

GENERAL SPECIFICATION

HVAC

GS EP HVA 100

HVAC Basis of Design

10	10/2012	Updating
09	01/2012	Updating
08	01/2011	Updating of defined words, formulae, heat dissipation from equipment
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00	10/2002	First issue
Rev.	Date	Purpose of the revision

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1. Scope

The present specification defines the reference documents and the data which shall be used as basis of design for *HVAC* systems.

The data listed in section 7 "Fixed data" are applicable to all projects.

The data listed in section 8 "Project data to be completed by Engineering" are specific to each project and shall be indicated and / or calculated by *HVAC ENGINEERING*.

The words and expressions in CAPITAL characters and *italic* are defined inside the general specification **GS EP HVA 801**.

When other words require a definition only to be used in the present document, then the definition is given in a dedicated paragraph of the present document and the defined word, when used, is marked in small and *italic* letters.

In case of the Basic Engineering is part of a design competition where the competitor has to produced a quoted offer, the competitor shall require the *HVAC* Basis of design document approval by COMPANY HVAC SPECIALIST. In case the above procedure is not respected by the competitor, this last one shall support the consequences (financial, technical and schedule) of a basis of design change during the detailed engineering phase.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Equipment and installations shall be in accordance with (in order of precedence):

1. The country local regulations where equipment and/or installations shall be operated
2. Total General Specifications as listed in **GS EP HVA 000**
3. The International Standards
4. The French Regulation (when Country local regulation does not exist).

International System of Units (SI) shall be used, whatever the document (drawing, data sheet, documentation...).

Notes:

- in case of either a local regulation, or a project position is in opposition with the principle and / or the philosophy usually applied by COMPANY, the assistance of the *HVAC SPECIALIST* shall be requested by the *HVAC ENGINEERING*, in order to define the principle / philosophy which has to be applied;
- in case of discrepancy among documents, the more stringent requirements shall apply;
- the *HVAC VENDOR* or *CONTRACTOR* may propose proven improvements to the reference documents but shall obtain written approval of the COMPANY prior to implementation;

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- an International Standard is a good "engineering practice" which shall be recognised and taken into consideration by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and/or *CONTRACTOR*. If required, the translation of the standards shall be included into *HVAC* scope;
- the latest revision of Standards, codes, regulations and the published errata if any shall be used and applied by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and *CONTRACTOR*.

Some documents listed hereafter are issued from the French Government and are applicable to the basic engineering, detailed engineering and construction. *ENGINEERING*, *CONTRACTOR* are in charge to translate or to entrust the translation to specialist.

When a requirement is mentioned in a General Specification, it prevails over the requirement on same topic as indicated in Standards, Codes, Other documents and Professional documents.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
ADC	Air Diffusion Council (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
AFI	American Filtering Institute (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
AGA	American Gas Association (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
AICVF Codes	Association des Ingénieurs de Chauffage, Ventilation Français (All codes in accordance with equipment or part of <i>HVAC</i> installation designed)
AMCA	Air Moving and Conditioning Institute (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
ARI	Air Conditioning and Refrigeration Institute (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers (All documents in accordance with equipment or part of <i>HVAC</i> installation designed)
Circulaire DGS n° 97/311	Circulaire de la direction générale de la santé 97/311 (French document)
Directive 1999/92/EC, referred to a ATEX 118 / 137	Directive of the European parliament and the council on minimum requirements for improving the safety and health protection of workers potentially at risk from explosives atmospheres

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Reference	Title
Directive 2004/108/EC dated 15 December 2004	Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC with EEA relevance
Directive 2006/42/EC dated 17 May 2006	Directive 2006/42/EC of the European parliament and of the council on machinery, and amending Directive 95/16/EC
Directive 2006/95 dated 12 December 2006	Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits
Directive 2009/125/CE	Directive 2009/125/EC of the European Parliament and of the Council of the 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products
Directive 94/9/EC, referred to a ATEX 100a / 95	Directive of the European parliament and the council on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosives atmospheres
Directive 97/23/EC dated 29 May 1997	Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment
Directive 98/37/EC dated 27 June 1988	Directive 98/37/EC of the European Parliament and of the Council of 22 June 1998 on the approximation of the laws of the Member States relating to machinery
EN 12100 (Parts 1; 2)	Safety of machinery - Basic concepts, general principles for design - Parts 1; 2
EN 13831	Closed expansion vessels with built in diaphragm for installation in water systems
EN 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 60079-14	Explosive atmospheres - Part 14: Electrical installations design, selection and erection
IEC 60335-1	Household and similar electrical appliances - Safety - Part 1: General requirements
IEC 60529	Degrees of protection provided by enclosures
IEC 61131-2	Programmable controllers - Part 2: Equipment requirements and tests
ISO 9614-1	Acoustics - Determination of sound power levels of noise sources using sound intensity
NF C15-100	Low voltage electrical installations

