

Rural Development Programme 2014 - 2020



Farm Business Improvement Scheme - Capital Tier 2 (Tranche 1)

Explanatory Booklet on the Design of Agricultural Buildings



Department of
**Agriculture, Environment
and Rural Affairs**
www.daera-ni.gov.uk



rural
Development
Programme



'The European Agricultural Fund
for Rural Development: Europe
investing in rural areas'.

Farm Business Improvement Scheme - Capital (FBIS-C) Tier 2 (Tranche 1) Explanatory Booklet on the Design of Agricultural Buildings

Please read this booklet carefully before completing the application form. It is also recommended that you refer to the relevant FAQ's on the DAERA website.

DAERA reserves the right to make changes to the requirements during the lifetime of the FBIS – C Tier 2.

Copies of this document can be made available, on request, in alternative formats e.g.

- Large Print
- Audio CD
- Braille
- Computer Disc

Tier 2 of the FBIS-C is administered by the Department of Agriculture, Environment and Rural Affairs (DAERA). If you require assistance please contact:

Telephone Number: 0845 026 7535

E-mail Address: tier2@daera-ni.gov.uk

Website: www.daera-ni.gov.uk



INTRODUCTION

This booklet highlights the general principles that should be considered when designing agricultural buildings for a range of different uses. In addition to the mandatory minimum requirements, there are some recommendations provided. These constitute advice on good practice and have been given to assist applicants with the development of their construction proposals.

Where a specification is stated it should be considered the minimum and detailed advice for full construction specifications for a particular site should be sought from a Chartered Engineer.

DAERA does not accept design responsibility for buildings constructed in accordance with the specification, and shall not be liable for any loss or damage resulting from the failure of any structure to perform as expected.

Applicants should appoint a Chartered Civil or Structural Engineer to prepare the design.

References to Standards are to the current edition of the British or European Standards and the UK National Annex for European Standards where applicable.

The details in this booklet should be read in conjunction with the Explanatory Booklet for the Farm Business Improvement Scheme – Capital, Tier 2 (FBIS - C). It should also be read with the other guidance booklets which form part of the scheme.

AGRICULTURAL BUILDING STANDARDS

It is important for sound economic reasons that all new farm buildings and other agricultural structures should be properly designed and constructed. A quality building, though perhaps of higher initial costs, will save ongoing maintenance and perhaps even future replacement costs, and should assist in achieving greater productivity.

Agricultural buildings must satisfy all relevant British Standards (BS), or other relevant standards.

Attention is particularly drawn to the provisions BS 5502-22:2003, which was amended (generally to reflect the introduction of the Eurocodes) in 2013.

BS 5502-22 contains specific details, such as animal weights and the density of stored materials. BS 5502 is published in separate parts to meet both general and specific interests and needs, covers those buildings including livestock, poultry, slurry storage and crop production.

Engineers must ensure that designs comply with all relevant BS.

One of the conditions that **must be satisfied** is the minimum design life for the building. Where the environment within the building may be corrosive (e.g. within a livestock building), consideration should be given to the coating on the steel, the type of purlins and the type of cladding used to achieve this.

In addition to the BS 5502 series, other standards are available which would also be of use in agricultural industry operations. Designers must state which standards have been used in the proposed structure and all related elements.

Specific BS codes will be referenced in this booklet to ensure the structures meet these standards.

Note:

All proposed projects, where applicable, will be assessed to ensure it complies with;

- minimum relevant building standards
- minimum animal welfare recommendations
- applicable Health and Safety recommendations

Any project which does not meet these minimum standards will be rejected.

It is very important that the specification for the design includes all features of the project.

No additional funding for unforeseen costs will be approved after the Letter of Offer has been issued.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS (NORTHERN IRELAND) 2016

Virtually everyone involved in a construction project has legal duties under the new Construction (Design and Management) Regulations (Northern Ireland) 2016 (CDM 2016) - there is no exclusion for small projects.

CMD 2016 aims to improve health and safety in the industry by helping to:

- sensibly plan the work so the risks involved are managed from start to finish
- have the right people for the right job at the right time
- cooperate and coordinate your work with others
- have the right information about the risks and how they are being managed
- communicate this information effectively to those who need to know
- consult and engage with workers about the risks and how they are being managed

Further details can be found at:

www.hseni.gov.uk/articles/construction-design-and-management-regulations-northern-ireland-2016

ELECTRICAL INSTALLATIONS

General

All electrical services installations shall be provided, installed, wired, connected, tested, commissioned and certified as described below;

Designs and installations shall adopt durable low maintenance materials, and avoid features or items expensive to operate and maintain and/or costly to replace.

All electrical services shall operate effectively and efficiently throughout their design life. All equipment, cables, cable containment, shall be appropriate to local

environmental conditions and risks as outlined below and further detailed in IEE Wiring Regulation, Section 705 and relevant documents of BS5502:

- water / dust ingress
- corrosion
- ambient temperature
- fauna, flora
- vermin

Installation(s) shall be:

- Beyond the reach of livestock
- Protected against impact and mechanical damage and
- Provide ready access for users and maintenance

Installer

The electrical installation contractor shall hold accredited membership of a 3rd Party body (Electrical Contractors' Association (ECA), National Inspection Council for Electrical Installation Contracting (NICEIC) or equivalent.

Installation, commissioning, certification and setting to work of specialist installations (e.g. milking equipment) will be carried out by specialist installers with a proven record in the relevant industry.

Standards

The following legislative requirements shall apply:

- Electricity at Work Regulations (NI) 1991
- Health and Safety at Work (NI) Order 1978
- CDM Regulations
- Construction Product Regulations 2011
- Conditions associated with Planning Approval

Designs, materials, components, installation, workmanship, testing and commissioning shall be in accordance with recommendations set out in the latest edition(s) of:

- The IEE Wiring Regulations (BS 7671),
Particular attention is directed to Section 705 'Agricultural and Horticultural Premises'
- BS 5502 'Buildings and structures for agriculture'
- Appropriate British Standard Specifications and Codes of Practice
- HSENI Approved Codes of Practice and guidance
- Industry best practice

PLANNING PERMISSION

Certain construction developments on a farm holding are deemed to be permitted development. This includes works for the erection, extension or alteration of an agricultural building, which are reasonably necessary for the purposes of agriculture within the unit.

However the development must comply with certain requirements set out in the relevant legislation, Planning (General Permitted Development) Order (NI) 2015.

Generally speaking planning permission is not required for changes to the inside of agricultural buildings provided it is for agricultural purposes or for small alterations to the outside e.g. the installation of an alarm box.

Further information can be obtained by contacting your Local Area Planning Office (Annex II).

Applicants will have to provide evidence that their proposed project is fully compliant with planning.

Permitted Development

Some of the practical rules defining permitted development are stated below:

- Must have an agricultural holding of greater than 0.5 Hectare
- Active farmer for minimum of 6 years
- Building height must not exceed 12m (3m if within a certain distance from an airport)
- Maximum distance of 75m from existing farm buildings within the holding
- No dwelling not connected with the farm holding within 75m of the nearest part of the proposed development
- The footprint of the building (may include below ground tank storage floor area) must not exceed 500m² in any 2 years
- A minimum of 9m from a minor road, 24m from all other roads

There are a lot of additional environmental rules that must be adhered to be eligible for permitted development and it is the applicant's responsibility to ensure these are also met.

A person intending to carry out a project which they believe falls under permitted development may choose to apply for a Certificate of Lawful Use / Development ("Certificate of Lawfulness") at their own expense.

However, applicants, whose projects appear to fall under permitted development rights may also choose to apply to FBIS-C Tier 2 without a Certificate of Lawfulness.

However these will be assessed and are likely to be subject to an environmental assessment by DAERA.

Building Control

Building Control is responsible for ensuring that the Building Regulations, a set of construction standards laid down by Parliament, are enforced in your local Council.

Buildings for agriculture or for keeping animals are exempted buildings provided certain conditions, as detailed in The Building Regulations (Northern Ireland) 2012, are met. Applicants should ensure that their proposed project meets the conditions for an exempted building, otherwise their building should comply with the Regulations and Building Control approval should be obtained.

Further details can be found at: <http://www.buildingcontrol-ni.com>

The Nitrates Action Programme Regulations (Northern Ireland) 2014

There are a number of different items covered by 'The Nitrates Action Programme Regulations (Northern Ireland) 2014' which need a minimum design life of 20 years.

Where the structural elements of any new design are likely to come into direct contact with silage, silage effluent or slurry, advice should be obtained from the design engineer on how to protect steel components against corrosion.

Any item covered by 'The Nitrates Action Programme Regulations (Northern Ireland) 2014' which is to be located within 10m of a watercourse or 50m of a well must have NIEA approval before a Letter of Offer will be issued.

