

3. Design and construction standards

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Technical guidance for the Crofting Agricultural Grant Scheme, Small Farmers Grant Scheme and New Entrants Capital Grant Scheme.

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3.1 Introduction

3.1.1

The purpose of this section is to give guidance on design and constructional standards to be used by professional officers.

3.1.2

Standards for design and construction are considered under two separate categories:

- a) General requirements which are applicable to all works and facilities.
- b) Specific requirements applying to the following works:
 - Buildings of framed construction.
 - Buildings of traditional construction.
 - Prefabricated buildings and structures of proprietary manufacture.
 - Sites, loadings, floors, walls, insulation and ventilation, internal partitions, door openings, drainage, storage containers for foul matter, water supply and painting.
 - Materials used in building construction.
 - Land drainage.
 - Roads, bridges, culverts and grids for livestock.
 - Croft/farm fences, walls and gates.

3.1.3

In the case of all other works and facilities for which a standard is not specified, officers should apply what they regard as the nationally accepted standard or practice appropriate in the particular circumstances. However, it may be permissible to depart from a too rigid adherence to the guidance and standards laid down where this is justified but such a change must be regarded as exceptional and must be capable of being supported on technical grounds.

3.2 General requirements

3.2.1

Certain buildings erected on agricultural land for the purpose of agriculture are exempt from the Building Standards (Scotland) Regulations 2004 (see section 1.9.7). In those cases where claimants are relieved of the responsibility of complying with the Regulations, officers should make sure that the standards applied under the schemes are not below the standards of the Regulations particularly with regard to the fire resistance requirements. The Town and Country Planning (General Permitted Development) Order 1992 now requires that Prior Notification Procedures be adopted on certain developments on agricultural land.

3.2.2

All designs, materials and constructions are expected to comply with the appropriate British Standards and/or Codes of Practice. When interpreting these, officers must use their professional and technical judgement bearing in mind the desired life of the structure, human safety and animal welfare.

3.2.3

The responsibility for insuring against all risks of injury, damage or loss arising while work is being carried out as well as for the design, erection and completion of any works and their subsequent performance, durability and safety, rests with the claimant and this should be made clear to them, when appropriate. Insurance costs are usually included in a contractor's estimate and are eligible costs. Where the army are carrying out work in lieu of contractors they will insist on insurance being taken out by the applicant. This is an eligible cost under the scheme.

3.2.4

When dealing with applications for approval of more complex farm buildings, no authority to proceed with work should be issued until such plans, calculations and specifications as are considered necessary have been provided and checked, or alternatively where the surveyor and/or engineer have considered it necessary, a design certificate from a professionally qualified civil or structural engineer has been provided. In these cases the caution at paragraph 3.2.3 above should be included in the approval letter.

3.2.5

In relation to livestock buildings, the recommendations contained in the Codes of Recommendations for the Welfare of Livestock should be taken into account.

3.2.6

Although the fire resistance requirements under the Building Standards (Scotland) Regulations 2004 with subsequent amendments do not apply to exempted buildings, officers must nevertheless assess the fire hazards both to humans and livestock. In addition it cannot be safely assumed that buildings which have been approved by the local building authority under the Buildings Standards (Scotland) Regulations will necessarily have sufficient fire resistance to comply with the Welfare of Livestock Codes. Such matters as the arrangements for emergency procedures and the distance from other buildings, boundaries or potential fire hazards should therefore be considered when applying the technical soundness test.

3.3 Standards for farm buildings and ancillary works

3.3.1

An EU directive which came into force on 1 July 2014 requires all new farm buildings manufactured using a steel frame to be CE marked.

The CE mark is an industry standard that proves that buildings comply with all relevant EU legislation and therefore "fit for purpose".

BS Standard

BS5502 Part 22, (the Standard in question), has c two main classifications of Farm Buildings:

- **Class 1** is any permanent Agricultural building which falls outside of the below parameters is a Class 1 building. A Class 1 building will be built to last 50 years and is designed to a higher standard to withstand more loading. Occupancy levels are unrestricted.
- **Class 2** are agricultural buildings occupied for less than six hours per day at a maximum occupancy of one person/100m² with up to a maximum of 10 people in the building. Class 2 buildings must be single-storey other than small mezzanine floors. They must also be located no higher than 200 metres above sea level. Finally they must have no loads applied to them other than normal environmental loads, i.e. wind and snow. A Class 2 building will be built to last 20 years and is designed to a lower design standard to withstand less loading.

Some examples:

- Class 1 – Small 18.30 x 9.15 x 3.66 metres (60' x 30' x 12') Sheep Building located at 300 metres above sea level.
- Class 1 – Grain store/ silage store – m any size, any location.
- Class 1 – Farm workshop with solar panels on the roof.
- Class 2 – Cattle shed on level ground, lowland position.

- **BS5502 Classification** – The buyer needs to make sure they specify what loads will be on the building when talking to the supplier so that they can correctly design and build it. Think about possible future uses as these may change the demands on the building. Importantly these changes being made should make sure that you are buying a properly designed and engineered building, safe and fit for purpose.

All buildings should be designed in accordance with Class 1 or 2 of BS 5502 and the Code of Practice for the Design of the Buildings and Structures for Agriculture. Building work which does not meet with this specification e.g. certain alteration works, may nevertheless be acceptable for grant provided they incorporate good building practice and satisfy the scheme conditions. It should be noted that all building work is required to pass the Capital Nature Test.

3.3.1.2

Fire Safety – Fire hazard and means of escape should be assessed during the early stages of the design process (see BS 5588-0) as remedial action can be difficult to achieve. In order to protect both personnel and livestock in or about agricultural buildings, to preserve the buildings and their contents, the factors highlighted in BS 5502:23 should be taken into account.

3.3.2

Buildings of framed construction – A building of framed construction is one in which the roof is supported independently of the walls on stanchions, pillars or posts and the frame is designed as a total entity.