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Reference	Title
Order in Council n°2007-1133 dated 24-07-2007	Décret n° 2007-1133 du 24 juillet 2007 relatif aux dispositions réglementaires du code du sport
Order in Council n°2008-244 dated 7-03-2008	Décret n°2008-244 du 7-03-2008 Article 9
Regulation No 327/2011	Commission Regulation (EU) No327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. (All documents in accordance with equipment or part of HVAC installation designed)
UTE C63-100	Low-voltage switchgear and controlgear for industrial use. Switching devices. Code of practice for the construction of appliances and their enclosures designed for operation in specific environments. Relevant tests

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP HVA 000	List of HVAC specifications
GS EP HVA 301	HVAC plant room
GS EP HVA 801	Terminology, definitions, abbreviations

GS PVV

The following Company General Specifications mainly related to design and sizing of Process equipment, **shall not be used** for design and sizing of HVAC equipment:

GS EP PVV 202: Standard drawings for accessories and equipment of vessels

GS EP PVV 211: Design and fabrication of pressure vessels according to ASME VIII

GS EP PVV 212: Design and fabrication of pressure vessels according to BSI PD 5500

GS EP PVV 312: Design and fabrication of metallic vertical storage tanks

GS EP PVV 402: Standards for exchangers accessories and equipment

GS EP PVV 411: Shell and tube heat exchangers

GS EP PVV 412: Plate and frame heat exchangers

¹ The second phase of art. 3 shall be applied on 1/01/2013 instead of 1/01/2015 as mentioned in the Regulation – COMPANY requirement

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GS EP PVV 414: Double pipe heat exchangers

GS EP PVV 415: Design and fabrication of air cooler

GS EP PVV 441: Procedure for shop hydraulic tests of shell and tube heat exchangers

