

PART 19 SCIENCE

- 19.1.2 Introduction This section refers to the requirements for science.
- For glasshouse requirements see the latter part of this guidance.
- 19.2 Type of Laboratory A general purpose science laboratory is suitable for the teaching of all branches of science up to at least the standard of the examination for the General Certificate of Secondary Education, and should normally be provided in an 11 to 16 school. In schools where the separate sciences are taught to GCE Advanced level, a proportion of the science accommodation may be in the form of customised laboratories through minor modifications to the general purpose layout; ie for biology, chemistry and physics. See item 19.10.10 CUSTOMISED LABORATORIES.
- 19.3 Maximum Class Sizes Laboratories are designed to cater for the following pupil maxima, subject to room size (ref DE Circular 2001/14):
- a. years 8 to 10, 26 pupils;
 - b. years 11 and 12, 24 pupils; and
 - c. years 13 and 14 (sixth form), 20 pupils.
- 19.4 Health and Safety The Department of Education (NI) booklet “Safety in Science General Laboratories” (No 1 in Safety series, 1989) deals with a number of potentially hazardous situations which could arise in relation to certain chemicals, liquids, the use of electricity, fire etc. The adoption of good practice and the application of certain safety standards are also discussed, and should be complied with in an endeavour to avert such occurrences. In instances where specific concerns may be raised reference should also be made to the advisory services of the relevant Education and Library Board (ELB) and, where appropriate, the CLEAPSS school science service.
- The accommodation shall be designed with reference to the relevant sections of the Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003, particularly with respect to the storage and handling of chemicals.

19.5 GAS INSTALLATIONS

GENERAL

Gas installations shall comply with the Gas Safety (Installation and Use) Regulations (Northern Ireland) 1997 and the associated approved codes of practice. Further guidance on the application to educational establishments can be found in the following documents:-

- Building Bulletin 80 (revised 1999), “Science Accommodation in Secondary Schools. A Design Guide”.
- “Guidance Notes on Gas Safety in Educational Establishments” (IM 25), British Gas, 1989.
- BS 4163:2000 “Health and safety for design and technology in schools and similar establishments- Code of practice”.

The installation may supply gas for other subject areas such as Home Economics.

BULK STORAGE OF LIQUEFIED PETROLEUM GAS (LPG)

If required, an LPG bulk storage installation shall be provided external to and removed from the building. In addition to the general requirements above the installation shall comply with the LPG Association Code of Practice 1 “Bulk LPG Storage at Fixed Installations”.

SUPPLY OF NATURAL GAS

If required, a natural gas main and associated equipment shall be provided by the regulated natural gas supplier. The gas main shall terminate in an external, wall mounted cabinet complete with meter, pressure reducing valve and isolating valve with over/under pressure control.

GAS PIPE INSTALLATIONS

Gas pipe installations shall comply, as required, with all the statutory requirements and associated guidance noted above. The installation shall be undertaken by an appropriately trained and accredited workforce in accordance with good industry practice.

- 19.6 First-Aid Equipment A first-aid cabinet (non-contract) should be readily available in all stores and preparation rooms for use by personnel who have received appropriate training in first aid. During refurbishment, or building of new laboratories, a low pressure, integrated eye wash unit should be installed in the preparation rooms. Eye wash bottles should not be

used. Eye protectors should be located appropriately in each laboratory (non contract).

- 19.7 Fire Fighting Equipment These items of fire fighting equipment must be provided to satisfy the requirements of the Building Control Authority

19.8 FUNCTION

- 19.8.1 ACCOMMODATION Accommodation will comprise the following:

- a. laboratories;
- b. associated preparation/store rooms;
- c. glasshouse and store;
- d. Head of Department office, either amalgamated with the main preparation/store room or provided separately, see PART 21 ADMINISTRATION & OFFICE ACCOMMODATION for details;
- e. chemical store, where approved, is for storage purposes only, and not for occupancy and dispensing of chemicals.

19.8.2 SIZE

LABORATORIES:

Laboratory should be 90 m² minimum in all new builds – for refurbishment of existing laboratories the minimum size should be 83 m².

