturers recommendations regarding minimum distances from bends and branches. The proposed "standard installation solution" must be supported by a valid test report or assessment provided by an approved 3rd party body.

The construction shall allow for all additional framing supports, bracing and fire stopping as may be necessary to adequately attach the fire dampers to the structure. The assembly is to be approved by the Building Control Officer, District Surveyor and Fire Officer.

Y30 – Air Ductlines

Each fire damper and installation mounting frame shall have at least the same standard of fire resistance as the wall or floor through which the duct passes. Unless otherwise indicated it shall have a minimum fire resistance rate of 2 hours to the dynamic heated gas flow tests of EN1366-2 Classification ES and to BS 476 Parts 20/ 22/24. When a fire resistance rating of 4 hours is required either two dampers factory assembled in series or a single damper having a fire resistance rating of 4 hours certified by an approved Testing Authority shall be provided.

Shutter dampers shall be provided with the shutter blades located outside the airstream (unless otherwise indicated). Each damper shall have a stainless steel curtain in all-welded galvanised steel casing with stainless steel side seal gaskets. The damper blade curtain shall be held in the folded position by a dual safe thermal actuator and fusible link.

All damper blades shall be tensioned to ensure instantaneous closure on thermal activation at 72 °C (unless specified otherwise elsewhere). A self-latching reset mechanism shall be provided for easy re-setting of the damper curtain.

On completion of the installation, the contractor shall be responsible for ensuring the inspection and testing of all fire dampers installed on the contract is carried out. Upon completion of the tests, the certificates must be issued for confirming that the dampers have been inspected and that they function correctly in accordance with the Manufacturers data sheets.

Access panels with chains shall be provided adjacent to the access side of all fire dampers.

In no instances shall flexible duct connections be allowed on to fire dampers or through floors and walls.

Provide installation frames, and local external visual indication of fire damper blade position, unless indicated otherwise.

3077 SMOKE CONTROL DAMPERS

Smoke dampers shall comply with DW144 Section 23.

Smoke dampers shall be supplied and fixed with installation mounting frames which conform to the prevailing Building Regulations and are acceptable to the District Surveyor/Building Control Officer and Fire Officer, in accordance with DW 144 Section 23, DW144 Fig Nos. 78 and 79 and with . The contractor shall obtain and issue proof of the necessary approvals.

The construction shall allow for all additional framing supports and bracing and fire-stopping as may be necessary to adequately attach the fire dampers to the structure. The assembly to be approved by the Building Control Officer, District Surveyor and Fire Officer. The proposed "standard installation solution" must be supported by a valid test report or assessment provided by an approved 3rd party body.

All smoke dampers shall be of the multi-blade type with interlocking stainless steel aerofoil blades in an all welded galvanised steel casing. The blades shall be held in the open position by an electrical power supply and thermal sensor incorporated within the control mode.

Upon removal of the power supply to the damper control mode, the damper blades shall move to their "fail-safe" position. When closed, damper blades shall interlock to provide tight smoke sealing and fire control. Exact method of activation shall be agreed with the Control Specialist.

All dampers shall be remotely re-settable. Each damper control mode shall have interface facilities to operate as commanded by a dedicated fire/smoke control panel within the building. The power supply shall be 24V, or 230V AC as required by the control system.

On completion of the installation the contractor shall be responsible for ensuring the inspection and testing of all smoke dampers installed on the contract carried out. Upon completion of the tests, the

Y30 – Air Ductlines

certificates shall be issued for confirming that the dampers have been inspected and that they function correctly in accordance with the Manufacturer's data sheets.

Access panels with chains shall be provided adjacent to the access side of all smoke dampers.

In no instances shall flexible duct connections be allowed on to smoke dampers or through floors and walls.

Provide installation frames, local external visual indication of damper blade position and facility for remote indication of damper blade position, unless indicated otherwise.

3078 COMBINATION FIRE/SMOKE CONTROL DAMPERS

Combination fire/smoke dampers shall comply with DW144 Section 24.

Smoke/fire dampers shall be supplied and fixed with installation mounting frames which conform to the prevailing Building Regulations and are acceptable to the District Surveyor/Building Control Officer and Fire Officer, in accordance with DW 144 Section 24, DW144 Fig Nos. 78 and 79. The contractor shall obtain and issue proof of the necessary approvals.

The construction shall allow for all additional framing supports and bracing and fire stopping as may be necessary to adequately attach the fire dampers to the structure. The assembly to be approved by the Building Control Officer, District Surveyor and Fire Officer. The proposed "standard installation solution" must be supported by a valid test report or assessment provided by an approved 3rd party body.

Each smoke/fire damper and installation mounting frame shall have at least the same standard of fire resistance as the wall or floor through which the duct passes. Unless otherwise indicated it shall have a minimum fire resistance rate of 2 hours to the dynamic heated gas flow tests of EN1366-2 Classification ES and to BS 476 Parts 20/22/24. When a fire resistance rating of 4 hours is required with two dampers factory assembled in series or a single damper having a fire resistance rating of 4 hours certified by an approved Testing Authority shall be provided.

All smoke/fire dampers shall be of the multi-blade type with interlocking stainless steel aerofoil blades in an all welded galvanised steel casing. The blades shall be held in the open position by an electrical power supply and thermal sensor incorporated within the control mode.

Upon activation of the thermal sensor at 72°C (unless otherwise specified elsewhere) or removal of the power supply to the damper control mode, the damper blades shall instantaneously close and interlock to provide tight smoke sealing and fire control. Exact method of activation shall be agreed with the Control Specialist.

All dampers shall be remotely re-settable by restoration of the power supply unless the thermal sensor has been activated. Each damper control mode shall have interface facilities to operate as commanded by a dedicated fire/smoke control panel within the building. The power supply shall be 24V, or 230V AC as required by the control system.

On completion of the installation the contractor shall be responsible for ensuring the inspection and testing of all smoke/fire dampers installed on the contract carried out. Upon completion of the tests, the certificates shall be issued for confirming that the dampers have been inspected and that they function correctly in accordance with the Manufacturer's data sheets.

Access panels with chains shall be provided adjacent to the access side of all smoke/fire dampers.

In no instances shall flexible duct connections be allowed on to smoke/fire dampers or through floors and walls.

Provide installation frames, local external visual indication of damper blade position and facility for remote indication of damper blade position, unless indicated otherwise.

Y30 – Air Ductlines

3079 FIRE DAMPER FUSIBLE LINKS:

Supply spare fusible links for fire dampers and combination fire/smoke dampers. Supply ten in total or 1 for every 10 dampers installed (whichever is the greater). Supply links to fuse at temperature indicated.

3092 PRESSURE CONTROL FLAPS, STAINLESS STEEL FRAMES:

Supply pressure control flaps as indicated on drawings or as scheduled. Supply flap and adjustable balance weight assembly manufactured from stainless steel. Construct wall mounting casings from stainless steel or nylon coated mild steel unless otherwise indicated.

Set the balance weight assembly on flap to control at pressure required.

3093 WALL MOUNTED PRESSURE RELIEF DAMPERS:

Provide wall mounted dampers with subframe. Supply frames made from galvanised sheet steel and blades made from aluminium unless otherwise indicated.

3094 DOOR MOUNTED PRESSURE RELIEF DAMPERS:

Provide door mounted dampers with subframe. Supply frames made from extruded aluminium section with aluminium or PVC blades unless otherwise indicated.

3095 SHUT OFF DAMPERS:

Supply shut off dampers to give shut off of 100%.

Manufacture from sheet steel coated with polyurethane lacquer, suitable for either pneumatic, electro-pneumatic or electric/electronic control as required by the control system.

3096 NON RETURN DAMPER:

Supply non-return dampers where indicated/specified. Manufacture with galvanised sheet steel frame and aluminium blades.

3101 FLEXIBLE DUCTS - METAL:

Supply bendable ducts in accordance with DW 144 Part 7 Section 25. Flexible ducts shall be manufactured from light gauge coated steel, helically wound with lock seams of circular section.

Building Control and Fire Officer approvals shall be obtained for the use of the flexible ductwork to be installed.

Comply with BS EN 13180.

Maximum length of flex to be three diameters or 1m, whichever is the smaller.

Flexible ductwork used to make final connection between distribution ductwork and terminal units only shall be kept as short and straight as possible and shall not be used to take up gross misalignment. Flexible duct shall be adequately supported to eliminate sagging.

Where the flexible ductwork is to be insulated, this shall be factory applied of a type approved for the application and to the thermal conductivity equivalent to the adjacent thermal insulation and shall be Class "O" fire rated.

The maximum frictional resistance to airflow per unit length of the flexible duct shall be agreed with the Designer. The radius ratio R/D for bends shall not be less than 2 where R is the centre line radius and D is the diameter of the flexible duct.

The flexible ductwork shall be to a standard of air tightness equal to that of the ductwork, and constructed to meet the fire precautions recommended in BS 5588 which comprise:-

Fire resistance to meet BS 476: Part 6 with indices of performances not more than i equal to 12 and i equal to

6.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\specs\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

87/245

07/07

EX000001613/136
EX000001613_0136

Y30 – Air Ductlines

Materials shall not produce smoke or toxic fume hazards if involved in a fire.

Flexible ducts shall be suitable for an operating temperature range of 180°C to 120°C.

The joints to rigid spigots shall be sealed with a jointing paste or mastic compound. Ducts up to 150mm dia shall be secured with a worm-drive type hose-clip complying with BS 3628. Ducts over 150mm dia shall be secured with a band clip.

3111 FLEXIBLE JOINT CONNECTIONS

Supply and install flexible joints as detailed in DW 144 Part 7 Section 26 or DW 154 Part 6 section 18, as appropriate. Comply with BS 476 Parts 6, 7, 20, 21, 22, 23 and 24.

Position

Use flexible joints to make connections to:

Air diffusers, grilles and air registers,
On inlet and outlet connections to all fans or fan and attenuator assemblies,
At building movement joints, and
Elsewhere as indicated/specified.

On fans;

Flexible joints on fan connections shall be between flanged ends. The flexible material flange shall be backed by an angle or flat iron flange and the flexible joints shall be secured held between the metal flanges. Flat iron bands used with fan inlets shall be not less than 5 mm thick.

Flexible joints shall be equal in cross-section to the points of connection, not longer than 250 mm or less than 50 mm.

Properties

Flexible joints shall be "Neoprene" coated glass fibre or other materials excluding asbestos and have fire resistance properties of 30 minutes integrity to BS 476:Part 24. Class 1 surface spread of flame to BS 476: Part 7 and not produce smoke or toxic fume hazards if involved in a fire.

3120 BIRD WIRE GUARDS:

Fit bird screens of 12mm square mesh wire on all intake and extract louvres to atmosphere. Wire gauge to be not less than 1mm.

Finish, plastic coated wire.

3130 INSECT GUARDS:

Provide insect guards where indicated/scheduled.

Screens to be supplied in kit form for installation on site.

Material: Black PVC coated glass fibre mesh

Aperture size: 1.1x1.55mm

Weight: 155 g/m²

Free area: 62%

3132 SPREADER PLATE:

Provide duct mounted perforated inlet plate to humidifier sections to equalize air velocity over humidifier section.

3131 SEALANTS GASKETS AND TAPES:

For sealing materials and method of use comply with DW 144 Section 8 or DW 154 section 8 as appropriate. Gaskets or performed strips must be of an equivalent width to the faces of joint flanges. The use of self-adhesive tapes shall not be permitted. On circular duct work chemical reaction sealing tapes may be used with the Designer's prior agreement. Sealants, gaskets and tapes shall be constructed using WRC approved sealants, gaskets, joints, adhesives etc, which will not support bacterial growth and which produce minimal fire or smoke hazards if involved in a fire, this to include attachments such as grilles etc.

3132 SPLITTERS:

Y30 – Air Ductlines

Do not use splitters without obtaining written consent or unless the use of splitters is specifically specified. Construct splitters in same gauge and material as enclosing ductwork and attach to duct as described in DW 144 Part 3.

3133 TURNING VANES

Use square bends with turning vanes in all cases for flat, oval and rectangular ductwork unless otherwise agreed in writing.

3135A TURNING VANES-LOW AND MEDIUM PRESSURE

Provide double skin aerofoil pattern turning vanes in low and medium pressure ductwork. Construct vanes from material similar to enclosing ductwork. Fasten turning vanes as described in DW 144 Part 3.

3135B TURNING VANES-HIGH PRESSURE:

Provide turning vanes of double skin aerofoil pattern in high-pressure ductwork, constructed from material similar to enclosing ductwork. Fasten turning vanes as described in DW 144 Part 3.

3141 PRESSURE CONTROL FLAPS (Air pressure control valves)

Supply pressure control flaps with flap and adjustable balance weight assembly manufactured from stainless steel. Construct wall mounting casings from stainless steel. Blades to pivot on sealed for life ball bearings.

Set the balance weight assembly on flap to control at pressure as indicated.

3151 PRESSURE RELIEF DAMPERS:

Wall mounted dampers with subframe.

Material

Supply frames made from Extruded aluminium section.

Supply blades made from Grade 304 stainless steel

3161 SHUT OFF DAMPER:

Supply shut off dampers to give shut off of 100%

Frame manufactured from galvanized sheet steel, blades to be double skin stainless steel with synthetic leading and trailing edge seals and double side seals suitable for electric/electronic control.

3171 NON RETURN DAMPER:

Supply non return dampers manufactured with galvanized sheet steel frame or aluminium alloy extrusions and aluminium blades supported on plastic moulded bearing surfaces

Ensure non return dampers in smoke handling systems have the required stability and integrity rating to match the system requirements.

4000 WORKMANSHIP

4011 GENERAL WORKMANSHIP:

Install ductwork in accordance with DW 144, DW 154 and DW 191 as appropriate. Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports.

Unless indicated otherwise, the outermost surface of exposed ductwork or insulation shall be not less than 100mm away from walls and ceilings to permit access for cleaning.

Ductwork shall be constructed such that all internal surfaces are generally smooth and will not normally retain moisture.

Ductwork shall be run generally parallel with walls and ceilings in order to circumvent building projections (or pass through structures where permitted) as shown on the drawings.

Y30 – Air Ductlines

Internal roughness and obstruction to airflow (other than dampers, vanes etc) or sharp edges of corners on the outside of ductwork, flange supports etc shall not be accepted.

Weatherproof collars shall be provided where roofs or external walls are penetrated.

Attention shall be paid to the making and sealing of joints in ductwork, particularly where these occur on the blind side of a duct or are subsequently obscured by other parts of an installation or building fabric etc.

Install pre-insulated ductwork in accordance with manufacturer's instructions.

4015 PROTECTIVE FINISHES:

Comply with DW 144 Section 27 for provision of protective finishes to ductwork. Make good welding damage as clause 27.3.2.

Paint all bare edges and bare metal with two coats of zinc rich paint.

Provide any other special finishes as defined.

4021 HANGERS AND SUPPORTS:

Support ductwork in accordance with DW 144 Part Six Section 19; DW 154 Part 5; or DW 191 Section 7 as appropriate.

Where insulation of duct work is specified, install supports to ensure that the insulation can be easily applied and (where applicable) that integrity of vapour seal can be maintained. When installing vapour seal insulation blocks at supports, ensure there is complete vapour seal around the block prior to fixing the bracket. Blocks shall be the same thickness as the insulation and be of sufficient length either side of the support so as to enable vapour sealing on to the block. (Vapour sealing must not incorporate the bracket).

The Contractor shall purpose design supports for diagonally or vertically run ducting or shafts and other particular applications.

Where ducts or shafts are outside buildings or protective enclosures, and Local Authority regulations apply -

- a) Submit detailed fabrication drawings to the Local Authority.
- b) Obtain written evidence of Local Authority approval.
- c) Submit drawings and evidence of approval to the Designer.

Where cantilever brackets or other special forms of support are required they shall be structurally strong enough to take the load and to transfer the imposed load to the building structure. Provide details of the loads imposed on the structure to the Structural Engineer.

The ductwork hangers shall be galvanised, adjustable and have, between the hanger and the ductwork, a gasket to prevent metal to metal contact.

Shot fired fixings shall not be permitted.

Bright zinc plated drop rods, nuts, bolts and washers shall be used on all supports.

All bearers shall be galvanised or zinc rich finish.

Two piece band clips, galvanised or zinc rich finish shall be used on circular ducts. Fig 65 (with drop rod) shall be used wherever applicable.

Flat oval ductwork – only Fig No 71 shall be permitted. Galvanised or zinc rich finish shall be used.

After all installation work is complete, cut back drop rods to ensure that projection through bottom bearer does not exceed twice the thickness of the securing nut.

Y30 – Air Ductlines

On all cold services (i.e. below 15 degC), a vapour seal is required (including air inlets and downstream of heat reclaim coils). Ensure continuity of vapour barrier over ductwork support.

4022 APPEARANCE OF DUCTWORK SUPPORTS:

Cut off protruding ends of hanger rods and bolts close to nuts. Ensure that supports and drop rods are clear of ducts and not enclosed in thermal insulation, as DW 144 Section 19.6.

4023 PROPRIETARY SUPPORTS:

Use proprietary system of ductwork supports as appropriate. Obtain prior agreement from Designer of system to be used.

4025 COMPONENT SUPPORT ON PRE-INSULATED ALUMINIUM DUCTWORK:

Support ducts with dimensions less than 1m at intervals of no more than 4m. Support ducts with dimensions over 1m at intervals of no more than 2m. Provide independent support for all accessories.

4040 DUCTWORK FLOOR SUPPORT

Submit proposals to Designers for comment.

4054 AIRWAY OBSTRUCTIONS

Fit and secure rigid sheet metal fairings which are shaped to form rounded leading edges on the 'Upstream' ends, and tapered trailing edges on the 'Downstream' ends of obstruction.

4055 DUCTWORK VIBRATION ISOLATION

Ensure that ductwork does not come in direct contact with building fabric except in cases of fire dampers, silencers and builders frames. Isolate all supporting members/bearers from ductwork; secure lining of 6mm thick rubber, PVC or felt strip to support by means of adhesive.

4056 ACCESSORY SUPPORT:

In accordance with DW 144 Part 6 for supporting ductwork ancillaries. Submit details of supports to Designer for agreement.

Provide additional supports adjacent to dampers, diffusers and other items of equipment as necessary to prevent distortion.

4057 EXTERNAL DUCTWORK AND SUPPORTS:

External ductwork shall be constructed from mild sheet and sections, minimum thickness 1.6mm and shall be galvanised after manufacture. All ductwork shall be flanged and all nuts, bolts and fixings shall be bright zinc plated.

All supports shall also be constructed from mild steel sections and shall be galvanised after manufacture. Submit proposals to Designer and Structural engineer for comment.

Particular care shall be taken in selecting structural fixings that will provide a life cycle appropriate to the buildings intended use. All supports and fixings shall comply with Local Authority requirements. All welding of both ductwork and supports shall comply with BS 2971 (Arc) and BS 2640 (Gas).

Obtain approval from the Local Authority where required.

4061 DRAINAGE OF DUCTWORK:

Arrange ductwork to drain any entrained moisture and ensure the lapping of joints prevents moisture leakage.

4071 CONNECTIONS:

Plant connections

Make connection between air handling assembly and ductwork system in accordance with DW 144 and manufacturers recommendations.

Connections to builders work

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

91/245

07/07

EXO00001613/140
EX000001013_0140

Y30 – Air Ductlines

Comply with DW 144 Section 28 or DW 154 Part 6 section 20 as appropriate.

4080 EXPANSION JOINTS - PLASTIC DUCTS:

Provide expansion joints in accordance with DW 154 Part 6 section 18

4091 INTERNAL CLEANLINESS:

Provide the level of care and protection as defined in HVCA document TR/19, level as scheduled. Where level is not otherwise specified, supply and recirculation systems are to be PDI level 3; extract systems are to be PDI level 2.

Seal all open ends as installation proceeds by caps or blank flanges, to prevent ingress of foreign matter.

Cap material

Metal.

or Plastic.

Unless scheduled otherwise for installations to PDI level 3 (and else where as specified), all ductwork shall be thoroughly cleaned immediately prior to hand over in accordance with TR/19 2005, using dry vacuum cleaners or a combination of the methods outlined in table 6 in TR/19 to ensure that no traces of dust, dirt or other foreign matter are present in the systems. To facilitate this requirement, provide cleaning access openings and covers in ductwork at intervals such that no point in the ductwork is more than 5 metres from an opening and elsewhere as required by TR/19. The location of the openings shall be selected by the contractor. Confirmation of the acceptability of the solution shall be obtained from a specialist cleaning contractor.

Comply with TR/19 section 7 and DW/172 in relation to kitchen extract systems.

4092 WET METHOD OF CLEANING:

Where specifically scheduled, the method of cleaning in accordance with the HVCA Guide to Good Practice, Cleanliness of Ventilation Systems TR/19 - Wet cleaning, Table 7 shall be used.

The system should be thoroughly dried prior to commissioning/de-commissioning to prevent moisture assisting in the growth of micro-organisms.

A risk assessment must be carried out before any cleaning chemicals or biocides are considered. The details of any such chemicals or biocides must be recorded and any adverse effects of the applied chemicals assessed and determined, with appropriate safe procedures set out in a formal method statement.

Steam cleaning and high pressure waterwash are not recommended for ductwork that is situated above ceilings or in sensitive areas unless carried out in a controlled manner to contain leakage. Procedures to take account of operative safety must be adopted, and should be set out in written form.

Careful consideration should be given to the use of chemicals and/or water for surfaces that are porous e.g. internally-lined ductwork, attenuators, fibre board ductwork, attenuators, fibre board ductwork etc., to prevent permanent damage.

Before applying wet cleaning methods care should be taken that condensed vapours and cleaning fluids can be removed from the ductwork system.

4101 WEATHERPROOFING

Fit ductwork with trimming angle and weather cravat, skirt, flashing plate and cowl where ductwork passes through or terminates in roof, to ensure a weatherproof seal to building structure.

4111 DUCTWORK SLEEVES:

Enclose ducts passing through building elements, (walls, floors, partitions, etc.) within purpose made sleeves. Cut sleeves of the same material as the duct and pack with mineral fibre or similar non-flammable and fire resistant material to form a fire/smoke stop of adequate rating and to prevent air movement and noise transmission between duct and sleeve.

Provide enclosing flanges on either side of wall where ductwork is exposed in rooms. Fix enclosing flanges back to wall to give a neat appearance.

Where finished insulation is carried through duct sleeves pack space between insulation finish and sleeve to form fire stop.

Y30 – Air Ductlines

4121 FIRE RATED DUCTWORK SLEEVES:

Ensure fire rated ductwork sleeves, when required, are installed to the manufacturer's requirements.

4125 EXPANSION AND CONTRACTION

When installing long runs of air ducting, give attention to the direction of expansion or contraction movement due to thermal changes. Take up movement by flexible inserts.

4127 MOVEMENT AND NOISE

Prevent undue ducting movement, with consequent noise, by separating metallic contact surfaces with packing material, and interpose auxiliary flexible joints and anchoring supports along with ducting runs.

4131 INSTALLATION OF CONTROL EQUIPMENT

Fit sensors, damper motors and other control equipment as required. All control equipment should be installed to manufacturers or specialist supplier's requirements. The installation must be checked by the manufacturer or specialist supplier, and rectified as necessary.

4141 INSTRUMENT CONNECTIONS:

Provide instrument connections as necessary.

4151 FIRE PRECAUTIONS:

Install fire dampers, smoke dampers and fire/smoke dampers as necessary to meet the fire compartmentation of the project.

4160 DAMPER ACCESS:

Ensure access is provided to damper mechanisms on fire dampers; smoke dampers; combined smoke and fire dampers; and volume control dampers through access doors, false ceilings etc.

Demonstrate that damper blades close completely.

Demonstrate that fire links can be replaced. Where more than one fire damper is installed in a frame ensure access is provided to all fire dampers.

4171 POSITIONING:

Position components in accordance with manufacturer's instructions as shown on the manufacturer's drawings or specialist supplier's drawings or specialist contractor's drawings as appropriate.

4181 FLEXIBLE DUCTWORK, WIRE LOOP TIES:

Ensure that flexible ductwork does not become kinked or flattened. Support flexible ductwork using wire loop tie supports to prevent sagging.

10000 Based on SPEX Y30 TEXT Nov 06

Y40 – Air Handling Units

1000 GENERAL

Mechanical performance - BS EN 1886 (refer to schedule for casing strength, air leakage thermal transmittance and thermal bridging classifications and general acoustic performance)

General requirements, ratings and performance for units, components and sections – in accordance with BS EN 13053

Fit clean filters in all air handling systems (AHU's and any duct mounted units) before the fans SFPv values are checked. (In accordance with BS EN 13779:2007).

1005 LOCATION:

Supply air handling units suitable for positioning as indicated.

1007 DESIGN DUTIES:

Supply air handling units to meet air volumes and external resistances, as indicated.

1010 AIR LEAKAGE:

Ensure air handling unit is sealed to prevent air leakage at design pressure.

Unless scheduled otherwise the maximum leakage class / rate shall be a function of the air filters within the air handling unit in accordance with BS EN 1886:1998

Determine air leakage in accordance with BS EN 1886: 1998 Table 2 at 400 Pa negative pressure and Table 3 at 700 Pa positive pressure.

Determine air bypass around filter cells in accordance with BS EN 1886. Ensure air leakage rates do not exceed the values given in table 4 of BS EN 1886 at a test pressure of 400Pa.

Provide special requirements as indicated

2000 PRODUCTS/MATERIALS

2021 DOUBLE SKIN CASING AIR HANDLING UNITS:

Outer skin material

Zinc coated steel hot dip galvanized to BS EN 10326, BS EN 10327 or BS EN 10143 and BS EN 10147, or Plastic coated galvanized sheet steel unless otherwise indicated.

Inner skin material

As outer skin

Outer and inner skin material

Construct double skin panels from proprietary building panels.

External casing / frame finish

Painted, three coats, with high quality gloss top coat colour to BS 4800 as indicated, or stove enamelled, unless otherwise indicated. If the manufacturer's proposals differ from this standard then details shall be submitted to the CA for comment prior to manufacture.

Internal casing / frame finish

Painted, three coats, with high quality gloss top coat colour to BS 4800 as indicated, or stove enamelled, unless otherwise indicated. If the manufacturer's proposals differ from this standard then details shall be submitted to the CA for comment prior to manufacture.

2030 AIR HANDLING UNIT CONSTRUCTION:

General construction

Construct unit to withstand maximum fan static pressure without plastic deformation.

Ensure panels do not deflect by more than the values given in table 1 of BS EN 1886 when in operation. Refer to schedule Y40 for class.

Casing Class 1 - 10mm/m maximum relative deflection.

Casing Class 1A - 10mm/m maximum relative deflection and capability to withstand maximum fan pressure.

Casing Class 1B - Capability to withstand maximum fan pressure without permanent deformation no requirements for maximum relative deflection

Casing Class 2 - 4mm/m maximum relative deflection.

Casing Class 2A - 4mm/m maximum relative deflection and capability to withstand

maximum fan pressure

Y40 – Air Handling Units

Use corrosion resistant fastenings throughout.

Do not use self tapping screws.

Provide panel gaskets to give a durable seal between panels and frames to prevent excessive air leakage.

Construct frame to prevent cold bridging and the risk of surface condensation when there are large temperature differences between inside and outside or when the air handling unit is located externally.

Stacking or vertical units

Configuration to be as scheduled. Strengthen framework to support additional weight.

Casing thermal performance

Ensure the casing thermal performance is tested in accordance with the requirements of BS EN 1886.

Thermal transmittance U of the casing shall be classified in accordance with Table 5 of BS EN 1886.

- Refer to schedule Y40 for class required.

Thermal bridging factors kb shall be classified in accordance with Table 6 of BS EN 1886. -Refer to schedule Y40 for class required.

Casing acoustic performance

Ensure that the sound insertion loss of the unit is determined in accordance with BS EN 1886

Casing Insulation

Ensure insulation complies with BS 476 parts 6 & 7. Ensure insulation is fixed securely to panel and protected to prevent migration of fibre into air flow. Insulation shall provide thermal and acoustic treatment. Insulation to be inorganic, vermin proof and non-hygroscopic. Provide insulation to achieve acoustic performance as indicated and meet the requirements of Y50 (ductwork)

Ensure insulation is vapour sealed throughout and incorporate thermal breaks

Framework

Ensure framework is self supporting and rigid enough to prevent distortion during transportation and final assembly on site.

For vertical units strengthen framework to support additional weight

Frame construction shall be welded, rolled or extruded with purpose made corner joints or pentapost type frame with purpose made corner joints.

If frame is welded ensure welds are ground flush and painted with an appropriate protective paint.

Insulate framework if it is considered that there is a risk of surface condensation.

Provide formed or RSC base with unit.

Casing finish to be as clause 2021

2041 AIR HANDLING UNIT ACCESS:

Provide access openings and covers complete with opening devices, and sealed to prevent air leakage.

Ensure seals are designed for normal maintenance operations for a minimum of 10 years.

Provide hinged access doors, 400mm minimum width.

Operating device

Lockable tee bar handles, or levers.

Provide access openings to fans, damper sections, filters, coils, inspection chambers, humidifiers, and additionally as indicated (access openings to humidifiers to have vision panel).

Permanent Access Platforms

Design, supply and install permanent maintenance access platforms for double deck AHU's where top of upper deck is 3m above FFL of general access area, details as scheduled.

Standard - BS ISO 14122-2

Materials – galvanised steel, with open mesh flooring.

2042 LIGHTING

Provide a suitably IP rated bulkhead light (compact fluorescent type) in each of the access and fan sections. Lights to be switched by a switch mounted on the side of the unit.

Provide all wiring as part of AHU package. Wire separately to Fan Motor. Terminate in a terminal box mounted on the unit. Power supply to the lighting shall be provided by the Controls Specialist from separately fused ways in the nearest MCC or distribution board within the plant room.

2050 WALK – IN AIR HANDLING UNITS:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

95/245

07/07

EX000001613/144
EX000001613_0144

Y40 – Air Handling Units

Ensure floor is double skin with internal framework to support weight of two men, tools and equipment.
Provide weatherproof bulkhead luminaries and switches.
Provide non slip floor surface
Ensure access doors can be operated from inside and outside.
Provide walkways in units over 2m high.

2061 EXTERNAL AIR HANDLING UNITS:

Construct air handling units for external use. Ensure casing is sealed with a permanently elastic sealing compound.
Provide weatherproof isolators.
Provide connection for lightning protection.
Provide sealed, pitched roof, extended beyond outer edges of unit case. Arrange unit to shed water from roof in a controlled manner.

3000 ACCESSORIES/COMPONENTS

3011 FAN SECTION:

Generally

Comply with the requirements of Y41 and Y92. Provide fan aerodynamic performance tests in accordance with BS ISO 5801, BS 848-1:2007; noise tests in accordance with BS EN ISO 5136 and Parts 1-4 of BS ISO 13347; fan vibration measurements in accordance with BS ISO 14695 and balancing and vibration measurements in accordance with BS 848-7 and BS ISO 14695.

Provide frame for motor and fan and comply with fire regulations. Ensure frame is isolated from casing.

Mount motor internally (or externally if so indicated).

For blow through units, ensure air flow in downstream sections of unit have relatively uniform velocity profile.

Supply fan guards to BS EN ISO 12100

Accessories

Provide flexible connection between fan discharge and casing spigot. Ensure flexible connections comply with fire regulations.

Provide manometer connections to measure static pressure at fan inlet eye.

Provide manometer connections to measure static pressure at fan discharge, and additionally as indicated.

Anti-Vibration mounts

Provide anti-vibration mounts with a minimum of 25mm static deflection to isolate fan & motor from the casing

Drive

Direct, or belt driven.

Provide belt driven fans with two or more belts. For each belt driven fan provide a change of belts and drives (to be sized after balancing the system). Allow for changing belts and drives and recommissioning fan and rechecking system as necessary.

Fit variable speed drives to all fans rated at more than 1.1kW and as scheduled

3020 FILTER SECTION:

Provide frames to allow withdrawal of filters.

Panel and bag filters shall be replaced with new, after commissioning and before the AHU SFP_v (Specific fan power) is checked for Building Regulations Part L compliance in accordance with BS EN 13779.

Filters shall be constructed such that no harmful fibres are carried out into the airstream.

Panel filters shall be constructed from water resistant materials.

Filters and frames in gas fired units shall be capable of withstanding temperatures that could result following a power failure or air flow failure (ie no run of fan).

3031 HEATER BATTERIES:

Provide slide rails to allow each coil section to be removed independently for access.

Fit baffle plates to prevent air bypass of coil.

The maximum air velocity through coils shall not exceed 4m/s

Rated performance shall be tested in accordance with BS 5141 part 2

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

96/245

07/07

EXO00001613/145
EX000001013_0145

Y40 – Air Handling Units

3032 GAS FIRED HEATING SECTION

Provide gas heater section comprising single or multiple indirect gas fired heaters manufactured with a tubular heat exchanger mounted in a steel support frame. The burner assembly to be complete with gas valve, burner relay, ignition and flame sensing rod, fan control relay, high and low limit thermostat. Unit shall be complete with induced draft combustion air fan. The unit shall be complete with a control panel incorporating all safety features and BMS interfaces as scheduled on the Controls diagrams (CON drawings)

Heaters to be installed within a suitable air handling unit section and include a separate section to contain the gas heater controls, induced draft fan and flue system. The section to be completely sealed from the ventilation air section and be complete with combustion air inlet hood and a lockable hinged access door. A blank panel shall be provided above the access door to accommodate the flue pipe connection. With an external weatherproof air handling unit the blank panel shall also contain flue discharge terminal complete with a mesh safety guard.

Install unit flue and flue connection from unit in accordance with manufacturer's instructions and recommendations.

Install factory-made chimneys to BS EN 1856-1 and BS EN 1859 in accordance with BS 7566-3.

Minimise the number of joints, do not locate joints in depth of floors. Install with any sockets facing upwards.

Fill joints with approved jointing compound to give gas tight seal.

Install non vertical runs at not more than 45° from the vertical.

Materials

Heat exchanger: Aluminised steel for recirculation units

Stainless steel for full fresh air applications

Controls

Modulating capacity control. The heater shall be interlocked with the supply fan to shut down on air flow failure.

Heater bypass air section complete with manual locking damper to be supplied by air handling manufacturer or as part of the heater unit supplied and fitted by the heater manufacturer.

Gas heaters to be commissioned by the heater manufacturer or specialist agent.

Y40 – Air Handling Units

3041 COOLING COIL SECTION:

Provide slide rails to allow each coil section to be removed independently for access.
Water shall not be carried over from the cooler into the airstream.

Incorporate drip trays with drains to both coil and headers.
The maximum air velocity through coils shall not exceed 2.0m/s, if eliminator not provided.
The velocity shall not exceed 2.5m/s with an eliminator fitted.
Rated performance shall be tested in accordance with BS 5141 part 1

3042 PLATE HEAT EXCHANGER:

Minimum effectiveness - 50% (actual energy transferred / maximum possible energy transfer)
Internal leakage < 1%
Limiting pressure drop < 250Pa

3043 THERMAL WHEEL:

Minimum effectiveness - 70% (actual energy transferred / maximum possible energy transfer)
Internal leakage < 5%
Limiting pressure drop < 200Pa

3044 RUN AROUND COILS:

Minimum effectiveness - 45% (actual energy transferred / maximum possible energy transfer)
Internal leakage < 1%
Limiting air side pressure drop across each coil < 100Pa
Limiting water side pressure drop < 25kPa
Rated performance shall be tested in accordance with BS 5141 part 1

3045 DETAIL SPECIFICATION OF COMPONENTS:

For further details of:	Filters	see	Y42
	Coils and heat recovery equipment		Y43
	Humidifiers	Y44	
	Attenuators	Y45	
	Louvres	Y45	and Y46
	Vibration isolation	Y52.	

3051 DRAINAGE FROM AIR HANDLING UNIT COMPONENTS:

Provide drainage pipework from cooling coils, humidifiers and components where water may collect.
Comply with recommendations in CIBSE Technical Memorandum TM13 in connection with Legionnaires' disease. As a minimum
Provide the following;

Drain pans shall be fitted under cooling coils and Humidifier, laid with a minimum fall of 1 in 20 in all directions towards a bottom drain connection. Side drain connections shall not be acceptable.
Drain pans shall be removable for cleaning.
Traps shall be in glass unless otherwise indicated.

A space of not less than 600mm shall be provided on either side of cooling coils and humidifiers to facilitate inspection, cleaning and maintenance.

Removable walkways shall be provided over flooded chambers.
All ferrous metal surfaces shall be treated to prevent corrosion.
Eliminator plates, where provided, shall be withdrawable for cleaning.
No materials which support bacterial growth shall be used in any of these assemblies. Such materials include some jointing compounds, rubber, mastic, wood and some plastics.
On all cooling coils provide drain trap of at least twice working air pressure in depth.

Provide an air break between trap outlet and drainage system. Pipe each trap to drain via a tundish or pipe each trap separately to discharge over a gully to prevent the potential of cross contamination between AHU's.

3055 HUMIDIFIER SECTION:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

98/245

07/07

EXO00001613/147
EX000001013_0147

Y40 – Air Handling Units

Provide humidifier section as indicated.

: Ensure casing is specially treated for moisture.

For vertical air handling units ensure that eliminators and drainage are correctly arranged on humidifiers.

3061 CONTROL DAMPERS:

Provide control dampers in accordance with DW 144 part 7 section 21.

Control damper type

Iris dampers, Multi-leaf dampers, or as otherwise indicated.

Section

Double skin section, unless otherwise indicated.

On large dampers arrange as multiple sections with individual actuators, to ensure correct operation.

Blades

Double sealed opposed blade, unless otherwise indicated.

Ancillaries

Position indicator, Locking device, and as indicated.

Motorized control dampers

Provide control dampers complete with extended spindle, and motor, motor linkage and motor support (details to be agreed with the specialist Controls supplier), unless otherwise indicated.

Ensure damper motors are selected to match torque rating of dampers.

3071 CONTROLS:

Provide control panels where required.

3081 FACTORY INSTALLED ACCESSORIES:

Provide the following in addition to scheduled items

protected wireways for power, lighting and control wiring.

external terminal boxes for all electrical components.

mounting plates for control and sensing devices.

internal access platforms to components above 1.8 metres.

vision panels to humidifier sections and as indicated.

4000 WORKMANSHIP

4011 COMPONENT ASSEMBLY:

Make up air handling units from standard modular components assembled such that air cannot by-pass active components and airflow is even throughout unit.

Assemble air handling units using gasket to prevent air leakage from casing.

Site drilling

Do not carry out any site drilling without prior agreement.

4020 ACCESS:

Ensure air handling units are positioned to allow adequate space for maintenance and access.

4030 HUMIDIFIER INSTALLATION:

Comply with manufacturer's installation instructions for steam electrode type of humidifier.

4040 DUCT CONNECTIONS:

Ensure air is straightened as it leaves unit discharge. Ensure duct work connection is long enough to ensure the aerodynamic performance of the fan is not affected.

4050 SERVICES CONNECTIONS:

Ensure panels are sealed around electrical cable and pipework service entry points to prevent air leakage. Provide flexible cables between fan motor and local isolator.

4060 ISOLATION OF UNITS:

Provide: means of isolating air handling units electrically to allow maintenance and repairs to be carried out.

Y40 – Air Handling Units

means of isolating pipework to air handling units to allow maintenance and repairs to be carried out.

means of isolating steam to humidifier when access door is opened.

4071 DRAINAGE OF FREE WATER:

Make provision for free water to be caught, collected and drained away.

Provide U-traps on all drains having a minimum depth of twice the maximum negative/positive pressure created by the fan. Allow for turbulence in the trap when selecting it.

Provide traps with a facility to allow the "topping up" of dry traps.

4081 SUPPORT AIR HANDLING UNIT

On builders work base, unless otherwise indicated.

4091 FACTORY TESTS:

Carry out tests at the factory as scheduled.

Factory tests can be tests undertaken by the manufacturer on a type basis.

Tests shall be in accordance with BS EN 1886 and BS EN 13053

4101 TESTING PRIOR TO INCORPORATION IN WORKS:

Carry out testing to measure the parameters as scheduled

Tests shall be in accordance with BS EN 1886 and BS EN 13053.

10000 NES Based on version Y40TEXT Sept 08

Y41 – Fans

1000 GENERAL

1005 APPROVED FIRMS:

Select fans from Quality Assured firms registered under CAME scheme, unless otherwise indicated.

1011 DESIGN DUTIES:

Air Volume

Ensure scheduled volume is provided when operating against resistance of system corrected for changes between specified and selected component resistances.

System Resistance

Adjust scheduled resistance to compensate for actual resistance of selected components and any changes made by the contractor to the ductwork layout, quantities and types of bends etc from that indicated on the tender drawings

Operating Point

Select operating point on pressure/volume curve to provide stable and efficient operation. Fans shall be selected to give the lowest possible noise rating having regard to their duty and type.

Guaranteed Performance

Provide fan performance figures in accordance with BS 848 Part 1 and BS 848 Part 9.

Quoted fan duties are based on pressure losses external to the fan unit and on the equipment air side pressure losses as scheduled in Y41sch.

Before ordering the fans, the contractor shall adjust the fan static pressures to suit pressure drops of actual components used in the systems

Adjust fan heads if changes are made to ductwork routing or arrangement in preparation of installation drawings or details.

Quoted fan duties include the following commissioning allowances :-

Low	Pressure Systems	Medium & High Pressure Systems
On Flow Rates	10 %	5%
On Head	20%	15%

Allow for a pulley and belt change on belt driven fans and impeller change or angle adjustment on direct drive fans.

1020 PROTECTION:

Protect casings, impellers and shafts against corrosion. Protect bearings against dirt and moisture.

1061 FAN MOTORS

Comply with reference section Y92 clauses.

1065 FAN MOTOR STARTERS

Incorporated in Controls - reference W60.

Comply with reference section Y72 clauses.

Fit variable speed drives to all fans rated at more than 1.1kW and as scheduled.

2000 PRODUCTS/MATERIALS

2010A OPERATING CONDITIONS, CIBSE NOISE REQUIREMENTS:

Installation arrangement as shown on drawings.

Configuration

Parallel or series operation as shown on drawings.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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Y41 – Fans

Sound Power Level

Select fan, motor, drive and speed control system not to exceed typical fan noise level spectra as given in CIBSE Guide.

Provide sound power data in accordance with BS EN ISO 5136 and parts 1-4 of BS ISO 13347

Select plant that does not have a distinguishable, discrete, continuous noise or give rise to distinct impulses.

Air Density

Relate fan performance to air density 1.20kg/m³.

Temperature Range

Minimum to maximum operating temperatures –5°C to 30°C or as indicated.

2010B POTENTIALLY EXPLOSIVE ATMOSPHERES

Constructional requirements:

The constructional requirements for fans constructed to Group IIG (of explosion groups IIA, IIB and hydrogen) categories 1, 2 and 3, and Group IID categories 2 and 3, intended for use in explosive atmospheres shall be in accordance with BS EN 14986 and BS EN 13463-1.

Ambient atmosphere pressure:

Absolute pressure ranging from 0.8bar to 1.1bar.

Temperature range:

Minimum to maximum operating temperatures of -20°C to 60°C inlet gas temperature, -10% to +20% of nominal gas flow.

2020A CONSTRUCTION AND HANDLING:

Casings

Construct rigid casing free from drumming under operating conditions.

Flange dimensions to BS 848 Part 4

Supply in sections as required for access or handling.

Safety BS

Standards

EN 60335 – 2 - 80

Rotating assemblies

Balance in accordance with BS ISO 1940-1; BS ISO 11342 or BS 7854-1; as appropriate.

Shafts and hubs

Machine impeller bosses and shafts to BS 4500 and key in accordance with BS 4235-1. Hold impeller to shaft with set screw or taper lock fitting.

Shaft bearings - Sealed for life.

Drives and guards

Provide guards over shaft, couplings and rope in accordance with BS EN ISO 121000 and Factory Inspectorate requirements.

Material - galvanized or sheet steel.

Lifting

Provide lifting eyebolts or similar facilities on fans or sections heavier than 20kg.

2031 TESTING:

Provide results of aerodynamic performance tests in accordance with BS 848-1; noise tests in accordance with BS EN ISO 5136 and parts 1-4 of BS ISO 13347

and fan vibration measurements in accordance with BS ISO 14695 and balancing and vibration measurements in accordance with BS 848-7 and BS ISO 14695.

2050A MATERIALS, GALVANISED SHEET STEEL:

Construct casing from galvanized sheet steel in accordance with BS EN ISO 1461, BS EN 10326, BS EN 10327 or BS EN 10143

2060z MOTOR:

Speed

Single, two or variable speed, as indicated.

Standards

Where variable speed drives are fitted to direct drive fans, ensure the drive meets the safety requirements of BS EN 61800-5-1. Comply with Y72 and Y92 clauses

Y41 – Fans

Options:

When fan is handling saturated or corrosive air, provide motor ventilation to clean air,

2065 DRIVE / COMMISSIONING ALLOWANCES:

Direct, or belt driven.

Provide belt driven fans with two or more belts. Belt drives shall comply with BS 3790 : 1995.

For each belt driven fan provide a change of belts and drives (to be sized after balancing the system). Allow for changing belts and drives and recommissioning fan and rechecking system as necessary.

For each direct drive, adjustable pitch, axial fan, allow for a change of pitch angle (to be determined after balancing the system). Allow for recommissioning each system after the fan blade pitch change.

2070A AXIAL FLOW FANS:

Aerodynamic efficiency not less than seventy per cent.

Operation

Single; two in series; or multi-stage contra- rotating as indicated.

Bearings

Provide bearings suitable for mounting and direction of flow as shown on drawings.

Impellers

Fixed pitch; or adjustable pitch as indicated.

Casing - enclosing impeller and motor.

2080A SINGLE INLET SINGLE WIDTH CENTRIFUGAL FANS:

Aerodynamic efficiency

Backward curved type, not less than 75%.

Forward curved type, not less than 65%.

Operation - single.

Impeller Design

Supply fan with impeller to suit operating conditions indicated.

Casing - single inlet single width.

Mounting - channel frame.

Drain

Fit drain connection at lowest point of scroll as indicated.

2080C DOUBLE INLET DOUBLE WIDTH CENTRIFUGAL FANS:

Aerodynamic efficiency

Backward curved type, not less than 75%.

Forward curved type, not less than 65%.

Operation - single.

Impeller Design

Supply fan with impeller to suit operating conditions indicated.

Casing - double inlet double width.

Mounting - channel frame.

Drain

Fit drain connection at lowest point of scroll where as indicated

2090A PROPELLER FANS:

Drives

When motor spindle is extended for mounting blade hub, connect motor to casing, diaphragm plate or mounting ring with support arms.

Impellers

Supply profile blades designed to give uniform airflow.

Mountings

Support fans on plate with circular opening sized and

Located in accordance with fan manufacturer's requirements.

Y41 – Fans

2100A MIXED FLOW FANS:

Operation - single.

Provide bearings suitable for mounting and position indicated on drawings.

2200z CONSTRUCTION OF SMOKE EXTRACT FANS AND NATURAL VENTILATORS (U14 300.021):

Ensure smoke extract fans and ventilators are constructed so that when in use no flames or hot gases are deflected directly onto an adjacent structure.

Ensure materials used in the construction of the smoke extract fans and ventilators do not add to the fire risk of the building, nor contribute to a fire during use.

Construct smoke extract fans and ventilators from material defined in BS 476 Part 4 as non combustible.

Ensure smoke extract fans and ventilators with insulation material, plastic louvres, flaps, sheets or slopes have a Class 1 spread of flame rating when tested in accordance with BS 476 Part 7 and are classified as 'does not readily sustain ignition' to BS 476 Part 12.

