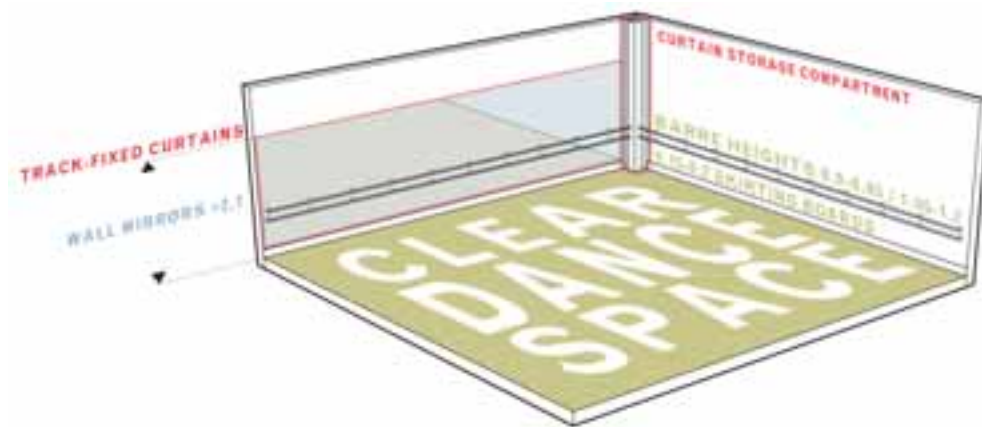




Generic Layout

Dance Studio Equipment



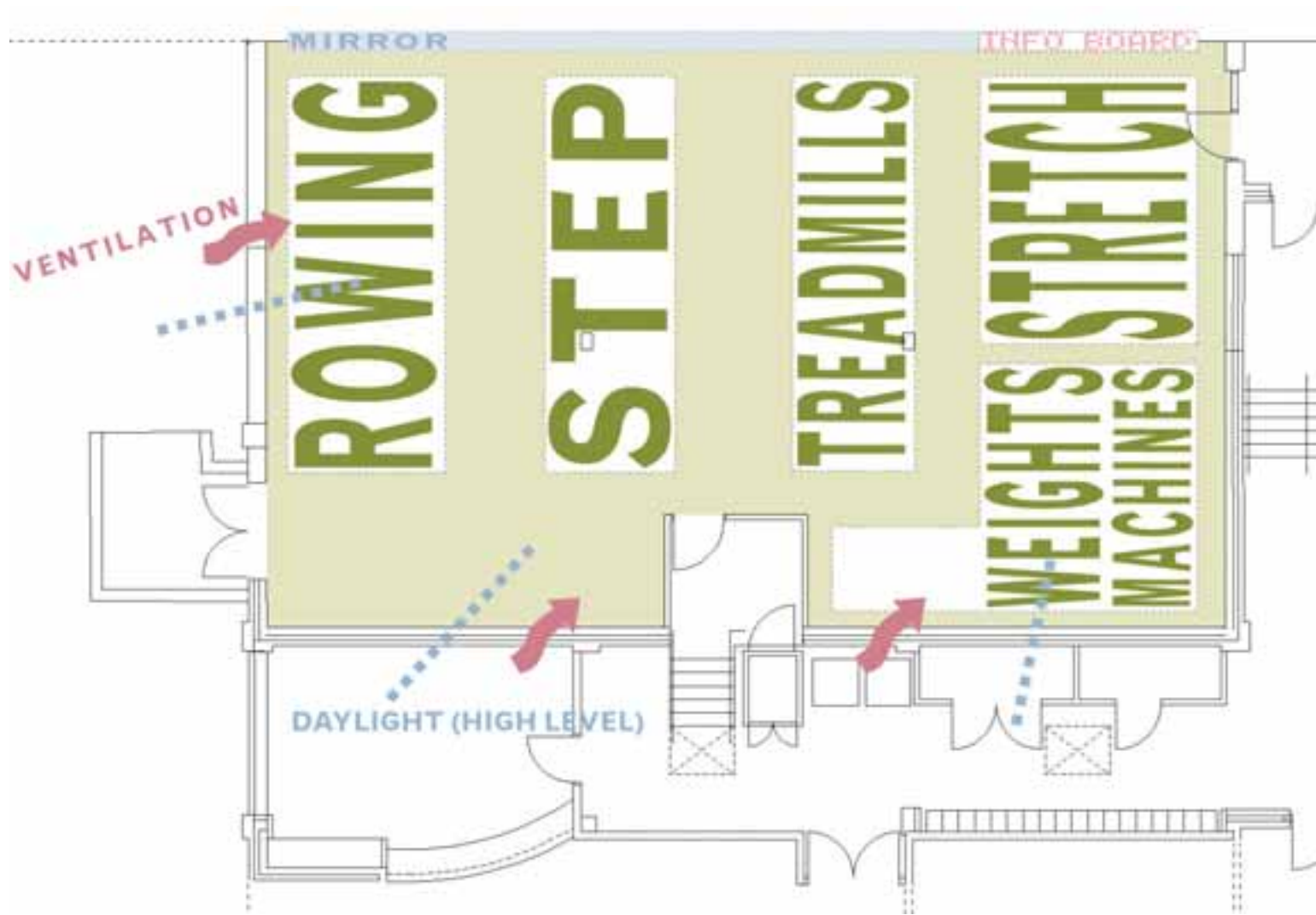
Mirrors

Dance mirrors allow dancers to check their position against the body's felt experience. Mirrors generally extend for the whole length of one long wall so each member of the class has a good view. Mirrors should be to a minimum height of 2.1m from floor level. A margin of 150 - 200mm above floor level should be left for skirting boards so mirrors are not damaged when the floors are cleaned. Mirror panels should be finished with polished edges and butt-jointed panel to panel without distortion or deflection between panels. Mirrors are best mounted on a sound, flat backing, such as a smooth wall, continuously supported sheet backing of 15mm ply or MDF boarding. The silver finish must be protected with a suitable foil backing before it can be mastic glued to a sound surface. Top and bottom edges of mirror panels should be finished with a protective batten to provide extra support and avert any slow creep of the adhesive. Mirrors secured by screwing fixings through the glass are apt to suffer stress cracks between the holes and the panel edges. Plastic or perspex mirror alternatives tend to give poor clarity and definition of the reflected image.

Barres

Dance barres are usually arranged along three sides of a dance studio to provide sufficient space for each member of the class when spaced at approximately 1.5m centres. Free standing, portable barres can be brought into the space when there is insufficient barre space along the walls or where they cannot be fitted. Barres need to be ruggedly constructed and firmly fixed or stabilised to give adequate support and to stand up to wear and tear. The barre should be continuous, without gaps or interruptions from the support brackets. Ideally the support bracket should be countersunk into the timber barre and provide support where junctions are lapped or scarfed together. The supporting brackets are usually purpose-made, and can be fixed either to the walls, if they are strong enough, or through the sprung floor system to the structural base, leaving room for some movement in the floor.

The diameter of the barre should be 42 - 48mm, with supports provided at approximately every 1.2m. The barre should be about 300mm from the wall at a height of 900 - 950mm from the finished floor level for younger and 1050 - 1200mm for older dancers. Two layers of barres can be provided when different age groups use the same space, so long as a gap of 140mm can be provided between the barres. The barre should be of smooth, fine-grained timber such as maple or beach to avoid splintering, and give slightly when force is exerted on it.



Fitness & Exercise

Fitness training is becoming a popular option in PESS provision in schools, and is being used successfully as a way of encouraging wider engagement in healthy activity. Fitness training in a secondary school is likely to be related to the range of the school's sporting activities and a brief should be produced for the equipment to be provided.

Fitness rooms benefit from natural light and a sense of openness and communication with other parts of the building. This can be achieved through glazed screens to, for example, circulation areas. Some users can be self-conscious and fitting blinds allows the option of visual privacy. Good ventilation is essential but should avoid draughts that chill warmed-up exercisers. Space should be provided for charts, notice boards and pictures in order to provide a tidy and coherent look to the space.



Generic Layout

Fitness & Exercise

Design Points

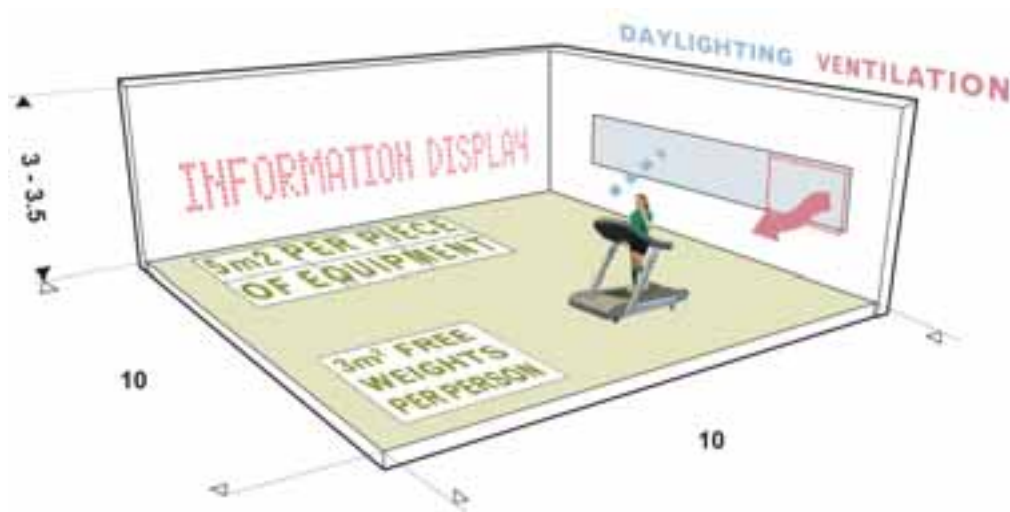
Ensure that there is sufficient space for a logical arrangement of equipment for different types of exercise

Ensure that there is multiple electrical supply and this is well distributed to allow revision of layouts

Ensure that there is adequate ventilation: fitness areas require high air change rates

Provide good daylight and views

The space should be easy to clean and supervise



Technical Points

Generally, exercise machines (both cardiovascular and resistance) function within the footprint area of the equipment, but space is needed between equipment for circulation and access. As a guide, designers should allow about 5m² per user to include circulation space around each piece of equipment. At least 1.0m should be allowed around machines except where they are placed back to back or against a wall.

