10.1 General

Part 10- External Works

10.1 General

FIXINGS

All fixings should:

- Be corrosion resistant where located externally and be appropriate for the proposed purpose.
- Resist or accommodate movement of the fixed element during the course of its normal life.
- Be chemically compatible with the element they support and adjacent elements.

CONTROL OF BUILDING MOVEMENT

In determining whether adequate precautions have been taken to minimize or accommodate whole and differential movement of elements, consideration must be given to the following causes of movement which occur within a building:

- Settlement and heave
- Deflection (lateral and vertical)
- Drying shrinkage
- Cyclical changes in moisture content and humidity
- Thermal movement
- Differential movement of adjacent dissimilar materials
- Chemical action

TREATMENT OF MATERIALS SUSCEPTIBLE TO PREMATURE DECAY OR DECOMPOSITION

In determining whether materials should be treated against premature decay or decomposition, consideration must be given to the resistance of the material to attack from the following:

- Frost
- Moisture
- Fungal growth
- Insects
- Sunlight
- Oxidation
- Atmospheric pollution
- Acid and alkaline attack
- Other chemical attack

Timber based materials should not be incorporated into the structure unless precautions have been taken to prevent the occurrence of dry rot, due account being taken of the location of the element. In particular, attention should be given to materials located within the external fabric of the building envelope, permanent shuttering, perimeter insulation and filling of movement joints.

STORAGE AND PROTECTION OF MATERIALS

Materials susceptible to damp, dust and frost should be stored before use in a clean and dry place. Those which have a limited storage life should be used in strict date rotation and before the use-by date. Out of date materials should not be used unless specifically agree with the manufacturer or supplier.

Manufactured units should be clearly identified and kept in their protective wrappings until incorporation into the construction.

Materials should be stored in such a manner that damage does not occur during the period of storage and so that individual elements may be withdrawn from storage without being damaged or causing damage to other elements, materials or components.

Materials which are withdrawn from storage for incorporation into the construction should be transferred directly to the work area or areas and where necessary temporarily stored in such a manner as to avoid damage occurring. Where possible materials should be used straight from storage so as to avoid damage occurring.

Damp susceptible materials should not be incorporated into the construction until the building is weathertight. Where appropriate, uncompleted construction work should be provided with temporary protection and support.

After incorporation into the construction, all work should be protected from damage until handover of the dwelling.
10.1 General

FENCES

Boundary wooden and concrete fences are not covered under the Build-Zone Warranty. Please contact a specialist fencing contractor for advice.
10.2 Concrete Mixes

GENERAL

Table 10.1 provides guidance on concrete mix design together with the required strengths and workability factors for various situations.

Other specific mix designs are acceptable, the table below provides guidance to suit the majority of situations found in house construction.

