# Application Instructions
## Single pack solvent-borne intumescent products

**Scope:**

This document gives detailed guidance on the use and application of Hempacore and Hempafire single pack solvent-borne intumescent products and must be used in conjunction with the relevant Product Data Sheets (PDS) and Material Safety Data Sheets (MSDS).

The products covered under current document are:

- Hempafire Pro 315 (43360)
- Hempafire Pro 315 Fast Dry (43361)
- Hempafire Pro 320 (43320)
- Hempafire Pro 320 Fast Dry (43321)
- Hempafire Pro 400 (43490)
- Hempafire Pro 400 Fast Dry (43491)
- Hempacore One (43600)
- Hempacore One FD (43601)

Hempacore and Hempafire intumescent products have been tested, assessed and certified for a range of approvals for the fire protection of structural steel. Please consult the Product Data Sheet for more information. For latest information about country specific approvals, please contact your local Hempel representative.

Reference throughout this document is made to industry best practice guidelines such as “European Industry Best Practice Guide on the application of intumescent coatings to constructional steel - CEPE/EAIPC/EAPFP 2015” and ASFP Technical Guidance Document TGD11 “Code of practice for the specification & on-site installation of intumescent coatings”.

For the primers and topcoats used as part of the Hempacore and Hempafire coating systems, data can be found in the relevant Product Data Sheets and the “Hempacore / Hempafire Cellulosic PFP Approved primer/topcoat” list.

**Storage conditions:**

Hempacore and Hempafire single pack solvent-borne products must be kept/stored in dry areas, always protected from direct sun light and frost, during storage and also during transport. During storage, containers must remain sealed.
Recommended storage and transportation conditions are between 5°C and 40°C. The shelf life of the product may vary depending on the storage conditions.
To facilitate the spraying of the product, it is recommended to store it between 15°C – 25°C-conditions for at least 12 hours before the start of the application.
The shelf life of each product can be found in the corresponding Product Data Sheet (PDS).

**Substrates and surface preparation**

Hempacore and Hempafire single pack solvent-borne products can be used for the fire protection of structural carbon steel and other structural metallic substrates that are covered in their approvals, depending the product this may include galvanised steel, stainless steel and thermally sprayed aluminium and/or zinc.

For each substrate, only certain primers at a specified film thickness can be used. Specific details can be found in the corresponding Product Data Sheet and the “Hempacore / Hempafire Cellulosic PFP Approved primer/topcoat” list. Please contact Hempel for specific information.

On carbon steel a cleanliness of Sa2½ must be achieved with a surface roughness of Medium (G) (ISO 8503-2) prior primer application. for further details see Hempel’s Technical Guidance for Surface preparation guidance. ST3 cleaning prior primer application is only allowed for repair areas, and restricts the primer selection. Galvanised and metallised steel require separate approval which is intumescent-product specific. Contact your Hempel representative for details on approved substrates, surface preparation and primers supported.

All relevant substrates to be coated with Hempacore or Hempafire single pack solvent-borne products must be clean, dry and free from contamination. Dirt, salts, oil and grease have to be properly removed with suitable detergent and high pressure fresh water cleaning.

**Primers:**

Hempacore and Hempafire single pack solvent-borne intumescent products must always be applied over an approved primer or primer system which has been tested for compatibility and performance in fire scenarios.
Hempacore and Hempafire single pack solvent-borne intumescent products may under no circumstances be applied directly to the steel or substrate’s surface.

A list of approved primers and primer systems with recommended dry film thicknesses and overcoating intervals is available for intumescent products. The maximum average dry film thickness of the primer system may never exceed 200 microns, and may be lower for certain primer systems.
The overcoating intervals of each primer with the various Hempacore and Hempafire cellulosic intumescent products can be found in the Hempacore / Hempafire Cellulosic PFP Approved Primer/Topcoat list.

In case of doubt about overcoating of the primer, e.g. surface contamination, film damages and defects, primer not approved, unknown type of primer pre-applied and excessive dry film thickness, consult your Hempel representative.

**Application conditions:**

Solvent borne Hempacore and Hempafire coatings are designed for on-site as well as off-site (in shop) application conditions.

The solvent borne Hempacore and Hempafire coatings are available in 2 versions a standard version and a Fast Dry (or 'FD') version. The standard version can be applied at substrate and ambient temperatures between +5°C and +50°C but for optimum results it is recommended in the range +15°C to +45°C. The Fast Dry version can be applied on substrate and ambient temperature from +5°C up to +30°C but for optimum results it is recommended in the range +5°C to 25°C. The minimum surface temperature must be 3°C above dew point.

For optimum application and drying, the air and substrate temperature should be greater than 10ºC and relative humidity less than 80%. Application at temperatures below 10ºC and at higher relative humidity than 80% will retard drying.

Do not apply the coating if the weather is unfavourable (or expected to develop unfavourably) for application or drying. It is recommended that ambient conditions are monitored every 4 hours or less.

The area where the intumescent is applied must be well ventilated and proper air circulation shall be secured for optimum drying. Minimum 4 times air volume/hour is recommended..