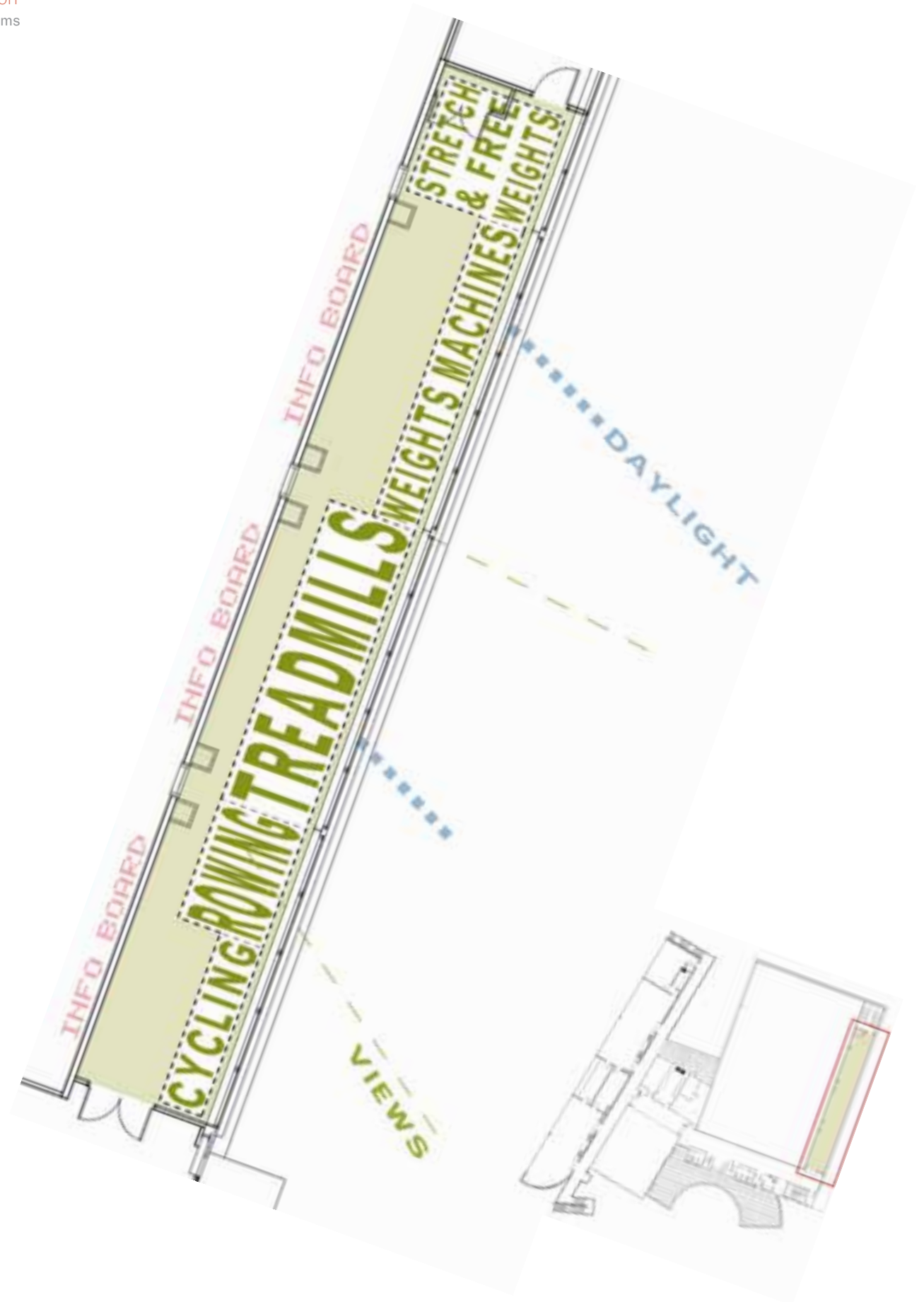
Designers should allow a further 3m² per exerciser for free weight exercise. Additional space is required for storage racks, benches, stands and space to move. The minimum practical floor area is 25m², and 80 - 100m² would be the norm where community users may also have access to the facility.

The shape of a fitness gymnasium is not critical, although a simple rectangular space with a length/width ratio of no greater than 3:1 should work best. There is no particular height requirement, but the spaces should be lofty enough to allow good air circulation (fitness areas with low ceilings can get hot and stuffy). A height of 3.0m - 3.5m is recommended.

Fitness & Exercise Example 1

Ivybridge Community College
Devon Property

The fitness suite provides a good range of equipment, and is sufficiently spacious to organise an effective class structure, rotating between different kinds of equipment. The standard of equipment is high, and the maintenance costs can be offset by a successful community-use programme. Good ventilation is achieved with high-level opening windows set on perpendicular walls (on one side the openings are at high level above the store rooms).





“**M**y worst nightmare is cross-country running. Now I can set my own target and run on the running machine, indoors. I really prefer this to cross-country.”

Pupil Waverley

● Fitness & Exercise Example 2

Waverley School
Southwark Building Design

This facility is imaginatively located on the mezzanine level of the sports hall. The particularly attractive feature of the suite is that the equipment is aligned with a window, which gives users a view across the playing fields and local park. Half-height translucent treatment to the glazing ensures privacy to the users themselves. The result is that the space has an upbeat, light feel. Ideally, though, it would be a bit wider, since some of the equipment is cramped. The linear arrangement of the equipment can make group teaching a little more difficult, though for community use this is not a problem.





“Our weight training has been a key ingredient in the development of the rugby team’s capability to compete at the top level in the country.”

Vice Principal Ivybridge Community College

Weight Rooms

Some schools are opting to build specialist weight rooms. The reasons for this range from developing the activity as a specialism in its own right, to programming weight training as part of the build-up for other sporting activities (for example rugby). Particularly for schools aiming to support elite-level sports pupils, weight rooms can be an important part of the provision.

● Weight Room Example

Ivybridge Community College
Devon Property



Generic Layout

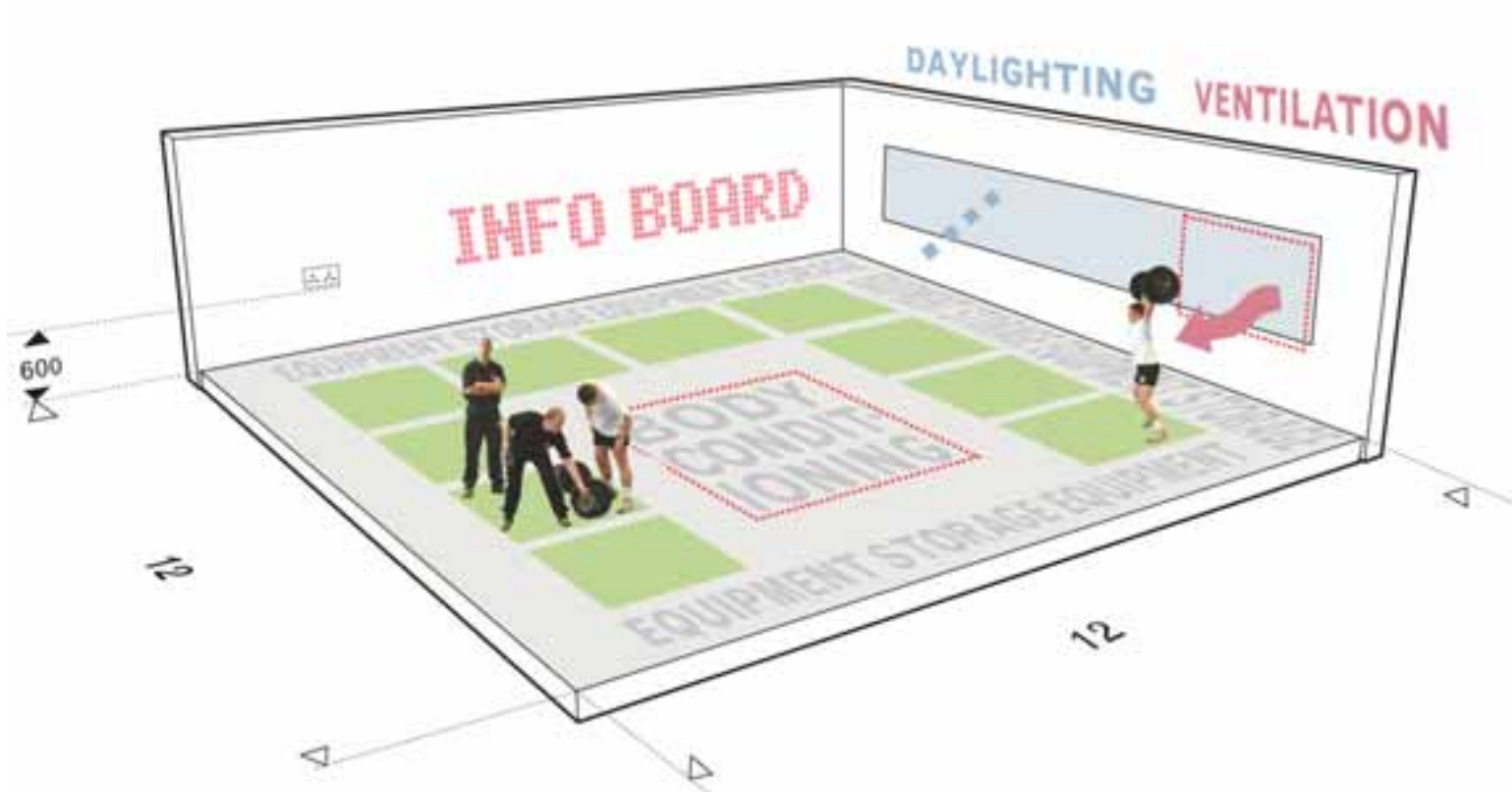
Fitness & Exercise: Weight Room

Design Points

Organise the space for safe working in groups

Ensure there is a regular maintenance programme to keep floor surfaces safe

Use robust electrical fittings



"This space is used only for weightlifting (12mx10m), with 10 dedicated colour coded platforms. You can safely hold a class of 30 pupils, 3 pupils per platform, without risk of accidents. A 12m by 12m space would have been optimal.

12m by 10m has allowed us to have a perimeter to the gym in which equipment can be stored. The flooring is designed with safety in mind. The blue areas are safe areas and places you can walk when lots of people are lifting at the same time. A large area in the middle is dedicated to conditioning and other exercises.

The green areas are called platforms and are clearly marked. People / groups stay within their platforms. This allows everyone their own space and prevents people drifting. An ideal space between platforms would be 0.5m.

Electrical sockets should be located at least 60cm off the ground for a weightlifting room so that when weights are rested against the walls they do not get damaged. Sockets should be metal. The floor surface should be cleaned regularly to prevent it becoming slippery.

The internal decoration of the room encourages students to work. It is a designated weights room but can be used for other activities if required e.g. circuits or aerobics. The platforms actually aid class organisation in these areas too."

