Teagasc
Agriculture and Food Development Authority

FARM CONCRETE

February 2017

S.100 – Farm Concrete

Every year, Irish farmers undertake a large amount of building work ranging from major new jobs to extensions to existing buildings and effluent tanks and minor improvements around the farm. Under the Rural Development Programme 2014-2020, it is likely that many farmers will avail of grant assistance for investment in farm buildings under the Targeted Agricultural Modernisation Scheme (TAMS II).

There are a few simple rules which if carefully followed, will ensure that the concrete used in the construction of these farm buildings is of good quality and will lead to a lifetime of trouble-free service. The 'design life', as recommended by European design standards, for agricultural buildings is 25 years.

S.100

S.100 is the minimum concrete specification required for the construction of agricultural structures in Ireland for compliance with the EU Nitrates Directive. The specification was revised by the Department of Agriculture, Food & the Marine in 2015.

There are two grades of concrete provided for under S.100 and these are the minimum legal mixes required by the Department of Agriculture, Food & the Marine for concrete used in structures that retain silage, silage effluent, slurry, farm yard manure or soiled water.

The first grade, S.100 (Mix A), must be used for concrete for silage pits and walls, silage aprons and silage effluent channels and stores.
The second grade, S.100 (Mix B) must be used for concrete for all other purposes on the farm.

S.100 (Mix A)

Mix Reference	S.100 (Mix A)	Used in:
Strength	45N/mm^2 (Strength Class C35/45)	Silage pit walls Silage slabs Silage aprons Silage effluent channels Purpose built silage effluent stores
Minimum Cement Content	360 kg/m^3	
Maximum Water / Cement Ratio	0.5	
Slump Class	S2 or S3	
Maximum Size of Aggregate	20mm	
Exposure Classes (25 year design life)	XA3, XC4, XF3	

S.100 (Mix B)

S.100 (Mix B) is the minimum grade of concrete used for all other farm structures including slurry tanks to which silage effluent may be directed.

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Supported by Cement Manufacturers Ireland

The key characteristics of S.100 (Mix B) are as follows:

Mix Reference	S.100 (Mix B)	Used in:
Strength	37N/mm^2 (Strength Class C30/37)	Slurry tanks to which silage effluent may be directed. All other farm structures except slabs exposed to freeze / thaw action (XF3 applies).
Minimum Cement Content	310 kg/m^3	
Maximum Water / Cement Ratio	0.55	
Slump Class	S2 or S3	
Maximum Size of Aggregate	20mm	
Exposure Classes (25 year design life)	XA1, XC4, XF2	

Other Changes to S.100

The revised 2015 specification permits the use of different cement types and the use of additions such as Ground Granulated Blastfurnace Slag (GGBS), fly ash and silica fume in the manufacture of concrete in line with the national concrete standard, I.S. EN 206. In addition, self-compacting concrete (SCC) is now permitted in walls and other vertical elements. Farmers should seek further advice from their farm contractor and concrete supplier on the use of self-compacting concrete.

Certification

All concrete used for farm structures must be produced by a concrete manufacturer independently certified to produce concrete in accordance with the concrete standard I.S. EN 206. For the purpose of claiming grant payment from the Department of Agriculture, Food & the Marine, a copy of the concrete manufacturer's annual I.S. EN 206 certificate and a copy of the Concrete Manufacturers Specification Certificate which gives details of all concrete deliveries, must be submitted with each grant claim. Farmers should ensure in advance of construction that concrete suppliers are able to produce both of these certificates.

Ordering Concrete

It is very important to order concrete in good time to allow orderly planning of deliveries. Farmers or farm contractors should order their concrete by clearly identifying the required grade of concrete. For example *"S.100 (Mix A)"* may be ordered or alternatively customers should request *"45N concrete with 360kg minimum cement content, 0.50 maximum water cement ratio, and slump class S2 or S3, certified to I.S. EN 206 for use to Specification S.100".*

Similarly customers may order *"S.100 (Mix B)"* or alternatively request *"37N concrete, with 310kg minimum cement content, 0.55 maximum water cement ratio, and slump class S2 or S3, certified to I.S. EN 206 for use to Specification S.100".*

Site Access & Preparation

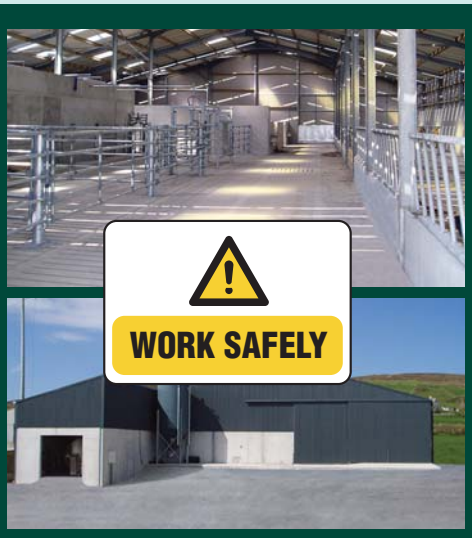
Farmers and farm contractors should provide good site access and firm ground for loaded concrete trucks. In addition, it is necessary to provide access around structures for delivery from truck chutes. Excessive transportation of concrete around the site or over rough ground should be avoided to prevent mix segregation.

Placing Concrete

Concrete should be placed as near as possible to its final position and should not be placed in extremes of weather. Concrete slabs should only be poured on a solid, properly constructed foundation. The work area should be stripped to provide a suitably stable base, backfilled with hardcore and properly compacted. The hardcore must be compliant with Annex E of SR 21:2014+A1:2016. SR 21 is Irish guidance on the European Standard for aggregates for use in unbound and hydraulically bound materials. Concrete should be ordered to a slump which allows placement on site without the need to add water. Adding water reduces the strength and durability of the concrete and increases the risk of cracking, surface damage and failure. The concrete should be fully compacted as soon as possible to eliminate entrapped air and close all surface voids which reduces strength and durability. It is important not to under-vibrate concrete as this could lead to honeycombing and voids. Slabs can be finished by simply tamping with the compacting beam, by brushing or by using a wooden or steel float. If power floating is used it is important to get the timing right to avoid drawing excess water and cement to the surface which will lead to surface deterioration and poor resistance to wear.

Curing Concrete

Concrete is fit for purpose only when proper curing procedures are employed and the structure is not put into use until an adequate curing time (usually a minimum of 28 days) has elapsed. Concrete needs to be protected to prevent moisture loss, especially for the first 7 days after placing. The longer the concrete is allowed to cure before use, the greater its durability and service life will be. Common methods for curing include using a spray-on curing compound, covering with a polythene sheet or damp sand and spraying continuously with water. Straw or thermal blankets can be used to insulate concrete when there is a risk of frost.



Department of Agriculture Specifications

There is a list of Department of Agriculture, Food & the Marine specifications for farm buildings and structures available on the Department's website. Some of the more important specifications are:

S.101	Minimum Specifications for the Structure of Agricultural Buildings
S.120	Concrete Walled Silos
S.122	Minimum Specification for Proprietary Over-Ground Circular Slurry / Effluent Stores
S.123	Bovine Livestock Units and Reinforced Tanks
S.123A	Extension of Existing Concrete Tanks
S.128	Concrete Silage Bases
S.128A	Resurfacing of Silo Floors
S.129	Minimum Specification for Farmyard Drainage, Concrete Yards and Roads