

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

**MINIMUM SPECIFICATION FOR RE-SURFACING OF SILO FLOORS**

**The receiving of this specification does not imply approval of a grant application.** However, if written approval is issued, then this specification becomes part of the contract between the applicant and the Department of Agriculture and Food.

This is a minimum specification. Where the word “SHALL” is used, then that standard (at least) must be followed in grant-aided buildings. Where a procedure is “RECOMMENDED”, this is advice only on good practice.

Note that all references to other Department Specifications are to the current edition of that specification [available on the Department of Agriculture and Food Website ([www.agriculture.gov.ie](http://www.agriculture.gov.ie)) under Farm buildings]. Similarly, references to Standards are to the current edition of the Irish, British or European Standard, as appropriate.

Where an approval is issued to re-floor a walled silo neither the Minister or any official of The Department of Agriculture, Food and the Marine shall accept responsibility or be liable in any way for the soundness or otherwise of any silo wall.

Due to its acidic nature, silage effluent can corrode both the concrete and the steel in silo walls and the concrete in the floors. This happens particularly with poor quality, badly cured or compacted concrete, or with concrete with inadequate cement content. It is very difficult to ascertain if an existing silo wall has reinforcing steel to the standard of S120. Extreme caution must therefore be exercised before re-flooring a walled silo and a careful visual inspection undertaken to ensure that all parts of the retaining wall are structurally sound. If there is doubt or disagreement on this point, then the applicant may be asked to furnish a report from an independent qualified Chartered Engineer that shall confirm the stability and integrity of the walls in question.

**Note:** This specification must be read in conjunction with either S. 128 (silo bases) or S. 120 (walled silos). **All requirements** of those specifications relating to floors must be followed including the points noted below.

## **1. Safety**

### **1.1 Responsibility for Safety**

Applicants are reminded that they have a duty under the Safety, Health, and Welfare at Work Act 2005 to provide a safe working environment on the farm, including farm buildings, for all people who may work on that farm. There is a further duty to ensure that any contractor, or person hired to do building work, provides and/or works in a safe environment during construction.

## 1.2 Safety during Construction

**Farmer/Applicant Responsibility:** Please note that neither the Minister nor any official of the Department shall be in any way liable for any damage, loss or injury to persons, animals or property in the event of any occurrence related to the development and the applicant shall fully indemnify the Minister or any official of the Minister in relation to any such damage, loss or injury howsoever occurring during the development works. It is the applicant's responsibility to provide a construction stage project supervisor.

**Dangers:** Where the applicant/farmer is undertaking any part of the above work, it is his/her responsibility to seek competent advice and to undertake all temporary work required to ensure the stability of excavations, superstructure, stanchion foundations, wall foundations, to guard against possible wind damage and to avoid any other foreseeable risk. It is also his/her responsibility to ensure that any drains, springs or surface water are diverted away from the works.

**Power lines:** Due to the complex criteria involved, where buildings are proposed within 35 metres of the centre of any overhead power line, the landowner shall contact ESB Networks in advance to ascertain the specific minimum building clearance requirement. It is a requirement on landowners under The Electricity Supply Acts to notify ESB Networks, at least, two months before commencement of any construction works near overhead lines. As a guide, table 1 below sets out the usual minimum clearance distances required, however, ESB Networks shall be contacted and their advice followed for any structure within 35m of the centre line of an overhead power line. ESB will provide landowners with written confirmation of the required clearances. Landowners can contact ESB through phone numbers provided on their electricity bills.

Where building work is undertaken near power lines there is also a safety issue regarding Machinery, Tipper Trucks and Elevators operating without proper safety measures in place. When landowners contact ESB they will be provided with relevant safety literature.

**Table 1:** In general the following clearances apply to various voltage levels.

<b>Voltage</b>	<b>Clearance</b>
Low Voltage	0.5 to 3 Metres
Medium Voltage	3 to 6 Metres
38KV Lines	10 to 17 Metres
110kv Lines	23 Metres
220KV Lines	30 Metres
400KV Lines	35 Metres

**Note:**

- ESB overhead lines consist of lines at various voltage levels and require specific safety clearances from buildings depending on voltage level and construction type.
- Clearances are specific to the line voltage, building height, location in line span and ground levels.

**Danger to children:** It is the applicants responsibility to prevent children from playing or spending time in the vicinity of any construction work.

## **2. Concrete Specification**

### **2.1 Certificates**

Concrete shall be produced in an 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 certificate, the "Concrete Manufacturers' Specification Certificate", is produced in triplicate. **The top certificate, printed on light blue paper, shall be retained by the applicant** and given to and retained by the local AES Office of the Department of Agriculture for inspection upon completion of the works.