Michaela Breeze, Weights Instructor, Ivybridge Community College



Swimming Pools

Swimming pools give a great deal of additional scope to the range of activities that can be offered within a physical education and school sport programme. Pools fall in to the category of 'supplementary net area'¹ and will therefore normally need other sources of funding (such as Lottery or DCMS). A typical brief for a school pool might be a 25m 4-lane pool which:

- Primarily meets the needs of the school and looks to help local clubs and teaching/training purposes. It may be made available for out-of-school activities and to other organisations at times when not required by the school.

- Is constructed to a high standard of materials, plant and equipment, which meets appropriate manufacturing and operating standards.
- Is sustainable, being responsive to environmental issues in terms of the use of energy and non-sustainable resources and the control of pollution.
- Is cost-efficient to allow the facility to be managed with sustainable operating costs.

Swimming Pools Example 1

Haute Vallée School
Architecture plb

¹ Building Bulletin 98: *Briefing Framework for Secondary School Projects* DfES/TSO 2004

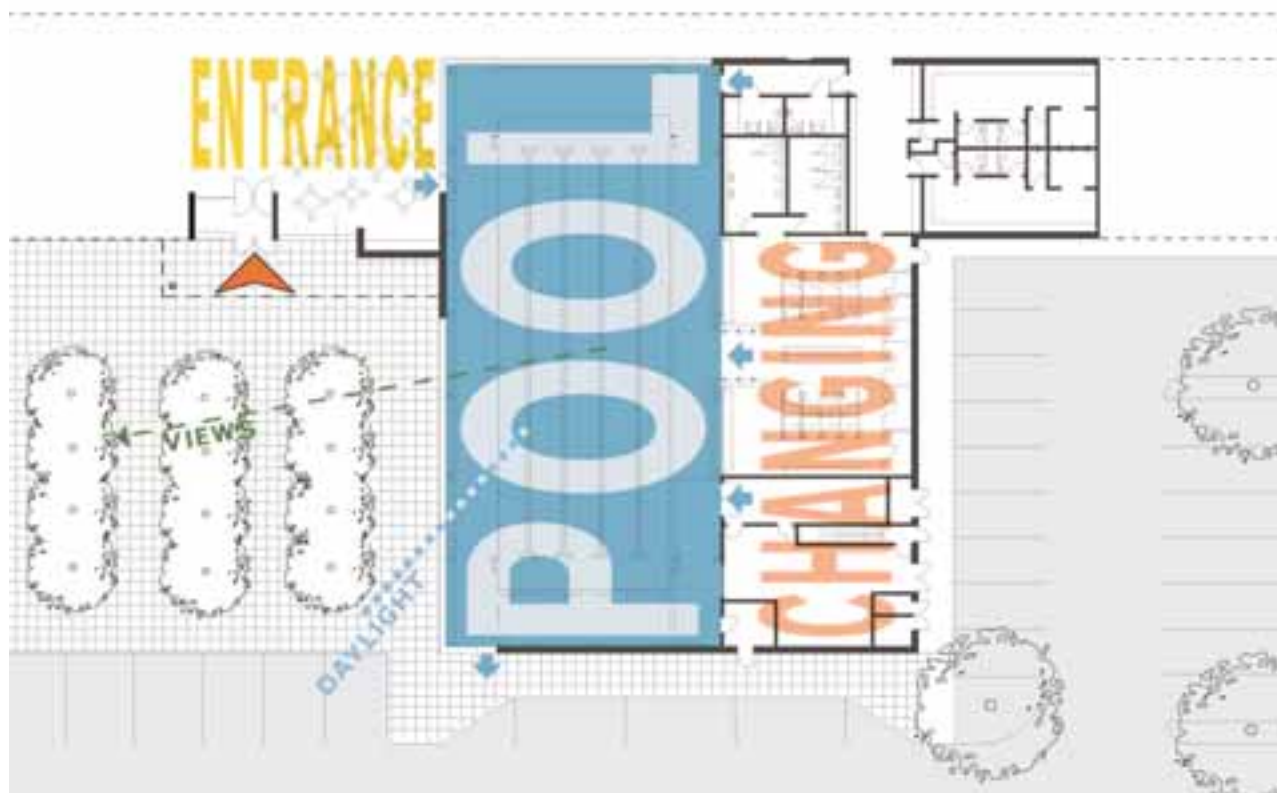


“If I can dream about having whatever I want for our future school sport provision, I would have to say a swimming pool.”

Head of PE Waverley School

The pool is housed in a simple shed structure with steel columns and beams, clearly expressed, and robust and non-slip tiled surfaces. The architecture is clean, and the finishing is durable. There is a viewing gallery along one side.

Daylighting enters through a clerestory window strip around three of the four sides of the box and through some skylights. One corner is fully glazed to give views to the outside. Uplighting, reflected from the ceiling, gives a well-distributed artificial lighting to the space, without glare.



● Swimming Pools Example 2

Chipping Norton Leisure Centre
Feilden Clegg Bradley Architects LLP

This is a good example of clever planning by the local authority. The leisure centre is a community facility, but it has been sited next to the school, so that the resource can be used for physical education and school sport. This means that the pool is very efficiently timetabled, and that the community as a whole, including the school, can take maximum advantage of the investment.

“This new and dual-use sport and leisure facility is on a prominent site adjacent to the existing secondary school on the edge of the town.



Accommodation includes a 25-metre swimming pool with movable floor to allow varying water depths, a four-court sports hall, fitness suite, dance studio, and three squash courts, as well as social and changing areas. The aim was to create a piece of high-quality contemporary architecture under tight budget constraints – a public building with a civic presence which sits well in its surroundings and makes a positive contribution to the adjacent school campus and surrounding area.

The layout of the building is arranged to provide clear, simple routes with both internal and external views whenever possible. Daylight and sunlight are allowed to penetrate the building in a number of ways leading to

an impression of openness and contact with outdoors, which is appropriate for a building concerned with health and exercise, but is often lacking from this type of building.

The building is accessible to all sections of the community for a maximum possible time. Careful consideration was given to the internal layout to ensure that the sports hall and main changing facilities can be used securely during the school day without interfering with access to the pool and other public facilities by the wider community. Access for people with disabilities has been carefully considered throughout.”

Feilden Clegg Bradley Architects

Technical Points

A pool should be designed within Standard ASA¹ guidelines. This is typically 25m long by 6 lanes wide, subject to the requirements and budget of the school.

Surfaces, material, finishes

Typically, non-slip tiles are used around the pool and specialist tiles or mosaic for the pool itself. Tiles are normally taken up walls to a height of 2.1 metres. Care should be taken in the setting out and drainage of tiles and in the specification of the grout that has to be stable in pool water. All tiles have to be coordinated with gullies and able to stand a hard pounding from the hoses they use to wash down the pool. Above 2.1 metres, plaster is often specified. Water-based epoxy paint must be specified in order to withstand the pool environment. Only the highest grade stainless steel can be used and this needs periodic cleaning or it will stain. All materials and components must be capable of withstanding the pool environment.

¹ Amateur Swimming Association, see www.britishswimming.org

3

Design Realisation
Secondary Specialisms



● Swimming pools **Example 3**

Langford Sports Centre, Jersey College
Architecture plb



The centre, which includes a sports hall, gymnasium, swimming pool and dance facilities, is for shared use by Jersey College for Girls and Victoria College for Boys and is also available for community use.

The pool is housed in a simple enclosure made with laminated beams and columns. It has good daylight from a row of clerestory windows on both long sides and transverse skylights in the ceiling. There is a viewing area along one side.

The pool is intelligently sited adjacent to the main changing block, which also services the sports hall.

Technical Points

Servicing

Check the guidance from the Sports Council¹. Ventilation tends to be delivered by air handling at high level and through poolside ducts at low level. Plant space for air handling and filters requires a large, accessible area, and easy access should be made for filter replacement. Backwash tanks (to store waste water in large volumes before discharging slowly into the foul system) also require considerable space. Separate chemical stores accessible from the outside are also required. Pools provide a demand for low grade heat, so a Combined Heat and Power (CHP) plant is an option worth considering.

Lighting

Glare is the main issue. Artificial light can be modelled to prevent glare but trying to provide views out and natural daylight while avoiding glare can be difficult. The lifeguard (or teacher) has to be able to see any person under the water who may be in trouble, and any reflection can obscure their vision. Effectively any visible sky (not just direct sunlight) reflected on the pool surface can be deemed to be a problem and low-level glazing can cause this, so needs to be carefully considered and designed.