Facilities shall comply with BS7346 Part 2 and BS EN 12101-3.

3000 ACCESSORIES

3010 INSPECTION DOORS - AXIAL FANS:

Fit air-tight inspection doors giving access to drive motors and other components requiring regular servicing or maintenance.

3020 INSPECTION DOORS - CENTRIFUGAL FANS:

Fit air-tight doors in scroll and cover.

3030 INSPECTION DOORS - PROPELLER FANS:

For diaphragm mounted fans fit an air-tight inspection door positioned to give access to drive, or other sub-components requiring regular servicing or maintenance.

3040 INSPECTION DOORS - MIXED FLOW FANS:

Fit air-tight doors giving access to drive motors and other components requiring regular servicing or maintenance.

3041 ACCESS PANELS – KITCHEN EXTRACT FANS

Access panels fitted to the casing shall be the full width of the impeller and located to facilitate cleaning and maintenance.

3050A GUARDS:

Provide guards in accordance with BS EN ISO 12100.

Fit safety guards on air inlet and air outlet connections where these are freely accessible to personnel in accordance with BS 848 Part 5.

Provide bird guards unless fans are protected elsewhere (eg by birdguards at louvres).

3060z CONNECTIONS TO DUCT:

Provide flexible connections unless otherwise indicated.

3070A GUIDE VANES - AXIAL FANS:

Supply fan with integral downstream guide vanes. Or guide vane unit fitted upstream, or as otherwise indicated.

3080 GUIDE VANES - CENTRIFUGAL FANS:

Fit automatically controlled inlet guide vanes to inlet of fan.

Provide an actuating device for each set of inlet guide vanes.

3090 GUIDE VANES - MIXED FLOW FANS:

Fit automatically controlled guide vanes.

Y41 – Fans

3100z SHUTTERS:

Fit shutters to prevent reverse flow through fan.
Back draft shutters or motorized shutters as indicated.

3110 AIR FLOW SENSORS:

Fit air flow sensors on twin fan units to sense fan failure and provide automatic changeover to standby fan.

3120 ACCESS:

Provide access via hinged casing or as otherwise indicated.

3141 SPEED CONTROLLER:

Where provided, ensure speed controllers are matched to fans.

3150 STANDBY MOTOR:

Provide standby motor as indicated.

4000 WORKMANSHIP

4010 LOCATION:

Install fans in positions indicated, in accordance with manufacturer's instructions and recommendations in the HEVAC Fan Application Guide.

4020 ATTITUDE:

Mount impeller shaft horizontally unless otherwise indicated.

4030 ALIGNMENT:

Ensure fan is installed aligned to allow optimum air flow path.

4040 TESTING:

Ensure fan is isolated from installation during air leakage testing of ductwork.

4051 DRAIN CONNECTION:

Fit trap to drain connection at lowest point of scroll on centrifugal fans unless otherwise indicated.

10000 NES

Based on SPEX Y41text July 07

Y42 – Air Filtration

1000 GENERAL

1005 DUTY AND PERFORMANCE:

Supply filters to meet duty and performance indicated.

Provide pressure data as initial pressure loss at rated airflow and recommended final pressure loss.

Filters and frames in gas fired air handling units shall be capable of withstanding temperatures that could result following a power failure or air flow failure (ie no run of fan).

Fit clean filters in all air handling systems (AHU's and any duct mounted units) before the SFP value is checked accordance with BS EN 13779:2007.

1010 PRESSURE LOSS DATA:

Provide pressure data as initial pressure loss at rated airflow and recommended final pressure loss.

1020 AIR FLOW THROUGH MEDIA:

Provide filter media surface of area and layout to achieve optimum air velocity through media.

1030 SEALS:

Provide filters with edge seals as appropriate to prevent air by-passing. Ensure seals remain effective after removal and replacement of cells.

2000 PRODUCTS/MATERIALS

2010A CASINGS WITH BOLTS, NUTS AND WASHERS FIXING:

Ensure casings are robust to prevent distortion. Drill steel section end frames for bolts, nuts and washers, and rivets.

2010B CASINGS WITH CAPTIVE NUTS OR TAPPED HOLES FIXING:

Ensure casings are robust to prevent distortion. Drill steel section end frames for captive nuts or tapped holes.

2018 ACCESS:

To be front, side, bottom or top withdrawal, to suit installed position.

2020B FILTER TESTING:

Test filters in accordance with BS 3928 or BS EN 779 or BS EN 1822 as appropriate.

Testing for ignitability to BS 5588 - 9

2040z PANEL FILTERS:

Ensure filter media is retained in frame.

Filter Media

Disposable

Down to 2 microns - glass fibre with scrim.

Down to 5 microns - composite fibre materials.

Filter frames

Water resistant cardboard.

2050A BAG FILTERS:

Ensure media retains its shape during full air-flow conditions.

Material

Provide synthetic or micro-fine glass fibre with reinforced backing mat.

Supply holding frame from material suitable for application complete with sealing gasket

Located in holding frame.

2070A HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTERS:

Standard - BS EN 1822

Filter media - HEPA filter media group H, classification as scheduled.

Filter casing with fitted gasket

Mild steel with corrosion resistant coating or stainless steel.

Job No: Services technical standards

Standard Mechanical & Electrical

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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Y42 – Air Filtration

Filter testing

Test each HEPA cell to BS EN 1822 and mark on a plate/label fixed to filter casing.

2070B ULTRA HIGH EFFICIENCY PARTICULATE AIR (ULPA) FILTERS:

Standard – BS EN 1822

Filter media - Ultra high efficiency filter media ULPA, group U, classification as scheduled.

Filter casing with fitted gasket

Anodised aluminium; wood; or chipboard.

Filter testing

Leak test each ULPA filter to BS EN 1822 using a suitable aerosol particle count scan.

2080A ACTIVATED CARBON FILTERS:

Provide absorbent bed filled with uniform thickness of activated carbon granules constructed to prevent settlement and pin holing.

Media type - disposable or reactivated as indicated.

Casing

Supply casing with removable panels, manufactured from mild steel with epoxy resin finish.

2081 FLAMEPROOF FILTERS

Ensure media is fire resistant to BS 5588 part 9. Ensure washable media complies both before and after wash treatment. Fabricate filter casings to comply with BS 476 Part 4, classified non-combustible.

3000 ACCESSORIES

3010z PRESSURE GAUGE:

Install inclined manometer type differential pressure gauge. Clearly mark scale with positions equivalent to "Filter Dirty" and "Filter Clean" conditions. Connect gauge to duct monitoring with PVC tubing. Fix external to unit to allow easy observation. Mount within 3m of filter. Where remote monitoring of filter condition is to be provided, install pressure differential switch for warning of "Filter Blocked Condition".

3020 FILTER HOUSING:

Provide filter housing to hold banks of filters rigidly in place.

3030A TERMINAL FILTER HOUSING, GASKET SEALS:

Supply terminal filter housing for HEPA and ULPA filters.

Housing seals

Provide gaskets to seal between holding frames on banks of filters.

3030B TERMINAL FILTER HOUSING, STEEL FRAME WITH EPOXY RESIN SEAL:

Supply terminal filter housing for HEPA and ULPA filters.

Housing seals

Seal filter into rigid epoxy resin finished steel casing with hard setting synthetic resin cement.

3040z SAFE CHANGE FILTER CHANGING UNIT:

Supply purpose built unit for changing high efficiency filters in areas where special regulations are enforced.

Material

All welded construction from mild steel with a double two – pack epoxy paint finish suitable for decontamination, or stainless steel, as indicated

3051 SPARES:

Supply spare panel and bag filters for each AHU and duct mounted filter.

3060 CLEANING:

Supply cleaning materials for metal plate filters, supply sufficient cleaning solution for one complete cleansing operation.

Y42 – Air Filtration

- 3071

MOUNTING FRAMES:

Where filter is mounted in walls or partitions, provide, complete with building-in ties and epoxy resin coated mild steel matching frames.
- 4000

WORKMANSHIP
- 4010

LOCATION:

Assemble filter in location indicated.
- 4020A

ACCESS FOR MAINTENANCE:

Provide access for changing filter media.

Provide access for maintenance of motor drive and associated control

Equipment without disturbing filter media.

Provide access for total duct maintenance.
- 10000

NES

Based on version Y42TEXT. 06 - 03/01

Y43 – Heating/ Cooling Coils

1000 GENERAL

2000 PRODUCTS/MATERIALS

2011 HEATING COIL - FROST PROTECTION:

Materials

Tubes

Copper to BS EN 12451, unless otherwise indicated. Cupro-nickel where waste water or sea water is used as the primary medium

Fins

Bare tubes, or purpose made aluminium wide finned coils (min spacing 6 mm, 4-5 fins per inch)

Electro –tinned copper fins to BS EN 187 2 in corrosive environments including coastal locations, swimming pools, airports, inner cities.

Headers

Copper with copper connections, unless otherwise indicated.

Casing

Galvanized sheet steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Casing

Make provision for expansion movement where tube connections pass through casing and seal against leakage. Fit internal baffle plates, as necessary, to prevent air from bypassing tube coils.

Supply coil with headers and bends exposed outside casing, unless otherwise indicated.

Draining and venting

Provide coil complete with venting and draining devices..

Pipe connections

To match pipework, unless otherwise indicated.

Duct connections

To match ductwork, unless otherwise indicated.

Coil Testing

Pressure test coils to a minimum of 1.5 times the design working pressure and provide signed test certificate declaring test results. Base coil design and sizing on performance test figures in accordance with BS 5141 Part 2, heating coils.

Packaging

Fit protection for fins prior to despatch. Protect coils from dirt after manufacture by fitting blank flanges/caps to pipe connections.

2012 HEATING COILS - HEATING WATER:

Materials

Tubes

Copper to BS EN 12451 unless otherwise indicated. Cupro-nickel where waste water or sea water is used as the primary medium

Fins

Aluminium, unless otherwise indicated. Fin spacing not less than 2.5 mm centres.

Electro –tinned copper to BS EN 1872 in corrosive environments including coastal locations, swimming pools, airports, inner cities

Headers

Copper with copper connections, unless otherwise indicated.

Casing

Galvanized sheet steel in accordance BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Casing

Make provision for expansion movement where tube connections pass through casing and seal against leakage. Fit internal baffle plates as necessary to prevent air from bypassing tube coils.

Supply coil with headers and bends exposed outside casing, unless otherwise indicated.

Y43 – Heating/ Cooling Coils

Draining and venting

Provide coil complete with venting and draining devices.

Pipe connections

To match pipework, unless otherwise indicated.

Duct connections

To match ductwork, unless otherwise indicated.

Coil Testing

Pressure test coils to a minimum of 1.5 times design working pressure and provide signed test certificate declaring test results. Base coil design and sizing on performance test figures in accordance with BS 5141 Part 2, heating coils.

Packaging

Fit protection for fins prior to despatch. Protect coils from dirt after manufacture by fitting blank flanges/caps to pipe connections.

2013 HEATING COILS - STEAM: (SPEX 2010I)

Materials

Tubes

Copper-nickel to BS EN 12541, unless otherwise indicated.

Fins

Aluminium, unless otherwise indicated. Fin spacing not less than 2.5 mm centres.

Headers

Copper with copper connections, unless otherwise indicated.

Casing

Galvanized sheet steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Casing

Make provision for expansion movement where tube connections pass through casing and seal against leakage. Fit internal baffle plates as necessary to prevent air from bypassing tube coils.

Supply coil with headers and bends exposed outside casing, unless otherwise indicated.

Pipe connections

To match pipework, unless otherwise indicated.

Duct connections

To match ductwork, unless otherwise indicated.

Coil Testing

Pressure test coils to a minimum of 1.5 times design working pressure and provide signed test certificate declaring test results. Base coil design and sizing on performance test figures in accordance with BS 5141 Part 2, heating coils.

Packaging

Fit protection for fins prior to despatch. Protect coils from dirt after manufacture by fitting blank flanges/caps to pipe connections.

2021 COOLING COILS - REFRIGERANT:

Material

No materials shall be used which could support bacterial growth shall be used.

Tubes and Headers

Solid drawn seamless, refrigeration quality, copper tubes for circuit tubes and distribution pipes. Include copper alloy liquid distributors to equalize refrigerant flow through circuits, unless otherwise indicated.

Fins

Aluminium unless otherwise indicated, where corrosion is not considered a risk.

Electro-tinned copper to BS EN 1872 for coils in corrosive environments including coastal locations, swimming pools, airports, inner cities

Fin spacing not less than 3.0 mm centres.

Casing

Galvanized sheet steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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Y43 – Heating/ Cooling Coils

Casing

Enclose body of coil, headers and bends within insulated casing, unless indicated otherwise.
Where eliminator plates are used these shall be withdrawable for cleaning.

Duct connection

To match ductwork, unless otherwise indicated.

Drip tray

Provide drip tray.

Coil Testing

Pressure test coils and provide signed test certificate declaring test results. Clean coils internally after testing, dehydrate, charge with inert gas and seal.

Packaging

Fit protection for fins prior to despatch.

2022 COOLING COILS - CHILLED WATER:

Materials

No materials shall be used which could support bacterial growth shall be used.

Tubes

Copper, to BS EN 12452 unless otherwise indicated. Cupro-nickel where waste water or sea water is used as the primary medium

Fins

Aluminium unless otherwise indicated, where corrosion is not considered a risk.
Electro –tinned copper to BS 1872 for coils in corrosive environments including coastal locations, swimming pools, airports, inner cities
Fin spacing not less than 3.0 mm centres.

Headers

Copper with copper connections, unless otherwise indicated.

Casing

Galvanized sheet steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Casing

Make provision for expansion movement where tube connections pass through casing and seal against leakage. Fit internal baffle plates as necessary to prevent air from bypassing tube coils.
Enclose body of coil, headers and bends within insulated casing, unless indicated otherwise.
Where eliminator plates are used these shall be withdrawable for cleaning.

Draining and venting

Provide coil complete with venting and draining devices..

Pipe connections

To match pipework, unless otherwise indicated.

Duct connections

To match ductwork, unless otherwise indicated.

Arrangement

Supply fins in vertical plate arrangement for cooling coils.
Supply cooling coil split where indicated.

or As otherwise indicated.

Drip tray

Provide drip tray.

Coil Testing

Pressure test coils to a minimum of 1.5 times design working pressure and provide signed test certificate declaring test results. Base coil design and sizing on performance test figures in accordance with BS 5141 Part 1, cooling coils

Packaging

Fit protection for fins prior to despatch. Protect coils from dirt after manufacture by fitting blank flanges/caps to pipe connections.

Y43 – Heating/ Cooling Coils

2041 HEATER BATTERIES - ELECTRIC:

Type

Air duct heaters, or stab in air heaters, unless otherwise indicated.

Phase

Up to 3kW - single phase.

3kW or greater - three phase - balanced across phases, unless indicated otherwise.

Casing

Material

Galvanized steel sheet, unless otherwise indicated.

Finish

Manufacturers standard unless otherwise indicated.

Heating Elements

Supply fin element mounted on removable terminal plate where required to meet duty.

Terminal Box

Construct terminal box of welded steel. Ensure box is treated to provide IP 42 protection in accordance with BS EN 60529.

Safety Cut-out

Provide bimetal disc type manual reset safety cut-out switch, wired in series or via contactor with heating elements. Provide manual reset facility external to the unit.

Contactors

Provide suitably rated contactors on each step or stage of heater.

Duct connections

To match ductwork

or Suitable for stabbing-in to duct.

or As otherwise indicated.

Air flow switch

Provide air flow detector switch (differential pressure type, unless otherwise indicated) wired in series with other safety devices.

Controls

Provide flow interlock to prevent heater running without airflow, and run-on timer to allow airflow to cool heater before switching off fan, unless otherwise indicated.

2071 RUN-AROUND COILS:

For limiting performance criteria refer to clause Y40 3044

Liquid media

25% solution of ethylene glycol, unless otherwise indicated.

Materials

Tubes

Copper to BS EN 12451, unless otherwise indicated.

Fins

Aluminium unless otherwise indicated, where corrosion is not considered a risk.

Electro-tinned copper to BS 1872 for coils in corrosive environments including coastal locations, swimming pools, airports, inner cities

Fin spacing not less than 2.5 mm centres (3.0 mm if condensing will occur under design conditions).

Y43 – Heating/ Cooling Coils

Headers

Copper with copper connections, unless otherwise indicated.

Casing

Construct casing from galvanized steel. to BS EN 10326, BS EN 10327 or BS EN 10143, unless otherwise indicated.

Casing finish

Manufacturer's standard, unless otherwise indicated.

Make provision for expansion movement where pipe connections pass through casing and seal against leakage. Fit internal baffle plates, to prevent air from by-passing tube coils.

Enclose body of coil, headers and bends within insulated casing, where condensation could occur, otherwise supply coil with headers and bends exposed outside casing.

Draining and venting

Provide coil complete with venting and draining devices.

Pipe connections

To match pipework, unless otherwise indicated.

Duct connections

To match ductwork, unless otherwise indicated.

Coil testing

Pressure test coils to a minimum of 1.5 times design working pressure and provide signed test certificate declaring test results. Base coil design and sizing on performance test figures in accordance with BS 5141 Part 2.

Packaging

Fit protection for fins prior to despatch. Protect coils from dirt after manufacture by fitting blank flanges/caps to pipe connections and enclosing complete units in dustproof containers.

Pump

Install duty and standby, in line, single cased twin centrifugal pumps complete with electric motors, flexible connections or anti-vibration mountings. Install strainer and isolation valve / commissioning station in the pipework. Duty as scheduled.

Support externally from casing on suitable brackets.

or Supply for independent fixing to building structure.

Provide sealed expansion vessel / pressurisation unit as scheduled.

Material

Manufacturer's standard, unless otherwise indicated.

Accessories

Fit a pressure gauge complete with copper alloy gauge cock with lever handle in the pump discharge connection, unless otherwise indicated.

Y43 – Heating/ Cooling Coils

2072 AIR TO AIR PLATE HEAT EXCHANGER:

For limiting performance criteria refer to clause Y40 3042

Standards

BS EN 13053

Units to be performance tested in accordance with BS 308 using the relevant testing protocol of Eurovent and shall be complete with by-pass with a pressure drop across the by-pass the same as the heat exchanger).

Units shall also comply with minimum requirements of ECA Energy Technology Criteria list

Materials

Plates – Aluminium for non corrosive environments, plates to epoxy coated aluminum for units in corrosive environments including coastal locations, swimming pools, airports, inner cities etc.

Seals – Manufacturers std to suit environment

Casing – Galvanised steel or Aluzinc steel for non corrosive environment, stainless steel for corrosive environment.

Ancillaries

Face and by-pass dampers

Stainless steel, full size drain tray

2073 THERMAL WHEEL:

For limiting performance criteria refer to clause Y40 3043

Standards

BS EN 13053

Units to be performance tested in accordance with BS 308 using the relevant testing protocol of Eurovent or ARI Standard 1060-2001. Units to be complete with a purge sector to prevent carry over of extract air to the supply side as the rotor rotates.

Units shall also comply with minimum requirements of ECA Energy Technology Criteria list

Materials

Rotor – Aluminium for non corrosive environments, epoxy coated aluminium for units in corrosive environments including coastal locations, swimming pools, airports, inner cities etc. Where moisture transfer is required rotors to be coated with silica gel.

Seals – Manufacturers std to suit environment

Casing – Aluzinc steel for non corrosive environment, stainless steel for corrosive environment.

Ancillaries

Drive system comprising motor and either constant speed or variable speed drive as scheduled.

3000 ACCESSORIES

3010z DRIP TRAYS:

On all cooling coils incorporate a removable drip tray into base of casing to collect condensate with a minimum fall of 1 in 20 in all directions towards a drain socket provided in the bottom of the tray. Side outlet connections will not be permitted. Extend tray under external header/return bends where these are not insulated/vapour sealed. Extend tray, or provide additional tray where eliminator plates are fitted.

Where coils are over 1200mm high and/or the coil conditions are such that the resulting condensate flows on the lower parts of the coil will compromise its performance or lead to "carry over" provide additional drip trays at 1200mm centre intervals maximum over height of coils, piped in copper or plastic to discharge into base tray.

Fabricate tray in one piece and finish as follows:-

Coat internal surfaces with a fire resistant epoxy resin or alternative water Proofing compound (two coats). Insulate external surfaces, at works, with 12mm minimum thickness slabs and cover with sheet metal.

3020z DRAIN TRAPS:

On all cooling coils provide drain trap of at least twice working air pressure in depth.

Provide an air break between trap outlet and drainage system. Pipe each trap to drain via a tundish or pipe each trap separately to discharge over a gully to prevent the potential of cross contamination between AHU's. Provide a label at each trap to state that it must be checked regularly / kept topped up.

Arrangement

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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114/245

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Y43 – Heating/ Cooling Coils

Ensure traps under suction have outlet lower than inlet by depth equivalent to at least one and a half times working pressure.

Ensure traps under positive pressure have inlet and outlet at same level.

Material: Glass, unless otherwise indicated.

Size: Sufficient to handle flow, 25 mm minimum.

Where freezing could occur traps shall be insulated and trace heated

3030 ELIMINATOR PLATES:

Where carry-over may occur install bank of side withdrawal eliminator plates downstream of coils to prevent carry over of condensate at design air face velocity. Construct plates, in sections if required to suit space available, to permit complete removal independently from coil casing. Ensure material of eliminators is compatible with casing.

3040 MOUNTING FRAME:

On heating coils provide mounting frame for grouting into wall where required.

3050A AHU DUCT CONNECTIONS:

To match air handling unit and specified method of assembly.

3060 MATCHING FLANGES - DUCTWORK:

Provide matching flanges for ductwork connections, to suit coil.

3070 MATCHING FLANGES - PIPEWORK:

Provide matching flanges for pipework connections, to suit coil.

3080 ANTI-FREEZE THERMOSTAT:

Provide antifreeze thermostat where indicated.

3090 AUTO AIR PURGING VALVE:

Provide an auto purging valve, where indicated.

3100z ACCESS SECTION:

Provide access sections, not less than 600mm wide, upstream and downstream of each cooling coil for inspection, cleaning and maintenance.

4000 WORKMANSHIP

4010 POSITION/LOCATION:

Install coils in air distribution system as indicated.

Locate coils in positions where air velocity is substantially equal over face of approach duct.

Arrange steam coils for horizontal air flow.

Ensure equipment, controls and instruments positioned adjacent to heating coils are not adversely affected by thermal radiation.

4020A COOLING COIL CONNECTIONS:

Drain pans shall be fitted under cooling coils laid with a minimum fall of 1 in 20 in all directions towards a bottom drain connection. Side drain connections shall not be acceptable. Drain pans shall be removable for cleaning.

Provide a drain line incorporating a deep seal trap

Arrange pipe connections to take up thermal expansion movement without imposing stress on coil

4020B HEATING COIL CONNECTIONS:

Arrange pipe connections to take up thermal expansion movement without imposing stress on coil.

4030 COIL SUPPORT:

Ensure that coils are fully supported independently of adjacent ductwork.

4040 PROTECTION:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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115/245

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Y43 – Heating/ Cooling Coils

Protect coils from damage and ingress of dirt during the course of contract. Restore fins and other parts of coils to original condition if any damage has occurred. Ensure all connected ductwork is thoroughly clean before removing protection and passing air through system.

4050 EQUIPMENT INSTALLATION:

Install equipment in accordance with manufacturer's recommendations. Ensure maintenance requirements are incorporated.

10000 NES

Based on SPEX Y43TEXT Dec 04

Y44 – Air Treatment

1000 GENERAL

1005 DESIGN DUTIES:

Supply humidifiers and dehumidifiers to meet required duty, with air conditions as indicated. Comply with any specific requirements or limitations. The humidifiers shall comprise all components described in this section of the specification, including duct section / access, drip trays, steam distributors, interconnecting pipework eliminator section, etc.

1010 GENERAL CONSTRUCTION:

Ensure all parts of humidifiers and dehumidifiers in contact with water and steam are manufactured from corrosion resistant material and are suitable for temperature and pressure conditions.
Ensure components in contact are arranged to avoid electro-chemical action between dissimilar metals.
Ensure humidifiers and dehumidifiers discharge uniformly over cross sectional area of air duct casing.

1020 PROTECTION:

Protect all equipment from dirt after manufacture by fitting blank flanges or caps to pipe connections and enclosing complete units in dustproof containers.

1030 STANDARDS

CE marking.
ISO 9002 Certified
Water Supply (Water Fittings Regulations) 1999.
HSC Approved Code of Practice L8 Legionnaires Disease.
CIBSE TM 13:2000 Minimising the risk of Legionnaires' disease

2000 PRODUCTS/MATERIALS

2010A STEAM GENERATOR TYPE WITH ELECTRIC RESISTANCE ELEMENTS:

Supply humidifier to discharge dry steam into air duct through distribution headers using an externally mounted generator.

Steam Generator

Removable electric resistance type elements arranged for indicated number of control steps.
Include separate pilot heater with controlling thermostat, low water level cut-out switch and overload protection for each section of element.
Provide access into generator for cleaning.
Provide connections for cold water inlet, drain and overflow.

Housing

Enclose steam generator, ancillary tanks and pipework, electrical equipment, and wiring within a compartmented housing manufactured from galvanized sheet steel with decorative finish.
Install operating switches and lamps/gauges indicating operating/fault conditions on outside of housing.
Include support points to allow wall mounting.

Steam Distributors

Construct in the form of a slotted sheet metal duct or perforated pipe. Steam pipes shall be installed with a built-in inclination for continuous condensate drainage without the need for a separate condensate return line.

Support

Provide all necessary flanges/cover plates, and brackets for fitting and supporting distributors within air duct casing. For manifolds in excess of 900mm in length provide support at both ends.

Connections

Connect to remote mounted steam generators using flexible steam hose enclosed in braided metal sheath or purpose made sheet metal duct. The hose shall be selected and supplied by the humidifier manufacturer and installed in accordance with the manufacturers instructions.

Casing

Y44 – Air Treatment

	Reinforce to form a rigid watertight structure. Incorporate glands or seals where pipes penetrate casing. Material - stainless steel to BS En 10259 :1997 Internal casing finish - Manufacturer's standard.
Drain	Drain all condensate formed in distribution headers back into generator or to waste via a condensate separator installed at the steam pipe connection to the distributor when condensate cannot return to the unit by gravity
Feed Tank	Include feed water tank with ball float valve. Equalize air pressure between air duct casing and feed water tank. Tank and fittings shall comply with The Water (water Fittings) Regulations 1999.
Controls	Provide all necessary electrical equipment pre-wired within humidifier. Provide facility for BMS monitoring of unit common alarm fault.
Power supply	Refer to W 60 for details of power supply. A mains isolator shall be provided Adjacent to the unit.

2010B STEAM GENERATOR TYPE WITH ELECTRODES:

Supply humidifier to discharge dry steam into air duct through distribution headers using an externally mounted generator.

Steam Generator	Fixed electrodes arranged for indicated number of control steps. Provide access into generator for cleaning. Provide connections for cold water inlet, drain and overflow as indicated.
Housing	Enclose steam generator, ancillary tanks and pipework, electrical equipment, and wiring within a compartmented housing manufactured from galvanized sheet steel with decorative finish. Install operating switches and lamps/gauges indicating operating/fault conditions on outside of housing. Include support points to allow wall mounting.
Steam Distributors	Construct in the form of a slotted sheet metal duct or perforated pipe.
Support	Provide all necessary flanges/cover plates, and brackets for fitting and supporting distributors within air duct casing. For manifolds in excess of 900mm in length provide support at both ends.
Connections	Connect to remote mounted steam generators using flexible plastic hose enclosed in braided metal sheath or purpose made sheet metal duct.
Casing	Reinforce to form a rigid watertight structure. Incorporate glands or seals where pipes penetrate casing. Material - stainless steel. Internal casing finish - Manufacturer's standard.
Drain	Drain all condensate formed in distribution headers back into generator or to waste as shown on drawings.
Feed Tank	Include feed water tank with ball valve complete with backflow prevention device to suit fluid category in accordance with the Water Supply (Water Fittings Regulations) 1999. Equalize air pressure between air duct casing and feed water tank.
Controls	Provide all necessary electrical equipment pre-wired within humidifier. Ensure electrical safety to BS EN 60335-2-88, or BS EN 60335-2-98.

2020A PREFABRICATED MAINS STEAM TYPE:

Supply prefabricated humidifier unit for discharging mains steam into air duct casing in a dry condition. Incorporate steam distributor pipes designed for low sound emission.

Steam Distributors

Construct in the form of a perforated pipe with steam heated jacket.

Y44 – Air Treatment

Provide all necessary flanges and cover plates, brackets for fitting and supporting distributors within air duct casing.

For manifolds in excess of 900mm in length provide support at both ends. Factory Insulate jacket to minimise heat loss to the duct ensuring no particle migration to the air stream will result.

Casing

Reinforce to form a rigid watertight structure.

Material – stainless steel to BS EN10259 :1997

A minimum of 2m of straight duct shall be provided downstream and 900mm upstream of the steam lance.

Drain

Drain all condensate formed within humidifier lance to collection point for removal via steam trap.

Pipe Connections

Provide steam and condensate connections to the humidifier unit (where supplied as a complete unit); to individual components (where supplied for site assembly).

Controls

Control output by means of control valve supplied with humidifier.

Incorporate means of separating condensate and dry steam before discharging to distributor tubes.

2071 EVAPORATIVE HUMIDIFIERS

The evaporative humidification system shall be supplied and installed by the air handling unit manufacturer in accordance with the manufacturers instructions, HSC Approved Code of Practice L8 and CIBSE TM 13:2000 Minimising the risk of Legionnaires' disease

The humidifier manufacturer shall test and commission the system.

The Contractor shall obtain a mains water analysis and the humidifier manufacturer shall include in the packaged humidifier all necessary facilities to enable the system to operate on this water supply without the need for additional water treatment plant.

Supply wetted media pad cassette(s) complete with reservoir/basin with a sloping bottom and a drain point located at the lowest point of the drain pan.

Materials []

Water re-circulation pump with flow regulation valves to cassettes.

Use non-corrosive materials for re-circulation pump.

Provide re-circulation pump motor suitable for operation in an environment saturated with moisture.

Water Connections

Provide backflow prevention arrangement applicable to fluid category as defined in The Water Supply (Water Fittings) Regulations 1999

Provide:

Automatic float operated water filling valve.

Overflow and deconcentration device.

Drain and overflow nozzles.

Use smooth bore mesh reinforced PVC pipework and fittings.

Run the de-concentration drain directly to a point of discharge.

Incorporate a water trap in the de-concentration drain and the emptying drain to prevent the water seal being removed by the negative air pressure within the air handling unit.

Ancillary components

Automatic solenoid valve with constant flow regulator on the incoming water supply.

Automatic drain valve and overflow.

Control the water level within the humidifier pan via a float valve and monitored flow with alarm.

Provide an automatic motorised ball valve operating the drain from the reservoir to ensure the pipework and the reservoir are both fully drained after every humidification operation or every 24 hours, whichever is the sooner.

Incoming and re-circulated water filters.

UV lamps.

Integral droplets separator.

Y44 – Air Treatment

Biocide dosing system.

Rigid wetted media

Material

Incombustible ceramic coated glass fibre material with wetting agents and additives.

Configuration

Corrugated and cross-channel with a horizontal mounted distribution pad.

Casing

Stainless steel frame incorporating a water distribution header with a flow regulator.

Header assembly

Secure the header assembly to the cassette with a safety catch.

Access

Provide a minimum maintenance access of 500mm downstream of the drain pan.

Face velocity

Maximum face velocity across the wetted media 3.5 m/s without a droplet separator.

Maximum face velocity across the wetted media 4m/s with a droplet separator fitted.

Dosing System

Install a dosing system to enable a time controlled dosing of biocides into the humidifier pan.

Components

Suction lance with level switch and dirt filter.

Pump, delivering a constant flow independently of the pressure head.

Nozzle for mounting on the humidifier pan.

Flexes, piping and pipe fasteners ready to assemble.

Alarms and controls.

Conductivity System

Install a conductivity system to allow conductivity controlled bleed-off.

Components

Conductivity transmitter with display of actual value or set point.

Probe with a cable and temperature compensation.

Alarms and controls.

Control panel

Supply a fully programmable control panel (for each humidifier)

Mount control panel on the side of the air-handling unit.

Include the following alarms and control functions:

Humidifier recirculating pump motor protection, pump failure alarm.

Drain valve malfunction alarm.

Reservoir water flow sensor – high water consumption alarm.

Operating hours counter with maintenance alarm.

Automatic draining of reservoir.

Automatic draining of internal supply pipes to headers.

Overflow protection (via flowmeter).

Dosing system timer and dosage control.

Low biocide level indicator.

Low UV intensity alarm.

Conductivity system display of set point and actual value.

High conductivity alarm.

Provide interface with the building management control system.

2072

DESICCANT DE-HUMIDIFIER:

Engage a desiccant dehumidification specialist to design, supply, install, commission and set to work the desiccant dehumidification installation.

Desiccant media

Silica gel.

Electrical supply to BS 7697

Casing

Corrosion resistant coated aluminium profiles or stainless steel sheet metal

Controls

Provide all necessary electrical equipment pre-wired within dehumidifier.

Job No: Services technical standards

Standard Mechanical & El

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

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Y44 – Air Treatment

- Control system
 - Integrated, Microprocessor based.
- Control features
 - Remote control with separate control relay
 - Humidity with alarm and display
 - Control panel with diagnostic display
 - Blocked filter alarm
 - Rotor stopped alarm
 - Low return airflow alarm

3000 ACCESSORIES

3002 ACCESS SECTIONS:

Provide access sections, not less than 600 mm wide, upstream and downstream of each humidifier for inspection, cleaning and maintenance.

3010A ACCESS DOORS:

Provide hinged airtight and watertight access door in casing for maintenance and cleaning purposes. On steam humidifiers, fix to access door an indelibly marked label to read "Isolate Steam supply before opening" in letters at least 25mm high.

3012 DRIP TRAYS:

Incorporate a drip tray into base of casing to collect condensate with a minimum fall of 1 in 20 in all directions towards a drain socket

Provided in the bottom of the tray. (Side outlet connections will not be permitted). Extend tray, or

Provide additional tray, where eliminator plates are fitted.

Fabricate tray in one piece from stainless steel and finish as follows:-

Provide water proofing compound (two coats).

Insulate external surfaces, at works, with 12 mm minimum thickness slabs and cover with sheet metal.

3020z INSPECTION WINDOWS:

Provide double glazed inspection window in casing.

3030 WALKWAYS:

Provide walkway for maintenance access.

3041 LIGHTING:

If mounted within an air handling unit provide bulkhead type luminaire with appropriate IP rating, wired to a switch mounted outside unit.

For duct mounted humidifiers provide a light box mounted externally to illuminate the interior of the humidifier section, wired to a switch mounted outside the unit.

Power supply to the lighting shall be provided by the electrical contractor from a separately fused way in the nearest lighting distribution board

3050 SPREADER PLATE:

A duct mounted perforated inlet plate shall be provided to equalize air velocity over unit section.

3061z ELIMINATOR SECTION:

Include eliminator section adjacent to the casing outlet to prevent water carry-over. Ensure eliminator section is removable. Support blades rigidly at top and bottom with intermediate support.

Blade material

or Stainless steel.

or Rigid polypropylene suitable for working temperatures of 130degC.

Incorporate an, insulated drip tray into the base of casing to collect condensate with a minimum fall of 1 in 20 in all directions towards a drain socket

Provided in the bottom of the tray.

(Side outlet connections will not be permitted.)

Y44 – Air Treatment

Fabricate in one piece and finish as follows:-

Fabricate tray in one piece from stainless steel and finish as follows:-

Provide water proofing compound (two coats).

Insulate external surfaces, at works, with 12mm minimum thickness slabs and cover with sheet metal.

3070 DUCT CONNECTIONS:

To match air handling unit and method of assembly.

or With external flanges drilled for bolting to counter flanges on adjacent plant or ductwork

4000 WORKMANSHIP

4010 POSITION/LOCATION:

Locate humidifier to ensure air velocity is uniform over inlet duct with at least 1.0m of straight outlet duct free of obstructions.

Ensure there are no adverse effect on air heating coils. Ensure no damage or hazard occurs in event of overflow.

4020 ASSEMBLY:

Connect between humidifier components (where not supplied already piped up) in accordance with manufacturer's recommendations.

4030 CONDENSATE CONNECTIONS:

Arrange condensate lines to ensure back pressure does not exceed manufacturer's recommendations.

4034 WATER CONNECTIONS:

On all water fed units provide automatic control & stop valves on cold water connections. Provide

4040 THERMAL EXPANSION:

Arrange pipe connections to take up thermal expansion without imposing stress on humidifiers.

4051 DRAIN CONNECTIONS:

From all humidifier base trays provide drain connections incorporating a glass trap with a seal of depth of at least twice the working static head pressure at that point in the system.

Provide each item with an independent drain, laid to a minimum fall of 1 in 60 with a cleaning eye at each change of direction, discharging with a minimum air gap of 100 mm over a gulley or tundish.

Protect any glass trap installations from damage.

Locate so that it can be back lit with a torch by maintenance staff.

4060 FIXINGS:

Support humidifiers from building structure on zinc coated steel supports, independently of adjacent ductwork.

Provide separate supports for casings (not forming part of an air handling unit) and components mounted outside casings.

4070 EVAPORATIVE HUMIDIFIER INSTALLATION:

Install the humidifier in accordance with the suppliers instructions.

Arrange the pipework to the distribution header and the drain pan in accordance with the manufacturers recommendations to ensure an even distribution of water across the full width of the cassette. Ensure that the distribution pipework drains back into the drain pan and the drain pan empties upon activation of the automatic drain valve. Avoid water traps in supply pipework.

10000 Based on SPEX (NES) Y44 text - March 04

Y45 – Silencers & Acoustic Treatment

1000 GENERAL

1012 DESIGN DUTIES:

Supply equipment to meet dynamic insertion losses or acoustic performance indicated with resistance to air flow as indicated with any specific requirements or limitations as indicated.

Note: Plastic films used to protect infill from moisture or grease ingress may reduce the acoustic performance. Where this method of protection is employed, due allowance shall be made for any loss of performance when selecting equipment to meet the specific insertion loss or acoustic performance.

1020z TESTING:

Manufacturers shall provide certified insertion loss data as defined and derived in tests to BS EN ISO 7235, for each of the eight octave bands.

Generated sound power levels in dB (re 10-12Watts) shall also be provided along with certified insertion loss data for each silencer duty.

Where equipment is manufactured in modules, the performance ratings shall apply to the unit as a whole.

1030z PROTECTION:

Where silencers are to be exposed to external weather conditions, their inner and outer surfaces shall be protected in accordance with the relevant ductwork specification.

Silencers are to be delivered to site with blocked ends to prevent damage.

Provide suitable bracing and restraint, for both transportation and storage, to maintain acoustic and physical integrity.

1040 DIRECTION OF FLOW:

Clearly mark direction of air-flow on silencers.

2000 PRODUCT/MATERIALS:

2010z FIRE PROPERTIES:

Use non-flammable adhesives. Ensure that all insulating materials and coverings are non-combustible material covered with a material that complies with flame spread requirements of BS 476 Part 7, Class 1 or Class 0 as required by Building Control/Fire Officer.

2020z CIRCULAR SILENCERS - CASING TO DW 144:

Provide circular silencers compatible with ductwork installation.

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.

Construct casing to DW144 with external flanges drilled for bolting to counterflanges on adjacent plant or ductwork, or with spigot ends where not connected to ductwork.

Retain infill by perforated galvanized mild steel sheet

Comply with IGE/UP/10 for attenuators in flue dilution systems and BS 6644. Material of construction to be 304 stainless steel.

2030z CIRCULAR SILENCERS - NON-METAL:

Provide circular silencers compatible with ductwork installation.

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.

Provide with external flanges drilled for bolting to counterflanges on adjacent plant or ductwork, or with spigot ends where not connected to ductwork.

2032z 'MELINEX' LININGS TO SPLITTERS AND SILENCERS:

Where a 'Melinex' lining is to be included in front of the infill to prevent product migration or contamination of the infill it shall be greater than 23µm thick.

Full account of the reduction in performance of the silencer brought about by the addition of the lining shall be made when selecting silencers to meet the required performances.

2040z RECTANGULAR SILENCERS - CASING TO DW144:

Provide rectangular silencers compatible with ductwork installation.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

123/245

07/07

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Y45 – Silencers & Acoustic Treatment

Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.
Construct splitters with low loss fairings where required to achieve pressure drop performance.
Construct casing to DW144 with external flanges drilled for bolting to counterflanges on adjacent plant or ductwork, or with spigot ends where not connected to ductwork.
Retain infill by perforated galvanized mild steel sheet
Comply with IGE/UP/10 for attenuators in flue dilution systems and BS 6644. Material of construction to be 304 stainless steel.

2041z ACOUSTIC SPLITTERS:

Fix half width splitter to each side wall or as indicated.
Construct splitters to ensure that infill is retained and individual acoustic integrity is maintained.
Construct splitters with low loss fairings on entry and exit where necessary to meet pressure loss requirements.
Provide additional stiffening on horizontally mounted splitters.
Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.
Retain infill by perforated galvanized mild steel sheet unless otherwise indicated.

2050z RECTANGULAR SILENCERS - NON-METAL:

Provide rectangular silencers compatible with ductwork installation.
Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.
Provide external flanges drilled for bolting to counterflanges on adjacent plant or ductwork, or with spigot ends where not connected to ductwork.
Construct splitters with low loss fairings where required to achieve pressure drop performance.

2051z AIR TRANSFER/CROSS TALK ATTENUATORS:

Provide attenuators for air transfer and cross talk applications where indicated.
Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic, and non-combustible.
Construct splitters with low loss fairings where required to achieve pressure drop performance.
Construct casing to DW144 or compatible with ductwork installation.
Provide external flanges drilled for bolting to counterflanges on adjacent plant or ductwork, or with spigot ends where not connected to ductwork.

2080z ACOUSTIC LININGS, PERFORMANCE TO BS EN ISO 354:

Line internal surfaces of ducts as described in DW 144. Part 7, section 29
Provide lining that is inert, fire proof, inorganic, vermin proof, non-hygroscopic and non-combustible.
Material - polyurethane foam, melinex foam.
Lining to achieve the following minimum random incidence absorption coefficients in accordance with BS EN ISO 354, or as indicated.

Frequency Hz	125	250	500	1k	2k	4k
	0.15	0.25	0.5	0.7	0.8	0.9

Protect lining against product migration and erosion.

2090z ACOUSTIC INSULATION:

Where indicated provide acoustic insulation.
Provide flexible system unless indicated otherwise. Supply with associated acoustic insulation as a factory made composite whenever possible.

Flexible system

Continuous quilted mineral (rock) fibre mat of density not less than 45kg/m^3 or foam at least 50mm thick with sandwich layer of polymeric material, minimum 1mm thick, with minimum mass of 10 kg/m^2 (unless scheduled otherwise elsewhere in the particular specification). Ensure surface finish complies with BS 476 Part 7, Class 1 as a minimum. The polymeric mass layer should be positioned outermost from the sound source and overlapped at all joints. The product must be designed to maintain its original thickness subsequent to installation. The lagging should

Y45 – Silencers & Acoustic Treatment

be cut 25mm oversize and a 25mm strip of the inner resilient element removed to create an overlap. The mass layer must not come in contact with the duct or pipe.

Overlap and seal all joints with adhesive and external reinforcing tape.

Overlap and seal all joints with adhesive and suitable external reinforcing tape.

Particular attention should be paid to support the acoustic lagging at joint locations and where sagging may occur, eg in "soffit" areas.

For circular applications including soil-vent and rain water pipes, ductwork etc, the lagging should be secured in place, either by using integral self adhesive overlap or an alternative method approved by the SO. For vertical installations above 3m additional support should be provided in the form of aluminium bands at 200mm

2140z ACOUSTIC ENCLOSURES:

Construct wall panels, frames and floor panels to meet the performance indicated, from materials suitable for location.

Ensure joints provide adequate seal to meet requirements.

Achieve minimum random incidence absorption coefficients in accordance with BS EN 20354, unless otherwise indicated.

Provide inspection windows where indicated.

Supply cable access floor panels where indicated.

3000 WORKMANSHIP

3010 GENERAL:

Install acoustic treatment equipment in positions indicated, in accordance with manufacturers instructions.

3020 ACOUSTIC ENCLOSURES:

Ensure that erection is carried out by enclosure manufacturer.

3030 ACCESS TO ACOUSTIC ENCLOSURES:

Provide door type openings in enclosures as required for access to items enclosed.

Provide openings for inlet and discharge ductwork and for connections as indicated.

Provide angle flange connections for mating to ductwork and equipment.

3040 SUPPORTS:

Supply steel section supporting frames or brackets where silencers are fixed to the walls of air chambers.

3050 ACOUSTIC LININGS:

Where personnel access is provided, protect acoustic linings to prevent damage.

3060z SOUND PRESSURE LEVEL READINGS:

Measure sound pressure levels at the positions indicated using

Equipment in accordance with IEC 179. All measurements to be carried out in accordance with the Association of Noise Consultant's Guidelines document, "Part 1. Noise from Building Services"

3070z SOUND INSULATION MEASUREMENTS:

Measure sound insulation of building elements in accordance with the relevant parts of BS EN ISO 140 Parts 4, 7 and 14 as appropriate.

10000 NES

Based on version SPEX Y45 text March 08

Y46 – Grilles/ Diffusers/ Louvres

1000 GENERAL

1011 PERFORMANCE:

Air Supply

Ensure air velocity at occupancy level is not greater than 0.25 m/s.

Blades

Supply grilles and diffusers with blade profile to ensure correct aerodynamic performance and minimal noise generation.

Louvres

Ensure air velocities through face area of louvres minimizes 'carry-over' of rain, snow or other precipitation into ducts, shafts or plant rooms.

1020z SIZE / FIXINGS GENERALLY

All sizes indicated are 'nominal'. Provide site dimensions of all louvres, diffusers and grilles before manufacture. Ensure integration and co-ordination with ceiling details, other drawings and with ceiling grid site setting out as indicated on the architects drawings.

1030 NOISE LEVELS:

Ensure sound power levels or room NR / NC levels indicated are not exceeded. Ensure accessories for grilles and diffusers have low noise generation characteristics, and cause minimum disturbance to airflow.

1041 ELECTRICAL BONDING TERMINAL:

Ensure an electrical bonding terminal suitable for connection of 6 mm² maximum conductor is provided on all metal grilles, diffusers and louvres.

1050 PROTECTIVE WRAPPING:

Apply protective wrapping to exposed architectural finishes prior to despatch to site.

1060 TESTING:

Provide air terminal devices tested in accordance with BS 4773 section 1.1, BS EN ISO 5135. and BS EN 13030 for louvres.

2000 PRODUCTS/MATERIALS

2009 MOUNTING:

Grilles

Flanged screw fixings - Used on the following grille types: fixed blade, adjustable blade, egg crate, non-vision

Concealed fixings - Used on the following grille types: mesh, linear unless otherwise indicated

Diffusers

Flanged screw fixings - Used on the following diffuser types: punkah louver

Hidden screw fixing - Used on the following diffuser types: circular, linear, straight line fixed louver

Rear suspension brackets - Used on the following diffuser types: perforated face, adjustable curved blade, straight line fixed louver, high induction, laminar flow panel

Internal concealed fixings - Used on the following diffuser types: linear lighting/ air module, straight line fixed louver

Hidden bayonet fixing - Used on the following diffuser types: extract/exhaust valve unless otherwise indicated

Louvres

Side screw fixings.

or Rear angles or cleats.

or As otherwise indicated.