### **2.2 Curing of Concrete**

**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.

All concrete shall be cured by keeping it thoroughly moist for at least seven days. Wetted floor slabs and tank walls shall be protected by polythene sheeting, kept securely in place. Alternatively proprietary curing agents may be used in accordance with manufacturer's instructions. When frost is a danger, straw bales shall be placed over the polythene on slabs. Concrete shall be at least 28 days old before being subjected to full load, or to silage or silage effluent.

For further information on curing, see the website of the Irish Concrete Society.

**Note: Uncured concrete is the chief cause of concrete failure in silage slabs.**

### **2.3 Concrete**

For walled silos, 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/mm<sup>2</sup> (strength class C35/45). Minimum cement content shall be 360 kg/m<sup>3</sup>. 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'.**

- The concrete is to be to I.S. EN 206-1:2002: Strength Class: C33/45, 360 kg cement, maximum water cement ratio of 0.50, Exposure classes: XA3, XC4 (25 year life), Slump class: S2 or S3, maximum aggregate size 20mm.

**Note:** The resistance of concrete to acid attack by silage effluent depends on a high cement content concrete as specified, on the use of the least amount of water to produce a stiff but workable mix, which is thoroughly compacted and subsequently properly cured as specified (see Clauses 2.2 and 18). Plasticisers or superplasticisers may be incorporated in the concrete, particularly in warm weather, to improve workability. Under no circumstances shall additional water be added to the concrete to change the workability. Any additives used shall comply with British Standard 5075; they shall be used strictly in accordance with manufacturer instructions and shall be added at the ready-mix plant. Where an additive is used it shall be certified on the invoice by the ready-mix supplier that it was used and complies with BS 5075.

## **2.4 Fibres**

Polypropylene fibres may be incorporated into the concrete mix to improve the properties of concrete. Only fibres which have been tested and approved by National or European approval authorities may be used. The use of fibres helps to reduce plastic cracking and improve surface durability but they are not a substitute for structural reinforcement. Fibres shall be used in strict compliance with manufacturer's instructions and shall only be added at the concrete manufacturing plant. The concrete certificate (Clause 2.1), shall clearly show the amount and type of fibre added. The mix design, compacting, and curing of fibre concrete is the same as concrete without fibre.

## **2.5 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](http://www.concrete.ie)).

## **2.6 Materials**

Cement and other materials used in the production of concrete shall be in accordance with Department of Agriculture, Food and the Marine specification S.100.

Plasticisers and other admixtures shall be to EN 934. All admixtures shall be used in strict accordance with manufacturer's instructions, and shall be added only by the concrete-mix manufacturer.

## **2.7 Tests**

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

## **2.8 Compaction of Concrete**

All concrete shall be compacted by either vibrating screed or poker vibrator depending upon the position of the concrete. Poor compaction leads to entrapped air, which will weaken the concrete and may cause premature failure. All concrete can be easily placed and compacted when using a vibrating screed or poker vibrator which helps ensure the concrete achieves its full strength.

# **3. Resurfacing with Concrete**

## **3.1 Preparation**

If the floor is extensively cracked by subsidence, the entire floor shall be taken up and site preparation carried out in accordance with Clause 6 of S. 120. If the floor has subsided in just a few local areas, break out the concrete at least 500mm into solid concrete; replace the hardcore to solid stratum and vibrate with a plate vibrator to the bottom level of the existing concrete base; wet existing concrete; refill with 45N concrete; vibrate with a poker vibrator and level off. Cut out any shrinkage cracks in the existing silo floor and repair with acid resistant mastic in strict accordance with manufacturers instructions.

### **3.2 Channels in a walled silo**

If channels are to be constructed in the replaced silo floor, these shall be formed in accordance with Clauses 17 & 19 of S. 120. To ensure that the specified 150 mm depth of concrete is maintained beneath the channels it shall be necessary to remove a 1200mm width of concrete and lower the foundation level. It is recommended that the floor be laid with a slope of 1 in 40 to the channels.

### **3.3 Channels in a silo slab**

Channels or kerbs shall be constructed in the replaced silo slab, these shall be formed in accordance with Clause 7 of S. 128. To ensure that the specified 150 mm depth of concrete is maintained beneath the channels it shall be necessary to remove a 1500mm width of concrete and lower the foundation level.