GS EP PVV 611: Welding of pressure containing piping and equipment

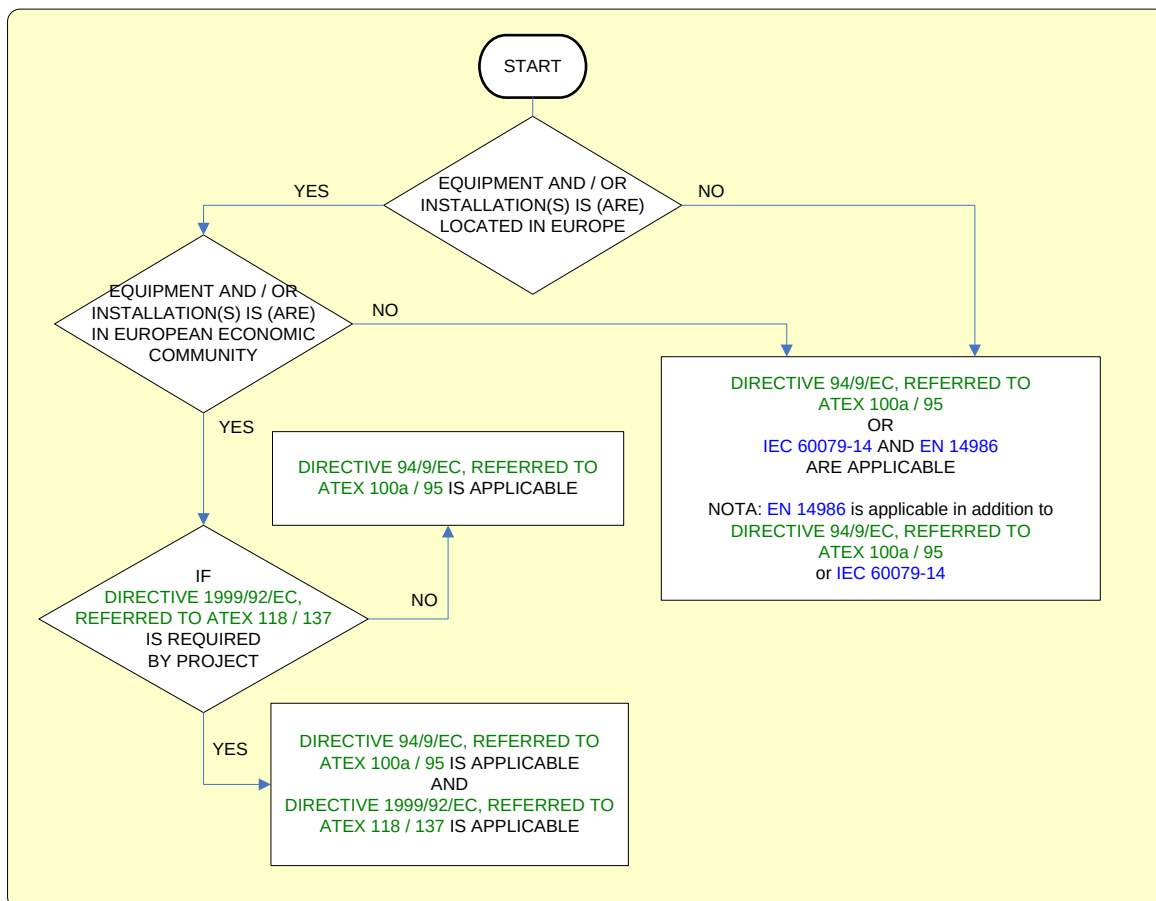
3. Notes Regarding ATEX Directives

ATEX Directives, as referred above, are applicable to *HVAC* equipment, without derogation. Unless otherwise stipulated in General Specifications, the certification of *HVAC* equipment has to be issued from a Notified Body agreed by COMPANY. The self-certification or certification by another Company than agreed Notified Body is rejected by COMPANY.

When equipment and / or components of a *SYSTEM* can produce an explosion risk, the whole *SYSTEM* (and not only components located in hazardous area) shall be designed taking into account ATEX Directives.

It means that *CONTRACTOR* is in charge to obtain a global certification of installed equipment, indicating that design and construction are in full accordance with requirements mentioned in ATEX Directives.

Both ATEX Directives shall be applicable for all the Company facilities located within the European Union (EU countries) and also outside the EU (whatever the location of Design, Construction and Installation).



4. Equipment Certified in Accordance with ATEX Directives

When ATEX Directives are applicable to equipment, requirements indicated in the General Specifications (whatever the discipline) shall be taken into account by the *MANUFACTURER* and by *HVAC CONTRACTOR*. A certificate shall be delivered, for each equipment by equipment *MANUFACTURER* taking into account the operating conditions and environment of that equipment.

The certificate shall be issued for equipment leaving the factory. Whatever the reason of equipment dismantling, (transportation, handling, installation, reparation ...), the re-assembly of unit shall be realized by the equipment *MANUFACTURER*. It is *HVAC CONTRACTOR*'s responsibility to purchase the re-assembly of unit to the equipment *MANUFACTURER* (mandatory). It is *HVAC CONTRACTOR*'s responsibility to indicate to *MANUFACTURER* that equipment shall be dismantled.

Installation of dismantled equipment shall be supervised by the equipment *MANUFACTURER*. It is *MANUFACTURER*'s responsibility to inform *COMPANY* when the above installation requirement is not respected.

Equipment inspection procedure by Notifying Body and by *MANUFACTURER*, in Factory and / or on site, shall be in full accordance with IEC 60079-14.

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5. REFRIGERANT Choice for HVAC Systems

CFC and HCFC use is strictly forbidden in refrigerating equipment (air conditioning, cold room, freezer room...), whatever the location of construction, of installation, of operation of equipment and even if these *REFRIGERANTS* are not excluded by local law where the refrigerating equipment is built, installed, operated.

Preferred and accepted *REFRIGERANTS* are:

Application	Accepted <i>REFRIGERANT</i>
Chilled water production	R134a, R410A
Split system (RS4, RS6)	R134a, R410A
Split system with direct expansion in <i>AHU</i> (RS9, RS10, RS12, RS14, RS15)	R134a, R410A
Positive cold rooms	R134a
Negative cold rooms	R404A

However, depending on specific operating conditions and / or refrigerating capacity, R407C may also be used with *HVAC SPECIALIST* agreement.

Note: *REFRIGERANT* gas detection shall be installed in each room housing a part of the refrigerating system.

6. Remarks Regarding the Use of Direct Expansion Refrigeration Systems

Remark 1: DX system (direct expansion of *REFRIGERANT* in a finned tube cooling coil – air cooling) for *HVAC* can be used, on condition that:

- the total cooling capacity (sensible and latent capacity) does not exceed 250 kW;
- the *OUTDOOR AIR* quantity of *HVAC* system does not exceed 25% of the *SUPPLY AIR* of *HVAC* system;
- a water cooled condenser is installed;
- the *REFRIGERANT* shall supply a maximum of two evaporators (duty and stand-by units);
- the mass of *REFRIGERANT* does not exceed the mass of *REFRIGERANT* which is contained in a *CHILLED WATER UNIT* having an equivalent total refrigerating capacity.