Other Legislation to Consider

Depending on the type of project and its location, other legislation may have an impact on the project. Some of these are highlighted below and may be required before work can commence:

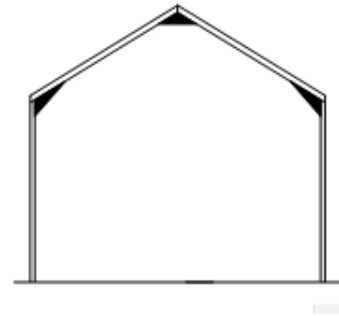
- Advice should be sought from NIEA for any proposed works which might interfere with an ancient monument or historical building.
- Pollution Prevention and Control licence for larger pig or poultry construction projects is required.
- Discharge Consent.
- If any new building is to be located where an existing hedgerow is currently present, applicants must obtain written consent to remove the hedgerow from DAERA Countryside Management.
- Any proposed housing for animals must adhere to the relevant animal welfare recommendations. In particular the correct recommended floor areas for the type, size of animal being housed and recommended passage width space, extra cubicles than number of animals in the house etc must be included in the design and specified on the plan submitted with the application form. It may be that the applicant is a member of a quality assurance scheme that requires the design above the minimum and this need to be stated on the plan. **Any proposed plan that does not meet the minimum standards will be rejected.**

STRUCTURE TERMINOLOGY

Agricultural buildings which will be considered for funding should be steel portal frame type (including propped portal), timber framed large span structures or steel hooped structure.

STEEL PORTAL FRAME

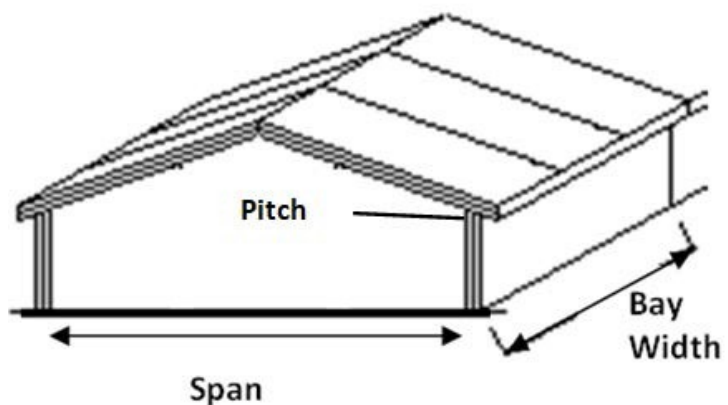
This is a single-span frame of stanchions and rafters, strengthened with knee and apex braces, and by beams and bracing between the frames. It is used for any house for a wide unrestricted span.



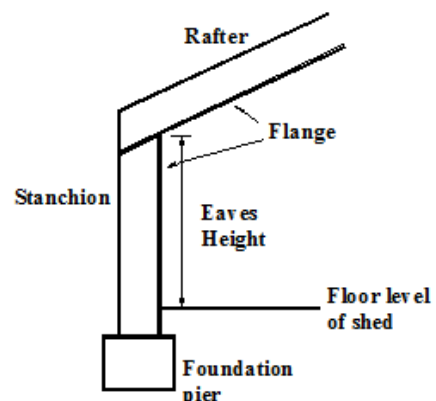
Bay Width: The bay width is the distance from the centre of a stanchion of one bay frame to the centre of the corresponding stanchion of the adjacent bay frame. The common bay widths for structural steel portal frame buildings are 4.8m and 6.0m. Alternative bay widths can be used and all specific details must be considered by design engineer.

Span: A span refers to the distance or dimension between two free-standing stanchions comprising a single bay frame of a steel frame building. The distance measured is from the inside flange of one stanchion to the inside flange of the other.

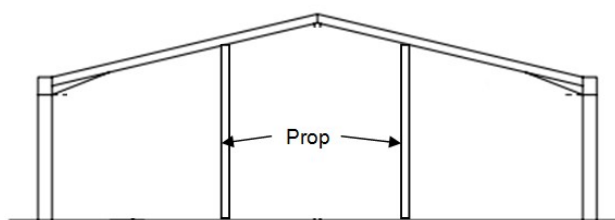
Pitch: This refers to the roof slope which is the angle of the roof beam and the horizontal. This is very important in achieving effective ventilation in livestock buildings. The pitch must be correct to assist in good ventilation especially as the width of the building is increased.



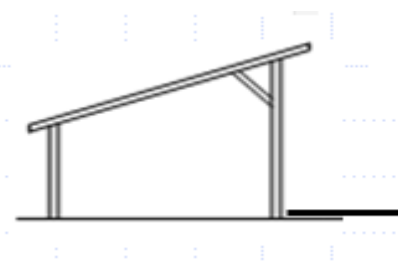
Eaves Height: is defined as the distance between the underside of the rafter and the internal floor of the building. The eaves height will be determined by the purpose of the building and the access needed with modern machinery.



Propped Portal: Where the span of a portal frame is increased and there is no requirement to provide an internal clear span, a propped portal may be suitable for the proposed project. The design engineer must consider the deflections and other loadings this imposes on the whole structure.



Open Sided Mono Pitch: This type of house is usually positioned where the back (closed in part) of the house is against the prevailing wind and the open front on the sheltered side. This can aid ventilation and more suitable for animals not affected by draughts.



Where the proposed project is a livestock house which includes in the design an “outside” feeding area - there must be an adequate system included in the design to demonstrate that wildlife cannot come in direct contact with the livestock.

CHARTERED ENGINEER

All designs shall be prepared under the supervision of a Chartered Engineer (Civil or Structural). The Engineer responsible for any project which involves construction will be required to prepare a scale drawing of your construction project to the appropriate British Standard or EN code. This initial drawing can be an outline drawing of the building, plan and elevation. This will be based on site visits and the requirements for the building.

The Chartered Engineer must be:

- a) qualified in Civil or Structural Engineering
- b) currently registered as a Chartered Engineer
- c) a corporate member of a recognised Engineering Institution (with current membership – it cannot have lapsed)
- d) have appropriate Professional Indemnity/Insurance in place

In cases where an application for Tier 2 is approved for grant then the fees (i.e. for post approval costs including visits to inspect the building at regular intervals during the construction) for a chartered engineer or technical costs may be grant aided. Refer to page 9 of Scheme Explanatory Booklet.

The design engineer must retain for inspection all relevant certificates for inspection by DAERA if required.

BUILDING CERTIFICATION

All structural steelwork shall comply with the National Structural Steelwork Specification for Building Construction, 5th edition CE marking version. It shall be CE marked and shall comply with BS EN 1090 Execution Class 1. It shall be fabricated and erected by a steelwork contractor with CE marking accreditation.

MATERIALS REQUIREMENTS:

- All steel shall be supplied with CE Marking and shall be, at least, steel grade S275 JR.
- All steel sections, plates and flats shall meet the quality requirements of BS EN 10025-2 and all hollow sections shall meet the quality requirements of BS EN 10210-1/10219-1.
- The surface condition of plates and flats shall meet class A2 of BS EN 10163-2 and the surface condition of sections shall meet class C1 of BS EN 10163-3.
- All material inspection certificates shall be type 3.1 to BS EN 10204. All material inspection certificates shall be issued and retained by the design engineer and supplied to DAERA if requested. Cast references shall be marked on all steel.
- All bolts used in the manufacture of steel frames should be a minimum of grade 8.8 and certified in accordance with EN15048-1:2007. They shall be supplied with an electroplated zinc coating in accordance with BS EN ISO 4042 and BS 7371.
- Where a component of a building is covered by a Harmonised Standard, then only products that are produced and certified in accordance with the relevant standard are permitted.
- The concrete shall comply with all clauses of the Minimum Specification for Concrete Composition used in Agricultural Structures.
- All materials used in the construction of grant aided buildings shall be sourced as new. Funding is not available for any second-hand materials including internal fixtures.
- Applicants may use internal fixtures that are not new and are not being funded provided they are deemed fit for purpose and meet any current minimum standards.

PROTECTION OF STEEL

Structural Steel must be protected with one of the following:-

SYSTEM I: Hot Dipped Galvanising

Hop dip galvanised coating shall be applied **after fabrication** in accordance with BS EN ISO 1461:2009 to a minimum average coating weight of 610gr/m².

Small areas of galvanised coating damaged by any subsequent welding, cutting, or by excessively rough treatment during transit and erection may be renovated by the use of at least 2 coats of "spray-on cold galvanising" supplied by the galvanising company; or at least 2 coats of zinc-rich paint/primer complying with BS 4652:1995.

Note: Hot Dipped Galvanising is recommended.

SYSTEM II: Shot-blasting, Priming, and Painting

All scale and rust shall be removed by shot-blasting to Sa 2.5 or BS EN ISO 8501-1:2007. A holding zinc-rich primer of 25 microns shall be applied within 6 hours of shot-blasting. A further 50 microns of zinc phosphate epoxy primer, an intermediate coat of 100 microns of high build epoxy micaceous iron oxide, and a re-coatable polyurethane finish of 60 microns shall be applied to provide a total dried coat of minimum 235 microns. This paint system may be substituted by a paint system to BS EN ISO 12944 which would give high durability in a C3 corrosivity category.

Damage to Paint Surfaces

Any damage to paint surfaces during transport or site erection shall be made good by brush treatment on site using specified primer and finishing coats.

