



**The SAPCA Code of Practice
for the Construction and Maintenance of
Fencing Systems for Sports Facilities**

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July 2006, (1st Edition)

ISBN: TBC

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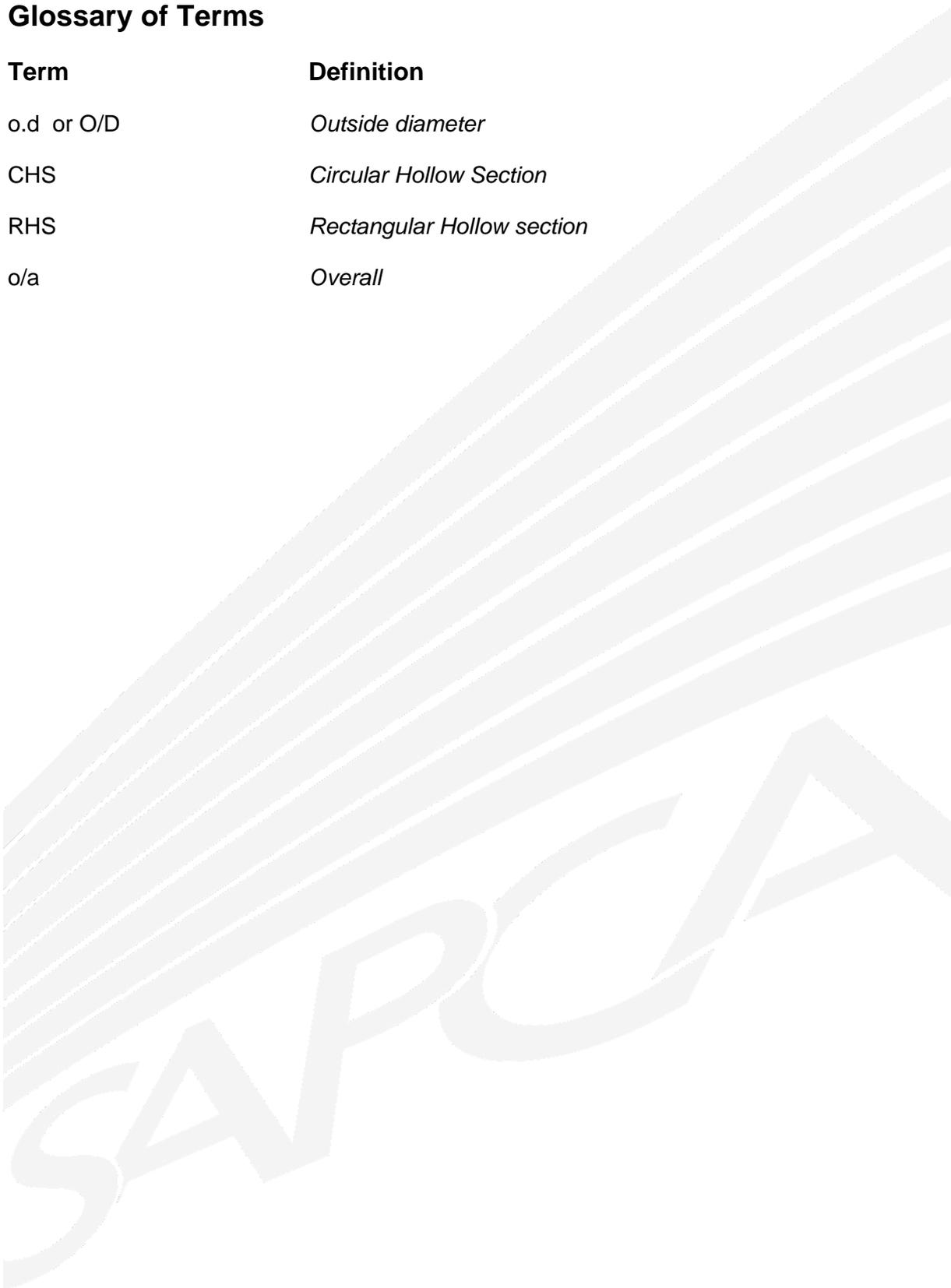
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Glossary of Terms

Term	Definition
o.d or O/D	<i>Outside diameter</i>
CHS	<i>Circular Hollow Section</i>
RHS	<i>Rectangular Hollow section</i>
o/a	<i>Overall</i>



Introduction

The Sports and Play Construction Association (SAPCA) has produced this Code of Practice to provide prospective clients and specifiers with guidance on the basic construction requirements and specifications currently employed in providing surround fencing for sports facilities.

The document calls on the experience of SAPCA member companies who have constructed a wide range of installations for a variety of clients over many years. Particular specialist contribution has been provided by the fencing manufacturers who are members of the Suppliers Group of SAPCA.

The requirements of the various sports governing bodies, the relevant British and European Standards etc, are also incorporated, where appropriate.

Whilst it is not intended that the Code of Practice should become part of a contract, it is hoped that it will prove useful in the selection of an appropriate system and form a useful reference in the design and construction process.

Notes to be read in conjunction with the Code of Practice

- This Code of Practice is intended for use by sports surfacing contractors, fencing contractors, sports facility design professionals and sports facility purchasers and owners. The Code of Practice should not be used as a substitute for carrying out appropriate surveys and obtaining professional advice in individual circumstances. Although the Code of Practice has been produced by reference to facilities constructed under normal climatic conditions in the United Kingdom, the Sports and Play Construction Association cannot accept any responsibility whatsoever for any loss, damage or injury whatsoever arising from reliance on the specifications within the Code of Practice.
- The Code of Practice provides minimum guideline specifications which members of the Sports and Play Construction Association are committed to meet. As guideline specifications, however, they do not supersede a reasonable interpretation of the specification and terms of contract applying in each project. For individual projects, variations in climate, soil conditions, topography and other site-specific conditions may necessitate standards of specification greater than those recommended in the Code of Practice.
- Users of the Code of Practice are advised to ensure that they are fully aware of any further technical requirements or criteria which may be imposed by a specific funding body for individual facility development projects.
- The information contained within the Code of Practice, whilst accurate at the time of publication, may be subject to change at a future date. Due to changing technology and new developments in construction methods as well as the changing requirements of the sport's governing bodies, revisions to the recommendations are likely, and only the most recent edition of the Code of Practice should therefore be used.
- A permanent joint committee will keep under review the use of the Code of Practice and will consider any suggestions for amendment, which should be addressed to the Chief Executive, The Sports and Play Construction Association, Federation House, Stoneleigh Park, Warwickshire CV8 2RF. Revision to the Code of Practice will be made when it is considered appropriate.

The Sports and Play Construction Association (SAPCA)

As the recognised UK trade association, SAPCA fosters excellence, professionalism and continuous improvement throughout the sports and play construction industry, in order to provide the high quality facilities necessary for the success of British sport.

SAPCA's Aims and Objectives

- To promote high standards of design, construction and workmanship for sports facilities in the UK.
- To regulate the industry through the vetting and monitoring of SAPCA members.
- To participate fully in the development of British, European and other Standards for the construction and performance of sports facilities, for all levels of play.
- To liaise closely with the governing bodies of sport, both nationally and internationally.
- To encourage the use of new technology in the design and construction of sports facilities.
- To provide and support training and education for the industry's workforce.
- To provide a strong voice for the sports construction industry in the UK.

www.sapca.org.uk

The SAPCA web site provides a wealth of valuable information for anyone involved in the development of sports facilities. Visit www.sapca.org.uk - for Industry News, Technical Guidance, Exhibitions & Events, the SAPCA Membership Database, and more. Visitors are invited to subscribe to the free SAPCA News Update service, for regular news bulletins.

Further information

The Sports and Play Construction Association operates through its own full-time administration. For further information, including a list of members, please contact SAPCA at the headquarters address below.