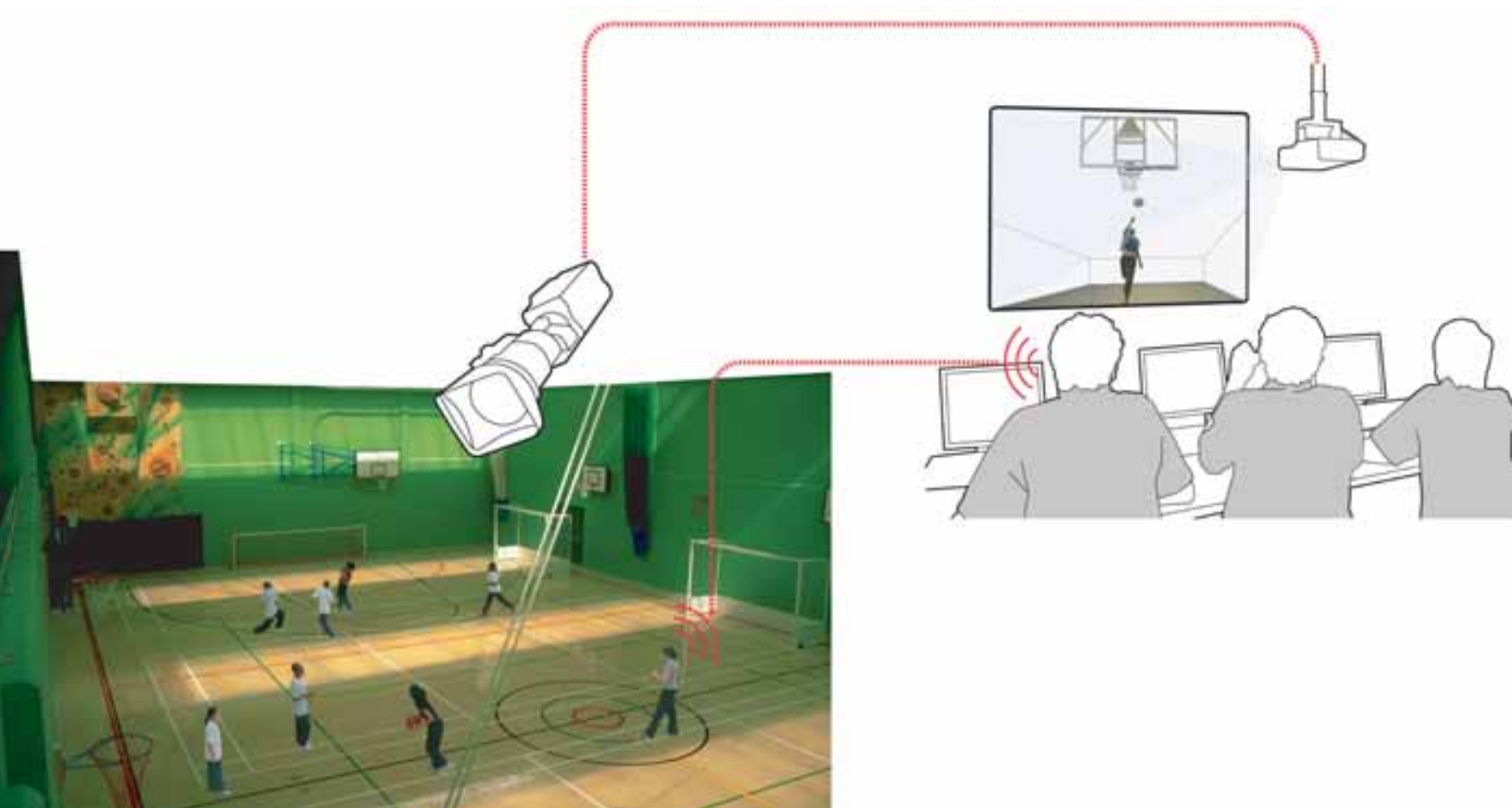
Swimming pool changing rooms

Changing room floors for swimming are wet. This means that pool changing does not make good general changing, so it is better to have separate facilities for other sports activities. Showers could be shared between changing rooms to make more efficient use of the space. Cubicles to changing areas are common and manufacturers produce standard doors and cubicles for use in the pool environment.

Maintenance

Wash down is required in all areas. For wash down and general use, falls to floors are important, even in the changing areas. It is common practice to plan for a drain down every 5 years. Maintenance to the ceiling above the pool needs to be planned carefully. For example, lights above the pool can be a problem to access, and are therefore best avoided.

¹ *Swimming Pools - Building Services* Sports Council Guidance Note. November 1994



ICT

As in all areas of the curriculum, physical education and school sport activities are benefiting from the explosion of ICT applications. ICT can assist in regular classroom activities (for example for GCSE and A level) when access to laptop and workstation facilities is as important as in other subjects. Pupils use them for preparing work, accessing the internet for research, downloading information, or creating and storing essays and other course work.

More advanced applications of ICT include the use of camcorders relayed to projectors, with a range of analytical and interpretational software. This allows teachers to review a particular move or sequence of moves with the pupils. This technique, which is used in the training of elite athletes and sports people, is excellent for fast learning and improvement. In

a teaching situation, it also has the added benefit of allowing a group to participate in the review and analysis of their own and their peers' movements, which can be a significant aid to group concentration. No one is left on the sideline with nothing to do.

Variations and enhancements of this technique include relaying the signal in real time to a classroom for review, and audio links between a teacher and a remote classroom, which enables practical and theory work to be carried out simultaneously. Although the technology allows the viewer to be located anywhere in the school (or off-site), it is better if the review room is located as near as possible, and preferably adjacent to the hall in which the cameras are located. There are significant opportunities afforded by this capability, in terms of PESS at GCSE and A level. Pupils in the classroom can interact directly with the

teacher in the remote sports hall, asking questions about why certain actions and decisions are being made. Currently cameras tend to be in a fixed location on the ceiling of a sports hall, but they have zoom that allows detail to be selected. In future, moving cameras (on tracks and rigs) and voice-activated camera movement are likely to give even greater precision to the use of this teaching and learning tool.

The investment in sophisticated ICT capability in physical education and school sport facilities may well need to be considered in terms of wider curriculum applications. Drama and English are obvious users, but foreign languages and mathematics departments have also been observed using these facilities provided by the physical education and school sport department.

Design Points

Ensure that the cabling connection protocol (or wireless network) is fully understood at the design stage

ICT equipment located in PESS areas needs to be robust and well-protected

Ensure that the setting-up times for any equipment are realistic for a learning and teaching timetable

Photos: Droitwich Spa High School



“I like the fact that you can judge for yourself whether you are playing the right badminton shot. People can tell you, but when you can see yourself doing it, and then look again on replay, it makes a really big difference.”

Pupil Droitwich Spa High School

ICT Example 1

Droitwich Spa High School

ICT is thoroughly integrated into the learning and teaching of physical education and sport at the school. Pupils are able to review real-time activities taking place in two sports halls. Video and audio links are relayed back to the review suite, where pupils can comment on what they are seeing and communicate with the teacher conducting the class in the hall. This 'reflective' capability is useful for improving sports techniques, and also for more theoretical study (such as reviewing the pace and structure of a lesson).

Another aspect of ICT use is analytical software which allows pupils to review their own and others' technique in sport activities. Video cameras are used to record a sequence, such as a series of trampolining exercises. Using proprietary software, pupils can review this, examine details of the exercise, and compare their technique with an equivalent 'exemplary' view. This kind of facility enables rapid review and improvement, and is proving to be a very effective learning and teaching tool.

“ICT is fundamental to every area of education, and will be an integral part of our pupils' future lives. There is no way back: we are keen to advance as fast as possible with the use of ICT for physical education and sports”.

Director of Sports Droitwich Spa High School

3

Design Realisation
Flexibility



Kings Avenue School



Capital City Academy

Flexibility

New facilities give an opportunity to enhance the quality of experience of PESS for the pupils of the school, but also are increasingly seen as an asset that can be made available to the wider community. The benefits of this extension are more intensive use of the facilities, community linkage, and possibly funding income to the school. The priority when planning for flexible use of resources should always be the interests of the school.

The increase in community participation, particularly through the growth of specialist sports colleges that have defined outreach objectives, has brought new considerations to bear on the design and management of school sports facilities. For the effective delivery of the physical education and school sport curriculum, it is very important that the management of the community use of the facilities does not impede the teaching and learning programme. This can occur if there is insufficient clarity of boundaries between the school and community use, leading to damage to the facilities and equipment or threats to the health and safety of school staff and pupils. In order to avoid such problems



it is advisable to analyse all of the likely use patterns of the community and school, and ensure that adequate lockable boundaries and security are designed to cope with all scenarios.



Photo: Shepheard Epstein Hunter

Flexible Use of Primary Main Halls

The following table, which is the result of a study of typical hall use based on Birley Spa Community Primary School in Sheffield, illustrates how intensively such spaces are used both for timetabled school activity, extra-curriculum and community events. It is clear that the configuration of the hall, storage, support spaces and servicing needs to be very carefully designed to meet this use pattern successfully.

Spaces should be flexible enough to accommodate a range of activities and changing requirements both for the school and the community.

		SCHOOL DAY					
Time	8.00 am	9.00 am	10.00 am	11.00 am	12.00	1.00 pm	
Activity	CHILD CARE	ASSEMBLY		PESS LESSON		DINING	
Number of People		400		30		200	
Equipment Used	<ul style="list-style-type: none"> • Learning resources • Chairs for children and staff • Tables • Refreshments 	<ul style="list-style-type: none"> • Stage blocks for recorder group • Chairs for staff • Stereo • Piano 		<ul style="list-style-type: none"> • Climbing frame • Games equipment • Gymnastics equipment 		<ul style="list-style-type: none"> • Kitchen hatch and cutlery • Tables x 30 • Chairs x 150 	
Storage	<ul style="list-style-type: none"> • Chairs and tables around edges of hall 	<ul style="list-style-type: none"> • Stage blocks in cupboards • Chairs around edges of hall 	15 min change-over time	<ul style="list-style-type: none"> • Climbing frame on wall • Games equipment cupboard 	15 min change-over time	<ul style="list-style-type: none"> • Chairs and tables around edges of hall 	
					25 min change-over time		



EXTRA-CURRICULAR USE

COMMUNITY USE

2.00 pm	3.00 pm	4.00 pm	5.00 pm	6.00 pm	7.00 pm	8.00 pm
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20 min change-over time

DRAMA LESSON

30

- Stereo
- Chairs

• Chars and tables around edges of hall

10-15 min change-over time

AFTER-SCHOOL CLUBS

10-15

- Gymnastics equipment
- Mats

• Storage cupboard attached to hall

15 min change-over time

YOGA CLASS

20

- Soft mats

• Storage cupboard attached to hall

10 min change-over time

LOCAL CHOIR

75

- Chairs x 75
- Piano

• Chairs around edges of hall

Playing Hours

The table¹ shows the playing hours analysis of a range of facilities used by a Specialist sports college, analysed in terms of use, space by space, by the school and the community. Note that community use of the facilities takes place on 355 days per year, compared with 195 days of school use. Although the patterns of space use are broadly similar (with indoor facilities being more intensively used by both groups) there are interesting differences, such as in the use of grass pitches.

The school has a 'sports barn', recently refurbished. This is an interesting building type, providing covered but unheated area, which can accommodate a wide variety of activities, and is relatively intensively used.

SCHOOL USE

	Playing Area sq.m	Hours used per day	Days used per year	Hours used per year	Pupil Use per year	Playing Hours per sq.m
MAIN HALL	604	5	195	975	27,910	46.21
SMALL HALL	226	5	195	975	7,120	31.50
FITNESS SUITE	123	1	195	195	4,880	39.67
SPORTS BARN	620	5	195	975	9,200	14.84
GYMNASIUM	244	5	195	975	7,020	28.77
ASTROTURF PITCH	5,400	5	195	975	10,250	1.90
OUTDOOR COURTS	3,360	5	195	975	14,760	4.39
GRASS PITCHES	20,000	5	195	975	33,860	1.69
TOTAL USAGE					115,000 (person hours per year)	

COMMUNITY USE

	Playing Area sq.m	Hours used per day	Days used per year	Hours used per year	Community Use per year	Playing Hours per sq.m
MAIN HALL	604	5	355	1,775	20,850	34.52
SMALL HALL	226	5	355	1,775	9,550	42.26
FITNESS SUITE	123	12	355	4,260	18,600	151.22
SPORTS BARN	620	5	355	1,775	12,850	20.73
GYMNASIUM	244	5	355	1,775	6,500	26.64
ASTROTURF PITCH	5,400	4	355	1,420	26,050	4.82
OUTDOOR COURTS	3,360	4	355	1,420	3,300	0.98
GRASS PITCHES	20,000	1	355	355	900	0.05
TOTAL USAGE					98,600 (person hours per year)	

¹ Playing Hours analysis prepared by Barbara Bakewell of the Manor School



Design Points

Aspects of the main hall design which might be flexible include:

- **Different floor surfaces:** this might include an area of sprung timber flooring for dance
- **An area of rubber crumb or sand-based synthetic grass**
- **Divisions between areas (netting or moveable partitions)**
- **Controllable lighting (for example to create special lighting areas for performance activities such as dance)**
- **Viewing areas (either permanent mezzanines or foldable bleacher seating)**



Flexible Use of Secondary Facilities

The use pattern of physical education and school sport facilities will vary seasonally and in relation to their suitability for play in certain weather conditions. Heads of PESS unanimously identify the sports hall as the most intensively used of all of the facilities, and grass playing surfaces as the least intensively used. Although this does not mean that grass surfaces are not useful (all Heads of PESS interviewed in our research cited their value for summer athletics) it is important that in the briefing and design process for new facilities, careful planning of the playing hours needed to fulfil the school's curriculum requirements is matched to the facilities planned.

