

APPLICATION INSTRUCTIONS

For product description refer to the product data sheet

HEMPEL'S GALVOSIL* 15620

Scope:

These application instructions cover surface preparation, application equipment, and application of HEMPEL'S GALVOSIL 1562.

The following are general rules, which may be supplemented with more detailed descriptions when needed, for instance for major newbuildings/new constructions or extensive repair jobs.

Steel work:

All welds must be free of pinholes and must be of highest quality so that they can be protected by the paint. This means perfectly filled, smooth welds with a slightly wavy surface.

All welds must be complete and continuous without cracks and fissures which will cause coating discontinuity.

All weld spatters must be removed.

All sharp edges must be removed or rounded off in such a way that the specified film thickness can be build-up on all surfaces. The radius of the rounding should be approximately 1-2 mm.

The steel must be of first class quality and should not have been allowed to rust more than corresponding to grade B of ISO 8501-1:1988.

Note: Porous surfaces such as certain types of cast iron cannot be properly protected with zinc silicate. Deeply corroded steel may also be difficult to protect with a zinc silicate.

All steel work (including welding, flamecutting, grinding) must be finished before the surface preparation starts.

Surface preparation:

Prior to abrasive blast cleaning of the steel, remove oil and grease and other contamination with a suitable detergent followed by high pressure fresh water hosing. Alkali deposits on new welding seams as well as soap traces from pressure testing of tanks to be removed by fresh water and scrubbing with stiff brushes.

On repair jobs, a rough blasting to remove all loosely adhering materials may be required before degreasing/washing is carried out.

Old steel: Even after a very thorough tank cleaning, pits may typically contain contamination in the form of remnants of old cargoes as well as water soluble salts. For this reason, repeated detergent washing plus abrasive blasting may be necessary.

After the first blasting, a very thorough vacuum cleaning is carried out in order to see if any "cargo bleeding" occurs as well as controls for water soluble salts are made. Reference is made to separate instructions. Special care should be taken in evaluating pitted areas.

Grit blast to minimum Sa 2½, SSPC-SP-10. For severe exposure, grit blasting to Sa 3, ISO 8501-1: 1988, SSPC-SP-5, is mandatory for optimum results.

The resulting surface profile must be equivalent to Rugotest No. 3, minimum BN 10a, Keane-Tator Surface Comparator, G/S minimum 3.0 or ISO/DIS 8503/1 rough MEDIUM (G).

Use steel grit, silica sand, aluminium silicate, or similar sharp-edged abrasives of good quality free from foreign matters, soft particles, and the like. When the abrasive material and deionized water is thoroughly mixed in a volume ratio of 1 to 2, the resultant conductivity of the water must not exceed 25 mS/m (20°C/68°F). Please see separate guidelines.

Steel grit with particle sizes of 0.2-1.2 mm or aluminium silicate of 0.4-1.8 mm will usually create the desired surface profile when the air pressure measured at the nozzle is 6-7 bar/85-100 psi. When the abrasive blasting is completed, remove residual grit and dust by vacuum cleaning. Abrasive particles not removed by vacuum cleaning are to be removed by brushing with clean brushes followed by vacuum cleaning.

The importance of a systematic working procedure must be stressed when blasting. Poorly blasted areas covered with dust are very difficult to locate during the blast inspection made after the rough cleaning.

The compressed air must be dry and clean. The compressor must be fitted with suitable oil and water traps.

Note: A lower surface profile than specified will cause reduced adhesion and increased tendency to mud cracking. On the other hand a too high surface profile should be avoided as this will introduce a risk of pinpoint rusting.

In case steel grit is used this must be controlled for foreign matters including oil and grease and be maintained at a proper grain size distribution.

Shopprimed surfaces: When shoppriming is required only straight zinc silicate shopprimer (such as HEMPEL'S SHOPPRIMER ZS 1572) may be used.

Before recoating with GALVOSIL 1562, intact shopprimer must be abrasive blast swept followed by vacuum cleaning to remove accumulated dirt and zinc salts and to ensure adhesion.

Welds, rusty spots, burned areas, and all areas with other types of shopprimers than the straight zinc silicates must be completely abrasive blastcleaned as described above.

Application/equipment:

HEMPEL'S GALVOSIL 1562 can be applied by conventional spray equipment or by brush.

Conventional Spray equipment: Standard industrial spray equipment with mechanical agitator and pressure regulators, air filters, and water traps.

Air hose: 10 mm (3/8") internal diameter
Material hose: 13 mm (1/2") internal diameter

Hoses should be as short as possible, preferably not longer than 10 metres/30 feet.