<table>
<thead>
<tr>
<th>Application</th>
<th>Standard mix</th>
<th>Designated mix</th>
<th>Compressive strength @ 28days N/mm² (MPa)</th>
<th>Suggested workability slump (mm)</th>
<th>Suggested method of compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>ST 2</td>
<td>GEN 1</td>
<td>10.0</td>
<td>75</td>
<td>Poker or beam vibration and/or tamping</td>
</tr>
<tr>
<td>Blinding and mass concrete fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strip footings</td>
<td></td>
<td>GEN 1</td>
<td>10.0</td>
<td>75</td>
<td>Poker or beam vibration and/or tamping</td>
</tr>
<tr>
<td>Mass concrete foundations¹</td>
<td>N/A</td>
<td>RC 35</td>
<td>35.0</td>
<td>75</td>
<td>Self compacting</td>
</tr>
<tr>
<td>Trench fill foundations¹</td>
<td></td>
<td>FND 2</td>
<td>35.0</td>
<td>75</td>
<td>Poker</td>
</tr>
<tr>
<td>Reinforced foundations¹</td>
<td></td>
<td>FND 4A</td>
<td>35.0</td>
<td>75</td>
<td>Poker</td>
</tr>
<tr>
<td>Foundations in class 2 sulphate conditions³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundations in class 3 sulphate conditions³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundations in class 4A sulphate conditions³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundations in class 4B sulphate conditions²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General applications</td>
<td>ST 1</td>
<td>GEN 0</td>
<td>7.5</td>
<td>V. low (10)</td>
<td>Tamping</td>
</tr>
<tr>
<td>Kerb bedding and backing</td>
<td></td>
<td></td>
<td>10.0</td>
<td>V. low (10)</td>
<td>Tamping</td>
</tr>
<tr>
<td>Drainage work to give immediate support¹</td>
<td></td>
<td></td>
<td>10.0</td>
<td>50</td>
<td>Tamping</td>
</tr>
<tr>
<td>Other drainage works¹</td>
<td></td>
<td></td>
<td>10.0</td>
<td>75</td>
<td>Tamping</td>
</tr>
<tr>
<td>Oversite below suspended slab¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floors</td>
<td>ST 2</td>
<td>GEN 1</td>
<td>10.0</td>
<td>75</td>
<td>Poker or beam vibration and/or tamping</td>
</tr>
<tr>
<td>House floors with no embedded metal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent finish to be added eg screed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No permanent finish to be added eg carpeted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garage floors with no embedded metal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House drives, domestic parking and external paving</td>
<td>N/A</td>
<td>PAV 1</td>
<td>35.0</td>
<td>75</td>
<td>Poker or beam vibration</td>
</tr>
<tr>
<td>Heave duty external paving</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other reinforced and prestressed concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>applications</td>
<td>N/a</td>
<td>RC 30</td>
<td>30.0</td>
<td>75</td>
<td>Poker</td>
</tr>
<tr>
<td>Reinforced or prestressed concrete: mild exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforced or prestressed concrete: moderate exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. in non-aggressive soils ie class 1 sulphate conditions as given in table 7a BS 5328: 1
2. see table 7a BS 5328: 1 for all sulphate conditions

1. Standard Mix ST 1
   - A standard mix is a concrete designed using the materials and mix proportions given in BS 5328:1 Section 4 and is suitable for most house construction activities. Note: Standard mixes should not be used in aggressive soil conditions where the soil, the ground water or any adjacent material contains sulphates or other aggressive chemicals.

2. Designated Mix (GEN, FND, RC, PAV)
   - Designated mixes are designed and specified in accordance with BS 5328: Section 5. It is a quality controlled mix, produced under BS EN ISO 9001 conditions. The purchaser orders the mix by specifying its required strength and is intended use ie RC to be used for reinforced concrete and GEN for general use.

Table 10.1: Selection guide to the use and specification of Standard and Designated concrete mixes
10.3 External Paths, Drives, Patios and Gardens

GROUND PREPARATION

Excavation to formation levels should be made ensuring that all organic materials are removed. On wet sites the ground under paths and drives may need to be drained by land drains and prepared or protected before any sub-base is provided.

Trenches should be backfilled with granular material to formation level, compacted in layers not greater than 300mm so as to achieve a level of compaction not inferior to the adjacent ground. Ideally, layers should be compacted in layers not exceeding 150mm.

Where the general ground level has to be raised to achieve the formation level, a properly compacted sub-base material should be used in layers not exceeding 150mm. (See diagram 10.2). Formation level tolerances should not exceed ±30mm.

Diagram 10.2: Filling to sub-base level

Sub-Base

The sub-base should be formed with either:

- Well graded crushed rock or concrete (maximum size of aggregate 75mm)
- Lean mix concrete (ST1)

In the case of weak sub-grade soils (i.e. soils having a California bearing ratio of less than 10%), a thicker sub-base is required and should be determined by an Expert.

Tolerance of finished sub-base level should not exceed ±20mm.

Granular sub-bases should be compacted in accordance with table 10.3.