The sports hall will be used intensively and for a wide variety of different activities for both pupils and community users; careful discussion at the briefing stage about the requirements for flexibility will help ensure maximum value from the facility.



Support Spaces

Attention to the design of toilets and changing rooms will help to ensure the best use of the PESS facilities, and can assist in encouraging pupils to feel confident about taking part in physical education and school sport. Storage areas require careful planning to make equipment changeover as fast and easy as possible.



Toilet Provision

Well-designed toilets are an essential feature of good PESS facilities, and will help to create the right environment for encouraging participation in sporting activities. Enough toilets should be provided to cope with the projected demand including demand from adult community users. WC accommodation for the general public and those with disabilities should be clearly signed, and located close to the reception and foyer areas¹.

¹ Guidance on the appropriate levels of accommodation is given in the following guidance documents: *Technical Standards for Places of Entertainment*, published April 2001 by The District Surveyors Association and the ABTT (Association of British Theatre Technicians); *Model National Standard Conditions for Places of Entertainment and associated Guidance*, published February 2002 by The District Surveyors Association, the ABTT and the Local Government Licensing Forum. British Standard (BS 6465: Part 1 1994 and Part 2 1996.)

“**G**ood changing rooms are an essential aspect of ensuring that pupils feel comfortable about taking part in sport and PE activities. Pupils are happy to use these facilities which are at a professional or club standard, since they feel respected. We have also seen a great improvement in the way in which the pupils treat space: there is now no vandalism or destruction in the changing rooms.”

Head of PE and Sport Manor School

Changing Areas

Clean, bright, well-designed changing rooms can make a very positive difference to pupils' experience of physical education and school sport. Including some individual changing cubicles, ensuring that shower cubicles have curtains, and providing robust, bright and well-designed changing rooms will help to give encouraging signals. Changing facilities in schools should be of the same standard as a good-quality health club (this is an additional attraction for community users).¹

The amount of space necessary for changing in primary schools depends on the number of pupils in the school and how they organise their PESS curriculum. The amount of changing space required should be discussed and agreed with the school to ensure that there is

adequate provision to meet their needs. If the hall is used by the community, adult changing facilities may need to be provided.

In secondary schools, the size of class groups and sports teams and the scale of peak-time demand affect the number of changing spaces to be provided. A further factor is the need for changing spaces for outdoor sport and whether these will share the same changing facilities as indoor sport. Outdoor sports require a greater provision of showering spaces. The mix between girls and boys using the facilities at different times must be carefully considered, as must the duplication of facilities required to accommodate changeover times between classes. A modular approach to the provision of changing room spaces offers a flexible way of fulfilling these requirements. Separate

facilities are required for girls and boys, and it may well also be desirable to allow different age groups to have separate facilities. There is a move away from communal showers in school changing rooms.

Pupils are usually timetabled in half year groups for PE and sport². Assuming a maximum class size of up to 30 pupils, with an equal split of boys and girls, changing room modules for up to 15 pupils each seem to be appropriate. A changing room buffer zone for up to a further 10 pupils per module could be allocated to one or other changing room by means of lockable doors to accommodate the disparity in numbers for unequal class mixes. By designing changing room capacity to maximum class sizes, the total accommodation provided should be large enough to cover the



requirements for all other community use activities³.

A modular approach to changing rooms is also a flexible way of allocating space to outside community users and reserving rooms that can be adapted to dressing rooms when required. Separate changing facilities should also be provided for staff (male and female) with secure lockers and separate showering and WC facilities.

● Changing Areas Example

Marriotts School
Widdup/Amer Architects

The changing rooms are equipped to a good standard. They are sensibly located to allow direct access to the outside (for the sports fields) or to the halls. There is also a clever planning inclusion of a 'buffer' space which can be annexed by either the male or female changing areas, to accommodate additional requirements (for example for competitions). The walls and floors are covered in ceramic tiles. Shower cubicles are robust and have curtains to give privacy. Benching is made from durable beech. All materials are of high quality.

Design Points

Use high-quality fittings for longevity and to engender ownership and pride

Individual changing cubicles will encourage participation

Shower cubicles should have curtains

Changing rooms should be light, bright and welcoming spaces

Technical Points

Changing rooms for secondary schools should be designed with 0.5m-deep benches allowing 0.5m of linear width per person. The minimum recommended distance between double rows of peninsular benches is 2.5m measured from bench back to bench back and 1.5m from bench back to wall for a single row. It is also useful to have an area designated for lockers, which should be moisture resistant, and generally located away from wet areas.

Changing room facilities for people with disabilities must be provided in compliance with requirements of the Disability Discrimination Act 2004 and integrated as far as possible with changing and dressing room facilities for the able-bodied.

Entrances must be screened and showers and drying-off areas should be located at the far end of the changing rooms. There should be one shower for every six changing spaces for indoor sports, and one for three or four changing spaces for outdoor sports.

¹ See Sport England Guidance Note *Changing Rooms and Lockers*

² Building Bulletin 98: *Briefing Framework for Secondary School Projects* DfES/TSO 2004

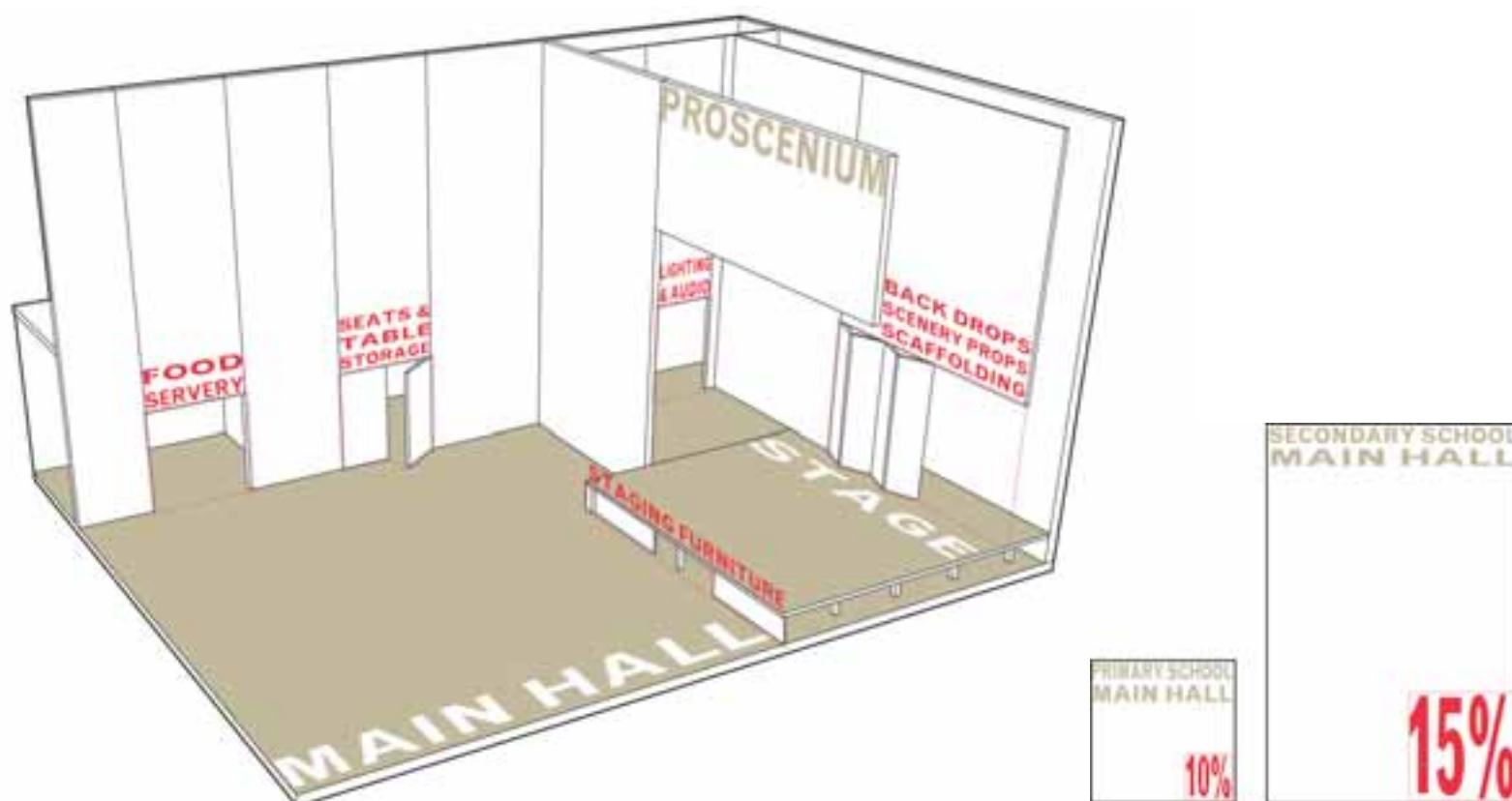
³ For further guidance on changing room capacities for different sports uses see Sports England Guidance Note, *Pavilions and Clubhouses and Sports Hall: Design*. See also *Handbook of Sports and Recreational Building Design, Vol. 2 - Indoor Sports*.

3

Design Realisation
Support Spaces

✓
Generic Layout
Primary Main Hall Storage

✓
Percentages for Storage Space



Storage

Physical education and school sport activities are equipment-intensive. As the curriculum changes and different activities become the focus of attention, specific storage requirements may change, but it will always be necessary to have a large storage provision. A schedule of the likely activities and the equipment required for these will provide a useful check for the briefing and design team.

At the design stage, it is relatively straightforward to ensure that all the equipment can be fitted in the store. After the facilities are completed, adding storage is difficult and disproportionately expensive.

Indoor spaces

For a primary school main hall, the minimum storage requirement is 10% of floor area. Space can be saved and duplication avoided by having communal storage space for the main hall and activity hall/studio. There should be space to store both PE equipment and dining tables and chairs if required.

