

METHOD STATEMENT
Sika CarboDur® System

19.06.2014 / VERSION 2.0 / SIKA SERVICES AG / ANNIKA BAIER

TEMPLATE FOR LOCAL ADAPTION

BUILDING TRUST

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1 SCOPE

This Method Statement is written as a guideline for the use of the Sika CarboDur® system. This document must be used and referred to, in combination with all other relevant Product Data Sheets (PDS), Material Safety Data Sheets (MSDS) and the specific Project Specifications.

Structural strengthening must only be carried out by trained and experienced specialists, if additional clarification or advice is needed, please do not hesitate to contact your local Sika Technical Service Department who will be pleased to assist you.

2 SYSTEM DESCRIPTION

The Sika CarboDur® system is a high performance structural strengthening system consisting of Sika CarboDur® plates and Sikadur®-30 or Sikadur®-30 LP adhesives. It is used for the post construction reinforcement of buildings and civil engineering structures or elements.

2.1 REFERENCES

This Method Statement has been written in accordance with the recommendations contained in **fib technical report bulletin 14**, especially chapter 8: "Practical execution and quality control" as well as with the advice contained in **ACI 440.2R-08.**

Pull-off tests for Quality Control purposes should be performed according to **EN 1542** *or the corresponding local standard.*

2.2 LIMITATIONS

- The products must only be used in accordance for their intended applications.
- Local differences in some products may result in performance variations. The most recent and relevant local Product Data Sheets (PDS) and Material Safety Data Sheets (MSDS) shall apply and must be referred to.
- For any other specific construction / build information refer to the Architect's, Engineer's or Specialist Contractor's details, drawings, specifications and risk assessments.
- All of the works must be carried out as directed by a qualified engineer as the Supervising Officer.
- ***This Method Statement is produced and intended as a guide and must be adapted to suit the local Products, Standards, Legislation or any other specific local requirements.***

3 PRODUCTS

Table to be adapted for local use (do not include technical or mechanical information).

Sika Brand	Description
Sika CarboDur®	Pultruded carbon fibre reinforced polymer (CFRP) laminates designed for strengthening concrete, steel, timber and masonry structures. Available in various cross sections.
Sikadur®-30	Thixotropic, structural two part adhesive, based on a combination of epoxy resins and special filler, designed for use at normal temperatures between +8°C and +35°C.
Sikadur®-30 LP	Thixotropic, structural two part adhesive, based on a combination of epoxy resins and special fillers, especially designed for use at higher temperatures between +25°C and +55°C.

3.1 MATERIAL STORAGE



Materials must be stored properly in undamaged original sealed packaging, in dry and cooled conditions. Refer to specific information contained in the Product Data Sheets regarding minimum and maximum storage temperatures. Protect the products from direct sunlight.

Sika CarboDur® plates may only be transported in their original packaging or otherwise adequately protected against any mechanical damage.

4 EQUIPMENT

4.1 TOOLS



Brush



Vacuum Cleaner



Application Trowels



Scraper



Rubber Roller



Concrete Grinder



Mixing Container



Mixing Spindle



Mixing Paddle (for larger quantities)

4.2 CLEANING

Clean all tools and application equipment with *Sika Colma® Cleaner, (or an Isopropanol based cleaner)*, immediately after use. Hardened material can only be removed mechanically.

4.3 ADDITIONAL TOOLS

Sika Carboheater

The Sika Carboheater equipment is a special tool that can be used in three situations:

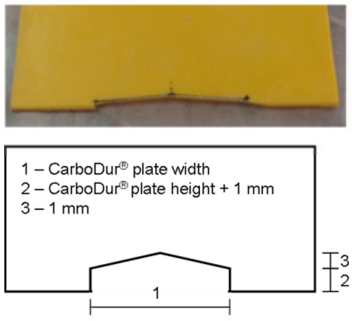
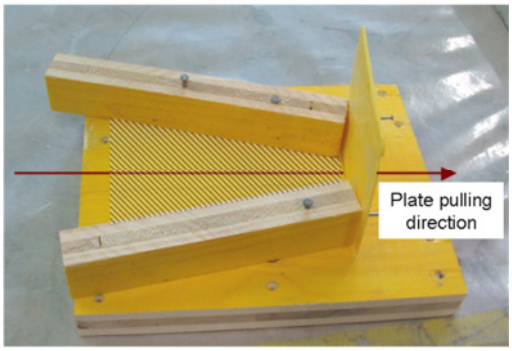
- If the ambient temperature during application is to be low (below 10 °C)
- If the service temperature will be above 50 °C and curing at high temperatures is therefore necessary (higher service temperatures only possible with Sikadur® -30 LP
- If the adhesive needs to be cured rapidly, in order to be able to take load very soon after installation

The Sika Carboheater is connected to both ends of a Sika CarboDur® plate and a high current is applied. Due to the high resistance of the carbon fibers, the plate heats up, which also heats the adhesive, which reduces its curing time and can increase the permissible service temperatures for the system (only for Sikadur®-30 LP).

