

EPSS Warehouse Floor Epoxy Coating

1. Background

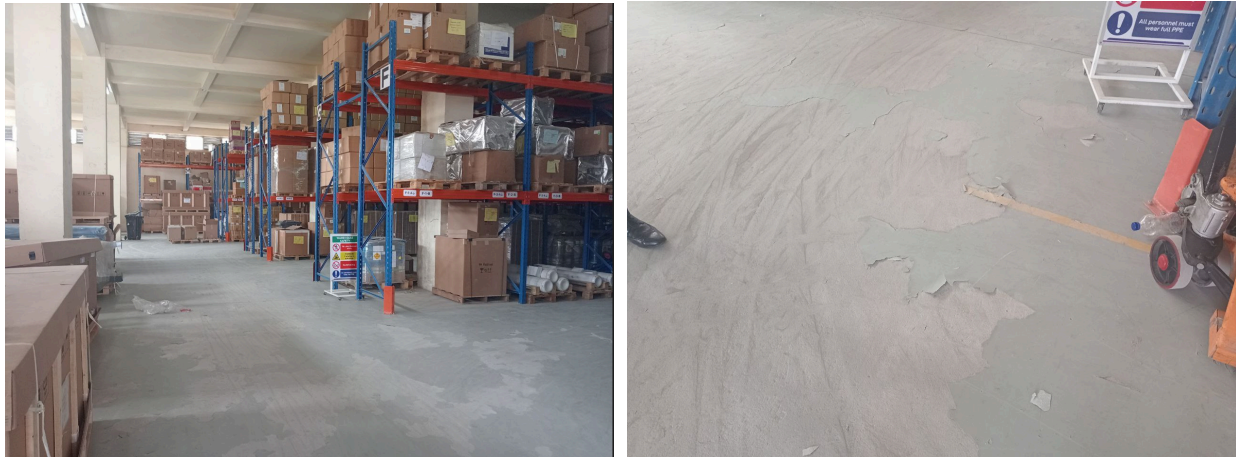
The Ethiopian Pharmaceuticals Supply Service (EPSS) is a veteran institution in providing pharmaceuticals, laboratory reagents, medical equipment and supplies in Ethiopia. The institution is responsible for supply chain management of public health commodities in the country. It currently manages about 19 warehouses of varying sizes that serve more than 3,800 health facilities in nine regional states and two administrative states.

Given the institution's core activity of improving the supply of pharmaceuticals within the overall health service delivery system, EPSS intends to install floor epoxy coating for the following existing warehouses located in Addis Ababa and Oromia regions.

- Central Warehouse: Two storied warehouse building with a total 10,000 m² area located in Addis Ababa close to "*Saint Paul Hospital*" within the main premises. The building is made of reinforced concrete framing system consisting of reinforced columns, concrete ground and suspended floor slab, beams and covered with metal sheet roofing and prefab metal external peripheral walls.
- Negele- Borena Branch Warehouse: a one storied building with a total of 1,700m² area located in Negele Borena, Oromia Region. This building is also made of reinforced concrete framing system with concrete slab on grade, reinforced concrete columns, beams and metal sheet roofing system and enclosed with prefab metal external walls.

Both warehouses are currently operational with pharmaceuticals and pallet racking systems with efficient storage and picking process systems. The warehouses are equipped with common material handling equipment such as forklifts, pallet jacks, hand trucks, platform trucks of maximum 5 ton capacity.

The structural floor of the buildings as it stands today appears sound and intact with no indication of deflection, settlement, distortion, cracks and any form of deformation. The reinforced flooring system is finished with smooth cement screed, poor wearing resistance, dusty and relatively uneven surface due to the movement of the material handling equipment. The importance of having good and quality flooring in the warehouse is pivotal, as it takes the burden of tones of the weight of racking and goods, as well as the continuous transit of the material handling equipment and workers.



EPSS Central Warehouse- Existing Floor

2. Objective

Improve the quality and durability of the warehouse flooring at two central warehouses located in Addis Ababa and one branch warehouse in Negele Borena. The epoxy coating intended to provide smooth, versatile, hard-wearing and seamless surface that can deliver excellent resistance against all types of traffic pressures and contaminants, from intense foot traffic and punishing impacts from heavy moving machinery such as forklifts to chemical, oil and food spills, temperature extremes and abrasive cleaning regimes.

3 Product

Epoxy warehouse floor coating having high-performance solution characterized by hardness, durability, and impact resistance, suitable for warehouse and other industrial floor applications. The epoxy coating is to be applied over the existing old concrete floor to create a smooth, seamless, durable, and low maintenance flooring surface having the performance properties defined below. Epoxy floor coating with an epoxy resin and a polyamine hardener that are mixed before application and the elements cross-link as they cure – resulting in a hardened, rigid plastic coating material that bonds well to the concrete base layers when applied.