3.3.2.1

The framework may be of steel, reinforced concrete, timber or aluminium alloy or a combination of any of these materials and should be designed for the uses intended for the particular site and for an adequate life. The frame may comprise stanchions and trusses which may be triangulated, curved, mono-pitch or of the portal type in which the principal rafters and stanchions are constructed to form a rigid arch without any tie beam in the roof space. Where stanchions are to be subjected to lateral pressure, e.g. in "on the floor" grain stores and silage barns they should be designed accordingly or otherwise strengthened.

3.3.2.2

Roof and wall coverings may be of galvanised steel, fibre cement, aluminium alloy, rigid plastics sheeting, timber or other acceptable material, fixed in accordance with the manufacturer's instructions or in the absence of these with accepted practice. The roof or wall covering may be insulated against heat transmission or coloured for amenity reasons.

3.3.2.3

Bay spaces between the stanchions may be open or in-filled with either solid walling, prefabricated wall units, cladding, or space boarding, or a combination of these. Cladding should be fixed to sheeting rails secured to the frame. It is most important to make sure that walls acting as retaining walls, e.g. in silage barns and "on the floor" grain stores, and their supports, are designed and constructed to resist the pressure involved.

3.3.2.4

Bracing – Roof, gable, side or knee bracing should be provided as necessary. Rafter and gable end bracing will restrain against any tendency of the roof to rack; side bracing will restrain stanchion movement and knee bracing will give rigidity across the spans. Bracing may be provided in the form of additional struts fixed at an angle or as an integral part of the frame, e.g. the gussets on portal frames and stiffeners cast on as haunches in reinforced concrete stanchions.

3.3.2.5

Purlins – Roof purlins should be of steel, reinforced concrete, or timber of section and dimensions suitable for the span between the supporting members. The spacing between individual purlins will depend on the type of sheeting to be used and the roof loading. The purlin adopted should comply with BS5502-20.

3.3.2.6

Sheeting rails – Sheeting rails or studding to support vertical cladding should be of steel, reinforced concrete, timber, or other acceptable material securely fixed to the stanchion or gable frame. The section, dimension and spacing of the rails should be adequate to safely support side cladding and resist the wind loads without deflection or buckling.

3.3.2.7

Foundations – Reference should be made to BS EN 1992-1-1 and BS EN 1997-1. Attention should be paid to the possibility of attack by sulfates or any other deleterious matter which may be present in the soil. The foundations of a building should safely sustain and transmit to the ground the combined dead and imposed load, and any dynamic loads, so as not to allow any settlement or other movement which might impair the stability or serviceability of, or cause damage to, the building or structure or any adjoining building or structure or works. The foundation should be taken down to a depth to safeguard the building or structure against swelling, shrinkage or freezing of the subsoil and be designed to resist overturning moments or sliding forces, especially where lateral imposed loads, induced by the storage of agricultural or other products against walls, are transferred to the foundations.

3.3.2.8

Steel framed buildings – The members of steel framed buildings should be arc welded or bolted together with high tensile bolts. Stanchions should have fixed, or have pin base foundations. Where stanchions are secured by holding down bolts embedded in a concrete base the bolt heads or nuts should be concreted over. The design of structural steelwork should be in accordance with BS EN 1993-1-1 and NA to BS EN 1993-1-1. Agricultural buildings should comply with BS 5502:22.

3.3.2.9

Concrete framed buildings – Concrete stanchions have fixed bases which are usually cast in site with a socket into which the stanchion is inserted and grouted. Because of the weight of the frame it is essential that the bases are sufficiently large to prevent spread particularly on sloping sites. All fixing bolts should be galvanised and straps and other metal work galvanised or painted to resist corrosion. All spalled concrete members should be repaired in an approved manner particularly if the reinforcement is exposed. Shattered or cracked members should not be used.

3.3.2.10

Timber framed buildings – All structural timber exposed to the weather or embedded in the ground should be preserved in an approved manner. Timber should be designed in accordance with BS EN 1995-1-1 and NA to BS EN 1995-1-1.

3.3.3

Buildings of traditional construction – A building of traditional construction is one in which the roof is supported on load bearing walls constructed of brick, concrete block, stone, timber, studding, or other material and where necessary incorporating a damp proof course or membrane.

The roof trusses and members spanning between the walls should be constructed of steel, concrete or timber properly secured into supporting piers. In all other respects the constructional standards for traditional buildings are similar to those specified for buildings of framed construction.

3.3.4

Prefabricated buildings and structures of proprietary manufacture – Cases involving applications for new or proprietary forms of design of buildings and components not previously grant-aided must be referred, via the PAO, to the Senior Buildings Officer.

3.3.4.1

Buildings – The construction standards for proprietary prefabricated buildings for livestock, silage, grain storage and other agricultural purposes should be in all respects similar to the standards applied to their counterparts in framed buildings as described previously. In the case of lighter types of prefabricated buildings the superstructure must be seen to have been anchored satisfactorily to site concrete, brick or concrete block dwarf walls by means of steel fixing plates or brackets, or holding down bolts.

3.3.4.2

Crop storage containers – Containers constructed of flexible materials must be on a permanent base and adequately supported. The container must be fire retardant but butyl lining is acceptable, being capable of resisting chemical attack from the stored product. The design of rigid containers or bins and the supporting foundation must be such that they are capable of resisting safely the vertical and lateral loads and overturning movements induced by the stored material and weather conditions.

3.3.4.3

Storage tanks – Storage tanks for solids or liquids should be lined or constructed of a material which is not liable to attack by the material to be stored.

3.3.5 Standards applicable to all buildings

3.3.5.1

Sites – Sites should be prepared in accordance with BS 5930. All sites for buildings should be adequately drained. Existing drains which are to be disused or any cavities, e.g. old cesspits, which are likely to become harbours for vermin should be grubbed up or filled in with either well consolidated hardcore or concrete.

3.3.5.2

Loadings – The foundations, structural frame, floors, walls and roofs of the buildings should be designed in accordance with BS 5502:22.