PREPARATION/STORE ROOMS:

- a. for a single laboratory generally 25 m² minimum; this includes laboratories which, for example in refurbishments and/or extensions to existing provision, may be located some distance away from other science facilities. Where the distant laboratory is used mostly for GCE chemistry, a store/preparation room of 30 m² is recommended;
- b. where possible, preparation/store rooms should be combined to be shared between two laboratories to make a space of 40 m². One of these preparation/store rooms should be larger at 60 m² to incorporate a departmental base, this should also serve as the preparation/store room for two adjoining laboratories. The head of science department office, with a floor area of 10m² may be amalgamated with this larger main preparation room to provide a space of 70m², or may be provided separately. See table below for options for the organisation of stores and prep rooms in new-build schemes and Sketches for suggested suite layouts.
- c. in refurbishment schemes it may not be possible to upgrade the storage/preparation space to match the dimensions

of new-build projects. In such projects the total area for storage and/or preparation space should be equivalent to at least 20 m² per laboratory - wherever possible at least one of the stores should be 50 m² - this can be regarded as the shared store/preparation room between two laboratories. Where problems with the sizes and location of stores and preparation rooms arise in refurbishment projects they should be discussed with the Education and Library Board advisory service and the Building Advisory Branch of the Department of Education.

A minimum ceiling height of 2.7 m is required.

TABLE: POSSIBLE COMBINATIONS FOR PREPARATION/STORE SPACES IN NEW-BUILD SUITES.

No of Laboratories in Suite	Total Storage/Preparation Space	Possible Combinations
1	25 m ²	1 x 25 m ²
2	60 m ²	1 x 60 m ²
3	80 m ²	1 x 60 m ² 1 x 20 m ²
4	100 m ²	1 x 60 m ² 1 x 40 m ²
4	100 m ²	1 x 60 m ² 2 x 20 m ²
5	120 m ²	1 x 60 m ² 1 x 40 m ² 1 x 20 m ²
5	120 m ²	1 x 60 m ² 3 x 20 m ²
6	140 m ²	1 x 60 m ² 2 x 40 m ²
6	140 m ²	1 x 60 m ² 1 x 40 m ² 2 x 20 m ²
7	160 m ²	1 x 60 m ² 2 x 40 m ² 1 x 20 m ²
7	160 m ²	1 x 60 m ² 1 x 40 m ² 3 x 20 m ²
8	180 m ²	1 x 60 m ² 3 x 40 m ²
8	180 m ²	1 x 60 m ² 2 x 40 m ² 2 x 20 m ²
9	200 m ²	1 x 60 m ² 3 x 40 m ² 1 x 20 m ²
9	200m ²	1 x 60 m ² 2 x 40 m ² 3 x 20 m ²
10	220 m ²	1 x 60 m ² 4 x 40 m ²
10	220m ²	1 x 60 m ² 3 x 40 m ² 2 x 20 m ²
11	240m ²	1 x 60m ² 4 x 40m ² 1 x 20m ²

19.8.3 LOCATION

The accommodation should be grouped together, preferably on the same floor, to facilitate servicing, maintenance and storage. The ground floor is generally preferable, particularly for chemistry (delivery of materials), and biology (for direct access to the glasshouse and garden). Where circumstances dictate that the science department needs to be located on two or more floors, the lift should be located close to the science laboratories to facilitate the safe transportation of chemicals and equipment.

Consideration should be given to the location of the suite in relation to other subjects with related areas of study; see paragraph 4.11 and Appendices 4 and 5.

19.8.4 LAYOUT

Laboratories should be near square in shape and have preparation/store rooms en-suite or as adjacent as possible. These may be arranged singly, or preferably with double or multiple sized preparation/store room(s); for example, in larger science departments, a centrally placed preparation/store room with a maximum floor area of 80m² may serve a suite of surrounding laboratories and allow a more efficient and effective use of space.

Each laboratory should have two doors, located as far as possible from each other and in such a way as to offer alternative exits in the event of emergency. Only one of these need open directly on to a circulation area. Each door should be wide enough to facilitate wheelchair entry and exit. In addition, each suite should include at least one laboratory that has been adapted for use by disabled pupils. In this laboratory, a portion of 650mm deep cantilevered benching, approximately 1,500mm long, should be provided to accommodate pupils in wheelchairs. The bench top should be fixed at a height of 760mm above floor and have a clear under bench height of 700mm. The benching should be complete with a small sink to one side (with a cold water supply). Gas, electricity and computer outlets should also be provided. It is suggested that the disabled pupil benching be located at the teacher's end of the laboratory, window wall perimeter, where adequate circulation space should be available.

Each preparation/store room should have a door opening directly on to a circulation area and to each adjacent laboratory.