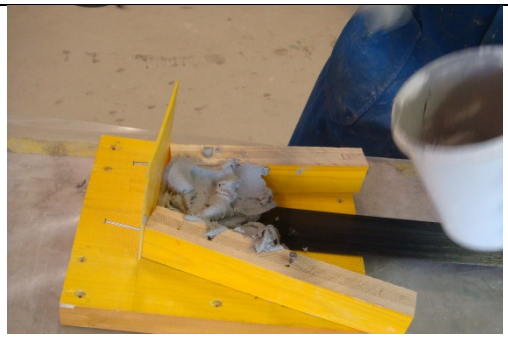
For detailed information please refer to your local Sika Technical Service Department.

Adhesive Application

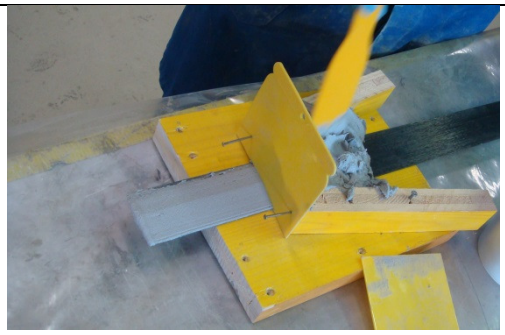
When a large number of Sika CarboDur® plates need to be installed on a structure, it is recommended to make a small tool which facilitates application of the adhesive onto the plates. A plastic or metal scraping tool is cut to shape suiting the desired adhesive profile on the plates, as shown in the picture below, together with a simple wooden framework for the plates to be fed through. As it is so simple, this tool can be cleaned after use (i.e. when using a durable metal scraper), or it can simply be discarded and remade on demand (i.e. when using plastic scrapers). The pictures below illustrate the application tool construction and the adhesive application process.

Application Tool Construction and Assembly	
	Top: Plastic Scraper with the cut-out made in the base Bottom: Dimensions ≤ 80mm: 3mm – 5mm ≥90mm: 3mm – 6mm
	Application tool for applying the Sikadur® adhesive onto the Sika CarboDur® plates The hatched area shows the adhesive 'feed area'

Application



Adding the Sikadur® adhesive – Tip: *-Always keep the bulk of the adhesive close to the pre-cut scraper to ensure uniform coverage!*



Simple and uniform application of the Sikadur® adhesive onto a Sika CarboDur® plate in the desired domed shape, by simply pulling the plate through the tool

If Sika CarboDur® plates of different widths are regularly applied, a more durable tool that accommodates all different plate sizes may be useful. The tool pictured right was created by Ugo Pala and Fernando Napoli from Sika Italia. The left L-shaped metal plate can be adjusted to the plate width, and a different plate with a roof-shaped cutout is inserted depending on the plate size to be coated. The tool is used in the same way as the one described above, but as it is reusable, it must be cleaned thoroughly after each use.



5 HEALTH AND SAFETY

5.1 RISK ASSESSMENT



The risks to health and safety from everything including any defects in the structure, working procedures and all of the chemicals used during the materials installation must be properly assessed and safely accommodated.

Any working areas on platforms and temporary structures must also provide a stable and safe area to work. All work and working procedures must be carried out fully in accordance with the relevant local health and safety legislation.

5.2 PERSONAL PROTECTION

Work Safely!



Safety shoes, gloves and other appropriate skin protection should be worn at all times. The use of disposable or new / clean protective clothing during the materials preparation and application is strongly recommended.

Always wear nitrile based protective gloves when handling epoxy adhesives as they can cause skin irritation.

Apply barrier cream to hands and any unprotected skin before starting work.

Appropriate eye protection should be worn at all times whilst handling, mixing and installing the products. Carrying an eye wash with you at all times is recommended.