Hempacore and Hempafire single pack solvent-borne intumescent products must be protected from condensation and water during application and drying. They must always be protected from pooling, standing or running water, rain and high humidity/condensation also when they are top coated.

**Application equipment**

The recommended method of application is by airless spray equipment with the following characteristics:

| | |
|---|---|
| Pump ratio: | min 45:1 |
| Filter: | It is strongly recommended to remove all in line filters |
| Nozzle size: | .017" - .023" |
| Nozzle pressure: | ≥200 bar/2900 psi |
| Fan angle: | 20-40º |

*(Airless spray data are indicative and subject to adjustment)*

Increasing spray hose diameter may facilitate paint flow, thereby improving the spray fan. If longer hoses are needed, then it may be necessary to increase the input pressure or pump ratio in order to keep same nozzle pressure.

It is best practice to use airless spray equipment dedicated exclusively for spraying solvent-borne coatings. Alternating use of water and solvent-borne coatings need conditioning of the spray equipment to avoid water contamination of the solvent borne paint. All equipment containing water in the pump, hoses and gun must be thoroughly cleaned with the cleaner recommended in the PDS of the last applied product, for waterborne products this is typically water. After the thorough cleaning, circulate a suitable polar thinner/cleaner through the equipment, hoses and gun until clean thinner/cleaner flows through them; isopropanol is frequently used as the polar thinner. This should be followed by flushing with clean Hempel's Thinner 08080 or Hempel's Tool Cleaner 99610 through the pump, hoses and gun until you see clean solvent flow. Thinner 08080 should be used as final flush just before the solvent borne Hempacore or Hempafire application. Care should be taken to ensure no flushing solvent is mixed with the product when the paint is circulated through the pump, hose and gun, as this could give an unintended thinning effect. Therefore, allow some of the product to flow out into the waste container to ensure that any product mixed with solvent is not used for spraying.

After finishing the application, clean the equipment immediately with clean Hempel's Thinner 08080 or Hempel's Tool Cleaner 99610.

**Thinning:**

Before use, Hempacore and Hempafire single pack solvent-borne intumescent products should be thoroughly stirred to uniform consistency with a power mixer.
The products are supplied ready for use and thinning is in in principle not recommended.
The products as supplied show the so called 'false body' viscosity effect. The false body will be broken when the product is mechanically mixed, which causes a drop in viscosity, that will under normal conditions not re-appear. This drop in viscosity is generally sufficient for proper spray application without any thinning.
In case that thinning still is required, then it is recommended to do it in a controlled way, such as adding thinner in increments of only 1% by volume at a time, followed by uniform mixing before spraying. This small amount normally has significant effect on the product's consistency. Excessive thinning will considerably impact the application properties and hold-up resistance. Never thin more than 5%.

When Hempacore and Hempafire single pack intumescent products are applied at low dry film thicknesses per coat (e.g. less than 300 microns), it may be necessary to make a controlled thinning in order to obtain a closed paint film, see thinning remarks above.

**Spray application:**

An application technique that will ensure good film formation on all faces of the profiles must be adopted. For proper application it is important to use nozzles of the correct size and to have a proper uniform distance of the spray gun to the surface; around 50 cm should be aimed at. Care must be taken not to over-apply on areas such as internal angles, corners, edges, etc. due to the risk of sag, cracks, surface defects and longer drying times. A good painting practice is to apply first a stripe coat on difficult to reach areas.
Once the film is fully dried, removal of dry spray and other painting irregularities will improve the finish appearance.

**Brush application:**

Application by brush is possible but in this case only between 250 and 400 micron wet film thickness may be achieved per coat, thus additional coats may be necessary to obtain the total specified dry film thickness. Moreover, a less smooth finish may be obtained by brush , that is why it is generally only recommended for small areas, repairs and touch-up.

**Wet/dry film thickness:**

The required dry film thickness of Hempacore and Hempafire single pack intumescent products on each steel member vary depending on among others the section factor (Hp/A value) and the configuration that the steel member is used in. On request, based on relevant project information Hempel can provide the required dry film thickness in a PFP Estimation Report.

It is recommended that the wet film thickness is constantly measured during the application using a wet film gauge to indicate if the specified thickness is achieved and to allow adjustment of the thickness if necessary. Good control of thickness per coat will facilitate a more rapid job completion.

Final verification of the thickness shall be done by means of Dry Film Thickness (DFT) measurements. Measurements of the dry film thickness should be conducted on a fully dried film, and can be done with the use of an electromagnetic induction DFT device. If the intumescent film is not sufficiently dry, then the probe of the gauge may indent into the intumescent film and give incorrect low readings. A best practice to obtain more accurate readings on still soft (not fully dried) intumescent coats is to use a plastic shim to be held in between the coating and the gauge-probe to avoid the indent on the film. Obviously, thickness of the shim should be extracted from the coating thickness measurement.

Where dry film readings include a primer, then the thickness of these coatings must be subtracted from the total reading for verification of the DFT of the intumescent coating.