Certificates

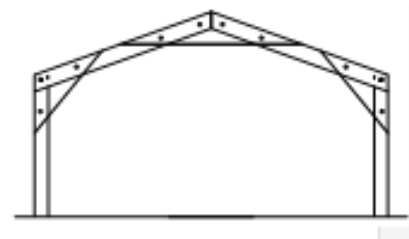
The design engineer should retain all certification from steel fabricators or contractors that painting or galvanising has been carried out to the specified standards on the whole superstructure in question. Where galvanising has been used, the certificate supplied by the fabricator/contractor shall state the name and address of the Galvaniser, and date and number of invoice/advice note which refers to the particular superstructure.

Treatment of Non-Structural Steelwork

It is recommended that all non-structural steel work is hot-dip galvanised to BS EN ISO 1461:2009. All non-galvanised non-structural steelwork shall be prepared by shot-blasting to Sa 2.5 or BS EN ISO 8501-1:2007. A holding zinc-rich primer of 25 microns shall be applied within 6 hours of shot-blasting. A further 50 microns of primer, and 50 microns of micaceous iron oxide finishing coat, shall provide a total dried coat of minimum 125 microns.

Timber Framed Large Span Structure:

Where timber portal frames or combination steel/timber portal frames, or similar large span prefabricated timber structures are proposed they shall be supplied and erected by specialist suppliers who are experienced in this type of structure. Specialist prefabricated agricultural buildings for particular sectors eg



poultry shall similarly be supplied and erected by specialist suppliers who are experienced in this type of structure. They shall be designed in accordance with BS 5502, BS 5268 or BS EN 1995. All timber is to be vacuum/pressure treated with an approved preservative. Such treatment shall ensure a preservative loading and concentration to provide a minimum service life of twenty years to satisfy hazard class 4 requirements, as defined in BS EN 335-1:1992.

Steel Hooped Structures

This consists of a series of curved steel frames, roofed with a simple, or insulated, plastic membrane. It is appropriate for mushroom and other horticultural buildings, for sheep and other animals and for low-cost. It is normally designed, supplied and erected by specialist companies who shall ensure it meets recognized standards (e.g. European Standards). These must have a minimum design life of 5 years after the date the final payment is made and a certificate stating such must be issued.



FURTHER SPECIFIC DETAILS FOR ALL BUILDING TYPES

PURLINS, SIDE RAILS & FIXING OF CLADDING

Timber Purlins: Timber purlins may be used in all framed structures with the design engineer specifying the purlin dimensions and spacing in accordance with the span, type of cladding used, roof pitch etc. Additionally, the purlin spacing shall not exceed that specified for the particular cladding as recommended by the manufacturer or stated in the relevant BS. All pre-painted metal sheets shall be separated from timber by a DPC strip the width of the purlin and fixed to the purlin. All timber purlins shall be at least C16 strength grade and treated with an approved preservative.

Steel Purlins: Steel purlins **must** be galvanised (minimum galvanised weight 275g/m²), sized and installed as per the manufacturer's instructions or stated in the relevant BS. All steel purlins shall be pre-painted in the factory to the same standard as pre-painted cladding material.

Laminated Timber: This type of purlins may be used instead of steel purlins provided a performance guarantee is given by the manufacturer that they are suitable for damp acid environments. They should be designed by a specialised supplier to BS EN 1995 be sized and installed according to manufacturer's instructions for fibre-cement and steel sheeted roofs as appropriate.

Purlin Cleats: Purlin cleats for timber purlins shall be at least 250mm wide and shall extend to a height of at least two thirds the purlin depth. They shall be placed down slope of the purlin and securely fixed. For steel purlins, cleats shall be fitted as per manufacturers' instructions.

Side Rails for Cladding: This must be specified by the design engineer, stating the purlin dimensions and spacing in accordance with the span and type of cladding. Where timber is used, a DPC strip shall be fitted between the treated timber and the pre-painted cladding sheet. Steel rails shall be sized and fixed in accordance with manufacturers specification and instructions.

Fixing of Spaced Roof Sheeting: It is recommended that the gap should not be less than 12mm (30mm gap is recommended for beef and sheep units, 20mm for cow units, and 12mm is recommended over the calf creep area in suckler units). The first two sheets at gable ends shall be overlapped, but all other sheets may have a space between them. All sheet fixings must be corrosion resistant and suitable for the type of purlin or rail used, as recommended by the manufacturer or design engineer. Sheets shall be fixed in the recommended manner and with the recommended number of fixings per sheet per purlin/rail. Suitable washers shall be used with each fixing.

ROOF CLADDING & SIDE CLADDING

Non-fragile roofs: Non fragile roofs shall be installed over all agricultural buildings except for polythene-covered hooped structures. The entire assembled roof shall have a non-fragility rating of at least CLASS C as defined in “ACR[M]001:2014: Test for fragility of Roofing Assemblies.” Rooflights shall be installed to manufacturer’s instructions to achieve CLASS B non-fragility.

Cladding: Generally all cladding shall comply with relevant British and European Standards in respect of materials, installation and performance. In particular it shall comply with BS 5427 and other Standards quoted. The cladding shall come complete with all flashings, trims and ridge pieces in the same material and to the same standards as the main cladding. Fixings, side and end laps, and all aspects of the installation shall be in accordance with the manufacturer’s recommendations.

Documentary evidence such as invoices shall be provided to confirm that the cladding meets the minimum standard specified.

The colour of the sheeting must be environmentally acceptable.

Single Skin Metal Roof Sheets: Single skin metal roof sheets of proprietary manufacture may be box profiled or corrugated. They shall be manufactured from steel to BS EN 10346, minimum grade S220GD + Z275, and a minimum thickness of 0.5mm. The external face shall have a pvc Plastisol coating or polyester paint coating or similar to give a minimum life to first maintenance of 10 years. The internal face shall have a painted finish to give a life to first maintenance of 10 years. Where the proposed project is a livestock building it is recommended a minimum thickness of 0.7mm and the external face should have a pvc Plastisol coating

In recent years manufacturers have been offering an antidrip membrane on the reverse side of the sheet. This has proved very beneficial where there is straw bedding and young calves as it improves animal health and welfare. Where this type of housing is proposed and tin is specified, the antidrip feature is recommended and should be stated in the drawing to assist in assessment of the project.

Single Skin Metal Side Cladding: Single skin metal side cladding must meet the same minimum as the roof cladding specification except that the minimum thickness shall be 0.5mm.

Also for young calves there can be a problem with draughts and this includes cold air coming into the building where the side cladding even though against the wall leave an opening where the corrugations are in the tin sheet. Where this type of housing is proposed and tin is specified, it is recommended there is adequate protection against

draughts and the method chosen should be stated in the drawing to assist in assessment of the project.

Steel Sheet Ventilated Side Cladding: It is essential to demonstrate in any livestock house that ventilation has been considered. Ventilated side cladding can be used in livestock buildings to create a cleaner and healthier environment. Humidity within the building combined with lower outside temperatures creates condensation. A damp humid atmosphere is one of the worst environmental conditions of animal housing. To avoid this fresh air must circulate constantly. Moist air must be evacuated and replaced with clean air. Ventilated cladding is one option which can assist in allowing clean air to enter the building.

Reinforced Corrugated Fibre Cement Sheeting: Reinforced corrugated fibre cement sheeting shall comply with BS EN 494: 2004. All flashings used shall be to the same standard as the main cladding sheets. Corrugated fibre cement sheets are installed in accordance with BS 5502-21:1990, BS 5427-1:1976 and BS 8219:2001. The purlins need to be designed to support the increased weight of this type of cladding. In livestock buildings which use this type of cladding it is important to design the correct outlet ventilation system to achieve the correct opening area. The colour of the sheeting must be environmentally acceptable

Double-Skin Insulated Metal Roof Sheets: Double skin insulated metal roof sheets of proprietary manufacture may be used in dairies, milking premises, produce stores and pig and poultry buildings.

Spaced Roof Sheeting: Spaced roof sheeting shall normally require that cladding materials be specially ordered. The cladding material must have an equal upstand on each side of the sheet.

ROOF DRAINAGE

Gutters and Down Pipes shall be sized and fitted complete with necessary brackets and securely fixed. Down-pipes shall be protected against damage. Pipes shall discharge at ground level over a gully trap or preferably through a back inlet type gully trap, to the clean water disposal system. It is recommended that all gutters are plastic, particularly in valleys to ensure a long life. Where galvanized steel gutters are used they shall be a minimum of 1.2mm thick.

WALLS

Foundations: Foundations shall be designed in accordance with BS EN 1997 or BS 8004. They shall be designed by a Chartered Engineer to support the applied load taking into account the ground conditions. The ground shall be inspected by the Engineer before any concrete is poured.

CONCRETE AND BLOCKWORK WALLS

Proprietary Precast Concrete Wall Panels: Proprietary precast concrete wall panels shall be supplied by a specialist precast concrete manufacturer. They shall meet the requirements of BS EN 14992:2007 and BS EN 1992 and shall be CE marked and have an accompanying 'Declaration of Performance'. The wall panel should be handled and fitted on site in accordance with the manufactures

recommendations. They must be permanently fixed in place and shall be supported as specified by the manufacturer. Where the precast panel is used in a building which falls under 'The Nitrates Action Programme Regulations (Northern Ireland) 2014' an effluent channel shall be constructed **outside the wall** in all cases and the channel linked to an adequate storage facility.