Remark 2: DX split units (RS4, RS6) can be installed for bedrooms and offices only if:

- the total cooling capacity of all split units for a building does not exceed 15 kW (sensible and latent capacity);
- the total number of split units installed for a building does not exceed ten (10) units.

Remark 3: Split systems installed for crane cabin in offshore installations shall be ATEX certified, when located in or out of hazardous area.

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7. Fixed Data

The *HVAC* documents (General Specifications, Particular Specification etc.) requirements may be more stringent than those dictated by the Regulations.

Sometimes requirements from Regulations are recalled in the *HVAC* documents.

Although some derogation to the Regulations, raised by *HVAC CONTRACTOR*, may be accepted by Notified Body, the *COMPANY* requirements shall apply. Such authorized derogations shall not prevail on *COMPANY* requirements as stated in the *HVAC* documents.

In the following sections, data refer sometimes to the occupation of the rooms. The number of occupants has to be considered as per the basis of design given in the present specification, except when the occupation is defined in the project specification. In this case, the occupation indicated in the project documentation (Pre-project, Basic Engineering...) prevails over the present General Specification and Derogation request to the present General Specification is not required.

7.1 Temperature of a Metal Surface Exposed to Direct Sunlight

A metal surface exposed to direct sunlight shall be considered at 80°Celsius. This value shall be used for thermal insulation calculation for all applications.

7.2 Indoor Conditions (Temperature / Humidity)

7.2.1 Indoor Conditions During Winter

The following temperatures shall be considered:

- The “Winter temperature design point” is the temperature value to take into account for calculations (Heat losses calculations),
- The “Winter temperature tolerance” is the acceptable difference between the “Winter temperature design Point” and the measured room temperature, when outside temperature is in accordance with the assumption for outside winter temperature.

Room	Winter temperature <i>DESIGN POINT</i> (°Celsius)	Winter temperature tolerance (°Celsius)
Ablution room	22	± 1
Air lock	16	± 1
Bakery	22	± 1
Battery room	16	± 1
Bed room (Hot climate) ²	22	± 1
Bed room (Cold climate) ³	20	± 1

² Refer to Project specification

³ Refer to Project specification

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Room	Winter temperature <i>DESIGN POINT</i> (°Celsius)	Winter temperature tolerance (°Celsius)
Changing room / lockers room	22	± 1
Coffee or tea room	20	± 1
Cold rooms plant room	16	± 1
Control room	22	± 1
Corridors	20	-1 / +2
Diesel oil purifier room	16	± 1.5
Dining room	22	± 1
Dish wash	22	± 1
Dryer room	18	± 1.5
Electrical room	19	± 1
Electrical room for pumps & HPU (Hydraulic Power Unit)	19	± 1
Fire control station	16	± 1
General service cooling water	16	± 1
Generator enclosure for Emergency diesel generator, Essential diesel generator, Main power generator	10 (maximum of 40°C when the generator is running)	± 2
Generator technical room	19	± 2
Generator room for Emergency diesel generator, Essential diesel generator, Main power generator	19 °C when the generator is not running (maximum of 40°C when the generator is running)	± 2
Grocery / dry goods store	18	± 1.5
HPU (Hydraulic Power Unit)	16	± 1.5
<i>HVAC PLANT ROOM</i>	16	± 1,5
Inert gas room	16	± 1
Instrument room	19	± 1
Kitchen	22	± 1
Laboratory	20	± 1
Laundry	18	± 1.5

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Room	Winter temperature <i>DESIGN POINT</i> (°Celsius)	Winter temperature tolerance (°Celsius)
Library	21	± 1
Marine store	16	± 1
Meeting room, conference room	21	± 1
Mortuary	8	± 1
Muster room, secondary muster room	19	± 1
Office	21	± 1
Photocopy room	21	± 1
Prayer room	20	± 1
Pump room	16	± 1.5
Radio room	21	± 1
Recreation room	22	± 1
Sewage treatment room	16	± 1.5
Shaft, riser	5	0 / + NC
Showers ⁴	24	± 1
Sick bay, first aid, infirmary	24	± 0.5
Sport room	18	± 1
Staircase (enclosed)	20	-1 / +2
Storage	16	± 1
Storage (non perishable foods)	14	-1 / +0
Telecom room	19	± 1
Transformer room	7	± 2
Toilets (except cabins)	20	± 1
TV room	22	± 1

⁴ Room given access to showers shall be maintained at 24°C

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Room	Winter temperature <i>DESIGN POINT</i> (°Celsius)	Winter temperature tolerance (°Celsius)
Vegetables preparation	16	± 1
Waste room / garbage	2 ⁵	± 1
Water maker (fresh water) room	16	± 1
Workshop	18	± 1.5

Note: NA = Not Applicable, NC = Not Controlled

A *RELATIVE HUMIDITY* at least equal to 30% shall be maintained in all areas and the necessary equipment shall be designed and supplied by the *HVAC CONTRACTOR*.