Always wash hands with suitable soap and clean water after handling the products and before food consumption, smoking, visiting the toilet and after finishing work.

The work area needs to be well ventilated and operatives should take frequent breaks in fresh air to avoid any other health issues.

Silica dust produced by the grinding or blast cleaning of concrete can be hazardous. Protect yourself and others by using a vacuum grinder or vacuum blast cleaning equipment with dust extraction and abrasive recycling attachments respectively. Always wear a dust mask/respirator when grinding concrete. Do not inhale the concrete dust.

For more detailed health and safety information, please refer to the relevant Material Safety Data Sheet (MSDS)

5.3 FIRST AID



If the epoxy resin based adhesive products come into contact with eyes or mucous membranes, remove any glasses or contact lenses and rinse with clean warm water for 10 to 15 minutes then seek medical attention.

Any chemical spillages on skin must be cleaned immediately and rinsed thoroughly with clean warm water.

For more detailed health and safety information, please refer to the relevant Material Safety Data Sheet (MSDS).

5.4 WASTE DISPOSAL

Do not empty any surplus material into drainage or water systems; dispose of all waste materials and packaging responsibly through licensed waste disposal facilities or contractors, fully in accordance with local legislation and the authorities requirements. Also avoid any chemical materials run-off into soil or into waterways, drains or sewers.

Any uncured adhesive waste or spillages must be disposed of as hazardous waste. Waste and / or leftover Sika Colma® cleaner must be disposed of according to local regulations. Cured adhesive waste can be disposed of safely as normal building materials waste according to the relevant local regulations.

For more detailed health and safety information, please refer to the relevant Material Safety Data Sheet (MSDS)

6 SUBSTRATE PREPARATION

Note: This Section only treats the preparation of concrete substrates for the installation of Sika CarboDur® plates. For the use of this system on wooden substrates, please refer to the Appendix to this document (Section 9.1). Masonry substrates can generally be treated in the same way as concrete substrates outlined below:

6.1 DAMAGED SUBSTRATES



Before preparing the substrate for the application of the Sika CarboDur® plates, the substrate must be thoroughly inspected and any unsound material (such as areas of damaged concrete or pieces of the original wooden formwork or tie-wires etc.) must be removed.

If inadequate concrete thickness or weak concrete cover has to be removed, or prior leveling of uneven surfaces is needed, then the following Sika repair materials / systems can be applied: (For full details on these materials and their application / limitations, please refer to the relevant Product Data Sheets)

- For the protection of prepared, exposed or corroded steel reinforcement: *SikaTop® Armatec® 110 EpoCem®*
- As structural concrete repair / replacement materials:

  Fast repairs in small areas: Epoxy resin based materials such as Sikadur®-41 mortar and Sikadur®-30 adhesive. The Sikadur®-30 adhesive can also be filled to a maximum of 1:1 by weight with Sikadur®-501 quartz sand, to get the ideal consistency and thixotropic nature for the application

  Larger areas or volumes: Cement based materials or systems: Sika MonoTop®-412 (multipurpose for horizontal, vertical, overhead applications) or Sika MonoTop®-438 (high performance for horizontal, top-side applications only).

The choice of the repair material largely depends on the time frame of the project: Curing time until installation of strengthening systems for epoxy resin materials is 3-4 days, for cement based products 28 days.



If there are large blowholes or honeycombing in the concrete surface, these must first be filled with a suitable repair mortar, such as Sikadur®-41 epoxy mortar, or filled or unfilled Sikadur®-30 adhesive. Sikadur®-30 adhesive must be used as a bonding bridge layer for both of these options to ensure a good bond with the concrete substrate and no voids in the repairs.

Where concrete repairs are necessary to a structure prior to bonding the Sika CarboDur® plates, it is important that the repair materials are fully compatible with the adhesive and suitable for use in a structural situation (i.e. low shrinkage, compatible modulus of elasticity, good interface bond and adequate strengths). If the repair materials are not suitable, the effect will be detrimental to the long-term performance of the bonded plates.

Further advice on all aspects of concrete repairs can be obtained from your local Sika Technical Service Department.

6.2 TESTING

The actual strength of the concrete substrate must be verified on all projects. If the necessary values can not be achieved, then strengthening may still be possible by use of the SikaWrap® Fabric system. Please refer to the SikaWrap® Fabric Product Data Sheets and Method Statements for this alternative Sika solution.

