Introduction

The following general application procedure is applicable to storage spheres supported on steel or concrete legs and shall be read in conjunction with the specific requirements of the client as detailed in the guideline specification prepared for the project.

Unless directed to the contrary in this proposal, Promat FENDOLITE® MII shall be mixed and applied in accordance with the current Promat FENDOLITE® MII & FENDOLITE® TG Energy Industries Application Manual.

During the Promat FENDOLITE® MII application process the sphere should be loaded to its maximum limit on-line or loaded with an inert substance (water). The load should not be removed until at least 5 days after the final Promat FENDOLITE® MII application.

Priming requirements

To ensure long term corrosion protection of the sphere and its steel supports and unless noted otherwise in the specification, Promat recommend that all surfaces are blast cleaned to SA 2½ in accordance with SIS 05 59 00 : 1967 and are primed and painted with a two-pack epoxy system, applied and cured in accordance with the manufacturer's recommendations.

Inspection of the primed steel surface

All steel surfaces to be protected shall be free from oil, grease, dirt, dust, grime or any other material likely to impair adhesion of PROMAT® PSK 101.

Application of PROMAT® PSK 101

Apply one coat of PROMAT® PSK 101 to primed steel surfaces at a wet film thickness of 100-150 microns (55-82 microns DFT) and allow to cure and dry. The purpose of PROMAT® PSK 101 coating is to create adequate bonding of the Promat FENDOLITE® MII to the primer.

Application of Promat FENDOLITE® MII collars and bands

The purpose of Promat FENDOLITE® MII collars and bands is to ensure that the wire reinforcement is consistently "stood off" the sphere and in the correct position. Collars and bands shall be formed using Promat FENDOLITE® MII which shall be spray applied as a series of horizontal collars around the sphere at 500mm – 1000mm centres.

The collars and bands should be 200 - 300 mm in width and may be levelled off (if necessary) to approximately 50% of the specified Promat FENDOLITE® MII thickness using a wooden float fitted with spacers or a suitable alternative. Additional vertical bands at nominal 500mm – 1000mm centres may also be applied (between the collars) to further assist with mesh location. The collars/bands may be applied in more than one pass if necessary. Apply first coat of Promat FENDOLITE® MII to steel support legs. The surface of collars and bands and the first coat on the legs

must be left with a rough texture. The Promat FENDOLITE® MII must be left for **at least 24 hours** to gain strength before proceeding further.

Installation of mesh retention system

Since welding is unlikely to be permitted on the sphere, the mesh retention system outlined below does not rely on welded fixings. The proposed system is based on the concept of a monolithic reinforcement of sufficient tensile strength to support the Promat FENDOLITE® MII with a safety factor. Promat FENDOLITE® MII bonds well to a variety of substrates but for calculation purposes, it has been assumed that Promat FENDOLITE® MII is not bonding to the sphere. The tensile strength of the Promat FENDOLITE® MII has also been ignored.

Mesh type

Promat propose the use of galvanised welded wire mesh of size 76mm x 76mm or 100mm x 100mm x 2.5mm - 3.0mm wire diameter. The tensile strength of the wire must be a minimum of 350N/mm² and it must be hot dip galvanised after manufacture to BS 729:Part 1 (or equivalent). On support legs, Promat recommend the use of 50mm x 50mm PROMAT® Plastic Coated Galvanised Mesh, available in 1m x 25m rolls, or 50mm x 50mm x 1.4mm - 1.6mm galvanised hexagonal mesh.

Mesh fixings

To follow the concept of a monolithic mesh reinforcement system, it is important that joins between the mesh sections are sufficiently strong to enable the overall tensile strength to be maintained at a high level, (not less than 50% of tensile strength of the mesh). Galvanised steel hog rings or galvanised wire ties are suitable, providing sufficient rings or ties are used to comply with the above strength concept.

Support rings

These are proposed to aid installation of mesh on spheres. These may be constructed from a single galvanised wire or woven wire rope to provide sufficient strength to support the weight of mesh plus any applied tensioning forces. For sphere diameters up to 12m, a tensile strength of the wire of at least 2 tonnes is usually sufficient.

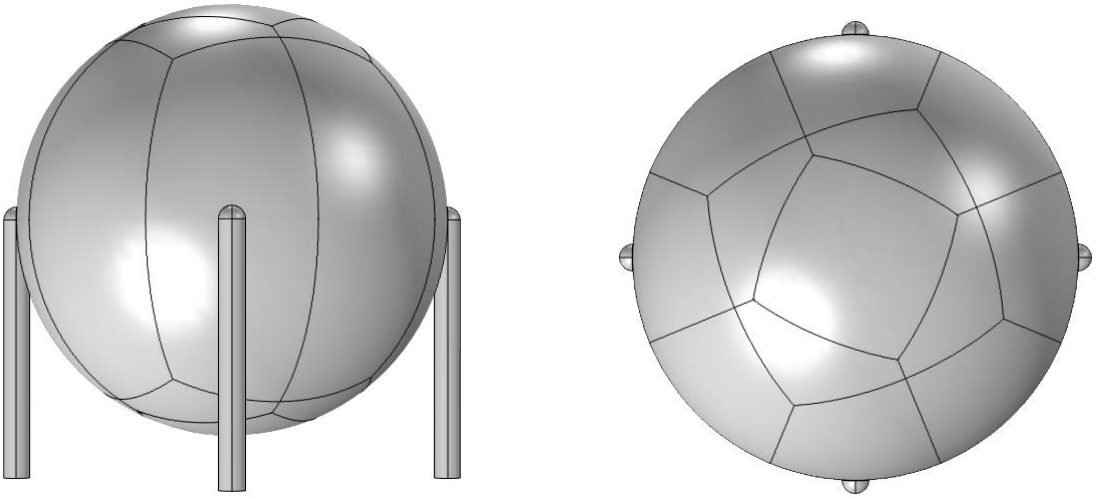


Figure 1: schematic view of floating support rings and drop wires (left: side view; right: top view)