Performance Properties of the epoxy coating

Epoxy coating with 98 ± 2 % solids Low Viscosity Primer and Sealer having the following properties.

- High tensile, compression, and bend strengths;
- Allow movement of forklifts with 5 ton capacity;
- High hardness, durability and impact resistance;
- Resistance to chemicals, particularly alkaline environments.
- Heat resistance.
- Adhesion to a variety of substrates.
- Low shrinkage during curing.
- High electrical insulation and retention properties.
- Corrosion resistance;
- Non-slippery
- Self-smoothing;
- Easy to apply and leaves seamless surface.

In addition, the epoxy coating for outdoor applications shall be UV resistant, and non-slippery when wet.

Physical Properties:

- 3mm minimum thickness base/topcoat application
- Elongation (ASTM-638) – Greater than 10%
- Compressive Strength (ASTM D695) – Min 80 MPa
- Tensile Strength (D790) – Min. 25 MPa
- Concrete Bond Strength (ASTM-882) – Min 15.8 MPa
- Flexural Strength (ASTM D790) – Min 40 MPa

4. Execution**Surface Preparation**

Epoxy should only be applied on a clean, porous, and completely flat surface free of moisture, greasy residue, debris, holes, and cracks. Surface preparation need to be made in order to remove possible loose particles, weak slurry layer, oil and dirt layer, and roughen and clean the surface. Processes like acid etching, diamond grinding, and shot blasting can remove unwanted irregularities from the entire floor and make the surface more adhesive for epoxy resin. Degreaser, stiff brush, vacuum cleaner and a simple sweep can keep the surface dirt and stain-free. Ensure the following prior to the application of the epoxy coating.

- Remove top layer of concrete by diamond grinding/shot blasting intended to remove any sealers/densifiers and open concrete pores to allow the epoxy coating to penetrate into the floor.
- The floor has to be thoroughly cleaned to remove any traces of grease, oil, or solvents with a scraper, wire brush or stiff bristle brush, remove all dirt, wax, dust, mildew and loose or separating material.
- Ensuring levelling and flatness. ...
- Patching holes and cracks in concrete. Any damages to the surface, such as cracks, must be repaired before application. Prior to system application, all control joints and cracks are to be treated with semi-rigid epoxy joint filler and rigid epoxy crack filler respectively as required.
- Proper primer selection helps to seal the pores, penetrate the pores, it makes it possible for adhesion and bonding to take place.

Temperature and Humidity

For epoxy coating application, the ambient and concrete surface temperature must be between +10°C and +30°C. The concrete surface must be dry with a moisture rate less than 4% by weight and the relative humidity in the environment should be less than 80%.

Application

Apply each component of the Epoxy Coating System in compliance with manufacturer's installation instructions including mixing and application methods, recoat windows, cure times and environmental restrictions. The system is to be applied directly over all non-expansion joints and cracks that have been treated as previously described.

- **Mixing Materials:** while preparing the epoxy material; first component A (epoxy resin) will be mixed with a low-speed (300-400 rpm) mixer, while the mixing process continues, component B (epoxy hardener) shall be added slowly until the material becomes homogeneous. The mixing process will take at least 3 minutes.
- **Minor Cracks** less than 1.5mm wide after surface preparation shall be filled in with appropriate epoxy resin, approved by Manufacturer, mixed and applied as recommended by the manufacturer's printed instructions. All treated cracks are to be sanded prior to applying primer.
- **Epoxy Primer:** The reinforced concrete surface, which has been prepared, cleaned and repaired and meets the minimum humidity condition shall be provided with solvent-free epoxy primer following manufacturer's mixing and application instructions. Epoxy primer penetrates into the concrete, fills the voids,

increases the impact and chemical resistance of the surface, and adheres to the reinforced concrete surface with a very high resistance. It enables the coating to be integrated with the reinforced concrete surface by adhering to the layers that comes after tit.

- Coating application- a solvent-free epoxy intermediate layer and topcoat applications to achieve a total minimum thickness of 3mm after the curing period of the prime application. Follow manufacturer's instructions for mixing and application techniques, add during mixing or broadcast non-skid grit silica-sanding into epoxy coating application to provide required physical properties, textured finish and surface roughness

Curing and Protection

- Cure Epoxy Coating System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the application and prior to completion of the curing process.
- The finished coating will also take time to cure – anywhere from 2 to 7 days, depending on the type of epoxy warehouse floor coating used and the size of the application.
- Wet epoxy during application smells terrible, and the fumes can be toxic – especially to asthmatic individuals. So wearing protective eye and mouth covering during the application is essential, and the entire area should be as ventilated as possible.
- Apply temporary protection until floor is fully cured. The Contractor shall protect the finished floor until safe utilization is ensured