If the Head of Department office is amalgamated with the main preparation/store room, it may be provided as a separate solid partitioned space within the area, or in an open plan arrangement.

See Sketches for typical laboratory layouts.

19.9 PERFORMANCE

19.9.1 FLOOR FINISH

Resistant to wear and corrosion, slip-resistant, quiet and easily cleaned. Continuous sheet vinyl is preferable; this should be sealed at benches, island units and walls to prevent water ingress.

- 19.9.2 WALL FINISH A smooth, easily cleaned surface is required.
- 19.9.3 CEILING FINISH Suspended ceiling, light in tone and manufactured from appropriate sound insulation/deadening materials with good acoustic properties.
- 19.9.4 WINDOWS In laboratories, windows to bench height on one side wall with opening lights at high and low level to provide adequate natural ventilation with fine adjustment.
- Windows on end walls should be avoided where possible.
- Non-flammable ‘dim out’ blinds are required in each laboratory, with at least one laboratory on each floor having black-out facilities, in addition to the ‘dim out’ provision. Window design should permit ventilation when dim-out blinds are in operation. All black out blinds should be enclosed within tracks
- Preparation/store rooms should have windows to bench height on one side wall and the remaining walls windowless. Dim out facilities should be provided.
- 19.9.5 DOORS See 19.8.4 LAYOUT for location of doors. A suitably glazed large vision panel must be provided in all doors.
- 19.10 FURNITURE AND FITTINGS**
(provided under the building contract)
- 19.10.1 TEACHER’S DESK A movable teacher’s desk with lockable castors should be provided for each laboratory. The desk should have minimum dimensions of 1800mm long x 750mm deep x 720mm high and be complete with lockable drawer units either side of a central knee space and modesty panel.
- The desk should be of solid, robust construction, and be finished in good quality plastic laminate (with balancing veneer provision) to match other units in the laboratory.
- 19.10.2 FUME CUPBOARDS Where schools are given the option of having some of the laboratories fitted out as specialist chemistry laboratories, each requires two fume cupboards, either located side by side or separately. These can be of the fixed type with associated external ducting, or be mobile, re-circulatory (filtration) type.
- Other science laboratories, the main preparation/store room and the chemistry preparation/store room should each have a serviced position for a mobile re-circulation (filtration) type fume cupboard. Mobile fume cupboards should be provided as part of the contract, on the basis of one shared between each pair of laboratories. Where an odd number of laboratories is approved, the provision of mobile fume cupboards should be rounded up. In certain circumstances the

provision of a single, fixed type fume cupboard may be considered, by the Department, in at least one laboratory in a suite.

Fume cupboards should be supplied and commissioned as part of the building contract. Water, waste and gas connections for mobile fume cupboards should be fitted with quick release gas and water connectors. The outlet valves should be located securely behind a protective panel allowing easy access for connection. The gas and water outlets should be capable of isolation from the main gas and water supplies by means of a lockable quarter turn tap located close to the quick release terminal.

Space requirements and the type of services connections should be appropriate for the particular type of mobile fume cupboard to be provided.

A location opposite circulation gaps between island benches is recommended as this permits mobile type fume cupboards to be pulled out from the benching, and viewed on three sides by pupils.

Fixed fume cupboards should have adequate makeup air provided to compensate for the mechanical extract ventilation

Fume cupboards window sashes must be properly tested to establish the correct face velocity by the 9-matrix point method (DfEE Building Bulletin 88 revised note 29)

All fume cupboards should meet the most recent specification of the DfEE Building Bulletin 88 (Revised Design Note 29) entitled "Fume Cupboards in Schools". This Building Bulletin also gives advice on the location of fume cupboards; corner locations not being suitable.

However, installations should comply with the following health and safety recommendations which supersede advice given in Design Note 29 in respect of DUCTED FUME CUPBOARDS ONLY:

- a. Each fume cupboard should have a separate flue to the fresh air. This is to avoid the mixing of certain gases within a combined flue, and the possible infiltration of gas into an adjoining cupboard.
- b. Flue extracts should not be fitted with a cowl in order that gases are directed upward rather than downward. To assist extraction, a venturi (restricted) opening at the top is recommended. Rain water is permitted to enter the flue and is drained away lower down.
- c. A relaxation has been given to provide a flue height of 1 m minimum above the highest part of the building rather than 3 m.

The above amendments are not applicable to the mobile recirculatory (filtration type) fume cupboards.