2010A GRILLES - FIXED BLADE TYPE:

Secure blades within flanged mounting frame or core collar.

Provide support mullions to ensure blade stability.

Y46 – Grilles/ Diffusers/ Louvres

Style, blade rows and air pattern control as indicated on schedule or drawings.
Fix blades at an angle to the horizontal

2020A GRILLES - ADJUSTABLE BLADE TYPE:

Pivot blades within flanged mounting frame and retain blades in set position by tensioners external to the airstream.
Allow each blade in a row of blades to be individually adjustable.

2030A GRILLES - MESH TYPE:

Core material
Cellular, expanded or perforated as indicated on schedule or drawings.
Frame
Flange mounting frame or plate flange as indicated on schedule or drawings.
Fixing
Permanently fixed or designed for easy removal, as indicated.

2040z GRILLES - EGG-CRATE TYPE:

Core material - Aluminium or plastic or as otherwise indicated.
Style – With frame or as otherwise indicated.

2050 GRILLES - LINEAR TYPE:

Supply linear type grilles with one row of parallel blades. Secure blades within mounting frame or opening. Permanently set at angle indicated.

2060A GRILLES - LINEAR FLOOR TYPE:

Supply linear type floor grilles with one row of parallel blades. Permanently set at angle indicated.
Incorporate bar reinforcement.
Loading
Pedestrian or computer room to special requirements as indicated.

2070A GRILLES - SIGHTPROOF NON-VISION TYPE:

Supply sightproof non-vision grilles with one set of blades.
Fix within a flanged mounting frame or a core box unless otherwise indicated.

2070B GRILLES - LIGHTPROOF NON-VISION TYPE:

Supply lightproof non-vision grilles with two sets of blades.
Fix within a flanged mounting frame or a core box unless otherwise indicated.

2080A CONE TYPE CIRCULAR DIFFUSERS:

Supply circular diffusers manufactured to ensure rigid and smooth outer cone or frame, and inner assembly.
Space all cones to ensure even distribution of air flow with minimum resistance and noise, and to allow easy cleaning.
Cone type
Fixed or adjustable deflection cone type as indicated.

2080B PAN TYPE CIRCULAR DIFFUSERS:

Supply circular diffusers manufactured to ensure rigid and smooth outer cone or frame, and inner assembly.
Pan type
Fixed or adjustable pan type as indicated.

2080C CIRCULAR DIFFUSERS - CORE ADJUSTMENT:

Provide core adjustment to obtain required air distribution pattern. Allow inner assembly to move vertically by vertical sliding action or rotation as indicated.

Y46 – Grilles/ Diffusers/ Louvres

2090A DIFFUSERS - LINEAR TYPE:

Supply single unit or continuous length linear diffusers manufactured with one or more rigid and smooth line slot units with parallel bars and partitions. Fit closing caps at ends of single or multiple continuous length units.

Provide continuous lengths complete with locating pins strips with keys to ensure correct alignment of abutted ends.

Air Controller - Fit each slot with device indicated.

2100 DIFFUSERS - PERFORATED FACE TYPE:

Supply perforated face diffusers with rigid and smooth inlet spigot expanded to butt and seal against easily removable framed perforated front panel. Incorporate back deflectors above front panel, set to give required performance.

Supply type and profile of framed perforated front panel to mount flush with surrounding false ceiling panels.

2110A ADJUSTABLE CURVED BLADE DIFFUSER:

Supply diffusers manufactured from curved cross sectional profile parallel blades pivoted at each end within flanged mounting frame. Ensure that each blade is individually adjustable to give directional control of airstream. Retain blades in set position by tensioners external to airstream.

Control ways as indicated on drawings or schedules.

2120A ADJUSTABLE CURVED BLADE DIFFUSER WITH REMOVABLE INNER CORE:

Supply diffusers manufactured from curved cross sectional profile parallel blades within removable core frame and include integral multi-blade volume control at each blade set. Ensure assembly is removable from flanged mounting frame. Make provision for volume control adjustment by loose key.

Ensure that each blade within core is individually adjustable, and that each core is designed to give directional control of airstream through each 90° angle.

Control ways as indicated on drawings or schedules.

2130A STRAIGHT LINE, FIXED LOUVRE DIFFUSER WITH FIXED CORE:

Supply diffusers manufactured from louvre type parallel blades permanently set and securely fixed within frame.

Pre-set each blade to give directional control of airstream.

Control ways as indicated on drawings or schedules.

2130B STRAIGHT LINE, FIXED LOUVRE DIFFUSER WITH REMOVABLE CORE:

Supply diffusers manufactured from louvre type parallel blades permanently set and securely fixed within frame.

Supply core frames which are easily removable from flanged mounting frame.

Pre-set each blade to give directional control of airstream.

Control ways as indicated on drawings or schedules.

2140A SPHERICAL PUNKAH LOUVRE DIFFUSERS:

Supply diffusers manufactured with adjustable core.

Supply core in the form of a rotatable sphere with circular outlet nozzle, the whole retained by a flanged cup allowing manual change of discharge air pattern to give an adjustable high velocity jet, full diffusion, or complete shut-off.

Incorporate tapped ring for duct mounting, complete with felt, foam rubber or plastic sealing ring and fixing bolts or screws. When connecting to ends of flexible ducting, fit rigid flanged extension collar.

2140B DRUM PUNKAH LOUVRE DIFFUSERS:

Supply diffusers manufactured with adjustable core.

Supply core in the form of a rotatable cylinder with a rectangular outlet nozzle, the whole retained by a flanged frame allowing manual change of discharge air pattern to give an adjustable high velocity jet or full diffusion, by adjustable integral vertical blades.

Y46 – Grilles/ Diffusers/ Louvres

Incorporate tapped ring for duct mounting, complete with felt, foam rubber or plastic sealing ring and fixing bolts or screws. When connecting to ends of flexible ducting, fit rigid flanged extension collar.

2150 DIFFUSERS - LINEAR LIGHTING/AIR MODULAR TYPE:

Supply diffusers complete with connecting unit for installation behind module flanges, ensuring neat and unobtrusive appearance.

Fit plenum box with integral independent air volume regulating vanes to direct an equal air velocity along complete length of connecting air diffuser slot. Ensure easy access from below to regulating vanes.

Retain vanes in set position by tensioners external to air stream.

Fit spigot, suitable for flexible ducting joint connection to plenum box.

Ensure that supports are independent, and do not depend upon module casing or flanges.

2160 LAMINAR FLOW PANELS:

Supply laminar flow panels each with a large perforated face plate complete with rear plenum box or spigot entry.

2170A HIGH INDUCTION DIFFUSERS, SECONDARY AIR INDUCTION:

Supply high induction diffusers fixed or variable geometry using secondary air induction into diffuser housing.

2170B HIGH INDUCTION DIFFUSERS, TURBULENCE/ROTARY MOTION:

Supply high induction diffusers fixed or variable geometry using high levels of turbulence or rotary motion in discharge air pattern to accelerate mixing.

2180 DIFFUSERS - EXTRACT/EXHAUST VALVE TYPE:

Supply diffusers incorporating intake ring and adjustable valve disc assembly.

Provide bayonet type fixing for purpose made mounting ring with plastic foam sealing gasket.

Provide setting template.

Adjust valve to required setting and lock valve in required position.

2190A LOUVRES - EXTERNAL AIR SUPPLY/EXTRACT TYPE:

Performance

Ensure louvre withstands specified wind loads and prevent ingress of rain. (test in accordance with BS EN 13030)

Construction

Construct louvre frame and aerodynamically profiled louvre blades from galvanized mild steel or aluminium.

Provide integral drainage channels.

Retain infill on louvre blades by perforated sheet of galvanized mild steel or aluminium.

Screen

Fit a bird-screen using mesh no coarser than 12mm, across inside face of louvres.

Fit an insect-screen using mesh no coarser than 3mm, across inside face of louvres as indicated

Quality assurance

Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce louvre to relevant Quality Assessment schedule.

2200 LOUVRES/SCREEN WALLING:

Supply louvres/screens designed to withstand design wind loads and minimise rain penetration. Construct with mullions into which blades are fitted and provide blades with aerodynamic profiles and integral drainage channels. Mount assembly within frame. Ensure louvre system is integrated with weather louvres and incorporates doors with concealed hinges and frames. Where necessary provide mitred corners and slope louvres.

Ensure adequate space for access and maintenance of louvres and associated equipment is provided.

Screen

Fit a bird-screen using mesh no coarser than 12mm, across inside face of louvres.

Fit an insect-screen using mesh no coarser than 3mm, across inside face of louvers as indicated

Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce louvre to relevant Quality Assessment schedule.

Y46 – Grilles/ Diffusers/ Louvres

2210A GALVANISED STEEL:

Galvanize steel in accordance with BS EN 10326, BS EN 10327 or BS EN 10143 and

2210B ALUMINIUM:

Use aluminium sheet/extruded aluminium produced to BS EN 485, BS EN 515, and BS EN 573 or BS EN 755

2220A GRILLE AND DIFFUSER CONSTRUCTION:

Ensure grilles and diffusers are robust and mounting frame flanges on square and rectangular terminals have mitred corners. Fit a rubber or plastic foam sealing strip or gasket to rear face of flange.

Diffusers

Ensure face of diffuser outer cone or frame is completely smooth.

Finish

Powder coat finish to an RAL colour specified as indicated or specified by the Architect.

2230A LOUVRE CONSTRUCTION:

Ensure louvres are robust. Incorporate in purpose made sub-frame. Provide drip cills.

2252 ACOUSTIC LOUVRES:

Performance

Provide acoustic louvres as indicated, to meet performance indicated when producing a static pressure loss within that scheduled for the specified air flow.

Provide certified acoustic performance data measured in accordance with BS EN ISO 140-3 (BS 2750 Part 3).

Ensure louvre withstands specified wind loads and prevents ingress of rain.

Construction

Construct louvre frame and aerodynamically profiled louvre blades from
galvanized mild steel.

or aluminium.

or as otherwise indicated.

Provide integral drainage channels.

Provide acoustic infill which is inert, fire proof, inorganic, vermin proof and non-hydroscopic.

Retain infill on louvre blades by perforated sheet of
galvanized mild steel.

or aluminium.

or as otherwise indicated.

Arrangement

In breakdown form for site assembly.

or In modular panel form.

or For assembly on site to form an enclosure complete with roof and door.

or As otherwise indicated.

Screen

Fit a bird-screen using mesh no coarser than 12mm, across inside face of louvres.

Fit an insect-screen using mesh no coarser than 3mm, across inside face of louvers as indicated.

Quality assurance

Ensure manufacturers are a firm of Assessed Capability to BS 5750 Part 1 and produce louvre to relevant Quality Assessment schedule.

3000 ACCESSORIES

3010A OPPOSED BLADE VOLUME CONTROL DAMPERS :

Balance and tension operating mechanisms to give positive setting for blade positions from fully open to fully closed.

Local blade operation

Supply device for operating the damper blades through face or side of grille/diffuser as indicated.

Job No: Services technical standards

Standard Mechanical & El

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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AECOM

07/07

Y46/130

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Y46 – Grilles/ Diffusers/ Louvres

Remote blade operation
Supply and install proprietary remote control unit with all necessary brackets and linkage at the control unit. Provide label at the control unit to indicate function.

3040A BUTTERFLY VOLUME CONTROL DAMPERS:

Operate via a simple hooked wire key connecting with a lug on the underside of each plate; or by a loose key locating into a control mechanism.

3051 'IRIS' TYPE VOLUME CONTROL DAMPERS:

When in fully open setting ensure that unit inside diameter is equal to full internal diameter of air diffuser spigot, or ducting branch connection.

Operation

By loose key, unless otherwise indicated.

3060A FIXED AIR FLOW DEFLECTORS:

Direct airstream evenly from main ducting into branches or spigots serving air grilles and diffusers by using a number of equally spaced curved blades linked together.

3060B ADJUSTABLE AIR FLOW DEFLECTORS:

Direct airstream evenly from main ducting into branches or spigots serving air grilles and diffusers by using a number of equally spaced curved blades linked together.

3070 BLANKING PLATES:

Supply blanking plates to restrict projection of air flow from a particular section of grille or diffuser. Ensure that indicated dimensions or angles in degrees are maintained.

3080 PERFORATED BAFFLE PLATES:

Cover full width or depth of plenum box and extend beyond each side of air inlet to ensure even air distribution. Position centrally relative to plenum box air inlet.

3090 PERFORATED SCREENS:

Fit perforated screens behind grille volume control devices to equalize air flow and pressure. Contain perforated sheet within rigid surrounding frame, incorporating fixing brackets or lugs.

3100 CEILING OR WALL MOUNTED PLENUM BOXES:

Supply single plenum box or series of plenum boxes butted together to form continuous length, as indicated. Ensure sturdy and rigid construction with circular inlet spigots 65mm minimum length. Incorporate at least four drilled angle brackets, or flat bar lugs, for securing to, or suspension by rods or wires from building or other construction.

3110 FLOOR MOUNTED PLENUM BOXES:

Supply single plenum box or series of plenum boxes butted together to form continuous length, as indicated. Ensure sturdy and rigid construction with circular inlet spigots 65 mm minimum length. Ensure box base material and reinforcement is able to withstand pressures of concrete handling and pouring when casting into floor slab.

Incorporate at least four drilled angle brackets, for fixing to slab soffit, or building ragged ties when casting into a floor slab.

3120A HINGED LOUVRE ACCESS PANELS AND DOORS:

Incorporate purpose made access panels or doors within body of louvres, manufactured from compatible materials.

Use hinged access panels or doors of single or double style and with front or rear locking facilities.

3130z SPARES:

Supply 5 loose keys, suitable for adjusting each size and type of grille, or operating accessories.

Y46 – Grilles/ Diffusers/ Louvres

4000 WORKMANSHIP

4010 GRILLE/DIFFUSER LOCATION:

Fit at terminal air supply, extract and transfer points indicated, in accordance with the HEVAC Air Diffusion Guide.

4020 LOUVRE LOCATION:

Fit at system main air intake and discharge points, as indicated.

4030 ACCESSORIES:

Supply all grilles, diffusers etc with OBDs unless indicated otherwise. Fit other accessories to each grille and diffuser in accordance with manufacturer's instructions and as indicated.

4040 CONNECTION TO DUCTWORK:

When connecting directly to duct spigot, secure grille mounting frame or flange with screws, or bolts and nuts, to returned flange, with filled in corners, at end of duct spigot.

4050z INSTALLATION IN BUILDERSWORK:

Ensure outer edge of grille mounting frame or flange extends on all sides beyond the joint between any builders work frame and surrounding building construction.

Ensure grilles are sealed to building fabric - including ceilings, to prevent air leakage from pressurized rooms to voids above.

Fix louvres to building fabric using

Face flange.

or Building in lugs.

or Rear studs.

or Masonry frame - supply only for fixing by others.

or As otherwise indicated.

4060A TRANSFER GRILLES:

Where transfer points are located in partitions or walls, prevent through vision by fitting a fixed blade grille on both faces of partition or wall. Connect cavity wall or partition transfer grille assemblies with ducting sleeve or collar extending between grilles.

4060B TRANSFER GRILLES WITH FIRE DAMPER:

Where transfer points are located in partitions or walls, prevent through vision by fitting a fixed blade grille on both faces of partition or wall. Connect cavity wall or partition transfer grille assemblies with ducting sleeve or collar extending between grilles.

Incorporate fire damper in fire compartment wall transfer grille assembly.

4070 FIXING:

Provide details of fixing method for approval.

10000 BASED ON SPEX Y46 March 05

Y50 – Thermal Insulation

1000 GENERAL

1010 TEMPERATURE RANGE:

Surface temperature within range –40°C to 230°C.

1021 STANDARDS:

All thermal insulation and methods of application shall comply with the requirements of the current version of British Standards, Codes of Practice Building Regulations including but not limited to:-

BS 476, BS 2972, BS EN 131616, BS 3958, BS 5422, BS 5588: Part 9, BS 5608, BS 5970, BS 7572, BS EN 13941 and BS EN ISO 12241

Building Regulations Part L Approved Documents 2006 and the following 2nd tier documents: Non domestic heating, cooling and ventilation compliance guide;

Domestic heating compliance guide;

TIMSA HVAC compliance guide.

Description of terms as BS3533.

1031 MATERIALS:

All insulation materials, adhesives and finishes shall be in compliance with BS 476: Part 4, non-combustion test; or obtain a Class 'O' fire rating to Building Regulations to BS 476: Parts 6 and 7 and shall not be flammable or support combustion.

Ensure metals and materials that cause galvanic corrosion are not installed in contact. Do not use galvanised or zinc coated steel jacketing and accessories on austenitic stainless steel or nickel steel/alloy equipment and piping.

All insulation materials shall be:-

- Inherently proof against rotting, mould and fungal growth and attack by vermin.
- Non-hygroscopic and in all respects be suitable for continuous use throughout the range of operating temperatures and within the environment indicated.
- Wholly compatible with the material it is insulating at the design working temperature and environmental conditions.
- Free from chemicals which may contribute to corrosion or degradation of the insulated surface or finish.
- Comply with the Health & Safety at Work Act and COSHH Regulations and be non carcinogenic.
- Asbestos Free. (Where any work is carried out on existing thermal insulation material or finish which contains asbestos in any form, attention is drawn to responsibilities under the provisions of the Asbestos Regulations 1969).
- First class quality new materials delivered to site fully dried out and housed in dry store until ready for use.

For all mineral wool insulation products, test evidence must be available showing that the fibres from which the products are made are not classified as a possible human carcinogen, as detailed by European Directive 97/69/EC and the Approved Supply List of CHIP98

1036 EUROPEAN CLASSIFICATION FOR REACTION TO FIRE PERFORMANCE:

Where applicable supply insulating materials that comply with Euroclass A1, A2, B or C.

1041 CFC'S / HCFC / HFC's:

Ensure all thermal insulants for the use in building services (including insulated pipe / duct supports) are made using materials with zero ozone depletion potential and a GWP of less than 5 (CFC, HCFC & HFC free).

1045 CONTROL OF FIBRE MIGRATION:

Ensure all mineral wool type materials are fully wrapped with foil cover and sealed with tape to stop fibre migration.

1051 SPREAD OF FLAME, BS 476 PART 7, CLASS 1:

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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AECOM

07/07

Y50/133

EX000001613/182
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Y50 – Thermal Insulation

When completed, ensure surface-finish complies with BS 476 Part 7 Class 1 spread of flame, unless otherwise indicated.

1052 PRE-INSULATED PIPELINES AND AIR DUCTLINES:

In locations where insulation cannot be installed after erection of pipelines or air ductlines pre-insulated sections shall be installed. Insulation to such sections shall be equivalent in thermal and physical properties to that specified for the remainder of the system. Where vapour barriers are provided their integrity shall be maintained over the pre-insulated sections and the junctions to the remainder of the system.

1060 PRE-INSULATED EQUIPMENT:

Where fire and surface spread of flame certificates relate to factory made products, ensure that certificates are still valid where products are incorporated in pre-insulated equipment.

1070 PROTECTION APPLIED IN SITU:

Where fire and surface spread of flame certificates relate to factory made products, ensure that the certificate remains valid when the finish is site applied.

1081 ELECTRICAL BONDING:

Ensure an electrical bonding connection of 6-mm² conductor is provided where required to maintain electrical continuity.

1091 INSPECTION AND TESTING:

Where indicated arrange performance test of thermal conductivity on materials selected, carried out at manufacturer's works or at an approved laboratory and in accordance with appropriate British Standard. Installed insulation shall be tested for thickness and compliance with specification. Allow for making good any sections cut during inspection.

2000 PRODUCTS/MATERIALS

2010 THERMAL CONDUCTIVITY:

Ensure values are in accordance with and BS 2972, BS EN 12667, BS EN 12939 or BS EN ISO 8990.

2016 THERMAL PERFORMANCE LIFE EXPECTANCY

Ensure the insulation will maintain its thermal performance for a minimum of the plant design life and provide manufacturers details which define the life expectancy of the insulation material. The "k" value of the insulation should also be quoted at both manufactured and aged value.

2021 RESTRICTIONS ON USE OF MATERIAL:

Protect insulated stainless steel surfaces from the risk of stress corrosion in accordance with the recommendations in BS 5970.

Do not install insulants with man made mineral fibres in food preparation areas or aseptic areas.

For all mineral wool insulation products, test evidence must be available showing that the fibres from which the products are made are not classified as a possible human carcinogen, as detailed by European Directive 97/69/EC and the Approved Supply List of CHIP98

2030 MINERAL FIBRE PIPE INSULATION:

Standard - BS 3958 Part 4

Nominal density - 120 kg/m³

Thickness 20mm to 100mm

Thermal conductivity

Not exceeding 0.037 W/mK at a mean temperature of 50°C

Finish

Reinforced aluminium foil with at least 25mm overlap.

2040 MINERAL FIBRE RIGID DUCT INSULATION:

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/134

EXO00001613/183
EX000001013_0103

Y50 – Thermal Insulation

Standard - BS 3958 Part 5.
Nominal density - 45 - 48 kg/m³
Thickness - 25mm to 100mm.
Thermal conductivity
not exceeding 0.04 W/mK at a mean temperature of 50°C
Finish
Reinforced aluminium foil

2050 MINERAL FIBRE FLEXIBLE DUCT INSTALLATION:

Nominal density - 45 kg/m³
Thickness - 25mm to 60mm
Thermal conductivity
Not exceeding 0.04 W/mK at a mean temperature of 50°C
Finish
Reinforced aluminium foil

2060 MINERAL FIBRE LAMELLA DUCT INSULATION:

Nominal density - 45 kg/m³.
Thickness - 25mm to 80mm.
Thermal conductivity
Not exceeding 0.043 W/mK at a mean temperature of 50°C
Finish
Reinforced aluminium foil.

2111 CLOSED CELL RIGID PHENOLIC FOAM (PF) PREFORMED SECTIONS - CFC AND HCFC FREE:

Standard - BS EN 13166. Nominal density - 35 - 40 kg/m³.
Temperature range - -180° to +120°C.
Thickness - 15mm to 50mm.
Thermal conductivity
Not exceeding 0.021 W/mK at a mean temperature of 10°C
Finish
Reinforced aluminium foil
The thermal conductivity value is to be the long term figure allowing for any "offgassing" of the blowing agent.
All phenolic foam sections shall have a passivating coating to the internal bore.

2121 CLOSED CELL RIGID LAMINATED PHENOLIC FOAM (PF), DUCT INSULATION SLAB - CFC AND HCFC FREE:

Standard - BS EN 13166. Nominal density - 40 kg/m³.
Thickness - 20mm - 50mm
Thermal conductivity
Not exceeding 0.021 W/mK at a mean temperature of 10°C
The thermal conductivity value is to be the long term figure allowing for any "offgassing" of the blowing agent.

2131 HIGH DENSITY PHENOLIC PIPE AND DUCT SUPPORT FOAM - CFC AND HCFC FREE

Standard - BS EN 13166
Nominal density - 80 kg/m³ to 120 kg/m³.
Temperature range - -180°C to +120°C.
Thermal conductivity
Not exceeding 0.040 W/mK at a mean temperature of 50°C.
The thermal conductivity value is to be the long term figure allowing for any "offgassing" of the blowing agent.

2140 CLOSED CELL NITRILE RUBBER ELASTOMERIC SHEET AND PREFORMED FLEXIBLE SECTIONS CFC/HCFC FREE AND ZERO ODP/GWP:

Nominal density - 50 - 80 kg/m³.

Y50 – Thermal Insulation

Temperature range - - 50°C to +105°C

Thickness

Sections

6mm to 32mm for pipe sizes 6mm to 140mm.

Sheets - 6mm to 32mm.

Thermal conductivity

Not exceeding 0.036 W/mK at a mean temperature of 20°C.

2171 VAPOUR BARRIER PERMEANCE:

Do not exceed the following permeance values for vapour barriers.

Permeance values

Cold water pipework - 0.05g/sMN.

Chilled water pipework and cooled air ductwork - 0.015g/sMN.

Refrigeration pipework - 0.0010g/sMN.

2185 ACOUSTIC INSULATION:

Where indicated provide acoustic insulation.

Refer to Y45 clause 2090z for technical details and schedule Y45sch for locations / systems.

2190 ADHESIVES

Comply with the recommendations of clause 8.2 of BS 5970 section 2 for insulation bonding adhesives; lagging adhesives; and facing and film attachment adhesives.

2195 FIRE PROTECTION CLADDING

Where called for, ductwork shall be provided with a fire protection cladding material as described in the following clauses.

The fire protection material shall have an inherent structural strength and be capable of retaining shape and resistance to heat transfer throughout the period of exposure to fire.

Generally all ducts shall be protected on all four sides. Where an adjacent slab or wall is conveniently placed to form one side of the enclosure this may be utilised subject to its fire rating being as that of the required enclosure being adequately connected and sealed to the wall or slab, and subject to agreement by the Engineer.

The recommendations of the manufacturer's shall be strictly adhered to in constructing the fire cladding enclosures.

The following constructions are given as guidance and represents the minimum required. All material thicknesses, adhesives and final installation shall in all ways comply with the requirements of the Building Regulations and the Buildings Control officer.

1. "Vicucld" Board Cladding

a) "Vicucld" board cladding or equal shall have a minimum density 430 kg/m³.

b) Where ducts are required to be protected, the ducts shall initially be encased with mineral rock fibre slabs having a minimum density of 60kg/m³ or 80kg/m³, as indicated in the following table of thicknesses, with a factory class 'O' bright reinforced aluminium foil laminate facing.

c) The mineral rock fibre slabs shall be securely fixed by means of a suitable non-flammable adhesive and self adhesive stick pin insulation hangers applied in accordance with the manufacturer's recommendations. The "dab" method of applying adhesive shall not be permitted.

d) Longitudinal and butt joints (and where stick pin insulation hangers protrude through the insulation and foil facing) shall be securely taped with a minimum 100mm wide Idenden T303, class 'O' plate in soft aluminium type.

Y50 – Thermal Insulation

- e) On ductwork carrying chilled air particular attention shall be paid to the application of the foil taping which shall be carried across Vicuclad board bearers to ensure maintenance of the vapour barrier.
- f) The minimum thickness of "Vicuclad" board cladding shall be as detailed in the following table:-

Period of Fire Protection (Hours)	Ducts Exposed To Internal Fire		Ducts Exposed to External Fire			
			without combustible linings or deposits (eg Air Conditioning & Ventilation ducts)		with combustible linings or deposits (eg Kitchen extract)	
	Vicuclad (mm)	Mineral Rock Fibre mm x kg/m ³	Vicuclad (mm)	Mineral Rock Fibre mm x kg/m ³	Vicuclad (mm)	Mineral Wool Rock Fibre mm x kg/m ³
0.5 35		-	35	-	50	-
1.0	30	30 x 60	30	30 x 60	70	60 x 60
1.5	35	30 x 80	35	30 x 80	70	70 x 80
2.0	40	40 x 80	40	40 x 80	80	75 X 80
3.0	50	50 X 80	50	50 X 80	-	-
4.0	70	60 X 80	70	60 X 80	-	-

*Where sheet metal ducts are to be fire protected for a period of 4 hours, the duct sections shall be connected by bolted flanges or socket and spigot joints secured with steel (not aluminium) rivets.

g) Should no exposure be detailed as required, then internal fire exposure shall be assumed and included in the Tender cost except for kitchen extract where the thickness in the tables shall apply.

h) Bearers (manufactured from "Vicuclad" board of depth equal to that of the mineral wool thickness) shall be located top and bottom of the ducts and fixed into place by means of tee or angle sections at the top and by channel or I sections at the bottom. These shall be secured by means of threaded rods.

i) Mineral wool insulation shall be applied between the spaces formed by the bearers and at the sides of the ducts the as detailed above.

j) The whole of the above shall then be covered with "Vicuclad".

k) Where the steel section occur, horizontal cross joints shall be further clad with "Vicuclad" cover strips.

l) The ductwork hangers shall also be clad or covered with "Vicutube". Supplementary hangers shall be installed as necessary to support the cladding to accommodate the additional imposed load.

m) Where fixings are from a concrete or composite concrete slab an area of 150mm from the centre of the fixing shall be protected by a minimum of 45mm thickness of "Vicuclad" bonded to the slab.

2. Rockwool "Fire Duct" Ductwork slab rigid Insulation Fire Protection Board Cladding

Fire protection shall be provided in accordance with BS 476 - 24: 1987, duct types A & B. The Fire Duct Ductwork system shall protect horizontal and vertical ductwork against both fire "break out" and fire "break in".

Y50 – Thermal Insulation

“Kitchen extract” ducts, which are subject to separate BS 476 - 24 requirements, are additionally covered for ½ and 1 hour protection periods.

The system shall be installed in accordance with the manufacturers instructions

Welded pin fixing method 1

1. All ductwork to be insulated ROCKWOOL Fire Duct Ductwork slab, having a factory applied reinforced aluminium foil to one face and complying with Building Regulations Class “O” requirements.
2. The Fire Duct Ductwork Slab shall de affixed to the duct using 2.5mm diameter welded steel pins and 38mm spring steel washers in accordance with ROCKWOOL manual “Fire Duct Ductwork System”.
3. The foil facing shall be removed from any surface to which Fire Duct glue is to be applied.
4. All corner joints shall be fixed with pigtail screws at 250mm maximum centres. Screw length is to be 2 x slab thickness.
5. All cross joints shall be filled with Fire Duct Glue and held tightly closed.
6. For duct sizes up to 1500 x 1500mm, drop rods and bearers shallbe at 1500mm maximum centres and to be M10 steel rod and 30 x 30 x 3 mm steel angle respectively. Ductwork shall be in accordance with HVCA Specification DW/144.
7. Drop rods and exposed bearers shall to be insulated with Fire Duct Ductwork Slab or Fire Duct Hanger Strip, as appropriate, thickness shall be inaccordance with the manufacturers recommendations. Rebates or cover pieces are to be used at duct flange and bearer locations according to site conditions and subject to ROCKWOOL approval.
8. Where a vapour barrier is required, all exposed Fire Duct edges and penetrations through the foil shall be sealed using soft self-adhesive aluminium foil tape.

Welded pin fixing method 2

Delete clauses 3 and 5 in Method 1 above, and insert new clause 5:

5. All joints shall be filled with Fire Duct Glue and held tightly closed. Nails shall be used at corner joints for this purpose.

Welded pin fixing method 3

Delete clauses 3 and 5 in Method 1 above, and insert new clause 5:

5. All cross joints shall be covered with centrally positioned 100mm wide strips of Fire Duct Ductwork Slab of the same thickness as t he insulation. The cover strips shall be fix ed along bot h edges usin g pigtail screws, as described above.

Alternatively the ROCKWOOL for Duct work system c an be fi xed using the Mitre -joint fixing method- please in accordance with the manufacturers instructions.

Insulation Thickness

Fire resistance (hours)	Duct Type	Required thickness	Joint Options	Hanger Protection		Max.duct size for mitre joint system (mm)	
				Ductwork Slab (mm)	Fire Duct Ductwork Section (mm)	Glued Joints	Pigtail Screws
½	Vertical	25	C	30	17 x 30	1000 x 1000	250 x 250
	Horizontal	25	C	30	17 x 30	1000 x 1000	250 x 250
	I	40	BC	30	17 x 30	1500 x 1500	250 x 250

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Serv ices Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/138

Y50 – Thermal Insulation

	Kitchen extract						
1	Vertical	30	C	40	17 x 40	1000 x 1000	250 x 250
	Horizontal	40	BC	40	17 x 40	1500 x 1500	250 x 250
	I Kitchen extract	90	ABC	40	17 x 40	1500 x 1500	250 x 250
1½	Vertical	50	BC	50	17 x 50	1500 x 1500	250 x 250
	Horizontal I	70	ABC	50	17 x 50	1200 x 1200	250 x 250
2	Vertical	70	ABC	60	17 x 60	1500 x 1500	250 x 250
	Horizontal I	90	ABC	60	17 x 60	1000 x 1000	250 x 250

Where the fire protection of circular ductwork is required two methods may be used both of which shall be applied strictly in accordance with the manufacturers installation recommendations as follows:-

Circular steel ducts of between 17 mm and 610 mm diameter may be protected using Fire Duct Ductwork Section. Fire Duct Ductwork Section must be glued with Fire Duct Glue at the joints and in the grooves. Steel bands or wires must be fitted circumferentially to the system at 300 mm nominal centres to hold all joints and grooves tightly closed while the glue cures. Where required, cover strips and bearer protection pieces are to be cut from Fire Duct Ductwork Section (or Fire Duct Ductwork PSM) of the appropriate diameter. The foil covering is to be removed from the area of Fire Duct Ductwork Section immediately beneath the cover strips prior to gluing into position and securing with steel nails or pins.

Self adhesive aluminium foil tape may be used to seal the joints where a vapour barrier is required. The hanger system is as described on page 7 of Rockwool technical data sheet, with the angle bearer formed into a circular shape to suit the diameter of the duct or the Fire Duct Ductwork Section (depending on whether the hanger is located inside or outside the protection).

Fire Duct Ductwork Section is used to protect the drop rods as described on page 7 of Rockwool technical data sheet.

General installation principles are as otherwise described as above in this specification for Fire Duct Ductwork Slab.

Circular steel ducts of 406 mm and greater diameter may also be protected using Fire Duct Ductwork PSM. Fire Duct Ductwork PSM must be glued at the joints and in the grooves with Fire Duct Glue. Steel bands or wires must be fitted circumferentially to the system at 300 mm nominal centres to hold all joints and grooves tightly closed while the glue cures.

General duct, hanger and installation details are as described for Fire Duct Ductwork Section.

Reference British Standards

BS 476, BS 3927, BS 2972, BS 3533, BS 3958, BS 5422, BS 5970

2201 POLYISOBUTYLENE PROTECTION:

Polyisobutylene - minimum thickness 0.8mm.

2202 PVC PROTECTION:

Rigid PVC - thickness 0.35mm.

2203 ALUMINIUM SHEETING PROTECTION:

Apply flat (embossed) or profiled aluminium cladding directly to insulating material, thickness, 0.56mm on pipework, 0.71mm on ductwork

2204 ALUMINIUM-ZINC COATED STEEL PROTECTION:

Mild steel sheet continuously hot dipped with 185gm aluminium-zinc coating to BS EN 10326 and BS EN 10327 applied directly to insulating material.

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/139

EXO00001613/188
EX000001013_0100

Y50 – Thermal Insulation

0.4mm thick flat sheet. Installation shall be in accordance with the manufacturers recommendations.

2205 LAMINATED FOIL/FILM PROTECTION:

Enclose insulation with laminated foil/film around insulation and finish. Film to be capable of providing vapour barrier. Product to be tested in accordance with BS 476 parts 6 & 7 and BS EN 1716. Finish to be class O. Products to be highly puncture and tear resistant and have supporting test data in accordance with ASTM D-1000 & ASTM D-624. Product to be supported by a 10 year guarantee.

Normal use:

5 ply laminate comprising 3 layers of aluminium and 2 layers of polyester film coated with pressure sensitive adhesive.

Minimum application temperature -20°C

Heavy duty use (eg pipework / ductwork which could be walked on regularly or low level pipework in plant areas): 13 ply laminate comprising 10 six layers of foil, four layers of polyester film embedded with a scrim reinforcement core. Minimum application temperature -20°C

Seams on bends, elbows, tees etc and underlying foil faced insulation are to be sealed with the foil/film manufacturers recommended tape. Installation to be in accordance with the manufacturer's recommendations.

2211 REINFORCEMENT:

Use one of the following methods where reinforcement is required.

Galvanized wire netting - comply with BS EN 10223, not less than 0.9mm diameter wire, 25mm mesh (50mm mesh on ductwork).

or Galvanized wire -not less than 0.9mm diameter wire, spirally wound at 75mm pitch.

or Aluminium bands - not less than 20mm wide x 0.5mm thick with galvanized wire end loops, at 300mm centres.

2221 VALVE AND FLANGE INSULATION:

Other than on pipeline ancillaries on hot services smaller than 50mm on internal applications, install insulation on flanges and valves. (Where un-insulated valves or ancillaries could cause a safety hazard, they shall be insulated)

Use a protected metal split casing fabricated from 1.2mm aluminium sheet fitted with spring clip fasteners, filled with insulating material with same thermal performance as insulation on adjoining pipe.

or Use moulded insulation boxes filled with insulating material with same thermal performance as insulation on adjoining pipe.

or Use flexible insulation jackets.

Valve boxes shall include removable covers over handwheels and stems; see also BS 5970:1992.

Additionally, on cold applications, wrap cold piping valve bodies and flanges with 50mm thick flexible material with facing and seal joints to maintain vapour barrier.

2225 DUCTWORK FLANGE INSTALLATION

Insulation thickness should be selected such that a minimum thickness is carried over flanges and/or stiffeners for continuation of vapour barrier and/or sufficient insulation to avoid condensation.

2231 PROTECTION FOR HEAT EXCHANGERS AND OTHER VESSELS WITH CHEST COVERS:

Insulation to be mineral wool lamella mat.

Finish with ribbed or embossed aluminium sheeting 0.9mm thick or 0.7mm aluminium-zinc coated steel embossed or ribbed sheeting with lapped, rivetted and sealed joints, laps to shed water. Seal all joints at manholes and stools. Fit cut outs with purpose made over-plates or collars. Domed tops of calorifiers to be finished in segments.

Enclose chests and access covers in removable aluminium covers lined with high density flexible material. Remove manufacturer's name plate and refix on cladding.

2241 INSULATION FOR BOILER FLUES, MINERAL FIBRE, ALUMINIUM BANDS:

Boiler flues and chimneys to be insulated in accordance with BS 5970 using mineral fibre industrial wired mat with a minimum density 90 kg/m³

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/140

EXO00001613/189
EX000001013_0109

Y50 – Thermal Insulation

Use preformed sections secured by metal bands direct to flue. Use multi-layers and stagger joints for thicknesses in excess of 65mm.

Material

Bonded mineral fibre with ribbed or embossed aluminium sheeting 0.9mm thick secured with aluminium bands.

2250 PRE-INSULATED BOILER FLUES:

Provide pre-insulated boiler flues where indicated.

2260 PRE-INSULATED STORAGE VESSELS:

Ensure insulation standards on pre-insulated storage vessels meet the general specification requirements of the works.

2270 CYLINDER JACKETS:

Provide cylinder jackets as indicated.

2281 PUMPS AND OTHER IRREGULAR SHAPES:

All pumps, heat exchangers and other irregular shapes shall be insulated to prevent condensation. All heat exchangers and other pipeline ancillary components shall be insulated to control heat loss. Where access is required to pumps and other irregular shapes submit proposals for materials and methods of applying a demountable finish, for approval.

2285 THICKNESS OF INSULATION:

Supply thickness of insulation as indicated. For HWS pipework trace heated for temperature maintenance refer to clauses 2291 and 2301 and schedule Y24.

Where a material with an alternative thermal conductivity (k factor) is offered, utilise a thickness which will provide an equivalent degree of insulation to the combination of thickness and k factor specified. The figures are derived from the tables given in BS 5422 and the calculation methods given in BS EN ISO 12441.

2291 NON DOMESTIC HOT WATER SUPPLY SERVICES THICKNESS TABLE MINERAL WOOL INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Nominal Steel Pipe Size (mm)	Thickness of mineral wool (mm)
15 25	
20 30	
25 30	
32 30	
40 35	
50 35	
65 35	
80 35	
100 40	
125 40	
150 40	
200 40	
250 40	
Flat surfaces	40

Basis: Horizontal pipe at 60°C in still air at 15°C

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. For trace heated HWS pipework for temperature maintenance, the thicknesses shall be adjusted (as advised by the trace heating specialist) to ensure the correct combination of thermal insulation (thermal conductivity / thickness) and heating cable (ie output / straight or double or spiral) to meet the design parameters in schedule Y24

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/141

Y50 – Thermal Insulation

2301 NON DOMESTIC HOT WATER SUPPLY SERVICES THICKNESS TABLE - PHENOLIC FOAM INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Basis: aged k-value and Horizontal pipe at 60°C in still air at 15°C

Nominal Steel Pipe size(mm)	Thickness of phenolic foam (mm)
15 15	
20 15	
25 20	
32 20	
40 20	
50 20	
65 25	
80 25	
100 25	
125 25	
150 25	
200 30	
250 30	
Flat surfaces	30

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. For trace heated HWS pipework for temperature maintenance, the thicknesses shall be adjusted (as advised by the trace heating specialist) to ensure the correct combination of thermal insulation (thermal conductivity / thickness) and heating cable (ie output / straight or double or spiral) to meet the design parameters in schedule Y24

2311 NON DOMESTIC HEATING SYSTEMS THICKNESS TABLE [INTERNAL PIPEWORK] MINERAL WOOL INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Nominal Steel Pipe Size (mm)	Temperature of contents °C		
	Low temperature hot water	Medium temperature hot water	High temperature hot water
	Thickness of mineral wool insulation (mm)		
15 30 30			30
20 35 40			40
25 35 45			50
32 35 50			60
40 40 50			70
50 40 60			70
65 45 60			80
80 45 60			80
100 45		70	90
125 50		70	90
150 50		70	90
200 50		70	90
250 & above	50	80	100
Flat Surfaces	50	80	100

The thicknesses tabled are the nearest commercial equivalent to calculated thicknesses based on: Horizontal pipe with water at 75°C (LTHW) or 100°C (MTHW) or 125°C (HTHW) in still air at 15°C. Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

Y50 – Thermal Insulation

2312 NON DOMESTIC HEATING SYSTEMS THICKNESS TABLE [EXTERNAL PIPEWORK] MINERAL WOOL INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Nominal Steel Pipe Size (mm)	Temperature of contents °C	
	75 (Low temperature hot water)	
	Thickness of mineral wool insulation (mm)	
15 60		
20 60		
25 60		
32 60		
40 70		
50 70		
65 70		
80 70		
100 70		
125 70		
150 70		
200 70		
250 & above	70	
Flat Surfaces	70	

The thicknesses tabled are the nearest commercial equivalent to calculated thicknesses based on: Horizontal pipe with water at 75°C (LTHW) in still air at 15°C. Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

2321 NON DOMESTIC HEATING SYSTEMS THICKNESS TABLE [INTERNAL PIPEWORK]- PHENOLIC FOAM INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide.

Nominal Steel Pipe size (mm)	Temperature of contents °C	
	Low temperature hot water	Medium temperature hot water
	Thickness of phenolic foam insulation (mm)	
15 15 15		
20 20 25		
25 20 25		
32 20 30		
40 25 30		
50 25 35		
65 25 35		
80 25 35		
100 30		40
125 30		45
150 30		45
200 35		45
250 & above	35	45
Flat Surfaces	35	45

The thicknesses tabled are the nearest commercial equivalent to calculated thicknesses based on: Horizontal pipe with water at 75°C (LTHW) or 100°C (MTHW) in still air at 15°C. Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

Basis: Aged k-value

2322 NON DOMESTIC HEATING SYSTEMS THICKNESS TABLE [EXTERNAL PIPEWORK] PHENOLIC FOAM INSULATION LOW EMISSIVITY OUTER SURFACE (0.05):

Y50 – Thermal Insulation

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Nominal Steel Pipe Size (mm)	Temperature of contents °C
	Low temperature hot water
	Thickness of phenolic foam insulation (mm)
15 30	
20 35	
25 35	
32 35	
40 40	
50 40	
65 45	
80 45	
100 45	
125 45	
150 50	
200 50	
250 & above	50
Flat Surfaces	50

The thicknesses tabled are the nearest commercial equivalent to calculated thicknesses based on: Horizontal pipe with water at 75°C (LTHW) in still air at 15°C. Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.
Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.
Basis: Aged k-value

2326 NON DOMESTIC HEATING SYSTEMS THICKNESS TABLE [INTERNAL PIPEWORK]- NITRILE RUBBER INSULATION:

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Nominal Steel Pipe size (mm)	Temperature of contents °C
	Low temperature hot water
	Thickness of nitrile rubber insulation (mm)
15 15	
20 20	
25 20	
32 20	
40 25	
50 25	
65 25	
80 25	
100 30	
125 30	
150 30	
200 35	
250 & above	35
Flat Surfaces	35

The thicknesses tabled are the nearest commercial equivalent to calculated thicknesses based on: Horizontal pipe with water at 75°C (LTHW) in still air at 15°C. Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

2331 DOMESTIC CENTRAL HEATING AND HOT WATER SYSTEMS THICKNESS TABLE - MINERAL WOOL INSULATION HIGH EMISSIVITY OUTER SURFACE (0.95):

Y50 – Thermal Insulation

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Insulation thickness for domestic central heating and hot water systems in potentially unheated areas to control heat loss.

Outside diameter of copper pipe (mm)	Water Temperature = 60°C	
	Pipework in still air at 15°C	Pipework in unheated areas with ambient still air temperature of -1°C
T	thickness mm	
15 20		30
22 20		40
28 20		40
35 20		40
42 20		45
54 25		45
cylinders 45		--

2336 DOMESTIC CENTRAL HEATING AND HOT WATER SYSTEMS - PHENOLIC FOAM HIGH EMISSIVITY OUTER SURFACE (0.95):

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Outside diameter of copper pipe (mm)	Water Temperature = 60°C	
	Pipework in still air at 15°C	Pipework in unheated areas with ambient still air temperature of -1°C
T	thickness mm	
15 15		15
22 15		20
28 20		25
35 20		25
42 20		25
54 20		25
cylinders 35		-

2341 HTHW HEATING SYSTEMS, STEAM AND CONDENSE THICKNESS TABLE MINERAL WOOL LOW EMISSIVITY OUTER SURFACE (0.05):

Nominal Steel Pipe size (mm)	Temperature of contents °C	
	Condensate below 100°C	Steam and condensate Above 100°C up to 150°C
	Thickness of mineral wool insulation (mm)	
15 40		60
20 40		60
25 45		70
32 45		70
40 50		70
50 50		70
65 50		80
80 60		80
100 60		80
125 60		80
150 60		90
200 60		90
250 60		90
300 70		90
Flat surfaces	70	90

2371 CHILLED AND MAINS COLD WATER SUPPLIES THICKNESS TABLE [INTERNAL PIPEWORK] TO PREVENT CONDENSATION AND CONTROL HEAT GAIN TO MAXIMUM PERMISSIBLE FIGURES STATED IN BUILDING REGS PART L NON DOMESTIC HEATING, COOLING & VENTILATION GUIDE - MINERAL WOOL LOW EMISSIVITY OUTER SURFACE (0.05):

Y50 – Thermal Insulation

Minimum insulation thickness with an ambient air temperature of 25°C and relative humidity of 80%

Nominal Steel Pipe Size (mm)	Temperature of contents °C		
	>10	5-10	0-5
	Thickness of mineral wool insulation (mm)		
15 20 25			30
20 20 30			35
25 20 30			35
32 25 30			40
40 25 35			40
50 25 35			45
65 30 35			45
80 30 40			50
100 30		40	50
125 30		45	60
150 35		45	60
200 35		50	60
250 40		50	70
300 40		60	70
350 40		60	70
400 40		60	80
450 45		60	80
500 45		60	80
Flat Surfaces	50	70	80

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. Thicknesses relate to class O rated insulation.