If ATEX is applicable, a special risk assessment shall be carried out and the above values should be modified (refer to COMPANY instructions).

For winterisation purpose of oil and gas process equipment located inside a closed space, the minimum temperature to be maintained in that space shall be +5°C. For other equipment or for functions indicated within above table, the values of this above table shall be applied.

7.2.2 Indoor Conditions During Summer

The conditions listed hereafter should be adequate for all equipment (*HVAC* equipment or all other equipment located in the rooms) even if sensitive to temperature or relative humidity. The *HVAC CONTRACTOR* shall check the recommendations from the various equipment *MANUFACTURERS* and use the more stringent requirements for design.

The following conditions shall be considered:

- The “Summer temperature *DESIGN POINT*” is the temperature to take into account for calculations. These temperatures are the maximum indoor temperature acceptable in summer period. It means that inside temperature in rooms can be lower than indicated values but this temperature shall be higher than “Winter temperature design point”.
- The “*RELATIVE HUMIDITY*” is the humidity which shall be achieved at any temperature within the setting range.
- The “Summer temperature tolerance” is the acceptable difference between the selected setting and the actual room temperature.

Room	Summer temperature <i>DESIGN POINT</i> (°Celsius)	<i>RELATIVE HUMIDITY</i> (%)	Summer temperature tolerance (°Celsius)
Ablution room	24	40 to 65	± 1
Air lock	24	NC	± 1

⁵ Whatever the outside temperature

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Room	Summer temperature <i>DESIGN POINT</i> (°Celsius)	<i>RELATIVE HUMIDITY</i> (%)	Summer temperature tolerance (°Celsius)
Bakery	24	NC	± 1
Battery room	24	40 to 60	± 1
Bed room	24	40 to 60	± 1
Changing room	24	40 to 65	± 1
Coffee or tea room	24	40 to 60	± 1
Control room	24	40 to 60	-1 / +0
Cold rooms plant room	26	30 to 50	± 1.5
Corridors	24	NC	± 1
Diesel oil purifier room	35	20 to 75	± 2
Dining room	24	40 to 60	± 1
Dish wash	24	NC	± 1
Dryer room	24	NC	± 1.5
Electrical room	26	40 to 60	-1 / +0
Electrical room for pumps & HPU (Hydraulic Power Unit)	26	40 to 60	-1 / +0
Fire control station	24	40 to 60	± 1
General service cooling water	35	20 to 75	± 2
Generator enclosure for Emergency diesel generator, Essential diesel generator, Main power generator	26°C when generator is not running 40°C when generator is running	NC	+ 2
Generator technical room	24	40 to 65	± 1
Generator room for Emergency diesel generator, Essential diesel generator, Main power generator	26°C when generator is not running 40°C when generator is running	NC	+ 2
Grocery / dry goods store	18	55 to 65	± 1.5

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Room	Summer temperature <i>DESIGN POINT</i> (°Celsius)	<i>RELATIVE HUMIDITY</i> (%)	Summer temperature tolerance (°Celsius)
HPU (Hydraulic Power Unit)	35	20 to 75	± 2
<i>HVAC PLANT ROOM</i>	24	40 to 60	± 1.5
Inert gas room	35	20 to 75	± 2
Instrument room	26	40 to 60	-1 / +0
Kitchen	24	40 to 70	± 1
Laboratory	20	50 to 65	± 1
Laundry	24	NC	± 1.5
Library	24	40 to 60	± 1
Lockers room	24	40 to 65	± 1.5
Marine store	26	30 to 50	± 3
Meeting room, conference room	20	40 to 60	± 1.5
Mortuary	8	60 to 90	± 1
Muster room, secondary muster room	22	40 to 60	± 1.5
Office	See hereafter	40 to 60	± 1
Photocopy room	24	40 to 60	± 1
Prayer room	22	40 to 60	± 2
Pumps room	35	20 to 75	± 2
Sport room ⁶	22	40 to 65	± 1
Radio room	22	40 to 60	± 1
Recreation room	24	40 to 60	± 1
Sewage treatment room	35	20 to 75	± 2
Shaft, riser	+5°C minimum	NC	NA
Showers ⁷	24	NC	± 1

⁶ For squash room, design point: 17°C / 40 to 65%

⁷ Room given access to showers shall be maintained at 24°C