- 19.10.3 CHALK/
WHITEBOARD/
MAGNETIC
WHITEBOARD
- The laboratory chalk/whiteboard should be of the roller type, incorporating a squared section for graphical work. Alternatively an interactive whiteboard and ceiling mounted data projector (non contract items) could be provided. Where interactive whiteboards are to be installed (resources must be available from within the approved equipment budget) they should be compatible with standard marker pens when not being in 'interactive mode'.
- 19.10.4 PROJECTION
SCREEN
- An inclined overhead projection screen is required for each laboratory. This should be ceiling mounted to the side of the main board so that both may be used simultaneously.
- 19.10.5 DISPLAY
BOARDING AND
HIGH LEVEL
STORAGE
- Adequate display boarding should be provided above worktop height. High level storage consisting of cupboards or shelves should be provided where recommended. This should not be on all walls in the room - at least one wall should be free of high level storage to allow the effective use of ICT. It may be more practical to dispense with these cupboards altogether and make the storage in the preparation/store rooms more efficient.
- High level cupboards, shelves or display boarding should NOT be provided above gas points.
- 19.10.6 FILING CABINETS
- There should be space for at least two lockable filing cabinets in each laboratory and preparation/store room.
- 19.10.7 STORAGE OF
PUPILS' COATS
AND BAGS
- Space should be provided in each preparation/store room for parking of the coat and bag trolley from each associated laboratory; the trolley is a non contract item.
- 19.10.8 BENCHING
- All benching in the laboratories and preparation/store rooms should be soundly constructed from hardwood or mineral-filled, resin surfacing and be provided as described for the particular laboratory type. Services should form an integral part of the furniture and be located to give easy access. Sinks should normally be ceramic; water taps should be single or double laboratory type; gas taps should be fixed securely to worktop; there should be easy access to under sink traps etc for maintenance purposes.
- All cupboards and drawers in the laboratories and preparation/store rooms should be lockable and master keyed.
- See also 19.13 SERVICES for the safe location of gas and electrical socket outlets.
- Adequate clearance is essential, allowing at least 1.2 m between benches where back-to-back working is likely.
- All working surfaces should be at a height of 850 mm and generally be 650mm deep.

Cantilevered perimeter benching along at least one wall should be 850mm high and 750-800 mm wide to permit computer use; in some rooms it may be necessary to use part of a second wall as a location for computers. Where this is the case the second portion of benching should be located close to the main provision and the services should be arranged to accommodate the designated workstations. Refer to 19.13 SERVICES and PART 12 ICT.

19.10.9 GENERAL
PURPOSE
SCIENCE
LABORATORIES

See Sketch for a suggested layout.

Two double electrical socket outlets and a double ICT outlet should be located on the wall at the proposed teacher's desk, near the overhead projection screen.

ISLAND SERVICE BENCHES:

These should be 1,220 mm long, 420 mm wide and 850 mm high, with a 25mm overhang, and arranged to permit movable tables to be placed alongside.

The following services are required on each island unit:

- a. two ceramic sinks, 400 mm by 300 mm, located at the extremities of the bench top, each provided with a cold water standard carrying two low level, laboratory type, outlets - ceramic sinks only should be used. It is essential that there is easy access to the catchpots located beneath the sinks;
- b. two double gas points located on the bench top;
- c. two double electrical socket outlets located below the worktop and so that they will not be obstructed by the movable tables;
- d. a suitable arrangement of conduits to provide easy access for maintenance;
- e. a spare cableway shall be provided to allow for the installation of additional services to each island unit in the future;
- f. a removable panel on the larger side of island units to allow access to services.

WALL BENCHES:

These should have a 650 mm wide worktop, except for along at least one wall which should be wider at 750-800 mm. Storage should be provided under most of the wall benches, gaps can be left at appropriate places to allow the slotting in of movable trolleys. The storage provided should consist of cupboards and drawers or plastic tray units. Cupboard carcasses should not be constructed from

chipboard, hardboard or any other man-made materials which cannot easily withstand contact with moisture, acids and alkalis; the joints should be biscuit or dowel and glued; cupboard doors should be hinged with heavy-duty 270 degree hinges; drawers should be fitted with heavy-duty, metal runners incorporating a roller-wheel system.

Two large ceramic 'Belfast' type wash-up sinks are required, with hot and cold water supply, a tall swan-neck outlet for burette washing and a grooved drainer. One of these should be located near the door to the preparation/store room. A sink 400 mm by 300 mm with a cold water standard carrying two or three outlets (one high level), should be provided on each of the side benches.