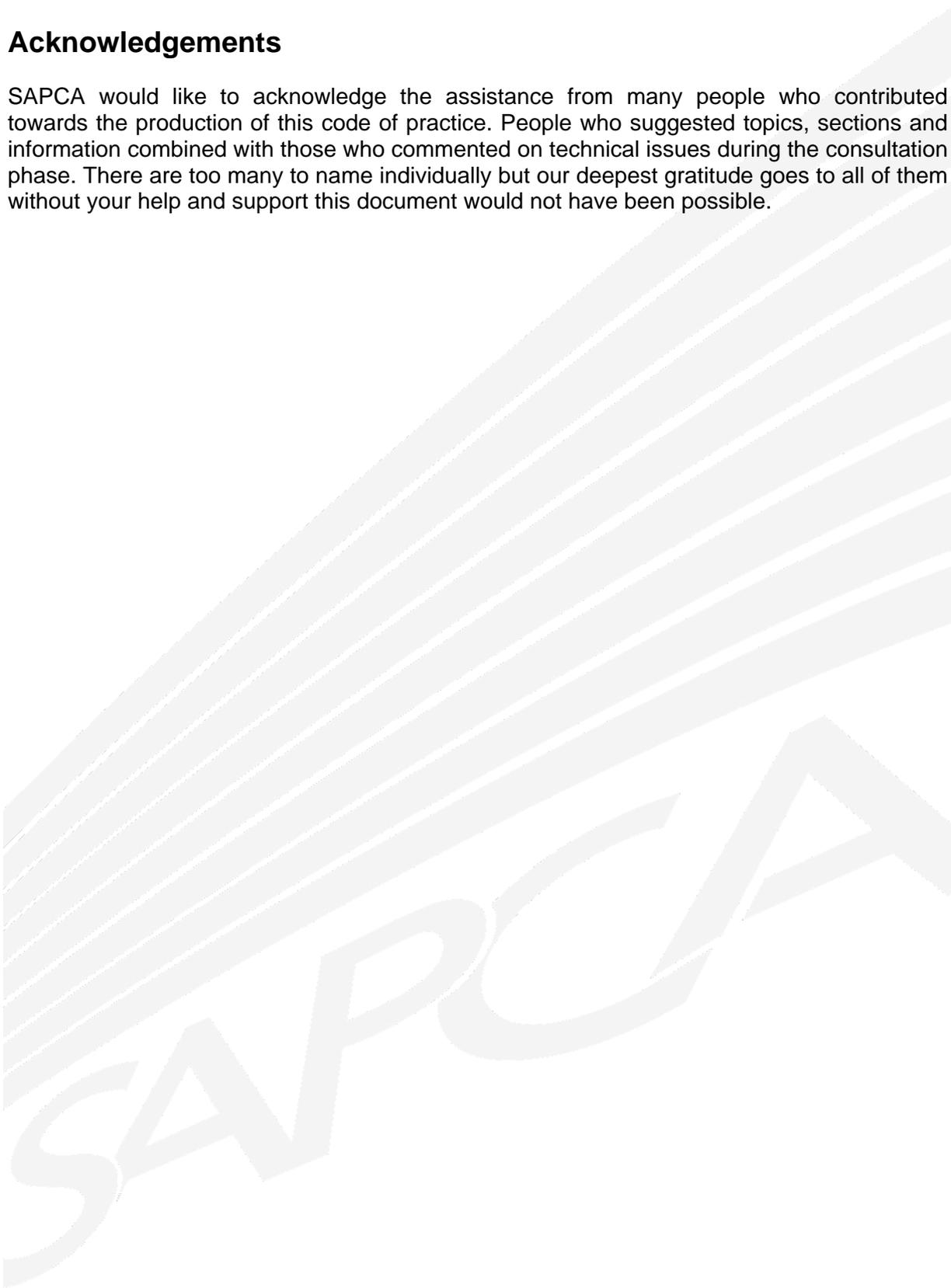
The Sports and Play Construction Association
Federation House
Stoneleigh Park
Warwickshire
CV8 2RF

Telephone: 024 7641 6316
Fax: 024 7641 4773
E-mail: info@sapca.org.uk
Web: www.sapca.org.uk



Acknowledgements

SAPCA would like to acknowledge the assistance from many people who contributed towards the production of this code of practice. People who suggested topics, sections and information combined with those who commented on technical issues during the consultation phase. There are too many to name individually but our deepest gratitude goes to all of them without your help and support this document would not have been possible.



Prologue

From the first considerations regarding the construction of a fencing system through to the final completion, a clear understanding is required of the process. The processes and decisions that need to be made can be complex and will depend upon many contributing factors.

The code of practice for the Construction and Maintenance of Fencing Systems for Sports Facilities has two main sections:

- The first deals with the construction of fencing systems and how they differ depending on the type of sports facility. Tennis is the first sport to be detailed and it lists types of fencing commonly used for the sport, which include systems such as tubular, chain link or mesh. Full sized sports pitches are detailed giving reference to perimeter, spectator and the types of fencing that can be used for each purpose. This document then provides guidance of fencing systems for athletics tracks and multi-use games areas (MUGAs).

The technical guidance within this first section provides a detailed approach to how a fencing system is constructed. The diagram on the following page is designed to help potential clients make the correct decisions at the right times by looking at the ideal routes a project may take from proposal to completion and the information required at each stage.

- The second section details the maintenance for the entire fencing system and why the system should be maintained. It describes maintenance requirements that must be taken into consideration for chain link, ball rebound and paint and protecting the systems. This is to ensure they are kept in a safe condition and can act as the purpose intended.

Construction of a Fencing System for Sports Facilities

This phase reviews the project brief and considers factors such as; location, sports usage, funding, procurement and project management.

1. Project Brief

This phase includes the development of a business plan, planning application and, if required, funding application. A consultant should be appointed during this phase.

2. Project Feasibility

Prior to the design phase a detailed site investigation is required. This includes topographical, geotechnical, electrical and drainage surveys.

3. Site Investigation

This phase includes the production of full design specifications and technical drawings.

4. Design Specification

In this section a review of the tender submissions is undertaken. This includes tender evaluation, short-listing and eventual contractor selection.

5. Tender Process

This phase includes the construction of the facility. If required independent quality control is undertaken to assess build quality and design specification conformity.

6. Construction Period

This section includes the hand-over of the completed project. If required performance testing should be undertaken to ensure compliance. Additionally, a maintenance regime should be provided by the installer/carpet manufacturer.

7. Project Completion

This phase includes the ongoing maintenance programme and warranty period of the installation. As required performance tests are undertaken to monitor surface behaviour.

8. Aftercare

1 Section One: General Construction Requirements

1.1 Design Considerations

The choice of surround fencing is usually dictated by the priority sport, site constraints and budget. The basic functions of a surround are to:

- Retain or rebound balls within the playing area
- Allow spectators to view the game safely
- Be aesthetically pleasing

In some locations, other major considerations may include security, keeping the surface free from contaminants and the need to keep out animals.

Each site will have its own specific requirements in terms of design and available budget.

Planning Permission and/or Building Warrant may be required from the Local Authority for new fencing installations.

A good contractor should be able to demonstrate a variety of options and advise on the advantages and disadvantages of each system. However the following guideline requirements apply generally.

1.2 Tennis

1.2.1 Rolled Steel Angle with Chainlink/Weldmesh Roll Cladding

1.2.1.1 Height of Fence

It is generally accepted that the recommended minimum height for a tennis surround is 2.75m. Higher sections are advisable when the court is sited adjacent to roads, etc.

Low viewing sections can be provided to sides at a minimum height of 900mm. With low viewing areas, provision should be made in the fence design to ensure that the top of the chainlink will not cause a hazard to players or spectators.

The maximum/minimum height of fencing is usually determined by the court's location in relation to surrounding properties and by local planning requirements. All safety standards should be adhered to.

1.2.1.2 Cladding Components and materials

PVC coated Chainlink on a galvanised steel wire core

Recommended grades:

Domestic tennis courts: 50 x 3.15/2.24mm (min.)

Tennis club courts: 50 x 3.55/2.50mm (min.)

The mesh dimension of 50mm is the most common size used throughout the industry for reasons of cost and ready availability. Specifiers should be aware however that, on rare occasions, a tennis ball impacting perpendicular to the fence at centre mesh may exit the court. A more costly 45mm mesh is available but should only be considered if total ball retention is essential.

Line Wire:

The Line wire should be PVC coated on galvanised steel wire core.

Size recommended: One size greater than the gauge of the chainlink e.g. 3.55/2.50 for 3.15/2.24 link and 4.00/300mm diameter wire for 3.55 /2.50 link.

There should be a minimum of 3 No line wires for 900 mm high link. 5 No line wires for 2.75m link and 6 No line wires for 3.6m high chainlink.

Consideration should be given to the lower section of the fencing to reduce the risk of damage. Either a bottom rail or additional line wires are options.