Table 10.3: Compaction of Sub-Bases

<table>
<thead>
<tr>
<th>Type of compactor</th>
<th>Size of compactor</th>
<th>Minimum of passes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100mm base</td>
<td>150mm base</td>
</tr>
<tr>
<td>vibrating plate</td>
<td>&gt;1400 &lt;1800 kg/m²</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>&gt;1800 &lt;2000 kg/m²</td>
<td>5</td>
</tr>
<tr>
<td>vibrating roller</td>
<td>&gt;700 &lt;1300 kg/m width</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>&gt;1300 &lt;1800 kg/m width</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>&gt;1800 &lt;2300 kg/m width</td>
<td>4</td>
</tr>
<tr>
<td>Engine driven</td>
<td>&lt;65 kg</td>
<td>5</td>
</tr>
<tr>
<td>Vibro-tamper</td>
<td>&gt;65 &lt;75 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;75kg</td>
<td></td>
</tr>
</tbody>
</table>

< less than > more than

Source: National Paving Kerb Association
**Edgings**

- Avoid damage and displacement of edgings of paths and drives.
- Edgings should be provided to all unsupported edges, with the exception of in situ concrete and (in the case of paths) precast concrete paving slabs laid on a mortar bed. Where necessary, a haunch to paths formed of precast concrete paving should be included.
- Concrete edgings to drives should be bedded on minimum 200 x 100mm deep ST1 mix concrete base and haunched with concrete to within 50mm of the top of the edging (See diagram 10.4).
- Edgings should be laid to a smooth alignment and to a tolerance of ±13mm measured over a 2m straight edge.
- Timber edgings should be preservative treated and should only be used for paths (i.e. not to be used for drives).
- Paths should be at least 600mm wide.
- Drives should be at least 2.4m wide, and turns should be laid out so as to be easily negotiated by a 5m car.
- Gradients should not be greater than 1:8.

![Diagram 10.4: Concrete edgings](image)

**SURFACING**

**Surfacing of Paths and Drives**

Surface coatings to paths and drives should comply with one of the specifications set out in table 10.5 and be laid to a tolerance of ±10mm measured over a 2m straight edge.

Paving slabs should be:

- Laid on either 25mm of sharp sand (BS 882) or a full bed semi-dry mortar mix of 3:1 sand cement
- Laid with a 2-4mm joint and filled with a jointing sand as recommended by the manufacturer
- Cut with a saw or disc cutter
- Where more than 25% of the slab is cut away the slab should also be mitre cut

Brick pavioirs should be:

- Bedded on 50mm of Grade C sharp sand (BS 882)
- Laid with a 2 - 5mm joint and after compaction with a plate vibrator, filled with a jointing sand as recommended by the manufacturer
- Cut with a mechanical or hydraulic block splitter
- Cut pavioirs should not be less than 25% of the original block size

In situ concrete should be:

- Laid in bays not exceeding 20m² or maximum bay lengths not to exceed 6m
- Isolated where abutting walls, etc (see diagram 10.6).

Sub-bases to macadam or asphalt paths and drives should be fully dried and primed before laying the surface covering. All surfaces should be consolidated by a vibratory roller to achieve the required texture of finish.
10.3 External Paths, Drives, Patios and Gardens

<table>
<thead>
<tr>
<th>type of surface</th>
<th>specification</th>
<th>Thickness (mm)</th>
<th>British Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>macadam single course</td>
<td>40mm coated macadam</td>
<td>75</td>
<td>BS4987</td>
</tr>
<tr>
<td>rolled asphalt</td>
<td>coarse asphalt, 10mm nominal size</td>
<td>60</td>
<td>BS594</td>
</tr>
<tr>
<td>macadam two course</td>
<td>base course open graded 20mm coated macadam.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>concrete</td>
<td>designated mix – See Table 10.1</td>
<td>75</td>
<td>BS8110</td>
</tr>
<tr>
<td>brick pavior</td>
<td>clay or calcium silicate laid to BS6672:2:1986</td>
<td>50</td>
<td>BS6677</td>
</tr>
<tr>
<td>block pavior</td>
<td>precast concrete block paving</td>
<td>60</td>
<td>BS6717</td>
</tr>
<tr>
<td>paving</td>
<td>dense concrete</td>
<td>50</td>
<td>BS7263:1</td>
</tr>
<tr>
<td>gravel</td>
<td>maximum 12mm well graded, washed crushed stone or gravel</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

* increase to 150mm for poor/weak soil or on clay
** 80mm if access is required for heavy vehicles. (ie commercial vehicles such as refuse lorry, removal lorry or tanker etc)
**** maximum slab size not to exceed 450mm x 450mm for drives. 600mm x 600mm can be used for paths

Table 10.5: Surface finish to paths and drives for family cars

Diagram 10.6: In situ concrete drives

LEVEL ACCESS

Level access details should be considered as shown in diagrams 10.7 – 10.9.