Two-compartment metallic DADO trunking should be provided on at least 2 walls to allow flexibility in location of power and ICT points and facilitate future alterations. Consideration should also be given to the provision of similar trunking at the front of the room where the teacher will access ICT points and electrical socket outlets. Trunking should also be provided where the side-benching has been adapted for use by disabled pupils. The trunking should be installed such that it does not obstruct access to any part of the white/black board.

At least four double ICT outlets should be provided for pupil use and an additional double outlet near the teacher's desk (as noted above). Two double electrical socket outlets should be provided adjacent to each double data point. At least two double electrical socket outlets should be provided above the side benching on each of the walls not used for the computers.

Two double gas outlets should be provided at appropriate locations on one of the side benches. These should be located close to the sinks.

See also 19.10.12 CHEMISTRY LABORATORIES: STORAGE.

19.10.10 CUSTOMISED LABORATORIES

Where schools have a tradition of providing GCE in the separate science subjects, they may be given the option of having the pupil benching in the following arrangements in half of the rooms designated for the subject. Given that the benching arrangements for biology are the same as those for the general-purpose laboratories only 25% of the total number of laboratories in the school should be designated as specialist chemistry or physics laboratories with fixed pupil benching. It should be noted that such fixed benching arrangements significantly reduce the flexibility of room use.

19.10.11 BIOLOGY LABORATORIES

See Sketch for a suggested layout.

A door giving direct access to the glasshouse and garden should be provided.

ISLAND SERVICE BENCHES AND WALL BENCHES:

The layout and services for a general-purpose science laboratory are appropriate.

19.10.12 CHEMISTRY LABORATORIES

See Sketch for a suggested layout.

ISLAND SERVICE BENCHES:

The arrangement should conform both to the function and dimensions of the room. A satisfactory arrangement is that suggested whereby a "U" of three benches is provided. The two larger parallel benches should be 3.5 m by 1.2 m, with the longer bench 650 mm wide and approximately 6.0 m long, arranged parallel to the demonstration bench near the back of the room.

Worktops, preferably of hardwood or mineral-filled resin, can incorporate draw leaves below for writing paper. Shallow storage cupboards below can protect service pipes and conduits, but access to under-sink catchpots is essential. Removable storage units can be used. Knee and toe space is essential.

Sinks should be placed so as to conserve bench top space as much as possible. Those at the end of benches should be flush with the end.

Each island bench should have four double socket outlets located below the worktop, and an adequate number of double or quadruple gas points on the worktop grouped so that, allowing for sinks and water standards, the maximum area of unbroken working surfaces is conserved.

WALL BENCHES:

These should be similar to the arrangements for the general purpose laboratories with the exception that the school may be given the option of having two fixed fume cupboards or two mobile fume cupboards to be located beside each other along one wall, preferably at the window side of the room.

STORAGE:

The types and extent of storage units to be provided within the laboratory will depend to a great extent on individual requirements. Where possible, the storage should be designed to fulfil stated requirements and should provide cupboards, drawers, trays, shelving etc, of suitable dimensions for the specific purposes. There should, for example, be selected locations for the storage of volumetric glassware such as burettes and pipettes. In the main, storage should be in the preparation rooms/stores.

19.10.13 PHYSICS
LABORATORIES

See Sketches for suggested layouts.

ISLAND SERVICE BENCHES:

A central spine of three or four fixed tables parallel to the demonstration bench with free-standing tables on either side is recommended. Table-tops should be of hardwood or mineral filled resin surfacing, 1.5 m long by 750 mm wide.

The three or four fixed tables should have two double electrical socket outlets at each end of the front rail. A double gas point is also required at each end of the table-top. a spare cableway should be provided to allow for the installation of additional services to each island bench in the future

WALL BENCHES:

Benches 650 mm wide, hardwood or mineral filled resin surfacing, with storage under is required. Cupboards fitted with wooden or plastic trays are more useful than drawers. A fixed worktop with mobile storage units under is a useful variant giving greater flexibility of arrangement.

The bench under the main windows should have up to three laboratory sinks and a larger wash-up sink (Belfast type) with hot and cold water supply, a tall laboratory type outlet for burette washing and a grooved hardwood drainer, located near the door to the preparation/store room.

A similar bench with three sinks should also be provided on the opposite side.

Three double gas points and three double electrical socket outlets are required to the side benches.