2372 CHILLED AND MAINS COLD WATER SUPPLIES THICKNESS TABLE [EXTERNAL PIPEWORK] TO PREVENT CONDENSATION AND CONTROL HEAT GAIN TO MAXIMUM PERMISSIBLE FIGURES STATED IN BUILDING REGS PART L NON DOMESTIC HEATING, COOLING & VENTILATION GUIDE - MINERAL WOOL LOW EMISSIVITY OUTER SURFACE (0.05):

Minimum insulation thickness with an ambient air temperature of 30°C and relative humidity of 80%

Nominal Steel Pipe Size (mm)	Temperature of contents °C	
	>10	5-10
	Thickness of mineral wool insulation (mm)	
15 30		60
20 30		50
25 40		50
32 40		50
40 40		50
50 40		50
65 40		50
80 40		50
100 40		50
125 40		50
150 40		50
200 40		50
250 40		50
300 40		60
350 40		60
400 40		60
450 45		60
500 45		60

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/146

Y50 – Thermal Insulation

Nominal Steel Pipe Size (mm)	Temperature of contents °C	
	>10	5-10
	Thickness of mineral wool insulation (mm)	
Flat Surfaces	50	70

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. Thicknesses relate to class O rated insulation.

- 2381 CHILLED AND MAINS COLD WATER SUPPLIES THICKNESS TABLE [INTERNAL and EXTERNAL PIPEWORK] TO PREVENT CONDENSATION AND CONTROL HEAT GAIN TO MAXIMUM PERMISSIBLE FIGURES STATED IN BUILDING REGS PART L NON DOMESTIC HEATING, COOLING & VENTILATION GUIDE - PHENOLIC FOAM LOW EMISSIVITY OUTER SURFACE (0.05):**
Minimum insulation thickness with an ambient air temperature of 25 °C and relative humidity of 80% or 30°C and relative humidity of 60%

Nominal Steel Pipe Size (mm)	Temperature of contents °C		
	>10	5 - 10	0 -5
	Thickness of phenolic foam insulation (mm)		
15 20 20			20
20 20 20			25
25 20 20			25
32 20 25			25
40 20 25			30
50 25 25			30
65 25 25			30
80 25 25			35
100 25		30	35
125 25		30	40
150 25		30	40
200 25		35	40
250 25		35	45
350 25		35	50
400 25		35	50
450 25		35	50
500 30		40	55
Flat Surfaces	30	40	55

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. Thicknesses relate to class O rated insulation.

- 2412 CHILLED AND MAINS COLD WATER SUPPLIES THICKNESS TABLE [INTERNAL and EXTERNAL PIPEWORK] TO PREVENT CONDENSATION AND CONTROL HEAT GAIN TO MAXIMUM PERMISSIBLE FIGURES STATED IN BUILDING REGS PART L NON DOMESTIC HEATING, COOLING & VENTILATION GUIDE - NITRILE RUBBER:**
Minimum insulation thickness with an ambient air temperature of 25 °C and relative humidity of 80% or 30°C and relative humidity of 60%

Nominal Steel Pipe Size (mm)	Temperature of contents °C		
	>10	5 - 10	0 -5
	Thickness of nitrile rubber insulation (mm)		
15 25		30	35
20 25		30	35
25 25		30	35
32 30		35	40
40 30		35	40

Y50 – Thermal Insulation

Nominal Steel Pipe Size (mm)	Temperature of contents °C		
	>10	5 - 10	0 -5
	Thickness of nitrile rubber insulation (mm)		
50 30		35	40
65 30		35	45
80 30		40	45
100 30		40	45
125 30		40	45
150 30		40	50
200 30		40	50
250 35		40	50
Flat Surfaces	35	40	55

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent diameter. Thicknesses relate to class O rated insulation.

2420 PROTECTION AGAINST FREEZING THICKNESS TABLE - MINERAL WOOL INSULATION:

Pipe size (OD) mm	Indoor installation where freezing might occur	Outdoor installation where freezing might occur
Copper pipe		
	Thickness of mineral wool insulation (mm)	
22 20		50
28 20		25
35 20		20
42 20		20
54 20		20
76 25		25
108 25		25
Nominal Pipe Size mm	Steel pipe	
20 20		45
25 20		25
32 20		20
40 20		20
50 20		20
65 25		25
80 25		25

Indoor condition is for ambient air temperature of -6°C, permitted ice formation of 50%.

Outdoor condition is for ambient air temperature of -10°C, permitted ice formation of 50%.

If mineral wool is used on pipes smaller than 20mmNB the required insulation thickness is too large to be applied in practice. To provide the appropriate degree of frost protection a combination of insulation and trace heating will be required.

2430 PROTECTION AGAINST FREEZING THICKNESS TABLE - PHENOLIC FOAM INSULATION:

Within scope of BS 5422 Table 23

	Indoor installation where freezing might occur	Outdoor installation where freezing might occur
Pipe size (OD) mm	Copper pipe	
	Thickness of phenolic foam insulation (mm)	
15 30		70
22 20		50
28 20		20
35 20		20
42 20		20
54 20		20
76 20		20

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

07/07

Y50/148

EX000001613/197
EX000001613_0197

Y50 – Thermal Insulation

	Indoor installation where freezing might occur	Outdoor installation where freezing might occur
108 20		20
Nominal Pipe Size mm	Steel pipe	
15 20		50
20 20		25
25 20		20
32 20		20
40 20		20
50 20		20
65 20		20
80 20		20

Indoor condition is for ambient air temperature of -6°C, permitted ice formation of 50%.
Outdoor condition is for ambient air temperature of -10°C, permitted ice formation of 50%.

2441 PROTECTION AGAINST FREEZING THICKNESS TABLE - CLOSED CELL NITRILE RUBBER INSULATION:

Nominal Steel Pipe size	Indoor installation where freezing might occur	Outdoor installation where freezing might occur
mm	Thickness of closed cell nitrile rubber (mm)	
15 60		-
20 25		55
25 15		35
32 15		20
40 15		15
50 15		15
65 15		15
80 15		15
Flat surfaces	15	15

Indoor condition is for ambient air temperature of -6°C, permitted ice formation of 50%.
Outdoor condition is for ambient air temperature of -10°C, permitted ice formation of 50%.
Use this table for insulation thickness of copper pipework of the nearest equivalent diameter.

2442 REFRIGERANT PIPEWORK AND EQUIPMENT THICKNESS TABLE

Nominal pipe bore mm	Thermal Conductivity (W/mK)					
	Bright foil faced phenolic foam (Low emissivity)			nitrile rubber (without cladding) (high emissivity)		
	Temperature of Contents C					
	-20	-10 0 -20			-10	0
	Minimum thickness of insulation (mm)					
15 or less than 15	35	30	20	34	25	25
25	45 35 25	34 32				25
50	55 40 30	38 32				32
100	65 50 35	44 38				32
150	70 55 40	50 38				32
250	80 65 45	59 44				38
300-450	95 75 50	59 44				38
Over 450 and Flat Surfaces	110	85 60 64 50				44

Insulation installed on pipes operating below -10 C, (see BS59 70:2001 Section 25.3.1), shall be installed in a minimum of two layers with all joints staggered eliminating 'straight through joints.'
Mineral fibre shall not be used on refrigeration applications.

Should a low emissivity finish or cladding be required over nitrile rubber the required insulation thickness will increase greatly.

Y50 – Thermal Insulation

2451 THICKNESS ON WARM AIR DUCTWORK TABLE TO CONTROL HEAT LOSS:

Minimum insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

Ambient temperature °C (K)	15 (internal)	-5 (external)
Heat loss (W/m ²) 16.34		16.34
Thickness of mineral wool insulation (mm)	40	80
Thickness of phenolic foam (mm)	25	45

Basis: Air temperature 35 °C, low emissivity facing 0.05

2452 THICKNESS ON CHILLED AND DUAL PURPOSE DUCTS TO CONTROL HEAT GAIN AND CONTROL CONDENSATION*:

Minimum insulation thickness to limit heat gain stated in the Building Regulations Part L Non Domestic Heating, Cooling & Ventilation Guide

* Ambient conditions: indoor still air temperature 25 °C, relative humidity 80%, dew point temperature 21.3 °C

Basis: low emissivity facing 0.05, maximum permissible heat gain 6.45W/m²

Air temperature in duct °C	Thickness mm			
	Ambient temperature 25 °C (internal)		Ambient temperature 30 °C (external)	
	Mineral wool	Phenolic foam	Mineral wool	Phenolic foam
20 25		25	40	30
18 25		25	55	35
16 35		25	65	40
13 50		35	80	50
10 65		45	95	60
5 95		60	120	80

Multi layering of insulation may be required for some applications.

All duct work shall be insulated where were visible (ie exposed ductwork) when the duct surface temperature is below the dew point of the air within the space served.

2475 CONDENSATION CONTROL ON CHILLED AIR DUCTWORK - CLOSED CELL PVC NITRILE FOAM:

Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25 °C, relative humidity 80%, dew point temperature 21.3 °C. All ductwork shall be insulated where were visible (ie exposed ductwork) when the duct surface temperature is below the dew point of the air within the space served.

Thermal conductivity of 0.036 W/mK at a mean temperature of 10 °C		
Minimum air temperature inside duct °C	Surface coefficients	
		0.9
	Thickness of foam (mm)	
15 10		8
10 16		12
5 19		16
0 25		25

3000 WORKMANSHIP

3011 GENERAL:

Carry out thermal insulation work using a specialist firm employing skilled craftsmen conversant with class of work, being members of the Thermal Insulation Contractors Association.

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure all materials are kept dry.

Job No: Services technical standards Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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Y50 – Thermal Insulation

Ensure all pipework surfaces are dry before the installation of thermal insulation.

Where systems are to be lagged, insulate all of the items on the system (eg plenum box) unless indicated otherwise.

Separation

Insulate each unit separately. Do not enclose adjacent units together.

Clearance

Ensure clearance between insulated pipes.

Application

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Finish

Neatly finish joints, corners, edges and overlaps and, where possible, arrange overlaps to fall on blind side.

Ensure overlaps are neat and even and parallel to circumferential and longitudinal joints.

All nameplates shall be covered with removable sections of insulation that are easily identifiable, or where practical, name plate is removed and repositioned on the outer face of the insulation.

The insulation shall be applied such that plant and equipment can be cleaned and inspected with allowance made for removal of access covers, bolts, nuts and probes without damage to the insulation.

Care shall be taken to ensure that where required, a complete vapour seal is maintained. In particular, the insulation to and around the points where supports, brackets and hangers occur on vapour sealed services shall ensure provision of a complete barrier to moisture transmission.

All exposed ends of insulation shall be sealed to prevent migration of fibres and then capped with suitable protective capping adequately fixed.

Where an insulated pipe/duct passes through an external building element adequate precautions shall be taken to prevent entry of the rain water into the building.

In instances where phenolic foam sections are applied to copper pipework, the pipework shall be clean and dry prior to the application of the insulation. Care shall be taken to ensure that in all cases where there is a likelihood of the copper pipework coming into contact with raw foam, a bore coating is incorporated into the phenolic foam.

Insulation shall be protected during the progress of the work and maintained dry.

NOTE:

Attention is drawn to the risk attached to the use of PIB, polyurethane, PVC, polystyrene, isocyanurates etc., even where these materials are claimed to be fire resistant and/or self-extinguishing, they have proved in the past to produce toxic smoke causing a hazard to persons working in the area and to fire fighting teams. These types of insulation or finish **shall not** be used inside of a building or areas under cover. PIB may be used external to the building only where indicated.

3020 INSTALLATION OF FOIL FACED MINERAL WOOL INSULATION ON PIPEWORK:

Ensure joints are close butted together. Secure overlaps with adhesive or matching class 'O' tape, a minimum of 50mm wide, on both longitudinal and circumferential butt joints. Insulate fittings to same standard as adjacent pipework and use mitred segments where necessary, taped as above.

Where a vapour seal or fibre containment is required tape exposed insulation membrane and return to pipe surface.

Where insulation abuts pipe support inserts that have integral vapour barriers seal using 'O' tape to continue vapour barrier or containment.

3030 INSTALLATION OF FOIL FACED PHENOLIC FOAM INSULATION ON PIPEWORK:

Ensure joints are close butted together. Secure overlaps with adhesive or matching class 'O' tape, a minimum of 50mm wide, on both longitudinal and circumferential butt joints. Insulate fittings to same standard as adjacent pipe work and use mitred segments where necessary, taped as above. Ensure the passivating internal bore coating of the insulation is not damaged, particularly at corners and other irregular shapes.

Y50 – Thermal Insulation

3040 INSTALLATION OF INSULATION ON PIPEWORK - WITH CANVAS FINISH:

Ensure joints are close butt ed together and secure ov erlaps with adhesive and smooth out. Insulate fittings to same standard as adjacent pipework and use mitred segments where necessary. Secure with adhesive using a minimum of 50mm w ide canvas to cut mitred joints. Apply t wo coats of c lass “O” polymer solution.

3050 INSTALLATION OF CLOSED CELL NITRILE RUBBER INSULATION ON PIPEWORK:

Install closed cell nitrile rubber in accordance with manufacturer’s recommendations.
Check installation procedure when closed cell nitrile rubber is to be installed on stainless steel pipework.

3060 INSTALLATION OF FOIL FACE SEMI-RIGID SLAB INSULATION ON DUCTWORK:

Secure the insulation with adhesive in accordance with manufacturer’s recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of ducts.

Cut slabs so that the top a nd bottom pie ces overlap t he sides. Seal joints and pin penetrations using 100mm wide class ‘O’ aluminium foil tape. Where cut outs for test holes, etc occu r tape over insulation membrane and return to the duct surface.

Where insulation abuts duct support inserts that have integral vapour barriers seal use class ‘O’ foil tape to continue vapour barrier.

3070 INSTALLATION OF FOIL FACED FLEXIBLE DUCTWORK INSULATION:

Secure the insulation with adhesive in accordance with manufacturer’s recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of rectangular and flat oval ducts.

Seal joints and pin penetrations using 100mm wide class ‘O’ aluminum foil tape. Where cut out s for test holes, etc occur tape over insulation membrane and return to the duct surface.

Where insulation abuts duct support inser ts that have integral vapour barriers use class ‘O’ foil tape to continue vapour barriers.

3080 INSTALLATION OF FOIL FACED LAMELLA ON DUCTWORK:

Secure the insulation with adhesive in accordance with manufacturer’s recommendations. Use insulation hangers spaced at maximum 300mm centres on the underside of rectangular and flat oval ducts.

Seal joints and pin penetrations using 100mm wide class ‘O’ aluminum foil tape. Where cut out s for test holes, etc occur tape over insulation membrane and return to the duct surface.

Where insulation abuts duct support inser ts that have integral vapour barriers use class ‘O’ foil tape to continue vapour barriers.

3090 INSTALLATION OF INSULATION ON TANKS:

Fit insulation so that tw o opposite pieces overlap the sides. Bond insulation to the tank w ith adhesive, applied in accordance with the manufacturer’s recommendations. Closely butt together all slabs and seal joints with a matching self adhesive tape 100mm wide.

3101 INSTALLATION OF MINERAL WOOL INSULATION ON VESSELS:

Cut Lamella t o length to wrap around vessel with an additional 75 mm to form an overlap. Remove insulation from facing of o verlap together with dust, a nd seal overlap with adhesive in accordance with manufacturer’s instructions. Butt joints closely together and seal with matching self-adhesive tape at least 100mm wide.

On heat ex changers and HWS calorifiers in plant roo ms, domed to ps of calorifiers shall be finished in 0.9mm stucco embossed aluminium sheeting in coned segmental tops.

Manway chests shall be enclosed in removable stucco embossed covers lined with mineral fibre mattresses of 80 - 100 kg/M3 density, flanges and end covers on heat exchangers shall be similarly treated.

3102 INSTALLATION OF INSULATION ON FLANGED TANKS:

Insulate with an initial layer of 40mm thic k plain mineral fibre slabs (nominal density 45 kg/M3) secured by approved adhesive and stick pins, follo wed by a furt her layer of 4 0mm thick mineral fibre slabs (nominal density 45 kg/M3), secured to first layer by an approved adhesive and previously applied stick pins. This shall

Y50 – Thermal Insulation

then present a uniform thickness at minimum of 40mm. Finish to insulation shall be factory applied reinforced aluminium foil laminate, joints in surface covering to be secured with 100mm wide plain soft aluminium foil self adhesive tape to maintain a vapour barrier. Particular attention shall be paid to the vapour barrier where self adhesive stick pins protrude through the mineral fibre insulation and its factory applied finish. (2nd layer).

Final finishes shall be as scheduled.

3105 INSULATION OF EXTERNAL DUCTWORK AND FLAT SIDED TANKS

On flat, oval or rectangular ductwork and flat sided tanks, build up the insulation on the top surface of the duct in order to provide a self draining surface. Minimum slope to be 1 in 10. Ensure average thickness for the side is equivalent to other sides and that at no point is the thickness below that required to avoid condensation.

3120 INSTALLATION OF POLYISOBUTYLENE (PIB) PROTECTION:

Wrap pipework and fittings, ductwork or tanks and vessels with PIB sheeting lapped at every joint by at least 50mm. Solvent weld joints in accordance with manufacturer's recommendations and arrange joints to shed water and prevent the ingress of water.

3131 INSTALLATION OF INSULATION ON PIPEWORK - WITH SHEET METAL FINISH:

Secure insulation with metal bands at each end of section and at maximum centres of 450mm. Ensure joints are close butted together. Insulate bends with mitred segments of insulation banded into position. Insulate fittings are to the same standard as the adjacent pipework. At bends on cold services the vapour barrier surface shall be protected with a suitable absorbing strip since it will be necessary to secure any swaged segments with pop rivets, ie. the vapour barrier shall be retained by bedding any rivets in to the strip (eg: Class 'O' Armaflex tape). If exposed to weather, seal all joints with suitable mastic. Form sheet metal to fit tightly over the outer circumference of insulation with a longitudinal overlap of at least 40mm. Secure the outer part of overlap with self tapping screws or rivets at centres of not more than 150mm except on pipes with vapour barrier; or metal bands.

Ensure circumferential overlaps are at least 50mm, secured with self tapping screws or rivets. Make provision to accommodate expansion and contraction at intervals. Ensure all joints are lapped to shed liquids and seal all joints exposed to weather or spillage. Cover all bends and fittings with matching sheet metal, tailored to fit and sealed as appropriate. Fit pre-insulated, purpose-designed boxes to valves, flanges, etc.

3141 INSTALLATION OF SHEET METAL FINISH ON DUCTWORK, TANK AND VESSEL INSULATION:

Form sheet metal to fit tightly over the insulation with a longitudinal overlap of at least 40mm. Secure the outer part of overlap with self tapping screws or rivets at centres of not more than 150mm.

Ensure circumferential overlaps are at least 50mm, secured with self tapping screws or rivets. Make provision to accommodate expansion and contraction at intervals. Ensure all joints are lapped to shed liquids and seal all joints exposed to weather or spillage.

Ducting - Rectangular

The whole shall be enclosed in 0.9mm stucco embossed aluminium cladding applied in the form of lock formed strip and/or folded or flat sheeting. Care shall be taken to support as necessary the underside to minimise sagging. Cladding shall be fixed to support cladding which shall be taped to and continues the vapour barrier.

Ducting - Circular

The insulation shall be enclosed in a layer of reinforced aluminium foil, joints secured with 75mm wide soft aluminium foil self adhesive tape to maintain a vapour barrier. The whole shall be enclosed in 0.9mm stucco embossed aluminium sheeting, secured by matching aluminium straps and/or self sealing rivets to avoid puncturing the vapour seal.

For low temperature ducting (below 10°C) mastic treatment shall be applied in the overlaps since rivets may puncture the vapour barrier.

Y50 – Thermal Insulation

3151 INSTALLATION OF PROTECTION:

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

3170 INSTALLATION OF PROTECTION - ALUMINIUM SHEETING:

Secure lapped joints (at least 40mm) by means of pop rivets at a maximum spacing of 150mm. For cold piping use matching aluminium straps at maximum spacing of 225mm. On piping operating below ambient temperature seal all joints against moisture. For external use make joints shed water and use sheets with treated surface.

Where 'lockform' seams are used submit proposals for dealing with surfaces curved in three dimensions.

3185 APPLICATION OF WEATHER PROOF PAINTS:

Do not apply weather proof paints in ambient temperatures below 5°C

3190 INSTALLATION OF RIGID PVC PROTECTION

Apply rigid pvc sheet and pre-formed fittings directly to insulation with an overlap of at least 40mm on longitudinal and circumferential joints.

Secure longitudinal laps with plastic rivets at 150mm centres.

Ensure rigid PVC is not installed in contact with heat sources.

3210 FLANGES AND VALVES:

Cut back to allow removal of bolts and nuts, finish with neat bevel or use end caps.

Where boxes are used fit over insulation on adjacent piping. Ensure operation of valve remains unimpaired with box in place.

3220 LINERS:

Where load bearing insulation is required use segmental liners suitable for temperature. Fit insulant up to liner and carry facing across the pipe ring.

3231 INSTALLATION WHERE INSULATION IS CARRIED THROUGH PIPELINE SUPPORT:

For cold services ensure insulation is carried through.

For load bearing insulation carry through insulation and finish.

For non-load bearing insulation on hot pipework close butt to section of load bearing finished material suitable for working temperature 100mm long.

For non-load bearing insulation on cold pipework, close butt to high density phenolic foam supports. Ensure the vapour barrier is maintained.

3240 INSTALLATION WHERE INSULATION IS NOT CARRIED THROUGH PIPEWORK OR DUCTWORK SUPPORT:

Provide end caps to match applied finish.

3241 PIPE SLEEVES:

Carry finished insulation including vapour barrier through pipe sleeve.

3242 PIPE SLEEVES THROUGH FIRE RATED PARTITIONS

Where the insulation is to be carried through the partition - thermally insulated proprietary fire sleeves shall be used tested in accordance with BS 476 to meet the fire rating of the partition. The sleeves shall be either:

"Rockwool" Insulated fire sleeves comprising a combination of mineral wool and graphite intumescent or "Pacifyer" one piece stainless steel sleeve with an intumescent lining the full length and 3 bands of acoustic foam adhered to the bore of the sleeve. Where the insulation is required to carry through the wall or partition / vapour seal is required oversized mineral wool shall be fitted to the pipe work with an oversized Pacifyer fitted over the mineral wool

Installation – In accordance with the manufacturer's requirements.

Y50 – Thermal Insulation

3250 INSTALLATION WHERE INSULATION IS CARRIED THROUGH DUCTWORK SUPPORT:

Provide insulation between duct and support using high-density phenolic foam or polyisocyanurate strips. Butt insulation to spacer and carry over finish by 40mm and tape joint. Provide a sheet metal protecting sleeve.

3251 DUCTWORK SUPPORTS:

On cold services, ensure insulation carried through between duct and support. Provide insulation between duct and support using high-density phenolic foam or polyisocyanurate blocks. Carry over finish by 40mm and tape joint. Provide a sheet metal protecting sleeve. Where insulation not carried through between duct and support provide end caps or bevelled seal.

3252 DUCT SLEEVES:

Carry finished insulation through duct sleeves.

3255 VAPOUR BARRIERS

Vapour barrier shall be applied over insulation on services, plant etc, working at or below ambient temperatures and they shall be continuous, maintained dry, completed and sealed as a vapour barrier throughout before reducing the service to its working temperature.

The insulation at all support points shall be pre-formed load bearing inserts manufactured from hardwood, phenolic foam or other specified material, and to the same thickness as the adjacent insulation on each side of the brackets/support.

Each insert shall incorporate a bright aluminium foil covering to provide a vapour barrier to match that of the adjacent insulation.

The length/width of each insert shall protrude not less than 40mm on either side of the bracket/support.

The insulation either side of the brackets/support shall butt up tightly to the insert and the vapour barrier made continuous by taping the joints between the foil faces on the insulation and inserts with a minimum 50mm wide Idenden T303 Class 'O' foil tape.

For HTHW, steam and condensate pipe work where roller and chairs form supports, a galvanised sheet steel protective sleeve shall be provided around the insert between the roller and the guide bracket (Phenolic foam shall not be used on HTHW and steam pipework or systems that exceed its temperature limit.

It is essential to maintain the integrity of vapour seals.

3260 LIQUID VAPOUR BARRIERS:

Apply vapour seal solution evenly by brush in accordance with manufacturer's instructions; use solution which dries to a colour distinctive from insulating material.

3270 INTEGRITY OF VAPOUR BARRIERS:

Where a vapour barrier is indicated ensure its integrity throughout.

Repair immediately any damage to vapour barriers and where such barriers have been applied off site, repair to manufacturer's instructions.

Where aluminium sheeting is used for protection submit proposals for securing sheeting without impairing the integrity of the vapour seal, for approval.

3280 WATER TANKS

Arrange insulation and finish to allow removal of access covers and/or tank top.

10000 Based on SPEX Y50 TEXT March 08

Y51 – Testing & Commissioning of Mechanical Services

1000 GENERAL

Undertake in spection and commissioni ng of the building services systems in accordance with The Building Regulations Approved Documents L1 & L2 and relevant CIBSE / BSRIA commissioning codes. Where an existing system has been ex tended or modified, then, unless noted otherw ise in the s cope of works, the co mplete system shall be re -commissioned. For ex ample if a new prime mover ha s been installed or the original prime mover up rated in an air or water system and the system has been extended to serve additional terminals.

Appoint a co mmissioning manager / Specialist Com missioning Agent and undertake Commissioning Management in accordance with CIBSE commissioning code M.

The Contractor shall revie w all de signs to ensure that systems are commissionable in accorda nce with the codes of practice detailed i n Y51. If additional facilities are required the Contractor shall advise the designer prior to commencing work on site.

Produce and issue a notice to the local authority at the end of the commissioning that shall declare that a commissioning plan has b een produced and follo wed and the com missioning results confirm that the performance of the engineering systems is in accordance w ith the original design. Where deviations / excursions from the design have been agreed with the designers / and client these shall be documented in the notice.

During the c ommissioning stage syste ms shall not be left runni ng / unattend ed without C ontractor attendance on site eg overnight or during w eekends. Should a component failure occur the engineerin g services shall be configured to safely shut down.

Carry out Seasonal Commis sioning as defined in clause 1002 (in accordance with the requirements of BREEAM) where specified in A31sch1 or A31sch2.

For Dry Riser and Wet Ris e fire fighting mains; where identified else where within this specific ation or required by the local fire bri gade, comply with the requirements of BS 9990 Clause 7.2 for protect ion of buildings under construction

1002 DEFINITIONS

The following definitions, generally extracted from BSRIA Application Guides 2/ 89.3 and 3/8 9.3, and BREEAM Offices 2006 and shall apply to all systems.

Capacity Tests

The proving that the capacity of installed plant and equipment items meets the specified duty.

Commissioning

The advancement of an installation from the stage of static completion to w orking order to s pecified requirements.

Design Criteria

The measurements and quantities selected as the basis for the design of a system.

Performance Criteria

The specified, numerically quantifiable, characteristics and tolerances to be achieved by the system.

Performance Testing

The proving that the installed system can maintain the specified, numerically quantifiable, characteristi cs and tolerances to be achieved by the system.

Fine Tuning

The adjustment of a system where usage and system proving has shown such a need.

Y51 – Testing & Commissioning of Mechanical Services

Pre-Commissioning Checks

Specified systematic checking of a completed installation to establish its suitability for commissioning.

Pressure and Leakage Testing

The measurement and recording of pressure retention, and fluid losses or gains in the plant equipment, distribution ways and terminals.

Regulation

The process of adjusting the rates of fluid flow in a distribution system to achieve specified values.

Setting to Work

The process of setting a static system in motion.

Static Completion

The state of the system, installed in accordance with the specification, clean and ready for setting to work. In the case of wet systems this includes flushing, cleaning, filling and venting.

System Proving

Measuring, recording, evaluating and reporting on the seasonal performance of the systems against their design values.

Testing

The measurement and recording of specified quantifiable characteristics of an installation or parts thereof. NOTE: This includes off-site testing.

Environmental testing

The measurement and recording of internal environmental conditions including temperature, humidity and noise levels (with artificial loads applied and using instruments independent of the BMS where indicated). The measurement of external noise levels
Refer to scope of work and Y51sch2 for details.

Seasonal Commissioning (as defined in BREEAM)

For buildings with Complex Systems including air conditioning, mechanical ventilation, displacement ventilation, complex passive ventilation systems, Building Management Systems and renewable energy sources the Commissioning Specialist shall undertake the following:

The testing of all building services under full load conditions, i.e. heating equipment in mid winter, cooling/ventilation equipment in mid summer, and under part load conditions (spring/autumn). Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy.

Carry out interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems.

Undertake re-commissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the O&M manuals

For simple buildings (largely naturally ventilated using cross flow ventilation) the Building Manager or his agent should review the thermal comfort, ventilation, and lighting at 3, 6 and 9 month intervals after initial occupation, either by measurement or occupant feedback.

2000 STATIC TESTING

Job No: Services technical standards

Standard Mechanical & Electrical

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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Y51 – Testing & Commissioning of Mechanical Services

2010z PRESSURE - GENERAL:

Comply with procedures given in HVCA Guide to Good Practice for Site Pressure Testing of Pipework. (TR6 2006) Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted. Isolate components that cannot withstand the test pressures. Isolate these as near to the component as possible.

Provide a blanked connection to accommodate a check gauge in addition to the accurate gauge fitted to section under test.

Test concealed or buried pipework and ductlines before any permanent covering is applied.

Carry out works test for individual items of equipment as detailed in the work sections of this specification

Advise appropriate personnel, in advance, of the time tests may be witnessed.

Agree test pressure and duration for water mains with local water authority.

2012 PRESSURE AND LEAKAGE TESTING - AIR DUCTLINES:

Carry out air pressure and leakage testing on air ductlines in accordance with DW 144 or DW 154 as appropriate and as indicated in section Y30.

2014 PRESSURE AND LEAKAGE TESTING - BUILDER'S WORK SHAFTS, VOIDS AND ENCLOSURES:

Ensure all builder's work shafts, voids and enclosures are pressure and leakage tested, and signify acceptance of standard and integrity of construction, prior to pre-commissioning of engineering installations.

2020 PRESSURE TESTING - WATER CIRCULATING AND SUPPLY SYSTEMS AND STEAM AND CONDENSE LINES:

Carry out Hydraulic Pressure Testing as described in HVCA Guide to good Practice for Site Pressure Testing of Pipework (TR6 2006). Test section by section for one hour, as the work proceeds and prior to application of thermal insulation as follows

Operating gauge pressure less than 3.5 bar, test gauge pressure one and a half times operating pressure.

Operating gauge pressure 3.5 - 7.0 bar, test gauge pressure twice operating pressure.

Operating gauge pressure greater than 7.0 bar, test gauge pressure 14.0 bar or one and a half times operating pressure whichever is the greater.

2030B PRESSURE TESTING - UNDERGROUND PIPEWORK, 4 HOURS:

Test to a gauge pressure twice the operating pressure or 7 bar, whichever is the greater, for 4 hours.

2042 PRESSURE AND LEAKAGE TESTING - WATER SERVICES INSTALLATIONS:

Inspect and test water services installations in accordance with BS 6700:1997 and to the requirements of the Local Water Undertaking.

Ensure the provisions laid down in HVCA Guide to Good Practice for Site Pressure Testing of Pipework (TR6 2006) for testing underground CWS mains are carried out.

2050 PRESSURE TESTING - FIRE RISERS:

Comply with the testing and commissioning requirements set down in BS 9990

For Dry Riser mains undertake static water test to a pressure of 10bar at the highest outlet for a minimum period of 15 minutes.

On completion of the static test check operation of the non return valves integral within the inlet breeching unit by using the static pressure exerted by the full water capacity of the riser.

For Wet Riser pipework undertake static water pressure test to a pressure not less than the system closed valve pressure exerted by the wet riser pump set when designed to operate at the flow and pressure defined in BS 9990 clause 6.4.1.4. Ensure pressure is maintained for a minimum period of 15 minutes.

Y51 – Testing & Commissioning of Mechanical Services

2055 PRESSURE TESTING - REFRIGERANT PIPEWORK:

Test refrigerant pipework using the strength test procedure as detailed in Clause R6.4 of the CIBSE Commissioning Code R: 2002. Test refrigerant pipework using the leak test procedure as detailed in Clause R6.5 of the CIBSE Commissioning Code R: 2002. Test refrigerant pipework using the deep vacuum test method as detailed in Clause R6.6 of the CIBSE Commissioning Code R: 2002

2062 PRESSURE AND LEAKAGE TESTING - GAS PIPEWORK OTHER THAN MEDICAL GASES:

Pressure test gas supply pipework systems in accordance with BS EN 12327:2000

For Natural gas systems, Purging and soundness testing shall only be carried out by authorised persons in accordance with the Institutions of Gas Engineers Publication IGE/UP/1 "Soundness Testing and Purging of Industrial and Commercial Gas Installations".

Test records shall be kept based on IGE/UP/1 requirements and prepared to provide a record of satisfactory witnessed tests and procedures for soundness testing and purging.

For other systems (such as gaseous fire protection systems), carry out a pneumatic leak test followed by a pneumatic pressure test as described in HVCA Guide to Good Practice for Site Pressure Testing of Pipework (TR6 2006). Upon their completion, pressure/leak test the areas to be protected to ensure that their leakage characteristics are as assumed in the specialist's design.

2065 PRESSURE TESTING - OIL PIPEWORK TO BS 5410:

Test oil pipework in accordance with BS 5410-2, Section 39.

2072 PRESSURE AND LEAKAGE TESTING - PIPED MEDICAL SERVICES:

Test to requirements of Hospital Technical Memorandum 02-01 Part A.

2082 PRESSURE AND LEAKAGE TESTING - SOIL, WASTE, VENTILATION, ANTI-SYPHON AND RAINWATER PIPEWORK:

Test section by section as the work proceeds and subsequently on completion with all sanitary fittings fixed and working.

Submit systems to two separate tests, Air test and Hydraulic Performance test in accordance with BS EN 12056 – 2 – 2000.

Siphonic rainwater pipework shall be tested in accordance with manufacturer's recommendations.

2090 PRESSURE TESTING - UNDERSLAB DRAINAGE:

Test section by section as the work proceeds and subsequently after completion of backfilling and compaction to the satisfaction of the Engineers and the local Authority.

Individually test sections which will be permanently embedded in the structure or concealed in ducts or voids.

Submit sections to two separate tests Water test and Test for Straightness and Obstruction in accordance with BS EN 752.

2100 VACUUM SYSTEM TESTING:

Test medical and laboratory vacuum systems in accordance with HTM 02-01 Part A.

2102 TESTING WIRING INSTALLATIONS:

Ensure all electrical installations associated with the system, are tested in accordance with the IEE Regulations, 17th Edition (BS 7671), before any plant is run.

2112 TESTING RECORDS:

Keep a systematic record of tests. Submit samples of test record sheets for agreement prior to testing. Obtain signatures of nominated witnesses to tests. Distribute records as indicated in specification section A33.

3000 COMMISSIONING

3002 COMMISSIONING PROPOSALS

Y51 – Testing & Commissioning of Mechanical Services

Submit proposals for commissioning as indicated in specification work Section A33 or A64 - General Engineering Technical Items. Use commissioning specialists who are members of The Commissioning Specialist Association (CSA).

3012 CLEANING DUCTWORK SYSTEMS:

Clean ductwork before plant is first run, using access openings in ductwork. Carry out cleanliness checks and procedures listed in CIBSE Commissioning Code Series A Air Distribution and BSRIA Application Guide 3/89.3 The Commissioning of Air Systems in Buildings. Also refer to specification section Y30, clause 4091.

3014 CLEANING PIPEWORK SYSTEMS:

Flush and clean all pipework systems before the plant is first run. Carry out flushing procedures listed in CIBSE Commissioning Code W: Water Distribution Systems and BSRIA Application Guide AG 1/200 1 Pre-commissioning cleaning of pipework systems. and the requirements of specification section Y25.

3020 COMMISSIONING CODES:

Carry out commissioning of installations in accordance with the latest version of the relevant BSRIA Application Guides and CIBSE Commissioning Codes.

3031 COMMISSIONING WATER DISTRIBUTION SYSTEMS INCLUDING BSRIA PRE-COMMISSIONING CHECKLIST:

Preliminary checks

Carry out checks and procedures as detailed in CIBSE Commissioning Code W.

Ensure system is statically complete as defined in section B4 of BSRIA Application Guide 2/89.3

Commissioning of water systems in buildings

Use pre-commissioning checklist from BSRIA Application guide 2/89.3

Setting to work and regulation

Set to work and regulate water distribution systems in accordance with CIBSE Commissioning Code W, and sections C3 and C4 in BSRIA Application Guide 2/89.3 Undertake an initial scan of the system and document the results.

Measurement

Use instruments for measurement generally as detailed in BSRIA Application Guide 2/89.3

For each belt driven pump provide a change of belts and drives (to be sized after balancing the system). Allow for changing belts and drives and recommissioning pump and then rechecking system as necessary to achieve the specified duty.

For each direct driven pump (both single pumps and twin headed pumps) without inverter or other speed control, allow for a change of impeller (to be sized after balancing the system). Allow for changing impeller and recommissioning pump and then rechecking system as necessary to achieve the specified duty.

Carry out commissioning of variable flow water systems in accordance with BSRIA Application Guide AG16/2002 – “Variable flow water systems, Design, installation and commissioning guidance” and CIBSE KS9 “Commissioning variable flow pipework systems”

3041 COMMISSIONING AIR DISTRIBUTION SYSTEMS INCLUDING BSRIA PRE-COMMISSIONING CHECKLIST:

Preliminary checks

Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1 .

Ensure system is statically complete as defined in section B4 of BSRIA Application Guide 3/89.3

Commissioning of air systems in buildings.

Use pre-commissioning checklist in BSRIA Application guide 3/89.3

Setting to work and regulation

Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2, and sections C3, C4 and C5 in BSRIA Application Guide 3/89. Undertake an initial scan of the system and document the results.

Y51 – Testing & Commissioning of Mechanical Services

Measurement of air flow

Use instruments for measurement and methods of measurement detailed in BSRIA Application Guide 3/89.3 and CIBSE commissioning guide, section A3.

For each belt driven fan provide a change of belts and drives (to be sized after balancing the system). Allow for changing belts and drives and recommissioning fan and rechecking system as necessary. For each direct drive, adjustable pitch, axial fan, allow for a change of pitch angle (to be determined after balancing the system). Allow for recommissioning each system after the fan blade pitch change.

3042 COMMISSIONING VAV AIR DISTRIBUTION SYSTEMS INCLUDING BSRIA PRE-COMMISSIONING CHECKLIST:

Preliminary checks

Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1. Ensure system is statically complete as defined in section B4 of BSRIA Application Guide 3/89.3 Commissioning of air systems in buildings. Use pre-commissioning checklist in BSRIA Application guide 3/89.3

Setting to work and regulation

Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2, and sections C3, C4 and C5 in BSRIA Application Guide 3/89.3 Undertake an initial scan of the system and document the results. For regulation of Variable Air Volume Systems follow routine in BSRIA Application Guide 1/91 The commissioning of VAV systems. Carry out fan volume checks at both maximum and minimum duties to confirm that the air volume differential between supply and extract is maintained at both extremes of duty.

Measurement of air flow

Use instruments for measurement and methods of measurement detailed in BSRIA Application Guide 3/89.3 and CIBSE commissioning guide, section A3.

3050 COMMISSIONING BOILER PLANT:

Follow the procedures laid down for carrying out Preliminary Checks and Start Operation in accordance with CIBSE Commissioning Code B and manufacturers instructions.

Apparatus and Instruments

Use Apparatus and Instruments detailed in CIBSE Commissioning Code B, Appendix B3.1. Apply tolerances defined in Appendix B3.2.

Commission the combustion aspects steam boiler plant in accordance with the principles outlined in CIBSE Commissioning Code B. Follow the procedures in the relevant parts of BS EN 12952 and BS EN 12953 for testing, commissioning and acceptance tests of steam boiler plant. The boiler manufacturers in accordance with a method statement, which has been approved by the client's insurance inspectors and the CA, must commission steam boiler plant.

3051 COMMISSIONING STEAM SYSTEMS:

Commission steam systems in accordance with:

CSA (Commissioning Specialists Association) Technical Memorandum - TM 7 Commissioning of Steam Systems.

3055 COMMISSIONING OF GAS PLANT AND SYSTEMS:

Commission gas fired plant on industrial and commercial premises in accordance with IGEN/UP/4. Comply with the requirements of section 17 of IGEN / UP / 2 for completion, commissioning and handover of gas installations. Commission gas supply systems in accordance with BS EN 12327.

3060 COMMISSIONING REFRIGERATING SYSTEMS:

Commission refrigerating systems in accordance with CIBSE Commissioning code R:2002 Use the testing and commissioning requirements in ARI 560 :2000 for absorption machines.

Y51 – Testing & Commissioning of Mechanical Services

3120 BMS COMMISSIONING – PRE-COMMISSIONING (inc NES clause 3140)

Ensure that the BMS is pre-commissioned to allow the building services plant to operate under "manual" running conditions.

Ensure that the control valves can be manually set in their fully open position to allow the balancing of pipework flows.

Ensure that dampers can be manually opened to allow the commissioning of air systems.

Ensure that as much pre-commissioning work as possible is performed off-site:

Ensure that the following is followed:

<i>Pre-commissioning action</i>		<i>Pre-commissioning off-site</i>
Control application software		Yes (final commissioning on-site)
User interface software		Yes (final commissioning on-site)
Control panels		Yes (final commissioning on-site)
Terminal units (fan coil units, etc)		Yes (final commissioning on site)
Wiring		No
Communications network		No
Sensors		No
Actuators		No
Integration gateways		Partial

Ensure that a record of all settings, set-points and offsets are maintained throughout the pre-commissioning period.

Ensure that all final physical adjustments to the field devices are indelibly marked.

Ensure that all packaged plant interfaced with the BMS is fully tested and commissioned by the manufacturer or installer.

Ensure that the BMS is pre-commissioned in accordance with the requirements of CIBSE Code C (Commissioning of automatic control systems).

Ensure that the BMS is pre-commissioned to allow the building services plant to operate under "manual" running conditions.

Ensure that the control valves can be manually set in their fully open position to allow the balancing of pipework flows.

Ensure that dampers can be manually opened to allow the commissioning of air systems.

3130A BMS COMMISSIONING - PLANT READY FOR CONTROL SYSTEM COMMISSIONING

Confirm that the following plant commissioning has been performed before commencing the final BMS commissioning:

Water systems

The system is cleaned and flushed to remove any debris.

All regulating, isolating and control valves in place and operating correctly.

That all flow measuring devices are in place and in the correct location for accurate measurement (including pressure tappings).

The system is vented.

That the proportional balancing is completed to obtain the branch flow rates in the correct ratio to each other (or through the use of and setting of self-balancing valves).

That the pump flow rate has been adjusted to provide the specified flow rate.

Air systems

Debris has been removed from the air distribution system.

That dampers are in the correct location and fully functional.

That fire/smoke dampers open.

Test holes have been drilled and sealed with removable plugs.

That in-situ flow measuring devices have been installed.

Ductwork air leakage testing has been performed (if specified).

Completion of proportional balancing of regulating dampers so that terminals share the air flow in the correct proportions.

Regulation of the fan(s) to provide the specified flow rate.

Packaged equipment

Ensure that plant and controls have been fully commissioned and are functional, ready for integration with other plant/systems.

Y51 – Testing & Commissioning of Mechanical Services

That control equipment inputs/outputs are in the specified format for connection to the main control system.

Confirm that the plant is commissioned in accordance with:

Air distribution systems, CIBSE Code A

Boiler plant, CIBSE Code B

Refrigeration systems, CIBSE Code R

Water distribution systems, CIBSE Code W

The commissioning of water systems in buildings, AG 2/89.3, BSRIA

The commissioning of air systems in buildings, AG 3/89.3, BSRIA.

3151 COMMISSIONING BMS / AUTOMATIC CONTROL SYSTEMS

Carry out commissioning of Automatic Control Systems in accordance with Manual prepared by the controls equipment manufacturer. Carry out the Checking and Setting-Up procedure detailed in the CIBSE Commissioning Code C, Section C1.

Measurement

Carry out measurements in accordance with CIBSE Commissioning Code C, Appendix C2.1.

Ensure that the BMS is commissioned in accordance with the requirements of CIBSE Code C

Wherever possible load, prove and commission all software off-site.

Carry out all tests necessary to ensure the correct operational state of the installation. Load and prove all software. Set all variable parameters and switches to the appropriate values and settings to ensure compliance with the specification.

Prior to activating any BMS control of plant demonstrate all safety interlocks and ensure all fail safe conditions are implemented and operational.

Record values and settings of all variable parameters and switches set as part of the commissioning process. Include these records in Record Documents.

Indelibly mark all physical adjustments to BMS devices.

3152 BMS WITNESSING REQUIREMENTS: (NES clause A32 151.000 / W60 360.010))

The Contractor shall implement the following CA's witnessing requirements. Ensure that on-site commissioning staff facilitate the witnessing process.

Confirm that the BMS hardware is installed in accordance with Section W60.

Verify any operator software and associated graphics.

Witness completely the control of any main and/or critical items of plant along with a random sample of other points.

If less than 300 points, witness all points. Between 300 and 1,000 points witness 50% (minimum of 300 to be witnessed). If more than 1,000 points witness 20% (with a minimum of 500 points witnessed).

Reserve the right to witness 100% of the points if the failure rate is greater than 5%.

Witness a sample of specific functions, eg 10% of alarms and 10% of data logging.

Witness one of several identical items of plant in detail with the others witnessed on a random basis.

Verify the system security access.

Verify that all safety-related functions perform to that specified, eg plant shutdown on fire condition.

Verify all plant restarts according to that specified after building power failure and local power failure.

Witness all power meter data-points to ensure that they match the meters.

Ensure that trend logs are used when witnessing points in order to monitor the performance of control actions.

Verify the handover of all operating manuals and system documentation.

Verify the handover of backup copies of software.

Verify the completion of any specified system operator training.

3153 BMS - POST HANDOVER CHECKS: (Edited from NES clause A32 152.000 / W60 360.050)

Ensure that the following post-handover checks are performed:

Global level checks

Internal air temperature.

Relative humidity.

Energy consumption (ensure that the pulse-input counters match the meters).

Check that each of the above meets the specified requirements.

System level checks

Control set-points. Check that the set-points in question are correct and appropriate for the actual operating conditions.

Control loop settings. Check that the control loop settings result in accurate and stable control.

Occupant controls. Check that occupant controls work correctly.

Job No: Services technical standards

Standard Mechanical & Electrical

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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Y51/163
07/07

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EX000001613_0212

Y51 – Testing & Commissioning of Mechanical Services

Sub-system/component level

Dampers and valves. Check that there are no dampers and valves that are jammed and that they operate as intended

3081 COMMISSIONING PLANT ITEMS AND OTHER SYSTEMS:

Where no CIBSE or BSRIA manuals are published that cover the commissioning of specific plant items or other systems submit detailed proposals and comply with the manufacturers' recommendations for setting to work.

3091 INSTRUMENTS AND GAUGES:

Ensure instruments are correctly calibrated. Record details of instruments on record sheets.

Submit evidence of correct calibration of instruments to be used in connection with commissioning and testing.

3101 AIR SYSTEMS COMMISSIONING RECORDS TO BSRIA GUIDE 3/89.3:

Keep a systematic record of commissioning results and distribute as indicated.
For air systems.

A record of the initial scan of the system shall form part of the commissioning results. These results shall be included in the Operation and Maintenance manuals.

Use record sheets as described in BSRIA Application Guide 3/89.3 Commissioning of air systems in buildings.

3102 WATER SYSTEMS COMMISSIONING RECORDS TO BSRIA GUIDE 2/89.3:

Keep a systematic record of commissioning results and distribute as indicated.
For water systems

A record of the initial scan of the system shall form part of the commissioning results. These results shall be included in the Operation and Maintenance manuals.

Use record sheets as detailed in BSRIA Application Guide 2/89.3, Commissioning of water systems in buildings.