If insufficient dry film thickness is measured then an additional coat of the same product or touch-up must be applied.

It is important that no topcoat is applied before the required dry film thickness of intumescent has been achieved.

**Recommended DFT/coat:**

The maximum dry film thickness that can be applied per coat is indicated in the Product Data Sheet of each Hempacore and Hempafire intumescent product.
When the project is preferred to be completed in least possible labour (i.e. least possible coating layers) it is possible to apply a high DFT, up to the maximum supported DFT as mentioned in the Product Data Sheet. This is a typical recommendation for an on-site application for structural steel that is already erected in the building being constructed.
For faster drying it may however be smarter to apply the products in multiple thinner coats. 750µm (or lower) per coat is typically recommended for faster drying and shorter overcoat times, which enables faster throughput of the steelwork.
Furthermore, when an aesthetic finish is important then it is recommended to apply also in coats of approximately 750µm dry each.

**Film thickness acceptance:** It is key that the total specified dry film thickness of the intumescent products is achieved to ensure proper fire protection. It is recommended that the maximum dry film thickness for relevant types of profiles is not exceeded by more than 20%. Furthermore the maximum DFT shall not exceed the maximum certified DFT by more than 10% for the relevant shape and orientation.
Although in all cases the application of too high DFT is not a good painting practice, it may be considered fire safe when more DFT of intumescent product is applied than specified, provided that the applied DFT is less than the maximum assessed DFT for the relevant shape and orientation. On request Hempel can provide further details.

For guidelines and acceptance criteria of dry film thickness measurements Hempel refers to industry best practice guidelines e.g. "European Industry Best Practice Guide on the application of intumescent coatings to constructional steel – CEPE/EAIPC/EAPFP 2015" and ASFP Technical Guidance Document – TGD11 "Code of practice for the specification & on-site installation of intumescent coatings".
The following is copied from the CEPE/EAIPC/EAPFP 2015 document:
"*Dry Film Thickness and Measurement - Acceptance criteria*
*The coating thickness acceptance criteria shall be as follows, assuming that the specified thickness is a nominal value:*

- *The average dry film thickness applied to each element shall be greater than or equal to the specified nominal value.*
- *The average measured dry film thickness on any face of any member shall not be less than 80% of the specified nominal value.*
- *Dry film thickness values less than 80% of the specified nominal value are acceptable, provided that such values are isolated and that no more than 10% of the readings on a member are less than 80% of the specified nominal value.*

*Where any single thickness reading is found to be less than 80% of the specified nominal value, a further two, or where possible three, readings shall be taken within 150 to 300 mm of the low reading. The initial reading may be considered isolated if all the additional readings are at least 80% of the specified nominal value. If one or more of the additional readings are less than 80% of the specified nominal value, further readings shall be made to determine the extent of the area of under thickness. In such cases, low thickness areas identified should be brought up to the required thickness before proceeding to the next application stage.*

- *All dry film thicknesses shall be at least 50% of the nominal value.*
- *The average measured dry film thickness of any face of any member should not exceed the manufacturer's recommended maximum thickness for the particular member shape and orientation."*

**Drying and overcoating** Data about drying times, recoating and overcoating intervals can be found in the relevant 'Drying time and Overcoating details'-document for relevant product. This data is based on results from internal laboratory tests performed under controlled conditions.

Overcoating too early with itself or with a topcoat may delay the drying of the total coating system.

**Cosmetic finish:** Final aesthetics performance of Hempacore or Hempafire intumescent products may vary depending on the method of application. Airless spray application is recommended to achieve the best cosmetic finish.

Before start of a project, it is recommended that a sample area is prepared and the standard of cosmetic finish is agreed by all parties.

ASFP Technical Guidance Document 11 section 2.1.11 outlines three levels that could be achieved. The type of finish that can be obtained may be depending on the product, the application equipment and project conditions:

1. *Basic Finish: the coating system achieves the required fire performance and corrosion protection performance but is not required to achieve any requirement for standard of finish.*

2. *Decorative Finish: In addition to the requirements for (1) above, a good standard of cosmetic finish is generally required when viewed from a distance of 5 metres. Minor "orange peel" or other texture resulting from application or localised repair is acceptable.*

3. *Bespoke Finish: In addition to the requirements for point (2) above, the coating finish is required to have a standard of evenness, smoothness and gloss agreed between the Specifier and Contractor.*

Achieving higher aesthetic levels might require smoothening by sanding or application of the intumescent product in lower film thickness per coat. It is important to ensure that the desired cosmetic finish is achieved before application of the topcoat.

**Weathering exposure:**

During the construction phase, Hempacore and Hempafire single pack solvent-borne intumescent products can be exposed to mild exterior conditions up to 12 months without a topcoat applied. In practical terms this means, that the surface shall be protected against longer periods of rainfall, snow and very high humidity, or there shall be applied an approved topcoat. Even when topcoated, the surface shall be protected from pooling or standing water, either by coverage or by drainage. When the coating system is using appropriate primer and is topcoated with an approved topcoat it is designed for exposure up to conditions mentioned in the 'Hempacore / Hempafire Cellulosic PFP Approved Primer/Topcoat List'. Depending the primer and topcoat selected the maximum exposure is C4-High according to ISO 12944.
The product is thermoplastic, prolonged exposure at temperatures above 40°C/104°F will reduce mechanical strength. When the temperature decreases the mechanical strength is recovered.