Spray-gun should be of special type to avoid clugging of the needle. For instance: DeVilbiss MBC, with air cap: 765E, fluid tip/needle: E, spring: heavy duty/mastic, packings: teflon or leather.

Atlas Copco "Ecco 40" with a needle of plastic-material may also be used..

Pot pressure: 2.5 - 5 bar (35 - 70 psi)
Atomization pressure: 1.5 - 2.5 bar (20 - 35 psi)
Nozzle orifice: 1.8 - 2.2 mm (.070" - .085")

(Spray-data are indicative and subject to adjustment).

The pressure pot must be placed at the same level as or at a higher level than the spray gun when spraying, owing to the weight of the material.

Alternatively to the pressure pot a diaphragm pump (e.g. "Husky 715", Graco) built together with a paint pail may be used. It facilitates recirculation of paint material as well as constant agitation of paint.

Thinning: Usually **no thinning** when applied inside tanks.

In other cases thinning with fresh water may be necessary and the amount will depend upon prevailing conditions:

Temperature, humidity, wind/ventilation, method of spraying, etc.

Cleaning of equipment:

During painting, the spray gun may need intermittent cleaning with fresh water to prevent clogging of the nozzle, particularly when painting undersides.

At short stops, prevent packing of zinc around the needle by placing the spray gun in fresh water and let some air pass the gun. Alternatively let the equipment run under full recirculation. At longer stops, clean the spray gun with fresh water.

The whole equipment to be cleaned thoroughly with clean, fresh water or preferably with a 10% soda solution after use. Let the cleaning water circulate for at least half an hour if possible.

Mixing:

- a. Do not open cans until immediately before use. The entire content of the two cans must be used for each batch to ensure a correct mixture.

Left-overs in the cans cannot be used later. Protect the ZINC DUST against moisture before mixing.

- b. Before mixing, shake or stir the GALVOSIL 1562 LIQUID very thoroughly.
- c. Pour the ZINC DUST slowly down into the LIQUID with constant, mechanical stirring. Do not mix in the reverse order. Continue stirring until the mixture is free from lumps.
- d. Strain the mixture through a screen, 60 - 80 mesh (250 - 160 DIN 4188).

Pot life:

5 hours at 20°C/68°F. **Do not use beyond this time even if the mixture appears unchanged.**

Temperature of paint:

In hot climate it is important that the cans with LIQUID are kept out of the sun and that the temperature of the liquid is kept below 30°C/86°F in order to avoid excessive dry-spray.

Application procedure:

Maintain constant agitation of the mixture until the batch is depleted. Use only one mix at a time. **The coating must be wet and smooth just after application.** Correct spray technique must be used to secure optimum film formation.

The wet film thickness must be checked immediately after application, but it can only be used as a rough guidance because of the fast drying.

For conventional spray regulation of the pressures of the material-flow and of the atomizing air can be made as follows:

1. Shut off the atomizing air.
2. Regulate the pressure in the pot so that the material reaches approximately 60 cm/20" horizontally out from the gun before falling to the ground.
3. Turn on the atomizing air using lowest possible pressure.

The spray gun should be kept at a maximum distance of 25-30 cm/(1 foot) from the surface. Hold the spray gun at a right angle to the surface, making even, parallel passes with about 50% overlap.

"Wet-in-almost-dry" application:

When coating tanks, it is possible when deemed necessary, to do a "two-layer" application as follows:

Apply one layer and follow with the next within 15-30 minutes, i.e. "wet-in-almost-dry" (when the surface of first layer is still not grey-dry but dark only). Using this method the most even film thicknesses are obtained, especially on surfaces of a complicated structure.

At the first pass usually sharp corners (for instance angle-welds) are almost fully coated whereas the second pass has to fulfil film thicknesses on adjacent areas.

A fifty percent overlapping and cross spray is recommended.

It is recommended to apply HEMPEL'S GALVOSIL 1562 up to full film thickness in "one go" or by the "wet-in-almost-dry" method.

Stripe coating:

All areas difficult to cover properly by spray application should be stripe coated with a brush immediately before the spray application, and - if necessary to obtain the specified film thickness - also after the spray application.

Microclimate:

The actual climatic conditions at the substrate during application:

During application:

The minimum surface temperature is 5°C/41°F, preferably above 10°C/50°F. The maximum recommended surface temperature is approx. 40°C/105°F. Yet, higher steel temperatures may be accepted provided proper film formation is obtained (and dry-spray is avoided) by using an extra careful spray application, and maybe a slight thinning. In extreme cases a reduction of the dry film thickness may also be necessary. In a warm climate it is recommended to carry out application during nighttime.