Reinforced Concrete Insitu Walls: Reinforced concrete insitu walls shall be constructed with reinforcement as specified by the design engineer. It is important that the reinforcement is placed with sufficient concrete cover for durability, taking into account the exposure conditions. Any blemishes, tie-bar holes, or honeycombing in concrete walls shall be filled/repared with an accepted, non-shrink proprietary cement mortar.

Where the stanchion is to be placed on top of a mass concrete wall (e.g. silo, midden) it is important that increased loadings on the wall are considered by the design engineer.

Block Walls: All block walls shall be of solid dense blocks that are certified to a minimum strength of 7.3N/mm², though it is strongly recommend that they be constructed of mass concrete. All blocks used shall be Category 1 and produced in a plant certified to EN 771-3:2011 and shall be CE marked. The use of hollowcore blocks is not permitted.

All Block Walls in Animal Houses, Dairies and Milking Premises: All block walls in animal houses, dairies and milking premises shall be rendered internally with two coats, 12mm and 6mm respectively, with 3:1 sand cement rendering with plasticiser or ¼ part lime, to a smooth steel trowel finish. Block walls shall have an externally rendering with a minimum one coat 12mm thick to a nap or smooth finish.

ADDITIONAL STRUCTURAL CONSIDERATIONS

Load bearing of existing building steelwork:

If the proposed project is to make use of steel stanchions of an existing farm building then the design engineer must submit a report stating that the existing stanchion and foundation is able to support the additional load at application stage.

Excavation in close proximity to an existing building:

Advice must be sought from the design engineer where any excavating work is to be carried out for a new proposed building in close proximity to an existing building. Particular care must be taken where this is close to a load bearing wall e.g. a silo which is full of silage or excavation for an underground slurry tank.

Drawings:

Outline drawings shall be prepared and submitted at the application stage as described in the FBIS-C Explanatory Booklet. If the application is successful and a letter of offer is made then a full set of design drawings and any supporting specifications shall be submitted before the start of construction. The design drawings should be fully dimensioned plans, elevations and sections showing the complete details of the proposed construction.

These should highlight specifically:

- Site preparation highlighting any additional work, including estimated quantities of elements that will incur additional costs
- Design criteria that is highlighting good animal welfare, if applicable
- Design criteria that is applying health and safety recommendations
- Design criteria that is specific to this building and introducing new technologies
- Health and Safety instructions during the construction phase

ADDITIONAL DESIGN CONSIDERATIONS

Health and Welfare of Housed Animals:

The Welfare of Animals Act (Northern Ireland) 2011 contains the general laws relating to animal welfare. It is an offence to cause unnecessary suffering to any animal. It is therefore important the design of any housing for animals takes into consideration the provision of a good well ventilated dry environment with the correct space allowances for the type and weight of animals housed. Adequate provision of food and water without bullying is essential and the ease of maintaining the cleanliness of the water needs to be considered. Other design features must include the specifications stated in certain EU directives especially relating to the pig and poultry sector. Any proposal which does not meet the minimum requirements for the specific animal type and weight will be rejected.

Health and Safety of personnel:

The health and safety of personnel working within any new proposed or amended house is critical for the project to be successful. All proposals whether new or amendments to an existing house will be assessed to ensure it meets the HSENI recommendations. Hence it is extremely important that consideration for all Health and Safety features are highlighted in the proposal. Special emphasis on the design especially around certain animals e.g. bulls, boars, freshly calved cows (see details on link below) must be stated and shown on the drawing.

(www.hseni.gov.uk/articles/animals-working-safely-livestock).

Ventilation:

Proper ventilation must be seriously considered in the design of all livestock buildings as a strict condition of grant-aid. Correct building design is critical to ensure adequate ventilation in order to protect animal health and the working life of the structure. The minimum requirements outlined below shall be followed for housing for dairy cows, suckler cows, beef cattle, calves, sheep, and deer. Natural ventilation is the least troublesome, most efficient and least expensive system for providing an optimum environment within a building. Buildings will naturally ventilate best when they are sited at right angles to the prevailing wind direction.

It is strongly recommended that a ventilation assessment based on the planned stocking density is carried out. Ventilation is made up of two components;

- Outlet
- Inlet

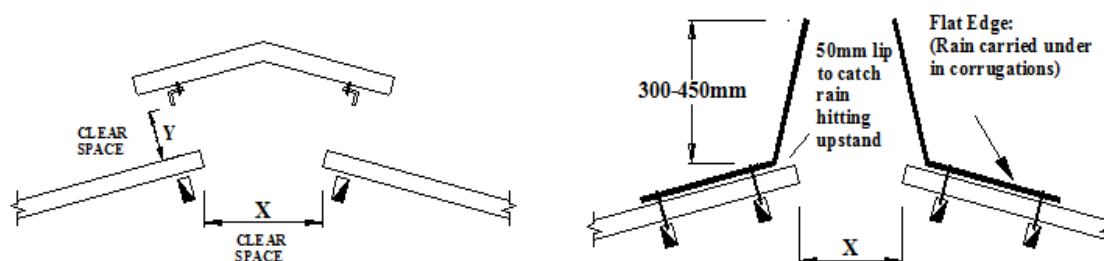
Outlet ventilation:

It is normal to provide an opening at the ridge of the roof as the outlet. There are several different designs and a calculation needs to be completed to get the correct opening. The pitch of the roof can have a serious impact on how well the stale air is exhausted from the building, particularly as the span of the building increases. The location of the building and the height of the building are other factors to consider when determining the roof pitch. It is recommended that the roof pitch on a livestock building should be a minimum of 15° , although in wider spans it could be 18° or even 22° .

A ridge cap over the outlet can be incorporated but when used it must stand unobstructed and set at the correct height above the roof sheeting (denoted by "Y" in Figure 1). Curved or angled upstands placed on the roof on both sides of the ridge outlet improve the ventilation and prevent most rain access. This is a recommended alternative to ridge capping. Under such upstands, the roof-sheet shall extend 50mm on each side to prevent rainwater dripping from the upstand (Figure 1).

Where spaced sheeting with a gap of at least 12mm is installed over the entire roof, then a central ridge outlet, though recommended, may be adequate

Figure 1



Inlet Ventilation:

It is ideally split evenly across the two side walls and should as an absolute minimum be twice the outlet area and is preferable four times the outlet area, although this depends on the purpose of the building. Consideration needs to be given to the prevailing wind direction when considering inlet ventilation. If there is insufficient weather protection, rain will drive into the building and result in wet areas where animals may be lying. In addition, wind velocity may blow the bedding away from the outer walls or off cubicle beds and lead to lower cubicle occupancy. It is very important to ensure the ventilation selected does not result in draughts as this could result in an increased stocking rate in the rest of the building and effect animal health.

Spaced (Yorkshire) boarding may be used in the side inlet gap. These shall also be installed with a minimum depth of 1.5m along the full length of the house. Boarding shall consist of treated timber laths and adequately secured to the cladding rails. Laths shall be a minimum of 25mm thick and a maximum width of 75mm: Gaps between laths shall be at least 25mm. Spaced boarding may also be installed in

place of gable cladding. Ventilated steel sheet cladding can be used to provide inlet ventilation. It is recommended that the openings are louvered on both sides.

Fabric or plastic mesh approved for ventilation in livestock housing shall be installed in accordance with manufacturers' instructions. Such materials shall be guaranteed for 10 years in normal working conditions. These materials shall not be used above eaves level on gable ends.

Adjustable side curtains are another option to consider as they offer the ability to adjust the amount of air to enter the building. These curtains can be adjusted manually or automatically and provide greater environment control within the building.

Where the inlet ventilation of an existing building is impaired as a result of the presence of an adjoining building, then the inlet ventilation provided in the new structure shall be sufficient to ventilate both buildings simultaneously. The ventilation spacing's shall be sized for the combined structure and not just the new part. This may involve removing the cladding on that part of the original structure that is common with the new building, and increasing the inlet ventilation of the existing building.

Where sliding doors are present on sidewalls, the inlet ventilation requirements for that sidewall shall also apply to the sliding doors. Therefore, if for example ventilated side cladding is present, then the doors shall also incorporate this form of cladding. This also applies to unobstructed ventilation: the top part of the door shall be left open.

Note:

The following types of inlet ventilation are **NOT** suitable for animal housing:

- Single board Yorkshire cladding
- Spaced full sheets of cladding
- Full sheets canted outwards to form a gap at the wall.

Mechanical Ventilation:

There may be conditions where mechanical ventilation is preferred to achieve the necessary air movement within a livestock building. This must be designed for the location of the building, the numbers and type of livestock to be housed to enable clean fresh air that is well distributed throughout the building.

For crop storage buildings it is very important to include the requirements for ventilation and/or refrigeration into the initial design so that a uniform air flow throughout the crop can be achieved. This might include features such as tapered air ducts or graduated lateral outlets to deliver similar quantities of air across the whole store. Also air leakage reduces the benefits of the store as it is likely to lead to loss of environmental control, crop weight loss and possible condensation on the crop. Ventilation or refrigeration run-time will increase, to cool the crop, warmed by the leaking air.