Figure 2: Biscuits, 0.3D and 0.5D support rings, drop wires and mesh on sphere

Installation of mesh

- Prepare two floating support rings of nominal 0.3D circumference and two floating support rings of nominal 0.5D circumference.
- Place one 0.5D ring on top of the sphere and attach at least four equally spaced drop wires to secure the bottom 0.5D floating ring in place.
- Place one 0.3D ring on top of the sphere and attach at least four equally spaced drop wires to secure the bottom 0.3D floating ring in place.

- Attach 4 lengths of mesh to top 0.3D ring at equally spaced intervals; overlapping the floating ring by at least 2 mesh apertures and secure with galvanised hog rings or wire ties and secure to bottom 0.3D ring ensuring a minimum overlap of two mesh apertures with hog rings/wire ties tensioning as required.
- Attach a length of mesh to the 0.5D ring such that it overlaps by a minimum of two mesh apertures at the equator one of the previously applied lengths of mesh and attach to the bottom 0.5D ring, tensioning the mesh as required. Join the mesh to the previous layer along its length with suitable fixings. The mesh fixings on the top section of the sphere are particularly important as they provide support for the lower section.
- Repeat the procedure alternating mesh strips between the 0.3D ring and 0.5D ring, thus building a complete and balanced coverage of the surface of the sphere. The mesh will require cutting to pass around support legs or other protrusions. Any uncovered areas above or below the top and bottom rings also needs covering with mesh (if not already covered by surplus mesh as above). Since pipework, etc., will vary from sphere to sphere, they must be considered separately.
- Wrap 50 mm x 50mm PROMAT® Plastic Coated Galvanised Mesh or 50mm x 50mm x 1.4mm - 1.6mm galvanised hexagonal mesh around the sphere legs, tightening as required and join to itself and the existing mesh on the sphere using galvanised wire ties or hog rings as previously described at 150mm centres. Ensure that a two mesh aperture overlap is maintained at all joins.

NOTES:

- *All overlaps of mesh (side and end), must be a minimum of two mesh apertures and must be secured with hog rings or soft fully galvanised wire of minimum tensile strength 350 N/mm² at 152mm intervals on floating rings and 76mm centres on a staggered pitch along the length of a join.*
- *No more than three layers of mesh must overlap at any one point. To achieve this, some cutting of the mesh will be necessary.*
- *In order to avoid galvanic contact between the mesh and the vessel, it may be necessary to add biscuits to stand the mesh off the vessel surface.*

Refer to the following EIDS for more information on the protection of storage legs:

- Steel legs (EIDS 021)
- Stainless steel legs (EIDS 044)
- Concrete encased steel legs (EIDS 046)

Application of subsequent coat(s) of Promat FENDOLITE® MII

Mix and spray apply Promat FENDOLITE® MII in the normal manner to the specified thickness on the sphere and its supports. Application may commence at the base of the sphere and proceed upwards or may commence at the top of the sphere and proceed downwards, but it application commences from the top of the sphere, **it is essential that any day joints are cut back to create a positive rake of**

not less than 30°. Where possible, the Promat FENDOLITE® MII should be applied as a single coat to the required thickness. It may be applied in more than one pass, however (i.e. a pass of material may be left for up to two hours to stiffen before application of another pass). If the material is allowed to set, the next layer is defined as another coat. The final coat shall be at least 8mm thick to avoid cracking.

Promat FENDOLITE® MII **must not be trowelled flush with the reinforcing mesh** as this can create a plane of weakness. The suggested finishing technique is to level the surface with a steel float to close down the surface.

Water shedding and sealing of Promat FENDOLITE® MII / steel junctions

Top surfaces shall be sloped to shed water. All terminations of Promat FENDOLITE® MII against steel must be sloped to shed water. Promat FENDOLITE® MII / steel junctions shall be sealed by cutting a 'U' into the material and applying a polysulphide or silicone based mastic sealer.

NOTE: Promat recommend that the mastic seal is not applied until after final surface treatment.

Final surface treatment

Promat propose that on curing and drying of the Promat FENDOLITE® MII, the surface is treated with a Promat approved topcoat paint system. The selected topcoat system must be applied strictly in accordance with the manufacturer's recommendations. It is necessary to maintain the correct environment conditions as stipulated in our current Promat FENDOLITE® MII & Promat FENDOLITE® TG Energy Industries Application Manual immediately before, during and after the particular application. Refer to Energy Industries Data Sheet EIDS 033 - Sikalastic (Decothane) Application Procedure.

NOTE: Ideally, all repair work should be carried out prior to application of the final surface treatment (refer to the current Promat FENDOLITE® MII & FENDOLITE® TG Application Manual).

The information given in this Application Procedure is based on practical experience, independent and other tests and represents, in Promat's opinion, the best technical advice available. Since the products are applied under circumstances beyond our control, Promat can accept no direct or consequential liability, whether in contract or in tort, for the interpretation of such recommendations and reserves the right to modify the recommendations as necessary. Should it be unclear as to the meaning of any of the instructions given above, or if further information is required, please consult Promat.