If the concrete is considered too weak for use and must be repaired as outlined in 6.1 above, then another test shall be performed after the repairs are completed and adequately cured. Please refer to Section 8 of this Method Statement for information on these testing procedures and the necessary concrete strength.

Concrete must normally be older than 28 days (dependent on the environmental situation, the mix design and effective strength requirements).

6.3 SURFACE LEVELLING, CLEANING, PRETREATMENT

The surface to be strengthened must be leveled to ensure that the specified tolerances are achieved and maintained as detailed in the table below. Any protrusions such as formwork joints must be ground off and any areas of grout loss or blowholes must be filled as previously advised in Section 6.1 to achieve the minimum tolerances required. The plane and level of the substrate is to be checked with a suitable wood or metal, straight edged batten. The tolerance required depends on the specified standard to be achieved. Sika generally recommends tolerance testing according to the fib bulletin 14, but the tolerance measurement and testing can be according to any local guidelines, but obviously testing must only be carried out in relation to one standard or another.



Standard	Fib bulletin 14
Tolerance for 2 m length	10 mm
Tolerance for 0.3 m length	4 mm





The leveling / grinding of the concrete surface should be performed shortly before the installation of the plates. Otherwise it is possible that the surface will get contaminated / dirty again, then additional cleaning would be required so as not to impair the quality of the adhesive bond. During this concrete grinding works, an integrated vacuum (see picture on the right) should again be used, in order to reduce the risk of contamination, plus a dust mask should be worn to prevent the inhalation of concrete dust.

After leveling the concrete substrate surface, it must also be prepared and cleaned as necessary so that it is free from oil, grease and any other contaminants, together with any loose or friable particles. The surface must finally be brushed and vacuumed immediately prior to the plate installation works. The picture on the left shows an example of a sufficiently grinded substrate surface with the grains showing.





As a result the areas of concrete or masonry surface where the Sika CarboDur® system is to be applied must be clean, dry and prepared to achieve a laitance and contaminant free, open textured surface. The substrate moisture content must be less than 4% pbw.

The exact locations on the substrate surface where the Sika CarboDur® plates will be applied can also then be marked out with tape, so the adhesive can be applied and spread very precisely, plus any excess can also be removed easily and neatly.

7 APPLICATION

Before starting the works on site, we always recommend that you prepare a checklist (an example is given in Section 9.3) to ensure that all of the necessary tools and materials are available on site when installing the plates. Review the ambient conditions and confirm that the most appropriate type of Sikadur® adhesive is available for the conditions on site, the specified program and the desired performance and exposure in service.

Immediately prior to commencing the actual installation works on site, make a final inspection and check that the substrate is level to the specified tolerances and that the surface is clean and as described above.

7.1 ADHESIVE

Dependent on the application temperature and the pot life requirements, either Sikadur® -30 or Sikadur® -30 LP adhesives are used with the Sika CarboDur® plates. For more details on their respective and comparative performance, pot life and other characteristics, please refer to the relevant Product Data Sheets.

The adhesives can either be mixed in pre-batched units, or from bulk packing, according to the volumes required and the practical situation on site.

Pre-batched packs:

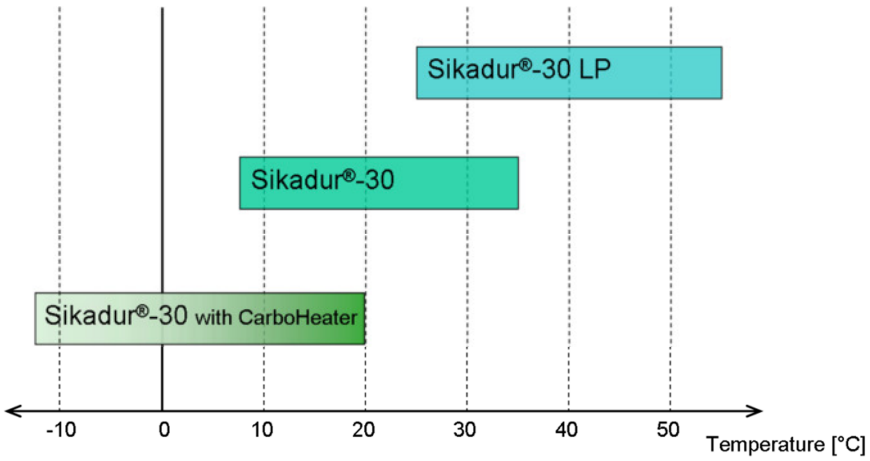
Add component B to component A and stir with a mixing spindle fitted to an electric low speed mixer (max. 500 rpm) to avoid entrapping air. Mix thoroughly for about 3 minutes to a homogeneous mix with a uniform grey color and appearance. Then, pour the whole mix into a clean container and stir again for approx. one more minute, again at low speed to keep air entrapment at a minimum.