All electrical installation will require a NICEIC certificate.

Natural Lighting:

Good use of daylight is important for safe working conditions and for animal health. The percentage of roof sheeting that is translucent should be considered by the design engineer and must be stated on the drawing.

It is recommended that an adequate safety system is incorporated to protect against the risk of falling through the translucent sheets.

A light ridge can improve natural light into the centre of the building which can be an advantage in wide span buildings as well as assist in improved ventilation, see figure 2.

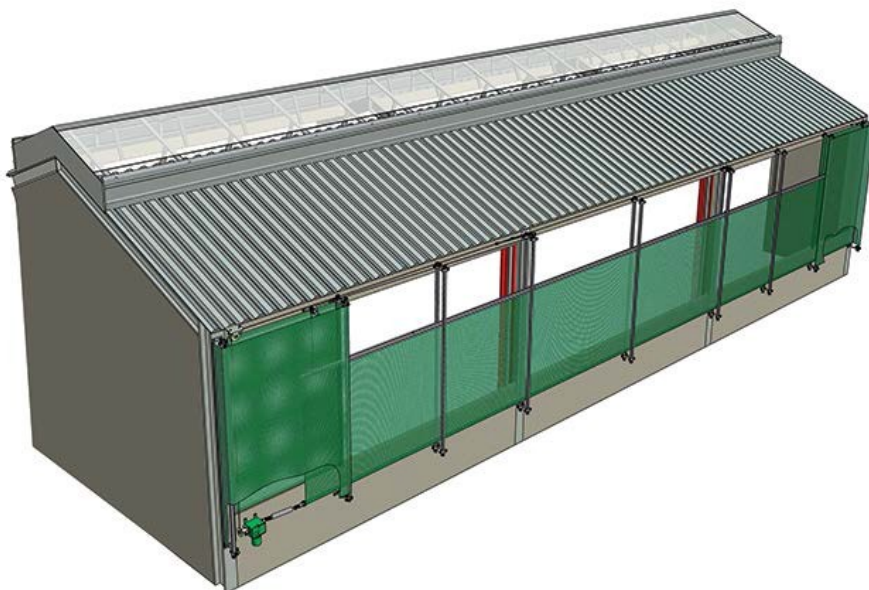


Figure 2

Feed Space and Drink Water:

Having sufficient feeding space for the type of animal, age and numbers needing to access feed will obviously have implications for welfare and performance of the animals. Where insufficient space is available at feed barriers, particularly with TMR feeding, the shiest and younger animals and those far down the herd hierarchy may not be able to feed sufficiently nor have the opportunity to eat the most freshly-mixed and dispensed feed. Advice should be sought in the design of any new house to ensure the recommended feed space per animal meets the minimum requirement.

All animals need to have access to good quality uncontaminated drinking water supplies. Certain animals have a high water intake requirement (dairy cattle) and the design of a new building should ensure animals have access to good quality drinking water. Recommendations for minimum space allowances of trough space per animal should be included in any new building project.

Competition for either feed or water space can have implications in terms of poor animal health and wellbeing and are likely to lead to animals suffering from health problems linked to poor nutrition and subsequent lowered immune defenses.

Collection of Pollutant:

All pollutants or dirty water which is produced in connection with a new building shall have within its design methods to collect all such material and not allow it to enter groundwater or watercourses.

DAERA is not responsible for any issues linked to pollution with funded project.

DOORS

All buildings which are designed as animal housing, with the exception of open fronted housing or the storage of animal produce, with the exception of silage must have doors that can be completely closed and made secure. The doors shall be specified to withstand wind loads appropriate to the location but as a minimum shall meet Class 2 of BS EN 12424. It is the responsibility of the installer to check that the door has been correctly installed in accordance with the manufacturers/assembler's instructions and works satisfactorily. He must also ensure that operating, maintenance and servicing instructions are provided. All roller shutter doors must be CE marked and a declaration of performance issued

Any roller shutter door must be fitted with an appropriate anti-drop safeguard as specified within the relevant product standards.

Doors shall comply with BS EN 12604 and BS EN 13241 and powered doors shall comply with BS EN 12453. Consideration shall be given to an appropriate level of safety devices to be provided taking into account the location and use; where provided they shall comply with BS EN 12978.

All powered doors shall be fitted with an emergency stop button. Electrically operated roller shutter doors should not have automatic closing; they should close on a 'hold to run' basis. All powered doors must be supplied with a NICEIC completion certificate.

Insulated roller doors will be funded where the proposed project requires an insulated door.

Fabric mesh roller shutter door or those made from other material are available. Must have a minimum design life of 10 years

If the doors are made from timber there should be a metal protector at the bottom for 0.5m min to reduce vermin damage

Pedestrian doors can be incorporated into the design but must be vermin proof and lockable.

Where the proposed project is a livestock house which includes in the design an "outside" feeding area - there must be an adequate system included in the design to demonstrate that wildlife cannot come in direct contact with the livestock.

Concrete Aprons:

Concrete aprons are eligible up to a maximum of 6m from the perimeter wall at door ways of the building. The specification for the apron must be supplied by the design engineer who will take in account the typical loading for the range of vehicles that will

be using it. The vehicular design loading needs to be stated in the overall certificate at claim stage.

If silage apron it must be for the full width of the opening to the silo and constructed to the same standard as the silo floor and should be cast at the same time as the silo floor. If the apron has a fall away from the front of the silo there should be a channel which has the potential to collect the runoff when the apron is contaminated. If no front channel then the apron must slope back to the channel at the front of the silo and therefore linked to the effluent storage facility.

Environmental Sustainability:

Other than pig and poultry most buildings are single skin non-heated structures and therefore will produce no carbon emissions.

As most structures are likely to be portal frame design which can be easily removed at the end of its useful life and being mostly of steel construction can be recycled.

Energy Efficiency in New Buildings:

Consideration must be given to the type of lighting supplied in new buildings with emphasis on reduced energy e.g. LED lights. It may also be an advantage to collect and use rainwater. Any such special energy saving features should be highlighted for consideration by DAERA.

Electricity Lines:

In the cases of all works, including works of demolition, development and construction, NIE plc (or other owner of cables) should be consulted at an early stage. NIE plc will whenever possible make available information which may include a copy of a cable plan indicating locations of any of their cables buried in the proposed work area to enable the works concerned to proceed, taking into account the safety measures required. This will assist the contractor to plan a safe working procedure after consulting NIE plc and will save time in the execution of the work and cause minimum inconvenience to the public.

Extreme caution must be exercised at all times when working in the vicinity of overhead lines.

Anyone planning to work close to NIE overhead lines or other equipment must contact NIE for advice on 08457 643 643 well in advance of work commencing. If there is a requirement to make any alternation to lines either rising or moving poles, be aware this may take up to 6 months and an upgrade to 3-phase may take longer. Further details are provided in the links below.

www.hse.gov.uk/pubns/gs6.pdf

www.nienetworks.co.uk/contractorsafety

www.nienetworks.co.uk/documents/Safety/Safety-awareness-for-contractors

Funding is not available for the supply or upgrade of existing electrical supply.

GENERAL HEALTH AND SAFETY

It is very important to consider the guidelines from The Health and Safety Executive NI (www.hseni.gov.uk/articles/animals-working-safely-livestock) when designing new facilities where there is a potential risk to the health and safety of yourself or the farm worker. Some examples are:

- Bulls being housed
- Calving pens and recently calved cows
- Livestock handling facilities
- Handling of boars

In any project proposal which includes the housing and handling of animals that are considered a potential risk, there must be a clear description of the design details that are specific to reducing risk of injury.

Where the project proposal includes the operation of machinery, or working from heights consideration must be given in the design to ensure all health and safety legislation and advice is complied with.

Proposed Work Connected with the Project at Applicants Own Expense:

It is important that all work carried out on a new building or modifications to an existing building for which funding is claimed is completed to the correct standards.

If the applicant wishes to complete some of the work connected with the proposed project without funding, it is very important that the specifications for this work is sought from the design engineer. Where any non funded work is an integral part of the building, this work will need to be covered in the design engineer's drawing and certification at claim stage. Also advice should also be sought from the design engineer where any ground works which are part of the structure are to be completed without funding. All specific ground works should be highlighted in the design drawing, even if not being funded.

Where the non-funded work falls under 'The Nitrates Action Program Regulations (NI) 2015', evidence that the relevant authorities have been notified must be submitted at claim stage.

Any ancillary item that is also being funded as part of the proposed project and being fixed on an existing area of concrete must have a certificate from an engineer e.g. new feed bin in connection with a new livestock building, slurry separation equipment etc.

Use of Existing Facilities as part of the New Housing Design:

For any proposed project that has the potential of producing dirty water, slurry or effluent there must be a collection system and storage facility provided as part of the plan. Where the applicant is proposing to use existing pipe work or storage facility there must be evidence from an engineer that all such facilities are of a suitable design and structurally adequate. Attention is drawn to 'The Nitrates Action Program (NI) 2015' which details conditions when certain existing facilities are changed. It is

also important that evidence is submitted to indicate that the minimum storage capacity is met.