Please note that even with strict supervision of the installation, chainlink fencing is prone to distortion by people leaning or playing heavier ball games like football against the fence.

The cladding shall be on the internal face of the posts. (The playing side)

Where cost considerations demand, it is permissible to use galvanised chainlink and appropriate line wire systems without PVC coatings.

1.2.1.3 Steelwork

Intermediate posts (Line posts)

The minimum size for domestic courts should be 45 x 45 x 5mm, rolled steel angle posts with a minimum of 3.5m overall length for 2.75 fence height. Club courts should have a minimum 50 x 50 x 6 mm section. For 3.6m high fencing the overall length should be 4.4m.

Corner & straining Posts

For domestic and club courts the corner straining posts, gate posts and two-way straining posts should all be constructed from 60 x 60 x 6mm angle iron, 3.5m long overall length for a 2.75m high fence and 4.4m overall length for a 3.6m high fence. Straining posts should be ragged or have a welded base flat/plate on the end below ground.

Struts and cross stays

Each two-way straining post and corner post should have two struts each complete with one cross stay per strut. Minimum size of struts and cross stays 40 x 40 x 5mm Rolled steel angle. Ends and gate end Straining post should have one strut and cross stay.

Struts should be ragged or have a welded base flat/plate on the end below ground.

For spectator areas

A minimum of 40 x 40 x 3 mm SHS (box) section posts or 42.1 mm outside diameter x 2mm CHS (tube) should be used to prevent any injuries. If a top rail/leaning rail is required then a minimum of 40 x 40 x 5 mm angle iron with a 20 x 5 mm clamp bar or a 42.1 x 2 mm tube should be used. Attention should be made to ensure that the top of the chainlink on viewing areas will not cause a hazard to players or spectators. If required a safety/shield guard may be used.

If top or bottom rails are required, a minimum of 40 x 40 x 5mm rolled steel angle fitted with a 20 x 5 mm clamp bar threaded through the chainlink or 42.1 mm o.d. tubular rails should be used.

1.2.1.4 Gate Frames & Gates

In the case of domestic courts, entry gate frames shall be minimum of 2m high and 1m wide. Club courts should be a minimum of 1.2m wide.

In viewing areas the minimum gate height should match the fence at 900 mm high.

Gates may be manufactured from a minimum 40 x 40 x 5mm rolled steel angle or other approved section. The space above the 2 m high gates to be infilled with chain link fixed by 20 x 5 mm clamp bars to 2 No. lintel bars 40 x 40 x 5mm rolled steel angle.

Gates should open out of court if possible.

Gates should be provided with lockable latches. Handles should not protrude into the court.

1.2.1.5 Protective Treatment

Steelwork

Hot dip galvanised to BS EN ISO 1461

Powder Coating to BS EN 6497

(If the galvanised steelwork is to be painted after erection a mordant wash should be applied prior to painting).

Care must be taken to ensure that no sharp edges are left after galvanising.

All holes must be drilled prior to hot dipped galvanising.

All welding must take place before hot dipped galvanising.

Bolts and nuts for fixing wire winders, struts and cross stays HRH should be galvanised or stainless steel.

1.2.1.6 Fittings

Wire Winders

Winders for the line wire should either be purpose designed or be manufactured from mild steel flat, fitted with a winding bolt 12mm diameter and ferrule all with a galvanised finish. The winders should be fixed to the main standards with straps or welded lugs/flats with M8 stainless / galvanised bolts. The winder should be of a suitable strength and type not to protrude into the court. All fixing bolts should be of a suitable length to avoid cutting or cropping.

Stretcher Bars/Clamp Bars

Stretcher bars are designed to clamp the mesh at the corner/straining post. They are manufactured from 20 x 5mm mild steel flat secured to the posts or wire winders. To suit 2.75m high fence these bars are slotted 5 times. To suit a 900mm high fence they are slotted 3 times. To suit a 3.6m high fence they are slotted 6 times. 2 No stretcher bars are required per corner or two way strainer and 1 per gate/end straining post.

1.2.1.7 Concrete surrounding base of posts and struts.

Concrete surrounding the bases of posts and struts should be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water. The constituents should be thoroughly mixed and the concrete placed in position and compacted to the full depth of the hole as soon as possible after mixing.

1.2.1.8 Installation

Straining posts

Straining posts should be provided at all corners and at any points where a change in direction or acute variation in level occurs.

Two-way straining posts should be installed in any tennis court surround where the length between corners exceeds 36m.

The holes for the straining posts should be filled full depth with concrete, which should be rammed as filling proceeds.

Intermediate posts (line posts)

Should be set at a maximum of 3.5m centres for domestic courts and 3m centres on a club court and be concreted in to the ground to the full depth of the hole.

See FIG 1 & FIG 2 for further information. (Pages 23 & 24)

Struts

Struts should be fitted to all straining posts with HRH stainless steel/galvanised bolts and nuts. Struts should be fitted within the top third of the length of the straining post above ground. Or, alternatively, horizontal bracing rails can be used.

Fixing of chain link

Chain link should be strained between each pair of straining posts and secured at each end by 20 x 5mm stretcher bars. The chain link must be attached to line wires with fencing clips or tie wires, the same colour as the chain link, or threaded through the mesh. It should be noted that even with strict supervision of the installation, chainlink fencing is prone to distortion by people resting against the fence or by heavier ball impact.

All steelwork including struts should be on the outside of the chain link fencing.

Screens and windbreaks

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.2.2 Tubular (RHS & CHS)

Specification requirements for chain link fencing or welded mesh rolls and circular or rectangular tubular steel posts for tennis court surrounds

1.2.2.1 Height of Fence

See Section 1.2.1.1

1.2.2.2 Cladding Components and materials

PVC coated chainlink on a galvanised steel wire core.

Recommended grades:

Domestic tennis courts: 50 x 3.15/2.24mm (min.)

Tennis club courts: 50 x 3.55/2.50mm (min.)

The mesh dimension of 50mm is the most common size used throughout the industry for reasons of cost and ready availability. Specifiers should be aware however that, on rare occasions, a tennis ball impacting perpendicular to the fence at centre mesh may exit the court. A more costly 45mm mesh is available but should only be considered if total ball retention is essential.

Line wire:

The Line wire should be PVC coated on galvanised steel wire core.

Size recommended: One size greater than the gauge of the chainlink e.g. 3.55/2.50 for 3.15/2.24 link and 4.00/300mm diameter wire for 3.55 /2.50 link.

There should be a minimum of 3 No line wires for 900 mm high link. 5 No line wires for 2.75m link and 6 No line wires for 3.6m high chainlink.

Consideration should be given to the lower section of the fencing to reduce the risk of damage. Either a bottom rail or additional line wires are options.

Please note that even with strict supervision of the installation, chainlink fencing is prone to distortion by people leaning or playing heavier ball games like football against the fence.

The cladding shall be on the internal face of the posts. (The playing side)

Welded mesh rolls.

Plastic coated on galvanised core wire.

Minimum 50 x 50 x 3.5/3.0mm wire

When welded mesh is specified, the intermediate posts should be set at maximum 3m centres and the mesh should be supported on either 3.55mm line steel galvanised or 3.15mm high tensile line wire clipped with stainless steel clips (5 per line per metre) Straining posts should have full length flat/s for fixing mesh with 25 x 5mm (minimum) stretcher bars. Where no top rail is specified, struts should be supplied with suitable cross stays or, alternatively, horizontal bracing rails can be used.

The cladding should be on the internal face of the posts. (The playing side) Welded mesh should be overlapped at joints and secured with stainless steel clips. Minimum overlap, horizontally and vertically, 150mm. (i.e. 3 no apertures if using 50 x 50 mesh.)

Line wire:

A minimum of 3 no line wires are required for 900mm high fence and 5 no line wires for 2.75m high fence and 6 no line wires for 3.6m high fence.

Consideration should be given to the lower section of the fencing to reduce the risk of damage. Either a bottom rail or additional line wires are options.

1.2.2.3 Hollow Section Steelwork

Domestic courts

The Intermediate posts should have a minimum dimension of 42mm O/D x 2.5mm, Circular Hollow Section (CHS), Or 50 x 30 x 3mm Rectangular hollow section (RHS).