For secondary school large halls, the largest pieces of equipment will often be trampolines. The speed and ease with which these and other equipment can be taken out and set up will have an impact on the efficiency of teaching and learning. Mats are almost universal, and intelligent strategies for fast

distribution (for example using trolleys) should be investigated. Gymnastic equipment is also large and takes time to set up, and should be carefully measured and accounted for in the storage planning.

When sports halls are used for assembly, storage is needed for gymnastics and other sports equipment and chairs. Openings into storage areas should be designed to accommodate portable equipment and allow easy access without having to move other equipment. Doors should be robustly constructed, particularly for wide openings and can be up-and-over, straight-sliding, sliding-folding or side-hung. Storage is also needed



Generic Layout

Primary Main Hall Storage



Ivybridge Community College

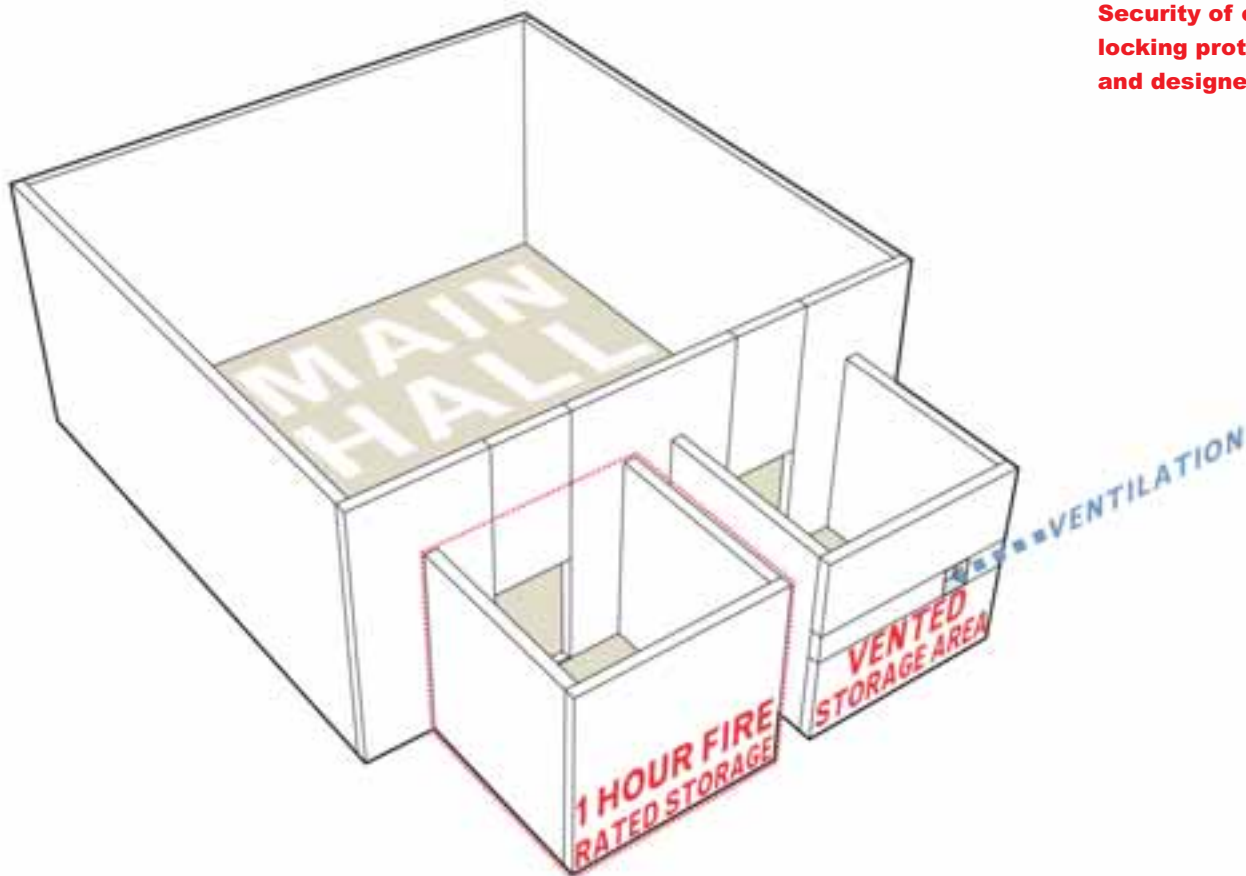
Design Points

Fast movement of equipment in and out of storage is essential for efficient teaching and learning

Outside spaces need storage as nearby as possible

Racking design can assist good storage: is it a football or a trampoline that is being stored?

Security of equipment is important, and locking protocols should be carefully briefed and designed



for cleaning equipment and materials. These should be located close to changing accommodation and include a bucket sink.

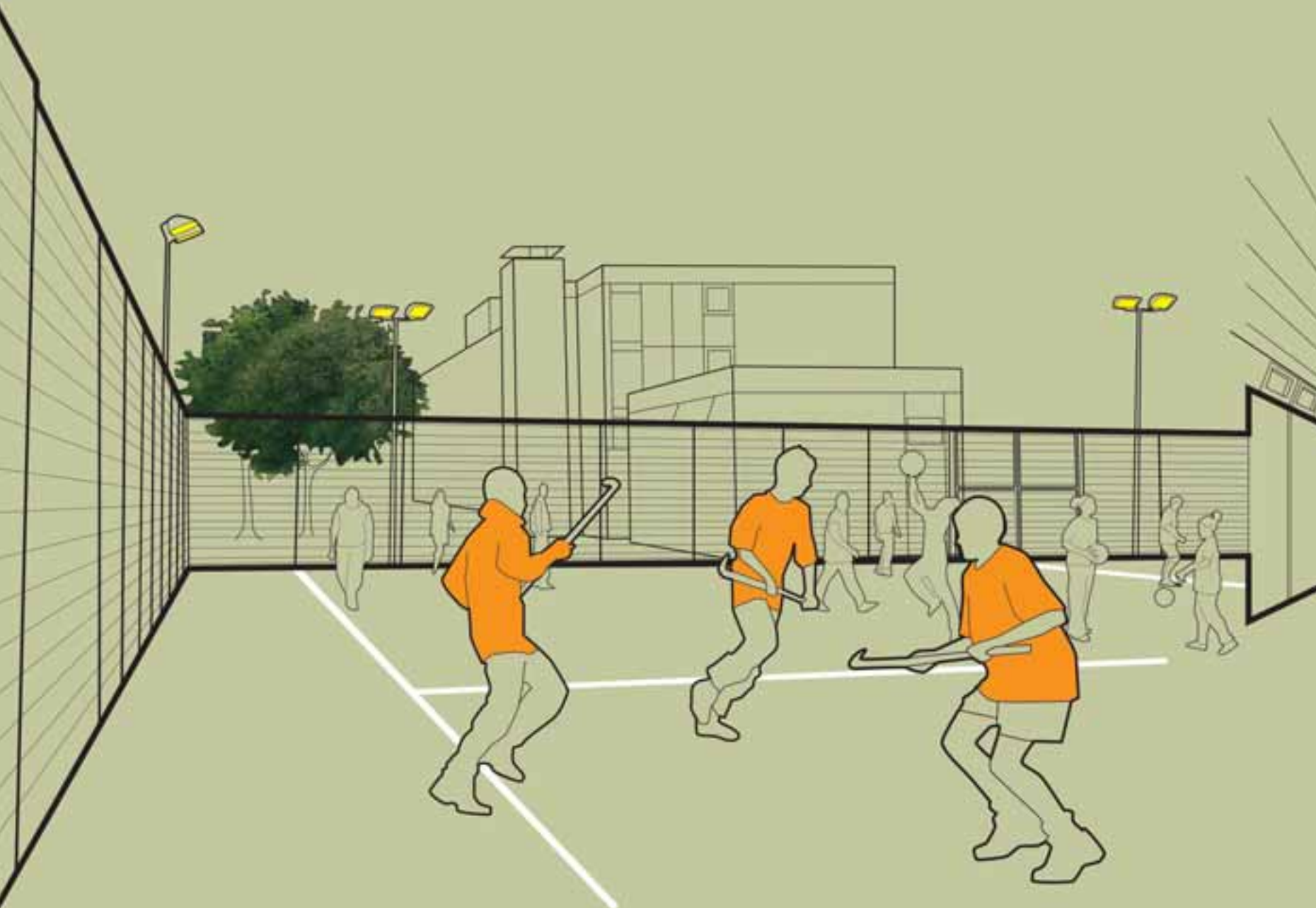
In primary and secondary schools additional storage for community users' equipment will need to be considered.