Protection against Vermin:

The potential of the transfer of disease to both animals and humans from a range of vermin is always a risk on any farm. Any new proposed farm building where animals are being housed or foodstuff stored must consider elements within the design that reduces this risk. For this reason any open fronted building for housing animals will need to include in the design a permanent method of excluding contact from vermin with the animal feed. All new buildings where animals are to be housed must have doors that can be fully closed.

Notification of Land Taken Out of Production:

It is important that you notify DAERA if any new building project is removing land that has been in agricultural production and has been used to claim funding on Basic Payment Scheme or any other Area Based Scheme.

CONCRETE SPECIFICATION

MINIMUM SPECIFICATION FOR CONCRETE COMPOSITION USED IN AGRICULTURAL STRUCTURES

The purpose of this guidance note is to assist Developers and their Designers/Contractors in the specification and use of concrete in agricultural structures. It aims to achieve a specification of durable concrete to BS 8500-1:2006 and BS EN 206-1 and responsible sourcing of concrete constituents. Durable concrete requires good specification for different uses and site environmental conditions. There is also a need for good site practice by the Contractor.

This specification sets out the minimum concrete specification for use in agricultural structures. It gives a breakdown on the types of cement that may be used in the production of concrete.

This Specification should be read in conjunction with the Explanatory Booklets for the Farm Business Improvement Scheme (FBIS - C). It should also be read with the other minimum Specification booklets which form part of the scheme.

There are two strength classes of concrete given in this specification:

- Concrete for silos, silage aprons and silage effluent stores
- Concrete for all other purposes

These two grades of concrete are the minimum concrete grades that shall be used in agricultural structures.

Structures that retain silage, silage effluent, slurry, farm yard manure or effluent runoff water shall comply with the 'Nitrates Action Programme Regulations (NI) 2014'.

Concrete produced and supplied is suitable **ONLY** if proper curing procedures are adhered to and the structure is not put into service until an adequate curing time has elapsed. The curing regime shall take account of best practice appropriate to the concrete binder composition and prevailing climatic conditions at time of placing.

CONCRETE FOR SILOS, SILAGE APRONS & EFFULENT STORES

For walled silos, silage aprons, silage effluent channels and purpose-built silage effluent tanks, concrete shall be provided on the basis of a;

- Characteristic 28 day cube crushing strength of 45N/mm^2 (strength class C35/45)
- The cement contents and water cement ratios are as determined as follows to reflect the 25 year design life for all agricultural concrete of;

Therefore:

- Minimum cement content shall be 360kg/m^3 .
- The maximum water to cement ratio will be 0.45.

- The specified slump class shall be S3
- Durability of coarse and fine aggregates to BS EN 12620 with particular reference to freeze thaw resistance as referred to BS 8500. It is recommended that limestone aggregates are not used. Maximum size shall be 20mm. The maximum limit on aggregate water absorption is 3%.

The assumed “Exposure class” related to environmental conditions in accordance with BS EN206-1:2000 and complementary standard BS8500 to be considered by the designer are as follows:

- XC4
- XF3
- XA classes; In chemically aggressive environments, the determination of the exposure class, Aggressive Chemical Environment for Concrete, ACEC, class, is only the first step in determining the concrete specification, refer to Table A.2 of BS 8500-1. The designer must acquire all relevant information to determine the appropriate ACEC class;
- Sulphate and magnesium content of the ground
- pH of the groundwater
- mobility of the groundwater
- whether the site is natural soil or is a brownfield site

Using this information the appropriate ACEC class may be selected. The ACEC classes range from AC-1 to AC-5. It should be noted that brownfield sites can contain unusual chemicals and may require special consideration which is outside the scope of BS 8500. When SO_4^{2-} leads to exposure Classes XA2 and XA3 it is recommended to use sulphate-resisting cement.

- Minimum cover to reinforcement, including allowance in design for deviation of the cover, 50mm.
- The location and type of joints, (Tied, Movement or Isolation joints) to be identified on drawings in compliance with best practice procedures.

The concrete may be ordered using the appended form for ‘C.100’ or by requesting the above mix certified to BS EN 206 in line with complementary BS 8500.

CONCRETE FOR ALL OTHER PURPOSES

For all other purposes including slurry tanks to which silage effluent may be directed, concrete shall be provided on the basis of a;

- characteristic 28 day cube crushing strength of $37N/mm^2$ (strength class C30/37).
- the cement contents and water cement ratios are as determined as follows to reflect the 25 year design life for the agricultural concrete. Therefore;
 - Minimum cement content shall be $325 kg/m^3$.

- The maximum water to cement ratio will be 0.55.
- The specified slump class shall be S3.
- Durability of coarse and fine aggregates to BS EN 12620 with particular reference to freeze thaw resistance as referred to BS 8500. Maximum size shall be 20mm. The maximum limit on aggregate water absorption is 3%.
- The assumed “Exposure class” related to environmental conditions in accordance with BS EN206-1:2000 and complementary standard BS8500 to be considered by the designer are as follows:
 - XC4.
 - For all exposed concrete subjected to the application of de-icing salts use XF4. Where this applies it is recommended to use a C40/50, with minimum cement content of 340 kg/m³ and the maximum limit on aggregate water absorption reduced to 1%.
 - XA1. In chemically aggressive environments, the determination of the exposure class, Aggressive Chemical Environment for Concrete, ACEC, class, is only the first step in determining the concrete specification. The designer must acquire all relevant information to determine the appropriate ACEC class.
- Minimum cover to reinforcement, including allowance in design for deviation of the cover, 40mm.
- The location and type of joints, (Tied, Movement or Isolation joints) to be identified on drawings in compliance with best practice procedures.

The concrete may be ordered using the appended form for ‘C.101’ or by requesting the above mix certified to BS EN 206 in line with BS 8500.

PERMITTED CEMENTS & COMBINATIONS

These cements may be used in the production of concrete for use in agricultural structures. Cements may be used as single powders or may be combined with fly ash or ggbs as permitted below.

Permitted Cement Types		Permitted Cement Combinations	
CEM I		CEM I + max. 31% fly ash (Class A or B)	Fly ash conforming to B.S. EN 450-1
CEM I – SR3			
CEM II / A-L or A-LL		CEM II / A-L or A-LL + max. 31% fly ash (Class A or B) Using the k-value concept	
CEM II / A-S			
CEM II / A-V			
CEM II / B-S		CEM I + max. 65% ggbs	ggbs conforming to B.S. EN 15167-1
CEM II / B-V	Fly ash content shall not exceed 31%		
CEM III / A		CEM II / A-V + max. 50% ggbs	
		CEM II / A-S + ggbs up to combined 50% total ggbs	

These cements and combinations are not a definitive list. They broadly align with BS8500-Part 1 table A.6. There are a number of cements and combinations not listed in this table that may be specified for certain specialist applications. The use of these designations is sufficient for most applications.

Where a more limited range of cement or combinations types is required, select from the notations given in BS 8500-Part 2.

The specification permits the use of microsilica (silica fume) of Class 1, up to a replacement level of 30 kg/m³ when used with CEM I, CEM II / A-L or A-LL, CEM II / A-S or CEM II / A-V.

Any additives used shall comply with BS EN 934; they shall be used strictly in accordance with manufacturer instructions and shall be added at the ready-mix plant.

Where concrete surfaces are subjected to high wear, consideration should be given to the use of polypropylene fibres to help prevent shrinkage cracking and provide a more durable surface with better abrasion resistance which also reduces the absorption of water, chemicals and dirt. Polypropylene fibres should only be added in strict compliance with manufacturer's instructions.

The Department reserves the right to require that concrete should be tested in accordance with EN 12390 and EN 12504.

Concrete construction supervision and checking shall be in compliance with BS EN 13670, Execution Class 2.

READY-MIXED CONCRETE

Concrete shall be produced in a QSRMC or BSI audited plant only. It shall not be produced on site. A numbered certificate, signed and stamped, shall be required for all concrete delivered to site. The production plant shall hold a current licence certified by a body accredited by UKAS to BSEN ISO/IEC 17065 for product conformity certification of ready-mixed concrete. The production plant shall inform the Contractor of the concrete composition in respect of pfa (fly ash), ggbs (ground granulated blast-furnace slag), or microsilica (silica fume) content as these may impact on the required curing time of the concrete. Source of ready-mixed concrete to be confirmed to Designer as follows;

- Name and address of depot: Submitted before any concrete is delivered.
- Delivery notes: Retain for inspection by Designer.
- Concrete mix data sheet: Retain for inspection by Designer.
- Declarations of nonconformity from concrete producer: The Designer must be notified immediately.