3.3.5.3

Floors – Upper or suspended floors should be constructed in accordance with BS 5502:

- Of timber boarding or the equivalent in plywood or reconstituted timber with wooden joists struttred as necessary; intermediate supporting beams, if required, should be of wood, steel or concrete.
- Of reinforced concrete cast in site, or of hollow or solid concrete slabs, or of hollow blocks supported on steel or reinforced concrete beams.
- In accordance with other accepted design.
- Floor finishes should not be significantly affected by chemicals which they may come into contact with in normal farming practices and, where necessary, be impervious to liquids.
- Floors should be given a slip-resisting texture but the texture should not be such as to harm personnel or animals.

Piers, columns or stanchions supporting the floor should be of brick, concrete, steel, wood or other acceptable material. New suspended floors and improvements to existing ones should be constructed to carry the intended loading with an adequate margin of safety. The minimum loading for which this type of floor should be designed in accordance with BS 5502:22.

Slatted floors of concrete or other materials should be designed in accordance with BS 5502 Part 51.

Concrete floors intended for storage should include a damp-proof membrane of polythene or other suitable material laid over the hardcore or incorporated in the concrete to form a sandwich floor. The membrane should be lapped into the DPC of the walls.

The floors of bedded areas in livestock buildings may be insulated against heat loss. The insulation may be hollow clay blocks, no-fines lightweight concrete, expanded polystyrene, resin bonded glass fibre or other suitable material laid on a waterproof membrane where necessary and covered with concrete or a protective screed of cement and sand.

3.3.5.4

Walls – The external walls of a building should be constructed so as to have adequate weather resistance. Bricks, blocks or like components should be properly bonded and solidly laid with a suitable mortar and built off a concrete foundation reinforced as necessary. A horizontal damp-proof course should be provided, whenever necessary. Where hollow blocks are used below ground level the cores should be filled with weak concrete as the work proceeds and, where a high degree of moisture resistance is required or where the bricks or blocks are of a porous nature, the walls should be rendered externally or alternatively continuous cavity walls should be used. Mass concrete walls should be constructed of concrete of suitable mix and thoroughly tamped. The wall may be supported by stanchions or other suitable means and should be reinforced as necessary. Precast wall panels may be fixed either at the top and bottom or at either end. The panels should be reinforced for non-thrust resistant walls. Walls subject to lateral pressure resulting from stored grain, potatoes, silage, liquid or earth can be built between supporting piers or stanchions and should be reinforced against tensional stress by steel bars or mesh reinforcement. Where the retaining walls transfer their loading to the structural frame the frame should be designed to accommodate all the loadings applied to it.

3.3.5.5

Ventilation – Buildings should be adequately ventilated without draught to the standard required for the well-being of the stock to be housed, or for the crops to be stored, or for such other use as the building is intended. The ventilation system may be either mechanical or natural or a combination of both. Ventilating ducts to which humans have access should be of sufficient strength and dimension so as not to present a hazard.

3.3.5.6

Insulation – Buildings should be adequately insulated to the necessary degree and penetration of moisture into the insulation prevented by the provision of a suitable vapour barrier normally on the side next to the warm air.

3.3.5.7

Walls, internal partitions, etc in livestock buildings – Internal wall surfaces, gates, partitions, fittings etc constructed of materials liable to be damaged or deteriorated due to contact with livestock or manure should be properly protected with galvanised steel or other suitable sheeting to an effective height and along with floor surfaces, should be constructed so that they can be cleaned easily and will not cause injury to livestock.

3.3.5.8

Lighting – Natural lighting is a desirable feature in most farm buildings and the number and positioning of windows and roof lights should be considered in relation to the intended use of the building. The levels of illumination both from natural and artificial sources should be sufficient for effective and safe execution of work being done and for proper welfare of stock. Where artificial lighting is to be installed, the recommendations of BS 8206 should be followed. For emergency lighting see BS 5266-1.

3.3.5.9

Door openings – Door openings in farm buildings should be large enough to permit the safe and unimpeded movement of agricultural vehicles servicing the building.

3.3.5.10

Drainage – Adequate means of drainage should be provided to convey any foul liquid and rainwater to a suitable place of storage or disposal. Drains should be constructed of materials of sufficient durability having regard to the liquid passing through them and the nature of the ground in which they are laid. Drains should be bedded or supported for the loads and forces to which they may be subjected and laid at a gradient and in such direction as to make sure that they will be self-cleansing and capable of discharging the full volume of drainage for which they are designed. Gullies, manholes, inspection chambers and rodding eyes should be provided where necessary with heavy duty covers where subject to animal or vehicular traffic.

3.3.5.11

Containers for the storage of foul matter – Any tanks, slurry pit, lagoon or holding area intended for the storage or settlement of foul matter from the farm-stead should be sited where it will not pollute any stream, spring, well or other source of water or become a source of nuisance or danger to human and animal health. There should be no overflow or discharge from the container unless the effluent discharged is satisfactorily treated before disposal. Where containers present a hazard they should be covered or fenced in. See 1.9.3 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 for further info.

3.3.5.12

Water supplies in buildings – Livestock buildings should be connected to an adequate water supply and due allowance should be made for adequate storage particularly where the supply is intermittent. Watering points in buildings may be troughs, water bowls, drinkers or other approved fittings. The supply, the fittings and the installation must comply with the relevant current local water byelaws.

3.3.5.13

Painting – In the case of woodwork which is normally painted, e.g. doors, windows, etc, three coats of non-toxic paint should be applied - priming, undercoat and finishing coat. As an alternative suitable preservative treatment is acceptable. All structural and other steelwork, unless galvanised should be painted with two coats of bituminous or other acceptable non-toxic paint. The first coat of paint should be applied before erection and the second during or after erection but before any sheeting is fixed. Alternatively, both coats may be applied at the works before delivery. Damaged paintwork should be touched up on site.