The steel temperature must be above the dew point. As a rule of thumb, a steel temperature which is 3°C/5°F above the dew point can be considered safe.

Ventilation is a must for proper filmformation and drying/curing.

In confined spaces, supply an adequate amount of fresh air during application and drying to assist the evaporation of water. It is of utmost importance that sufficient ventilation is covering all parts of the surfaces painted. Per 100 sq.m. painted surface, 20-25 litres of water will be released during drying.

Sufficient capacity of dehumidifiers will thus have to be linked to the ingoing airstream if exterior air is not dry enough. Ventilation requirement to remove the water vapour liberated during application and drying is:

- At 10°C/50°F: Approximately 150 m³/litre (20.000 cuft/US gallon) of paint
- At 20°C/68°F: Approximately 75 m³/litre (10.000 cuft/US gallon) of paint

(Relative humidity of the air supply 40%). With higher Relative Humidity (RH) more air shifts will be necessary. Take care that the tank bottoms, particularly along bulkheads and corners, are sufficiently ventilated.

Recommended number of airshifts during the application and the following approximately 8 hours:

Size of tank painted	Number of airshifts, with air of 40% RH (ingoing value) and 20°C/68°F
100 m³/3500 cbft	Approx 75
400 m³/14000 cbft	Approx 45
1000 m³/35000 cbft	Approx 25
4000 m³/140000 cbft	Approx 20

Humidity in the tank: 50-75% RH during application and the first 2-3 hours. The actual number of air shifts will depend on the actual rate of application, but the above is a relevant basis.

The conditions as described above must be followed to **secure that the paint film is through dry within preferably 1, max. 2 hours after application**. At longer drying times there is a substantial risk of improper film formation giving reduced anticorrosive properties.

During curing:

Humidity after through-dry can preferably be raised to 70-85% RH, and best with intermittent wetting, see below, under Complete Curing.

Steel temperature during curing, is minimum 10°C/50°F.

In practice the following is recommended: let the dehumidifiers run until film thicknesses have been checked, possible rectifications have been done and the following hours until a possible extra layer has become through-dry. (See page 6, EXTRA COAT, SELF RECOATING).

Drying time:

Approximately 30 minutes to 1 hour in 100-125 micron/4-5mils dry film thickness at 20°C/68°F and 50% RH with sufficient ventilation.

Note: The drying time will be prolonged at higher film thicknesses, at lower temperatures and at higher humidities, but must never exceed 2 hours.

Complete curing:

Curing is dependent on temperature, humidities and direct exposure to water. It will generally take minimum 10 days to obtain full cure at a steel temperature of 20°C/68°F. The first 7 days after application keep away from prolonged exposure to rain or water.

To facilitate curing and to neutralize the coating under dry or in-door conditions, e.g. when used in tanks, wash or sprinkle over the coating once or twice with **seawater** and let it dry in between as follows:

- First water washing to take place after 24 hours at 20°C/68°C and 70-85% RH at the earliest. 7 days after application **at the latest**. However, it is very important that the coating will not be wet for more than 4 hours. Any pools on horizontal surfaces have to be removed (mopped up).
- Allow the coating dry through for min. 24 hours, assist with sufficient ventilation.
- If needed, repeat the washing procedure (ref.: "Control of curing", below).
To safeguard against high water temperatures it is recommended in warm weather to do the washing during nighttime.

Control of curing:

In places chosen at random in the tank, place a piece of cotton wool soaked in fresh water on the surface. Cover it with plastic fastened with tape and leave it for 24 hours. No softening after drying up again indicates full cure.

Sufficient mechanical strength can be checked by scraping with e.g. a knife or a coin which shall produce a bright mark leaving some loosened zinc but no irregular detachment. Yet this method does NOT replace the above described water test.

Recommended film thickness:

For long time protection, **without topcoat:**

100 micron/4 mils dry; 150 micron/6 mils wet (undiluted).

In tanks: 125 micron/5 mils dry; 175 micron/7 mils wet, is usually specified.

For a tank coating specification the film thickness must obey the 80-20 rule, yet on stiffeners, brackets and similar narrow places, the 70-30 rule, ie 80% (respectively 70%) of the dry film thickness measurements must be equal to or greater than the specified film thickness (100-125 micron/4-5 mils) and of those below the specified film thickness, no measurements must be lower than 80% (respectively 70%) of the 100-125 micron/4-5 mils.

Too high dry film thickness, ie above approximately 250 micron/10 mils, should be avoided due to the risk of mud cracking or peeling. (Please observe that according to accepted rules of measuring "a measurement" is to be the mean of three single readings taken in a close vicinity).