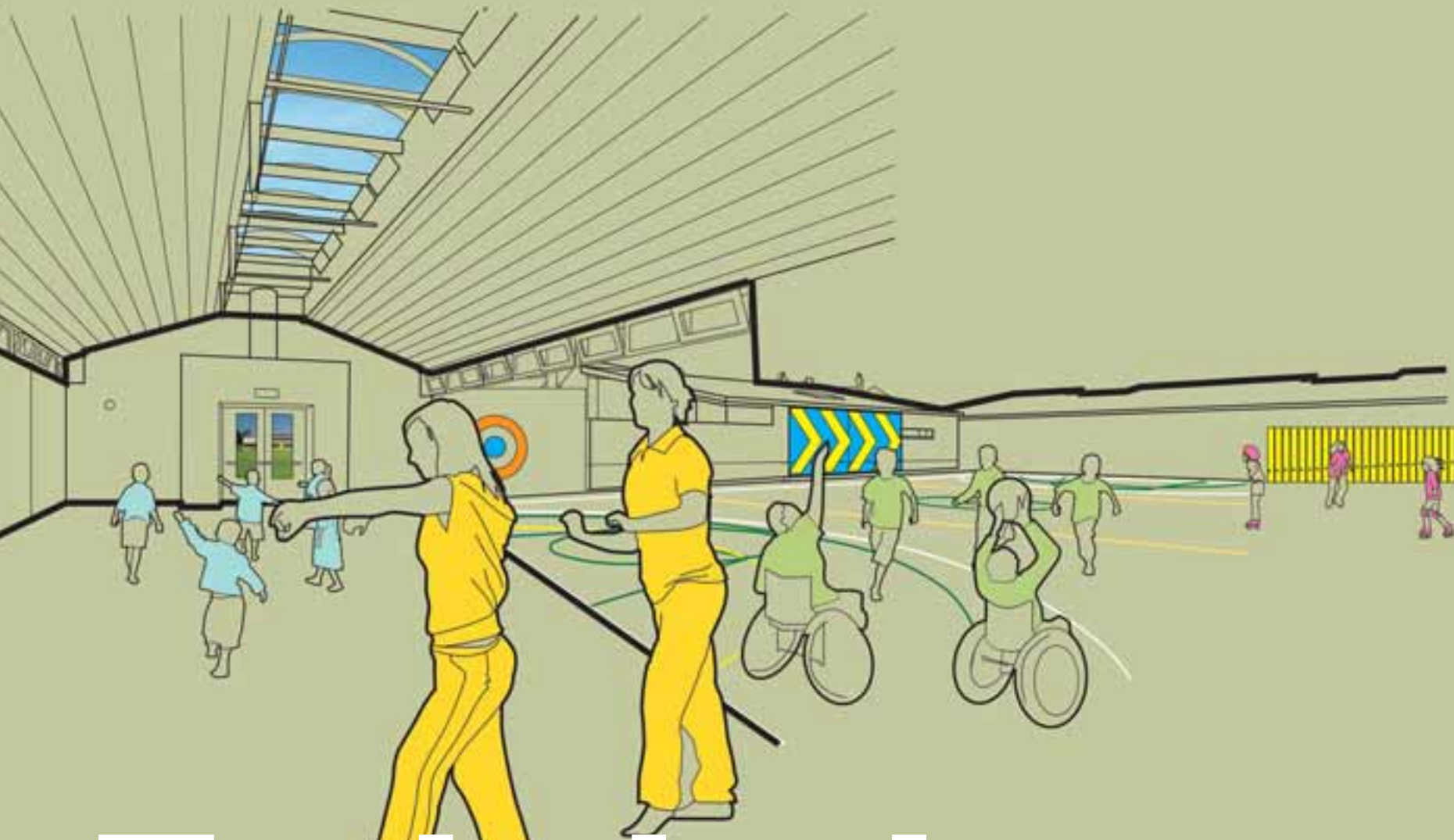
Outdoor spaces

Storage areas can either be located in the main school building with access from the outside or in stand-alone stores. An alternative and inexpensive solution is to use containers, which are secure, and can be fitted with suitably designed racking.



4





Technical Detail

Building Elements

School sport facilities are used intensively, and good detailing and material selection will ensure that the fabric lasts well and gives maximum value.



Walls, Windows, Doors & Ceilings

Walls in sports halls should be flush faced and impact resistant, with no perimeter intrusions which might cause accidents. The following combinations of materials are often used and give satisfactory internal finishes:

- Fairfaced brickwork or solid concrete blockwork with flush joints
- As above, decorated with matt paint or clear sealant
- Smooth plastered brickwork or concrete blockwork
- Composite construction of fairfaced brickwork or solid blockwork with flush joints up to 3 metres above floor level with either timber boarding, ply or particle board or metal-faced insulating panels to roof level
- Horizontal or vertical natural timber boarding or ply or particle boarding from floor to ceiling.

Window and door openings and reveals must be designed with the same concern for avoidance of injury, particularly at low levels where there is a risk of impact on sharp

corners. Corners should be avoided or gently rounded. Ledges at high level can trap shuttlecocks. Openings for ventilation grilles must be carefully sited and robustly constructed to avoid damage through impact. Fire extinguishers, sensors or other items of equipment should either be recessed or located in corners to lessen the risk of obstruction and damage.

All low-level glazing in windows and doors must incorporate safety glass. Any low-level glazing in a sports hall must be safe, which may mean fitting fold-back panels for protection. Viewing galleries or windows should be positioned to avoid distraction to players and windows should be fitted with safety glass, without projections. Blackout blinds, shutters, curtains or drapes should be detailed to avoid mechanical damage. It may help to store them in purpose-made recesses or storage containers when not in use.

Doors should generally open outwards in the direction of escape and internal doors between main spaces need vision panels of a height and

size appropriate for wheelchair users.

Door frames and leaves should be flush with the wall or have splayed reveals to minimise risk of injury. Fire escape doors should have recessed panic buttons or flush-mounted push pads for the same reason. The number, location and width of escape doors should be agreed with the Fire Officer, particularly where the hall may draw large numbers of spectators.

The choice of structural framing and support for the roof has a fundamental impact on the appearance and form of the ceiling. The layout of structural members needs to coincide with the need for structural support for certain elements, tracks for space dividers, support for sporting equipment and ducts for engineering services. Sports hall ceilings need to be robust enough to withstand the impact of balls from indoor football, volleyball or basketball so suspended ceilings, for example, are inappropriate.



Floors

Sporting activities need elastic floors capable of absorbing impact and energy.¹ Semi-sprung beech, maple, beech or maple veneer and various composition and synthetic surfaces meet the criteria of British Standard 7044 (Part 4). Bleacher seating systems can score hardwood surfaces unless effectively detailed and floors must be capable of carrying the imposed loads. Heavy equipment can also mark surfaces unless suitable trolleys and wheels are used. Roller skating makes particular demands on hardwood surfaces and skirting boards and must be appropriately detailed. The appropriate surface maintenance regime should be considered as part of the floor selection process. Floors in circulation areas surrounding the hall should be designed to remove grit and dirt before being tracked in.

Dance, unlike other sports activities, is usually undertaken in bare feet or thinly-soled shoes and the dancer's body takes the full force of impact with the floor. A sprung or semi-sprung floor system that complies with the European DIN-standard 18032 Part II giving a shock absorption coefficient of at least 55% (preferably 60%) is an absolute minimum for dance. A common difficulty when dance classes are programmed in sports halls is the degree of 'slip' or 'grip' (coefficient of friction) experienced on a sports floor surface, particularly wooden floors. These are generally sealed with thick protective layers of floor sealant that have non-slip qualities suitable for sports shoes but which are slippery for ballet shoes. Using a roll-out dance surface over the sports floor can ease this problem.

Where halls may be used for non-sporting activities the choice of finish must suit a range of functional and aesthetic requirements. The floor colour should contrast with the walls and be of 40 - 50% reflectance value. For assembly and theatre performances, temporary carpeting or surfaces can help to protect timber floor finishes.

¹ See Sport England Guidance Note *Floors for Indoor Sport*



Maintenance

At the briefing and planning stage, a strategy for maintenance should be included. Since all sports facilities have intensive wear and tear, careful thought at the design stage can greatly extend the useful life of spaces and equipment. Choosing good quality at the design stage will often result in considerable economy over the life of a facility. Conversely, lower quality finishes fittings and equipment may well require more frequent replacement, and involve higher costs in maintenance over the lifetime of the building.

The following points about indoor and outdoor surfaces may assist in discussing maintenance programming and budgeting:

Outdoor

- Rubber crumb: Rubber crumb tennis surfaces require 'dragging' with nets. Ideally this should be done after every playing session. A good tip is to build this in to the pupil regime: dragging the surface following a game will increase the pupils' understanding of and respect for the facility.
- Sand-filled synthetic turf requires special equipment (tractors) to redistribute an even spread of sand in the artificial grass mat. This is a labour-intensive activity, and maintenance budgets should be planned accordingly.
- All-weather macadam surfaces require the least maintenance of any artificial play surface. Line marking is, however, an expensive activity, and careful planning of the optimum line marking should be undertaken at the design stage.

Indoor

Sprung wooden floors require stripping and resealing. Regular sweeping will reduce maintenance, as will ensuring the correct footwear is used. Equipment should have suitable 'feet' that do not cause point loading, and equipment that needs to be moved in and out should have casters.



Ivybridge Community College

Environment

Acoustic quality, lighting, heating and ventilation and the effects of these on the general ambience of the space all need to be thought about. The level and quality of technical infrastructure and the time and resources needed to change the hall from one use to another are important considerations in designing for combined use.

The design of a large space used for sports presents complex technical challenges and specialist consultants are essential. Spaces that will be used for assembly, theatre performances, exams, exhibitions and social events as well as sporting activities present difficulties in environmental design. These activities have conflicting environmental requirements and appropriate systems and controls can have a considerable impact on design. A mechanical and electrical services consultant should be brought in at an early stage in the project¹.

¹ Preliminary guidance is available from the Chartered Institute of Building Services Engineers



**Generic Layout**

Acoustics in a hall used for performance



Capital City Academy



Acoustics

The different acoustic requirements for physical education and school sport activities make this a complex design issue. This is particularly true for multi-use spaces such as a primary school main hall where the need for different reverberation times for different activities are likely to make it difficult to achieve a completely satisfactory result for all users. The degree of acoustic separation required will depend on the nature of the hall and activities in adjacent spaces. It will be helpful to engage an acoustician early on.

The large volume of sports halls lengthens reverberation time and hard surfaces and solid parallel walls increase acoustic reflectivity and create a reverberant internal acoustic. These need treatment to provide the acoustic environment for performances and for teaching sessions. Acoustic absorption needs to be introduced to reduce reflectivity and dampen the acoustic brightness of the space. This is best provided at high level in the ceiling or wall where it is least likely to be damaged by sporting activities. Hard perforated surfaces provide a robust solution. Coarser finishes diffuse sound more effectively than smooth finishes, but in sports halls finishes up to a