19.10.14 MAIN
PREPARATION/
STORE ROOMS

As much of the available volume of the room as possible should be given to the storage of equipment and materials. Wide floor to ceiling shelving (slotted metal angle type) arranged in a peninsular manner is most convenient; (a small ladder is required to provide access to upper shelves). Provision is required for long and bulky items of equipment as well as for small items of delicate construction. Shelving should be a mixture of multi-shelving units and slotted shelving for storage trays.

Work benches incorporating storage cupboards, drawers and tray units are also required.

A bench should normally be located on the window wall and be provided with a large sink with hot and cold water supply, and two suitably located double gas points and two double electrical socket outlets. At least one double ICT point should be provided in each store/preparation room with two double outlets in the main preparation room. A dishwasher should be provided in at least one preparation room - it should be noted that current models of dishwasher and fridge might not fit under the standard recommended bench height. In these circumstances the bench height should be adjusted accordingly.

Suitable provision is also required in preparation/store room(s) for the following:

- a. workshop facilities (work bench with vice and tool racks and/or cupboard);
- b. a small sink with a cold water supply to serve a deioniser for the preparation of ion-free water;
- c. an ice maker;
- d. space for a mobile fume cupboard;
- e. a base for two, non-contract, trolleys (approximately 1.2 m²);
- f. space for an under-bench fridge (non-contract);
- g. space for an upright fridge/freezer (non-contract);
- h. space for two filing cabinets (non-contract);
- i. space for a table and chairs (non-contract);
- j. separate waste bins (non-contract) distinctively marked, for broken glassware, flammable material and other waste.
- k. a base for oxygen and other compressed gas cylinders approximately 0.5 m²);

l. space for a commercially produced cabinet (non-contract) for the storage of flammable liquids (designed to conform to the requirements of the Highly Flammable Liquids and Liquid Petroleum Gases Regulations (NI) 1975) or equivalent. See also paragraph 19.5 re the storage of liquefied petroleum gas;

m. space for separate robust lockable, fire-retardant cupboards (non-contract) for the storage of:

i. concentrated acids and other corrosive liquids (suitable sump arrangements should be provided);

ii. poisons; and

iii. other dangerous chemicals,

19.10.15 BIOLOGY

In addition to the requirements for general purpose preparation/store rooms, a work bench with one double gas point and three double electrical socket outlets along half the length of one other wall. The fridge/freezer, filing cabinet and trolley could be located along the remainder of this wall together with a chart cupboard.

PREPARATION/ STORE ROOMS

19.10.16 CHEMISTRY/ PREPARATION/ STORE ROOMS

In addition to the requirements for general purpose preparation/store rooms, the following are required for chemistry preparation/store rooms, see also 19.8.2 SIZE:

a. a second worktop with gas point and electrical socket outlets;

b. also, if necessary, a glass working bench and storage for glass tubing; and

c. a serviced space for a mobile fume cupboard .

19.10.17 CHEMICAL STORAGE

A proprietary cupboard is sufficient for the storage of chemicals in most schools.

In schools with post 16 provision in chemistry, the Department will consider the provision of a separate, chemical store. This store with a floor area of 12m² should be associated with the chemistry preparation/store accommodation, be internally located and have direct access from a preparation/store room.

The enclosed store should have suitable fire resistance, to the satisfaction of the Building Control authority.

The floor finish and skirting to the store should be slip resistant and impervious to chemical attack. A 100mm high bund should be provided and the floor should have a slight fall to a single collection point to facilitate spillage collection.

The door in the store should be outward opening, of solid construction, appropriately fire rated and lockable.

Adjustable shelving should be provided to all available wall space, and should be 250mm deep, constructed from hardwood lipped blockboard and provided from 400mm to 1,800mm above floor level at approximately 350mm centres.

See current CLEAPSS advisory booklet on storage of chemicals.

Refer to 19.13 SERVICES for details of the mechanical and electrical services associated with such a store.

19.10.18 PHYSICS
PREPARATION/
STORE ROOMS

In addition to the requirements for general purpose preparation/store rooms, two side benches are required with gas points and electrical socket outlets.