### **3.4 Concrete Floor Slab**

The concrete floor slab shall be laid in accordance with Clauses 6 and 10 of S.128, or Clauses 18 and 19 of S120 and shall be at least 125mm thick. Where there is a **slight** subsidence at joints in the existing floor, or where there is substantial localised "pitting" of the concrete surface, a 50 mm layer of well compacted sand shall be laid on the existing concrete to provide a more even distribution of load from the new floor. A 1000 gauge polythene membrane shall be laid on the prepared existing slab/floor. The overlaps shall be sealed with suitable adhesive tape. The polythene sheet shall be laid up to the existing silo wall in all walled silos. **All** joints shall be formed and sealed as per S. 128. The floor shall be laid with a slope of at least 1 in 60 to the front channel.

### **3.5 Shrinkage Cracks to Silo Walls**

Shrinkage cracks to silo walls shall be repaired by cutting a groove with a disc cutter 12mm x 25mm deep, thoroughly cleaning out by power hosing and sealing when concrete is dry in accordance with Clause 9 of S. 120.

## **4. Resurfacing with Hot Rolled Asphalt**

Asphalt shall be manufactured with **non limestone aggregate** and comply with BS 594: Part 1: 1985. Confirmation shall be required from the **manufacturer**, on headed paper, that this specification has been fully complied with. Asphalt shall be laid only by a competent asphalt contractor using a recognised asphalt pavior machine.

### **4.1 Floors not Suitable for Re-surfacing**

Any floor extensively cracked by subsidence is not suitable for re-surfacing by asphalt and shall be replaced in concrete as above.

### **4.2 Preparation of Suitable Floors**

Completely clean the surface area to remove all traces of dirt by high pressure wash or steam cleaning equipment.

If the floor has subsided in just a few local areas, break out the concrete well into solid stratum, replace the hardcore to a solid stratum, vibrate with a plate vibrator to within 125mm of the existing concrete surface, refill with 45N concrete to the existing floor surface.

Small areas of damaged or poor concrete where subsidence has not occurred shall be cut back to sound concrete. Bitumen emulsion shall be brush applied to those areas and the depressions filled with thoroughly compacted Asphalt.

All joints and cracks in the existing floor shall be cleaned cut, enlarged where necessary and filled with hot poured bitumen.

### **4.3 Joint and Channel**

#### **Constructing a sealed joint between the asphalt floor and a new effluent channel.**

Cut out a strip of existing concrete at least 1.3m wide and at least 40mm deep, to provide a new concrete base and effluent channel and to give a smooth change of surface levels to the new topping as shown in Figures 1 & 2. Channel shall be returned around apron to ensure collection of all effluent. Joint between old and new concrete shall be cut out and sealed with hot poured bitumen prior to laying asphalt.

**Note: A feathered edge to the asphalt covering is not acceptable.**

### **4.4 Side Kerbs for Silage Bases**

Where it is proposed to lay asphalt on a silage base, a raised kerb shall be constructed, as per Figure 3, along each side of the base to contain effluent. The foundations for the kerb shall be taken to solid ground and not less than 450mm deep. Backfill shall be fully consolidated and section of existing floor, as necessary, replaced as per Clause 4.2. Joint between old and new concrete to be cut out and sealed with hot poured bitumen before laying asphalt.

### **4.5 Laying of Asphalt**

After cleaning and preparation, the surface shall be fully dry before a tack coat of cationic bitumen emulsion type K1-40 tack is applied evenly at 0.3-0.5 litres/m<sup>2</sup> to the whole area including the bottom 50 mm of walls, in accordance with BS 434: Part 2: 1984, and allowed to 'break' (change from brown to black) before covering.

Apply a minimum 40mm thickness at any point, of hot rolled asphalt, laid in bays running down slope with the fall and with a minimum of joints.

### **4.6 Compaction**

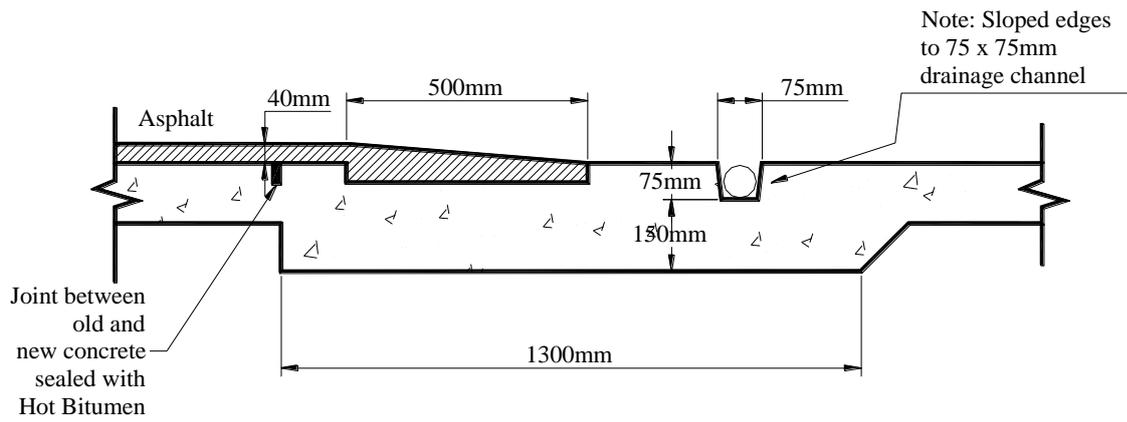
Asphalt shall be compacted with at least an 8 tonne roller or equivalent vibratory roller. Adequate compaction shall be achieved at wall and kerb junctions and corners with vibratory plate or pneumatic hammer.