In severe/very severe exposure zones set frame well back to provide further protection (it is recommended to provide a storm porch or canopy whenever using level thresholds). It is recommended to provide a proprietary mat well projecting beyond the swing of the door.

Diagram 10.7: Level threshold with approach rising towards property
AVOIDING PONDING OF PATHS AND DRIVES

Paths and drives should be properly drained in order to ensure that rainwater is evacuated and that ponding does not occur adjacent to the dwelling.

Areas of particular concern include paved areas that provide:

- access for the disabled
- access for solid waste disposal
- passage giving access to the building where this is intended to be used in common by the occupiers of one or more other buildings.

Impervious surfaces should be laid to falls away from buildings to a trapped gully or a permeable part of the garden provided that it is free draining. Rainwater should not discharge onto a highway or adjacent property.

No part of the finished external ground surface should be less than 150mm below the dpc with the exception of the level access arrangements at entrance doors, where provision should be made to prevent water ingress. Access ramps built up to the external face of the building should be provided with a drainage gap, or the cavity of the structure should incorporate a low level stepped cavity tray with associated weep holes.

Surfaces should be laid to cross falls of not less than 1.25% (1:80) and not greater than 8.3% (1:12) (see diagram 3.64). Drainage channels should be laid to longitudinal falls of not less than 1% (1:100).

Gullies should be trapped when a drain discharges to a soakaway in order to prevent long term silting of the soakaway.

Trapped gullies are also required when Local Authority approval has been granted to permit rainwater to discharge into a foul sewer.

A gully should be provided for every 50m² of impervious drained area and should be centrally located particularly in the case of enclosed courtyards.
STANDING WATER

One hour after rain has stopped isolated areas of temporary standing water up to 1m² and no deeper than 7mm are considered to be reasonable.

VARIATIONS IN SURFACE FINISH

The surface should not exceed ±10mm deviation from a 2m straight edge with equal offsets.

Diagram 10.10: Drainage of paths and drives

REINSTATEMENT of GARDEN AREAS

Redundant foundations, masonry structures and the like found within 300mm of the finished ground level should as a matter of good building practice be grubbed out and cleared from the site. Garden levels and top soil should be reinstated to uniform levels appropriate to the level of the building, adjacent roads and other properties.

Where the ground levels need to be raised by site fill, any excessive thickness of existing topsoil should first be removed and subsequently reinstated.

Where slopes exceed the natural angle of repose for the soil material, retaining walls should be provided or other soil stabilisation methods used.

Trees and large bushes should not be planted within 3m of any building unless considered fully in the foundation, drain or underground service design. As a general rule, a distance equal to the mature height of the tree or bush should be taken as the closest permissible distance.

Avoiding Flooding of Garden Areas

Subsoil drainage may be necessary in garden areas in cases where:

- Site works have affected the natural flow of ground water within 4m of the dwelling (e.g. exposing of underground springs)
- Ground water table rises to within 250mm of the finished ground within 4m of the dwelling
- Subsoil is poor draining and the ground contours make the site prone to waterlogging within 4m of the dwelling (see diagrams 10.11 – 10.13).
Provide land drainage if site works expose underground water courses within 4 m of dwelling.

Diagram 10.11: Ground water exposed by site works

Provide land drainage if water table rises within 250mm of finished ground level within 4 m of the dwelling.

Diagram 10.12: Ground water – high water table

Provide land drainage if subsoil is poor draining and the ground contours make the site prone to waterlogging within 4m of the dwelling.

Diagram 10.13: Ground water – waterlogged site
10.4 Walls

RETAINING WALLS

Where retaining walls are provided they should be designed and constructed of materials suitable for the ground conditions. Retaining walls should be designed to resist vertical movement, overturning, sliding, rotation, and thermal and moisture movement (see diagram 10.14).