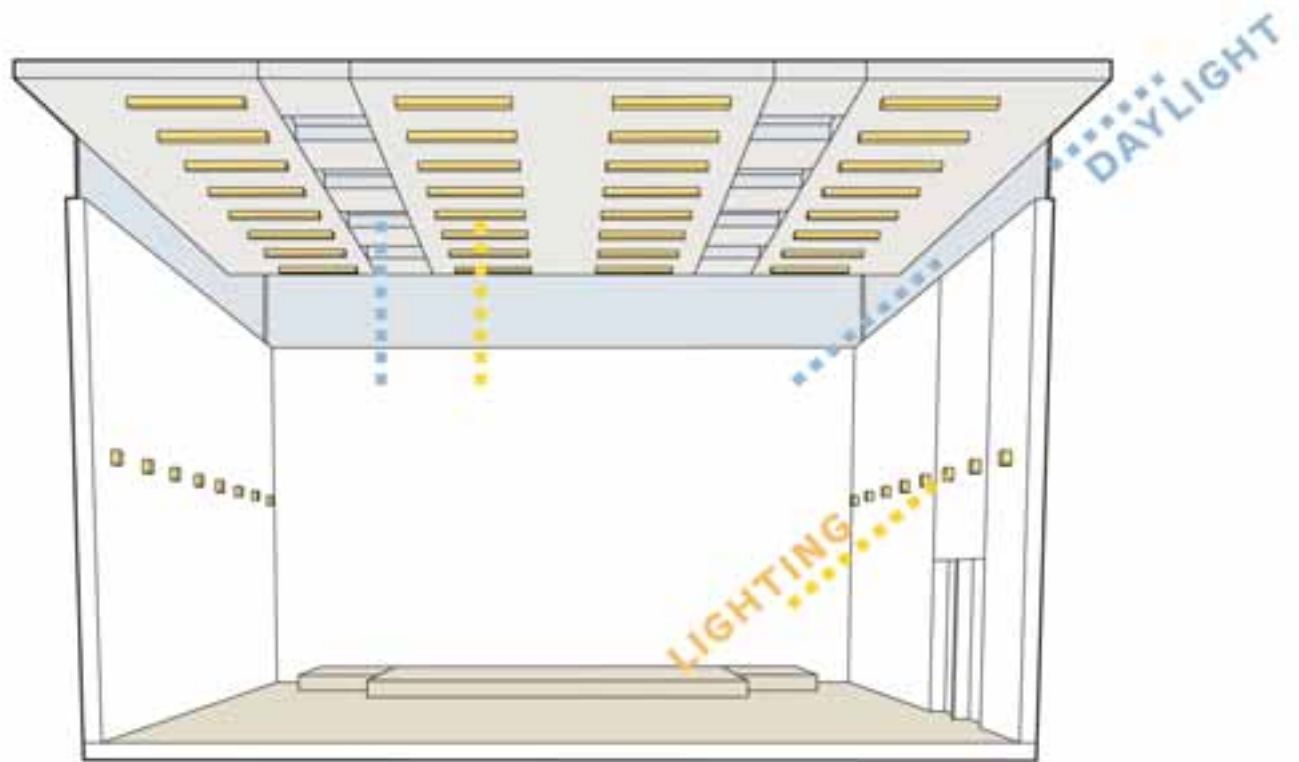
height of 3m should in any case be tough and nonabrasive. Internal walls separating the hall from other spaces should generally be of high mass construction to reduce noise transfer.

Where there are to be variable acoustic controls, simple comprehensible solutions are required as users can often misunderstand the effect of variable acoustics. Noise reduction can be achieved principally by high mass construction. Windows and door openings should be airtight and the junctions where services penetrate should be sealed. Piped services should be critically damped or encased and ventilation ductwork should be attenuated.



Plant should, ideally, be totally isolated from performance spaces or flexibly mounted. Corridors located between noise-sensitive areas can form a useful sound break and sound lobbies should be provided where sound-sensitive spaces adjoin sound-producing spaces like foyer areas, bars, kitchens and WCs¹.

¹ For further information see Building Bulletin 93
Acoustic Design of Schools, DfES 2003



Lighting

The method of lighting is a fundamental decision affecting the design of all PE and sport spaces. Particular care must be taken when designing for multi-activity spaces.

For sports use, the main hall requires a uniform lighting level of between 300 and 400 lux. The area of glazing in sports halls is limited by the needs of sports functions and natural lighting levels are often low. Natural lighting improves the ambience of a hall but because it needs to be supplemented with artificial light at night and in dull weather, it is expensive to provide relative to the benefits gained. Some natural light is essential for halls that have constant daytime use or are used for social functions. Daylight in activity areas makes it easier to provide natural

light in circulation and social spaces, which creates a more attractive and welcoming sports environment. Natural light in sports halls must be controlled so as not to reduce users' concentration.

The intensity of light from roof lights is much greater than through windows in a wall. Natural light through rooflights needs to be carefully oriented to avoid direct sunlight and well attenuated to give an even, well distributed and reflected light. The reflectivity of floor, wall and ceiling surfaces affects the control of light and glare within sports hall spaces. High-level side windows provide a good source of evenly distributed natural lighting, so long as direct sunlight and glare are controlled.

Artificial lighting also needs careful control and must be designed to reduce operational costs. Reflecting light off wall or ceiling surfaces can be an effective way of distributing light more evenly, while diffusers mounted onto fittings can also help to reduce glare. Light reflected off a coloured surface receives a cast from the light. White surfaces produce a light neutral tone, materials such as wood reflect a warmer, softer tone, and colours towards the cool end of the spectrum produce less flattering results.

Low-energy light sources, provided by high frequency tubular or compact fluorescent fittings, are generally appropriate for sporting and teaching activities. Many types are available, but care is needed during specification to ensure the appropriate light quality is achieved'. Lights



should be carefully integrated with the layout of the space and ceiling structure to avoid distracting players. Locating lights along the side margins between badminton courts reduces glare over the playing area. Fittings should be positioned to avoid damage from soft balls or shuttlecocks. They should also be easy to reach for maintenance and lamp replacement.

¹ For further information see Building Bulletin 90
Lighting Design for Schools DfES 2003



Jubilee Primary School; Photo: Tim Soar



Temperature (°C)

Illuminance (lux)

	Temperature (°C)	Illuminance (lux)
AEROBICS	18	200
ASSEMBLY	18	200
BADMINTON	16	300
BASKETBALL	16	200
CRICKET PRACTICE	16	750
DANCE	21	200
EXAMS	18	500
FIVE-A-SIDE FOOTBALL	12	200
GYMNASTICS	18	200
JUDO	12	200
TRAMPOLINING	14	300
CHANGING ROOMS	20-25	200
WCs	18-21	200
CORRIDORS	18	100-150
RECEPTION AREAS	18	250-350

Heating & Ventilation

Fresh air requirements depend on the number of occupants and the level of activity taking place. 1.5 air changes per hour is appropriate for most sports halls of average height (around 7 - 8m high) provided the air distribution is adequate. This figure should be increased for facilities lower than 7m and can be decreased in those higher than 8m. For dance studios and smaller spaces where intensive activity will take place, ventilation rates will need to increase to 6 - 8 air changes per hour. The large volume of air in large sports halls can act as a buffer if heat gains are well-controlled. Sensors that detect the carbon dioxide levels

are an economical way of determining activity and occupancy levels and controlling the rate of ventilation.

The ideal solution for a multi-use space would be to provide flexible environmental services capable of responding continually to different needs. However, this ideal is hard to define, expensive to achieve and a very inefficient use of energy. A recommended solution is to base the environmental services design on the highest priority activity and ensure, as far as practicable, that all other activities are catered for and the design has enough flexibility for realistic programming.

Main hall heat sources need to be visually unobtrusive and capable of producing comfortable conditions in a relatively high space. Effective solutions include underfloor heating systems, ducted warm air, recessed low level radiant panels or high-level gas-fired radiant heaters. Community areas should be zoned and metered separately for economy and to allow costs to be monitored. Pipe circuits in buildings with a central boiler should be grouped together in compatible zones. Master controls should be in a secure place by the final exit from the building. Whatever form of heating is used it is essential to have high levels of insulation and a well-sealed building envelope. There should be a draft lobby at the entrance.



The table gives guidance for both temperature and illuminance levels required for common activities that may take place in multi-purpose sport venues. Where activities with different requirements take place in the same space, schools and designers will have to consider the predominant activity and design accordingly. Some compromise may be necessary.

Appendix 1

Briefing Checklist



Achieving the best possible outcome from any building project requires careful planning and sustained effort. Useful publications that will assist the client in achieving a good outcome include:

- *Creating Excellent Buildings: A guide for clients* Cabe 2003
- *21st Century Schools* Cabe 2003
- *Building Schools for the Future* Cabe 2005
- *Client Guide: Achieving well designed schools through PFI* Cabe 2003
- *Being involved in school design* Cabe 2004
- *A Guide for School Governors* RIBA 2000 and available from School Works, (www.schoolworks.org):
- *The A-Z Sketchbook of school design*
- *Extra Time Special: Creating Schools for the Whole Community*
- *Creating New Schools*
- *The School Works Toolkit*

Here are a few simple guidelines:

- Form a client team to formulate the physical education and sport brief for feeding into the overall brief for the new school/refurbishment project.
- Focus on the teaching/learning

ambitions of the physical education and school sport programme, rather than writing a shopping list of spaces.

- Select a really good design team (using the client design adviser to give guidance on a shortlist) and give them freedom and encouragement to propose really inspiring ideas; be prepared for expectations to be challenged.
- Take time to look at good and relevant precedents.
- Participate actively in the formulation, evolution and refinement of the design.
- Press for quality in the built delivery.

Briefing checklist:

- What types and scales of sports activities are to be accommodated, for school use, and for community use?
- How many people will use the space at any time?
- Is there likely to be an audience, how large will this be, how will they be accommodated?
- What should be the capacity, size and proportion of the space?
- Can some of these activities be programmed into a single space?

- What entrance/reception spaces are needed to support each activity or use?
- What changing facilities are required to support each activity/use?
- What other ancillary spaces are required to support each activity /use (for example storage and plant areas)?
- How much of the storage is required for school use?
- How much for community use?
- What environmental conditions are required (heating, lighting, air quality)?
- What are the opportunities for outside sports facilities?
- What ancillary or support spaces do these need (storage for maintenance equipment, storage for sports equipment)?
- What are the considerations for circulation, orientation and signage? Are the requirements different for school and community users?
- How will the facilities be managed and maintained? What administrative spaces are required for this? Are the requirements different for school and community users?
- How will people with disabilities access and use the facilities?

Appendix 2

Funding & Management



The increasing use of school sports facilities by the wider community means that management of these facilities is required outside school hours. There are two main options for schools: to manage the hire-out of the facilities themselves, or to contract it out to an external (probably non-profit) company. Widening access to school PESS facilities can help justify bigger or higher quality facilities and make more specialist spaces a feasible option.

Spaces such as specialist gymnasia and swimming pools are cost-intensive, both in terms of capital and revenue spending, and will be outside DfES net site area calculations (and therefore designated 'supplementary net area')¹. It is likely that specialist gymnasia and swimming pools will need to be capital funded from a number of sources. This may include relevant central government funds, local authority and private grants. Some schools find that it is cost-effective to designate staff with a half-time or even full-time responsibility for fundraising and managing capital projects. Such facilities will need to be supported by a clear business plan that includes community

use. At one school, for example, the centre management is undertaken by the school and includes the hiring out of the gymnastics hall, the fitness centre and the dance hall. The dance hall is always fully booked, and the fitness centre has become a popular family-based resource, filling a niche which is not met by other local fitness facilities. This helps contribute towards the high costs of maintaining the gymnastics equipment to the required standard. At another school, the management of after-hours and community use of the sports hall, dance studio, playing fields and MUGAs is undertaken by a not-for-profit company which manages public sports facilities in the borough.

In both cases, the schools were very satisfied with the facility management model they had chosen. It is likely that variations and refinements of these models will evolve, as community use of school sport facilities increases. It is worth noting that adequate administration areas need to be allocated for management of the facilities, whoever is undertaking this role.

¹ See Building Bulletin 98: *Briefing Framework for Secondary School Projects* DfES/TSO 2004

The authors would like to thank the following schools and consultants for their help on visits and for providing information for the publication:

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