19.11 MOVABLE
FURNITURE
(not to be provided
under the building
contract)

Movable tables and stools etc should be provided as required. (Mobile fume cupboards are to be provided under the building contract). Tables should be of robust construction 850 mm high having hardwood or resin filled tops 1,220 mm by 610 mm. The heights of tables should be adjustable with metal locknuts between the range of 840 mm to 860 mm to allow for differences in flooring thickness. Stools must be supplied to match the height requirements of the pupil tables. If metal stools are used, the base of the legs must be securely sealed and have no protruding screws. Where stools with metal legs are supplied, and the legs are sealed with rubber ferrules (end caps), care must be taken to ensure that it is possible to purchase replacement ferrules - this is necessary to prevent the loss of the ferrules which then make the metal legs bore holes into the floor surfaces. Stools with 'skid' bases should also be considered to avoid the indentation of the flooring.

19.12 ENVIRONMENT

19.12.1 TEMPERATURE 18°C

19.12.2 VENTILATION Good natural ventilation is required in laboratories and preparation/store rooms to satisfy the needs of the occupants. Supplementary mechanical supply and extract ventilation may be required to provide make up air for a fixed fume cupboard installation, if provided, and to purge a room of unpleasant smells following experiments.

19.12.3 DAYLIGHTING A satisfactory level and distribution of daylight is required. See also 19.9.4 WINDOWS.

19.12.4 ACOUSTICS Good acoustic levels are required throughout the suite with adequate sound insulation between rooms/areas.

19.13 SERVICES

19.13.1 GENERAL

See also 19.10 **FURNITURE AND FITTINGS** for particular requirements in:

- a. a fume cupboard;
- b. fixed island service and wall benches.

19.13.2 WALL BENCHES

Gas points should NOT be located in close proximity to display, or under high-level storage.

Electrical socket outlets should be mounted on the wall or trunking above the worktop, and be at least 1 m from the nearest water tap.

19.13.3 SINKS

Ceramic sinks are recommended, and the minimum satisfactory dimensions (external), except for those in fume cupboards, are approximately 400 mm by 300 mm.

19.13.4 FITTINGS

Gun-metal fittings, plastic coated, are recommended for gas and water taps.

19.13.5 ISOLATING CONTROLS

In each laboratory there should be master isolating switches or taps to govern:

- a. mains electricity supply;
- b. gas supply; and
- c. water supply.

These should be clearly identified and located convenient to the teacher's desk and nearby exit.

In addition, isolating controls for gas and water supplies should be provided for each bench to facilitate maintenance. (See also isolating controls for fume cupboard fittings.)

A single unit combining isolation of electricity, gas and water may be used subject to compliance with the particular requirements of each service.

19.13.6 EXTRACT VENTILATION

Mechanical supply and extract ventilation shall be provided for the following purposes.

- To provide a make up air supply for fixed fume cupboards, if provided. Refer to page 22 of Building Bulletin 88 "Fume Cupboards in Schools" for additional information.
- To purge a room of unpleasant smells/fumes following a practical experiment.

It is anticipated that wall mounted, variable speed, reversible fans will serve the purpose. The fans should supply air at low speed when providing make up for the fixed fume cupboards and operate at high speed in series to purge the space.

Preparation/store rooms should be ventilated in accordance with the guidance contained in “The Storage of Chemicals, L148a” published by CLEAPSS, School Science Service.

19.13.7 MECHANICAL

HEATING:

Ceiling panel, high level radiant panel or underfloor heating should be used wherever possible, complete with an appropriate thermostatic control. This control may be either a local tamperproof thermostatic type or an electrically operated zone valve and associated sensor operated through a BMS.

Fan assisted convection heaters are not acceptable. It is unlikely that there will be adequate wall space to accommodate conventional radiators mounted at low level.

GAS SUPPLY:

See the particular requirements under 19.10 FURNITURE & FITTINGS.

WATER SUPPLY:

Good water pressure is essential for all laboratories. A mains supply should be provided wherever possible, but where this is so, a reducing valve under the control of the teacher should be provided.

A hot water supply is required only to wash-up sinks.

DRAINAGE:

The use of a complete corrosion resistant plumbing system with screw-off, bottle-type catchpots below sinks is preferable for the ease of maintenance.

Well sited rodding points are essential.

19.13.8 ELECTRICAL

LIGHTING:

A maintained illuminance of 350 lux is required on the working plane in laboratories and preparation/store rooms.

Lamps shall be specified with a colour rendering index (Ra) of not less than 80, with an intermediate colour appearance.

A maintained illuminance of 350 lux is required on the working plane in the chemical store.

The general lighting installation in the store shall be controlled from a switch outside the store. The switch should be labelled and incorporate a neon indicator. The luminaires need not be classified for use in a hazardous area however they should have an ingress protection rating of IP 65.