**Topcoats:**

In general, solvent-borne intumescent products cannot be exposed outdoors without a topcoat. However, during construction phase, a limited period of outdoor exposure is allowed. In above paragraph 'Weathering exposure', as well in the product specific 'Hempacore / Hempafire Cellulosic PFP Approved Primer/Topcoat List' the maximum supported conditions are stated.

Depending on end use environment conditions of the coating system, Hempacore and Hempafire single pack solvent-borne intumescent products may be supported without a topcoat. For situations where topcoats are desired or required anyway, the 'Hempacore / Hempafire Cellulosic PFP Approved Primer/Topcoat List' provides relevant topcoat information. Only Hempel approved topcoats can be used. Based on relevant project information, your Hempel representative can provide proper advise on topcoat selection.

It is very important to ensure that the total specified dry film thickness of the intumescent layer is achieved prior to the start of the topcoat application. If a topcoat has been applied on an area with insufficient dry film thickness of the intumescent, then the topcoat must be removed, the intumescent be rectified so the specified thickness is achieved and finally a new layer of topcoat re-applied.

Recommended topcoat and its dry film thickness depends on the exposure conditions. For C2-internal conditions (according ISO12944) Hempacore and Hempafire solvent-borne intumescent coatings may be used without topcoat. For higher durability environments and/or aesthetic appeal, a topcoat is recommended in all cases.

The 'Hempacore / Hempafire Cellulosic PFP Approved Primer/Topcoat List' and 'drying time and overcoating intervals' documents provide relevant data and are available on request.

**Handling of applied sections**

Due to the relative high film thicknesses of intumescent systems and the characteristics of the product's chemistry, the applied coating is prone to mechanical damage that could occur by mechanical impacts during the service life of the coating system, or handling, transportation and/or erection of the coated steelwork. It is important to note that due to the thermoplasticity of single pack intumescent coatings, they are sensitive to damage, even when it is fully dried.

The paint system should be allowed to dry for as long as possible before (light) mechanical exposure and/or handling, the product specific 'drying time and overcoat time' documents provide further recommendations.
Maintain sufficient ventilation, also when the product is considered dry. Therefore, wrapping of the sections is not recommended.

During on-site application handling (i.e. movement or other manipulation of steelwork) will not normally be necessary, but for off-site applications or other situations where handling would be required, special care should be taken on how to handle the coated steel sections, because this can likely prevent the extend of repair needed afterwards. Lifting devices should be of suitable material in order to limit the extent of film damage. It is advised to incorporate lifting eyes into the fabrication process to facilitate the lifting of large or complex configurations of steel sections, and/or installation of lifting straps on uncoated parts (if available).

The area of contact with supporting trestles shall be limited to the minimum required, preferably "sharp" contact points to minimise the area of damages.

**Repair procedure:**

Ensure that all damaged or not properly coated areas are repaired/painted with the relevant coating system.

Hempacore and Hempafire single pack intumescent products are subject to mechanical damage and repair is necessary to ensure the expected fire protection. Repairs should be carried out at the earliest opportunity.

Normally the damage of the intumescent coating can be repaired using the same Hempacore or Hempafire product. The touch-up with freshly applied product can be done by airless spray, brush cladding, spatula or putty knife. Prior to repair, make sure that the surface is clean and free of contamination. Conditions during a repair application shall fulfil the same requirements as during a normal application.

The repair method will depend upon the extend of the damage, with three distinct cases.

Damage down to steel
Loose/soft paint must be removed at the damaged area. The damaged area must be cleaned mechanically to minimum St. 3 according to ISO 8501-1 and the edges to be taken back to a firm, well adhering intact paint film, followed by removal of dust. Apply the primer specified for the project (or another approved Hempel primer) in the specified dry film thickness. Respecting the over coating interval, relevant for the applied primer, Hempel's intumescent coating can be applied in the dry film thickness specified for the steel section. Multiple coating applications may be needed. A top coat can be applied when the intumescent is dry, if originally specified.

Damage down to intact primer:
Loose/soft paint must be removed at the damaged area and the edges to be taken back to a firm, well adhering intact paint film, followed by removal of dust. Hempel's intumescent coating can be applied in the dry film thickness specified for the steel section. Multiple coating applications may be needed. A top coat can be applied when the intumescent is dry, if originally specified.

Damage only to the topcoat
Remove loose or unsound coating to a firm edge and feather the edges. Reinstate the topcoat following the original specification

**Maintenance:**

The fire protection properties of the Hempacore and Hempafire intumescent coating system will remain as long as the full coating is maintained in good condition.