SURFACES TO RECEIVE CONCRETE

Required cleanliness of surfaces immediately before placing concrete:

- Clean with no debris, tying wire clippings, fastenings
- Fresh concrete should not be placed on frozen ground or against frozen surfaces
- Dry, free of water
- Reinforcement to be cleaned of any rust

PREMATURE WATER LOSS

Prevent water loss from concrete laid on absorbent substrates by providing an underlay. Underlay to be selected by the Contractor and shall conform to best practices procedures in terms of lap installation and edge details. Suitable underlay may be;

- Polyethylene sheet: 250 micrometres thick
- Building paper: To BS 1521, grade B1F

REQUIRED RECORDS

Records to be maintained by the Contractor for inspection by Designer as follows;

- Date and comments provided of pre-pour inspection by Designer.
- Time and date at placing of concrete, including where appropriate timing of casting of individual batches
- Date and time stamped pre-pour digital photographs for foundations
- Weather conditions
- Time of removal of coverings
- Time of removal of formwork
- Concrete delivery docket
- Location of all pours
- Record of concrete cube testing carried out on site

PLACING

- The temperature of concrete on delivery shall not be below 5°C
- Place as soon as practicable after mixing and while sufficiently plastic for full compaction
- Temperature limitations for concreting:
 - 30°C (maximum)
 - 5°C on a falling thermometer or below 3° C on a rising thermometer
 - Do not place against frozen or frost covered surfaces
- Ensure continuity of pouring by placing in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
- When discharging concrete prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
- Place the concrete in agreed thickness of layers to suit methods of compaction and achieve efficient amalgamation during compaction.
- Do not use Poker vibrators to make concrete flow horizontally into position, except where necessary to achieve full compaction under void formers and cast-in accessories and at vertical joints.

COMPACTING

Fully compact concrete to full depth to remove entrapped air. Continue until air bubbles cease to appear on the top surface. Pay particular attention to the following areas:

- around reinforcement
- under void formers
- cast-in accessories
- corners of formwork and at joints
-

Methods of compaction:

- To suit consistence class and use of concrete.

CURING

All concrete shall be cured by keeping it thoroughly moist for the specified minimum curing period. Wetted floor slabs and tank walls may be protected by polythene sheeting, kept securely in place. Alternatively proprietary curing agents may be used in accordance with manufacturer's instructions.

- Curing class standard to BS EN 13670 Curing class 3
- If a curing compound is used it should be a resin based curing compound containing a fugitive dye with curing efficiency of not less than 75% or for surfaces exposed to abrasion 90%.
- Prevent evaporation from surfaces of concrete, including from perimeters and abutments, throughout curing period.
- Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.
- Top surfaces:
 - Cover immediately after placing and compacting with suitable impervious material.
 - If covering is removed for finishing operations, replace it immediately afterwards.
 - Until surfaces are in a suitable state to receive coverings in direct contact, cover with impervious sheeting held clear of the surface and sealed against draughts at perimeters and junctions.
- Surface temperature:
 - Maintain above 5°C throughout the specified curing period or four days, whichever is longer as determined by the Designer.
- Minimum curing period when not noted otherwise by Designer, to BS EN 13670, Annex F.8.5. Concrete shall be at least 28 days old before being subjected to full load, or to silage or silage effluent.
- Protection:

Prevent damage to curing surfaces;

- From rain, indentation and other physical damage.
- From dirt, staining, rust marks and other disfiguration.

Prevent damage to curing concrete;

- From thermal shock, physical shock, overloading, movement and vibration

Prevent damage during cold weather to curing concrete;

- From entrapment and freezing expansion of water in pockets, etc.

Form C.100

Specification of Concrete for silos, silage aprons and effluent stores

Supply concrete as a designed mix in accordance with the relevant clauses of B.S. EN 206-1	
Mix reference	C.100
Strength Class	C35/45
Nominal maximum size of aggregate in mm	20
Types of aggregate	Coarse to B.S. EN 12620
	Fine to B.S. EN 12620
Cement type to EN 197 (<i>select one and delete as appropriate</i>)	CEM I
	CEM I – SR3
	CEM II / A-L or A-LL
	CEM II / A-S
	CEM II / B-S
	CEM II / A-V
	CEM II / B-V
	CEM III / A
Additions (<i>select one and input %, and delete others as appropriate</i>)	ggbs to B.S. EN 15167-1
	Fly ash to B.S. EN 450-1
	Silica fume to B.S. EN 13263-1
Exposure Classes (25 year design life)	XA3, XC4, XF3
Chloride Class (<i>select one and delete others as appropriate</i>)	Cl 1,0 (mass concrete)
	Cl 0,4 (reinforced concrete)
Minimum cement content, kg/m³	360
Maximum water / cement ratio	0.45
Consistence (<i>select one and delete others as appropriate</i>)	Slump Class S3
	Slump flow class SF2 for SCC
Method of placing (<i>for information</i>)	
Other requirements (<i>only if appropriate</i>)	

Form C.101

Specification of Concrete for other purposes

Supply concrete as a designed mix in accordance with the relevant clauses of B.S. EN 206-1	
Mix reference	C.101
Strength Class	C30/37
Nominal maximum size of aggregate in mm	20
Types of aggregate	Coarse to B.S. EN 12620
	Fine to B.S. EN 12620
Cement type (<i>select one and delete others as appropriate</i>)	CEM I
	CEM I – SR3
	CEM II / A-L or A-LL
	CEM II / A-S
	CEM II / B-S
	CEM II / A-V
	CEM II / B-V
	CEM III / A
Additions (<i>select one and input %, and delete others as appropriate</i>)	ggbs to B.S. EN 15167-1
	Fly ash to B.S. EN 450-1
	Silica fume to B.S. EN 13263-1
Exposure Classes, other than Freeze/Thaw (25 year design life)	XA1, XC4
Exposure Class, Freeze/ Thaw (<i>select one and delete others as appropriate</i>)	XF2
	XF4 (see other requirements)
Chloride Class	Cl 1,0 (mass concrete)
	Cl 0,4 (reinforced concrete)
Minimum cement content, kg/m³	325
Maximum water / cement ratio	0.55
	Slump Class S3
	Slump flow class SF2 for SCC
Method of placing (<i>for information</i>)	

AGRICULTURAL BUILDINGS STANDARDS

Regulations	BS 5502-0,11
General Design	BS 5502-20,21,22,23,25
Environment	BS 5502-30,31,32,33
Cattle Buildings (provisional)	BS5502-40,41,42,43,49,50,51,prEN12737
Crop Buildings	BS 5502-60,65,66,70,71,72,74,75
Ancillary Buildings	BS 5502-80,81,82
Crop Storage	BS 6279-2 (ISO 6322-2)
Livestock	BS EN 60335-2-71, PAS 44
Milking Equipment	BS 5226, BS 5306, BS ISO 3918, BS ISO 5707

ABSTRACTS**AGRICULTURAL BUILDINGS AND STRUCTURES****BS 5502 Buildings and structures for agriculture:**

The BS 5502 series provides information and gives recommendations on the principles involved in the design and construction of buildings and structures used in agriculture. The recommendations are primarily intended to be applicable to new buildings, conversions and extensions, though they are also relevant to renovation and repairs of existing buildings

General design BS 5502 - 20 Code of practice for the general design considerations:

Covers general design considerations, but excludes those aspects specifically covered by other parts of the design series, namely materials (Part 21), structural design (Part 22), fire precautions (Part 23) and services (Part 25). It outlines the general design objectives in relation to statutory requirements, and makes recommendations regarding siting of the building in the context of climatic exposure, atmospheric corrosion and its built and landscape surroundings. Specifically covers visual aspects of the building, including features and form and external colours. Gives recommendations on preferred building sizes. This part also describes internal environmental requirements, including levels of natural and artificial lighting, heating, ventilation and infiltration, sound insulation, energy conservation and thermal insulation. The need for good workmanship, ease of maintenance and safety and hazard warning notices are also given.

BS 5502 – 21 Code of practice for the selection and use of construction materials:

Covers the selection, performance and use of materials commonly used in agricultural situations according to the buildings design classification in relation to their durability, effects of corrosion, and specifically in relation to liquid fertilizers and

farm effluents, and gives information on their preservative treatments. Specifically covers timber, plywood, fibre building boards, fibre reinforced cement products, aluminium, steel, glazing, concrete and mixes, and masonry for use, as appropriate, for purlins and rails, cladding and ventilated cladding. Recommendations for their fixings are also given. BS 5502 – 22 Code of practice for design, construction and loading

BS 5502 – 22 Code of practice for design, construction and loading:

This part of BS 5502, uses design principles and the loading factors given in existing British standard structural design codes for buildings. It classifies agricultural buildings into two design groups based on minimum design life, maximum normal human habitation and distance to a classified highway or to human habitation.

The standard covers preparation of the site, service life, foundations and other works below ground and above foundations, protection of floors, walls, piers and columns, roofs and balustrades and safety rails.

Recommends characteristic loads, dead and imposed loads, and gives information about loads from stored materials, services, impact and dynamic loads. Also provides information on wind loads and other imposed roof loads, floor loads for livestock and for storage and for bedding materials, and vehicle loading, and loads for walls, suspended crops, balustrades and rails, and purlins.

Also recommends partial load factors for the structural use of timber, steelwork, concrete and masonry for frames, purlins and claddings by reference to the existing national structural design codes.

Special structures are also covered by other parts of BS 5502 and for greenhouses by BS EN 13031-1.

LIVESTOCK BUILDINGS

BS 5502 – 40 Design and construction of cattle buildings:

Describes the design of buildings used for the housing of cattle, specifically for cows, beef cattle, bulls, young stock and calves. It excludes provisions for milking premises, which are covered separately in Part 49.