3112 COMMISSIONING OF ELECTRICAL INSTALLATIONS:

Ensure all electrical installations associated with the system are tested and commissioned before any plant is run.

Carry out electrical checks listed in CIBSE Commissioning documents :-

Series A Air Distribution Systems - A1.5

Code W:1989 Water Distribution Systems - W1.7

4000 PERFORMANCE TESTING

4010z SYSTEM DEMONSTRATION:

Demonstrate the performance and control sequence, including the operation of all safety devices, of installations including single, standby, multi-duty plants and systems, and of plants specified for future use.

4015 TESTING OF RESIDENTIAL VENTILATION SYSTEMS:

Demonstrate the performance of residential ventilation systems through performance testing and installation checks in accordance with BS EN 14134.

4020z PERFORMANCE TESTS, CAPACITY TESTS AND ENVIRONMENTAL TESTING:

Carry out performance and capacity tests and environmental testing for all systems and in all areas of the building to prove and demonstrate the performance of the systems and plant item duties.

Undertake Specific fan power validation (SFPv) tests on all air handling systems in accordance with BS EN 13779:2007.

Job No: Services technical standards

Standard Mechanical & Electrical

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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Y51/164
07/03

EX000001613/213
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Y51 – Testing & Commissioning of Mechanical Services

For environmental testing, the minimum requirement is to test each room using the BMS (unless stated otherwise in Y51sch2) for at least 48 hours during which period the temperature and humidity (if controlled) set points must be varied at least twice to prove the correct responses of control systems and plant. Temperature / humidity logs shall be provided as a record of the testing.

Apply artificial loads / use calibrated data loggers or chart recorders (independent of the BMS) in those areas detailed in the scope of works, or where indicated in schedule Y51sch2 or otherwise provide test arrangements to simulate the full range of operating conditions and duties.

Undertake system proving during the defects period by recording, evaluating and reporting on the seasonal performance of the systems against their design values. Ensure that both summer and winter maximum and minimum conditions are covered by the test results.

Carry out ambient air quality tests in accordance with BS EN 13528-1 and BS EN 13528-2 as scheduled.

Carry out measurements of sound or noise levels in all internal and external areas of the building or project to demonstrate that the designed values are being achieved or not exceeded as appropriate.

4024 CONTROLS DEMONSTRATION AND VERIFICATION:

Demonstration and verification that the controls systems are fully operational, commissioned and deliverables have been made shall include, but not be limited to, the following:-

- : Demonstration of operation of software prior to installation
- : Audit of cabling and hardware installation
- : Demonstration of physical and logical integrity of system, including demonstrating that sensors and actuators correctly connected and addressed.
- : Demonstration of control actions, including operation of all safety devices
- : Demonstration of sensor calibration
- : Demonstration of successful system software commissioning, including reloading software and documented commissioning data from media and subsequent satisfactory operation.
- : Verification of specified graphics
- : Verification of satisfactory training of client's staff
- : Verification of the handover of all specified operating manuals, documentation and drawings
- : Verification of handover of back-up copies of software
- : Verification of handover of consumable spares

4030z RECORDERS:

During performance, capacity and environmental testing provide records as necessary to demonstrate the system performance.

Following completion provide and maintain on free loan portable at least three seven day space temperature and relative humidity recorders, together with adequate charts.

Provide other recorders as agreed with the engineer.

4040A RAINWATER SYSTEMS:

Demonstrate by flow tests that the systems give satisfactory performance.

4040B SANITARY SYSTEMS:

Comply with performance tests given in BS EN 12056 – 2 - 2000.

4040C COLD WATER / BOOSTED COLD WATER SYSTEMS:

Demonstrate and record that outlets supply adequate rates of flow.

4041 HOT WATER SYSTEMS:

Demonstrate and record that outlets supply adequate rates of flow and the water temperature reaches 50°C within 30 seconds of fully opening the tap at the furthest outlet in the system.

4040D FIRE FIGHTING SYSTEMS:

Comply with requirements of the local Fire Authority and comply with the commissioning / setting to work requirements as set down in BS9990 and BS 5306-1 (Hose reels) for non automatic fire-fighting systems.

Y51 – Testing & Commissioning of Mechanical Services

Dry Riser System; undertake flow and pressure test at the highest outlet of a flow of 25l/s at a running pressure of 4 bar or as agreed with the fire brigade. On each valve outlet below highest outlet undertake full bore flow test to prove no impedance to valve outlet flow

Wet Riser System; Undertake flow and pressure test at each outlet of 25l/s at a running pressure of 8bar. Or as agreed with the fire authority.

Where requested by the engineer carry out proving test of the riser's intermediate isolation valves and pump suction and delivery valves. Where the valves are monitored undertake proving test of the monitoring system by means of closing each valve and witnessing the alarm signal at the central panel location.

Wet riser storage tank infill main where installed undertake flow test utilising inline flow meter.

Carryout proving test on the open and close operation of the storage tank infill float valves and prove operation of the storage tank high water level and low water level tank alarms and witness alarm signal at the alarm panel

On each pump undertake flow and pressure proving test utilising pump back to tank test line

Undertake pump automatic start test by lowering system pressure to below pump start pressure Test to be undertaken to each pump simulating standby pump operation by isolating lead pump and lowering system pressure..

Witness alarm signal of pump starting at alarm panel.

Simulate pump failure to prove pump failed signal on system alarm

On diesel pump set undertake '6 crank test' to simulate diesel pump failed to start signal.

4040E HYDRAULIC SYSTEMS:

Comply with requirements as indicated.

4040F MEDICAL GAS AND AIR SYSTEMS:

Comply with Hospital Technical Memorandum 02-01 Part A.

4040G LABORATORY AND INDUSTRIAL SYSTEMS:

Comply with requirements as indicated.

4040H GAS SYSTEMS:

Comply with the requirements of the local Authority.

4040I SILENCERS AND ACOUSTIC TREATMENT:

Demonstrate by measured tests that noise criteria indicated have been achieved.

4040J ACOUSTIC ENCLOSURES:

Demonstrate that measured air leakage complies with scheduled values.

4050z PERFORMANCE TEST RECORDS:

Keep a systematic record of tests. Distribute records as indicated in Section A 33.

4062 FINE TUNING:

Carry out fine-tuning as required by the engineer.

10000 NES

Based on version Y51 of SPEX text - July 07

Y52 – Vibration Isolation Mountings

1000 GENERAL

1010 DESIGN INTENT:

Supply equipment indicated to ensure that vibration from equipment is not transmitted to building, other supporting structure, pipework or ductwork. Consider the potential for structure-borne noise transmission as well as vibration.

1012 SELECTION OF MOUNTINGS

Mountings and inertia bases should be selected to suit the equipment and static deflections scheduled. Number of mounts to be selected by the specialist supplier.

1013 INERTIA BASES

Inertia bases and steel frames are intended to provide a more stable base for plant, provide more uniform weight distribution, reduce the centre of gravity and, if massive enough, reduce the amplitude of vibration.

1020 SPRING ANTI VIBRATION MOUNTINGS:

Select spring mounts with an overload capacity of 50%, for metal springs the outside diameter should be at least 75% of operating height. Permanently identify individual mounts with their load capacity.

1030 SPRING HANGERS:

Provide spring hangers that allow the lower hanger rod to move laterally at least 15°.

1040 LOCKING FACILITY:

Where indicated, provide lockable levelling device.

2000 PRODUCTS/MATERIALS

2011 MAT AND PAD MOUNTINGS:

Provide configured mat mountings with a waffle or ribbed section manufactured from synthetic rubber or neoprene.
or Provide pad mountings manufactured from composite synthetic rubber.
or as otherwise indicated.

Where mats are stacked, bond 1mm steel sheet thickness between each pad and to the top and base without filling voids.

2021 TURRET COMPRESSION MOUNTINGS:

Provide turret compression mountings fabricated from synthetic rubber or neoprene and mild steel.
or as otherwise indicated.
Protect the metal from corrosion by painting and fix friction pads to top and bottom.
Provide bolt holes to allow fixing.

2030 SPRING COMPRESSION MOUNTINGS:

Provide spring compression mountings comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted on pre-drilled base for bolting down, and enclosed with cap. Protect metal from corrosion.

2041 CAPTIVE SPRING MOUNTINGS:

Provide captive spring mountings comprising high strength low stress helical spring designed to achieve horizontal and vertical snubbing. Mount spring on resilient base pad predrilled for bolting down and protect against corrosion. Supply complete with a lockable levelling device.

2051 TURRET COMPRESSION HANGERS:

Provide turret compression hangers fabricated from synthetic rubber or neoprene and mild steel.

Y52 – Vibration Isolation Mountings

or as otherwise indicated.

Protect the metal from corrosion by painting and fix friction pads to top and bottom.

Provide bolt holes to allow fixing.

Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

2061 SPRING COMPRESSION HANGERS:

Provide spring compression hangers comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted within hanger box. Construct hanger box from steel (minimum thickness 1.6mm) complete with hole for suspension rod and enlarged lower hole for drop rod to equipment.

Provide spring hangers that allow the lower hanger rod to move laterally at least 15°.

2080 HORIZONTALLY RESTRAINED SPRING MOUNTINGS:

Provide horizontally restrained spring mountings comprising high strength low stress helical spring capped with steel pressure plate, on resilient base pad, mounted within hanger box. Construct hanger box from steel (minimum thickness 1.6mm) complete with holes for installing across connection. In addition supply synthetic rubber or neoprene snubber as a horizontal buffer.

2091 INERTIA BASES - CONCRETE FILLED:

Provide purpose built inertia bases constructed using welded steel frame formwork containing concrete reinforced with 12mm minimum diameter bars at 100 mm maximum centres, 35mm above the bottom of the base; and mounted on spring compression mountings.

2092 INERTIA BASES - STEEL FRAMED:

Provide purpose built inertia bases constructed using welded steel frame mounted on spring compression mountings.

2095 MULTIPLE PUMP BASES

Where multiple pumps are fixed to a common base, and they are not to always run at the same time, provide vibration isolation to individual pumps, designed to both avoid the transmission of vibration into the adjacent pumps (in order to avoid "Brinelling" their bearings) and into the pipework to which they are connected.

2101 VIBRATION ISOLATION HOSES:

Provide flexible hose couplings for connecting pipework comprising nylon fabric or steel mesh carcass with waterproof cover and internal lining of material to suit fluid conveyed, temperatures and pressures.

2111 PIPEWORK NOISE ISOLATION:

Incorporate within pipework support ring purpose made isolators manufactured from synthetic rubber or neoprene.

or as otherwise indicated.

2121 PIPE WALL AND RISER SEALS:

Provide pipe sleeves, minimum length 300mm, with lining of minimum 25mm dense mineral fibre packing sealed with soft setting mastic to both sides unless otherwise indicated.

3000 WORKMANSHIP

3010 GENERAL:

Install vibration isolation equipment and carry out levelling of equipment in accordance with manufacturer's instructions.

3021 CAST IN SITU BASES:

Ensure bases are cast so that in conjunction with the plant load the design static deflection is achieved.

Y52 – Vibration Isolation Mountings

- 3030 FIXING:**
Fix down vibration isolation mountings only where indicated.
- 3040 HORIZONTALLY RESTRAINED SPRING MOUNTINGS:**
Ensure snubbers for limiting excessive movement are installed out of contact during normal operation.
- 10000 NES**
Based on version Y52STANDARD Oct 02

Y54 – Identification (Mechanical)

1000 GENERAL

1010 REQUIREMENTS:

Identify all pipework, ductwork, equipment, appliances and ancillaries comprising the various systems.

1021 NEW SYSTEMS:

Comprehensively label and colour code throughout the works.

Any systems which have the same colour coding but serve different purposes (eg laboratory / Domestic hot and cold water services) shall have additional descriptive identification.

1030 EXISTING SYSTEMS:

Where identification details are incompatible with those required for new systems, obtain approval to mode of cross referencing.

1041 COLOURS:

To colour ranges given in BS 381C and BS 4800.

1045 PERFORMANCE and DURABILITY:

Ensure durability of all safety signage / identification is in accordance with BS ISO 17398

2000 PRODUCTS/MATERIALS

2011 PIPEWORK IDENTIFICATION:

Standards

Colour code and label to BS 1710.

Identification

Apply primary and secondary identification, to each pipe at least:

Once in every room or enclosed area.

At intervals not exceeding fifteen metres.

At every junction.

At every valve.

At every inspection and access position into service shafts, false ceilings, bulkheads etc.

Primary Identification

Apply colour bands, 300mm wide.

Secondary Identification

Apply colour bands, 50mm wide, and superimpose a legend identifying circuit, direction of fluid or gas flow, nominal pipe bore and, where appropriate, fluid or gas pressure.

Legends

Apply to colour bands by transfers of an approved type.

2021 DUCTWORK IDENTIFICATION:

Standards

Generally colour code and label to HVCA Specification DW 144 (Appendix B).

Identification

Apply primary and secondary identification, to each duct at least:

Once in every room or enclosed area.

At intervals not exceeding fifteen metres.

At every junction.

At every damper.

At every inspection and access position into service shafts, false ceilings, bulkheads etc.

Primary Identification

Apply colour bands, 300mm wide

Secondary Identification

For ducts with longest side or diameter up to and including 225mm. Paint colour bands 50mm wide and superimpose legends.

For ducts with longest side or diameter over 225mm. Paint or apply transfers to identification triangles, or triangular plates. Superimpose or incorporate legends.

Triangular Plates

Y54 – Identification (Mechanical)

Attach to buckle bands or stool pieces and fix to ducting, with apex indicating direction of airflow. Submit details of plates and fixings for approval before painting and marking. Use equilateral triangle of side 150mm minimum.

Legends

Apply transfers of an approved type to colour bands or triangles or triangular plates. Identify floor and space served, associated equipment reference and direction of airflow.

2030z PLANT AND EQUIPMENT IDENTIFICATION, LAMINATED PLATES:

Standards

Identify each item of equipment by name and, where appropriate, by agreed reference characters. Provide colour identification as called for in work sections and, in all cases, colour fire fighting equipment red.

Plates

Use rectangular metal or laminated plastic, securely fixed to each item of equipment.

Lettering

Laminated plates, multi-coloured with outer layer removed for lettering. General labels to be white with black lettering.

Legends

Engrave plates with an approved text. Incorporate operating duty of equipment where this is not incorporated in other labelling.

2035 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Graphical symbols for use on equipment to be created and applied in accordance with BS EN 80416-1, BS EN 80416-2, BS EN 80416-3.

2040z VALVE AND COCK IDENTIFICATION:

Standards

Identify each valve, cock, stop valve, air vent, drain cock etc. with disk engraved with numerical reference and service. Except where exposed in occupied areas.

Discs

Securely attach metal or laminated plastic discs, minimum diameter 35mm, to each item. Discs to be white with black lettering.

Legends

Engrave discs with permanent characters, minimum height 6mm.

Incorporate in operating instructions relating to regulating valves and flow measuring Equipment, details of flow rate, pressure differential and setting.

2050z MEDICAL GAS TERMINAL UNITS:

Label and colour code to HTM 2022.

Label and colour code cylinders to BS EN ISO 407

2060z LABORATORY OUTLETS:

Colour code and label taps and valves for use in laboratories to BS EN 13792.

2070 AIR VOLUME REGULATING AND CONTROL DAMPER IDENTIFICATION:

Standards

Identify each regulating and control damper except where exposed in occupied areas.

On ductwork dampers, clearly indicate commissioning set point.

Identification colours

Use primary and secondary identification colours of associated system for painted or self colour disks.

Discs

Securely attach metal or laminated plastic discs, minimum diameter 35mm, to each item.

Legends

Engrave disks with permanent characters, minimum height 6mm.

Y54 – Identification (Mechanical)

2080 INSTRUMENT IDENTIFICATION:

Standards

Identify each instrument by name and, where appropriate, by agreed reference characters.

Plates

Use rectangular metal or laminated plastic, securely fixed to each instrument.

Legends

Engrave plates with an approved text.

2091 DANGER AND WARNING NOTICES:

Hazardous Systems

Colour code and label hazardous systems and equipment to requirements of Health and Safety Executive

Guidance Notes.

On natural gas systems, provide identification and warning notices and labels (including a notice adjacent to each main and emergency shut off valve) to meet the requirements of the Gas Safety (Installation and use) Regulations 1998, and Institution of Gas Engineers (IGE) requirements.

2105 SYSTEM IDENTIFICATION INSTALLATION CHARTS:

System Schematics

Supply and fix a referenced schematic diagram (or diagrams) of all systems as installed, including equipment and ancillary schedules. Show scheduled information on diagram.

Identify all items by appropriate reference characters.

Control Schematics

Supply for incorporation in O&M manuals a referenced schematic diagram (or diagrams) of all control systems as installed, including equipment and ancillary schedules. Show scheduled information on diagram. Identify all items by appropriate reference characters.

Location

Fix in each boiler house, calorifier room, plant room or equipment room.

Finish

Plastic encapsulated chart.

10000 NES

Based on SPEX Y54text July 05

Y60 – Conduit & Cable Trunking

1000 GENERAL

1010 STANDARDS:

Provide conduit and cable trunking in accordance with the relevant British Standards and in particular the requirements of BS 7671 Requirements for Electrical Installations (The IEE Wiring Regulations).

1012 TRUNKING LAYOUT

Set out cable trunking as indicated on the drawings, making due allowance for any diagrammatic presentation. Provide all necessary offsets, bends, tapers, transformation pieces etc. required as trunking manufacturers standard accessories whether or not these are detailed.

2000 PRODUCTS/MATERIALS

2011 CONDUITS:

Use surface conduit or conduit concealed in building finishes as described in the Work Sections, Schedules or shown on the drawings. Minimum size of conduit shall be 20mm unless otherwise indicated.

Comply with BS EN 50086, BS EN 61386-21, BS EN 61386-22, BS EN 61386-23 as appropriate.
Use conduit from one manufacturer throughout. Use fittings to match conduit grade and finish.

For metal conduit use solid couplers to join lengths of conduit up to 25mm diameter, use oblong 'draw in' boxes to join lengths of conduit of 32mm, 1 1/2" and 2" diameter.

Electrical characteristics for metal conduit shall be electrical continuous.

For plastic conduit do not use slip joints, use expansion couplings where required.

Electrical characteristics for non-metallic conduit shall be electrical insulating.

Temperature classification of conduits shall be -5+60°C

Conduits shall be non-flame propagating.

Resistance against ingress of water and solid foreign bodies shall be rated to BS EN 60529. minimum IP 31 for indoor use, IP65 for exterior

2051 CONDUIT FITTINGS AND ADAPTABLE BOXES-METALLIC

For metal conduit use malleable iron conduit fittings, for external areas use malleable iron adaptable boxes and for internal areas use steel adaptable boxes.

Do not use factory made bends, inspection bends or inspection couplers except with 32 mm, 1 1/2" and 2" conduits. Ensure fittings are same class and finish as associated conduit system. Supply covers for circular or adaptable boxes in the same material and finish as boxes. Use steel dome or cheese headed screws to secure covers for Class 2 finish. Use brass dome or cheese headed screws to secure covers with rubber gaskets for Class 4 finish. Limit number of entry holes within loop-in boxes to four.

The minimum size of an adaptable box shall be 100 mm x 100 mm x 50 mm.

Connections use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use flanged couplers with washers.

2061 CONDUIT FITTINGS AND ADAPTABLE BOXES - INSULATING :

Do not use factory made bends, inspection bends or inspection couplers. Use boxes and connections to suit size of conduit and method of jointing. Use heavy gauge, high impact rigid PVC conduit fittings.

Provide all boxes for supporting luminaires or other heavy devices with metal brackets or insert clips to provide a support independent of the box. Provide boxes for flexible conduit, accessories and luminaire connection with a brass earthing terminal and/or steel circular earthing ring.

Y60 – Conduit & Cable Trunking

2080 CABLE TRUNKING AND FITTINGS:

Comply with BS 4678. Use trunking of each type from one manufacturer.
Provide trunking systems to BS EN 50085.

2091 METAL SURFACE TRUNKING:

Steel Trunking - Comply with BS EN 50085:1999

Extruded aluminium - BS EN 50085

Material Steel trunking to BS 4678 Part 1. Gauge of Metal Table 1 BS 4678. Supply partitions and covers same material as trunking. Use trunking manufactured with inward return edge flanges and fitted with flange couplers which ensure that when the cover is removed a minimum of 80% of the nominal trunking or compartment width is available for access.

Resistance against ingress of water and solid foreign bodies shall be rating IP31 to BS EN 60 529 for internal use.

Colour to be Manufacturers standard or to BS 4800 standard as scheduled.

CLASS	PROTECTION TO BS 4678 PART 1
Class 2	Electroplated zinc having a minimum thickness of zinc coating of 0.0012mm inside and outside with additional coating of stoved or air drying paint, applied at least to the external surface.
Class 3	Hot dip zinc coated steel to BS EN BS EN 10327 10143 and BS EN 10147.

Fixings

Use purpose made brackets to fix to structural steel or suspension rods. Provide external fixing lugs where specified protection for the installation is IP44 or greater.

Fittings

Use bends, tees and angles of similar gauge, type and finish as trunking body and supplied by same manufacturer. Use standard fittings where possible. Where site fabricated fittings are necessary ensure they are comparable in construction and finish with system. Obtain prior approval in writing before site fabricating any fittings or special accessories.

Partitions and Covers

Ensure partitions are electrically continuous with the body of the trunking or provide a connector for a circuit protective conductor. Ensure gap between partitions and lids maintains segregation of circuits.

Joints

Use purpose made jointing pieces fixed with screws into captive nuts. Ensure screws do not protrude through the nuts. Ensure rigidity of trunking is maintained across joint. Ensure external dimensions of trunking are maintained and not reduced by more than 4% across joints between trunking lengths and/or fittings. Use purpose made fittings of the same manufacture where trunking connects to switchgear and distribution boards.

Provide flanges for connection of flush floor trunking to vertical trunking to maintain the cross sectional area of compartments with 50 mm minimum radius.

Maintain electrical continuity at each joint by a copper link, (tinned copper for galvanized trunking), fixed on outside of trunking, secured by screws, nuts and shake proof washers. Screws must not project through the nut. Make provision for continuity to be achieved without need to remove paint from ferrous metal where trunking has a painted finish.

Screws, Nuts, Washers

Do not use self tapping screws. Use cheese or round head screws except where provision is made for the use of counter-sunk heads. Screws, nuts and washers to be made of brass or steel zinc coated to BS 3382-1 and BS 3382-2.

Cable supports

Y60 – Conduit & Cable Trunking

Provide horizontal trunking with removable cable retainers or bridges to retain cables in situ. Provide vertical trunking with pin racks to support cables at 3000 mm maximum spacing. Use insulated pins or insulation sleeved pins on pin racks.

Lighting Trunking Cover

Provide cover strip to prevent ingress of foreign materials, locate cabling in place and act as closure strips between luminaires. Use trunking cover strip clipped into place in trunking body. The Cover strip is to match lighting trunking body or high quality colourfast extruded plastic as scheduled. Colour and shade to BS 381 and/or BS 4800 as indicated.

2101 FLUSH FLOOR STEEL TRUNKING:

Trunking material Sheet steel trunking to BS 4678 Part 2. Gauge of Metal Table 1 BS 4678. Degree of Protection Class 3. Provide flanges for connection of vertical trunking and temporary blanking plates.

Flush floor cable trunking shall be manufactured from zinc coated sheet steel and shall comprise of a 1.5 mm minimum thickness body section with 3 mm double thickness walls and 3 mm lid section for 'standard duty lids and 5mm for heavy duty lids.

The trunking body walls shall be provided with a return flange to facilitate fixings and key the trunking into the screed. The compartment separators shall support to the lid and shall be provided with a PVC edging strip, which together with a hard rubber gasket on return edges shall eliminate drumming effect.

All bends, tees intersections and other accessories shall be factory manufactured and finished by the trunking manufacturer. Accessories shall be of a similar construction and finish to the main trunking.

All trunking sections and accessories shall form modules or whole multiples of modules of a size specified, except where special units are required to suit installation requirements. Lid shall be provided in one module lengths and fixed by 4 number countersunk head screws. Where specified, screw collars (of a finish to match to exposed edges of the trunkings) shall be provided to ensure that the fixings screws are flush with the applied floor finish.

At each module position within the trunking body, a brass earth terminal shall be provided within the power compartment.

All trunking bends, tees, intersections, service outlets and telephone distribution boxes shall be provided with recessed lids (to accept the specified floor finish). Where external carpet flanges are specified, they shall be adjustable.

2102 UNDERFLOOR STEEL TRUNKING

Trunking material Sheet steel trunking to BS 4678 Part 2. Gauge of Metal Table 1 BS 4678. Degree of Protection Class 3. Provide flanges for connection of vertical trunking and temporary blanking plates.

Unless specified otherwise, trunking shall be manufactured from 1.5mm minimum thickness body sections with 3mm double thickness walls and 3mm lid section.

The trunking body shall be provided with a return flange to facilitate fixings and 'key' the trunking into the screed.

All bends, tees, intersection and other accessories shall be factory manufactured and finished by the trunking manufacturer. All bends shall be of the accessible type unless specified otherwise. Accessories shall be of a similar construction and finish to the main trunking.

Trunking joints shall be provided with a saddle type coupler to prevent the ingress of screed, which shall screw fix to the base flange each side of the joint.

Y60 – Conduit & Cable Trunking

All bends, tees, intersections and service outlet boxes shall be of the dimensions and type specified, the depth of the box shall suit the minimum screed depth. The boxes shall be provided with an adjustable frame and recessed lid (suitable to accept floor finish). Lids shall be manufactured from 1.5 mm minimum gauge zinc coated steel and comprise of a pan plate forming the recess for the finish with a welded re-inforcing plate. Lids at service outlet boxes shall be hinged and lids at bends, tees and intersections shall be screw fixed with screws located in the corners of lids. At trunking connections a 'spout' coupler shall be provided which shall screw fix to the trunking body.

Boxes and frames / lids shall be supplied separately and all boxes shall be fitted with a blank plate to prevent ingress of screed during installation.

Rising bends shall be provided with an 50mm internal radius or gusset.

2103 SKIRTING AND DADO TRUNKING (STEEL)

Skirting and dado trunking body shall be manufactured from 1.2 mm (minimum gauge) hot dipped galvanised sheet steel and covers from 1.2mm electrozinc coated sheet steel.

All bends, tees, inter sections and other accessories shall be factory manufactured and finished by the trunking manufacturer. Accessories shall be of a similar construction and finish to the main skirting trunking body / cover.

Joint cover strips shall be provided to secure cover section to the main body and prevent the ingress of dust and moisture.

All special non-standard bends, tees, inter sections and other accessories shall be factory manufactured. No site-manufactured accessories shall be permitted unless otherwise approved by the Engineers.

Outlet plates shall be supplied separately and all accessories plates shall be fitted with a blank plate to prevent ingress of dust and moisture.

2111 SERVICE OUTLET BOXES:

Provide service outlet boxes and junction boxes constructed from sheet steel with same finish as trunking. Maintain continuity and segregation of compartments through boxes and fit flyovers where necessary. Provide service outlet boxes with separate and segregated access to outlets associated with each wiring compartment. Fit cable guard or grommet to each section. Incorporate spigots or adaptors on boxes for connection to trunking or conduit as appropriate. Make frames adjustable on each corner, recess lids as indicated. Manufacture frame and lids for service outlet boxes and junction boxes and suitable to accept type of floor covering specified.

Provide outlet plates for each low voltage compartment equipped as indicated on the drawings. Provide outlet plates for each telephone compartment that ensure the telephone compartment and its outlet plate conform to the requirements of BT and of the telephone system installer. Provide blank outlet plates for any unused compartments.

2121 SERVICE POLES:

Provide service poles and associated conduit or trunking fittings as shown on the drawings. maintain continuity and segregation of circuits throughout. Provide outlet boxes with separate access to wiring compartments.

Material -	Extruded Aluminium
Finish -	Manufacturer's standard
Style -	As scheduled or indicated on the drawings.
Fixings -	Free standing or complete with fixing brackets at top as indicated.
Accessories -	As scheduled or indicated on the drawings.

2131 SURFACE TRUNKING OF INSULATING MATERIALS:

Trunking to BS 4678 Part 4. Material as indicated.

Mechanical properties, trunking for medium mechanical stress.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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Y60 – Conduit & Cable Trunking

Temperature tolerances BS 4678 Part 4, Table 1. (-5+60°C)

Electrical characteristics shall be electrical insulating.

Resistance to ingress of water and solid objects shall be minimum rating IP31 to BS EN 60529. for internal use.

Trunking shall be Non flame propagating.

Fittings

Use fittings from same manufacturer of trunking.

Use 'snap-on' covers.

Use trunking fittings and accessories suitable for jointing by solvent welding.

Use proprietary cable retaining clips at 500 mm maximum intervals on trunking that exceeds 1.8 m in length. Where junctions occur ensure first clip is not more than 300 mm from junctions.

2141 UNDERFLOOR TRUNKING OF INSULATING MATERIALS:

Material Heavy gauge, PVC trunking to BS 4678 Part 4.

2151 SEPARATE OR MULTI-COMPARTMENT TRUNKING:

Use separate trunking or multi-compartment trunking for segregation of services. Ensure steel partitions have a provision for connecting a circuit protective conductor.

Provide separation of wiring as required by BS 7671 and the following:

low voltage circuits.

extra low voltage circuits.

communications/data.

emergency lighting.

fire alarm circuits.

incoming telephone circuits supplied by others.

2171 SUPPORTS AND FIXINGS:

Provide proprietary suspension systems comprising channel sections with return lips and compatible fixing accessories of materials to BS EN 10162 or BS EN 10210 and/or slotted angles to BS 4345.

Ensure support components for Class 4 conduit have the same finish method as the conduit carried out after manufacture. Ensure components in direct contact with conduit match profile of conduit.

Ensure all steel components such as studding, bolts and steel screws, bolts, nuts and washers are either cadmium plated and passivated or zinc electroplated to BS 3382 after manufacture. Do not use metal fixing components likely to deteriorate and/or cause damage through electrolytic action.

2176 WIRE ROPE SUSPENSION SYSTEM:

Where specified within the Scope of Works or Schedules, use proprietary Wire Rope Suspensions Systems which comply with BS EN 12385-1, BS EN 13411-3, BS EN 13411-4, DIN 3093, and BSRIA COP 22/2002. Wire Rope Suspensions to be suitable for the safe working load and comprise Stainless Steel grade 316 wire rope, Stainless steel grade 302 Spring fasteners with fixings by loops, stud (permanently fixed to wire rope length) or toggle as appropriate. The installation shall comply with BSRIA COP 22/2002 and 'solid' stud type suspensions shall be provided at maximum spacing of 20m, with a minimum of one in any straight run.

Y60 – Conduit & Cable Trunking

3000 WORKMANSHIP

3011 GENERAL:

Ensure entire system is electrically and/or mechanically continuous, to BS 7671.

Fire barriers

Comply with the requirements of BS 7671 wherever the conduit or trunking passes through the perimeter of a fire compartment (wall, floor or ceiling).

Appearance

Arrange conduit, trunking and ducting to present neat appearance, parallel with other service runs and lines of building construction, except where in screed or in-situ concrete. Ensure plumb vertical runs.

Cable installation

Install cable in conduit, trunking or equipment enclosures only when completely erected throughout its length.

Do not use framework of partitions or similar unless indicated.

Building expansion and settlement

Make provision in conduit and trunking at expansion and settlement joints to allow for movement of building structure. Provide circular through or adaptable boxes no more than 300 mm either side of expansion or settlement joints for conduit crossing. Join boxes with flexible steel conduit.

Quality

Cut conduit clean and square with axis. Remove any burrs prior to erection. Set form 90° in conduit wherever practical or use circular or adaptable boxes. Construct bends and sets cold with a bending machine. Do not apply heat when forming sets or bends. Use bending tools complying with British Standards appropriate to conduit material. Ensure no indentation or reduction in cross sectional area occurs during installation. Use correct tools to assemble conduit. Ensure no tool marks or damage to components occurs.

3021 LAYOUT:

Ensure the maximum circuit lengths and groupings of cables indicated are not exceeded.

Where dimensions are not indicated select trunking and conduit sizes in accordance with Appendix A of Guidance Note 1 Selection and Erection published by the IEE.

3030 SPACING:

Install conduit, trunking and equipment clear of other services. Measure distance from external surface of any thermal insulation. Notify instances where minimum clearance cannot be achieved and bond items concerned.

Minimum general spacings between conduits, trunking and equipment and insulated steam services - 300 mm.

other services excluding steam - 150 mm.

above central heating radiators - 1000 mm.

Ensure separation is in accordance with Appendix I of Guidance Note 1 Selection and Erection published by the IEE.

3040 CONDENSATION PREVENTION:

Install conduit and trunking systems to ensure internal condensation does not affect operation of associated circuits. Provide drainage points in accordance with BS 7671.

Where conduit passes through external wall between two areas of different ambient temperatures or in other locations likely to cause condensation, install a conduit or adaptable box. After wiring fill box with inert, permanently plastic compound with high insulation value.

3051 PROTECTION AND REPAIR OF STEEL COMPONENTS:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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Y60 – Conduit & Cable Trunking

Paint joints of conduit and minor damages to finish of conduit and trunking, including metal support systems, immediately after erection or after damage occurs.

Use paint compatible with finish as follows:-

For galvanised finish, use two coats zinc rich paint.

For black enamelled finish, use two coats of good quality, air drying, black enamel paint.

Remove grease, oil, dirt and rust before applying protective paint. Notify serious damage and repair or replace as instructed.

3060 EQUIPMENT CONNECTIONS:

Where surface mounted equipment is installed in conjunction with concealed conduit work, terminate concealed conduit at flush mounted conduit or adaptable box. Drill back of equipment, bush for back entry and mount equipment to conceal back box.

Connect to fixed equipment via conduit box located adjacent to termination point, using either solid or flexible conduit as indicated for final connection to equipment terminations.

Use conduit box as cable change point to facilitate changed wiring locally to adjacent equipment.

Connect trunking to equipment by specially fabricated connectors or by couplers and externally screwed brass bushes.

3070 CLEANING BEFORE WIRING:

Clean inside of conduits and trunking with swabs immediately before wiring.

Inspect all components and remove any foreign matter, fit temporary plugs to open ends of conduit and trunking to prevent ingress of water and solid material.

3081 WIRING:

Comply with BS 7671 when wiring installations. Segregate circuits as indicated.

Ensure draw wires are left within empty conduits for use of specialist installers. Use draw wires comprising galvanized soft iron wires or nylon tapes with fitted eyelets.

For concealed conduit ensure system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only. Draw-in boxes will only be permitted with prior permission in writing.

Do not use tallow or any other substances to facilitate drawing-in of cables.

3090 BUILDERSWORK:

Ensure conduit is not concealed until work has been inspected and approved.

Obtain permission before horizontally chasing walls.

Ensure that conduit and fittings buried in concrete or behind plaster are protected against corrosion or electrolytic action prior to rendering.

Ensure conduit concealed in wall chases is covered by plaster and/or rendering to minimum depth of 12 mm.

Y60 – Conduit & Cable Trunking

4000 WORKMANSHIP FOR CONDUIT

4010 DRAW-IN BOXES:

Provide draw-in boxes in conduit at maximum intervals of 10 metres or after bends and/or sets totalling 180 degrees.

4020 INSTALLATION OF CAST IN OR BURIED CONDUIT:

Ensure cast-in conduits are firmly secured to reinforcing steelwork and that accessory and/or conduit boxes are secured so they do not move during subsequent building operations.

Ensure there is no blockage immediately shuttering is removed. Check there is no mechanical damage to conduit in floor or screed prior to screeding. Fix securely before screed is poured. Provide temporary protection to conduits until screeds are laid. Ensure minimum amount of cross-overs occur dependent upon screed depth. Do not install draw boxes in floors.

Do not install conduits in screeds in areas indicated, within site blinding or in main structural slabs unless prior permission in writing is obtained.

4030 CONDUIT BOXES:

Ensure that wherever conduit boxes are cast in, the face of the box is flush with the face of the concrete or plaster. Fit circular conduit boxes with extension rings to ensure a flush face with plaster or concrete or where terminal blocks are to be accommodated.

Ensure fixing holes are countersunk where material thickness allows or use round head screws to prevent damage to cables and remove burrs before cables are drawn in. Use a minimum of two screw fixing for standard circular conduit boxes and four screws for large conduit boxes and adaptable boxes up to 150 mm x 100 mm. Use back outlet boxes where surface conduits pass through walls, to outside accessories or lighting points.

Secure switch boxes and socket boxes using countersunk steel screws where provision is made for them or if not use round head screws, along with plug inserts. Recessed boxes shall be finally grout in position prior to plastering or screeding.

4040 FIXING CONDUIT:

Support conduit in accordance with Appendix I of Guidance Note 1 Selection and Erection published by the IEE. Ensure conduit is not under mechanical stress. Fix conduit boxes independently of conduit. Make allowance for any additional mechanical loading supported by conduit boxes. Where protection is specified as IP44 or greater ensure fixings of conduit boxes are suitable to maintain degree of protection.

Use following methods of fixing conduit:-

LOCATION	TYPE OF FIXING
Floor screeds	Saddles or crampets
Buried in plaster or render	Saddles or crampets
Above false ceilings	Saddles
Surface Saddles	

4050 FLEXIBLE AND PLIABLE CONDUIT:

Use flexible conduit for final connections to motors, other equipment subject to vibration or adjustment and to thermostats, motorised valves and similar items mounted in pipelines or ducts. Use sufficient length between equipment and circular through box at end of conduit run (minimum 450 mm) to allow necessary full range of withdrawal, adjustment or movement.

Use solid type adapters to terminate flexible conduit. Use PVC covered flexible conduit where installed externally, exposed to weather or in any position where ingress of moisture or condensation may occur.

Y60 – Conduit & Cable Trunking

4060 SCREWED STEEL CONDUIT:

Use materials clean and free from defects, rust, scale and oil. Obtain prior permission in writing for use of materials subject to remedial work before erection. Repair any damage caused by threading, bending or erection by painting with zinc rich paint before any rust occurs.

Ensure length of thread on conduit matches that in conduit couplers, fittings or equipment with no thread exposed after erection except at running couplers. Ensure conduits butt inside couplers. Use lubricant when cutting threads.

Use minimum number of running couplings

For running couplings in Class 2 conduit, use coupler and locknut. Paint exposed thread with zinc rich paint.

For running couplings in Class 4 conduit, use three piece conduit unions.

4070 NON-METALLIC CONDUIT:

Comply with manufacturer's instructions for bending, setting and jointing of conduit.

Use plastic conduit only where indicated. Do not install conduit when ambient working temperature is or will be below -5oC or above 60oC.

Use solvents recommended by manufacturer of conduit when using solvent welded joints and ensure spigots enter full depth of sockets. Hold joints rigid and in position until weld sets. Remove excess solvent before surface damage occurs.

Use slip joints as necessary, but not exceeding 6 metres on straight lengths to allow for expansion and contraction over temperature variation as indicated. Use semi-mastic adhesive where expansion joints are formed.

Where fittings do not have shaped or smooth conduit entries connect with male bushes and external couplings. Ensure special care is taken to prevent mechanical damage or warping to conduit where mechanical loads are imposed on conduit system, e.g. lighting fittings.

4080 UNDERGROUND INSTALLATION:

Where buried below ground, use Class 4 conduit. Do not use any buried conduit boxes unless prior permission in writing has been obtained. Wrap conduit with PVC self-adhesive tape, half lapped. Extend taping 150 mm beyond point where conduit leaves ground.

Install circular through conduit boxes at the end of the tape. Fill conduit boxes after cable installation with inert, permanently plastic compound with high insulation value, and wrap in PVC self adhesive tape.

Y60 – Conduit & Cable Trunking

5000 WORKMANSHIP FOR TRUNKING

5010 MANUFACTURE OF TRUNKING:

Take measurements on site before producing drawings for manufacture of trunking.

5020 ACCESS:

Arrange trunking to allow access to wiring. Locate covers on top or sides of trunking if practicable. Arrange access so covers are on a continuous face and cables can be laid in throughout the length of the trunking. Notify where either condition cannot be achieved.

5031 FIXING TRUNKING:

Ensure trunking is independently fixed and supported from building fabric. Obtain approval for proposed fixings/supports.

Support trunking in accordance with the manufacturers requirements and/or Guidance Note 1 Selection and Erection published by the IEE. Use two fixings minimum at intervals, not exceeding 800mm or 225 mm from accessories, which shall be independently fixed.

5041 STEEL TRUNKING:

Install steel trunking in accordance with the manufacturers requirements and those of BS 76 71. Use trunking to avoid multiple parallel conduit runs, subject to approval.

Cut trunking clean and square with axis, prepare ends and remove burrs and sharp edges. Ensure inside of trunking is free from anything liable to damage cables either during installation or after covers are fitted.

When trunking is held in a vice, ensure surfaces remain undamaged and components are not warped. Avoid tool marking or damage to trunking system components.

Use folding bars when bending trunking fabric to site form junctions and angles. Ensure corners are neat and metal on either side of corners is not distorted. Do not form flanges by cutting or bending trunking material.

Form circular holes over 6 mm diameter in trunking body using correctly sized punch sets. Use twist drill for holes up to 6 mm maximum diameter.

Use only factory formed openings for accessories. Line unprotected apertures in trunking with PVC or nylon edging strip. Fit ends of runs with removable blanking plates.

Ensure connections are not made to covers unless indicated or approval obtained. Provide fixed section of cover projecting 25 mm either side of fabric where trunking passes through wall, floors or ceiling.

Fit cable retaining straps at 500 mm intervals except where cover is on top.

5051 UNDERFLOOR AND FLUSH FLOOR TRUNKING INSTALLATION:

Trunking shall be cut to length by the manufacturer where possible, however, site cutting by the Electrical Trade Contractor may be necessary to suit site installation conditions (using a bench mounted saw / disc, to ensure a square cut). Trunking lengths and accessories shall be provided complete with coupling pieces and aluminium earth links.

Lay underfloor and flush floor trunking straight and level, flush floor trunkings shall be laid on a levelling screed. Adjust height of services outlets, junction boxes and flush floor trunking to suit top of screed level. Ensure that spaces below trunking are free from voids and correctly packed. Prevent ingress of screed by masking where necessary.

Ensure trunking levelling and alignment is carried out in co-operation with person(s) responsible for confirming location and finish of floor levels.

Y60 – Conduit & Cable Trunking

Immediately following installation of trunking fit temporary covers to service outlets, junction boxes and flush floor trunking, joints between lids, and lids and body shall be sealed by an approved tape. Fit temporary blanking plates over open connections to vertical trunking. Retain temporary covers until permanent covers are installed.

At trunking ends a suitable end cap shall be provided.

Trunkings shall be thoroughly cleaned of steel and brass particles and swabbed through prior to the installation of cables.

Ensure underfloor trunking systems are fully rewirable to final circuit outlets.

Connect conduits only at inspection or other easy access points.

5052 SKIRTING AND DADO TRUNKINGS

Skirting trunking shall be cut to length by the manufacturer where possible, however site cutting by the Electrical Sub Contractor may be necessary to suit site installation conditions (using a bench mounted saw / disc, to ensure a square cut) .. Trunking lengths and accessories shall be provided completed with coupling pieces and tinned copper earth links.

The trunking body shall be placed direct onto the wall and fixed into place with roundhead screws at top and bottom at regular intervals not exceeding 800mm or 225mm from accessories which shall be independently fixed.

Prior to wall and floor finishes outlet plates shall be fitted with blanking plates. On completion of the finishes the blank plates shall be removed and the accessories (i.e. socket) fitted.

At trunking ends a suitable end cap shall be provided.

The trunking shall be thoroughly cleaned of steel and brass particles and swabbed through prior to the installation of cables.

5060 TRUNKING OF INSULATING MATERIAL:

Comply with manufacturer's instructions. Do not install trunking where ambient temperature is below -5°C or working temperature is above 60°C.

Use solvents recommended by trunking manufacturer when making solvent welded joints. Remove excess solvent before surface damage occurs. Hold joints rigid and in position until welds set.

Use manufacturer's standard radiused bends, connector tees, off-sets, end plates and component parts of trunking system assembly.

Ensure no type of trunking other than that specified is installed without approval.

Trunking may be substituted for conduit at certain positions subject to approval.

10000 Specification Expert VERSION Y60 TEXT March 2008.

Y61 – HV/LV Cables & Wiring

1000 GENERAL:

1011 CABLE MANUFACTURER:

Use new cables, delivered to site with seals intact, manufactured not more than one year prior to delivery, labelled with manufacturer's name, size, description, BS number, classification, length, grade and date of manufacture.

All power cables shall have an independent HAR certification by the designated body for the country of manufacture to confirm their compliance with Harmonised Standards, British Approvals Service for Electric Cables (BASEC) is the preferred designated body, alternatively fire rated cables may be certified by the LPCB.

1020 CABLE CERTIFICATION MARKING:

Mark all types of power cable with CENELEC cable certification marking together with the HAR Certified body.

1031 CABLE RECORDS:

Keep records of cable drum numbers and supporting information, mark information on record drawings, indicating precise location of each length of cable, and submit copies of manufacturer's cable test certificate.

1032 CABLE DESCRIPTIONS IN SCHEDULES

See Schedules for particular requirements of cables.

2000 PRODUCTS/MATERIALS

2005 LSOH SHEATHING:

Supply cables with Low Smoke Zero Halogen (LSOH) sheathing, tested in accordance with BS EN 50267-2-1 and BS EN 60332-1-2.

2011 FLEXIBLE CORDS AND INDUSTRIAL CABLES:

All flexible cords and industrial cables shall have copper conductors and be rated at 300/500V for single phase and standard duty applications and 450/750V for three phase and industrial/heavy duty applications, unless otherwise indicated. Performance characteristics shall be suitable for the application.

2021 STANDARD WIRING AND POWER CABLES:

All wiring and power cables shall have copper conductors unless otherwise indicated. All cables shall have a voltage rating and performance characteristics suitable for the application. For multicore cables the conductors shall be circular up to 16mm² and shaped over 16mm² unless otherwise indicated. LSF means Low Smoke and corrosive gas emission compound.

2031 STANDARD MEDIUM VOLTAGE (MV&HV) POWER CABLES:

All power cables shall have copper conductors unless otherwise indicated. All cables shall have a rated voltage and performance characteristics suitable for the system.

Unless indicated otherwise, voltage ratings cables shall be selected for Category A in accordance with BS 6622 (phase to earth faults shall be disconnected from the system within 1 minute).

2041 MINERAL INSULATED WIRING AND POWER CABLES:

All conductors shall be copper unless otherwise indicated. All cables shall have an outer sheath as indicated. 500V light duty cables shall be used for sizes up to 2.5mm², 750V heavy duty cables for sizes over 2.5mm² to 25mm² and 750V heavy duty single core cables for over 25mm² unless otherwise indicated. Outer sheath colours shall be:-

Red	-	Fire Alarms
White	-	Emergency Lighting
Orange	-	Other Services

Fire performance standards - BS 5839-1, BS 6387, BS 7346-6 as appropriate.

Y61 – HV/LV Cables & Wiring

2051 CONTROL AND AUXILIARY CABLES:

All conductors to be copper unless otherwise indicated.

Standard BS 5308, BS 5467, BS 6346, BS 6724, BS 7211, BS 7629, BS 7846, BS 7870, BS EN 50288-7 as appropriate.

Fire performance standards BS 6387, BS 7346-6, BS EN 50200 as appropriate.

2071 STANDARD COMMUNICATION CABLES:

For outdoor or underground use:

Standard BS 3573, Tables 7, 8, 9, 10 and 11

For indoor use:

Standard BS 5308, BS EN 60708, BS EN 62012-1 as appropriate.