POWER:

A plentiful supply of socket outlets is required. Normally this should not be less than two double socket outlets close to each double ICT outlet, and at least three double sockets along other walls - two double sockets are required close to the teacher's desk. See the particular requirements under 19.10 FURNITURE & FITTINGS.

Under no circumstances should electrical socket outlets be provided in the chemical store.

The system to isolate the electrical installation shall have a single key switch controlling all electrical outlets within the laboratory except those at the teachers' demonstration area, the designated ICT bench or for cleaners' use. The outlets not controlled through the isolation system shall incorporate a neon indicator. The key should be removable in either the on or off position and an indicator lamp, clearly visible from any location within the room, should be provided to indicate the condition of the power supplies within the room. The

key switch to energise the system shall be located adjacent to the chalkboard/whiteboard and must be clearly labelled as follows:

“WARNING: THIS SYSTEM WILL ISOLATE DESIGNATED CIRCUITS ONLY AND OTHER CIRCUITS DESIGNATED FOR TEACHERS’ USE, ICT EQUIPMENT OR CLEANERS’ USE WILL REMAIN LIVE WHEN THIS SYSTEM IS OFF”.

- 19.13.9 CONNECTION FOR INTERACTIVE WHITEBOARD SYSTEMS Provision shall be made for the services necessary to connect projectors and whiteboards that make up an interactive whiteboard system. These shall include the electrical socket outlets for each projector and whiteboard and a trunking link to facilitate the interconnecting control/audio/video cabling.

GREENHOUSE

19.14 FUNCTION

- 19.14.1 ACCOMMODATION This will consist of a glasshouse and store/potting area.

- 19.14.2 SIZE Glasshouse: a standard rectangular commercial unit, 24 m² to 31.5 m² in area. Dimensions within the range of 6 m to 7 m long and 4 m to 4.5 m wide.

Store: 12 m².

- 19.14.3 LOCATION The glasshouse and adjacent store should be, in a sunny location and with, if possible, convenient access to a biology laboratory.

The potential for vandalism or the proximity of ball games should also be considered when assessing possible locations.

If possible, a north-south axis for the building should be provided.

19.15 PERFORMANCE

- 19.15.1 GLASSHOUSE Brick walls 850 mm high with a fully-glazed superstructure.

Floor to be left in earth where under staging, with the remainder in concrete paving slabs laid on sand.

- 19.15.2 STORE/POTTING AREA Of traditional construction, having an external door of 1 m minimum width and entrance ramp.

19.16 FURNITURE AND FITTINGS (provided under the building contract)

- 19.16.1 GLASSHOUSE Staging at both sides 750 mm to 900 mm wide, 600 mm to 750 mm high, consisting of timber, brick or galvanised slotted metal angle supporting a structure of timber, metal or other suitable material with

sides forming a tray type top (waterproof for automatic watering) 100 mm to 130 mm deep.

Space 1,200 mm to 1,800 mm should be left free from staging at one end for tall plants and a propagator unit.

Central staging 750 mm high with a minimum size of 3,000 mm by 1,200 mm, consisting of slotted metal angle support with zinc or laminated plastic covered wood top. This should preferably be in two or three movable sections.

19.16.2 STORE/ POTTING AREA

A workbench with compost and fertiliser bins below.

Pot shelving and racking for the storage of hand tools should also be provided.

19.17 ENVIRONMENT

19.17.1 TEMPERATURE

It may be necessary to maintain a minimum internal temperature of 7°C throughout the year.

19.17.2 VENTILATION

Either by vents on both sides of the ridge together with box vents under side staging, both controlled from within the glasshouse; or by extractor fan, thermostatically controlled, with vents under side staging, internally controlled.

19.18 SERVICES

19.18.1 MECHANICAL

A mains water tap (house connector type) is required adjacent to the stage on each side of the glasshouse. These should be positioned over a soakaway and 1,200 mm from ground level.

19.18.2 ELECTRICAL

Heating for the glasshouse is normally by horticultural, tubular electric heaters located beneath side staging and controlled by a rod-type thermostat placed approximately 1 m above the staging.

An overhead radiant heater should be provided in the store/potting area.

A maintained illuminance of 200 lux is required in both the glasshouse and store/potting area.

Double socket outlets with an Ingress Protection rating of IP 65 are required: one located centrally to the rear of each side staging unit in the glasshouse, and one located above the bench in the store/potting area.