It covers animal welfare considerations, occupancy levels and makes recommendations for solid, slated, perforated and wire mesh floors, walls and roofs. Environmental considerations are explained, including climate, gas concentrations and ventilation requirements, levels of lighting, together with the provision of electricity and drainage services and storage, feeding and drinking arrangements. The standard details dimensions and space allowances for cattle, including those for bedding, loafing, feeding areas and cubicles.

Recommendations are also given for suckler and ancillary accommodation for calving pens and yards, isolation pens, cattle handling, bull pens, and bull beef buildings. Also advises on chemical and medicine storage, safety signs and notices.

BS 5502-41 Design and construction of sheep buildings and pens:

Gives recommendations for the design and construction of buildings and pens for the housing of sheep. It covers animal welfare considerations, design and construction of floors, walls and roofs, suitable floor areas and provision of feeding and drinking arrangements, including recommended drinking trough lengths. Includes provision of services, electricity, water supply and drainage, carcass and membrane disposal. It also advises on handling, fences and gates, chemical and medicine storage and safety signs and notices.

BS 5502–42 Design and construction of pig buildings:

Covers the design and construction of buildings for the housing of pigs and specifically the housing of sows and sows with litters and covers animal welfare considerations, design and construction of floors, walls and roofs, suitable floor areas, gas concentrations and ventilation and insulation requirements and lighting. Provision of feeding and drinking arrangements, services, electricity, water supply and drainage requirements are also covered.

Ancillary accommodation specifically covers, farrowing accommodation, boar and service pens, and isolation and quarantine pens, safety signs and notices.

BS 5502–43 Design and construction of poultry buildings:

Gives recommendations for buildings used for poultry and specifically for rearing and housing turkeys, ducks, broiler and laying hens, and covers animal welfare considerations, design and construction of floors, walls and roofs, depopulation facilities, suitable floor areas, temperature and humidity levels, ventilation and lighting. Provision of feeding and drinking arrangements, services, electricity, water supply and drainage requirements are also covered.

Advice on ancillary accommodation, storage of chemicals and medicines, safety signs and notices are also included.

BS 5502-49 Design and construction of milking premises:

Identifies regulatory and licensing requirements and animal welfare requirements for milking parlours and rooms. Detailed design and construction requirements are given for siting and 7 access, and for floors, walls, roofs and ceilings. Recommends dimensions and space, provision of services, fittings and equipment, ancillary and storage facilities.

Also advises on dimensions, paving and walls for collecting and dispersals yards associated with milking parlours, the exclusion of vermin and warning and safety signs.

BS 5502-50 Design, construction and use of storage tanks and reception pits for livestock slurry:

Covers the siting, odour and pollution control and other factors, sizes, and slurry and wind loads, for storage tanks and reception pits. Also recommends on structural design aspects, specifically on slurry and loads, below ground pressures and surcharges. Advice is given for cylindrical steel plate tanks and concrete stave tanks, materials used for their construction, corrosion problems, and for joints, sealing and waterproofing.

Safety aspects, relative to guarding, access, safety and warning signs and details of supporting operational and maintenance information are given.

Note: Should be read in conjunction with BS 5502 Part 22, BS 8007 and ADAS Guides CGN 001 – 006, 10 and 11.

BS 5502-51 Design and construction of slatted, perforated and mesh floors for livestock:

Details are given for the design and construction of slatted, perforated and mesh floors for the housing of cattle, pigs and sheep, so as to provide self cleaning by allowing animal waste to pass through the voids. The recommendations given on welfare, materials general design and installation are applicable to other types of livestock providing that additional consideration is given to the particular needs of the livestock being housed. These recommendations are not applicable to poultry. Covers materials, such as reinforced and prestressed concrete, metals, plastics, timber and composite constructions, and recommends geometry and tolerances, design and other construction aspects.

CROP BUILDINGS

BS 5502-60 Design and construction of buildings for mushrooms:

Covers the design and construction of foundations, floors, walls and roofs of compost yards and production buildings used for the cultivation of mushrooms. The recommendations specifically include the use of film plastics clad structures, insulation, vapour checks, heating, refrigeration and ventilation requirements and supporting electrical, lighting, water and drainage services. Hygiene, welfare, safety aspects and control of infestation are also covered.

BS 5502-65 Design and construction of crop processing buildings:

Recommendations are given for the design and construction of buildings used for the processing and packaging of horticultural produce. Covers siting, space requirements, and the design of floors, walls, ceilings and roofs and doors, windows, access and walkways.

Provides advice on lighting, electrical installation, thermal insulation, temperature, ventilation, water and drainage and the control of infestation. Advice is also given on staff facilities.

BS 5502-66 Design and construction of chitting houses:

Recommendations are given for the design and construction of building used for chitting potatoes and covers naturally lit stores, stores with artificial lights and refrigerated stores. Provides information on the design of floors, wall and roof cladding, insulation, layout and dimensions, as well as on lighting, temperature and ventilation, and supporting electrical services. Includes information on safety and welfare.

BS 5502-70 Design and construction of ventilated on-floor stores for combinable crops:

Note: See BS 5502-74 for bin and silo storage.

Describes general requirements, siting and design recommendations and materials for different types of floors, walls, roofs and upper wall cladding, doors, ventilation ducts and exhaust vents, elevator pits grain conveyors, air ducts, fan housings access and walkways used in floor stores.

Also covers store geometry and layout, and gives information on bulk densities and angle of repose for different crops and angles for crop flows. Describes typical storage periods, maximum temperatures for drying grain and storage grass seed and wheat.

Advises on methods of drying, storage and conditioning and gives recommendations on electrical services, lighting, water supply and drainage and the control of infestation health and storage in of bulk and hygiene.

BS 5502-71 Design and construction of ventilated stores for potatoes and onions:

Covers the design of buildings used for bulk storage and storage in boxes of potatoes and onions using forced ventilation and/or refrigeration. Makes recommendations for design and materials of floors, walls, roofs and upper wall cladding, doors, air ducts, fan housings, access and walkways. Gives specific guidance on thermal insulation requirements. Covers store geometry bulk densities for potatoes and onions, store environment, ventilation air speeds, relative humidity, and heat output from the crops. Electrical, water supply and drainage services are also covered and well as health and safety aspects.

LOCAL PLANNING CONTACT DETAILS

Council District/Borough	Office Address and Contact Details
ANTRIM & NEWTOWNABBEY email: planning@antrimandnewtownabbey.gov.uk	Local Planning Office Mossley Mill Carnmoney Road North Newtownabbey BT36 5QA Tel: 0300 123 6677
MID & EAST ANTRIM email: planning@midandeastantrim.gov.uk	Local Planning Office County Hall 182 Galgorm Road Ballymena BT42 1QF Tel: 0300 200 7830 (NI Only) or (028) 9151 3101
MID-ULSTER email: planning@midulstercouncil.org	Local Planning Office Mid-Ulster Council Offices 50 Ballyronan Road Magherafelt BT45 6EN Tel: 03000 132 132
BELFAST email: planning@belfastcity.gov.uk	Belfast Planning Service Belfast City Council Cecil Ward Building 4-10 Linenhall Street Belfast BT2 8BP Tel: 0300 200 7830 (NI Only) or (028) 9151 3101
LISBURN & CASTLEREAGH email: planning@lisburncastlereagh.gov.uk	Local Planning Office Lagan Valley Island Island Civic Centre The Island Lisburn BT27 4RL Tel: 0300 200 7830 (NI Only) or (028) 9151 3101
ARD & NORTH DOWN email: planning@ardsandnorthdown.gov.uk	Ards and North Down Planning Dept The Council Office 2 Church Street Newtownards

	<p>BT23 4AP Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>
<p>NEWRY, MOURNE & DOWN Applications can also be submitted at Newry, Mourne & Down District Council Office, Monaghan Row, Newry BT35 8DJ Email: planning@nmandd.org</p>	<p>Local Planning Office Downshire Civic Centre Downshire Estate Ardglass Road Downpatrick BT30 6GQ Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>
<p>ARMAGH CITY, BANBRIDGE & CRAIGAVON email: planning@armaghbanbridgecraigavon.gov.uk</p>	<p>Local Planning Office Marlborough House Central Way Craigavon BT64 1AD Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>
<p>FERMANAGH & OMAGH email: planning@fermanaghomagh.com</p>	<p>Local Planning Office County Hall Drumragh Avenue Omagh BT79 7AF OR Local Planning Office County Buildings 15 East Bridge Street Enniskillen BT74 7BW Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>
<p>DERRY CITY & STRABANE email: planning@derrycityandstrabanedistrict.com</p>	<p>Local Planning Office 98 Strand Road Derry BT48 7NN Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>
<p>CAUSEWAY COAST & GLENS email: planning@causewaycoastandglens.gov.uk</p>	<p>Local Planning Office County Hall Castlerock Road Coleraine BT51 3HS Tel: 0300 200 7830 (NI Only) or (028) 9151 3101</p>

Rural Development Programme 2014 - 2020

ISBN: 978-1-84807-725-6

Farm Business Improvement Scheme - Capital Tier 2 (Tranche 1)

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