2081 STANDARD COAXIAL CABLES:

Standard BS EN 50117, BS 61196-3, ISO/IEC 8802-3.

CAI cable types to BS EN 50017, CT 100, CT 125, CT 165, as appropriate. Provide cables with CAI benchmarking status.

2091 OPTICAL FIBRE CABLES:

Standard BS EN 60793, BS EN 60794, BS EN 187103,

2101 INFORMATION TECHNOLOGY OR SPECIALIST SYSTEMS CABLES

Provide IT or Special Systems cables in accordance with the system suppliers specification.

Structured Wiring : Category 5

Standard BS EN 50173-1, BS EN 50288-3-1

Termination reference EIA/TIA TSB-40

Common construction – Multi pair; unshielded (UTP)

Information Technology cables:

Standard BS EN 50173-1, BS EN 50090-9-1, BS EN 50098, BS EN 50288, BS EN 61196, EIA/TIA 568.

2201 PRE-FABRICATED WIRING SYSTEMS

Pre-fabricated wiring systems shall comply with the requirements for fixed wiring installations in accordance with BS 7671.

Systems shall comprise of Home Run cables, Master Distribution Boxes (MDB's), extension cables, connectors, fused tees and luminaire flex tees. All connections with the exception of those to be terminated within the distribution boards shall be pre-terminated into 'snap-fit' plug and socket connectors. Refer to Schedule Y61sch3 for details of the system.

Conductors for Home Run cables shall be selected in accordance with BS 7671 to cater for grouping based on the number of circuits and the circuit ratings.

Y61 – HV/LV Cables & Wiring

Different distinct types of connectors (colour coded and keyed) shall be used on MDB ports and extender cables to differentiate between circuit ratings (generally lighting circuit shall be rated at 20A and power circuits rated at 20A or 32A), to prevent different rated circuits being interconnected.

Male & Female connectors shall provide a minimum of IP31 degree of protection and terminations shall be 'maintenance free', screwless without terminal blocks. Connectors shall incorporate a locking mechanism to prevent accidental disconnection.

Home Runs and Extender cables shall incorporate separate cpc's for each circuit. On metallic sheathed systems, the sheath shall be earthed and provide full circumferential bonding onto the casing of the connectors.

Where Pre fabricated wiring systems incorporate signal wiring for building control systems, it shall be ensured that the type of signal cable used is suitable for the system protocol and combination with the LV circuit wiring, without interference or affecting the operation of the building control system. Bridging between signal cables shall maintain the required network topology and maximum network lengths.

MDB's shall comprise of a steel enclosure with output ports located around the perimeter, external fixing lugs shall be provided to prevent damage to the internal wiring.

Cables are to be continuity and polarity tested at the works and each passed cable assembly is to be serial numbered with the recorded data detailed on the product. Once integrated into the works the Pre-Fabricated wiring shall be fully re-tested as part of the fixed installation in accordance with BS 7671 Regulation 713-01-01.

3000 ACCESSORIES

3011 CABLE GLANDS:

Standard BS 6121, BS EN 50262

Cable glands shall be suitable for the type of cable, environment and mechanical forces present all glands shall incorporate a method of cable retention. Metallic glands to be brass except where aluminium gland plates are provided where nickel plated brass glands shall be used, include shroud (LSOH for cables with LSOH sheath) and for metallic sheathed or armoured cables shall incorporate armour locking ring and earth tag for protective connection to earth.

Cable type	Application	Cable type	Gland type				
			Material	Cable retention	Ingress Protection to BS EN 60529	Type to BS EN 6121-5 Annex A	Environment
Unarmoured, Flexible;	Indoors	Wiring and power; control and auxiliary; and communications	Non-metallic	Class A	IP54	Type A1	Indoor
	Outdoors			Class A	IP66	Type A2	Outdoor
Armoured cables	Dry Indoors	Wiring and power; control and auxiliary;	Metallic Class A	A	IP54	Type B	Dry Indoors
	Indoors				IP54	Type B	Indoors
	Outdoors		Metallic	Class A	IP66	Type C	Outdoor

Where a cable gland or armour gland is required which has resistance to extreme conditions not covered by the requirement specified in BS 5026 2 or BS 6121 (e.g. resistance to chemical attack, resistance to

Y61 – HV/LV Cables & Wiring

ingress of water in deluge conditions, resistance to strong ultraviolet light), advice should be sought from the gland manufacturer.

Cable glands used with fire performance cables shall be such as to minimize the probability of early failure in the event of fire.

Cable glands shall be certified to BS EN 60079 and BS EN 61241 for hazardous areas.

3021 CABLE SEALS AND GLANDS - MINERAL INSULATED CABLES:

Comply with BS EN 60702-2

Use seals and glands for mineral insulated cables in accordance with BS 6207, recommended or supplied by cable manufacturer for the type and temperature rating of the installation classification.

Gland type shall be cable grip type, externally threaded with lock washer and nut. Seal type shall be Self-threading pot and the pot closure shall be as manufacturers standard for type of seal specified.

Pot sealant compound / glazing flux shall be suitable for the temperature rating required and environment.

Use Medium Temperature seals (150°C) for terminations associated with life safety equipment.

Cable glands shall be certified to BS EN 60079-14 and BS EN 61241 for hazardous areas.

Gland shroud material and shroud colour to match cable sheath.

3031 VOLTAGE SURGE SUPPRESSORS FOR CABLES:

Provide voltage surge suppressors in accordance with cable and equipment manufacturer's recommendations. Suppressors shall be suitable for the rated voltage, connection arrangement and characteristics for the load concerned.

Standard

BS EN 60099-1

BS CECC 42200

3041 CABLE TERMINATING AND JOINTING SOCKETS:

Unless otherwise indicated all cables shall be terminated using approved cable lugs, ferrules, and spade type connections to suit the terminal arrangements of all devices, instruments and equipment.

Standard

Compression to: BS EN 61238-1

Solder sockets to: BS 91

Clamping units to: BS EN 60999

Telecommunication connections to: BS EN 60352-3

3051 INSULATING TAPE/OVER SLEEVING AND HEAT SHRINK SLEEVING:

Shall be of same material as the cable insulation.

Standard

BS 3924

BS 3858

BS EN 60454

3061 CABLE JOINTS AND TERMINATIONS:

Use cable joints as supplied and approved by cable manufacturer for the application and installation involved.

Standard

BS 6910

BS 7888

BS 7197

BS EN 50393

BS EN 60998

Y61 – HV/LV Cables & Wiring

3071 PAPER INSULATED CABLE ACCESSORIES

Use cable joints as supplied and approved by cable manufacturer for the application and in stallation involved.

Standard

BS 7197

3081 CONNECTORS FOR COAXIAL CABLES:

Connectors to be suitable for the application and to match the equipment

Standard

BS 3041

BS EN 60169

BS QC 221100

BS QC 221300

BS QC 221400

BS QC 222000

IEC 95

3091 OPTICAL FIBRE TERMINATIONS :

Terminations to be suitable for the application, fibre style, terminated fibre type and required installation characteristics.

Standard

BS EN 50377

BS EN 60874

BS EN 61754

BS EN 186110

BS EN 186150

BS EN 186160

BS EN 186220

BS EN 186230

BS EN 186260

BS EN 186270

BS IEC 60874

3101 OPTICAL FIBRE CABLE JOINTS

Joints shall be suitable for the style, and required installation characteristics.

Standard

BS EN 61073-1

3111 CABLE DUCTS:

Provide cable ducts as indicated on Schedules and drawings.

Standard

IEC 61386-24

All cable ducts and joints shall have a smooth internal bore.

Cable ducts for electricity cables shall be colour coded black. Cable ducts for other services shall be colour coded in accordance with Table 1 and Table 2 of NJUG Volume 2.

Cable ducts for the Distribution Network Operators shall be to NJUG Volume 2 unless supplied by the Distribution Network Operator.

3121 CABLE SLEEVES:

Supply and hand to others for installation non ferrous cable sleeves for incorporation into the structure where cables pass through fire compartment floors and walls. The contractor is responsible for sealing cable sleeves following installation of cabling, method of sealing to be appropriate to prevent water ingress and maintain fire integrity, as applicable.

3131 CABLE COVERS AND MARKERS

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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188/245

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Y61 – HV/LV Cables & Wiring

Cable covers are to be manufactured from concrete in dented lettering warning of the danger electricity below.

Cable covers are to be wider than the width of the service cables that they are protecting.

Plastic warning tapes to be yellow with blue legend in accordance with BS EN 12613.

4000 WORKMANSHIP

4011 CABLE INSTALLATION - GENERAL:

Use and install cables only as directed in the appropriate standard or as directed by the manufacturer in writing. Lay cables in one length unless otherwise indicated. Obtain permission from supervising officer for all through joints, and where overall length requirement exceeds practical drum size.

Install cables when ambient temperature is 5°C or greater, using cables stored at or above this temperature for not less than 24 hours. (Refer to manufacturers recommendations for bitumen covered cables etc).

Use drum stands, drum axles, fair leads, rollers, cable stockings and other equipment as recommended by the cable manufacturer and as appropriate to the method of installation. Ensure over sheaths are not damaged by abrasion or scuffing.

4012 CABLES INSTALLED EXTERNALLY

4020 CABLE INSTALLATION IN LOW TEMPERATURES:

Install cables at lower installation temperatures when authorised by manufacturer in a written statement.

4031 CABLE ROUTING

Minimum spacings between cables and other services ;

Insulated Steam Services 300mm

Other mechanical services (excluding steam) 150mm

The minimum spacings (taken from outside surfaces) between LV cables and containment for elv cables (installed in air) shall be in accordance with IEE Guidance Note 1 'Selection and Erection', Appendix I, Table 11. For HV cables a minimum separation distance of 1,000mm shall be provided.

Where cables are specified as being routed by 'diverse' routes, each cable shall be run along a route of low risk from fire or mechanical damage and where possible within separate fire compartments. Where cables enter common rooms, entries shall be separated by a minimum of 4m. Under no circumstances shall the cables forming both groups, be run on the same containment.

4040 INSTALLATION OF UNARMoured CABLES

Install and use unarmoured cable to BS 7540-1, BS 7540-2 and BS 7450-3 or the manufacturers written instructions.

4051 CABLE TRENCHES:

Cable trenches to be by others but supervision of all works is to be carried out by Electrical Contractor.

Work in adopted streets to comply with the New Roads and Streets Works Act 1991.

Carry out walk over survey of trench route, dig trial holes in any area considered to be potentially difficult. Establish location of any other underground service adjacent to cable route.

Re-plan cable routes after survey and trial holes, Submit report of survey and trial holes. Carry out any instructed work to adjacent services. Set out cable trenches, excavate trench carefully setting aside any materials required for backfilling or reinstatement. Excess excavated material to be removed from site.

Minimum cover in cable trenches

Y61 – HV/LV Cables & Wiring

HV cables 800mm; LV cables 500mm; communications cables 500mm; all cables 800mm under roadways.

Trench

Common trench for all underground services

Grade trench bottom to a maximum slope of 1:12.

Clear trench bottom of loose stones and place bedding to full width of trench.

Bedding

Riddled earth 6mm grid for cables; riddled earth 12mm grid for ducts; imported soft sand; or pe a shingle for ducts.

Bedding thickness – 75mm; or 100mm for ducts.

Install cables or ducts. Haunch cables or ducts in bedding material to a minimum depth of 75mm above highest cable or duct.

Warning tapes to be installed in accordance with the following table :-

WIDTH	up to 600mm	600-1000mm	1000-1400mm	1400-1800mm
DEPTH up to 500mm	1 tape at 200mm below ground level in the centre of the trench	2 tapes at 200mm below ground level horizontally spaced 400mm apart	3 tapes at 200mm below ground level horizontally spaced 400mm apart	4 tapes at 200mm below ground level horizontally spaced 400mm apart
DEPTH 500-800mm	1 tape at 200mm and 1 tape at 500mm below ground level in the centre of the trench	2 tapes at 200mm and 2 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart	3 tapes at 200mm and 3 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart	4 tapes at 200mm and 4 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart

Backfill trench using two layers 100mm thick hand rammed. Complete backfilling in layers and reinstate trench.

Backfill material – as excavated from trench.

4061 CABLE INSTALLATION IN TRENCHES:

Lay cables on newly prepared bedding. Ensure multiple layers of cable are separated vertically by a 50mm layer of hard rammed bedding material. Cover newly laid cables with 100mm of bedding material.

When using a power winch ensure tension on the cable is taken by element of the cable designed for that purpose, that is armour or conductor cores as appropriate and not plastic sheath, metal sheath or core insulation.

During hand pulling cable ensure no kinks are formed and that flaking when used is one in the correct direction.

Do not allow cable to twist during installation. Use swivels to connect pulling bond to cable stocking or equivalent fitting.

Check drum is suitable for jacking before commencing installation. If drum or reel is unsuitable for jacking, flake cable in correct direction in maximum size turns from drum or reel before commencing installation.

Use skilled labour to supervise all unreeling, flaking or running of cable from a drum.

Lay cables in the formation shown, ensure spacing is not reduced below that indicated.

Bind trefoil groups at 1m intervals. Bind any associated earth or protective conductor to its cable or trefoil group at 1m intervals.

Ensure installation radii and permanent bending radii are not less than those recommended by the manufacturer.

Do not lay cables to BS 6007, BS 6500, BS 7211 or BS 7919 direct in the ground.

4071 CABLE DUCTS:

Duct work - Carry out all duct laying where specified.

Lay ducts, jointed in accordance with the manufacturer's instructions, in the formation shown on to newly prepared bedding.

Ensure that ducts slope no more than 1:60 vertically or 1:30 horizontally.

Ensure that pre-formed duct bends used at ends of duct routes meet the requirements of the cable manufacture for bending radii.

Construct manholes, draw pits and jointing chambers, as indicated.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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190/245

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Y61 – HV/LV Cables & Wiring

Prove alignment of completed duct run by drawing through a mandrel of diameter 7mm less than nominal duct bore of minimum length 250mm. Clean completed duct run by drawing through a circular wire brush of diameter 12mm more than nominal duct bore.

Install in each empty duct a draw wire of corrosion resistant material of minimum breaking strength 550N. Plug and seal all ducts on completion with proprietary duct plugs.

4080 CABLE INSTALLATION INTO DUCTS:

Install cables into newly proved and cleaned duct. Use lubricants, recommended by the cable manufacturer in writing, to assist drawing process.

Flake cable if drums or reels are not suitable for jacking. At intermediate draw pits with exit duct more than 15° off line of entry duct flake cable before entering or provide comprehensive system of corner plates, roller and blocks. Use the maximum practical size of turns when flaking and ensure direction of flake is correct.

Do not exceed manufacturer's installation tension on cable and ensure the pulling tension is taken on cable elements designed for that purpose, that is armour or conductor cores and not on other elements, such as plastic sheath or conductor insulation.

Do not allow cables being pulled into ducts to twist. Use appropriate swivel between pulling bond and cable stocking or similar appliance.

Bind trefoil groups of single core cables installed into a single duct at 1m intervals. Install earth or protective conductors into the same duct as the associated cable where practical, binding the two together through manholes, draw pits and jointing chambers. Pull all cables in one duct as a group. Ensure the group does not twist or cross over. Report any damage to cable sheath during installation and carry out any instructed work to remedy the damage.

Seal between cable and duct ends after cable installation. Ensure cable ends in jointing chambers are temporarily sealed where required.

4091 CABLE INSTALLATION IN CONDUIT AND TRUNKING:

Install cables so that they are orderly and capable of being withdrawn.

Arrange single core wiring generally using the loop-in method.

Trunking

In vertical trunking provide pin racks at 3m intervals. Use ties for all wires of the same circuit reference at 2m intervals. Mark ties at 10m intervals with circuit reference number.

Conduit

Provide cable clamps in conduit boxes at 10m intervals in vertical conduit.

Allow for full range of movement at building construction movement joints. Make all joints to wiring at terminal blocks in conduit boxes/adaptable boxes to suit cable size.

Where wiring is to be drawn into existing wired conduits, withdraw existing wiring and replace.

4100 CABLE INSTALLATION ON TRAY AND RACK:

Place cables side by side or as indicated, fix using cleats or metallic cable ties so that any cable may be individually removed.

4111 CABLE SURFACE INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection.

Clearance as determined by fixing method unless otherwise indicated. Use metallic clips on cables with specified fire performance.

4121 CABLE EMBEDDED INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection. Ensure plaster or screed over cable is a minimum of 12mm. Protect embedded cables (not complying with BS 8436) by metal capping.

4131 CABLE INSTALLATION - MINERAL INSULATED CABLES:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

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Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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191/245

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Y61 – HV/LV Cables & Wiring

Straighten and dress cables using methods and tools recommended by cable manufacturer.

Use thermoplastic or LSF sheathed cables, colour and location indicated and where cables may come into direct contact with any material that may be corrosive to copper.

Fit temporary seals to mineral insulated cable end when cut.

Fit temporary seals to mineral insulated cable if the cable is left unterminated underground, or where the termination is not to be made within 12 weeks.

Allow extra length on installed cables for cutting back of moisture affected ends. Store mineral insulated cables in the form supplied by manufacturer.

4132 CABLE INSTALLATION – PRE-FABRICATED WIRING SYSTEMS

Drawing shall be prepared by the Pre-Fabricated Wiring System manufacturer, detailing the installation and identifying each component and its location.

Connectors shall only be installed in dry environments e.g. not within wet areas such as showers and bathrooms. Connections shall only be located such that they are accessible after all works are completed.

Cable assemblies shall be of the correct length between connections onto MDB's or outlets or equipment without intermediate connectors, extensions or excessive slack.

Home Run cable shall be fixed directly to the soffit, where groups of 2 or more cables are run together these shall be run on cable baskets or trays.

Extender cables shall be clipped to the soffit or structural elements, independent of ceiling supports.

Home run and extender cables shall be installed such that they are supported clear from the ceiling and run along the lines of the ceiling grids so that they do not restrict access to the ceiling void or other services.

All cables without mechanical protection installed within partitions shall be routed in accordance with permitted cable routes in accordance with BS 7671.

Un-used connectors are to be fitted with end caps.

4140 CABLE INSTALLATION - FLEXIBLE CORDS:

Grip cords securely at connections. Where they do not form an integral part of the connected accessory or equipment, provide separate proprietary cord grips.

4151 CABLE JOINTING AND TERMINATING GENERALLY:

Ensure all joints and terminations are made by appropriately qualified cable jointers, using jointing materials, components and workmanship recommended by the cable manufacturer and the jointing accessory manufacturer. Install cable glands in accordance with BS 6121-5. Cold pour resin and heat shrink joints:

Cut all cable ends immediately prior to jointing or terminating. Seal cables left unconnected for more than 24 hours to prevent the ingress of moisture.

Seal plastic sheathed cables using proprietary shrink on end caps. Seal lead sheathed cables by a plumbed dressed lead cap with an air space to allow conductor movement.

Strip cables to bring out the cores and expose conductors, for the minimum length required for connection, to leave no exposed length of conductor after termination. Ensure that strands are not damaged when stripping cable cores. Twist strands together. Do not reduce number of strands. Secure all strands at terminations.

Clean armour thoroughly prior to jointing or terminating.

At connections to equipment and switchgear without integral cable clamping terminals, use compression or solder type lugs for bolted terminal connections, of correct bore. Form all compression connections to components using tools that cannot be released unless the correct degree of compression has been achieved. Install and inspect compression and mechanical connectors in accordance with BS EN 60228 and BS 7609.

Y61 – HV/LV Cables & Wiring

Bolt core terminations with lugs to equipment using washers or proprietary shakeproof devices. Provide separate bolted connection for each core.

For auxiliary and sub-circuit wiring do not bunch more than three cores at clamping terminals or bolted connections. Individual stranded cores should be twisted together and folded back to form a "U" where entering screw or clamp type terminals.

Mark cable conductor phasing, or other core identification, at each end of all cables, and at all joints, maintaining consistency of marking with any existing system.

Connect all cores, including multicore cable spare cores, at all joints and terminations. Bond any unused cores of multicore cables to earth at both ends, unless otherwise indicated.

4161 CABLE JOINTING AND TERMINATING - PAPER INSULATED CABLES:

Make cable joints and terminations using the material and methods recommended by the cable manufacturer. Employ only labour certified by cable manufacturer as qualified to make paper insulated cable joints. Cold pour resin and heat shrink joints

Ensure cores are insulated and separated using compatible materials. Keep all materials for paper insulated joints in sealed containers until used. Use only cable manufacturers approved jointing materials for type and application involved. Where proprietary mechanical glands and armour clamps are not used, use tinned brass wiping gland and armour clamp plumbed to sheath.

4171 CABLE JOINTING AND TERMINATING - ELASTOMER AND PLASTIC INSULATED CABLES:

Joint cables using glands of the type indicated, in accordance with the manufacturer's instructions. Use shrouds at all glands unless otherwise instructed, match material and colour of cable sheath.

At core connections to equipment without integral clamping terminals use compression lugs unless otherwise indicated.

4181 TERMINATING - MINERAL INSULATED CABLES:

Use terminations in accordance with BS EN 60702-2 and components and materials recommended or supplied by cable manufacturer.

Use seals of the maximum temperature rating indicated, with stub caps to the largest size available, with drilled caps and headed sleeves for larger sizes.

Use glands of type indicated, except at terminations to accessory boxes within a plaster or render finish, where cable clamps fixed to accessory box and firmly gripping cable sheath may be used. Use earth tail seals with sheath grip type accessory boxes.

Secure glands at equipment not provided with threaded entries using lock washers and locknuts or brass conduit bush. Use gland shrouds when plastic covered MI cables are used to the same colour and material as cable oversheath.

Using thermoplastic, PIB or LSF material tape to BS 3924 or BS EN 60454 to match sheath, tape overall gland any bare copper sheath and form seal to cable sheath, under all shrouds.

Mark core sleeving with appropriate identification.

Install voltage surge suppressors in accordance with manufacturer's recommendations and, to BS 7671 Section 331-01-01 or as otherwise indicated.

4191 CABLE JOINTS - MINERAL INSULATED CABLES:

Joint mineral insulated cables using methods and materials recommended by cable manufacturer.

Terminate cables in externally threaded glands using seals of temperature rating indicated. Join conductors using crimped connectors, as required.

Insulate connectors using thermoplastic tape to BS 3924 or BS EN 60454, ensuring good seal to conductor sleeving. Make off glands into either end of internally threaded brass sleeve of correct size.

Protect brass sleeve using heat shrink sleeve, unless otherwise indicated.

4201 COMMUNICATIONS COAXIAL, OPTICAL FIBRE AND DATA CABLE JOINTING AND TERMINATING:

Use methods approved by cable and accessory manufacturers. Employ only labour certified by acceptable body as qualified to make joints and terminations in the referenced cable. Obtain in writing approval of cable manufacturer for accessories not supplied by them.

Identify cables using structured numbering scheme.

Install optical fibre cables in accordance with BS EN 50174-3.

Y61 – HV/LV Cables & Wiring

4211 CABLE SLEEVES:

Pack sleeves with fire resistant material after cable installation in accordance with the design ated fire rating of the area involved and to comply with Building Regulations.

Cables shall be cleats, cable ties or cable supports shall be installed within 750mm each side of cable sleeves and shall be suitable to withstand the mechanical loads expected following collapse of the supports on the fire side of the sleeve, to the extent that no strain is transferred to the seal.

4212 MARSHALLING TERMINAL BOXES

Standard BS EN 60670-22 and BS EN 60947-7.

Provide steel enclosure to IP 31 (indoor) or IP 65 (outdoor) with lockable hinged lid, DIN rail mounted terminals, 25A minimum, labels and warning signs.

Arrange terminals in single or three phase, or function order groups with spacer plates between groups, end stops and clamps at each end of rail.

Number each terminal and fit each conductor with identification ferrules, cross-referenced to circuit charts and as installed drawings.

10000 Specification Expert VERSION TEXT Y61 March 2008

Y62 – Busbar Trunking

1000 GENERAL

1010 BUSBAR SYSTEMS:

Supply and install busbar trunking systems in accordance with BS 159, BS EN 60439-1, BS EN 60439-2 and the requirements of BS 7671 Requirements for Electrical Installations (The IEE Wiring Regulations).

Powertrack systems shall comply with BS EN 61534.

1011 BUSBAR LAYOUT:

Set out busbars as indicated in diagrammatic form on the drawings. Provide all necessary offsets, bends, tapers, transformation pieces, expansion joints, anchor points etc. as required whether or not these are detailed.

Busbar systems for general power and lighting shall be of proprietary plug-in type.

2000 PRODUCTS/MATERIALS

2011 BUSBAR SYSTEM

Electrical Supply voltage between phases, frequency, current rating, classification, short circuit fault current and short time rating all as scheduled.

Power track, Bench, Dado and Underfloor trunking systems to comply with BS EN 61534-1

Use high conductivity copper busbars and connections unless otherwise specified. Full size neutral shall be used.

2021 BUSBAR TRUNKING

Enclosure to be extruded aluminium and comply with BS EN 50085, steel and comply with BS EN 50085 and relevant sections of BS 4678 or thermoplastic. Enclosure material and degree of protection as detailed in the schedule.

For steel enclosures, apply a high standard of finish to enclosures. For a paint finish apply a minimum of one coat rust inhibiting primer, one undercoat and two semi-gloss finish coats. Remove rust and degrease metal prior to application of selected finish. Zinc coated steel is acceptable as anti-rust treatment. Use rust-proofed (e.g. cadmium plated) screws, bolts, nuts and washers.

Finish and colour Manufacturer's standard, unless detailed otherwise in the Schedule.

Use trunking fittings of the same type and manufacture as the busbar trunking. Use manufacturers purpose made units/fittings at changes of direction. Use screw fixed covers for metal enclosures and snap on for thermoplastic.

Provide facilities for the correct termination of supply cable.

Provide external fixing brackets at not greater than 2m intervals. In accordance with manufacturers recommendations.

Provide clear marking of busbars and tap-off outlet sockets with phase colours to enable sequence identification throughout system.

2031 END-FEED UNITS, CENTRE-FEED UNITS AND TAP-OFF UNITS:

Provide end-feed units, centre-feed units and tap-off facilities along the busbar system, with current rating, number of poles and phases as indicated on the drawings.

Provide tap-off units with Fuses/MCCB's current rating, class and type as indicated on the drawings. Provide termination points for outgoing cables in every tap-off unit. Provide isolating switch with number of poles as indicated.

Follow the proprietary layout, as indicated on the drawings.

2041 PROTECTIVE CONDUCTORS:

Where specified, provide separate protective conductor throughout busbar system length comprising copper tape, size shall be as on the schedule or drawings.

Y62 – Busbar Trunking

The protective conductor shall be installed internally or externally to busbar enclosure as indicated. Bond the protective conductor to the trunking enclosure using a method in accordance with BS 7430 at 1.2m maximum intervals or as otherwise indicated, using high tensile brass bolts and locking nuts.

Complete trunking system before installing the protective conductor. Ensure the continuity of protective circuits.

3000 WORKMANSHIP

3011 GENERAL:

Install busbar trunking in accordance with manufacturers' instructions and relevant standards. Check total length of busbar system required on site prior to manufacture commencing.

The manufacturer's recommendations for minimum spacings between busbar surfaces and adjacent busbars or other surfaces shall be maintained throughout the busbar run, to avoid the need to de-rate to busbars.

Fit covers at end of each run or provide proprietary end boxes.

3021 BONDING:

Bond between adjacent lengths of busbar trunking with approved mechanical means to maintain conductivity. Tighten bolted connections between adjacent lengths of busbars to correct torque setting. Avoid damage to conductors.

3031 EXPANSION:

Anchor busbars rigidly in a minimum of one position and provide means of absorbing maximum expansion and contraction likely to occur in busbars under normal operating conditions. The locations of expansion joints and anchor points shall be determined by the manufacturer based on the geometry of the proposed busbar installation.

Busbars shall be spaced from other services and the fabric of the building to ensure that these do not act as unintentional anchor points, when the busbar expands.

Busbar supports shall be independent of any other service.

3041 LABELS:

Fix identification and warning labels throughout system length. On non-encapsulated conductors marked clearly with phase colours to enable sequence identification throughout system.

3050 FIRE BARRIERS:

Provide barriers of fire-resisting materials within the busbar trunking where vertical runs pass through floors and horizontal runs pass through fire break walls to prevent spread of fire (BS 7671 Chapter 527).

10000 Specification Expert VERSION Y62 TEXT November 2006

Y63 – Support Components – Cables

1000 GENERAL

1010 APPLICATION:

Cables referred to in this section are only those types that can be installed without further mechanical protection.

1012 LAYOUT AND SEGREGATION

Set out cable support systems as indicated in diagrammatic form on the drawings. Provide all necessary offsets, bends, tapers, transformation pieces etc. required whether or not these are detailed. The layout of the systems and the routing of cables shall ensure maximum circuit lengths and grouping shown on drawing and schedules are not exceeded.

2000 PRODUCTS/MATERIALS

2011 CABLE SUPPORTS:

Support all cables throughout their length using conduit, trunking and enclosures, cable tray, cable racking, special support systems, cleated or clipped fixing direct to building fabric, or aerial catenary suspension systems, as required.

Ensure tray, racking and special support systems are continuous and firmly fixed to building fabric. Allow space for indicated cables + 30% spare, unless otherwise indicated.

Ensure cable support system allows for spacing in accordance with BS 7671 for the design current of the cable.

Cable support systems for fire rated cables shall afford the same resistance to fire as the specification for the cable to ensure continued operation of the circuit during a fire.

2012 FIXINGS FINISHES:

Ensure finish for all support components, fixings, hangers and accessories is galvanized or sherardized finish.

2021 CABLE SUPPORT SYSTEM:

Standard BS EN 61537

Material

Hot rolled steel galvanized after manufacture to BS EN ISO 1461; or bending and profiling quality hot dipped galvanized steel to BS EN 10143, BS EN 10326 and BS EN 10327.

Finish - Self colour galvanized.

Perforated tray.

Use return flanged type with manufacturer's standard perforations pattern, unless otherwise indicated. The thickness of the tray shall be the Manufacturer's standard thickness for type.

Cable rack (ladder)

Proprietary system of channel sections with return lip and compatible jointing and fixing accessories.

Cable basket.

Cable baskets to have 50 mm square grid and side walls.

Light duty to be 25 mm sides, medium duty 50 mm sides and heavy duty 75mm sides.

For under floor basket tray three independent support legs shall be provided along each standard section of basket, where legs are required. Support leg depth as indicated. Every section shall have at least one connection point screwed to the floor.

Accessories and fittings shall be as manufacturers standard items.

Include take-off plates for conduits, trunking etc.

Cable support system fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as the cable support system, site modified fittings will only be acceptable on existing installations. Use reducers, inside angles, outside angles and drop outs as manufacturer's standard. Use flat bends, equal tees, unequal

Y63 – Support Components – Cables

tees and crosses with gusseted corners. Join lengths of cable support system and fittings using manufacturer's standard shouldered ends, fish plates, or couplers, with galvanised or zinc plated slotted domed head 'roofing' bolts, nuts, washers and shake proof washers.

Each fitting shall have a bonding braid attached across it to form the continuous bonding of the support system.

Tray/rack supports

Use threaded rod or proprietary support channel.

2022 WIRE ROPE SUSPENSION SYSTEM:

Where specified within the Scope of Works or Schedules for the support of cable trays or baskets, use proprietary Wire Rope Suspensions Systems which comply with BS EN 12385-1, BS EN 13411-3, BS EN 13411-4, DIN 3093, and BSRIA COP 22/2002. Wire Rope Suspensions to be suitable for the safe working load and comprise Stainless Steel grade 316 wire rope, Stainless steel grade 302 Spring fasteners with fixings by loops, stud (permanently fixed to wire rope length) or toggle as appropriate. The installation shall comply with BSRIA COP 22/2002 and 'solid' stud type suspensions shall be provided at maximum spacing of 20m, with a minimum of one in any straight run.

2026 CABLE CLIPS AND CLEATS

Standard BS EN 50368

Bolted cleats shall be aluminium alloy, galvanised iron or moulded black polythene. Galvanised iron cleats shall be used to fix fire rated cables.

Proprietary cable ties shall be wrap round self locking releasable pattern. Cable ties may be Nylon except where used to fix power or fire rated cables, where stainless steel ties shall be used. Stainless steel cable ties shall be suitable to withstand the forces exerted by power cables under short circuit conditions, including a safety factor of 3.

Fixings used for fire rated cables shall sustain the same fire conditions as that provided by the cable, without failure.

Cable clips shall be the Polypropylene surface type with pre-fixed hardened steel pin for general use except on mineral insulated cables. For mineral insulated cables use bright copper one hole 'P' clips or two way saddles (for runs of multiple cables) for unsheathed mineral insulated cables, PVC covered for sheathed mineral insulated cables

3000 WORKMANSHIP

3011 CABLE SUPPORT INSTALLATION:

Support from building fabric with minimum clearance behind of 20mm. Install fixings at regular intervals to prevent visible sagging when loaded, with maximum spacing 1.2m and 230mm from fittings.

Keep cutting of cable tray to a minimum. Cut along a line of unperforated metal. Ends of hangers to be cut flush with locking nuts or support brackets. Make good finish with zinc rich paint, primer and top coat, or two pack epoxy paste, as appropriate to material and finish.

Fit holes cut in tray for passage of cables with grommets, bushes or other lining. Install all bolts, fixings and hangers with threaded portion away from cables.

3021 CABLE CLEATS, TIES, SADDLES AND CLIPS INSTALLATION:

For cables supported on horizontal tray use ties for each circuit. Use tie manufacturer's special tensioning tool where available. Crop off tie ends.

For cables on inverted horizontal or vertical tray use cleats bolted to tray for paper, plastic or elastomeric insulated cables above 35 mm diameter and ties for smaller cables. Use saddles or clips for mineral insulated cables. Use cleats sized to grip cables firmly without undue pressure or strain on cable, but preventing slipping.

For cables on vertical or horizontal rack use proprietary fixings for plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables.

For sub-circuit wiring on continuous flat surfaces of wood, plaster, brick etc. use polypropylene surface fixing clips with pre-fixed hardened steel pin for PVC insulated and sheathed cables and sheathed or

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

198/245

10/02

EX000001613/247
EX000001613_0247

Y63 – Support Components – Cables

bright mineral insulated cables. Use round or flat or flat twin pattern as appropriate, manufactured specifically for cable being fixed. Use one hole 'P' clips or two way saddles of bright copper for unsheathed mineral insulated cable. Use PVC covered for sheathed mineral insulated cables. Space cleats, ties, saddles and clips as Appendix G of Guidance Notes 'Selection & Erection' published by the IEE.

10000 Specification Expert VERSION Y63 TEXT March 08.

Y71 – LV Switchgear & Distribution Boards

1000 GENERAL

1011 STANDARD:

Comply with BS EN 60439-1.

Assemblies shall be type tested (TTA) in accordance with BS EN 60439-1

1012 TYPE TEST:

Provide verification of type test in accordance with Table VII of BS EN 60439-1. For type tested assemblies, the short circuit strength of main busbars, busbar supports, connections to incoming and outgoing units in the configuration to be used, shall be verified. Certificates issued by The Association of Short-Circuit Testing Authorities (Inc) - ASTA - are preferred, but certificates from other testing authorities will be considered.

1013 ELECTRICAL CHARACTERISTICS:

Ensure that electrical characteristics of component parts of assemblies are as indicated and apply when components are mounted in enclosures. Allow appropriate de-rating factors for effect of enclosures, other components and interconnections. Ensure that all components supplied and installed are suitable for Voltage, Current, Fault Levels and Frequency as scheduled.

1014 INFORMATION ON DRAWINGS

The following electrical characteristics are shown on the system or the distribution diagram drawings:-

Type of earthing system

Number and type of live conductors at the origin

Normal Voltage

Frequency

Maximum prospective short-circuit current at the origin (Ip(max)).

Minimum prospective short-circuit current at the origin (Ip(min)).

Earth-fault loop impedance at the origin (Ze)

Electricity supplier's protective device and its tripping time at current Ip

Protective devices

Current rating

Type

Category of duty

2000 PRODUCTS/MATERIALS

2011 LV SWITCHGEAR AND CONTROLGEAR ASSEMBLY:

Standard - BS EN 60439-1.

External design- Cubicle or Multi-cubicle type assembly as indicated on Schedules or drawings.

Degree of protection BS EN 60529

Indoors boards to be rated to IP31 unless otherwise indicated.

External boards to be rated to IP65

Service conditions - Ambient air temperature and altitude as BS EN 60439.

EMC-Environment A Light Industrial/Commercial

Provide facilities to allow future extension of switchboard at either end.

2012 NEUTRAL POLES

Neutral poles on 4 pole circuit breakers or switches shall be rated at 100% of the current rating indicated for the phase poles. Neutral poles of protection relays on 4 pole circuit breakers shall have the same rating as the phase poles, unless indicated otherwise. Neutral links of TP&N circuit breakers or switches shall be rated at 100% of the current rating indicated, except when 'double neutral' (DN) links are indicated, where 200% rated links shall be provided.

2021 ASSEMBLY CONSTRUCTION:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

200/245

07/07

EX000001613/249
EX000001613_0249

Y71 – LV Switchgear & Distribution Boards

Standard BS EN 62208

Material of enclosure to be steel. Supply doors with fastenings and provision for locking in closed position. Use covers which require special tools for removal. Large removable covers to be provided with lifting handles and location brackets. Provide enclosure with fixing holes. Where enclosure is mounted externally provide fixing lugs external to enclosure.

All busbars are to be fully rated for Current carrying capacity, Frequency, Fault Level and rated Voltage as detailed on the drawings and/or schedules. Neutral bars are to be fully rated and not ½ sized bars.

Internal Separation to BS EN 60439-1 National Appendix and as Schedules or Drawings

Assembly to provide protection against direct and indirect contact. Protection to be maintained after removal or withdrawal of removable or withdrawable parts.

Ensure that fixed panel or cubicle of withdrawable type units are fitted with label to identify circuit with wording identical to that on the withdrawable portion.

Terminals for external conductors

Accommodate cross-sectional area of cables scheduled.

Parallel cabling to be provided with an individual terminal for each cable.

Mark terminals as BS 7671.

Provide earth terminal, or for multi-cubicle enclosures a copper earth bar the full length of the enclosure, so that exposed conductive parts of the assembly can be connected to the protective conductor. Ensure earth connection can be made to the assembly without damage to the finish coating. Make provision for armouring and metal sheaths of all incoming and outgoing cables, including common and individual glanding plates, to be bonded to earthing terminal or bar.

Accessibility for inspection

Arrange for following operations to be performed when assembly is in service and under voltage.

Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.

Adjusting and re-setting of relays, releases and electronic devices.

Replacement of fuselinks.

Replacement of indicating lamps.

Fault location by voltage and current measuring.

Accessibility for maintenance.

Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.

Short-circuit protection and short-circuit withstand strength as Schedules or drawings. Co-ordinate short-circuit protective devices and short-circuit current arising from rotating machines as detailed in Work Section V20. For motor control centres this information as detailed in Work Section W61.

Input voltage variations for electronic equipment supply as BS EN 60439,

Supply frequency deviation as BS EN 60439

2031 ENCLOSURES FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.

Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.

Finish and colour as Manufacturer's standard unless otherwise stated in the schedules. When other than manufacturer's standard finish is specified samples for each paint system and for each colour shall be provided.

Y71 – LV Switchgear & Distribution Boards

2041 TYPE TESTS:

Provide certificates of verification of
temperature rise limits.
dielectric properties.
short-circuit strength.
continuity of protective circuit.
clearances and creepage distances.
mechanical operation.
degree of protection.

Temperature rise limits

Temperature rise test for test current greater than 3150 A to be agreed by the engineers.

Temperature rise when ambient temperature exceeds +40°C or is lower than +10°C to be agreed by the engineers.

Short circuit withstand strength

Value of neutral bar current for short-circuit test 60%.

2051 ROUTINE TESTS

Carry out the following Routine Tests at the works after the panels have been finished and before shipping to site:

Dielectric test
Insulation resistance test
Primary and/or secondary current injection
Phase rotation
Operation of protection devices, instruments and measuring devices
Operation of control and monitoring devices

The Engineers/design team/client shall be invited to witness these tests at a time convenient to them.

2052 TESTS ON SITE

Repeat routine tests on site.

2060 SITE BUILT ASSEMBLIES:

Ensure that components of site assemblies are part of a proprietary system and type tested as defined above. Install assemblies in accordance with manufacturer's drawings and instructions.

2070 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for the arrangement of components.

2081 BATTERY CHARGER AND BATTERY UNIT:

Function, Input Voltage and Frequency as Schedules or drawings.

DC Output Voltage drop at full load 2%

Operating temperature range -10°C to +45°C.

Charger type Thyristor or Transistor.

Battery type Nickel Cadmium (maintenance free).

Enclosure, sheet steel, IP31

Corrosion resistant epoxy paint or Manufacturer's standard.

Colour Manufacturer's standard.

Facilities

MCB input protection.

Float charge.

Battery over-discharge protection

Fuses for battery protection.

MCB's for outgoing circuits as indicated.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

202/245

07/07

EX000001613/251
EX000001613_0251

Y71 – LV Switchgear & Distribution Boards

Automatic selection of boost charge.

Meters

Battery voltage.

Charge/discharge current (dual scale for float and boost).

Lamp indications

Supply on.

Supply fail (monitor input terminals).

Float charge.

Boost charge.

No charge (when supply is on).

Battery voltage low.

Battery voltage high.

Earth fault on output.

Common Alarm (connected to operate a relay with shrouded 230V 3A a.c. or 0.5A d.c. N/O-N/C volt free contacts, closed on any alarm, for remote indication circuit)

Supply failed.

No charge (when supply is on).

Battery voltage low.

Battery voltage high.

Earth fault on output.

2091 AIR-CIRCUIT BREAKERS

Comply with BS EN 60947-2. Provide fixed or isolating (withdrawable) removable type circuit breakers with provision for safe maintenance. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage and that Utilisation Category is B.

Withdrawable and plug-in circuit breakers shall be provided with an earthing device to permit earthing of either the bus bar (main incoming devices only) or outgoing circuit. A minimum of 1 No earthing device shall be provided for each frame size per switchboard.

Provide circuit-breaker with rated service short-circuit breaking capacity (Ics) and short-time withstand current (Icw) equal to or greater than that for the associated switchboard.

Provide operating mechanism, controls, accessories and protection as indicated on Schedules or drawings.

Provide a minimum of 3 (unless otherwise detailed or required) N/O-N/C volt free auxiliary contacts rated a minimum 10A 230V wired to external terminals within the outgoing cabling section.

Provide interlocks to prevent movement of the circuit-breaker within the housing when in 'closed' or 'service' position. Provide automatic shutters to cover all live contacts when circuit-breaker is isolated, withdrawn or removed from housing.

Provide facility to padlock circuit-breaker in isolated/ withdrawn position, and to lock automatic shutters covering live contacts when breaker withdrawn from housing.

2092 CIRCUIT-BREAKERS-MOULDED CASE

Comply with BS EN 60947-2. Provide moulded case isolating (withdrawable) or fixed type circuit-breakers, as detailed, with provision for safe maintenance. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage and that Utilisation Category is B.

Y71 – LV Switchgear & Distribution Boards

Withdrawable and plug-in circuit breakers shall be provided with an earthing device to permit earthing of either the bus bar (main incoming devices only) or outgoing circuit. A minimum of 1 No earthing device shall be provided for each frame size per switchboard.

Provide circuit-breaker with rated service short-circuit breaking capacity (Ics) and short-time withstand current (Icw) equal to or greater than that for the associated switchboard.

Provide manual closing mechanism and protection by combination of adjustable magnetic/thermal compensating devices unless otherwise indicated.

Provide 2 (unless otherwise indicated or required) N/O - N/C volt free auxiliary contacts rated a minimum of 10A 230V AC wired to external terminals within outgoing cabling section.

Where withdrawable provide interlocks to prevent movement of circuit breaker within housing when in 'closed' or 'service' position. Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.

Provide facility to padlock circuit-breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.

2101 AIR BREAK SWITCHES:

Comply with BS EN 60947-3. Supply air break switches with uninterrupted rated duty and Utilisation Category AC 23 B.(infrequent operation) unless otherwise indicated.

Operational performance not less than requirements of BS EN 60947-3, Table IV.

Fit fuse switches with cartridge fuse links in accordance with BS 88 (BS EN 60269). Fit removable neutral link in switches controlling circuits with neutral conductor. Fit solid links in isolating switches. Fit each switch with facility to padlock in OFF position.

Ensure that withdrawable chassis isolating type switches are provided with fully shrouded fixed contacts or insulated cover plates, to prevent accidental contact with live parts.

Ensure that switches have individual enclosures and earth terminal, meet the degree of protection for the switchboard and have operating mechanisms interlinked with access door.

The means of operating (handle, push button etc) switches provided as the means of emergency switching shall be coloured red and the device facia shall be coloured yellow.

2111 PROTECTION DEVICES AND RELAYS

Comply with BS EN 61810.

Provide protection devices and relays as specified in the Work Sections, on drawings or Schedules.

Locate such that operation may be observed and the devices reset or adjusted without access to the interior of the enclosure..

2112 AUTOMATIC TRANSFER SWITCH EQUIPMENT (ATSE)

ATSE - Electromechanical ATS'S

Unless indicated otherwise in the Schedules, Electromechanical ATS's shall be enclosed within separate enclosures to their associated lv switchboards.

Where the transfer switch is specified with a draw-out function, shutters shall be provided which automatically close to fully shroud the live terminals when the transfer switch is withdrawn.

For closed transition switches, a timer shall be provided to limit the maximum period that the two sources are connected in parallel (adjustable 0 to 60secs), on expiry of the timer, the source 2 transfer switching device shall open.

Y71 – LV Switchgear & Distribution Boards

Manual bypass facilities provided for test and maintenance purposes shall be incorporated within the ATS enclosure. The bypass shall allow the load to be connected to either of the sources without interruption of the supply to the load and shall be interlocked to prevent paralleling of the two sources.

Volt free contacts shall be located in a segregated section of the ATS enclosure.

ATSE - Interlocked Circuit Breakers

Shall comprise of motorised, 'plug-in' pattern non-automatic circuit breakers (Reference Y71.2091 & Y71.2092) mechanically and electrically interlocked to prevent both circuit breakers being simultaneously closed.

The incoming supply section for each device shall be segregated from the other and it shall be possible to remove either circuit breaker for maintenance purposes without disruption of the supply to the load. No live parts shall be exposed by removal of a device and a minimum of IP31 degree of protection shall be maintained.

It shall be possible to perform the following on the circuit breakers from the front fascia of the switchboard without opening or removing covers:

Manual opening or closing of each circuit breaker

Padlocking the circuit breaker in their OFF positions for maintenance.

Circuit breakers shall incorporate an opening coil so that they may be opened upon failure of either source.

Mains sensing equipment shall be located within a separate controls section of the LV switchboard / ATSE Assembly.

Mains sensing shall be carried out by phase failure relays fitted to each supply phase which shall operate upon the voltage between any phase and neutral falling below a pre-set threshold for a pre-set period. After the pre-set period has elapsed and a voltage is sensed on the standby circuit breaker, the primary circuit breaker shall open and the secondary circuit breaker shall close.

Restoration of the normal supply shall be detected by the voltage between all 3 phases and neutral being above the pre-set threshold for a pre-set period.

After the pre-set period has elapsed the primary circuit breaker shall open, the secondary circuit breaker shall close.

Volt free contacts shall be fitted wired to a 'field wiring' terminal rail located within the controls section of the enclosure.