The overall post length should not be less than:

- 1.5m long for 900mm high fencing
- 3.5m long for 2.75m high fencing
- 4.4m long for 3.6m high fencing

Club Courts

For club courts the intermediate posts should have a minimum dimension of 60.3mm O/D x 3mm Circular hollow section or 50 x 30 x3mm/ Rectangular Hollow Section.

See Fig 1 and Fig 2 for further detail.

Main standards

All corner straining posts, gate posts and two way straining posts should have a minimum dimension of 60.3mm O/D x 3.2mm Circular Hollow Section or 60 x 60 x 3 mm Rectangular Hollow Section (it is recommended that all tube main standards should have either a base flat/plate or supplied with a hole for a dowel rod.

Straining posts for welded mesh should have either two separate 25 x 5 mm stretcher bars to clamp the welded mesh to the post (minimum) or a full length flat welded to the post with a separate 25 x 5 mm stretcher bar or other alternative secure clamping system.

Strutted System

Intermediate straining posts and corner posts should have two struts of 42mm O/D x 2mm (minimum) Circular Hollow Section or 50 x 30 x 3mm (minimum) Rectangular Hollow Section. Box section courts should have a single cross stay. Alternatively horizontal rails can be used. Straining posts for welded mesh should have either two separate 25 x 5mm straining bars to clamp the welded mesh to the post (minimum) or a full length flat welded to the post and a separate 25 x 5mm stretcher bar or other alternative secure clamping system.

Gate end Straining posts should have one strut minimum 42mm O/D x 2mm Circular Hollow Section or minimum 50 x 30 x 3mm Rectangular Hollow Section. Box section systems should have a single cross stay. Alternatively horizontal rails can be used. Straining posts for welded mesh should have either two separate 25 x 5mm (minimum) straining bars to clamp the welded mesh to the post or a full length flat welded to the post and a separate 25 x 5mm stretcher bar or other alternative secure clamping system.

Top Rail System

Top Rail should be a minimum of 34.9mm O/D x 1.6mm Circular Hollow Section joined where appropriate. The top rail should be joined to the main standards with end caps attached to bracing straps/clamps or welded lugs/flats, with stainless/galvanised 8mm bolts. The welded mesh should be fixed securely to the top rail with suitable fixings or purpose designed clamps. Alternatively the Top Rail used on a RHS fence may be a minimum dimension 40 x 40 x 5mm Rolled Steel Angle, bolted to fixing lugs welded at the top of the posts, and supplied with a 20 x 5mm (minimum) slotted stretcher bar for chainlink and 25 x 5 mm (minimum) for welded mesh for securing the top edge of the chosen material.

Straining posts for welded mesh should have either two separate 25 x 5mm straining bars to clamp the welded mesh to the post (minimum) or a full length flat welded to the post and a separate 25 x 5mm stretcher bar or other alternative secure clamping system.

1.2.2.4 Gates & Gate Frames

In the case of domestic courts, entry gate frames shall be a minimum of 2m high and 1m wide. Club courts should be a minimum of 1.2m wide.

In viewing areas the minimum gate height should match the fence at 900 mm high.

Gates should be manufactured from minimum of 42mm O/D x 2mm Circular Hollow Section or 50 x 30 x 3mm Rectangular Hollow Section. The gate leaf should be in-filled with chain link or welded mesh, fastened to the frame with slotted stretcher bars 25 x 5mm (minimum

for welded mesh) 20 x 5mm flat (minimum for chainlink) The space above the gates should be in-filled with chain link, or welded mesh, fixed to two lintel bars, 42mm O/D x 2mm Circular Hollow Section, or Rectangular Hollow Section 50 x 30 x 3mm lintels, supplied with a 20 x 5mm minimum chainlink or 25 x 5mm minimum for welded mesh.

The chainlink/welded mesh should be fixed securely to the lintels with suitable fixings or purpose designed clamps.

Gates should, preferably, open out of court and be supplied with a lockable latch. Handles should not protrude into the court.

1.2.2.5 Protective Treatment

See section 1.2.1.5

1.2.2.6 Fittings

See section 1.2.1.6

1.2.2.7 Concrete surrounding base of posts and struts.

See section 1.2.1.7

1.2.2.8 Installation

See section 1.2.1.8

Line Wire

Line wires may either be threaded through a pvc bush attached to the face of the post, or threaded side to side through holes or through a suitable ring clip, or lashed with stirrup wires through holes in each side of the posts.

Fixing of chain link

Chain link should be strained between each pair of straining posts and secured at each end by stretcher bars. The chain link should be attached to line wires with fencing clips the same colour as the chain link (5 per line per metre) or threaded through the mesh. Chain link should be fixed securely to the top rail with suitable fixings or purpose designed clamps.

Fixing of welded mesh

Welded mesh should be strained between each pair of straining posts and secured at each end by stretcher bars bolted to the front face of the posts. The welded mesh should be attached to line wires with stainless steel clips (5 per line per metre) If an angle iron or rectangular box section top/bottom rail is to be used, then the welded mesh should be clamped to the rail with a 20 x 5mm (minimum) stretcher bar and 8mm bolts. If a tubular top/bottom rail is used, the welded mesh should be fixed securely to the rail with suitable fixings or purpose designed clamps.

All steelwork, including rails and struts, should be on the outside of the chain link or welded mesh fencing. (I.e. outside of the court)

Screens and windbreaks

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.2.3 Welded Mesh Panels on Rectangular Hollow Section Posts

Traditionally, tennis courts have been constructed using a chain link cladding. When placed in public areas, a system based upon welded mesh panels may also be considered. These systems offer a higher degree of vandal resistance but will have totally different rebound characteristics to chain link.

1.2.3.1 Height of Fence

Recommended minimum height 2.75m. Higher sections are advisable when adjacent to roads, etc. Low viewing sections to sides of courts should have a minimum height of 900mm. Provision must be made to ensure that the top of the welded mesh panels on viewing areas will not cause a hazard to players or spectators.

The maximum/minimum height of fencing is usually determined by the court's location in relation to surrounding properties and by local planning requirements. All safety standards should be adhered to.

1.2.3.2 Cladding Components and materials

Welded mesh panels may be manufactured from mild steel, galvanised and optionally polyester powder coated. There are a variety of robust welded mesh panel systems available

1.2.3.3 Steelwork

Steel work for this type of fence would depend on the cladding materials specified.

1.2.3.4 Gate Frames & Gates

Gate frames shall be minimum of 2m high and 1m wide (domestic courts) 1.2m wide (club courts). Gates should be manufactured from a minimum 50 x 50 x 3mm rectangular hollow section or other approved section. The Gate and the space above should be in filled with welded mesh to match the rest of the court.

Whenever possible, gates should be specified to open through 180 degrees so that they close against the back of the fence.

Gates should be provided with lockable latches. Handles should not protrude into the court.

1.2.3.5 Protective Treatments

Hot dip galvanised to BS EN ISO 1461

Powder Coating to BS EN 6497

Care must be taken to ensure that no sharp edges are left after galvanising.

- All holes must be drilled prior to hot dipped galvanising.
- All welding must take place before hot dipped galvanising.
- Bolts and nuts for fixing panels should be galvanised or stainless steel.

1.2.3.6 Fittings

Stretcher bars/clamp bars

Stretcher bars (if fitted) should be fabricated from adequate section mild steel flat or pre-formed equivalent.

1.2.3.7 Concrete surrounding base of posts and struts

Concrete surrounding the bases of posts and struts to be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water. The constituents to be thoroughly mixed and the concrete placed in position and compacted as soon as possible after mixing.

1.2.3.8 Installation

Where two adjoining panels meet at a post, due care and attention should be paid when setting out the court to ensure that post centres are correct.

Where the fencing needs to step due to changes in levels, steps should be even along the run of fencing.

Posts holes should be neatly dug with straight sides, filled full depth with concrete, which should be rammed as filling proceeds.

Welded mesh panels should be installed on the inside (playing side) surface of posts.

Where panels are cut, e.g. at the end of a run, at a corner or when meeting a gatepost, care should be taken to ensure the cut-end of the panels do not endanger the players. Any cut-ends of the panels should be touched up with galvafruid spray/paint to manufacturer's specification.

Screens and windbreaks:

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.3 Full Sized Sports Pitches

1.3.1 Perimeter fence

Specification requirements for welded mesh fencing and steel posts for Hockey and football pitch surrounds.