3.3.5.12

Safety and warning notices should be displayed in all agricultural buildings, where applicable. The following is a list of instances where a safety notice is required:

- Hazardous atmospheres – Particularly where concentrations of dangerous gases can build up, e.g. in silos, slurry pits, tanks and below slatted floor systems.
- Housing dangerous animals – Pens, isolation boxes and other accommodation for the housing of fractious animals should be robust in construction and have suitable safeguards and means of escape. See BS 5502:2.2.
- Fragile roofs – Suitable warning notices about fragile roofs should be displayed at each end of the building.
- Retaining walls – Notices describing the design parameters should be displayed clearly as per BS 5502:22.
- Chemical stores – Special provisions exist for design and construction and reference should be made to BS 5502:81.
- Danger notices should be permanently fixed in a prominent position and be large enough to be easily discernible. Colours used should be as per BS 5378.

3.3.6

Standards for materials used in building construction

3.3.6.1

General – Materials used in the construction and for the modification of agricultural buildings should be selected to satisfy the building design classification (Table 1 and clause 14 of BS 5502:22). The use of any material or any method of mixing or preparing materials, or applying or fixing materials should be in accordance with the provisions of the relevant British Standard specification or code of practice. All materials, surfaces and fittings that under normal operations may be likely to come into contact with persons and/or livestock should be free from projections, sharp edges or perforations that could cause damage or injury.

Materials exposed to the weather should be able, within normal circumstances to withstand the local climatic conditions for the expected design life of the material concerned.

Selected materials should be painted or coated with a resistant material to provide protection from chemical attack that could arise from farm products.

Wood preservative should be applied on timbers with low natural durability where a biological attack such as fungi or insects that could lead to wood rot.

Materials should be of sufficient inherent strength and be so sized and be of such configuration to perform adequately the functions for which they are intended.

Reference should be made to the relevant British Standards code of practice covering the design of building and structures for suitable methods of protection of corrosion. See also BS 5502:21.

3.3.6.2

Vapour barriers – A vapour barrier should be provided to insulating layers to the 'warm side' to minimise the movement of water or water vapour into the insulating material. Where an insulating layer is in contact with the ground, a damp proof membrane should be provided beneath that layer.

3.3.6.3

Surface finishes – Lead based or other toxic paints should not be used on agricultural buildings.

Roof finishes should resist weather and should be firmly fixed to and supported by the substructure.

External wall finishes, in addition to weathering, should be capable of withstanding damage during use. Materials should be fixed to the substructure and have similar thermal and moisture movement properties to those of the substructure.

Internal finishes should be capable of withstanding anticipated dead load and impact loadings and abrasive forces without undue damage. Finishes should be easily cleaned and fixed to the substructure and have similar moisture movement properties as those of the substructure.

Ceiling finishes should be easily cleaned and unaffected by high humidity and properly fixed to the substructure.

Floor finishes should not be significantly affected by chemicals used in normal agriculture practice and should be impervious to liquids. Floors should be given a slip resisting texture but the texture should not be as such to cause harm to persons or livestock.

3.3.6.4

Galvanised steel - The minimum gauge of profiled galvanised mild steel sheeting should normally be 0.5 millimetres overall but galvanised and coated high tensile sheeting of 0.4 millimetres thickness may be accepted.

Attention should be paid to the need to seal laps at low pitches and on exposed sites. Refer to the BS for further information on laps. Sheetting over highly corrosive internal atmospheres (e.g. stock housing) requires a higher standard of protection. Protection should be provided between steel supporting members or timber-treated with metallic preservatives and the metal roof sheeting. See BS 5502: Part 21, Paragraph 7.3.

3.3.6.5

Fibre cement sheeting – For complete weather tightness, all fibre reinforced cement corrugated sheeting should comply with the relevant requirements of BS 5427 and be supported by an appropriate assessment for its use. Attention should be paid to the need for sealing laps at low pitches and on exposed sites. See BS 5502: Part 21, paragraph 8.

3.3.6.6

Aluminium sheeting – Profiled and corrugated aluminium sheets should comply with BS 4868 except those limiting the profile and should have a thickness of 0.5mm. Attention should be paid to the need for sealing laps and to prevent corrosion due to electrolytic action resulting from contact with other materials. Refer to BS 5502:21 paragraph 6.3.2 for further information on laps.

3.3.6.7

Plywood and hardboard – For wall claddings, timber boarding and plywood should have adequate thickness to perform their intended functions. Please refer to BS 5502:21 paragraph 4.4 for minimum thickness of plywood and timber boarding. Sizing for ventilated cladding will differ and further reference should be made to the BS noted previously. External grade plywood or WBP grade may be accepted in suitable circumstances as cladding materials for walls. Tempered hardboard may be used for internal linings. Plywood as above may be used as a cladding material for roofs providing that it is covered with acceptable felt. Plywood should comply with BS EN 314-1 & -2 and may be modified by BS 5502:22.

3.3.6.8

Roofing felt – Bitumen felt roofing should consist of a minimum two layers of felt complying with BS 747 and laid in accordance with BS 8217. The specification of the roof felt should be as per BS 5502:21.

3.3.6.9

Translucent plastic sheeting – Translucent plastic sheeting should be ultraviolet inhibited and have a light transmission of not less than 80% of that of glass, unless light transmission is not critical to the crop. Sheetting should match the profile of the roof or wall cladding and have a fire resisting performance equal to that of the roof cladding or equal to that which is necessary for the cladding into which it is fixed.

3.3.6.10

Other cladding materials – All other cladding materials should be of a suitable quality in relation to the purpose for which they are used and the degree of exposure to which they will be exposed and should have a fire resistance appropriate to the needs of the building. Cladding should be fixed in accordance with the relevant British Standards or, where these are not appropriate, in accordance with the manufacturers recommendations.