It is recommended to establish regular inspection intervals. The inspection shall consist of visual check of the condition of the coating system. Any defect or damaged areas must be repaired the soonest according the recommendations given above. In particular any damage on the topcoat must be repaired immediately to ensure the sealing protection to the underlying intumescent coat against weathering conditions.

Repair maintenance of a Hempacore or Hempafire intumescent coating system with incorrect product and/or preparations may affect the fire performance. It is therefore recommended to consult Hempel for approval of the intended maintenance.

Maintenance of Hempacore and Hempafire coating systems outside Hempel's instructions is subject to the conditions given in GENERAL CONDITIONS OF SALE OF HEMPEL PRODUCTS AND/OR SERVICES.

**Safety:**

Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel's Safety Data Sheet for this product along with the Product Data Sheet.

**Important information:**

**It is the applicator's responsibility to ensure that all coatings of a Hempacore or Hempafire coating system are applied in accordance with these application instructions. It is furthermore the responsibility of the applicator to ensure that the specified dry film thickness is achieved. Technical assistance can be provided by Hempel to assist the applicator and is given subject** to GENERAL CONDITIONS OF SALE OF HEMPEL PRODUCTS AND/OR SERVICES.

Issued by: HEMPEL A/S

# Hempafire Pro 315/320

**This document is an appendix to the Product Data Sheet of Hempafire Pro 315 and Hempafire Pro 320**

## Introduction

There are many factors under real life conditions that may have an influence on the drying of Hempafire Pro 315/320, such as the applied thickness, ambient and steel temperature, relative humidity, ventilation, the state of drying of previously applied coats and type of topcoat applied, amongst others.

Data accuracy, completeness or appropriateness under operational conditions may be different. Therefore, such data should always be used as a guideline only for field applications. It is recommended to carry out a test under the relevant project-specific conditions to determine the actual drying state of the coating in order to know when to apply the next coat, when to apply the final topcoat layer and when the sections are dry to handle.

'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage.

An indicative assessment of the 'dry to handle' state can be determined by applying a firm pressure with a thumb onto the film. However, in general, intumescent coatings get soft at temperatures above 25ºC due to the thermoplastic properties of the binder. Such softness should not be confused with insufficient drying.

## Product characteristics

Drying studies have been carried out at Hempel's laboratories under controlled conditions. These test results are the basis for the drying times mentioned in this document. Drying times of Hempafire Pro 315/320 are dependent on temperature, ventilation, amount of air renewal, air movement, state of the drying of previously applied coats, etc. Hence, the mentioned times are indicative and should be used as a guideline only for field applications. **Drying times (provided there is good ventilation and RH < 85%):**

| Table 1: Surface-dry (ISO 9117-3:2010) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 315/320 (750 µm DFT) | 30 min | 15 min | 10 min | <8 min |
| Hempafire Pro 315/320 Fast Dry (750 µm DFT) | 15 min | 5 min | 3 min | <3 min |

| Table 2: Through-dry (ISO 9117-1:2009) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 315/320 | 48 hours | 21 hours | 15 hours | 8 hours |
| Hempafire Pro 315/320 Fast Dry (750 µm DFT) | 28 hours | 14 hours | 8 hours | 5 hours |

| Table 3: Dry to handle (Hempel internal method RD-857) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 315/320 | 800 µm | 1 | 6 days | 1 day | 15 hours | 8 hours |
| | 1600 µm | 2 | 18 days | 2 days | 1 3/4 day | 1 1/2 days |
| Hempafire Pro 315/320 Fast Dry | 800 µm | 1 | 5 days | 16 hours | 13 hours | 6 hours |
| | 1600 µm | 2 | 15 days | 1 1/2 day | 32 hours | 28 hours |

**Note:** 'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage. However, intumescent coatings like Hempafire Pro 315 and Hempafire Pro 320 are always sensitive to damage due to the nature of the product and its thermoplasticity. Special care shall be taken to handle elements coated with Hempafire Pro 315 and Hempafire Pro 320.

**Note**: The dry to handle times for multiple coats in the table are measured using overcoat intervals of 24 hours. When shorter overcoat times are used, considerable longer dry to handle times will be valid.

| Table 4: Minimum overcoating times (overcoating with itself) | | | | | |
|---|---|---|---|---|---|
| | DFT | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 315/320 | 800 µm | 10 hours | 6 hours | 4 hours | <4 hours |
| | 1600 µm | 24 hours | 14 hours | 10 hours | <10 hours |
| Hempafire Pro 315/320 Fast Dry | 800 µm | 8 hours | 4 hours | 3 hours | <3 hours |
| | 1600 µm | 20 hours | 12 hours | 7 hours | <7 hours |

**Note:** For maximum throughput when applied in shop, it is good practice to determine the condition of the paint prior to recoating or overcoating. In order to obtain the fastest drying of especially high-thickness-coating-system (total DFT above 750 µm), the previous intumescent layer shall be dry hard, which means no mark can be easily made in the paint by pressing firm with a thumb. The coating does not necessarily have to be so called "nail hard". For maximum throughput longer overcoat times are recommended as mentioned in table 5, 24 hours is common practice.