1.3.1.1 Height of Fence

Height of fence will normally be in the range 3.0m – 5.0m.

The maximum/minimum height of fencing is usually determined by the pitch location in relation to surrounding properties and local planning requirements or by client requirements. All safety standards should be adhered to.

Lower viewing sections may be required in some cases and spectator rails are a common requirement.

1.3.1.2 Cladding Components and materials

The most common form of cladding is welded mesh in its various forms and specifications. Most common of these is welded mesh in rolls.

When specified as galvanised the wire in the mesh should have a minimum 3mm diameter, 50 x 50mm mesh size.

If the specification calls for PVC coating, the minimum gauge should be 3.50 / 3.0mm with a 50 x 50mm mesh size.

Line wire

Either a 3.55 galvanised mild steel or a 3.15mm high tensile wire should be used with welded mesh. Where required PVC coated wire may be used.

1.3.1.3 Steelwork

For post section and details see **Fig 1** for Rolled Hollow Section (RHS) and **Fig 2** for Circular Hollow Section (CHS)

Up to and including 3m high

Each two way straining post and corner straining post should have two struts with cross stays, manufactured from 42.1mm O.D. (min.) CHS or 50 x 30 x 3mm RHS (min.), or alternatively horizontal rails can be used.

Gate posts and end straining posts should have one strut and two cross stays. Alternatively horizontal rails can be used.

Horizontal rail options: 34.9mm o/d x 1.6mm (light duty minimum) or 42.1mm o/d x 2.0mm (heavy duty minimum)

When a timber kickboard is required, all posts with should be fitted with a welded plate/s or separate fixing brackets for attachment to the specified height to suit the specified kickboard.

Above 3m high, up to and including, 3.6m High

Each two way straining post and corner straining post should have two struts with suitable cross stay manufactured from 42.1mm OD, CHS (min.) or 50 x 30 x 3mm RHS.(min.)

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Gate posts and end straining posts should have one strut and three cross stays. Or alternatively horizontal rails can be used.

Horizontal rail options: 34.9mm o/d x 1.6mm (light duty minimum) or 42.1mm o/d x 2.0mm (heavy duty minimum)

When a timber kickboard is required, all posts with should be fitted with a welded plate/s or separate fixing brackets for attachment to the specified height to suit the specified kickboard.

Above 3.6m high, up to and including, 4.5m High

Each two way straining post and comer straining post should have two struts with suitable cross stays manufactured from 50 x 30 x 3mm RHS. Alternatively horizontal rails can be used.

Gate posts and end straining posts should have one strut and three cross stays. Alternatively horizontal rails can be used.

Horizontal rail options: 34.9mm o/d x 1.6mm (light duty minimum) or 42.1mm o/d x 2.0mm (heavy duty minimum).

When a timber kickboard is required, all posts with should be fitted with a welded plate/s or separate fixing brackets for attachment to the specified height to suit the specified kickboard.

Table 1 Requirements for a Rectangular Hollow Section Fence Surround (RHS)

Suitable for use with standard weights of Rolled Welded Mesh and Rolled Chainlink.

PROPOSED FENCE HEIGHT		1.0 – 3.0M	3.0 – 3.6M	3.6 – 4.5M
1	Minimum size rectangular hollow section (mm)	50 x 30 x 3	60 x 40 x 3	60 x 40 x 3 (minimum standard)
2	Corner/end/strainer post section (mm)	60 x 60 x 3	60 x 60 x 3	60 x 60 x 3 (minimum standard)
3	Min. Post foundation dimensions (mm)*	350 x 350 x 750	450 x 450 x 850	450 x 450 x 950
4	Line wires only, with no top rail or horizontal rails	Struts required for corner/end/ strainer posts		
5	Min. number of horizontal bracing rails (no top rails or struts)	1	2	3
6	Maximum post centres in metres	3.0	3.0	3.0

Table 1-Requirements for a RHS fence

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Note: If a top rail is specified, additional bracing rails/struts may be required on certain heights and specifications.

* These are minimum recommendations for good soil conditions, but due regard should be given to localised ground conditions and the exposure to the prevailing wind. Advice should be sought from an experienced manufacturer/installer.

Table 2 Requirements for a Tubular Fence Surround Circular Hollow Section (CHS)

Assumed External Tube diameter = 60.3mm (minimum specification)

Suitable for use with standard weights of Rolled Welded Mesh and Rolled Chainlink.

PROPOSED FENCE HEIGHT		1.0 – 2.4m	2.4 – 3.6m	3.6 – 4.5m
1	Intermediate post wall thickness (Minimum mm)	2	3	3
2	Corner/end/strainer post wall thickness (min. mm)	3	3	3
3	Min. Post foundation dimensions (mm)*	350 x 350 x 750	400 x 400 x 850	450 x 450 x 950
4	Line wires only, with no top rail or horizontal bracing rails.	Struts required for corner/end/ strainer posts		
5	Min. number of horizontal bracing rails at straining posts (if no top rails or struts are required)	1	2	3
6	Maximum post centres in metres	3.0	3.0	3.0

Table 2 Requirements for a CHS fence

Horizontal rail options: 34.9mm o/d x 1.6mm (light duty)

42.1mm o/d x 2.0mm (heavy duty)

* These are minimum recommendations for good soil conditions, but due regard should be given to localised ground conditions and the exposure to the prevailing wind. Advice should be sought from an experienced manufacturer/installer.

1.3.1.4 Gate Frames & Gates

Single leaf gates should be a minimum of 1.2m wide x 2m high and be manufactured from a minimum 50 x 30 x 3mm RHS.

The space above the gate should be filled with welded mesh fixed to 2 No lintel bars 50 x 30 x 3mm by means of 25 x 5 mm (minimum) stretcher bars.

Single gates should have lockable slide latch/bar. Handles should not protrude into the pitch.

Double leaf gates should be a minimum 2.5m high x 3m wide and be manufactured from a minimum 50 x 30 x 3mm RHS.

The space above the gate should be filled with welded mesh fixed to 2 No lintel bars 50 x 30 x 3mm by means of 25 x 5 mm (minimum) stretcher bars.

Double gates should have lockable slide latch/bar and lockable drop bolts if specified. Handles should not protrude into the pitch.

Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

1.3.1.5 Protective Treatment

See section 1.2.1.5

1.3.1.6 Timber kick-board (for hockey)

Where specified, the timber kick-board at the base of the perimeter fence should be minimum 150 x 38mm sawn timber. Normal practice would be to use a 200 x 50mm (nominal) section, planed on two faces (i.e. 1 no 200 mm face and 1 no 50 mm face) Tanalith E treated softwood.

It should be noted that, being a natural material, softwood boards are prone to warping and splitting and the grain may lift when treated.

The end of each board should be secured to each post with a minimum 2 no 8 mm CSH bolts (dome headed)

1.3.1.7 Fittings

All nuts and bolts should be galvanised or stainless steel. And be of a suitable length to avoid cutting or trimming.

1.3.1.8 Installation

Mesh should be taken behind kick-board. (Minimum of 50 mm)

Metal, PVC or welded caps shall be fitted to the top of all posts. Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

On low level fencing a tubular leaning rail, set above mesh, should be considered. No ends of mesh or wire shall cause hazard to players.

There shall be no protruding fence or other fixings within the pitch. All fixing bolts shall be assembled safely with any protruding thread/nut on outside of the court, shear nuts fitted if necessary.

If security nuts are to be fitted to the timber boards, an alternative security nut should be used, as shear nuts will over tighten the bolts and cause damage the face of the timber boards when tightened.

1.3.1.9 Concrete surrounding base of posts and struts

Concrete surrounding the bases of posts and struts should be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water.

The constituents should be thoroughly mixed and the concrete placed in position, to the full depth of the hole, and compacted as soon as possible after mixing.

1.3.1.10 Post hole sizes

See Table 1 and Table 2.

1.3.1.11 Struts

Struts should be fitted to all straining posts with M10 bolts and nuts. Struts should be fitted to the outside of the facility and within the top third of the length of the straining posts above ground.

Struts should have cross stays of the same cross section as the strut.

1.3.1.11.1 Top rails

If a top rail is specified it should be positioned at the very top of the fence bolting onto the adjacent posts using a minimum of 8 mm bolts.

The mesh should be secured to the top rails by the previous methods described.

Top rails should be fitted to the outside of the fence. On certain heights of fence, when using a top rail, additional bracing may be required.