The findings and recommendations of the site investigation report should be taken into account. Small masonry retaining walls retaining less than 1200mm of dry earth may be designed using the empirical formula (See diagram 10.14) A = D ÷ 3, where

\[
\begin{align*}
A &= \text{Thickness of wall at considered point} \\
D &= \text{Height of retained earth at the point considered}
\end{align*}
\]

Retaining walls should be provided with a damp-proof course at low level and tanking system so as to prevent ingress of moisture from the retained ground. The damp-proof course should not be of a membrane type (2 courses of engineering brick is recommended).

Subsoil drainage should be provided behind a retaining wall where underground waterways are interrupted or where it is likely that the ground water table may rise above the foundation level.

Retaining walls constructed of proprietary precast concrete units or timber cradles are to be used in accordance with the manufacturer’s recommendations. Retaining walls should be designed by an Expert and constructed in accordance with BS 8110 or BS 5628 as appropriate.

Diagram 10.14: Retaining walls – design principles
BOUNDARY WALLS

Walls should be constructed on a concrete foundation capable of safely transmitting all loads into the ground without causing excessive movement.

The recommendations of the site investigation report should be taken into account for the design and construction of walls. Design of such structures should be undertaken by a fully insured and competent building professional. Generally, free standing walls should be designed and constructed in accordance with BS 5628:1 and of materials as specified in BS 5628:3, Table 13(J).

- Clay bricks should be type FN or FL (or type MN or ML if a minimum 45mm overhang to the coping is provided). Bed in a 1:3 to 1:4 sulphate resisting cement-sand mortar with plasticizer or a 1:1:2:4 sulphate resisting cement : lime : sand.
- All materials above high level DPC should be frost resistant.
- Concrete bricks (compressive strength 20 N/mm²) and calcium silicate bricks (classes 3 – 7) should be bedded in a 1:5 to 1:6 cement: sand with plasticizer or a 1:1:5 to 6 cement : lime: sand mortar.
- All materials above high level dpc should be frost resistant.
- Concrete bricks (compressive strength 20 N/mm²) and calcium silicate bricks (classes 3 – 7) should be bedded in a 1:5 to 1:6 cement : sand with plasticizer or a 1:1:5 to 6 cement : lime: sand mortar.

See diagram 10.15 for general construction details.

![Diagram 10.15: Freestanding walls](image-url)

Where a brick wall is located amongst windbreaks such as other structurers or a well wooded area, then table 10.16 may be used to give a maximum height to thickness ratio up to a maximum height of 2.5m, otherwise design by an Expert is necessary.

<table>
<thead>
<tr>
<th>Wind Zone</th>
<th>H/W</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>8.5</td>
</tr>
<tr>
<td>2</td>
<td>7.5</td>
</tr>
<tr>
<td>3</td>
<td>6.5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

W = width of wall H = height of wall from ground level
See diagram 10.17 for wind loads

Table 10.16 Maximum height to thickness ratio (H/W)

Walls should be provided with a two course engineering brick damp-proof course situated not less than 150mm above the adjacent finished ground level. A precast concrete coping or other durable capping should also be provided in order to prevent ingress of rainwater into the top of the wall.
Diagram 10.17: Wind zones – British Isles
10.5 Garages and Small Outbuildings

GENERAL

Garages and small outbuildings including carports and other single storey outbuildings etc., should be designed and constructed to adequately resist lateral and vertical loads such as wind (including uplift), self-weight, snow and other live loads. Refer to Part 5 ‘Substructure and Foundations’ and Part 6 ‘Superstructure’.

In particular, foundations for garages, conservatories or any other permanent outbuilding should be designed and constructed to suit the ground conditions and loadings relevant to the particular site.

In all cases, foundations should be constructed under the same criteria as that of the house. Reference should be made to Part 4 ‘Site Investigations and Foundations’.

- All walls should be laterally tied to roofs
- Roofs should be securely tied down to walls where required by the design to resist wind uplift.

Walls, columns and piers should be constructed on a concrete foundation capable of safely transmitting all loads into the ground without causing excessive movement.

Walls should be designed and constructed so as to accommodate movement.

Masonry walls taller than 2400mm above the ground level should be designed and constructed in accordance with BS 5628.