#### **4.7 Joints**

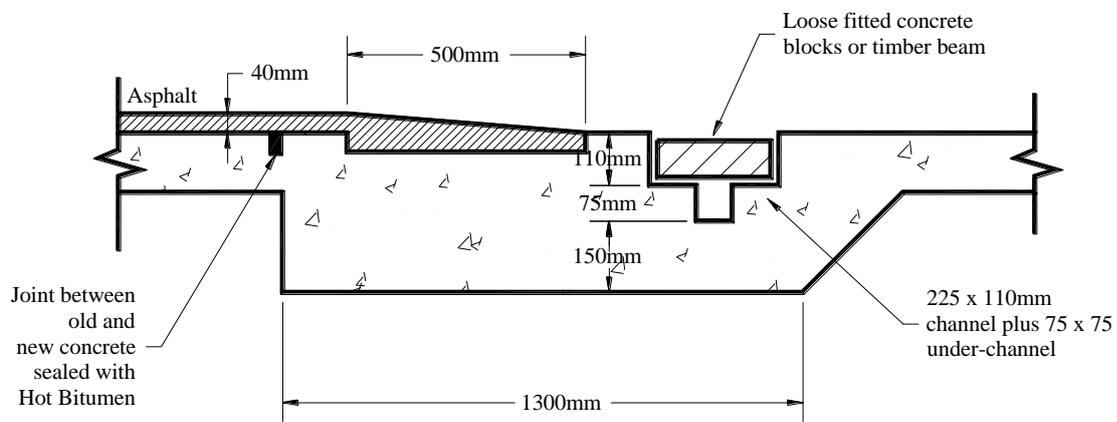
Great care shall be taken in forming joints between bays, and at walls or kerbs, to ensure that the joints are completely sealed. Joints shall be hot formed or sealed with hot bitumen after compaction.

**Note:**

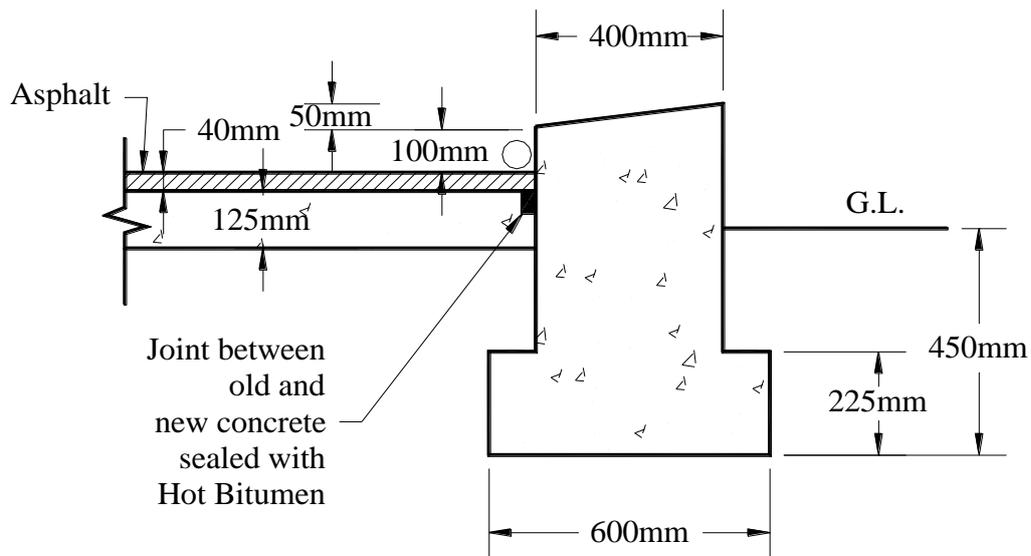
1. Asphalt surfaced silage bases may be subject to blistering and possible lifting when subject to sunshine and high temperatures when uncovered prior to silage harvesting.
2. Protruding metal parts from damaged or badly maintained farm machinery may seriously damage asphalt surfaces.



**Figure 1**



**Figure 2**



**Figure 3**