Please consult your fencing manufacturer for further details.

1.3.1.11.2 Horizontal/bracing rails

If bracing/horizontal rails are specified they should be positioned to the outside of the fence, fixing to the adjacent posts using a minimum of 8 mm bolts.

1.3.1.12 Intermediate posts

Intermediate posts set at maximum 3m centres and concreted into ground.

1.3.1.13 Line Wires

Line wires may either be threaded through a pvc bush attached to the face of the post, or threaded side to side through holes or through a suitable ring clip, or lashed with stirrup wires through holes in each side of the posts.

Where a top rail is used a top cap is fitted over the top of the line post to accept the top rail.

- 3m high fences to have minimum 5 No line wires
- 3.6m high fence to have minimum 6 no line wires
- 4.5m high fences to have minimum 7 No line wires

Specifiers may wish to add extra line wires, up-graded mesh or rails for additional strength.

1.3.1.14 Welded mesh

Welded mesh should be overlapped at joints and secured with stainless steel clips. Minimum overlap horizontally and vertically 150mm. (i.e. 3 No. apertures if using 50 x 50 mesh).

1.3.1.15 Stretcher bars

Stretcher bars should be manufactured from 25 x 5mm flat. (Minimum) All steelwork including struts and rails should be on the outside of the welded mesh. (I.e. on the outside of pitch)

Screens and windbreaks

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.3.2 Spectator Fence for a Pitch

1.3.2.1 Height of Fence

Height of fence to spectator rail should be 1.2m

1.3.2.2 Cladding Components and materials

The cladding system for a spectator fence should be galvanised or PVC coated welded mesh. Minimum gauge 50 x 50 x 3mm galvanised and 50 x 50 x 3.5 x 3mm PVC coated.

For kickboard details, see Clause 1.3.1.6

1.3.2.3 Line Wire

3.15mm high tensile wire or 3.55mm mild steel galvanised wire should be used with welded mesh.

Welded mesh must be secured to line wires with stainless steel clips. (5 per line per metre)

1.3.2.4 Steelwork

Intermediates and main standards should be a minimum of 60.3 x 2 mm outside diameter tube and 1.8m overall length. Posts should have flats, holed to accept kick-board in playing area. All posts fitted with appropriate caps.

1.3.2.5 Leaning rail

Minimum 42.1 x 2mm Circular Hollow Section fixed to posts internally.

1.3.2.6 Gate Frames & Gates

The minimum gate frame construction should be either 42.1 x 2mm outside diameter tube or 50 x 30 x 3 mm RHS section with a 42.1 x 2 mm o.d. tube top rail to suit.

The gate should be fitted with a lockable slide latch and the handles must not protrude into the playing area. The gate should be clad with welded mesh to suit the system, fixed with 25 x 5mm (minimum) stretcher bars.

Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

1.3.2.7 Protective Treatment

See Clause 1.2.1.5

1.3.2.8 Fittings

Wire winders

Winders for the line wires should either be purpose designed or be manufactured from mild steel flat, fitted with a winding bolt 12mm diameter and ferrule all with a galvanised finish.

The winders should be fixed to the main standards with straps or welded lugs/flats with M8 stainless / galvanised bolts. The winder should be of a suitable strength and type not to protrude into the court. All fixing bolts should be of a suitable length to avoid cutting or cropping.

Stretcher bars

Stretcher bars should be manufactured from 25 x 5mm mild steel flat (minimum).

1.3.2.9 Concrete surrounding base of posts and struts.

Concrete surrounding the bases of posts and struts should be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water.

The constituents should be thoroughly mixed and the concrete placed in position and compacted to the full depth of the hole as soon as possible after mixing.

1.3.2.10 Installation

Straining posts should be provided at all corners and at any points where a change of direction or acute change in level occurs.

Intermediates should be installed at maximum 3m centres.

Line wires may either be threaded through a pvc bush attached to the face of the post, or threaded side to side through holes or through a suitable ring clip, or lashed with stirrup wires through holes in each side of the posts.

All steelwork should be on outside of fence. (I.e. outside of the pitch)

1.3.3 Welded Mesh Panels on Box/Rectangular/Circular Hollow Section Posts

Traditionally, hockey and football have been constructed using a roll-form welded mesh cladding. When placed in public areas, a system based upon heavier duty welded mesh panels (as opposed to rolls) may also be considered.

These systems may, subject to individual specification, offer a higher degree of vandal resistance but will have different rebound characteristics. It is important that the specifier examine the mesh, the post and the fastening method when determining the suitability and durability of any system.

1.3.3.1 Height of Fence

Recommended height should be in the range 3.0m – 6.0m. Low viewing sections may be required.

1.3.3.2 Cladding Components and materials

Welded mesh panels manufactured from mild steel, galvanised and optionally polyester powder coated.

There are a variety of robust welded mesh panel systems available. Where children are the primary users considerations should be given, when selecting a cladding, to meeting the non-entrapment and avoidance of hazardous protrusions as defined under The Product Assessment Specification 30 1998 ("PAS 30") for Outdoor recreational multi-sport equipment.

At the time of writing this specification is as a draft BSI proposal – Draft EN 15312 Free access multi-sports equipment. This standard covers multisport ball court fence systems and defines avoidable hazards and relates not to just the mesh, but also the posts and how they are connected.

At the time of drafting this document, this BS EN 15312 is only a draft proposal, and does not necessarily apply to all situations covered by this Code of Practice

The cladding shall be on the internal face of the posts. (The playing side)

1.3.3.3 Steelwork

Up to and including 3.6m high

Intermediate and corner posts: minimum size 80 x 40mm rectangular hollow section.

Above 3.6m high and including 4.5m high

Intermediate and corner posts: minimum size 100 x 50mm rectangular hollow section.

Above 4.5m high and including 6.0m high

Intermediate and corner posts: minimum size 120 x 60mm square hollow section.

For lower spectator areas and lesser specification mesh, a minimum of 60 x 40mm rectangular hollow section can be used. Provision must be made to ensure that the top of the welded mesh panels on viewing areas will not cause a hazard to players or spectators.

1.3.3.4 Gate Frames & Gates

Single leaf gate frames shall be a minimum of 2m high and 1.2m wide, constructed from a minimum of 42mm circular hollow section or 60 x 40 x 3mm RHS in filled with mesh to suit. The space above the gate should be in filled with a panel to suit.

Single gates should have lockable slide latch/bar. Handles should not protrude into the court.

Double Leaf Gates should be a minimum of 2.5m wide x 3m high, constructed from a minimum 42mm circular hollow section or 60 x 40 x 3mm rectangular hollow section or other appropriate section. The Gate and the space above should be in filled with a welded mesh panel to match the rest of the fencing system.

Double gates should have lockable slide latch/bar and a lockable drop bolt to each leaf. Handles should not protrude into the court.

Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

1.3.3.5 Protective Treatment

Hot dip galvanised to BSEN ISO 1461

Powder Coating to BSEN 6497

Care must be taken to ensure that no sharp edges are left after galvanising;

- All holes must be drilled prior to hot dipped galvanising.
- All welding must take place before hot dipped galvanising.
- Bolts and nuts for fixing panels should be galvanised or stainless steel.

1.3.3.6 Timber kickboard (for Hockey)

See Clause 1.3.1.6

1.3.3.7 Fittings

Stretcher bars/clamp bars

Stretcher bars (if fitted) should be fabricated from adequate section mild steel flat or pre formed equivalent.

Concrete surrounding base of posts and struts

Concrete surrounding the bases of posts and struts should be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water.

The constituents to be thoroughly mixed and the concrete placed in position and compacted to the full depth of the hole as soon as possible after mixing.

1.3.3.8 Installation

Where 2 adjoining panels meet at a post, due care and attention should be paid when setting out the court to ensure that post centres are correct.

Where the fencing needs to step due to changes in levels, steps, (wherever possible) should be even along the run of fencing. Note should be made that on a sloping surface a gap will be created under one end of a stepped panel.

Posts holes should be neatly dug with straight sides, filled full depth with concrete, which should be rammed as filling proceeds.

Welded mesh panels should be installed on the inside (playing side) surface of posts.

Where panels are cut, e.g. at the end of a run, at a corner or when meeting a gate post, care should be taken to ensure the cut-ends of the panels do not endanger the players, any cut-ends of the panels should be touched up with galvafruid spray/paint to manufacturers specification.