Floor construction should be a minimum 100mm float finished grade ST4 or GEN3 concrete laid on a minimum 100mm consolidated and blinded hardcore. If a perimeter toe-beam is provided it shall extend to 350mm below ground level and be a minimum of 350mm wide.

It is recommended that a DPM be incorporated under garage slabs to resist the ingress of ground moisture.

Walls should have the minimum weather resistance equivalent to that provided by 100mm masonry pointed both sides of the wall.

Prefabricated buildings should be erected in accordance with the manufacturer’s instructions.

Doors to outbuildings should be externally lockable.

Roofs should be weather-tight and provided with a minimum fall of 1:40, or if a specialist roofing system is used then falls in accordance with the Third Party accreditation certificate. Rainwater must discharge into a rainwater drainage system or a soakaway located at least 5m from any building or watercourse. The soakaway should have a minimum capacity of 1m$^3$.

All separating walls between multiple garages should be taken up to the underside of the roof to provide adequate security and fire resistance between garages.

Small Outbuildings of Masonry Wall Construction

Small outbuildings of masonry wall construction which are:

- Not higher than 2400mm above ground level
- Located on ground having a minimum safe bearing capacity of 100 kN/m$^2$ and not requiring special precautions and
- Which only support wind and distributed roof loads

may be constructed in accordance with the guidance in diagram 10.18.

Minimum wall thickness should be 100mm for stability and weather resistance (pointed both sides of the wall).

A 100mm thick wall will not necessarily resist wind driven rain. If a greater degree of weather resistance is required an extra wall thickness or an external coating/cladding should be considered.
10.5 Garages and Small Outbuildings

Diagram 10.18: Small detached outbuildings

**ROOF TIMBERS**

Piers or wall returns should be provided at each end of the wall and at centres not exceeding 3m maximum. Piers and returns should be of sufficient depth to provide lateral stability to the supported wall, due account being taken of the wind exposure of the site (consult Building Control Authority).

The top of all walls should be laterally supported by the roof structure or other means at maximum 2m centres.

Walls should be provided with a damp-proof course situated not less than 150mm above the adjacent finished ground level.

Wall thickness should be in accordance with Approved Document A.

Suitable concrete or steel lintels should be provided over window and door openings.

Timber span tables 8.32 – 8.35 in Part 8 ‘Roofs’ provide guidance on the selection of ceiling joists and rafter sizes for the majority of spans and loading cases for small outbuildings.
10.6 Security

DESIGN – GENERAL

Comprehensive security can be provided to the dwelling and site by following the guidance set out below. The guidance given also reflects the principles of the Secured by Design scheme operated by the UK Police Authorities.

The objectives of Secured by Design is to encourage the building industry to adopt recommended crime prevention guidelines, in both house and estate design, and thus gain approval to use an official Police approved logo in marketing of new houses.

To achieve approval under the Secured by Design initiative, it is important for the designer to consult with the Architectural Liaison Officer of the relevant Police Authority at an early stage of the design.

The provisions illustrated in this section are designed to limit the incidence of attempted burglary and burglary.

In most cases of reported burglary, entry was gained by means of an unlocked or unsecured door or window; many of the following provisions therefore relate to effectively securing doors and windows. The high incidence of forced entry necessitates sufficiently robust fixings and fittings to all doors and windows.

Burglars are interested in buildings where access is easy and where the contents are valuable. Accessible windows and external doors that are at the rear of the dwellings and that are out of sight of neighbours and passers-by in the street are especially vulnerable. Ground floor windows and windows accessible from balconies, walkways and adjacent roofs are more vulnerable than upper level windows that are beyond normal reach.