Bulk packaging, not pre-batched:

Stir the material components well in their individual containers. Measure and add the components together in the correct proportions to a suitable mixing container, then stir using an electric low speed mixer and continue as stated above for the pre-batched packs. For larger quantities use a mixing paddle instead of a mixing spindle.

The adhesive pot life begins when the resin and hardener are mixed. It is shorter at high temperatures and longer at low temperatures. Additionally the greater the quantity / volume of material mixed together at one time, the shorter the pot life. To obtain longer workability at high temperatures, the mixed adhesive may subsequently be divided into portions; alternatively another method is to chill the components A and B before mixing them.

The graph below shows the application temperature ranges of the different Sikadur® adhesives. This is intended as a guideline for selection of the right product; please also refer to the respective Product Data Sheets prior to any use.



Excess adhesive extruded from under the plates during the bonding operation should be scraped neatly away before curing. Do not reuse this material for bonding additional plates.

The sequence of operations should be planned to ensure that the adhesive can be applied, the plates bonded and installation completed within one hour of mixing the adhesive, or within 80% of the pot life, whichever comes first.

Adhesive Consumption

Width of CarboDur® plate	Typical Consumption of Sikadur®-30
50 mm	0.20 – 0.28 kg/m
60 mm	0.24 - 0.32 kg/m
80 mm	0.32 - 0.44 kg/m
90 mm	0.40 - 0.56 kg/m
100 mm	0.44 - 0.64 kg/m
120 mm	0.45 – 0.80 kg/m
150 mm	0.68 - 1.00 kg/m

Important Note: Dependent on the substrate surface plane, profile and roughness, together with any plate crossings and the degree of loss or wastage, the actual consumption of adhesive can be higher.

7.2 CARBODUR® PLATES

The Sika CarboDur® plates can either be ordered pre-cut to length, or as a continuous roll with the required lengths to be cut on site. When unpacking the rolled product on site, it must be handled very carefully to ensure and facilitate controlled uncoiling. Special care should also be taken to avoid splintering of the plate ends. Loose carbon fibres may well also be present, so gloves, masks and goggles are recommended to be worn whilst handling and working with the plate strips.

To cut the plates to length on site, tape the area to be cut to prevent excessive dust generation and use a rotary disc cutter, alternatively a normal hacksaw can be used. Always support the Sika CarboDur® plate strip on both sides during cutting to avoid splintering of the ends and cut perpendicular to the fibres. Please note that carbon fibres are electrically conductive, so protect electrical equipment and electronics from the dust produced by cutting Sika CarboDur® plates.



Clean the surface of the plates with a clean white cloth and *Sika Colma® cleaner (or an Isopropanol based cleaner)* to remove any dust or grease. The solvent must have evaporated and the surface of the plate must be completely dry before the application of the adhesive. Apply the Sikadur®-30 adhesive onto the CarboDur® plates, so it is approximately 1 mm thick on the sides and 2 mm thick in the middle of the plate. Apply the adhesive to the plain side so the printed side is facing outwards, with the product name and batch number visible for later inspection. If a large number of plates need to be installed, it is also possible to use a dome shaped spatula or to make a special adhesive application tool (see Section 4.3).

Scrape a very thin layer of the thoroughly mixed Sikadur®-30 adhesive carefully into the prepared, dust free substrate with a spatula, then place the coated Sika CarboDur® plate onto the prepared concrete surface. Using a Sika hard rubber roller, press the plate firmly onto the substrate until the material is forced out on both sides of the plate (see pictures below). Finally remove and dispose of this surplus Sikadur®-30 epoxy adhesive.



In situations with plate intersections the first Sika CarboDur® plate applied is allowed to cure and then the surface in the intersecting area is again cleaned and degreased with *Sika Colma® cleaner (or an Isopropanol based cleaner)*. When dry, the Sikadur® 30 adhesive for the next plate should be applied to the clean and prepared concrete substrate on both sides of the existing plate to level out the variation from the underlying plate, so the overlapping plate will also lie on a smooth, flat surface.