Screens and windbreaks

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.3.4 Spectator Fence for Pitch - Welded Mesh Panels on Rectangular Hollow Section Posts

1.3.4.1 Height of Fence

Height of fence to spectator rail is normally 1.2m

1.3.4.2 Cladding Components and materials

Welded mesh panels manufactured from suitably robust mild steel, galvanised and optionally polyester powder coated.

The cladding shall be on the internal face of the posts. (The playing side)

1.3.4.3 Steelwork

A minimum of 60 x 40mm rectangular hollow section should be used. Provision must be made to ensure that the top of the welded mesh panels on viewing areas will not cause a hazard to players or spectators. All posts fitted with PVC/ welded caps.

1.3.4.4 Leaning rail

Minimum 42.1 x 2mm Circular Hollow Section (or suitable RHS section) fixed to posts internally.

1.3.4.5 Gate Frames & Gates

Minimum gate frames should be either 42 x 3.2mm o.d. tube or 60 x 40 x 3mm SHS section or suitable RHS section with a top rail to suit. Fitted with a lockable slide latch (or suitable locking mechanism), handles should not protrude into the pitch.

The gate should be in-filled with welded mesh to match rest of pitch. Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

1.3.4.6 Protective Treatment

See Clause 1.2.1.5

1.3.4.7 Timber kickboard (for Hockey)

See Clause 1.3.1.6

1.3.4.8 Fittings

Stretcher bars/clamp bars

Stretcher bars (if fitted) should be fabricated from adequate section mild steel flat or some pre-formed equivalent.

1.3.4.9 Concrete surrounding base of posts and struts

Concrete surrounding the bases of posts and struts should be a minimum strength classification of 20N with a coarse aggregate of 20mm nominal size, mixed with a minimum requisite quantity of water.

The constituents to be thoroughly mixed and the concrete placed in position and compacted to the full depth of the hole as soon as possible after mixing.

1.3.4.10 Installation

Where 2 adjoining panels meet at a post, due care and attention should be paid when setting out the court to ensure that post centres are correct.

Where the panelled fencing needs to step due to changes in levels, steps should be even along the run of fencing. Note should be made that on a sloping surface a gap will be created under one end of a stepped panel.

Posts holes should be neatly dug with straight sides, filled full depth with concrete, which should be rammed as filling proceeds.

Welded mesh panels should be installed on the inside (playing side) surface of posts.

Where panels are cut, e.g. at the end of a run, at a corner or when meeting a gate post, care should be taken to ensure the cut-ends of the panels do not endanger the players, any cut-ends of the panels should be touched up with galvafruid spray/paint to manufacturers specification.

1.4 Athletics

In the case of an athletics track the purpose of any fencing is more likely to be to act as an external boundary fence, or a spectator rail, rather than a fence to retain a ball as in the case of tennis, hockey, soccer, etc.

1.4.1 Height

The maximum/minimum height of fencing is usually determined by the track location in relation to surrounding properties and local planning requirements or by client requirements. All safety standards should be adhered to.

1.4.2 Access

Entry into the playing area will be required by players (able-bodied and disabled) maintenance machinery, emergency vehicles and possibly spectators.

One 3 metre wide double gate is therefore a minimum requirement. Additional pedestrian gates to be provided as required. To prevent contamination of the track surface, suitable facilities for cleaning footwear should be provided at each access point. These may consist of a hard standing area with foot-wipes, grilles etc.

1.4.3 Materials

Contact should be made with a reputable fencing manufacturer/contractor or a specialist consultant to discuss options. The specifications contained in the previous sections of this document will provide a satisfactory selection of fencing options.

1.4.4 External Trackside Fence

A 1.20m-high pedestrian barrier erected externally around the track, parallel to the outside kerb line, provides further security to the athletes and gives spectators a leaning rail at trackside.

This fence should not be located closer than 1.00m to the outside of the external kerb line.

A suitable barrier may be constructed from 2.0m-wide prefabricated galvanised steel panels consisting of a frame fabricated from 50mm x 30mm RHS with galvanised steel in-fill bars of 12mm diameter. Adjacent panels are bolted together using 2No M10 x 75mm galvanised nuts, bolts and washers.

Alternatively a suitable secure barrier with a tubular leaning rail in-filled with a suitable mesh/vertical bar infill may be considered or a welded mesh panel system such as in Clause 1.3.2.

Support legs should be set in concrete to a minimum thickness of 150mm on all sides.

1.5 Multi Use Games Areas (MUGAs)

1.5.1 Posts and Foundations

Posts are commonly installed in a range of heights from 1.2m to 5.0m. When considering the fence height, due regard should be given to the location of the facility, e.g. being close to a road where higher fence may be appropriate. Site security may be a consideration.

For RHS and CHS post dimensions and requirements Fig 1 & Fig 2 in section 1.3.

In the case of a rigid welded mesh panel system (or propriety system), straining posts are not required.

For steelwork treatments please refer to Clause 1.2.

1.5.2 Cladding Options

Typical rebound materials:

Table 3 Table showing the possible dimensions of different rebound materials

A simple rule recognized thought out the industry is the denser the material/mesh the truer the rebound

Material	Widths	Thickness
Recognised phenolic faced birch throughout boards plywood.	2.99/2.44 metre	18,12mm
Ranch style planed and treated timber boards 5 x 200 x 50mm (before planing)	Max. 3.0 metre	50mm
Dense wire mesh panels 76.2mm x 12.7mm x 4 mm (commonly known as 358 mesh)	2.515 metre	4mm
Open steel flooring panels 50mm x 38mm apertures.	2.0 metre	5mm rods with 25x3mm flats
Multi wire panels 50 x 66mm apertures.	2.5 metre	Twin 8mm horizontals single 6mm verticals
Open steel flooring panels 60 x 66mm apertures.	2.0 metre	5mm rods with 25 x 3mm flats
Welded Mesh panels 200 x 50 mm	2.5 to 3.0 metre	Minimum 6mm wires

Table 3 Rebound Size Chart

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The fence can be clad either with a full height rebound material or a minimum 1200mm high with a lighter material overhead.

When using timber rebound materials it would be usual to clad up to 1200mm only. It is good practice to raise the height of the rebound material to a minimum of 2.4 metre high to the back and sides of any goal recess or goal area.

If a rebound panel is added to the fencing it should be of high quality, true rebound panel like a phenolic coated rebound panel, 358-prison mesh panel, or a heavy duty open steel flooring panels.

The more solid the board or rebound panel the truer the rebound capabilities. If a 1200 mm high timber rebound board or a mesh panel is used then it should be supported by a minimum of 40 x 40 x 5 mm angle iron rails, top and bottom.

Heavy duty welded mesh panels are also now available that have a denser mesh pattern at the bottom of the panel to improve rebound qualities where this is required.

Above the rebound various welded mesh specifications are available:

- 75 x 25 x 3 - Galvanized only
- 75 x 25 x 3.55/3 - Galvanized wire core with a PVC Coating
- 50 x 50 x 3 - Galvanized only
- 50 x 50 x 3.55/3 - Galvanized wire core with a PVC Coating
- 200 x 50 Welded Mesh Panels manufactured from wires from 6 – 6/8mm with either single or double horizontal wires

Available either galvanised only or galvanised and polyester powder coated.

Fencing must be fixed to inside face of the playing area. Cladding should be 50mm x 50mm x 3mm galvanised welded mesh (minimum) 1800 metre high, mesh above boards/panels. The mesh should be supported on a minimum of 3 No line wires or horizontal rails.

Fixing should be by way of 5 stainless steel clips on line wires and by clamps on to rails.

1.5.2.1 Welded mesh panels and proprietary systems

For welded mesh panels, the vertical supports should be as above but minimum panel thickness will be 4mm and panels usually galvanised/bezinal/pre-galvanised and powder-coated or galvanised/bezinal only.

Manufacturers' specifications should be consulted for proprietary systems.

Chainlink of any kind is not recommended in this application as it is prone to ball damage and the wire ends will present a hazard at an inappropriate height, i.e. 1.2m above the court surface.

Other Considerations:

When selecting a post and cladding specification it is important to consider the court's level of use, the aesthetic appeal and the rebound qualities required. Is the court to be used in a highly supervised situation within a secure boundary fence with minimal risk of abuse, or is the court to be unsupervised, unrestricted and free to public access with the accompanying risk of vandalism?