The security provisions in this section apply to houses, flats and maisonettes and cover the following matters:

- Passive security measures such as estate layout, landscaping and the design of doors and windows
- Active security measures such as intruder alarms and security lighting

Estate Layout and Landscaping

Designers should achieve the following objective for layout and landscaping of new estates and wherever possible for new dwellings constructed in existing residential areas:

- Estate boundaries should be clearly defined and dwellings sited in small clusters which provide an unobstructed view of neighbouring homes (with a minimal effect on the residents’ individual privacy).
- There should be a mixture of housing, e.g. bungalows, two and three bedroomed dwellings, etc., whereby opportunities for natural surveillance are increased, as there is then potential for occupation throughout the day.
- Create a semi-private appearance to common areas which is likely to discourage intruders from passing beyond an estate boundary (whether real or imagined) and entering into the estate (see diagram 10.19 note 2).
- Position individual dwellings so that there is a clear view of adjacent dwellings but without impinging excessively on individual privacy.
- Limit the number of access roads and paths to the estate in order to facilitate surveillance by residents or people entering the estate.
- Deter access by intruders to private areas of individual dwellings, e.g. by providing secure gates and fences near to the building line, linking the side elevations of buildings (see diagrams 10.19 note 3 and diagram 10.20).
- Meter boxes and refuse collection points should be located in areas which do not require officials to enter the secure part of a garden (see diagrams 10.19 note 5 and diagram 10.20).
- Avoid wherever possible the location of private gardens adjacent to open land, recreation areas, public roads and paths, railways and the like by which an intruder can gain access to the estate, e.g. by providing back to back rear gardens (see diagram 10.19 notes 4 and 6).
- Car parking areas should be off-street and, together with garage entrances, should be located so they can be easily viewed by estate residents (see diagram 10.19 note 7).
1. Encourage neighbourhood style community by small grouping of dwellings in clusters.
2. Create semi-private appearance of estate by use of different colour or texture of road surface and limit the number of access roads and footpaths.
3. Restrict access to rear gardens by providing a secure fence and gate near front building line.
4. Provide secure fences (minimum 1.8m high) to boundaries of common land adjacent to roads, etc.
5. Locate meter boxes and refuse collection point away from private rear gardens.
6. Back to back gardens provides mutual protection against intruders.
7. Provide off-street parking.

Diagram 10.19: An option of a typical estate layout

Diagram 10.20: Security of rear gardens
10.6 Security

DOORS

External doors should be constructed to the following standards or an acceptable equivalent.

- Where a porch is provided:
  - Either the external door should be considered as the principal door (see diagram 10.21) and comply with the recommendations set out below
  - Or, the porch perimeter and outer door should be glazed to provide an adequate view of the inner principal door which should comply with the recommendations set out below (see diagram 10.21).

- Door frames should be securely fixed to reveals of openings (600mm centres maximum and at least one fixing 150mm from the corners of the frame).

- Doors should be of robust construction to resist forced entry by kicking, charging, levering, etc. Non-panelled areas should be at least 44mm thick solid core. Timber door stiles should be at least 119mm wide (see diagram 10.22).

- Doors should be hung on minimum 3 No. 100mm metal hinges. If the hinge pin is externally located, complementary hinge bolts should be provided (see diagram 1-22).

- Non-glazed door panels should be small enough to prevent entry by a person (see diagram 10.22) or made sufficiently robust to resist unauthorized entry.

Main Entrance Doors

SINGLE DWELLING-HOUSES

The principal door to a single dwelling-house should be provided with a security lock and key, complying with BS 8621, or that has:

- An automatic deadlocking facility
- At least 1000 differs
- A fixing which if forced open would not pull out without breaking the frame or door
- A hardened steel bolt or inserts to prevent sawing
- The capability of operation from the inside by simple manual use not requiring a key
- A restraint arm or security chain together with a wide angle viewfinder
- The "throw" of the lock of 20mm

Glazed panels should be located out of reach of the door lock, i.e. more than 1m is generally considered reasonable, or laminated glazing should be used (see diagram 10.22).

Diagram 10.21: Security principal entrance door
10.6 Security

**Flats and Maisonettes**

The main communal entrance door to buildings containing flats or maisonettes should be provided with an automatic locking latch and the door fitted with a self-closing device (See diagram 10.23). Where there are more than four flats or maisonettes in the building, the main entrance door should be provided with an intercom and electronic lock release facility which can be operated from within each flat or maisonette.