| Table 5: Minimum overcoating time with approved Acrylic topcoat | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 315/320 | 800 µm | 1 | 2 hours | 1 hour | 3/4 hour | <3/4 hour |
| | 1600 µm | 1 | 4 hours | 2 1/2 hours | 1 1/2 hour | <1 1/2 hour |
| Hempafire Pro 315/320 Fast Dry | 800 µm | 1 | 1 1/2 hour | 1/2 hour | <1/2 hour | <1/2 hour |
| | 1600 µm | 1 | 3 1/2 hours | 2 hours | 1 hour | <1 hour |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

| Table 6: Minimum overcoating time with approved Polyurethane topcoat | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10 °C | 20 °C | 30 °C | 40 °C |
| Hempafire Pro 315/320 | 800 µm | 1 | 3 days | 1 day | 15 hours | 8 hours |
| | 1600 µm | 1 | 10 days | 2 days | 1 3/4 day | 1 1/2 day |
| Hempafire Pro 315/320 Fast Dry | 800 µm | 1 | 2 1/2 days | 16 hours | 13 hours | 6 hours |
| | 1600 µm | 1 | 8 days | 1 1/2 day | 1 1/4 day | 1 day |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

Hempafire Pro 315 and/or Hempafire Pro 320 may only be used in combination with approved primers and topcoats. The overcoating time of primers prior overcoating with Hempafire Pro 315 or Hempafire Pro 320 is primer dependent. See separate list of “Hempacore / Hempafire Cellulosic PFP Approved Primers/Topcoats” for overcoating and other primer-specific details.

# Hempafire Pro 400

**This document is an appendix to the Product Data Sheet of Hempafire Pro 400**

## Introduction

There are many factors under real life conditions that may have an influence on the drying of Hempafire Pro 400, such as the applied thickness, ambient and steel temperature, relative humidity, ventilation, the state of drying of previously applied coats and type of topcoat applied, amongst others.

Data accuracy, completeness or appropriateness under operational conditions may be different. Therefore, such data should always be used as a guideline only for field applications. It is recommended to carry out a test under the relevant project-specific conditions to determine the actual drying state of the coating in order to know when to apply the next coat, when to apply the final topcoat layer and when the sections are dry to handle.

'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage.

An indicative assessment of the 'dry to handle' state can be determined by applying a firm pressure with a thumb onto the film. However, in general, intumescent coatings get soft at temperatures above 25ºC due to the thermoplastic properties of the binder. Such softness should not be confused with insufficient drying.

## Product characteristics

Drying studies have been carried out at Hempel's laboratories under controlled conditions. These test results are the basis for the drying times mentioned in this document. Drying times of Hempafire Pro 400 are dependent on temperature, ventilation, amount of air renewal, air movement, state of the drying of previously applied coats, etc. Hence, the mentioned times are indicative and should be used as a guideline only for field applications. **Drying times (provided there is good ventilation and RH < 85%):**

| Table 1: Surface-dry (ISO 9117-3:2010) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 400 (750 µm DFT) | 30 min | 15 min | 10 min | <8 min |
| Hempafire Pro 400 Fast Dry (750 µm DFT) | 15 min | 5 min | 3 min | <3 min |

| Table 2: Through-dry (ISO 9117-1:2009) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 400 (750 µm DFT) | 48 hours | 21 hours | 15 hours | 8 hours |
| Hempafire Pro 400 Fast Dry (750 µm DFT) | 28 hours | 14 hours | 8 hours | 5 hours |

| Table 3: Dry to handle (Hempel internal method RD-857) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 400 | 750 µm | 1 | 6 days | 1 day | 15 hours | 8 hours |
| | 1500 µm | 1 | 18 days | 2 days | 1¾ day | 1½ days |
| | 3000 µm | 2 | 1½ month | 14 days | 10 days | 5 days |
| | > 3 mm | 3+ | >1½ month | >14 days | >10days | >5 days |
| Hempafire Pro 400 Fast Dry | 750 µm | 1 | 5 days | 16 hours | 13 hours | 6 hours |
| | 1100 µm | 1 | 15 days | 1½ day | 32 hours | 28 hours |
| | 2200 µm | 2 | 3 weeks | 9 days | 5½ days | 3 days |
| | > 2.2 mm | 3+ | >3 weeks | >9 days | >5½ days | >3 days |

**Note:** 'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage. However, intumescent coatings like Hempafire Pro 400 are always sensitive to damage due to the nature of the product and its thermoplasticity. Special care shall be taken to handle elements coated with Hempafire Pro 400.
**Note**: The dry to handle times for multiple coats in the table are measured using overcoat intervals of 24 hours. When shorter overcoat times are used, considerable longer dry to handle times will be valid.

| Table 4: Minimum overcoating times (overcoating with itself) | | | | | |
|---|---|---|---|---|---|
| | DFT | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 400 | 750 µm | 10 hours | 6 hours | 4 hours | <4 hours |
| | 1500 µm | 24 hours | 14 hours | 10 hours | <10 hours |
| Hempafire Pro 400 Fast Dry | 750 µm | 8 hours | 4 hours | 3 hours | <3 hours |
| | 1500 µm | 20 hours | 12 hours | 7 hours | <7 hours |