What level of monies, if any, will be available in later years for maintenance?

Processed natural materials, such as timber, offer excellent rebound qualities at an economical cost; however in high vandalism areas the boards are prone to graffiti, burning, and de-lamination due to water ingress.

Open mesh rebound materials offer very good rebound qualities, are visually open, and no large surfaces to support graffiti and offer considerably more vandal resistance. These materials are likely to cost more initially but offer considerably reduced maintenance costs.

In highly demanding environments with totally open and unsupervised facilities it is increasingly popular to clad to the full height with a proprietary brand of steel rebound material. In all cases it is recommended that full height steel rebound material be used in and around goal areas

1.5.3 Ball Rebound Characteristics

Varying levels of importance can be attributed to the ball rebound characteristics depending upon the court's use.

To ensure a good quality ball rebound the material used must be rigid between the posts with minimal deflection of the rebound material on ball impact. The deflection is a function of the rigidity of the material itself and the distance between post centres. Recognised timber phenolic rebound boards should always be strengthened with top and bottom rails.

The degree by which posts or fittings protrude in front of the rebound material will affect the way a ball rebounds at that point. Both of these factors will detract from the "True Rebound" of the ball and the level of importance attributed to this needs to be considered by the specifier with due regards to the formality of the intended facility and the additional costs in achieving 'true rebound'.

Countersunk or domed bolts are recommended on the inner court side.

1.5.4 Line wires

Rebound materials do not require line wires but overhead welded mesh does. Having 3 of the line wires set at 250mm centres, just above the rebound panel, or other method of strengthening the welded mesh, would be good practice.

If the fencing is not having a heavy duty rebound panel fitted to the lower section, special attention should be given to the lower part of the fence to ensure durability. (Extra line wires/bottom rails)

Welded mesh panel systems do not require line wires.

1.5.5 Gates for pedestrians and maintenance

Single leaf gates should be a minimum of 1.2m wide x 2m high and be manufactured from a minimum 50 x 30 x 3mm RHS. The space above the gate should be filled with welded mesh fixed to 2 No lintel bars 50 x 30 x 3mm by means of 25 x 5mm (minimum) stretcher bars. Single gates should have lockable slide latch/bar. Handles should not protrude into the court.

Double leaf gates should be a minimum 2.5m high x 3m wide and be manufactured from a minimum 50 x 30 x 3mm RHS. The space above the gate should be filled with welded mesh fixed to 2 No lintel bars 50 x 30 x 3mm by means of 25 x 5mm (minimum) stretcher bars. Double gates should have lockable slide latch/bar and lockable drop bolts. Handles should not protrude into the court.

Whenever possible the gates should be specified to open through 180 degrees so they close against the back of the fence.

1.5.6 Screening and Windbreaks

The above specification is not suitable where it is intended to mount screens or windbreaks on the fence. If these facilities are required the fence must be designed for appropriate wind loading from either side of the fence.

1.5.7 Dividing fences

Dividing fences are often required to be temporary and present a number of practical problems. The same rebound performance is required and yet the fence must be in lightweight portable sections for removal. In this case ground sockets with slip resistant cover caps are required.

The practical considerations often require compromise. (Consult your fencing manufacturer and/or surfacing installer).

If permanent dividing fences are required to present a "playable face" to each court, this can be achieved with both timber and steel rebound mesh systems.

1.5.8 Goals

The goals may be recesses in the fence line or alternatively be a proprietary free standing brand of goal.

The design and dimensions of goal recesses will depend on the type of fence being specified, for instance pre-formed panel fences will require a design to suit the modular dimension of the panel.

If it is intended to use free standing goals within recesses, the design of the recess in the fence must take account of the external dimension of the goal structure (depth as well as width) and the need to manoeuvre the goal in and out of the recess.

In a multi-sport ball court the goal mouth dimensions are often a compromise between differing sports. The most popular proprietary dimensions are 3m wide x 2m high for junior football and hockey.

With recesses, the dimension of the gap will be governed by the dimension of portable goal being catered for.

The standard 'small sided' football goal dimensions are:

Mini soccer, 7-a side	3.66 x 1.83m
5-a-side senior	4.88 x 1.22m
5-a-side junior	3.66 x 1.22m
5-a-side mini	2.44 x 1.22m
Futsal	3.00 x 2.00m

Full size goals dimensions are:

Football	7.32 x 2.44m
Hockey	3.66 x 2.14m

All freestanding equipment should be substantial and robust in design whilst remaining easily manoeuvrable. When in use, freestanding equipment must be anchored by methods approved by the equipment supplier to prevent overturning.

The Football Association have produced guidance in the form of a document entitled Goals for Football: 2003.

This is available from the FA web site. BS 8461 and BS 8462 have been extended to include requirements for goals intended for youth football, Futsal, Mini-soccer and Small-sided football.

1.6 Programming

Wherever possible, it is important to have full layout drawings to work from.

The fence can be installed at a number of different stages and the choice often involves compromise.

a) After the stone sub base - This assumes that the stone has been sufficiently compacted to support the posts and that the macadam installer can work around the fence without colliding with it and causing damage or loosening posts. The tolerances on rebound fence systems are often such that the rebound panels require to be fitted along with the posts. The cost of later removal and refitting can be high.

b) After the base course macadam - Assuming correct compaction of the sub base stone this provides an ideal working surface for the fence installer. This still inhibits the working space for the macadam installer if a wearing course is required. If not compacted adequately by hand around posts, the macadam surface may disintegrate. If a sports surface of polymeric or synthetic turf is to be installed onto base course macadam' then this would be the best stage to install the fence.

c) After the wearing course: This permits the macadam installer a clear run for machinery without the hindrance of fence posts and increasing the likelihood of a better surface finish.

The fence is installed into the completed macadam and concreted up to 30mm below the finished level. The holes are subsequently "topped - off" with macadam and hand finished.



2 Section Two: Maintenance

2.1 General

Ensure gates are closed and the latches are in the closed position when not in use to prevent wind damage. Lubricate latches and locks.

Cut away any vegetation growing on fencing.

Apply a suitable weed-killer around perimeter of facility where fence meets ground.

Check intermediate posts, 2-way strainers and corners for stability, especially after high winds.

Wash down powder coated materials on a regular basis. Ask your supplier for details.

Any damage to steelwork (i.e. exposed bare metal) should be made good by rubbing down and applying 1 no coat of Galvafrid and 1 no coat of oil based paint.

All drop bolt tubes to be kept free of debris/sand to enable drop bolts to be operational.

Where installed, dividing net type pitch dividers must be used at all times with both cables, and importantly, the freestanding support posts in place to support the top cable and net when in use. Failure not to use either will result in damage to the net and cables. (In addition over tightening of the cables will cause damage to the cable and the winches.

Check that all bolts are tight.

2.2 Chainlink

From time to time the line wires may be required to be tightened. Check every three months.

Check for snagging and vandal damage.

2.3 Rebound systems

Bottom of timber rebound boards should be kept free from build up of sand to prevent moisture being absorbed by the boards.

Phenolic coated rebound boards should be inspected every six months and the edges resealed as deemed necessary using a suitable sealant to prevent the ingress of moisture.

Regularly inspect for damage/vandalism to faces of boards. Any scratches/groves must be treated and/or sealed to prevent the ingress of water.

Phenolic coated rebound boards are not recommended for hockey.

Any football marks can be removed from a phenolic coated board with a damp non-abrasive cloth.

Proprietary steel rebound panels that are treated properly for corrosion protection, should only require the inspection of fixings on a regular basis.

2.4 Paint and protective systems

If the fence has a protective paint coating this will need to be re-coated as required by local conditions

The Galvanizers Association (www.hdg.org.uk) have conducted field tests with galvanized steel samples throughout the U.K. and identified localised corrosion rates within 10 mile squares.

The results of their tests indicate that steelwork of 3mm and 5 mm thick. Hot Dip Galvanized to BS EN 1461 : 1999 giving a coating thickness of 55 and 70 microns respectively, typically provides protection against corrosion in excess of 25 years.

On the basis of this Hot Dip Galvanising to BS EN ISO 1461: 1999, prior to Polyester Powder Coating to BS 6497, should be considered as providing the most cost effective way of protecting steel from corrosion and the best value for money for the customer.