2131 TRIP/CLOSE SWITCHES AND CONTROL SELECTOR SWITCHES:

Standard BS EN 60947-5-1

Provide a panel mounted heavy duty, spring return key operated trip/close switch on each circuit-breaker fitted with electrically operated closing mechanism.

Ensure contacts have a continuous rating of 10A minimum at between 30V to 250V ac and dc, and make and break duty rating of 30A at 250V ac or dc for a minimum period of 3 secs.

Where remote trip/close control is required, supply a panel mounted selector switch to select circuit-breaker for local or remote operation. Ensure that selection of remote or local closing does not prevent circuit breaker tripping under fault conditions.

2132 CONTROL CIRCUITS:

Control circuit voltage shall preferably not exceed 110 Volts ac (55-0-55)

Where control circuits are taken outside the enclosure to remote equipment use 24 Volts ac.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\specs\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

205/245

07/07

EX000001613/254
EX000001613_0254

Y71 – LV Switchgear & Distribution Boards

For circuit-breaker shunt trip and protective circuits use 30 Volt dc, for integral protective devices 230 Volts ac, or as otherwise indicated.

Provide control circuit transformers to supply power at voltages to suit control components in accordance with BS 3535, Section D complete with primary and secondary fuses.

2140 CURRENT TRANSFORMERS:

Comply with BS EN 60044-1. Provide separate current transformers for each protection device and instrumentation. Ensure current transformers provide appropriate accuracy and are compatible with protective device characteristics, performance and VA rating required for satisfactory operation of protection devices, instruments and meters indicated.

Ensure that current transformers are capable of withstanding maximum short time withstand current of value and duration indicated for assembly.

Provide test links in secondary connections of all current transformers to facilitate testing of instruments, meters and protection devices.

2151 INSTRUMENTS AND METERS:

Standards

Comply with BS 89 and BS EN 60051 for voltmeters, ammeters, watt meters, frequency indicators and power factor indicators.

Comply with BS 7856, BS EN 62053-11, BS EN 62053-22, or BS EN 62053-21 for kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters and BS EN 62053-23 for kVAh meters. Where a meter is to be used to measure the amount of electricity supplied for billing purposes, for applications up to 100kW/100kWh the meter shall be MID Approved. For applications above 100kW/100kWh meters shall be of an approved type for electricity, by OFGEM. In addition, meters for domestic use shall be certified.

Protect wiring to voltmeters by separate fuses. Protect potential coils of watt meters, frequency indicators, power factor indicators and kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters by separate fuses.

Supply instruments and meters suitable for flush mounting and type, size and accuracy as drawings or schedules.

Ensure that indicating scales for all instruments comply with BS 3693. Supply so that normal indication is 50% to 75% of full scale deflection.

Completely segregate all instruments in instrument compartments. Panel mount meters on front of instrument compartment.

2171 INDICATOR LIGHTS:

Standard BS EN 842 and BS EN 60947-5-1

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility. Supply interchangeable indicators for respective units.

Include an integral double wound transformer for each lamp unit on ac indicator circuits. Include an integral ballast resistor for each lamp unit on dc indicator circuits. For LED indicators, include a voltage suppressor on each LED.

Usage Lamp	Type
Switchboard	Filament Lamp. Include an integral double wound transformer for each lamp unit on ac indicator circuits unless otherwise indicated.
Motor control centres	Filament Lamp. Include an integral double wound transformer for each lamp unit on ac indicator circuits, or provide 24V indicator circuits with 30V lamps unless otherwise indicated.
Where appropriate	Neon indicators
Where appropriate	LED

Y71 – LV Switchgear & Distribution Boards

Protect wiring to indicator lamp units by separate cartridge fuses.

Lens Colour in accordance with BS EN 60073.

2176 AUDIBLE ALARMS:

Provide audible alarm system as specified in the Work Section.

2177 PADLOCKS

Provide padlocks and cabinet as specified in Work Section.

Provide each padlock with two keys complete with disc and ring. Engrave disc and padlock with suitable legend.

Provide wall mounted steel cabinet with hinged door for storing padlocks and keys on hooks.

2178 SWITCHBOARD INSTRUMENT AND CONTROL WIRING:

All instrument and control wiring to be either single core insulated cable contained within plastic panel wireway or double insulated cabling installed in a harness.

Identify each end of each wire with a unique number using colour coded 'O' ring markers. Fit lugs at termination points.

All wiring is to be neatly arranged and securely fixed. Where appropriate protect by cartridge fuses complying to BS 88 (BS EN 60269).

2179 MOTOR CONTROL CENTRE, STARTER AND CONTROL PANEL INTERNAL WIRING:

Segregate control wiring from power circuits.

Contain control wiring within plastic wireways or in a harness.

Identify each end of each wire with a unique number using colour coded 'O' ring markers. Fit lugs at termination points.

Take account of thermal effects of grouping when routing power wiring.

All wiring is to be neatly arranged and securely fixed. Where appropriate protect by cartridge fuses complying to BS 88 (BS EN 60269).

2180 LOW VOLTAGE COILS RATING:

Ensure coils for switching relays, contactors and other applications are capable of withstanding inherent voltage drop within system without armature or switching apparatus dropping out of position.

2191 FRAMEWORK:

Construct framework for supporting electrical equipment from mild steel plate and strip, cold and hot rolled steel sections or slopped angles, in accordance with BS EN 10210 and BS 4345 respectively. Comply with BS EN 1011-2 for metal arc welding.

Finish

Frameworks mounted inside building shall have a galvanized finish in accordance with BS EN 10142 or BS EN 10143 and BS EN 10147.

Frameworks mounted outside building shall be hot dip galvanized to BS EN ISO 1461 following fabrication.

Supply cadmium or zinc electroplated bolts, nuts, washers and screws.

2201 FUSES:

Supply cartridge fuse links including fuse carrier, bases and associated components that comply with BS 88 (BS EN 60269), fusing factor category gG, unless otherwise indicated.

Use motor circuit fuses where indicated.

Y71 – LV Switchgear & Distribution Boards

2211 DISTRIBUTION BOARDS:

Comply with BS EN 60439 -1 and BS EN 60439-3, as appropriate. Enclosure to be steel, with hinged lockable cover, internal separation Form 1, degree of protection IP31, unless otherwise indicated. Make fuseboards fully shrouded. Fit each distribution board with an isolating switch, size as shown on the drawings.

Install busbars in same position relative to their fuse carriers or miniature circuit-breakers (MCBs) for each pole. In TPN distribution boards supply neutral busbars with one outgoing terminal for each outgoing circuit.

Neutral to be rated as phase conductor.

Provide a multi-terminal earthing bar for circuit protective conductors for both insulated and metal-cased boards, with one terminal for each outgoing circuit. Connect directly to earthing terminal without dependence on exposed conductive parts of enclosure.

Identify each fuseway and MCB way by numbering. Identify each terminal on neutral busbar and earthing bar with its respective fuseway or MCB way.

Provide durable, printed circuit identification chart inside enclosure.

Enclosures finish

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.

Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.

Finish and colour as Manufacturer's standard unless otherwise stated.

When other than manufacturer's standard finish is specified, samples for each type of paint system and for each colour shall be provided.

Provide spare ways, 25 % or as indicated. Where specific ratings are indicated incorporate fuses or MCBs, otherwise leave ways blank complete with blanking covers for future additions.

2221 CONSUMER UNITS:

Comply with BS 5486 Part 13 and BS EN 60439-3. Supply consumer units with minimum degree of protection in accordance with BS EN 60947-1, IP31. Provide fuses or miniature circuit-breakers and means of isolation as indicated.

Enclosures finish

For steel enclosure apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.

Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.

Finish and colour as Manufacturer's standard unless otherwise indicated..

When other than manufacturer's standard finish is specified samples for each type of paint system and for each colour shall be provided.

2231 MINIATURE CIRCUIT-BREAKERS:

Standard BS EN 60898.

Supply miniature circuit-breakers in accordance with BS EN 60898. Voltage and current ratings, type according to instantaneous tripping current, rated breaking capacity and frequency as drawings or schedules.

2241 RESIDUAL CURRENT DEVICE:

Comply with BS EN 61008. Supply residual current devices (RCDs) with rated voltage, rated current, rated tripping current, rated tripping time and rated breaking capacity as indicated.

Y71 – LV Switchgear & Distribution Boards

Rated Tripping Current
30mA unless otherwise indicated on the drawings.
Rated Tripping Time
30ms unless otherwise indicated on the drawings.

Fit RCDs with integral over current protection as detailed on drawings or schedules.

Refrigerators and deep freezers should not be connected to RCD Protected Circuits unless written confirmation is obtained.

Supply combined residual current/over current operated circuit-breakers to BS EN 61009

2242 RESIDUAL CURRENT MONITORS

Standard BS EN 62020

2250 CABLE TERMINATIONS:

Ensure that switchgear and distribution boards are provided with facilities to terminate size, number and type of cable indicated. Where necessary use fabricated steel extension boxes for glanding large and multiple cables.

Provide non-ferrous metal glanding plates for single core cable terminations.

2251 TERMINAL BLOCKS FOR AUXILIARY WIRING:

Provide rail mounted moulded terminal blocks with fully shrouded connectors, segregation plates, and end clamps. Ensure insulating material is suitable for maximum operating temperature of conductors. Provide connectors to clamp conductors between metal surfaces. Ensure clamping screws do not make direct contact with conductors. Ensure conductors maintain sufficient contact pressure to ensure negligible impedance. Make metal in contact with conductors 85% copper alloy and screws of metal electrolytically compatible with copper alloy.

Provide each terminal with marking tag fitted into moulded tag slots.

Provide test probe facilities and integral disconnecting device to facilitate testing on terminals for indication, instrumentation and metering.

Manufacture rails from steel, hot dipped galvanised after manufacture.

2252 COMPONENT MOUNTING:

Mount all components on removable back plates. Ensure no fixings protrude into busbar chamber.

2301 SWITCHGEAR AND CONTROL GEAR ACCESSORIES

Provide switchgear and controlgear accessories as indicated. Provide insulating mats to BS 921 the operating length of each switchboard of minimum width 1,000mm. Provide all switchgear operating tools required for each switchboard. Provide 10% of the number of each size of fuses used as spare.

3000 WORKMANSHIP

3010 FIXING:

Fix all equipment independently of wiring system. Use cadmium or zinc electroplated bolts, nuts, washers and screws.

3021 MOUNTING HEIGHT:

Mount single items of equipment 1450mm above finished floor level to centre of equipment, unless otherwise indicated.

Y71 – LV Switchgear & Distribution Boards

Arrange groups of equipment, other than floor mounted assemblies, so that all parts of equipment requiring access for operation or maintenance are at least 500mm and no more than 2000mm above finished floor level (max height of operating handles 1800mm), unless otherwise indicated.

3030 ACCESS:

Ensure that clearance in front of switchgear and controlgear is not less than 1m, or as indicated.

3031 ACCESS TO CONTROL COMPONENTS:

Arrange control components to ensure adequate access for operation and maintenance.

3032 ANCILLARIES:

Install ancillaries in accordance with manufacturer's instructions.

3041 MARKING:

Number terminals, cables and component parts to correspond with manufacturer's certified drawings.

3051 CABLE TERMINATIONS:

Terminate paper-insulated cable by means of switchboard manufacturer's standard compound filled cable boxes.

Terminate PVC, XLPE and MICC cables inside enclosure by securing cables to switchboard with glanding plates or glanding brackets; and outside enclosure with glanding plates or fabricated steel extension boxes.

Provide cable support systems within the switchboards between cable entry point and connection to respective devices. Where multicore cables are glanded at a distance from device connection points the inner cable sheath should be maintained and supported and fixed within the switchboard.

3061 INSTALLATION AND COMMISSIONING:

Install and commission switchgear and controlgear in accordance with the appropriate standard and the manufacturers recommendations. Include CT Polarity check in commissioning tests.

Commissioning of all equipment to be carried out by relevantly qualified specialist personnel.

10000 Specification Expert VERSION Y71 TEXT December 04.

Y72 – Contactors & Starters

1000 GENERAL

1011 ELECTRICAL SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for power supply indicated.

1041 CONTROL DETAILS

Control details for electrical switchboards are in Work Section V20 and for mechanical controls in Work Section W60 which must be read for details on control philosophy.

2000 PRODUCTS/MATERIALS

2021 ENCLOSURES:

For control equipment remote from MCC and not a package unit.

Standard

BS EN 62208

Material

Metal clad or

Impact resistant moulded plastic.

Degree of protection - BS EN 60529 , IP 31 for units installed inside buildings .

IP 65 for units installed externally.

Finish and colour to Manufacturers standard unless otherwise stated.

2051 LV CONTACTORS:

Application: Mechanical plant control

Standard

BS EN 60947-4-1 and -4-2.

Solid state to BS 5424 Part 2.

BS EN 61095.

Type of contactor

Air break.

Classification

Electromagnetic.

Rated operational voltage,current and poles to suit application.

Uninterrupted duty.

Utilization category (ac contactors)

AC3 for Direct-on-Line, Star Delta, Auto Transformer Starters.

AC4 for Direct-on-Line, Reversing Starter.

Operational Performance not less than Table VIII of BSEN 60947-4-1

Mechanical durability 3 million no-load operations

2052 COIL POWER SUPPLY:

Contacting closing coil power supply:-

To match control operating voltage.

2053 AUXILIARY CIRCUIT CONTACTS:

Application to match specific control requirements.

Utilization category

AC15 for ac circuits to BS EN 60947-5-1.

DC13 for dc circuits to BS EN 60947-5-1.

Ensure mechanical and electrical endurance compatible with contactor.

2054 CO-ORDINATION WITH SHORT CIRCUIT PROTECTION DEVICES:

Provide co-ordination to Type '2' of BS EN 60947-4-1.

Unless otherwise indicated supply cartridge fuse links including fuse carrier, bases and associated components that comply with BS 88, utilisation category 'gC'.

Y72 – Contactors & Starters

Provide verification of co-ordination with short circuit protection devices.

2071 IN-BUILT ISOLATING SWITCHES/DISCONNECTERS:

Standard-BS EN 60947-3 or BS EN 60947-2 (MCCB).

Provide independent manual operation with rated operational current and utilization category compatible with contactor.

Ensure drive disconnecter isolates all circuits including those from external sources prior to allowing access to the interior of enclosure.

2081 IN-BUILT CONTROL SELECTOR SWITCHES:

Standard-BS EN 60947-5-1

Provide panel mounting independent manual operation rotary type switch to select local/off/remote control.

and to match specified plant control requirements.

Ensure switch rated thermal current, rated operational current, and utilization category are compatible with contactor control circuit characteristics and circuit protection device.

2091 IN-BUILT PUSH BUTTONS:

Standard BS EN 60947-5-1

Provide panel mounting type push buttons with actuator colours to BS EN 60073 to suit application and as specified.

Ensure rated thermal current, rated operational current and utilization category of push button contacts are compatible with contactor control circuit characteristics and circuit protection device.

Emergency Stop buttons to incorporate mushroom actuator and require positive resetting action by key unless otherwise indicated.

2101 INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility. Supply interchangeable indicators for respective units.

Standard-BS EN 842 and BS EN 60947-5-1

Include an integral double wound transformer for each lamp unit on ac indicator circuits. Include an integral ballast resistor for each lamp unit on dc indicator circuits.

Usage Lamp	Type
Switchboard	Filament Lamp. Include an integral double wound transformer for each lamp unit on ac indicator circuits unless otherwise indicated.
Motor control centres	Filament Lamp. Include an integral double wound transformer for each lamp unit on ac indicator circuits, or Provide 24V indicator circuits with 30V lamps unless otherwise indicated.
Where appropriate	Neon indicators
Where appropriate	LED

Protect wiring to indicator lamp units by separate cartridge fuses.

Lens Colour in accordance with BS EN 60073.

2111 CONTACTOR CONTROL RELAYS:

Standard-BS EN 60947-5-1

Install relays in contactor enclosure or install relays in separate enclosures and interconnect relays with contactor control circuits as detailed.

Relay enclosure protection to BS EN 60529 compatible with contactor enclosure.

2121 CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

Provide in contactor enclosure separate low voltage fuse bases, fuse carriers and cartridge fuses for protection of control circuits and indicator light circuits.

Fuses

Y72 – Contactors & Starters

Fully shrouded impact resistant moulded plastic fuse bases and carriers in accordance with BS 88 (BS EN 6 0269). Supply category gG cartridge fuses to BS 88 (BS EN 6 0269) unless otherwise indicated.

2131 MOTOR STARTERS - GENERAL:

Provide fuses or circuit breakers for motors below 0.37 kW.

Provide starters incorporating over current protection for motors above 0.37kW and below 37 kW
Provide starter with manual reset, adjustable, inverse time delay, and ambient temperature compensated thermal over current release to BS EN 60947-4-1. Ensure over current release is compatible with starting, accelerating and running characteristics of motor, starter and driven machine combination. Use phase unbalance protection on three phase equipment.

Provide starters incorporating solid state motor protection above 37 kW and below 75 kW or as otherwise indicated.

Provide starters incorporating over current protection for motors above 75 kW

Provide starter with sensitive discriminating thermal magnetic over current relay with precise time/current characteristics to BS EN 61810. Protect motor against effects of sustained and cyclic over current, out of balance phase current, stalled condition and earth faults. Use running load indication type over current relays with accuracy of setting and indication within plus or minus 3 per cent, expressed as a percentage of setting indicated.

Generally the type of starters shall be dependent on the size of the motor, see table below. See Work Section or Schedules for particular requirements.

MOTOR STARTING METHOD	No starters	Direct On Line	Star-delta	Soft Start	Inverter	Assisted start (auto transformer/ assisted start)
MOTOR SIZE RANGE & TYPE	Below 0.37kW	0.37- 7.5kW	7.5-30kW	7.5-400kW	Where speed control is required	As indicated

2141 MOTOR STARTERS - CURRENT LIMITING TYPE (SOFT START):

Use static type thyristor voltage control starter to provide reduced current starting. Not exceeding 1 x FLC.

Provide energy saving units where indicated.

Provide adjustable ramp times.

Provide contactor for switching and disconnecter for isolation.

2150 MOTOR STARTERS - DIRECT-ON-LINE TYPE:

Use direct-on-line starter to BS EN 60947-4-1, with single phase motors and three phase motors.

2161 MOTOR STARTERS - STAR DELTA TYPE:

Use star delta starter to BS EN 60947-4-1 with three phase motors.

Incorporate adjustable time delay contactor relays, to control star delta changeover, ensuring electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

Where star-delta starters are used on motor sizes in excess of 30kW, 'closed transition' type starters shall be employed.

2170 MOTOR STARTERS - AUTO-TRANSFORMER TYPE:

Use auto-transformer starter to BS EN 60947-4-1 with three phase motors.

Provide 2 step closed transition auto transformers suitable for 3 operating cycles per hour.

Provide auto transformers with three tapplings for selection of motor starting voltage. Arrange tapplings to limit motor starting current to 80 per cent, 65 per cent and 50 per cent of full voltage starting current.

Y72 – Contactors & Starters

Incorporate adjustable time delay contactor relays, to control automatic change over from selected reduced voltage to full voltage, having an electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

2180 MOTOR STARTERS - STATOR ROTOR TYPE:

Use stator rotor starter to BS EN 60947-4-1 with three phase motors.

Provide starter resistors suitable for indicated operating cycles per hour.

Incorporate adjustable time delay contactor relays, to control starter resistor short circuiting contactors, having electrical endurance compatible with starter contactors. Ensure starting sequence activated on voltage restoration.

2191 MOTOR STARTERS - INVERTER TYPE:

Supply inverters to control speed of standard AC Squirrel cage motors.

Inverter type Digital PWM, unless specified otherwise, 6 pulse inverters may be used for motor ratings up to and including 35kW with 6 pulse rectifiers used for motor ratings greater than 35kW.

Where a variable speed drive is integrated with a pump it shall be isolated from any vibration from the pump / motor and have a life expectancy no shorter than the motor life expectancy.

Locations as indicated in Work Section W60.

Control range 0.5 to 120 Hz.

Provide near unity power factor over speed range without the use of power factor correction condensers.

Starting current not to exceed 1 x FLC.

Characteristics

Ensure acceleration and deceleration ramps are independently adjustable.

Allow connection to a turning motor without braking to a standstill.

Allow connection to a reverse wind milling fan without causing tripping and return fan to correct speed.

Ensure inverters require no additional means for starting.

Supply inverters that do not require electrical matching to motor.

Ensure inverters are capable of running motors in parallel.

Ensure electronic maintenance and commissioning can be carried out without motor being connected.

EMC characteristics to BS EN 61800.

Mains interruption

Ensure inverter does not cause tripping through a mains interruption of 200 msec unless otherwise indicated.

Protection

Ensure inverter incorporates the following protection to cause electronic shutdown without operating circuit protective devices.

Motor phase to phase fault.

Motor phase to earth fault.

Over voltage.

Under voltage.

Inverter overheat.

Motor overheat.

Stall protection.

Loss of control signal.

Loss of auxiliary control voltage.

Current limit.

Inverter controls

Local/remote facility.

Provide a means of running at a fixed, selectable speed on closure of a remote volt free contact.

Ensure this over-rides the normal speed control reference signal.

Display

Make provision for inverter to display externally, external and internal faults following a failure.

Show 1st, 2nd and 3rd up sequential faults.

Provide digital readout to show

Output frequency Hz.

Y72 – Contactors & Starters

Reference 1 (Hand).
Reference 2 (Auto).
Motor current (% or Amps).
Torque (% x PN).
DC Link voltage (%).
Temperature (oC).
Fault memory.

Provide volt free remote signalling contacts to indicate:

Over current.
Frequency alarm.
Common fault.
Reference fail alarm.
Running/stopped conditions.
Healthy/tripped conditions.

Ensure parameters can be set and fault memory interrogated with door closed, and without additional instrumentation.

2201 AUTOMATIC CHANGEOVER FOR RUN/STANDBY DUTY :

Provide paired contactors incorporating mechanical and electrical interlocks to prevent simultaneous closure to meet the control requirements Work Section W60

Fit a rotary control switch to starter enclosure arranged to select either motor for 'run' or 'standby' duty. Indicate selection of respective motor and over current tripping of motors by illumination of indicator lights on starter enclosure.

Provide facilities for connection of remote indicator lights to indicate selection/operation of system and for connection of a system malfunction alarm, as indicated.

Arrange for selected 'run' duty motor to operate in response to system controls, and in event of operation of duty motor starter over current trip, for automatic changeover to 'standby' motor.

Control power supply to contactors by an air-break isolating switch interlocked with enclosure access door.

Where dual power supplies are available ensure isolating switch disconnects both supplies and indicate presence of either supply.

2220 CONTROL CIRCUIT TRANSFORMERS:

Provide control circuit transformers to supply power at voltages to suit control components.
Standard

Use transformers in accordance with BS EN 61558 or BS EN 61558-1 and provide an external label of approved type and size.

Protection Primary and secondary fuses.

2231 SWITCHING AND INDICATION:

Provide switches, indicating lamps, instruments and controls of uniform appearance and physically protected.

Switches and indicators to be fitted on panel or access doors and unless otherwise indicated shall be:

Motor circuit isolating switches.
Stop/Start/Reset push buttons.
Auto/Off/Manual control selector switch.
Run and trip indicator lights.

2241 AUDIBLE ALARMS:

Provide audible alarm system as specified in Work Section.

2251 PLC SYSTEM:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

215/245

07/07

EX000001613/264
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Y72 – Contactors & Starters

Provide programmable logic controllers in accordance with BS EN 61131, the manufacturer's recommendation and the specified control requirements. Provide an isolator for the Programmable Logic controller. Programming language standard - BS EN 61131. Install PLC in separate compartment with viewing window.

Control system communications to BS EN 61158-2.

2261 STARTER AND CONTROL PANEL INTERNAL WIRING:

Segregate control wiring from power circuits.

Contain control wiring within plastic wireways or in a harness.

Identify each end of each wire with a unique number using colour coded 'O' ring markers. Fit lugs at termination points.

Take account of thermal effects of grouping when routing power wiring.

All wiring is to be neatly arranged and securely fixed. Where appropriate protect by cartridge fuses complying to BS 88 (BS EN 60269).

2271 COMPONENT MOUNTING:

Mount all components of the switchgear and controlgear in accordance with the manufacturer's instructions.

Mount control components on removable back plates.

2281 CONTROL SYSTEM FUNCTION CHARTS

Prepare function charts for the control system in accordance with BS EN 60848. Obtain approval of function chart before design of system hardware or writing control software.

Function chart format - Combined function chart/circuit diagram.

3000 WORKMANSHIP

3010 INSTALLATION:

Install contactors and starters in accordance with BS EN 60947 and manufacturer's recommendations.

10000 NES VERSION Y72 TEXT December 2004.

Y73 – Luminaires & Lamps

1000 GENERAL

1010 STANDARDS:

Supply luminaires and lamps as indicated to standards as appropriate.

1011 BUILDING REGULATIONS

The contractor shall ensure that all luminaires comply with the Building Regulations (Part B2 section 6) with respect to their fire retardant properties, in the configuration indicated on the drawings.

1012 PARTICULAR REQUIREMENTS

Provide luminaires as indicated in the Schedules and/or drawings.

2000 PRODUCTS/MATERIALS

2011 LUMINAIRES:

Standards

Supply luminaires with photometric data in accordance with BS EN 13032-1. Ensure luminaires of similar type have same photometric characteristics.

- Supply luminaires in accordance with BS 4533 (BS EN 60598).
- Fixed general purpose luminaires to BS 4533 Section 102.1 (BS EN 60598-2-1).
- Recessed luminaires to BS EN 60598-2-2.
 - Supply luminaires with type “n” protection in accordance with BS EN 60079-15
- Luminaires for road and street lighting to BS 5489 and BS EN 60598-2-3).
- Floodlights to BS EN 60598-2-5, N Protection to BS 4533 Section 102.51.
- Luminaires with built-in transformers for filament lamps to BS EN 60598-2-6
- Luminaires for swimming pools and similar applications to BS EN 60598-2-18.
- Air-handling luminaires to BS 4533 Section 102.19 (BS EN 60598-2-19).
- Luminaires for hospitals and health care buildings to BS EN 60598-2-25.
- Electrical supply track systems for luminaires to BS EN 60570.
- ELV lighting systems for filament lamps to BS EN 60598-2-23
- Luminaires with limited surface temperature to BS EN 60598-2-24

Classification BS EN 60598-1 as indicated.

Safety- Fit luminaire with cover glass to protect against ultra-violet emission and risk from explosion of lamps where scheduled.

Safety-Support for Components-Provide secondary support for translucent covers, diffusers and gear trays so they are prevented from falling when their primary fixing is released.

Electromagnetic Compatibility- Ensure luminaires comply with BS EN 61547 for immunity.

2021 EMERGENCY LIGHTING LUMINAIRES:

Comply with BS EN 60598-2-22.

Comply with ICEL:1001. Ensure emergency lighting luminaires are marked with ICEL certification label.

2030 EXIT SIGNS:

Comply with BS 5499 Parts 1 & 3.

2041 HAZARDOUS AREA LUMINAIRES:

Standard

BS EN 60079-15

BS 5501 and BS EN 50017, BS EN 50020, BS EN 60079-0, BS EN 60079-1 BS EN 60079-14.

2050 SIGNS & HIGH VOLTAGE INSTALLATIONS:

Standard

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

217/245

10/02

EX000001613/266
EX000001613_0266

Y73 – Luminaires & Lamps

Comply with BS 559 and BS EN 50107.
Neon transformers
Supply transformers for tubular discharge lamps with no-load output voltage exceeding 1000 V in accordance with BS EN 61050.

2061 LAMPHOLDERS - GENERALLY:

Standards
Lamp caps - BS EN 60061-1.
Lamp holders - BS EN 60061-2. Enhanced safety type BS 7895.
Bayonet lampholders - BS EN 61184.
Lampholders for tubular fluorescent lamps and starterholders - BS EN 60400.
Edison screw lampholders - BS EN 60238.

Interchangeability-Ensure lampholders in luminaires of similar type and rating are identical.

Earthing-Ensure metal lampholders incorporate an earthing terminal.

Material-When plastic is used in the lampholder it shall be heat resistant moulded plastic.

2070 LAMPHOLDERS - TUNGSTEN FITTINGS:

Use following lampholders for tungsten filament lamps unless indicated otherwise.

Lamp Lampholder	
up to 150W	bayonet B22d
200W	edison screw E27 2A
300W and above	edison screw 16A

Shade Rings-Provide a shade carrier ring for separately mounted lampholders for GLS tungsten filament lamps

Polarity of Edison Screw Lampholders-Ensure phase conductor is connected to centre contact.

2080 LAMPHOLDERS - MOUNTING:

Securely mount lampholder in luminaire when it is sole support for lamp.
Cord grip - provide integral cord grip type when lampholders are suspended by cord.
Conduit Mounted - when mounted directly to conduit system use backplate lampholder for conduit box.

2090 CONTROL GEAR AND COMPONENTS

Compatibility
Ensure control gear and components are suitable for lamp type, wattage, starting characteristics, and luminaire environment.
Obtain from manufacturers written confirmation of compatibility.

2101 FLUORESCENT LAMP BALLASTS AND STARTERS:

Standard
Ballasts
BS EN 61347-2-8 and BS EN 60921 for fluorescent lamps.
BS EN 61347-2-4,2-5,2-6,& 2-7and BS EN 60925 for d.c. supplied electronic ballasts.
BS EN 61347-2-3 and BS EN 60929 for fluorescent lamps and high frequencies.
Supply thermal protectors for ballasts for tubular fluorescent lamps to BS EN 60730-2-3.
Starters
BS EN 61347-2-1 and BS EN 60927 for starters other than glow switch.
BS EN 60155 for glow switch starters.
Use low distortion type.

2110 DISCHARGE LAMP BALLASTS AND STARTERS:

Standard
Ballasts - BS EN 61347-2-9 and BS EN 60923.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

218/245

10/02

EX000001613/267
EX000001613_0267

Y73 – Luminaires & Lamps

Starters - BS EN 61347-2-1 and BS EN 60927.

2120 CAPACITORS:

Use capacitors in accordance with BS EN 61048 and BS EN 61049 in tubular fluorescent, high pressure mercury and low pressure sodium vapour discharge lamp circuits.

2130 SUPPLY TERMINALS:

Use screw terminals for supply cables and circuit protective conductors, sized to terminate up to three 2.5mm² conductors. Provide separate terminal blocks for each incoming circuit, with marking to identify each circuit.

2141 FUSE:

Include a fuse holder and BS 1362 fuse in each incoming circuit phase connection for fluorescent and discharge luminaires.

2150 INTERFERENCE:

Comply with BS EN 55015.

2160 REMOTE GEAR:

Locate control gear in separate lockable cabinet of sheet steel with same degree of protection and finish specified for luminaire. Comply with manufacturer's recommendations for cable type and maximum length between gear and lamp.

2170 TUNGSTEN FILAMENT LAMPS:

Comply with BS EN 60064, BS EN 60432-1, and BS EN 60630

Supply electronic step-down converters for filament lamps to BS EN 61347-2-2 and BS EN 61047.

Comply with BS EN 61549 for double cap and ELV lamps.

2180 FLUORESCENT LAMPS:

Standard

Internationally specified tubular fluorescent lamps to BS EN 60081.

UK tubular fluorescent lamps to BS 1853 Part 2.

Single capped fluorescent lamps to BS EN 60901 and BS EN 61199.

Double capped fluorescent lamps to BS EN 61195 and BS EN 60081.

Self ballasted lamps to BS EN 60969 and BS EN 60968.

2185 TUNGSTEN HALOGEN LAMPS

Comply with BS EN 60357, BS EN 60432-2.

2190 HIGH PRESSURE MERCURY VAPOUR LAMPS:

Comply with BS EN 60188 and BS EN 62035.

2195 METAL HALIDE LAMPS

Comply with BS EN 62035 and BS EN 61167

2200 HIGH PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 62035 and BS EN 60662

2210 LOW PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 60192 and BS EN 62035

2221 TRANSFORMERS FOR LV LUMINAIRES

Standards; * BS EN 55014, BS EN 61000., BS EN 61047., BS EN 61347-2-2, BS EN 61558.

Provide electronic or wound type as specified. Provide secondary fuse or thermal cutout with automatic reset.

2230 LAMP MANUFACTURER:

Ensure that lamps of each type are from same manufacturer.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

219/245

10/02

EXO00001613/268
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Y73 – Luminaires & Lamps

2241 SUPPORT SYSTEM - CONDUIT/TRUNKING:

Use not less than 20mm conduit of same type as main conduit system. Trunking type and size as indicated on drawings.

2251 SUPPORT SYSTEM - ROD:

Use continuously threaded rods with matching washers and nuts, minimum 6mm diameter and a carrying capacity of not less than twice the weight of the complete luminaire. Material, Cadmium plated steel unless otherwise indicated.

2260 SUPPORT SYSTEM - CHAIN:

Use cadmium plated steel chain with load carrying capacity of not less than twice the weight of complete luminaire.

2271 SUPPORT SYSTEM -FLEXIBLE CORD:

Use size and type as appropriate. Confirm temperature rating is suitable for operating temperature of luminaire or lampholder. Confirm that cord is adequate for mass to be supported.

2280 SUPPORT SYSTEM - WALL BRACKETS:

Provide wall brackets. Confirm wall brackets are suitable for supporting luminaire.

2290 SUPPORT SYSTEM - BALL AND SOCKET:

Provide ball and socket as top support, complete with cover fixed to circular conduit box.

2295 SUPPORT SYSTEM – WIRE ROPE

Standards BS EN 12385-1, BS EN 13411-3, BS EN 13411-4, DIN 3093, and BSRIA COP 22/2002
Use proprietary Wire Rope Suspensions Systems comprising of stainless steel components.

2301 COLUMNS AND BOLLARDS:

Standards

BS 5649, BS EN 40-5, BS EN 40-6, BS EN 40-7 and BS EN 12767

Material, finish, height and lamp as specified in Work Section or on drawings.

Applied loads-Supply columns designed for additional externally applied loads 3 times luminaire mass.

Cutout and fuses-Provide cut-out fuses and cable termination within accessible, lockable services enclosure.

Earthing-Include earthing terminal fixed within service enclosure.

Column base plate-Manufacturers standard.

OPTICAL FIBRE LUMINAIRES

Where indicated provide optical fibre luminaires.

Optical fibre connection to BS EN ISO 11149.

3000 ACCESSORIES

3011 TRACK LIGHTING:

Where indicated provide track for fixing fittings in accordance with BS EN 60570.

3021 INTEGRAL PHOTO-CELLS:

Incorporate integral photo-cell on luminaire where indicated, or provide photo cell control as indicated.

3031 AIR HANDLING LUMINAIRES:

Provide assembly of luminaire and exhaust air device or luminaire and supply air device to meet design requirements for illumination and air flow. Ensure assembly can be integrated into a false ceiling, flush mounted as indicated on the drawings

Fixing-Ensure the fixing is capable of carrying the weight of the whole assembly.

Provide air-flow/noise performance data and air flow / light output characteristics.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

220/245

10/02

EX000001613/269
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Y73 – Luminaires & Lamps

4000 WORKMANSHIP

4011 ORIENTATION:

Install luminaires in accordance with the drawings, and in horizontal plane unless otherwise indicated. Orientation of lamps to be consistent throughout installation.

4021 CLEANLINESS:

Ensure luminaires are clean and grease free on handover.
Use gloves to prevent contamination of optical components as recommended by the manufacturer.

4030 INSTALLATION OF RECESSED FITTINGS:

Install luminaires flush with finished ceiling level.

4040 INSTALLATION OF SEMI-RECESSED FITTINGS:

Install luminaires as manufacturer's detail.

4050 INSTALLATION OF WALL MOUNTED FITTINGS:

Install luminaires at height indicated.

4061 MATERIAL OF SUPPORTING SURFACE:

Ensure classification of luminaires is appropriate. Do not mount luminaires on or adjacent to readily flammable surfaces.

4070 INSTALLATION IN POTENTIALLY EXPLOSIVE ATMOSPHERES:

Comply with BS EN 60079.

4080 LUMINAIRES IN AREAS WITH INFRA-RED CONTROL SYSTEM:

Install luminaires in areas with infra-red control systems or data bearers so as to cause minimum disturbance to the infra-red transmission system in accordance with BS 7693.

4090 SIGNS & HIGH-VOLTAGE INSTALLATION:

Comply with BS EN 50107 and BS 559: 1998.

4101 INSTALLATION OF EXTRA LOW VOLTAGE TUNGSTEN HALOGEN LAMPS:

Use same wattage lamp on luminaires fed from common transformer. Supply each luminaire on common transformer by separate cable of same cross-sectional area and length.

4110 SUPPORT

Ensure support is adequate for weight of luminaires.

Provide the following minimum number of supports for each luminaire longer than 600mm.

Luminaire Width mm	Minimum number of supports
Up to and including 300	2
Over 300	4

4120 SUPPORT FROM CONDUIT:

Where luminaire is supported from conduit provide a conduit box forming an integral part of conduit system at each point of suspension. Ensure suspensions are vertical.

Where conduit enters luminaire use back-nuts and washers to secure luminaire body to conduit support. Provide tube with corrosion resistance equal to conduit system.

Do not support luminaires directly from conduit boxes made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60°C or the mass suspended exceeds 3kg.

4130 SUPPORT FROM TRUNKING:

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

221/245

10/02

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Y73 – Luminaires & Lamps

Where luminaire is supported from trunking use proprietary clamps or brackets appropriate to the luminaire and trunking.

Do not support luminaires directly from trunking made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60°C or the mass suspended exceeds 3kg.

4141 SUPPORT BY DIRECT FIXING:

Refer to fixing methods as manufacturer's recommendations.

4151 SUPPORT IN SUSPENDED CEILING:

Support luminaires directly from building fabric and independent of ceiling unless otherwise indicated.

4160 SUSPENSION:

Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

4170 SUSPENSION BY ROD:

Use washers, nut and lock-nut at top and bottom of rod. Paint cut ends with calcium plumbate primer or zinc rich paint.

4180 SUSPENSION BY CHAIN:

Use hook cover for suspension from circular conduit box. For connection to luminaires use luminaire manufacturer's own chain hook, but if not available use hook with standard screw threaded body to be secured to luminaire body with nuts and washers. Where indicated use captive hooks.

4190 SUSPENSION BY FLEXIBLE CORD:

Suspend cord from ceiling rose.

4200 SUSPENSION BY BALL AND SOCKET:

Install cable through ball and socket connected to conduit box.

4205 WIRE ROPE SUSPENSION SYSTEM:

Only use where specified within the Scope of Works or Schedules.

Proprietary Wire Rope Suspensions Systems which comply with BS EN 12385-1, BS EN 13411-3, BS EN 13411-4, DIN 3093, and BSRIA COP 22/2002. Wire Rope Suspensions to be suitable for the safe working load and comprise Stainless Steel grade 316 wire rope, Stainless steel grade 302 Spring fasteners with fixings by loops, stud (permanently fixed to wire rope length) or toggle as appropriate. The installation shall comply with BSRIA COP 22/2002

4211 COLUMNS AND BOLLARDS

Location-Confirm location before excavation.

Bases- Install bases or supervise work by others.

Mounting-Mount column or bollard on base as recommended by manufacturer.

Ensure columns and bollards are vertical.

Earthing-Install circuit protective conductor to connect luminaire to earthing terminal in service compartment; size circuit protective conductor same as live conductors. Bond accessible metal parts of column or bollard to earthing terminal.

4220 CONNECTIONS TO LUMINAIRES

Cable Protection -Use appropriate size of grommet where cables enter through hole in luminaire body.

Earthing-Ensure that the earthing terminal of luminaire is connected to the conduit protective conductor of the supply circuit.

Loose Wiring-Clip or tie back with suitable proprietary devices loose wiring within luminaire, at 300mm intervals.

Y73 – Luminaires & Lamps

4231 CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT:

Terminate circuit wiring in luminaire terminal block using loop-in system taking all conductors through same cable entry of luminaire, unless stated otherwise in work section V21.

4241 CONNECTIONS TO LUMINAIRES - DIRECT TO TRUNKING:

For lighting trunking terminate wiring in luminaire terminal block using loop-in system taking all conductors through the same cable entry of luminaire, unless stated otherwise in work section V21.

4250 CONNECTIONS TO LUMINAIRES - SUSPENDED FROM TRUNKING:

Where luminaires are suspended from trunking, secure plug and socket type ceiling rose to BS 546, adjacent to, or on side of, trunking. Terminate circuit wiring at socket. Take flexible cord from plug of ceiling rose to supply terminals of luminaire.

4261 CONNECTIONS TO LUMINAIRES - RECESSED FITTINGS:

Where luminaires are recessed in a suspended ceiling, terminate circuit wiring at plug and socket type ceiling rose to BS 546, located not more than 500mm from the access through the ceiling. Use flexible cord from plug of ceiling rose to supply terminals of luminaire.

4270 CONNECTIONS TO LUMINAIRES - CONDUIT SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cable from terminal block to luminaire, installed within tube.

4280 CONNECTIONS TO LUMINAIRES - ROD OR CHAIN SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire and clip cable to one of the rods or chains, do not weave cable through links of the chain.

4290 CONNECTIONS TO LUMINAIRES - MICS CABLE:

Fix cable gland to luminaire and continue conductors to supply terminals of luminaire.

4301 LIGHTING SWITCHES ON DIFFERENT PHASES:

When lighting switches on different phases are in a common box, use phase barriers. Provide warning label in accordance with Y82 - Clause 1010

10000 Specification Expert VERSION Y73 TEXT March 08

Y74 – Accessories for Electrical Services

1000 GENERAL

Install all switches, controls, outlets and meters in accordance with BS 8300:2001. Design of buildings and approaches to meet the needs of disabled people in accordance with the Disability Discrimination Act.

1010 APPLICATION:

Supply fixed electrical wiring accessories for use with fixed and portable peripheral equipment using either power or signalling cables.

1020 SAMPLES:

Where indicated submit samples of proposed materials and equipment for approval before work is started. Label each sample with name, catalogue number and services in connection with item.

1021 ACCESSORIES SUPPLIER:

Unless otherwise indicated source all accessories from the same manufacturer.

2000 PRODUCTS/MATERIALS

2011 ACCESSORIES - COMMON REQUIREMENTS

Provide accessories as detailed in the Work Sections and shown on drawings.

Enclosure box to BS4662 for recessed

Enclosure box to BS5733 for surface

Degree of protection IP30 Interior
to BSEN 60529 IP54 Exterior
Hazardous area classification to BS EN 60079-14

Degree of mechanical protection to BS EN 50102 1K

Switches for Home and Building Electronic Systems (HBES) to comply with BS EN 50428.

Coverplates to be overlapping unless otherwise specified

Enclosure material and finish to match conduit system. Enclosures to be recessed unless otherwise specified.

2021 INTERIOR LIGHTING SWITCHES:

Standard

BS EN 60669-1

Switchtype

Switches shall incorporate rocker bars unless otherwise specified. For emergency lighting a secret key switch shall be used with rocker bars as other switches in that area. If dimmers and/or press switches are shown on drawings then they shall be of the same rocker bar pattern as the switches in that area.

Rating of all the switches to be 15A. Mounting to be on an adjustable steel grid. All switches shall have a snap action microgap mechanism. Pole configurations as indicated on the drawings.

Electronic control switches e.g. dimmer switches and time switches are to comply with BS 60669,

Ancillaries

Earthing terminal integral within switch box.

Blank inserts in all spare ways.

Neon's, shrouds, red rocker bars and operating keys as specified.

Y74 – Accessories for Electrical Services

2022 PULL CORD SWITCHES

Standard
BS EN 60669-1.

Rating of all the switches to be 16A for lighting circuits and 40-45A for show ers, fans etc as specified. Mounting shall be surface. All switches shall have a snap action microgap mechanism. Pole configurations for 40-45A switches shall be DP and for 16A as specified (ie 1 way, 2 way, SP or DP).

Ancillaries
Earthing terminal integral within switch box.
Neon indicator lamp.
Integral patress for surface mounting.

2031 EXTERIOR LIGHTING SWITCHES:

Standard
BS EN 60669-1.

Switch type shall be either rocker bar with sealed-in plastic membrane or rotary disc or lever operating through sealing gland. Rating of all switches shall be 15A. Action shall be two position, unless otherwise stated. Enclosure pattern shall be weatherproof and shall be surface, unless otherwise stated. Enclosure material shall be galvanized cast iron or impact resistant moulded plastic.

Ancillaries
Earthing terminal integral within switch box.
For neon etc shall be as indicated on the drawings.

2041 TIME SWITCHES:

Wire timer and switch circuits to separate terminals. Information regarding control and additional specification for time switches used for lighting is in work section V21, for all other uses see work section V20.

Standard BS EN 60730-2-7.

Time switch type shall be quartz stabilized motor with 30 hour spring reserve or quartz stabilized solid state with a minimum of 50 hour nickel cadmium battery backup unless otherwise specified.

Enclosure shall be dustproof sheet steel or impact resistant moulded plastic with viewing panel and arranged for conduit entry, unless otherwise indicated.

2051 LUMINAIRE CONNECTORS:

Rating shall be 5A.

Connector type
Load carrying captive cord grip type plug/socket and clip -on cover to BS 5733, BS 546 or BS 5733 Load Supporting BS 7001 (3 or 4 pin as appropriate).

Load carrying capacity to match connected luminaire.

Cover plate finish white moulded plastic.

2071 ISOLATING SWITCHES:

Provide isolating switches for fixed appliances, with utilization category and making capacity as indicated.

Standard
BS EN 60669-1 or BS EN 60947-3.

Mounting to be on an adjustable steel grid. Engrave front plate to indicate equipment served. Switch type toggle.

Y74 – Accessories for Electrical Services

Ancillaries

Earthing terminal integral within switch box.

Neon indicator with red lens.

Cord outlet with cord grip.

2081 FUSED CONNECTION UNITS:

Standard

BS 1363 Part 4.

Engrave front plate to indicate equipment served. Pole configuration to be DP switched or unswitched as shown on the drawings.

Ancillaries

Fuses to BS 1362 sized as indicated.

Cord outlet and cord grip, where scheduled.

Neon indicator where scheduled.

2091 SOCKET-OUTLETS:

Standard

13A socket-outlet to BS 1363.

Industrial socket-outlets, BS EN 60309-1.

Socket outlets shall be single or twin and DP switched or unswitched as shown on drawings. The rating shall be 13A. Provide separate earth terminals for termination of CPC's suitable for high protective conductor currents, where scheduled or where circuits are identified.

Ancillaries

Plug tops, provide for 25% of outlets.

Where protected outlets specified extend outlets to have either a spring flap covering whole of outlet, or screw type weathering cap and chain.

Neon indicator where specified.

2101 COOKER CONTROL UNIT:

Standard

Cooker unit to BS 4177.

With integral 13 A switched socket-outlet and pilot light.

Pole configuration to be DP switched. The rating shall be 45A.

2111 CORD OUTLETS:

Standard

BS 5733.

BS EN 61058-2-1.

Engrave front plate to indicate equipment served. Rating shall be 20A for all outlets except cooker and for cooker outlets 45A. Pole configuration to be DP & E.

Ancillaries

Cord grid. Cord Set to BS EN 60799.

Terminal block sized for cables.

For cooker 2x10mm², for all others 2x2.5mm²

2121 CABLE AND APPLIANCE COUPLERS:

Standard

BS EN 60309-2.

Industrial couplers, BS EN 60309-1.

BS EN 60320-2-2.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

226/245

10/02

EX000001613/275
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Y74 – Accessories for Electrical Services

BS 196.

Material polycarbonate male and female type connectors.

Colour

25V, Violet.
50V, White.
110 - 130V, Yellow.
220 - 240V, Blue.
380 - 415V, Red.
500 - 750V, Black.