3.3.6.11

Timber – All timber used should be of good quality, straight in grain, free from large knots and waney edges. Except for the heartwood or oak, larch, sweet chestnut, yew or Western Red cedar, all timber and plywood (except that comprised wholly of a durable species) which is in contact with the ground or manure, or enclosed in brickwork, masonry or concrete, or inadequately ventilated, or liable to remain damp for long periods, should be preserved by one of the treatments appropriate to the species. The application of the preservative should be as per the requirements of BS 5502:21 paragraph 4. Where timber is exposed to the weather but is not in contact with the ground or manure and is not liable to remain damp for long periods then it may be protected by painting with three coats of non-toxic paint. If the timber is of a pine species then in these circumstances only it may be treated with an approved product suitable for the species. Paint or preservatives toxic to humans, animals or living plants or deleterious to stored crops should not be accepted.

3.3.6.12

Drainage pipes – Salt glazed fireclay, concrete, or rigid plastic pipes may be used for farm drainage systems. Cast iron pipes may be necessary where there is a risk of damage, eg. shallow drains under roads or pavings. Pipes should be encased in concrete where necessary. Un-jointed or perforated pipes may be used for certain systems of surface water drainage at shallow levels or in conjunction with the disposal of treated effluent.

3.3.6.13

Water pipes – Mains water supplies should be provided in accordance with the statutory requirements. Clean uncontaminated water is required for livestock as drinking water and feed preparation and cleaning purposes. External water fittings should be protected from extreme weather conditions and any other potential hazards. Stop valves should be provided close to where the service enters a building. Storage tanks and cisterns should be accessible for inspection, maintenance and cleaning.

3.3.6.14

Firefighting supplies – Firefighting supplies should be in accordance with BS 5306:1 and BS5502:23.

3.3.6.15

Second-hand materials – Second-hand building materials for any purpose may be accepted for grant provided that they meet the capital nature and other requirements of the Scheme and are suitable for their intended purpose. Any proposal to use second hand materials should be referred to the Senior Buildings Officer for consideration. The only exceptions are items which involve stone or hardcore (e.g. soakaways or dry stone walling) for which previously used brick stone or other suitable material may be used.

3.3.7

Concrete mix selection – If specifying concrete mixes, consideration should be given to the recommendations of BS 5328-1.

3.3.7.1

Designated mixes – Should be ordered in accordance with BS 5328-2. Suppliers of designated mixes are covered by a quality assurance scheme. Note that the specification of designated mixes given in BS 5328-2 is not necessarily applicable to factory produced precast concrete products.

3.3.7.2

Standard mixes – Should be as per table 13 in BS 5502:21 Appendix C.

3.3.7.3

Mix proportions – For most applications there is a standard mix equivalent to the quality assured designated mix. Where there is no guidance on equivalent mixes, the mixes defined in BS5502:21 Appendix C should be used. Site mix proportions are also detailed to produce concrete equivalent to the mixes stated.

Caution should be exercised if using mixes with high cement content as there is a risk of the concrete cracking due to the high early temperatures or other internal effects of chemical reactions within concrete.

With all reinforced concrete there is a risk of corrosion of the steel if the aggregate or mixing water has a high salt content. It is not advisable to use unwashed beach material or contaminated water for reinforced concrete or for concrete containing other embedded material such as holding down bolts.

3.3.7.4

The surface finish of floors and pavings should be appropriate to their use and should not be such as to create animal welfare problems.

3.3.7.5

Steel reinforcement should comply with BS 4449, 4466, 4482, 4483 or 6744 as appropriate and should be free of rust scale and other deleterious matter.

3.4 Standards for roads, bridges, culverts and livestock grids

3.4.1

Roads – Roads should be designed to allow for the anticipated traffic, the climatic conditions and the natural ground conditions. For a main access, the width should normally be at least 900 millimetre greater than the track dimension of the largest vehicles liable to use the road. All the usual materials, including materials of local origin, may be allowed, such as broken stone, quarry waste, binding gravel or mine waste. Care must be taken in the use of mine or quarry waste to make sure that no metallic or other organic matter is involved which may be harmful to stock etc. The foundation of a road should be excavated and in-filled in layers with compacted hard material, well drained and soft patches should be filled in with hard material. Geo-textile matting may be used where necessary. Provision should be made for surface drainage and on sloping sites cross grips may be provided.

3.4.1.1

Hardcore roads – the hardcore should be spread in layers to a minimum consolidated total thickness of 150 millimetres of new roads on rolled and blinded with quarry scalplings and dust or gravel/sand mixture.

3.4.1.2

Concrete roads – The thickness should be not less than 100 millimetres but will be determined by the quality of the road foundation and the likely traffic weight and frequency.. The mix of concrete should comply with BS 5502:21 Appendix C. A hardcore sub-base is normally necessary but can be omitted where the sub-strata is firm and of a sand and gravel mixture. Reinforcement should not normally be required but may be necessary where the foundation of the road is soft or where heavy loads are to be carried. Damage to concrete from de-icing salts can be minimised by using 'air-entrained' concrete. This should be used for at least the first 50 metres of the farm access road.

3.4.1.3

Surface dressings – Surface dressings of uncoated material should be laid to a minimum compacted thickness of 75 millimetres. Coated macadam suitably surface sealed, should be laid to a depth appropriate to the grade of the macadam and strength of base.

3.4.2

Bridges and culverts – Bridges and culverts should be designed and constructed to suit the needs of the agricultural business, in accordance with civil engineering practice and, if appropriate, any local authority requirements of any loading notices restricting the passage of vehicles where the bridge has been designed with a limited capacity. It is however strongly advised that irrespective of a local authority requirement, bridges designed for a specific maximum loading should have loading notices displayed. Bridges should be constructed of steel, concrete, reinforced concrete or impregnated timber with abutments, wing walls and aprons soundly built to prevent any movement or subsidence from loading or erosion. Wheel kerbs and guard rails should be provided where necessary. Pipe culverts should be of concrete or suitable preformed steel sections, not less than 225 millimetres in diameter adequately protected and having suitable head walls, wing walls and aprons.

3.4.3

Livestock grids – Livestock grids should be constructed in accordance with BS4008 or with any other additional requirement requested by the Local Authority.