In order to ensure adequate means of escape and firefighting access in case of fire, entrance doors of individual flats should have a 5 lever mortice lock of a type which does not operate automatically when the door is slammed shut. The deadlock mechanism should be non-key operated internally (see diagram 10.24).
10.6 Security

Part 10 External Works

LETTER-PLATES

Letter plates should comply with BS 2911 and either be located not closer than 400mm to the main door lock or be fitted with a limited opening flap. (see diagram 10.22).

Where fitted to a fire resistant door (e.g. in flats), the letter plate should have the same degree of fire resistance as the door or an inner steel plate should be fitted, preferably with an adequate overlap. The letter plate should not be set any higher than halfway up the door as the lateral pressure of fire against the door increases with height.

GLAZING TO DOORS

Glazed side panels should be located on the hinge side of the door wherever possible (see diagram 10.25).

Laminated glass should be used in small glazed panels to doors and adjacent side glazing if within 1m of the door lock (see diagrams 10.25 and 10.26). Generally glazing should comply with the safety requirements of BS 6206.

Diagram 10.25: Glazed side door panels
Other External Doors

Other external doors such as side and rear doors (including communicating door to integral garages) should be provided with a 5 lever deadlock to BS 3621 and robust bolts at the top and bottom of the closing edge of the door e.g. 100mm barrel bolts fixed with robust screws (e.g. at least 30mm long No.8 screws). Where the door is panelled or glazed or if there are adjacent glazed panels, then the bolts should be key operated unless the glazing is laminated (see diagram 10.26).

Sliding doors should be designed so that they cannot be forced out of the frame from the outside and if not fitted with a multi-point locking system, are provided with push to lock key operated locking bolts located at the top and bottom of the meeting stile of the inner door leaf. The sliding door should be glazed with laminated glass and be preferably located on the inside of the frame (see diagram 10.27).

The meeting stiles of external double doors such as French doors should be rebated and meet the security provisions of other doors, i.e. key operated bolts to the leading edge of the first closing leaf with the second closing leaf secured by a mortice deadlock to BS 3621.

Doors to outbuildings should be provided with a five lever morticed deadlock or a stout padlock.
10.6 Security

WINDOWS

Windows should be constructed to the following standards or an acceptable equivalent:

- Window frames should be fixed to reveals (maximum 600mm centres and within 150mm of the frame corners).
- Opening lights should be provided with a securing device that cannot be sprung open by levering the casement or sash from the outside.
- Externally located hinge pins should be non-demountable (e.g. welded or disturbed ends).
- Trickle ventilators should be used in preference to small opening fanlights that can be left open.
- Louvred windows should not be used.
- Key operated locks should be provided to all opening window lights on the ground floor and on upper floors where access can be gained by a balcony, flat roof, drain pipe, etc. Window locks which are push-to-lock, key-to-unlock type are recommended.
- External timber glazing beads should be continuously glued or pinned to frames at maximum 150mm centres. It is important to ensure that the weather-tightness of the window is maintained by using a flexible putty, sealant or mastic (compatible with frame and glazing unit) that can accommodate movement.
- External glazing beads to aluminium and PVC-u windows should be effectively secured in position (e.g. mechanically or by bonding). Alternatively, the glass may be secured in position prior to positioning the beads. As another alternative, the recommendations of the Glass and Glazing Federation can be followed.
- Rooflights should not be used on single storey or other accessible roofs unless they are specifically designed to provide adequate deterrent against forced entry (e.g. use of wired glass and lockable with a removable key).

N.B. The requirements of Approved Document B must also be considered with regards to means of escape.

LIGHTING/ALARMS

Lighting

Lighting should be provided to the following standards or an acceptable equivalent:

- Electric lighting should be provided to public footpaths, roadways and communal garage areas, communal entrance halls and access areas. Well-lit general circulation areas contribute to easy observation of intruders and would often be aesthetically desirable to residents.
- Security lighting should be provided adjacent to principal entrances and other external entrances of residential buildings. The lighting should be operated when someone is nearby by a photo-electric cell or an infra-red detector on a time switch for economy.

Intruder Alarms

Facilities for the easy installation of intruder alarms should be provided and an unswitched 13 amp fused spur with neon indicator should be located in a suitable place for the installation of an alarm control panel (e.g. in a stair or cloaks cupboard).

Further information about Secured by Design can be found at: www.securedbydesign.com.