**Note:** For maximum throughput when applied in shop, it is good practice to determine the condition of the paint prior to recoating or overcoating. In order to obtain the fastest drying of especially high-thickness-coating-system (total DFT above 750 µm), the previous intumescent layer shall be dry hard, which means no mark can be easily made in the paint by pressing firm with a thumb. The coating does not necessarily have to be so called "nail hard". For maximum throughput longer overcoat times are recommended as mentioned in table 5, 24 hours is common practice.

| Table 5: Minimum overcoating time (overcoating with approved acrylic topcoat) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| Hempafire Pro 400 | 750 µm | 1 | 2 hours | 1 hour | ¾ hour | <¾hour |
| | 1500 µm | 1 | 4 hours | 2½ hours | 1½ hour | <1½ hour |
| | 3000 µm | 2 | 8 hours | 3 hours | 2½ hours | 2 hours |
| | > 3 mm | 3+ | >16 hours | >4 hours | >3 hours | >3 hours |
| Hempafire Pro 400 Fast Dry | 750 µm | 1 | 1½ hours | ¾ hour | <½ hour | <½ hour |
| | 1500 µm | 1 | 3½ hours | 2 hours | 1 hour | <1 hour |
| | 3000 µm | 2 | 7 hours | 2½ hours | 2 hours | 1½ hours |
| | > 3mm | 3+ | >8 hours | >3 hours | >2½ hours | >2 hours |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

| Table 6: Minimum overcoating time (overcoating with approved Polyurethane topcoat) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10 °C | 20 °C | 30 °C | 40 °C |
| Hempafire Pro 400 | 750 µm | 1 | 3 days | 1 day | 15 hours | 8 hours |
| | 1500 µm | 1 | 10 days | 3 days | 1¾ day | 1½ day |
| | 1500 µm | 2 | 7 days | 1¾ day | 1½ day | 1 day |
| | 3000 µm | 2 | 1½ month | 14 days | 10 days | 5 days |
| | 3000 µm | 4 | 15 days | 7 days | 5 days | 3½ days |
| Hempafire Pro 400 Fast Dry | 750 µm | 1 | 2½ days | 16 hours | 13 hours | 6 hours |
| | 1500 µm | 1 | 8 days | 2 days | 1½ day | 1 day |
| | 1500 µm | 2 | 5 days | 1½ days | 1¼day | <1 day |
| | 3000 µm | 2 | 3 weeks | 9 days | 5½ days | 3 days |
| | 3000 µm | 4 | 12 days | 5 days | 3½ days | 2½ days |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

Hempafire Pro 400 may only be used in combination with approved primers and topcoats. The overcoating time of primers prior overcoating with Hempafire Pro 400 is primer dependent. See separate list of “Hempacore / Hempafire Cellulosic PFP Approved Primers/Topcoats” for overcoating and other primer-specific details.

# Hempacore One

**This document is an appendix to the Product Data Sheet of Hempacore One**

## Introduction

There are many factors under real life conditions that may have an influence on the drying of Hempacore One, such as the applied thickness, ambient and steel temperature, relative humidity, ventilation, the state of drying of previously applied coats and type of topcoat applied, amongst others.

Data accuracy, completeness or appropriateness under operational conditions may be different. Therefore, such data should always be used as a guideline only for field applications. It is recommended to carry out a test under the relevant project-specific conditions to determine the actual drying state of the coating in order to know when to apply the next coat, when to apply the final topcoat layer and when the sections are dry to handle.

'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage.

An indicative assessment of the 'dry to handle' state can be determined by applying a firm pressure with a thumb onto the film. However, in general, intumescent coatings get soft at temperatures above 25ºC due to the thermoplastic properties of the binder. Such softness should not be confused with insufficient drying.

## Product characteristics

Drying studies have been carried out at Hempel's laboratories under controlled conditions. These test results are the basis for the drying times mentioned in this document. Drying times of Hempacore One are dependent on temperature, ventilation, amount of air renewal, air movement, state of the drying of previously applied coats, etc. Hence, the mentioned times are indicative and should be used as a guideline only for field applications. **Drying times (provided there is good ventilation and RH < 85%):**

| Table 1: Surface-dry (ISO 9117-3:2010) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempacore One (750 µm DFT) | 30 min | 15 min | 10 min | <8 min |
| Hempacore One FD (750 µm DFT) | 15 min | 5 min | 3 min | <3 min |

| Table 2: Through-dry (ISO 9117-1:2009) | | | | |
|---|---|---|---|---|
| Temperature | 10°C | 20°C | 30°C | 40°C |
| Hempacore One (750 µm DFT) | 48 hours | 21 hours | 15 hours | 8 hours |
| Hempacore One FD (750 µm DFT) | 28 hours | 14 hours | 8 hours | 5 hours |