3.5 Standards for fencing and gates

3.5.1

General – For all types of fences and gates it is a general requirement for construction to be of a design and to a durable standard that permits satisfactory use for the intended agricultural purpose. Fences should be erected in accordance with BS 1722 as appropriate. Straining posts and gate posts (if purchased) may be of good quality, adequately protected, second-hand materials, but all other components must be new.

Claims based on actual costs for materials and the "labour only" standard cost rate are acceptable.

3.5.2 Fence and gate posts

3.5.2.1

Straining posts should be at least 2.1 metres long. If round timber they should have a minimum diameter of 125 millimetres for three wire fences increasing to a minimum diameter of 175 millimetres for heavy duty fences of six or more wires. On the same basis the minimum cross-sectional dimensions for sawn timber straining posts should be 125 x 125 millimetres increasing to 150 x 150 millimetres or to other

cross sections giving equivalent strength. They should be set at centres not exceeding 150 metres for normal, strained-line fences (mild steel wires) or 200 metres for high tensile fences. In addition there should be a straining post set at each change of direction and at each significant change of gradient. Post holes for strainers must be at least 450 millimetres deep and excavated as narrow as practicable with vertical sides. When the post is in position the soil should be rammed back in 150 millimetre layers. Gate posts should be of similar dimensions and securely set in the ground as described for strainer posts.

Posts made from other materials, like reinforced concrete or steel (Clipex Fencing), should be of dimensions that provide an equivalent strength and set in the ground according to any specific instructions supplied by the manufacturers.

Sound railway sleepers, telephone or electricity poles are acceptable for grant to be used for straining posts.

3.5.2.2

Struts to support strainer posts should be at least 1.8 metres long. Round timber struts should not be less than 100 millimetres in diameter and sawn timber struts should have cross-sectional dimensions not less than 100 x 100 millimetres. The top end should fit into a notch in the strainer post and the lower end should be at least 300 millimetres below ground level resting against a suitable base plate.

3.5.2.3

Fence posts (intermediate posts) to carry the wires should be at least 1.6 metres long. Round posts should have a diameter not less than 63 millimetres for a three-wire fence and not less than 75 millimetres for a heavy duty fence. Similarly, if they are sawn posts the cross-sectional dimensions should range from 63 x 63 millimetres to 75 x 75 millimetres, minimum, depending on the type of stock to be controlled. Timber posts should be pointed and firmly driven into the ground to form a straight line between strainers. They need to be set at centres not exceeding 3.5 metres for three-wire strained-line fences and not exceeding 2.1 metres for heavy duty fences while, for all high tensile fences, post spacing should not exceed 12 metres. Other types of posts such as metal (Clipex) posts should be secured as recommended by the manufacturers.

3.5.2.4

Fence wires must be to BS 4102, galvanised and equivalent in strength and durability to:

- Four millimetre mild steel wire, or
- 2.50 millimetre (12 g) and 2.64 millimetre (12.5 g) high tensile steel wire, or
- 2.5 millimetre mild steel two-ply twisted barbed wire, or
- Oval section 13 gauge barbed wire.

NB: 3.15 millimetres high tensile wire can be used where atmospheric pollution is a serious problem or where salt laden sea winds could be severe.

The wires should be sufficiently strained and fastened to posts with galvanised staples which should be driven in obliquely but not fully home to leave the wires free to move. The top wire must be fixed at not less than 1.05 metres above the general ground level. Wires should be tied off at straining posts.

3.5.2.5

Woven wire must be galvanised and comply with BS 4102. If the woven wire selected is less than 1.05 metres in width, the required fence height must be achieved by fixing additional wires above or below the woven wire. If the woven wire selected is 1.15 metres in width, the fence posts must not be less than 1.8 metres long. Heavy gauge woven wire is recommended for areas subject to rapid corrosion due to atmospheric pollution.

3.5.2.6

Proofing against rabbits and hares requires galvanised wire netting to BS EN10223 – 2:2012 The netting should be not less than 1.05 metres wide and have a mesh no larger than 31 millimetres. The top edge of the netting must be at least 900 millimetres above ground level. The netting should be fastened to the fence and the bottom edge of the netting should be buried in the ground to a suitable depth or turned outwards and anchored. All gates in proofed fences must also be proofed.

3.5.2.7

Droppers for high tensile fences with widely spaced posts must be of galvanised steel or timber and spaced so that the distance between droppers or between a dropper and a post is not more than 3.5 metres. All droppers must be kept clear of the ground.

3.5.2.8

Wooden post and rail fencing should not be less than 1.05 metres high from the general ground level to the top of the top rail. For rectangular posts no side shall be less than 63 millimetres and for half round posts the flat face must be at least 150 millimetres wide when barked and peeled. The posts should be at least 1.8 metres long and set at centres not exceeding 1.8 metres. The rails should be 75 x 38 millimetres sawn timber or half round timber not less than 100 millimetres across the flat face when barked and peeled. The rails should be skew nailed to posts with galvanised nails.

3.5.2.9

A concrete foundation may be required to secure posts in unstable ground. In conditions where it must be used the posts should be set in concrete not less than 400 x 400 x 500 millimetres deep.

3.5.2.10

Electric fencing – Permanently sited electric fencing, supplied either from the mains or batteries is eligible for grant provided the controller complies with the appropriate BS. Mains controller/energisers, battery controller/energisers and dual mains/battery units must comply with BS EN 60335-2-76:2005+A2:2015. The batteries are not eligible. Where permanent electric fencing is supplied from the mains the claimant must provide a certificate stating that the work complies with the requirements of the Institution of Electrical Engineers Regulations. The following points should be noted:

- Barbed wires must not be used in electric fencing. Where electrified stand-off wires are used on a fence incorporating barbed wires, the offset brackets must not be attached to barbed wires and the stand-off wire must not be less than 150 millimetres from the vertical plane through the strained wires of the fence.
- Where it is proposed to erect a permanent electric fence alongside a public road or footpath, the fence must always be separated from it by a verge, ditch, bank or hedge. Applicants must have consulted the local authority before starting work and taken account of any comments or advice during construction before grant can be paid.
- Electric fencing powered by mains, mains/battery or battery operated controller/energisers can cause interference on nearby telephone circuits, particularly those that are underground. Care is needed to make sure that such interference with telephone circuitry does not occur. Proposals to erect electric fences in the vicinity of telecommunications infrastructure should be shared with Openreach.

