

AN ROINN TALMHAÍOCHTA, BIA AGUS MARA
DEPARTMENT OF AGRICULTURE FOOD AND THE MARINE

**MINIMUM SPECIFICATION FOR CONCRETE COMPOSITION USED IN
AGRICULTURAL STRUCTURES.**

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. Procedures on CERTIFICATION, TESTING and CURING shall be as defined in the relevant Department Specification for the proposed structure.

There are two strength classes of concrete given in this specification: ‘Concrete for silos, silage aprons and silage effluent stores’ and ‘Concrete for all other purposes’. These two grades of concrete are the only concrete grades that shall be used in agricultural structures. **For structures that retain silage, silage effluent, slurry, farm yard manure or soiled water the concrete mixes specified in this document are the legal minimums required.**

Concrete produced and supplied is fit for purpose ONLY IF proper curing procedures are adhered to and the structure is not put into service until an adequate curing time (usually a minimum of 28 days) 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. For further information on curing, see the relevant Department of Agriculture, Food and the Marine specification and advice on the website of the Irish Concrete Society.

The producer 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.

1 Concrete for silos, silage aprons and silage effluent stores

For walled silos, silo slabs, silage aprons, silo channels and **purpose-built** silage effluent tanks, concrete shall be purchased on the basis of a characteristic 28 day cube crushing strength of 45N/mm² (strength class C35/45). Minimum cement content shall be 360 kg/m³. The maximum water to cement ratio will be 0.5. The specified slump class shall be S2 or S3. Maximum aggregate size shall be 20mm.

The concrete shall be ordered using the appended form for ‘S.100 Mix A’ or by requesting ‘45N concrete with 360kg cement minimum, 0.50 water cement ratio maximum, and slump class S2 or S3, certified to IS EN 206, for use to Specification S.100’.

2 Concrete for all other purposes

For all other purposes including slurry tanks to which silage effluent may be directed, concrete shall be purchased on the basis of a characteristic 28 day cube crushing strength of 37N/mm² (strength class C30/37). Minimum cement content shall be 310 kg/m³. The maximum water to cement ratio will be 0.55. The specified slump class shall be S2 or S3. The maximum aggregate size shall be 20mm.

The concrete shall be ordered using the appended form for ‘S.100 Mix B’ or by requesting ‘37N concrete with 310kg cement minimum, 0.55 water cement ratio maximum, and slump class S2 or S3, certified to IS EN 206, for use to Specification S.100’.

In the case of exposed yard slabs where freeze/thaw action is a concern, ‘S.100 Mix B’ shall be used with 3.5% minimum air entrainment. Alternatively ‘S.100 Mix A’ may be used.

3 Self-Compacting Concrete

Self-compacting concrete (SCC) may be used in vertical elements only. SCC must comply with all requirements of this specification, except for the slump class which must meet slump flow class SF2. SCC shall be produced by a manufacturer with experience in producing SCC and should be placed by a contractor with experience using SCC.

If it is proposed to use SCC, additional guidance shall be sought by the contractor undertaking the works. Particular care must be taken in the use of fully sealed formwork, designed to withstand the higher hydrostatic pressure exerted by SCC. Guidance can be obtained from the Irish Concrete Society website (www.concrete.ie).

4 Exposure classes for concrete uses.

The assumed exposure classes to be considered by the concrete producer are as follows:

Concrete for silos, silage aprons and silage effluent stores: XA3, XC4, XF3 (25 year life).

Concrete for all other purposes XC4, XF2 (except for exposed yard slabs where XF3 applies), XA1 (25 year life).

The design life for all agricultural concrete is 25 years, and the cement contents and water cement ratios are stepped back one level to reflect the shorter working life compared with IS EN 206:2013 + IS NA 2015.

5 Permitted cements and combinations.

This section sets out the permitted cements that 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	
CEM I	
CEM I – SR3	
CEM II / A-L or A-LL	
CEM II / A-S	
CEM II / A-V	
CEM II / B-S	
CEM II / B-V	Fly ash content shall not exceed 31%
CEM III / A	

Permitted cement combinations	
CEM I + max. 31% fly ash (Class A or B)	Fly ash conforming to I.S. EN 450-1
CEM II / A-L or A-LL + max. 31% fly ash (Class A or B), using k-value concept	
CEM I + max. 65% ggbs	ggbs conforming to I.S. EN 15167-1
CEM II / A-L or A-LL + max. 50% ggbs	
CEM II / A-V + max. 50% ggbs	
CEM II / A-S + ggbs up to combined 50% total ggbs	

The specification permits the use of microsilica (silica fume) of Class 1, conforming to I.S. EN 13263-1, 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.

Form S.100 A

Specification of Concrete for silos, silage aprons and silage effluent stores

Supply concrete as a designed mix in accordance with the relevant clauses of I.S. EN 206-1	
Mix reference	S.100 Mix A
Strength Class	C35/45
Nominal maximum size of aggregate in mm	20
Types of aggregate	Coarse to I.S. EN 12620 and SR16
	Fine to I.S. EN 12620 and SR16
Cement type to EN 197 (select one and delete as appropriate)	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
Additions (select one and input %, and delete others as appropriate)	ggbs to I.S. EN 15167-1
	Fly ash to I.S. EN 450-1
	Silica fume to I.S. EN 13263-1
Exposure Classes (25 year design life)	XA3, XC4, XF3
Chloride Class (select one and delete others as appropriate)	Cl 1,0 (mass concrete)
	Cl 0,4 (reinforced concrete)
Minimum cement content, kg/m³	360
Maximum water / cement ratio	0.50
Consistence (select one and delete others as appropriate)	Slump Class S2
	Slump Class S3
	Slump flow class SF2 for SCC
Method of placing (for information)	
Other requirements (only if appropriate)	

Form S.100 B

Specification of Concrete for other purposes

Supply concrete as a designed mix in accordance with the relevant clauses of I.S. EN 206-1	
Mix reference	S.100 Mix B
Strength Class	C30/37
Nominal maximum size of aggregate in mm	20
Types of aggregate	Coarse to I.S. EN 12620 and SR16
	Fine to I.S. EN 12620 and SR16
Cement type (select one and delete others as appropriate)	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 (select one and input %, and delete others as appropriate)	ggbs to I.S. EN 15167-1
	Fly ash to I.S. EN 450-1
	Silica fume to I.S. EN 13263-1
Exposure Classes, other than Freeze/ Thaw (25 year design life)	XA1, XC4
Exposure Class, Freeze/ Thaw (select one and delete others as appropriate)	XF2
	XF3 (see other requirements)
Chloride Class	Cl 1,0 (mass concrete)
	Cl 0,4 (reinforced concrete)
Minimum cement content, kg/m³	310
Maximum water / cement ratio	0.55
Consistence (select one and delete others as appropriate)	Slump Class S2
	Slump Class S3
	Slump flow class SF2 for SCC
Method of placing (for information)	
Other requirements (only if appropriate)	3.5% minimum air entrainment (Exposure Class XF3 only)