Degree of protection to BS EN 60529

Internal- IP 44.

External - IP 67

Ancillaries as indicated on drawings.

2125 REMOTE CONTROL STATIONS

Standard

BS EN 60947-5-1

Actuator colours and marking to BS EN 60073.

2131 TELEPHONE OUTLET SOCKETS:

Standard

For jack socket to BS 6312 Part 2 or RJ 45,LJU.

Size shall be standard unless otherwise indicated. Circuit configurations as indicated on drawings. Connections shall be insulation displacement type unless otherwise indicated.

2151 D TYPE MULTIPIN CONNECTORS:

Circuit configurations as indicated on drawings. Connections shall be solder terminals. Size and circuit configuration (single or twin) shall be as indicated on drawings.

2161 BNC SOCKETS:

Circuit configurations as indicated on drawings. Connections shall be crimp terminals. The impedance of the outlet shall be 75 ohm. The mounting shall be insulated unless otherwise indicated. Connections shall be insulation displacement type unless otherwise indicated.

Ancillaries shall be dust caps for sockets unless otherwise indicated.

2171 AERIAL SOCKETS:

Standard BS 3041 Part 2

Circuit configurations (single or twin, TV, FM or DAB) as indicated on drawings. Connections shall be insulation displacement type unless otherwise indicated

Ancillaries safety isolation to CIA recommendations for communal aerial systems.

2181 LOW VOLTAGE ISOLATING TRANSFORMER UNITS:

Standard BS EN 61558, BS EN 61588-2-15 (in medical locations).

The configuration shall be single phase, double wound. Rating - Input 230V/ Output power 1500VA, unless otherwise indicated on the drawings.

Y74 – Accessories for Electrical Services

Type Output	Voltage	Description
V1	110V	For power tools in plantrooms with plug and socket to BS EN 60309-1
V2	24V	For portable lights in plantrooms
V3	110/24V dual	For power tools and portable lights in plantrooms

Ancillaries

Plug and socket for 110V.

Plug and socket for 25V.

DP switch primary supply.

Centre tapped secondaries.

Secondary side fusing.

2191 SHAVER POINTS:

Provide shaver points, internally switched by plug insertion.

Standard

BS 4573.

BS EN 61558-2-9.

BS EN 61558-2-5.

Engrave input and output voltages and 'SHAVERS ONLY'. Rating 20VA. .

Components

Double wound single phase transformer 230/230V and 110V to BS EN 61558-2-23, with Internal overload protection.

3000 WORKMANSHIP

3010 EARTHING:

Ensure metal framework of equipment is bonded to main earth point. Ensure that cable CPC's are connected to earth bar.

Provide earth CPC between earth lug on metal box and accessory casing except where accessory is encased in plastic.

3020 PROTECTION:

Ensure there is no physical or electrical damage to accessories when they are removed from their packaging and during installation.

Provide masking covers for surface mounted accessories to protect surface from paint.

Where accessories are flush mounted install front plate after painting is finished.

3030 FIXING:

Align accessories horizontally and vertically, as indicated. Where accessories are grouped, mount horizontally in line and parallel to each other and equidistant.

Fix cover plates to boxes with brass fixing screws.

3041 MOUNTING HEIGHTS:

Mounting heights shall be in accordance with Schedule Y74sch2, unless indicated otherwise.

10000 Specification Expert VERSION Y61 TEXT March 2008

Y81 – Testing & Commissioning for Electrical Services

1000 GENERAL

1010 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 Requirements for Electrical Installations (the IEE Wiring Regulations), IEE Guidance Notes Number 3 Inspection & Testing and other British Standards as indicated.

1020 SUPPLY CHARACTERISTICS:

Obtain information called for in BS 7671 about supply characteristics from Supplier, other than where to be measured as part of testing procedure.

1030 DESIGN INFORMATION:

Obtain all design assumptions, calculations and any other information to enable compliance with BS 7671 to be verified.

2010 INCORPORATED EQUIPMENT CHARACTERISTICS:

Obtain and use information from manufacturers of equipment provided.
Use information provided, for equipment supplied by others and incorporated into installation.

2021 PROSPECTIVE SHORT CIRCUIT CURRENT (IP):

Determine values of IP by measurement, unless other means are indicated. Determine IP at all necessary points within installation to confirm correct equipment selections.

Where necessary obtain from supply undertaker values of IP at the origin of the installation taking into consideration any alternative supply arrangement giving rise to the highest IP value.

2031 INITIAL VERIFICATION:

Carry out detailed inspection to verify the requirements of BS 7671 Section 611 in the order given in clause 611.3.

2041 TEST EQUIPMENT AND CONSUMABLES:

Provide test equipment and consumables in accordance with BS EN 61557 to complete tests satisfactorily, and to retest any failed installations following corrective measures.

Test equipment quality assurance requirements to BS EN ISO 10012.

2051 TESTING

Carry out in the same order as published the tests required by BS 7671 Section 612.

2061 CONTINUITY OF PROTECTIVE CONDUCTORS:

Confirm continuity. Use ac or dc source

2071 EARTH FAULT LOOP IMPEDANCE (ZS):

Use 25 A test current. Measure and record source impedance (Z_e)

Where necessary obtain from supply undertaker value of Z_e at the origin of the installation taking into consideration any alternative supply arrangement giving rise to the highest Z_e value.

Measure Z_s with main equipotential bonding conductors connected. Do not summate values of several parts of each loop.

2080 SETTINGS AND ADJUSTMENTS:

Confirm characteristics and settings of protective devices are within maximum and minimum specified tripping times.

Check correct operation of devices.

Confirm interlocks and sequences operate safely and as indicated.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

229/245

07/07

EX000001613/278
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Y81 – Testing & Commissioning for Electrical Services

2091 STANDBY GENERATORS:

Perform works tests on standby generators and provide test certificates.

Comply with BS7698, BSEN60034

Carry out load test where specified within Work Sections.

Allow for attendance by the Engineer to witness works tests.

Carry out special tests where indicated in the Works Sections.

2101 HV AND LV SWITCHGEAR:

Perform works tests on HV and LV switchgear in accordance with BS EN 62271 and BS EN 60439-1, as appropriate, and provide test certificates.

Allow for attendance by the Engineer to witness works tests.

Carry out special tests where indicated in the Works Sections.

2111 HV POWER TRANSFORMERS:

Perform works tests on HV power transformers in accordance with BS EN 60076, BS 171, Parts 3 and 5 and provide test certificates.

Allow for attendance by the Engineer to witness works tests.

Carry out special tests where indicated in the Works Sections

2121 SPECIALIST INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for specialist installations in accordance with:-

fire detection and alarm systems - BS 5839.

lightning protection - BS 6651.

fire protection of electronic data processing installations - BS 6266.

fire extinguishing installations and equipment on premises - BS 5306.

Emergency Lighting installations and equipment on premises - BS 5266 and BS EN 13032-1.

Fire Alarm and Voice Alarm Installations

The voice alarm system shall be tested in accordance with BS 5839 : Part 8. In particular the following shall be performed;

- All communications and speaker circuit wiring shall be tested for insulation resistance, continuity, presence of earth loops and polarity prior to commencing commissioning.
- Load on each output circuit (subsequent to completion of audibility measurements and final setting of loud speaker tapings).

The Fire Alarm Trade Contractor shall carry out audibility measurements in all areas of the building to ensure that minimum audibility levels have been achieved in accordance with BS 5839 for fire alarm installations and BS EN 60849 Annex C and BS 5839 : Part 8, Clause 28.5. for Voice Alarm Installations.

Audibility measurements shall be performed once areas are complete (including all finishes and furnishings where provided within the Contract) and plant operational under normal conditions. The Fire Alarm Trade Contractor shall allow to adjust loudspeaker tap settings to achieve a sound level within the 'preferred' range. Following adjustments to loudspeaker tapings, audibility measurements shall be repeated.

Results of final audibility measurements and 'as-installed' loudspeaker tap settings shall be recorded on Record Drawings.

For Voice Alarm Systems, subjective assessment of intelligibility may be acceptable during commissioning and for system demonstration prior to acceptance, if this is the preferred method of the Building Control / Fire Officer. In the event of a dispute, measurements shall be taken in accordance with BS EN 60268-16, any costs associated with these measurements shall be borne by the Electrical Trade Contractor.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

230/245

07/07

EX000001613/279
EX000001613_0219

Y81 – Testing & Commissioning for Electrical Services

Standby power supplies shall be subjected to a discharge test to demonstrate that they have sufficient capacity to maintain power to the system in its quiescent and alarm states, for the rated durations. Dummy loads shall be added to the system to simulate loads allowed for future capacity.

2131 CALIBRATION:

Provide current certificates of calibration for all instruments used during test procedures. Record particular instrument identity on record sheets.

2141 CERTIFICATION AND REPORTING

Complete and hand over to the Client a Completion or Periodic Inspection Certificate to BS 7671 Appendix 6 as appropriate.

Certificates shall be accompanied by a complete schedule of test results:

Record details of departures from BS 7671 (IEE Wiring Regulations) on Completion Certificate.

Where appropriate provide copies of calculations justifying departure from BS 7671 (IEE Wiring Regulations) and attach to certificates.

2161 RECORDS:

Record all results and instrument readings on approved Record Sheets and hand over to the client two copies for each inspection and test, as soon as possible after such inspection and test.

3000 WORKMANSHIP

3011 CONDUCTIVE PARTS:

Test for protection against direct and indirect contact in accordance with BS 7671 (IEE Wiring Regulations) dependant on the method of protection.

3020 PHASE SEQUENCE:

Check and confirm correct polarity of all conductors in all circuits.

3031 HIGH VOLTAGE TESTS:

Carry out high voltage tests as indicated:

Comply with BS 923, BS EN 61180, BS EN 60060 and BS EN 61180 as appropriate.

3041 CABLES:

Test continuity and insulation of all cables and carry out HV tests on HV cables prior to handover.
Test continuity and insulation of buried cables immediately after back-filling.

3051 CONDUIT, TRUNKING AND DUCTING:

Test and confirm electrical continuity of metal containment systems before installing cables.

10000 Specification Expert VERSION TEXT Y81 September 2008

Y82 – Identification – Electrical Services

1000 GENERAL

2000 PRODUCTS/MATERIALS

2011 LABELS AND NOTICES:

Apply identification labels and notices in accordance with BS 7671 (IEE Wiring Regulations), Section 514 to all electrical cables plant and equipment including components of mechanical systems. Fit labels and notices as shown on drawings or specified in the Work Sections.

BS 7671 Labels and Notices

Identification of protective devices.
Diagrams, charts or tables to comply with Clause 514.9, 560.7.9 and as indicated.
Warning notices, voltages in excess of 230 volts.
Isolation notices
Periodic inspection and test notices.
Residual current device notices.
Earth electrode safety electrical connection label.
Bonding conductor connector point to extraneous conductive parts label.
Earth free local equipotential bonding areas warning notice.
Electrical separation areas warning notice.
Outdoor equipment socket outlet notice.
Circuits with high protective conductor current (Regulation 607-03-02).
Wiring complying with previous versions of Section 514 (Regulation 514-14-01)

2021 MATERIALS:

Use materials for labels and notices with a predicted life equal to or greater than the design life of the electrical cables, plant, equipment or installation to which it refers.

External- Engraved thermosetting plastic laminate.

Internal - Engraved thermosetting plastic laminate.

Labels shall be coloured in accordance with The Health and Safety (Safety Signs and Signals) Regulations 1996, generally as follows:

Application	Background Colour	Colour of Lettering / Symbols
Danger notices	RED	WHITE
Warning notices	YELLOW	BLACK
Identification or descriptive notices	WHITE	BLACK
Mandatory notices	BLUE	WHITE
Emergency escape / First Aid notices	GREEN	WHITE

2031 FIXING:

Fix labels and notices using materials compatible with label or notice and surface to which it is fixed using fixing screwed into tapped hole. Use adhesives only with written consent from the Engineer.

2041 ARRANGEMENT:

Obtain approval prior to manufacture, with regard to style, colour, lettering, size and position of all labels and notices. Provide sample showing style, colour, lettering and size, for approval.

2051 LETTERING AND SIZE OF LABELS AND NOTICES:

Ensure that all lettering and symbols comply with the requirements laid out in BS 7671 (IEE Wiring Regulations), Section 514 and BS 5499-1. Use BS 5499-1 for height of lettering where not otherwise indicated. Ensure labels and notices of adequate size for the lettering required, and allow a minimum margin around all lettering of one line space vertically and two letter spacing horizontally.

Font - Helvetica Medium unless otherwise indicated.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

232/245

07/07

EX000001613/281
EX000001613_0201

Y82 – Identification – Electrical Services

2060 CONDUCTOR ARRANGEMENT:

Arrange circuit polarity so that phases read in phase rotation order followed by the neutral, if any, from top to bottom in horizontal conductor layouts and left to right in vertical conductor layouts. Ensure flat horizontal arrays have leading phase to the left and neutral to the right from left to right when viewed from supply point. Arrange phase or live pole of two wire apparatus at top or left hand and neutral and earth both at bottom or right hand side. In all cases, ensure conductor arrangements defined are when viewed from front face of all equipment and terminating facilities. Apply identification markers in accordance with BS 7671 (IEE Wiring Regulations), Table 51 to all conductor termination points.

2070 SAFETY SIGNS:

Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5 where voltages above ELV exist. Provide with each safety sign 8.A.0044 supplementary or text signs complying with BS 5499-5 unless otherwise indicated.

Label all electrical plant and equipment with the labels specified in the appropriate British Standards for that plant or equipment. Identify each sub station and main switchroom with safety sign, 8.A.0044 of BS 5499-5 with supplementary signs to BS 5499-5 notices and signs required by BS 5499 for any fire extinguishing system and notice giving details of,

- Name of the Substation or switchroom.
- The presence of High and Low Voltages.
- Administrative instructions for access.
- Location and method of contacting controlling authority.
- Actions to be taken in an emergency.

2080 PLANT AND EQUIPMENT LABELS:

Fit labels on all items of plant, equipment, switches, etc., include the following information:-

- service controlled.
- circuit reference.
- voltage, type of supply and phase etc.
- circuit protection type and rating.

2085 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Graphical symbols for use on equipment to be created and applied in accordance with BS EN 80416-1, BS EN 80416-2, BS EN 80416-3.

2090 MAINTENANCE NOTICES:

Fix notices giving warning of, and instructions on, any special maintenance procedures to plant and equipment.

2091 Moulded Case Circuit-Breaker - Warning Label

Where moulded case circuit breakers are used in the construction of a switchboard or panel board the contractor shall provide a warning notice in minimum print size of 5mm letters fixed in a prominent position clearly visible from the operating side of the switchboard or panel board to warn of possible danger as follows:-

WARNING LABEL

ALL MOULDED CASE CIRCUIT-BREAKERS WHICH TRIP FOR ANY REASON DURING OPERATIONAL USE MUST BE VISUALLY INSPECTED FOR ANY FORM OF DAMAGE PRIOR TO ANY ATTEMPT BEING MADE TO RESET THE DEVICE TO SERVICE CONDITION.

Reference to manufacturers recommendations and instructions for use and operation of MCCB devices must be identified in all operations and maintenance documentation.

2100 COLOUR CORRECTED LIGHT FITTINGS:

Fix a warning or identification disc to light fittings containing colour corrected fluorescent tubes or other colour corrected light sources to ensure that maintenance staff install the correct lamps.

Y82 – Identification – Electrical Services

2101 ELV LIGHTING TRACKS

Where ELV lighting tracks are intended to serve extra-low voltage luminaires without integral transformers a warning label shall be affixed either to the track or adjacent to the track. The label shall be engraved; 'WARNING: Transformer fed track. No more than n x 50 watt 12 volt fittings (or equivalent) to be connected to this track'. Where 'n' is the maximum quantity appropriate to the transformer rating.

2110 MOTORS AND STARTERS LABELS:

Fit identification labels to all motors, starters and starter panels. Ensure positive identification of respective motors and starters. Provide motors with non-corrodible labels attached adjacent to each bearing giving details of the lubricant to be used. Mark direction of normal rotation on motor casing. Provide labels to identify motor equipment fitted with surge suppressors and thermistors stating that insulation test voltages must not be applied to thermistors and thermistor control units. Ensure labelling is compatible with schematic and wiring diagrams, and complies with BS 4999, Part 108. Labels fitted at manufacturers Works or, if indicated otherwise, labels fitted at site.

2120 ENGRAVED ACCESSORY PLATES:

Engrave switchplates, spur units, pushes and special plates for bedhead units, call systems, fire alarms, etc. as indicated. Use 6mm high letters with engraving coloured red, except where otherwise indicated.

2131 SWITCHGEAR:

Fit labels on switchgear as required by BS 7671 and BS EN 60439 to indicate duty of unit, its voltage, phase and current rating, protective device rating size of conductor involved, and all other necessary details. Use an agreed serial coding system, provide at the switch a key to the coding system, as required.

Any identification of a switchboard busbar or conductor shall comply with the requirements of BS 7671 Table 51, so far as these are applicable.

2141 DISTRIBUTION BOARDS:

On each distribution board identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item and area supplied by circuit.

Where final circuits are intended to serve circuits with high protective circuit currents, provide labels in accordance with BS 7671, Regulation 543.7.1.5.

Where alterations or additions are made to an installation that includes conductors identified using colours complying with versions of BS 7671 prior to Amendment No2:2004, a warning notice complying with Regulation 514.14.1 shall be affixed to each switchboard or distribution board which serves circuits wired using both the current and previous versions of BS 7671.

2191 SCHEMATIC DIAGRAMS:

Provide a purpose made schematic diagram permanently fixed showing the connections of the equipment and plant.

- Locations - At main switchgear, (fixed to structure).
- Materials - Printed paper, transparent cover and framing, or printed paper, encapsulated.

2161 SPECIAL PURPOSE EARTHING:

Fit labels to special purpose earthing conductors and connection points, describing their purposes and any instructions necessary for their operation and maintenance.

- IT equipment 'Clean Earths'.
- Telecommunications functional earths.

2171 INDICATOR LAMPS AND PUSH BUTTONS FOR POWER SYSTEMS:

Use indicator lamp and push button colours in accordance with BS EN 60073.

Y82 – Identification – Electrical Services

Indicator lamp	Red	-	danger or alarm.
	Yellow	-	caution.
	Green	-	safety.
Where not defined submit details of proposed colours for other lamps.			
Push buttons	Red	-	emergency action.
	Red	-	stop or off.
	Yellow	-	intervention.
	Green	-	start or on.
Where not defined submit details of proposed colours for other lamps.			

2181 CONDUIT AND TRUNKING COLOUR CODING:

Provide colour coding where specified in Work Sections for special applications.

Place identification colours at bulkheads, wall penetrations and any other place where identification is necessary.

2191 CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring enclosed in conduits or trunking, with labels fixed at each end of cable, either side of wall and floor penetrations, at approximately 12m intervals on route or at convenient inspection points by means of non-releasable plastic straps unless otherwise stated.

Ensure labels show the following information:-

Reference number of cable.

Size and number of conductors.

2201 TERMINAL MARKING AND CONDUCTOR IDENTIFICATION:

Provide for switchgear and control gear elements whose terminals are marked in accordance with BS 5472 (EN 50005) and BS 6272 (EN 50042). Use a unique reference to identify each element in the switchgear or control gear. Mark on or adjacent to each element its reference. Identify each terminal for connection to external wiring or cabling using a reference system complying with BS EN 60445 based on the element reference and the appropriate element terminal reference and BS 7671, where applicable.

On terminals use lettered or numbered ferrules or sleeves to BS 3858 to mark each auxiliary conductor or control cable core with the identity of the terminal to which it is connected and the reference of plant or equipment to which it is connected and the identity of the terminal at the remote end. Ensure that main circuit conductors are identified in accordance with BS 7671 (IEE Wiring Regulations) Table 51. Ensure that all identification of terminals and conductors is recorded and included on record drawings and in operation and maintenance documentation.

At each interface between conductors identified using colours or markings complying with versions of BS 7671 prior to Amendment No2:2004, identification ferrules shall be fitted to the existing conductors marked in accordance with BS 7671 Appendix 7 Table 7A or Table 7E, as appropriate.

2211 UNDERGROUND CABLE IDENTIFICATION:

Identify external underground cable routes by means of approved concrete markers along their length at distances not exceeding 35m and where a change of direction occurs on such routes. Provide cable markers with a brass plate or impress concrete to clearly indicate the reference number of the cable and operating voltage of cable.

Provide key to any reference system used at switchgear.

Y82 – Identification – Electrical Services

Mark direct buried cables with plastic tape yellow printed black as detailed below:-.

WIDTH	up to 600mm	600-1000mm	1000-1400mm	1400-1800mm
DEPTH up to 500mm	1 tape at 200mm below ground level in the centre of the trench	2 tapes at 200mm below ground level horizontally spaced 400mm apart	3 tapes at 200mm below ground level each tape horizontally spaced 400mm apart	4 tapes at 200mm below ground level each tape horizontally spaced 400mm apart
DEPTH 500-800mm	1 tape at 200 mm and 1 tape at 500mm below ground level in the centre of the trench	2 tapes at 200mm and 2 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart	3 tapes at 200mm and 3 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart	4 tapes at 200mm and 4 tapes at 500mm below ground level each tape on each level horizontally spaced 400mm apart

2221 CABLE CONDUCTOR COLOUR CODING:

Identify cable conductors in accordance with BS 7671 (IEE Wiring Regulations) Regulation 514 and Appendix 7, note that a lighting sub-circuit switch wire is a phase conductor in a single phase circuit.

In alterations or additions to existing installations identify conductors and terminals as BS 7671 Appendix 7.

All single phase final sub-circuit phase wiring carried out-using single core cables shall be coloured brown. Where multi-core cables are used for switch wires, blue, black or grey conductors shall be coded Brown at terminations.

2231 CABLE JOINTING AND TERMINATION:

Connect all cables in the installation so that the correct sequence of phase rotation is maintained throughout. Where straight through joints are approved joint high voltage conductors as they lie, ensuring their complete length is phased out on completion. Ensure connections at terminations of HV cables are made in the correct phase rotation and ensure cable conductor termination marking if any, complies with this phase sequence. Where straight through joints are approved on low voltage cables, whether power cables, control or auxiliary cables, joint conductors strictly in accordance with their colour or numeric coding. Where such joints are approved on mineral insulated or other non-coded conducted cables, identify each core at the joint and make the joint core to core.

2241 CABLE SHEATH IDENTIFICATION - INTERNAL:

Use the following coloured cables sheaths and cable codes for various services as follows:

Service	Sheath Colour	Cable Code
Fire alarm	Red	FA
Clock circuits	Brown	CL
Telecommunications Grey	Grey	T
Data	As system suppliers requirements or as indicated	D
Control Black		C
Radio frequency	Black	RF
Low voltage	Black	LV
Low voltage mineral insulated	Orange, unless otherwise indicated on the drawings	
Low voltage essential circuits	Blue	
Extra low voltage control	Brown	ELV
High voltage	Red	HV

2251 CABLE SHEATH IDENTIFICATION - EXTERNAL:

Identify cable sheaths for various services in accordance with NJUG7, as follows,

HV	-	Red.
LV	-	Black.
Telecommunications and data	-	Grey.

Y82 – Identification – Electrical Services

2261 ADDITIONAL SAFETY SIGNS:

Provide at locations shown or as appropriate safety signs to BS 5499-5 with dimensions as Tables 5 and 6 of Part 2. modular height (a), 75mm.

For main switch and electrical plant room access doors. BS 5499-5, complete with supplementary signs as shown.

6.C.0019. 6.A.002, with supplementary sign "Authorised persons only".

7.A.022

For use with permit to work systems, BS 5499-5, complete with supplementary signs as shown.

6.C.0021. Printed on rigid plastic, with hanging loop, with supplementary wording "Do not operate. Work in progress".

For use at each emergency stop. BS 5499-5, complete with supplementary signs as shown.

9.B.0097. With supplementary sign "Emergency stop push-button".

10000 Specification Expert VERSION Y82 TEXT September 2008.

Y90 – Fixing to Building Fabric

1000 GENERAL

1010 PREPARATION:

Mark-out, set-out and firmly fix all equipment, components and necessary brackets and supports.

1020 MANUFACTURER'S DRAWINGS:

Use manufacturer's drawings and templates for purposes of marking and setting out.

1030 FIXINGS:

Ensure structure and fixings are suitable for items to be fixed.

1040 LOADING DETAILS:

Provide loading details for all fixing types.

1050 BUILDING-IN BY OTHERS:

Provide all necessary assistance to enable any item of building-in type to be built in by others.

1060 SIZE OF FIXING:

Use largest size of bolt, screw or other fixing permitted by diameter of hole in item to be fixed.

1070 GREASING OF FIXINGS:

Ensure all bolts, screws or other fixings used are greased or lubricated in accordance with manufacturer's instructions.

2000 PRODUCTS/MATERIALS

2010 STANDARDS:

Comply with BS 3974 Part 1 for fixings. Ensure that fixings such as expanding anchors are tested for tensile loading in accordance with BS 5080.

2020 PLUGS:

Use plugs of suitable size and length for fixings. Use plastic, fibrous or soft metal non-deteriorating plugs to suit application. Do not use wood plugs.

Ensure that when screw is in place, threaded length is in plug. Ensure plugs used for screw fixing are set-in to correct depth prior to final tightening.

2030 SCREWS:

Use screws to BS 1210. Generally use sheradized steel wood screws for fixing to concrete, brickwork or blockwork.

In damp or exposed situations use greased brass wood screws.

2040 CAST-IN FIXINGS:

Where cast-in fixings are permitted, mark out and set fixings in accordance with manufacturer's instructions.

2050 SHOT FIRED FIXINGS:

Obtain approval prior to using shot fired type fixings.

2060 SELF ADHESIVE FIXINGS:

Obtain approval prior to using self adhesive type fixings.

2070 PROPRIETARY CHANNEL INSERTS:

Provide proprietary channel inserts for casting in where indicated.

3000 WORKMANSHIP

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\spec\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

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238/245

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Y90 – Fixing to Building Fabric

3010 DRILLING:

Drill holes squarely. Use drills of requisite size and depth, and appropriate to fabric. Do not flame-cut holes in metal work.

3020 PROPRIETARY FIXINGS:

Comply with manufacturer's instructions for all fixings.

3031 FIXING TO REINFORCED CONCRETE:

Take precautions to avoid fixing through reinforcement. Unless otherwise indicated do not fix to the bottom, or within 100mm of the bottom, on the sides of concrete beams.

3040 FIXING TO BRICKWORK:

Do not fix to unsound material or mortar between brickwork courses.

3050 FIXING TO TIMBER RAILS:

Fix equipment, brackets and supports by drilling hole through timber rail and fixing with bolt, back plate, washer and loose nut.

3061 FIXING TO HOLLOW STUD/TILE/BLOCK WALLS:

Fix equipment, brackets and supports where there is access at rear of wall, by drilling hole through wall and fixing with bolt, back-plate, washer and loose nut.

Fix equipment, brackets and supports where there is no access at rear of wall, drill hole and use, screw anchor type fixing, or gravity type toggle fixing or spring type toggle fixing.

3071 FIXING TO CONCRETE, BRICKWORK OR BLOCKWORK

Fix equipment, brackets and supports using wood screws in plugs or drill holes and fix using steel bolts of grouted bolt type or expanding bolt type fixing, as required.

3081 FIXING TO METALWORK:

Fix equipment, brackets and supports by drilling holes and fixing using either self-tapping screws or gravity type toggle fixing or spring type toggle fixing or set screws or bolts complete with washers, shakeproof washers and loose nuts as recommended by the manufacturer

3091 FIXING TO STRUCTURAL STEELWORK AND CONCRETE STRUCTURES:

Provide manufacturer's information on recommended fixing. Obtain approval for any fixing to structure steel work and concrete structures.

Generally use proprietary fixings to structural steelwork and concrete structures.

Obtain approval to cut holes in structural steelwork or concrete structures or weld to structural steelwork.

10000 NES VERSION Y90 TEXT 03-04/95

Y91 –Offsite Painting & Anticorrosion Treatments

1000 GENERAL

1010 GENERAL REQUIREMENTS:

Where particular methods of finish and painting are not specified, ensure following requirements are met.

Protect all metal work, plant, equipment, pipelines and fittings, ductlines, and ancillaries, brackets and supports against corrosion and oxidization.

Provide ferrous metals, machined or otherwise with protective coatings at manufacturer's works.

Ensure all items requiring on-site decorative finishes are provided primed to suit base material and required finish.

1020 DAMAGED FINISHES:

Following delivery to site, storage on site and installation make good any damage to finishes, by cleaning, degreasing and re-furbishing.

2000 PRODUCTS/MATERIALS

2011 PAINT MATERIALS:

Use the following materials as appropriate:

PAINT / COATING	MATERIAL
Solvent borne priming paint to BS 7956	Bare woodwork
Red Oxide priming paint	Bare iron & steelwork
Zinc Chromate priming paint	Bare ferrous & non-ferrous metals
Calcium Plumbate priming paint to BS 3698	Galvanised steel or composite wood/metal components
Undercoating paint	Previously primed or painted surfaces before application of finishing coats
Gloss finishing paint	Previously primed or painted/ undercoated surfaces
Epoxy resin paint	Specialist coatings calling for resistance to acids, alkalis, oils, solvents, abrasion, or high humidity, unless otherwise indicated
Powder coating to BS EN 13438	Previously galvanized or sherardised steel products, for architectural (internal and external application), fencing and construction purposes.
Aluminium paint to BS 388	Structural steelwork, storage vessels, heated metallic surfaces and similar applications calling for moisture and heat resistant properties, unless otherwise indicated
Cold galvanizing paint	Making good damage to previously galvanised surfaces and protection to galvanised materials modified during the installation process, unless otherwise indicated
Zinc-rich metallic to BS 4652	Bare iron and steelwork where electrical conductivity has to be ensured
Black tar-based paint to BS 1070	Moisture resistant protection to metal surfaces where decorating appearance is not important
Bitumen based coatings for cold application to BS 3416	Protection of iron and steel, typically steel pipelines and fittings for use in contact with potable water
Bitumen based coating for cold application to BS 6949	Not to be used in contact with potable water

2020 PAINT QUALITY:

Ensure paints used are of quality and type to suit application and that:-
primers have good adhesion, covering power, rust-inhibiting and grain filling properties.

Job No: Services technical standards/Standard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

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240/245

07/07

EX000001613/289
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Y91 –Offsite Painting & Anticorrosion Treatments

gloss finishing paints are of machine finish grade having high adhesion and high resistance to solvents, mineral oils, cutting oils, detergents, chipping and impact damage.

2030 HEAT RESISTANT PAINT:

Use heat resistant paints for applications to surfaces over 80°C.

3000 WORKMANSHIP

3010 GENERAL:

Ensure paints are applied in accordance with manufacturer's instructions and to BS 6150.

3020 WEATHER AND OTHER CONDITIONS:

Do not apply paints where weather, temperature, humidity or other conditions may have a damaging effect upon finish or paint.

3030 CLEANING:

Ensure metal surfaces are thoroughly cleaned, all mill and weld scale removed and finally degreased.

Clean steel surfaces to BS EN ISO 8503.

Prepare surfaces for painting in accordance with BS EN ISO 4618.

3040 APPLICATION OFF-SITE:

Wherever possible ensure paint finishes applied by component manufacturers are spray applied.

3050 APPLICATION:

Apply paint evenly and ensure finish shows no excessive brush marks, grinning, runs, sagging, ropiness or other application defects.

3060 COLD GALVANIZING:

Repair damage to galvanized components due to installation process, i.e. following cutting, drilling or welding, by applying 2 no. substantial coats of cold galvanizing paint.

3070 PROTECTION OF BRIGHT MACHINE PARTS:

Apply a protective coating to all bright machined parts before despatch from works.

Do not remove protective coatings unless required for installation, testing or commissioning purposes and in such cases reinstate upon completion.

Repair any damaged protective coating on bright machined part, or where necessary replace damaged component.

Use and apply metal coatings as required and in accordance with manufacturer's instructions.

Complete where possible all welding, drilling, bending and other work before metal coating.

3081 DRAINAGE PIPEWORK WHERE VISIBLE EXTERNALLY

Where rainwater or drainage pipework is visible externally or is in a quasi-external location such as a car park area paint the system with 2 coats of black bitumen paint.

10000 NES (SPEX) VERSION Y91 Nov 06

Y92- Motor drives electric

1000 GENERAL

1010 STANDARDS:

Supply and install motors in accordance with BS 4999, BS EN 50347 BS EN 60034 and BS EN 62114 as appropriate and local supply authority regulations.

1020 ELECTRICAL SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for power supply indicated.

1030 PERFORMANCE CHARACTERISTIC DETAILS:

Provide details of electrical input, starting and performance characteristics of all motors above 750W to an agreed format.

1060 MOUNTING:

When duplicate motors are required for automatic changeover, mount separately, ensure each is complete with drive and guard and make due allowance for power loss of idling motor.

1070 KEYS:

Ensure motors and drives are supplied complete with keys and keyways.

2000 PRODUCTS/MATERIALS

2011 OPERATING CONDITIONS:

Ensure motors, starters and ancillary equipment are suitable for operation at full capacity at heights above sea level not exceeding 1000m, with air cooling at an average temperature over 24 hours not exceeding 35°C dry bulb with maximum conditions of 40 °C dry bulb and 50 per cent RH ; above 1000m, with conditions exceeding 40°C dry bulb and 50 per cent RH; or as defined in the "A" series Work Sections, whichever is the most onerous.

2020 MOTORS - GENERAL:

Standard

Use motors which conform to BS 2048, BS 4999, BS EN 50347 and BS EN 60034, as applicable, which operate at lowest possible speed, compatible with performance requirements.

Ratings

Select maximum continuous rating (MCR) such that:-

driven machine operates at correct speed or speeds at design duty.

when running continuously at design rated duty, the temperature of the motor parts is within limits defined in

BS EN 60034-1.

when provided with excess motor current (over-load) protection of thermal over current release type, ensure operation is within tolerances of tripping as defined in BS EN 60947-4-1

Insulation

Use motors with Class 130 or 155 insulation, with temperature rise as defined in BS EN 62114.

Conduit entry

Fit motor bodies with conduit entry terminal box or cable gland as required, and to suit type and size of cable being terminated.

Enclosures

Provide protected enclosures as indicated.

2026 MOTOR EFFICIENCY:

Supply a Class Eff 1 High Efficiency Motor (HEM) whenever one is available for the application, with a stated efficiency as European Motor efficiency classes table. Eff 2 motors can only be used if an Eff1 motor is not available for the particular application. Eff 3 motors should only be used as a last resort.

2030 SLIDERAILS

Fit motors on slide rails or other suitable means of adjustment to facilitate correct alignment and belt tension.

Job No: Services technical standardsStandard Mechanical & Electrical Y Reference Clauses

Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01

Date: February 2009

Filename: f:\projects\services technical standards\specs\section 3 y03-m&e\section 3 y03-m&e_(13-02-09 12-55).doc

AECOM

242/245

07/07

EX000001613/291
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Y92- Motor drives electric

2040 PLINTHS

Where plinths are built in by others, provide all necessary assistance and information.

2051 MOTOR RATINGS:

Up to and including 0.75kW

Single or three phase, totally enclosed, frame cooled or fan cooled. For duty and torque requirements of driven machine.

Above 0.75kW up to and including 4kW

Three phase, squirrel cage induction type, totally enclosed, frame cooled or fan cooled. To BS EN 60034-5 and BS EN 60034-6 IP44 - IC 01.411.

Above 4 kW

Unless indicated otherwise or required to suit installed location provide three phase, squirrel cage, induction type, drip-proof enclosure. To BS EN 60034-5 and BS EN 60034-6 IP 22S-IC 01.

2061 MOTORS - OVER TEMPERATURE PROTECTION THERMISTORS:

Fit positive temperature coefficient thermistors to BS EN 60043-11. Provide a minimum of 3 PTC thermistors in each motor with 2 ends terminated in motor terminal box clearly and permanently marked.

For motor ratings between 30kW & 75kW provide a single thermistor in each phase.

For motor ratings 75kW and above provide two thermistors in each phase.

Provide control unit to BS EN 60034 to motors fitted with thermistors. Interconnect control unit with thermistors and starter to trip starter when one or all of thermistors detect overheating.

2062 MOTORS BELOW 0.37 kW:

Provide fuses or circuit breakers for motors below 0.37 kW.

2071 INDIRECT DRIVES:

Belts

Use endless standard 'V' or where required use toothed belts both in accordance with BS 3790. Provide at least two matched belts for any drive, of anti-static type and rated to transmit full machine power with one belt removed.

Pulleys

Construct pulleys from approved materials and statically balance. Lock close limit bores by keys fitting in to machinery shaft keyway.

Pulley Adjustment

Adjust pulley to give alignment and correct belt tension.

2081 DIRECT COUPLED DRIVES:

Use an extended motor shaft coupled to machine, or a flexible coupling connecting driving and driven shafts, incorporate suitable arrangements for aligning the two shafts.

Mount motors on a substantial mild steel bed plate fixed to machine casing separately supported or supported entirely from the machine casing.

2085 VARIABLE SPEED DRIVE:

Use variable speed drive to match design and installed flow volume. Ensure the drive meets the safety requirements of BS EN 61800-5-1. Select drives to meet design duty at 45Hz.

Y92- Motor drives electric

2091 GUARDS:

Totally protect drives and couplings. Fit around all exposed or otherwise accessible drive shafts, pulleys, 'V' belts or couplings, purpose made guards.

Ensure guards comply with National or Local Safety Codes, Acts and Bye-Laws and incorporate following features:-

Construction to BS EN ISO 12100 and generally of galvanized steel wire mesh.
Stiffening within the guards to ensure rigidity and freedom from vibration.
Allowance for prime mover adjustment during belt tensioning procedures.
Temporary access to all shafts for use of Tachometer.
Any special features as indicated.

10000 NES VERSION Y92 TEXT March 08

End of Specification

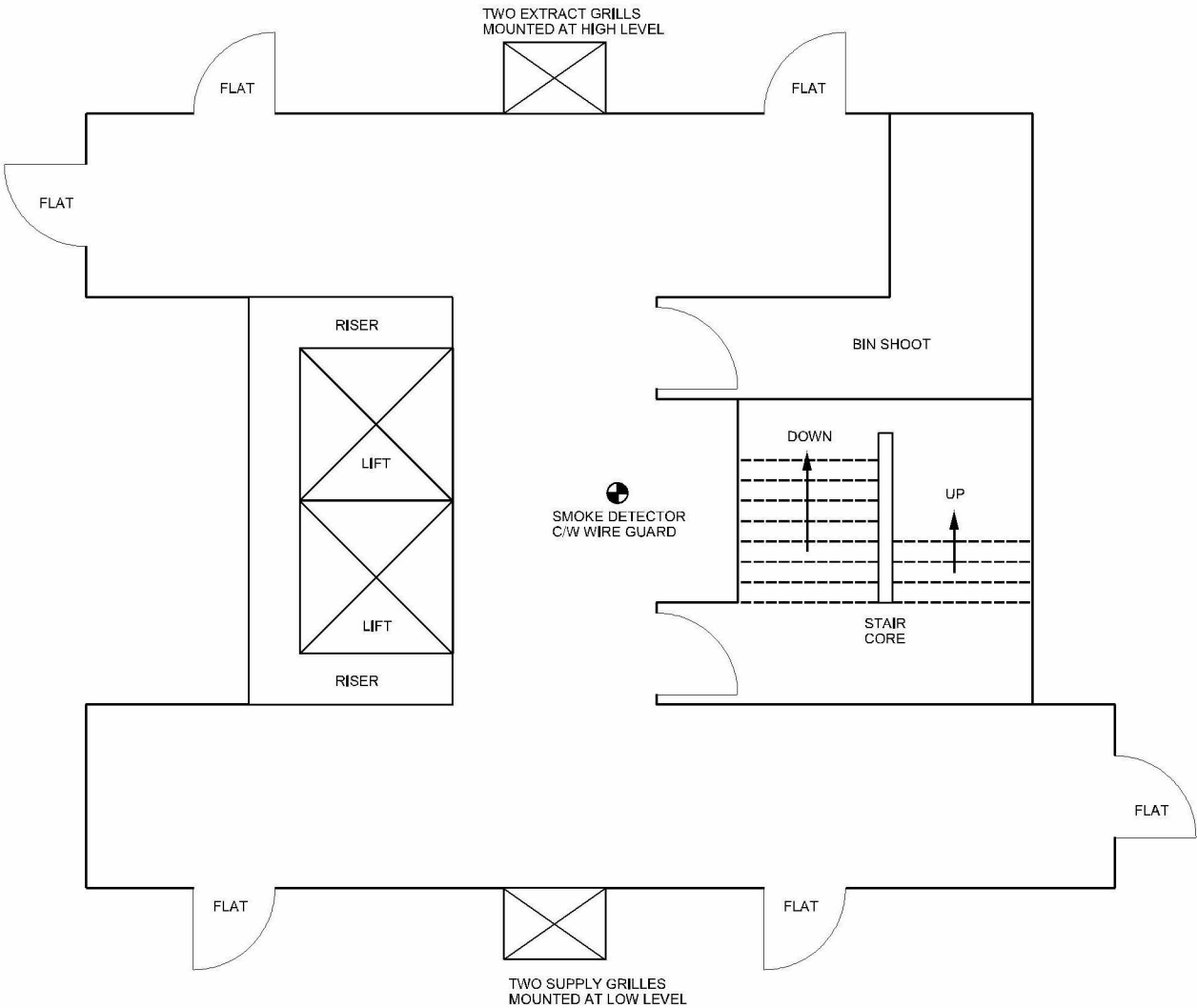
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Job No: Services technical standards
Reference: Services Technical Standards/Section 3 Y03-M&E/RM/MC rev 01
Date: February 2009
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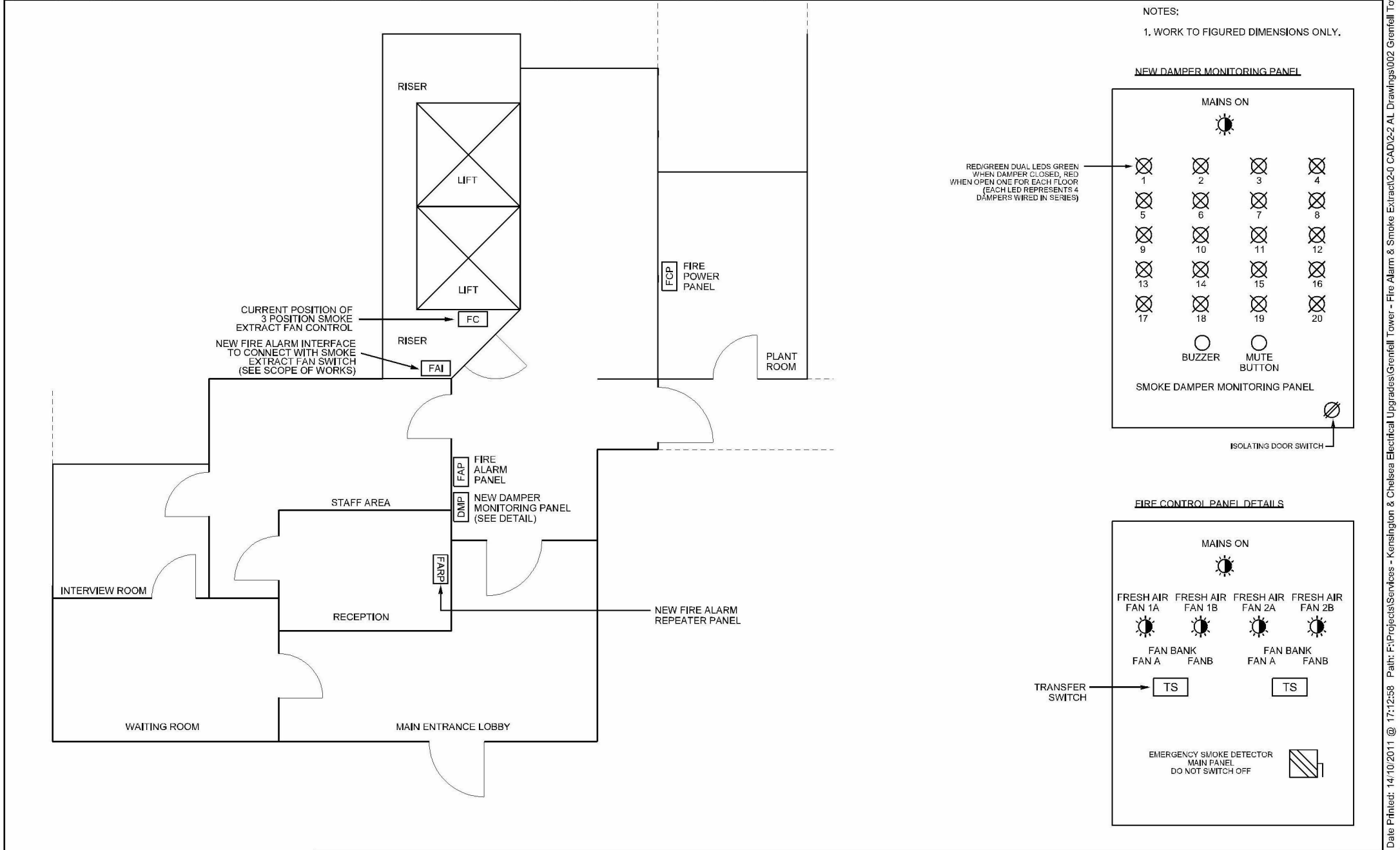
NOTES:
1. WORK TO FIGURED DIMENSIONS ONLY.




						Client: ROYAL BOROUGH OF KENSINGTON & CHELSEA TMO	Project: GRENFELL TOWER	Title: TYPICAL FLOOR LAYOUT	Eng: AP	CAD: AP	AECOM House 63-77 Victoria Street St Albans, Hertfordshire AL1 3ER  www.aecom.com	Drawing No: 60190925/GT/001	Rev: -	cm											
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						Client: ROYAL BOROUGH OF KENSINGTON & CHELSEA TMO	Project: GRENFELL TOWER	Title: GROUND FLOOR LAYOUT	Eng: AP	CAD: AP	AECOM House 63-77 Victoria Street St Albans, Hertfordshire AL1 3ER www.aecom.com	T: F: 	cm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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Job No: 90190925

Sheet No: 1 of 1

Discipline/Subject	Issue Date	Day	14												Archive Ref N ^o :
		Month	10												
		Year	11												
Document Title	Document	Amendments													

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Distribution		No. of Prints (X = Issue Sheet)(E=E-mail or disc)														
Keith Fifield	TMO	E														A3+Scan
Trevor Stiff	TMO	E														
Martin McGoldrick	AECOM	E														A4 Scan
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																Disk N ^o :
Scanning		-														D/base N ^o :
Purpose of Issue		T														
I=Information, A=Approval, S=Scheme Design, B=Billing, T=Tender, C=Construction, Ar = Archive																

Page: 1 Doc. F7/04 Revised: April 2009
F:\Projects\Services - Kensington & Chelsea Electrical Upgrades\Grenfell Tower - Fire Alarm & Smoke Extract\5-0 Document Control\5-3 Outgoing Documents\Grenfell Tower - Document Issue Sheet.doc

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Document Issue & Archive Record



Project: **Kensington & Chelsea TMO** Job No: **90190925**

Grenfell Tower – Fire Alarm & Smoke Extract Upgrade

Originator: **Andrew Pearson** Sheet No: **1 of 1**

We enclose copies of the Documents listed below.

Discipline/Subject	Issue Date	Day	14															Archive Ref N ^o :
		Month	10															
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