3.5.3

Gates – Gates should be soundly framed, soundly constructed and of suitable materials. They must be constructed of timber or of steel to the appropriate BS requirements.

The dimensions of components used for the construction of gates should be adequate for the design, size and intended use for each kind of material.

Steel gates must be hot dipped galvanised after manufacture or painted with two coats of suitable non-toxic paint. Cold galvanising is classed as a painted finish. All gates must have a minimum height of 1.1 metres from the bottom of the bottom rail to the top of the top rail. The width should be adequate for the intended agricultural purpose and not less than three metres where access is required for firefighting purposes. Openings greater than 4.5 metres must have two gates. All gates must be complete with all the fittings needed for their efficient operation. They should be securely hung on hinges, affixed to the gate post, so that they can swing freely to the fully open position without coming in contact with the ground and easily closed with a securing latch or bolt.

3.5.4

Protection of materials used in fences and gates – All timber should be treated as specified in Appendix E of BS 1722. Fence wires and woven wire netting must be galvanised to BS EN ISO 1461:2009. Steelwork may be either galvanised to the appropriate BS or painted with one coat appropriate primer and one coat finishing paint. All paintwork damaged during construction should be repaired before the work is completed.

3.6 Standards for land drainage

3.6.1

General – Land drainage can be a complex investment requiring a range of designs to solve a number of distinct drainage problems and is unlike most other investments under capital grant schemes in that the completed work is buried in the ground and out of sight. For these reasons it is essential that the efficiency of the design, the standards of workmanship and quality of materials used are all of a sufficiently high standard at the time of installation. It is not intended that this section is a complete specification but the minimum standards indicated will provide the basis of sound land drainage work. It should be borne in mind that poorly designed or poorly executed projects or the use of poor quality materials may cause an investment to fail to meet the capital nature test.

3.6.2 Workmanship standards for ditch Improvements

3.6.2.1

All woody growth which would obstruct the work should be trimmed or grubbed out before the excavations begin. Where branches of trees require to be lopped this should be done with care to avoid damaging the trees. All branches and trimmings should be burnt or carted away so that they do not become mixed with spoil from the ditch. The removal of bankside vegetation should be the very minimum necessary for the efficient functioning of the ditch.

3.6.2.2

Ditches should be cut to the design dimensions as determined by the depth needed to provide outfall for drains, the gradient and the amount of water to be carried. The ditch bottom must have an even gradient and the sides need to be sufficiently stable to avoid bank slips in the type of soil forming the banks. Care is needed to avoid undermining dykes, roads or buildings. Excavated material must be placed at least 600 millimetres from the edge of the ditch and spread in such a way that it does not cause ponding of surface water. Bank slips must be cleared and rectified and any silt accumulated during excavation should be cleared before the scheme is completed.

3.6.2.3

Ditch banks should be examined for old drains. If functional they should be cleared and provided with satisfactory outlets.

3.6.2.4

Where ditch crossings are required the necessary bridges or culverts should be constructed with adequate dimensions and to a standard which allows them to withstand the weight of vehicles crossing. The culvert pipes should be suitable for the situation and have positive joints to preserve alignment. The pipe diameters should be sufficient to carry the anticipated flows and in any case not less than 225 millimetres. Pipes should be set on a firm bed in a recessed trench bottom and aligned to provide an unimpeded continuation of the adjoining ditch. Protective measures may be needed to prevent erosion of the ditch channel at the outflow end of the culvert. Headwalls may be required at both ends of the culvert.

3.6.2.5

Protective fences alongside ditches should be erected at least 450 millimetres back from the edge. The fences should be soundly constructed using good quality adequately protected materials as detailed in the fencing section of this guidance.

3.6.2.6 In the absence of a piped water supply stock watering points should be constructed using solar powered pump systems or stock-powered pump systems.

3.6.2.7 Any work on drainage ditches must be carried out in accordance with the Controlled Activity Regulations (CAR)

3.6.3 Workmanship standards for under-drainage

3.6.3.1

Attempting land drainage operations with modern heavy tackle when the soil is wet can leave the land in a poorer condition than before, especially on heavy land. If at all possible drainage should be carried out during the summer months when land is in grass, or after early harvest, or through a standing crop early in the growing season.

3.6.3.2

Drain trenches should be cut to design depth, true to line and gradient and the trench bottom should provide a secure seating for the pipes. The minimum depth of cover over any lateral drain should be 600

millimetres and over leader drains 675 millimetres. Gradients normally should not be less than one in 400 and sealed pipes are necessary in leader drains at gradients greater than 1 in 60.

3.6.3.3

Pipes should be laid in a true line and gradient on a firm bed free from loose soil and must never be laid on soil backfill or when the trench is in a slurried condition. Clay tiles should be evenly aligned and well butted together to avoid large gaps. When plastic pipes are used the bottom of the trench should be shaped to support the side walls of the pipes and where the plastic is PVC the pipes should not be laid or backfilled when the temperature is less than 5°C. All drain junctions should be made with purpose-made tile or plastic branch pieces. Where possible pipes should be blinded by stone-free earth to avoid damage or displacement during backfilling.

3.6.3.4

With the exceptions of very deep drains on level sites and shallow systems that can be completely disrupted by subsoiling, all old drains encountered during the drain-laying operation must be positively connected to the new drains by means of purpose-made junctions or by using sufficient amounts of permeable infill to connect the two systems. When the old drains are deeper than the new system on a sloping site a number of deeper drains are needed to cut and bleed the old system.

3.6.3.5

When draining running sand, old ditch lines or other unstable conditions, special precautions are needed to maintain drain alignment. A preliminary de-watering system of open channels is of great value in waterlogged soils and the laying of tiles on boards may be essential where drains pass through unstable land such as backfilled pipeline trenches or deep ditches, the pipes should be supported on a bridging device of wood, reinforced concrete or steel.