| Table 3: Dry to handle (Hempel internal method RD-857) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| Hempacore One | 750 µm | 1 | 6 days | 1 day | 15 hours | 8 hours |
| | 1500 µm | 1 | 18 days | 2 days | 1 3/4 day | 1 1/2 days |
| | 3000 µm | 2 | 1 1/2 month | 14 days | 10 days | 5 days |
| | > 3 mm | 3+ | >1 1/2 month | >14 days | >10days | >5 days |
| Hempacore One FD | 750 µm | 1 | 5 days | 16 hours | 13 hours | 6 hours |
| | 1100 µm | 1 | 15 days | 1 1/2 day | 32 hours | 28 hours |
| | 2200 µm | 2 | 3 weeks | 9 days | 5 1/2 days | 3 days |
| | > 2.2 mm | 3+ | >3 weeks | >9 days | >5 1/2 days | >3 days |

**Note:** 'Dry to handle' is the minimum time for a coating to achieve sufficient hardness so that it can be handled with care without causing significant damage. However, intumescent coatings like Hempacore One are always sensitive to damage due to the nature of the product and its thermoplasticity. Special care shall be taken to handle elements coated with Hempacore One.
**Note**: The dry to handle times for multiple coats in the table are measured using overcoat intervals of 24 hours. When shorter overcoat times are used, considerable longer dry to handle times will be valid.

| Table 4: Minimum overcoating times (overcoating with itself) | | | | | |
|---|---|---|---|---|---|
| | DFT | 10°C | 20°C | 30°C | 40°C |
| Hempacore One | 750 µm | 10 hours | 6 hours | 4 hours | <4 hours |
| | 1500 µm | 24 hours | 14 hours | 10 hours | <10 hours |
| Hempacore One FD | 750 µm | 8 hours | 4 hours | 3 hours | <3 hours |
| | 1500 µm | 20 hours | 12 hours | 7 hours | <7 hours |

**Note:** For maximum throughput when applied in shop, it is good practice to determine the condition of the paint prior to recoating or overcoating. In order to obtain the fastest drying of especially high-thickness-coating-system (total DFT above 750 µm), the previous intumescent layer shall be dry hard, which means no mark can be easily made in the paint by pressing firm with a thumb. The coating does not necessarily have to be so called "nail hard". For maximum throughput longer overcoat times are recommended as mentioned in table 5, 24 hours is common practice.

| Table 5: Minimum overcoating time (overcoating with approved acrylic topcoat) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10°C | 20°C | 30°C | 40°C |
| HempacoreOne | 750 µm | 1 | 2 hours | 1 hour | 3/4 hour | <3/4 hour |
| | 1500 µm | 1 | 4 hours | 2 1/2 hours | 1 1/2 hour | <1 1/2 hour |
| | 3000 µm | 2 | 8 hours | 3 hours | 2 1/2 hours | 2 hours |
| | > 3 mm | 3+ | >16 hours | >4 hours | >3 hours | >3 hours |
| Hempacore One FD | 750 µm | 1 | 1 1/2 hours | 3/4 hour | <1/2 hour | <1/2 hour |
| | 1500 µm | 1 | 3 1/2 hours | 2 hours | 1 hour | <1 hour |
| | 3000 µm | 2 | 7 hours | 2 1/2 hours | 2 hours | 1 1/2 hours |
| | > 3mm | 3+ | >8 hours | >3 hours | >2 1/2 hours | >2 hours |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

| Table 6: Minimum overcoating time (overcoating with approved Polyurethane topcoat) | | | | | | |
|---|---|---|---|---|---|---|
| | DFT | Nr of coats | 10 °C | 20 °C | 30 °C | 40 °C |
| Hempacore One | 750 µm | 1 | 3 days | 1 day | 15 hours | 8 hours |
| | 1500 µm | 1 | 10 days | 3 days | 1 3/4 day | 1 1/2 day |
| | 1500 µm | 2 | 7 days | 1 3/4 day | 1 1/2 day | 1 day |
| | 3000 µm | 2 | 1 1/2 month | 14 days | 10 days | 5 days |
| | 3000 µm | 4 | 15 days | 7 days | 5 days | 3 1/2 days |
| Hempacore One FD | 750 µm | 1 | 2 1/2 days | 16 hours | 13 hours | 6 hours |
| | 1500 µm | 1 | 8 days | 2 days | 1 1/2 day | 1 day |
| | 1500 µm | 2 | 5 days | 1 1/2 days | 1 1/4 day | <1 day |
| | 3000 µm | 2 | 3 weeks | 9 days | 5 1/2 days | 3 days |
| | 3000 µm | 4 | 12 days | 5 days | 3 1/2 days | 2 1/2 days |

**Note:** Overcoating early with a topcoat may delay the drying of the total coating system. The note from table 4 applies.

Hempacore One may only be used in combination with approved primers and topcoats. The overcoating time of primers prior overcoating with Hempacore One is primer dependent. See separate list of “Hempacore / Hempafire Cellulosic PFP Approved Primers/Topcoats” for overcoating and other primer-specific details.