Note: Special care is necessary to ensure proper film thickness on welding seams, edges, corners, ribs, etc.

**Extra coat,
selfrecoating:**

It is strongly recommended to apply sufficient film thickness from the beginning, however, never exaggerate - reference is made to the "wet-in-almost-dry" procedure of application (page 3).

Film thicknesses to be checked as soon as the paint film is hard dry allowing any needed extra paint to be applied within maximum 3 days at a steel temperature of 20°C/68°.

The extra coat should be diluted, up to 15-20%, and must be applied in a relatively high thickness to avoid "shock drying" by absorbing the liquid.

Repair:

Minor areas for instance crackings along welding seams may be repaired by hard scraping re-moving defective paint followed by re-application by brush. This procedure has to be executed within 8 hours at a steel temperature of 20°C/68°F.

Spreading rate:

Theoretical (on a smooth surface):

dft, micron	dft, mils	m ² /litre	sq.ft./US gallon
100	4	6.9	277
125	5	5.5	221

Practical (with a consumption factor of 1.8):

dft, micron	dft, mils	m ² /litre	sq.ft./US gallon
100	4	3.8	154
125	5	3.1	123

**RECOATING interval,
topcoating:**

GALVOSIL 1562 is normally used as a single coat, but in case of topcoating, it must be fully cured and show a neutral pH of the surface before topcoating.

Topcoating procedure:

If topcoated, please observe the following:

Non-weathered zinc silicate coatings are porous and popping may occur in the subsequent coat(s). One way to reduce the risk of popping is to apply a mist coat as the first pass of the topcoat, let the air escape, and then apply the remainder of the top coat.

Some of HEMPEL's products will substantially reduce the risk of popping when applied directly on top of the zinc silicate. Reference is made to the product data sheets for HEMPEL'S SHOPPRIMER E 1528, HEMPADUR 4508, and HEMPADUR HI-BUILD 4523.

Advanced paint systems are recommended for topcoating, e.g. HEMPADUR qualities.

In specifications with a high total film thickness of the entire paint system the GALVOSIL 1562 dry film thickness can advantageously be kept at 50 micron /2 mils.

Surface cleaning:

Before a possible topcoating the surface must be thoroughly washed with fresh water. Check with pH-paper that the surface is neutral and let it dry completely before recoating. This means in practice at least 2 hours in dry weather after the colour has changed to light grey.

In addition the cleaning before topcoating depends on the condition of the surface:

1. **Intact zinc silicate surface with sporadic formation of "white rust" corrosion products).**
 - a. Remove oil, grease, dirt , etc. by detergent wash.

- b. Remove "white rust" by high pressure fresh water cleaning 200-350 bar (2900-5000 psi) at a nozzle-to-surface distance of 15-20 cm (6-8"). If the surface is only slightly contaminated, corresponding to 1-2 months of exposure in a mildly corrosive environment, hosing down of the surface with fresh water and scrubbing with stiff brushes (nylon) may be sufficient and more practical.

Check that the coating is through dry before recoating.

2. **Zinc silicate surface with extreme formation of "white rust" which cannot be removed as described above.**

- a. Remove oil, grease, dirt, etc. by detergent wash.
- b. Abrasive blast sweep to remove "white rust", followed by vacuum cleaning to remove abrasives and dust.
- c. Restore the zinc layer with any solvent borne GALVOSIL quality, HEMPADUR ZINC 1536, or HEMPEL'S ZINC PRIMER 1649.

3. **Damaged areas, burns, weld spatters, etc.**

- a. Remove oil, grease, dirt, etc. by detergent wash.
- b. Remove weld spatters.
- c. Abrasive blasting to min. Sa 2½, followed by thorough removal of abrasives and dust by vacuum cleaning.
- d. Restore the zinc layer with any solvent borne GALVOSIL quality, HEMPADUR ZINC 1536, or HEMPEL'S ZINC PRIMER 1649.

Safety precautions:

Protect the ZINC DUST against moisture.

Use with adequate ventilation. In confined areas, observe usual precautions to prevent damage to health. Use air masks, safety goggles, and working gloves.

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of (liquid) soap and water.

Safety:

Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Harmful or fatal if swallowed; immediately seek medical assistance if swallowed. Avoid inhalation of possible solvent vapours or paint mist, as well as paint contact with skin and eyes. Apply only in well ventilated areas and ensure that adequate forced ventilation exists when applying paint in confined spaces or when the air is stagnant. Always take precautions against the risks of fire and explosions.

This Product Data Sheet supersedes those previously issued. For definition and scope, see explanatory notes to applicable Product Data Sheets.

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