3.6.3.6

Solid pipes or pipes with sealed joints are required near trees and hedges so that roots cannot enter and block the drains.

3.6.3.7

Where the design specifies permeable infill, care should be taken to prevent mixing with earth and the pipes should be covered to design depth. The depth of infill should be sufficient to provide a suitable connection, as appropriate, between the new drains and any old drains, channels created by moling or subsoiling or the plough layer where the subsoil is slowly permeable.

3.6.3.8

A properly constructed outfall is essential where leader drains discharge into an open channel. The last length of the buried pipe and any projecting part of the pipe must be solid and frost-proof and the outfall should be at least 150 millimetres above normal ditch water level wherever possible. The last two metres of buried pipe must be sealed with well-rammed soil to avoid water flow outside the pipe. Headwalls of cemented stones or bricks or purpose built installations are needed to stabilise the bank and to keep the pipe in position. Drip stones or concrete aprons may be needed to prevent erosion of the channel. Discharges from outfalls come under the scope of the Controlled Activities Regulations (CAR).

3.6.3.9

At major pipe junctions or at reductions of gradient in leader drains it is advisable to construct inspection chambers with silt traps of satisfactory design.

3.6.3.10

All inlets for the entry of water from an open channel must be provided with a silt trap and grating of satisfactory design.

3.6.3.11

Piping open ditches is an operation requiring careful planning and assessment of likely flow rates. In particular the pipe must be large enough to carry peak flow rates and where open channels discharge into the pipe it must be capable of carrying storm water flows. All existing drains discharging into the ditch must be located and connected to the new pipe. Special precautions are needed where circumstances demand that water should not leak from the pipe. In the interest of conservation of the countryside, the piping and filling of ditches should be restricted to the minimum amount required for efficient land drainage.

3.6.3.12

Trenches must never be backfilled when the soil is in a slurried condition. Large stones should be removed and the trenches carefully backfilled with excavated material in such a way that the pipes are not damaged or displaced and the fill should be firm but not compacted.

3.6.3.13

Trenchless drainage techniques can present difficulties. It is particularly important to make sure that where required a sufficient amount of permeable backfill is installed to provide adequate permeability in the "trench" and the necessary connections between old drains and the new system.

3.6.4

Workmanship standards for soil treatments

3.6.4.1

Mole draining should only be carried out on suitable subsoils, over an efficient under-drainage system and in the right soil moisture conditions. The subsoil requires to be plastic at mole depth to form a stable channel but dry enough above to promote soil fissuring. These conditions are most likely to occur when the soil is drying out in late spring and early summer. The equipment used must be capable of drawing a mole channel of circular shape (not less than 75 millimetres diameter) evenly and continuously at the design depth parallel to the general ground surface. The channels should be deep enough to avoid damage by subsequent cultivations and close enough to make sure good drainage usually 1.5-2.5 metres apart. Gradients may range from one in 300, to one in 15. Steeper gradients which may cause erosion of the channel can be avoided by moling diagonally across slopes. All mole channels should be connected to the drains by permeable infill in the drain trenches. The top level of the permeable backfill should be at least 150 millimetres above base of the mole channel which should be drawn across the line of the collector drains.

3.6.4.2

Subsoiling should be carried out only when the subsoil is dry enough to obtain adequate shattering and fissuring of the soil and over an efficient under-drainage system. Suitable conditions for subsoiling occur in a dry summer or autumn after plant growth has removed a substantial amount of moisture from the subsoil. The subsoiling should be carried out at the depth needed to burst the compact layer in the subsoil and at intervals of not more than 1.2 metres. When soil conditions are right for maximum effect a high power capability is essential.

3.6.5 Workmanship standards for hill drains

3.6.5.1

This section applies to the clearing of existing hill drains only, the cutting of new hill drains is no longer permitted. Where necessary consultations should be arranged with interested parties such as NatureScot before work commences.

3.6.5.2

The channel should have a tapered section with a bottom width of 150 millimetres to 300 millimetres, a top width not less than 550 millimetres, a depth of not less than 350 millimetres and continuously graded to one or both ends of its length. Hill drains shall be cleared with a tracked excavator with "V", or standard bucket. The provision of a new system of hill drains is no longer eligible.

The excavated material should be deposited on the downslope side at least 600 millimetres from the near edge and spread in such a way that it does not cause ponding of surface water. Bank slips must be cleared and rectified and any silt accumulated during excavation should be cleared before the scheme is completed.

The laterals should be connected to the leaders with a clean and undiminished cross-section, hand labour being used where necessary. The channels should be cleared in such a direction that the gradient is sufficient to allow self-cleansing flow velocities in average conditions but in no case so steep that scouring can occur. Special care is needed to make sure that main outlet channels are not seriously scoured and eroded.

Discharges from outfalls come under the scope of the Controlled Activities Regulations (CAR)

3.6.6

Quality of materials used

3.6.6.1

All pipes must be suitable for their required drainage function and conform to the appropriate British Standard BS 1196 for clayware tiles and BS 4962 for plastic piping.

3.6.6.2

Permeable backfill must be clean gravel, stone chips or other approved durable material with no dimensions greater than 50 millimetres or less than six millimetres.

Other materials used for land drainage works, usually building materials should be of a standard specified in the appropriate sections above.

Annex 1 - List of eligible operations



[Capital Grant Technical Guidance 2015-2020 Annex 1 \(PDF, Size: 112.4 kB\)](#)

doc_external_url: <https://www.ruralpayments.org/media/resources/Capital-Grant-Technical-Guidance---Annex-1---update-02-22.pdf>

Annex 2 - Summary of British Standards



[Capital Grant Technical Guidance 2015-2020 Annex 2 \(PDF, Size: 23.1 kB\)](#)

doc_external_url: <https://www.ruralpayments.org/media/resources/Capital-Grant-Technical-Guidance-2015-Annex-2.pdf>