In general, we recommend putting plates next to each other. If space is limited however and more than one plate is to be bonded together for higher loading capabilities, they must be cleaned on both sides with *Sika Colma® Cleaner, (or an Isopropanol based cleaner)* in all areas of plate-adhesive contact. To bond a second plate on top of the first layer, Sikadur®-30 or Sikadur®-30 LP is used. Make sure that not all adhesive is squeezed out and a thin layer of adhesive (0.5-1 mm) remains between the plates

Dependent on the structure, the loading and the anchoring needs, many different details and detailing solutions are possible to anchor the ends of the Sika CarboDur® plates into the concrete in an appropriate position. Please refer to your local Sika Technical Services Department for more information and specific advice.

The freshly bonded system should not be disturbed for at least 24 hours and any vibrations should normally be kept at a minimum during the curing period of the adhesive. The full design strengths of Sikadur®-30 are reached after approximately 7 days at 20 °C.

7.3 ADDITIONAL

Once installed the Sika CarboDur® plates must be protected from: permanent exposure to direct sunlight to prevent UV degradation of the epoxy matrix; permanent immersion in water, mechanical abrasion or impact, which could affect their mechanical properties.

Therefore dependent on the anticipated future exposure and environmental conditions of the project, additional protection of the plates may be necessary. This is easily achieved by means of a suitable Sikagard®, SikaTop® or Sika MonoTop® protective coating system as outlined in the table below.

To apply a protective coating product to the installed Sika® CarboDur® plates, thoroughly clean the surfaces with *Sika Colma® cleaner (or an Isopropanol based cleaner),* allow it to evaporate and the surfaces to dry completely, before applying the selected coating.

The table below summarizes a few of the coatings that can be used for further protection of the Sika CarboDur® plates when this is necessary. Please refer to the relevant Product Data Sheets and Method Statements for the product / system details and application requirements. Further advice on these additional protective products and systems can also be obtained from your local Sika® Technical Service Department.

Situation	Special need	Sika® solution
Direct sunlight	UV protection	*Sikagard®-550W Elastic* *Sikagard®-675 W ElastoColor*
Use in humid or wet environment	Protection against water ingress.	*Sikagard®-680 S*
Use near/in water - Immersion in water	Protection against water ingress.	*Sikagard®-63N* *SikaTop®-121* *Sika MonoTop®-107 Seal* *or Sika Permacor® range*
Increased fire resistance required	Fire protection	*Sikacrete®-213F*

8 INSPECTION, SAMPLING, QUALITY CONTROL

8.1 BEFORE APPLICATION:

The substrate strength (concrete, masonry, natural stone) must always be checked and verified in all situations by means of a series of pull-off tests (as outlined in Document 810 4: "Description of Test Procedure: Surface Adhesion Strength of Concrete"). The mean adhesive tensile strength of the prepared concrete substrate must be *2.0 N/mm^2, min. 1.5 N/mm^2 (standard Sika recommendation).* If the strengthening work has to be performed according to fib bulletin 14, then the concrete needs to have a minimum tensile strength of 3 N/mm^2.

Concrete substrates must generally be at least 28 days old, (dependent on the environmental situation, the mix design and effective strength requirements).

If the substrate is too weak, then either preliminary repair of the substrate, or application of the SikaWrap® fabric strengthening system, as an alternative to using Sika CarboDur® plates, could be considered. If the substrate is weak or damaged and needs to be repaired, a repetition of these substrate strength pull-off tests is necessary after the repair work is completed and prior to installation of the strengthening system.

8.2 QUALITY CONTROL AFTER INSTALLATION

After the installation of the Sika CarboDur® plates additional tests should be performed. As a pull-off test is semi-destructive, it is recommended to apply an additional / leftover piece of Sika CarboDur® plate to the substrate in an adjacent area that does not need strengthening, but which has comparable concrete quality and strength. This additional plate must be applied in the same manner and at the same time as all of the other ones.

Plate pull-off testing

A pull-off test series should be performed on the reference plates *3 and/or 7 days after installation according to EN 1542 or ACI 440.3 L.1*. The overall procedure is the same and the different details and values required are summarized in the table below. Please choose only one column and test according to your local requirements.

To test the adhesion of the Sika CarboDur® plate to the concrete and the failure mode, at least 3 but usually 5 tests are required. Holes are drilled with a diamond core drill of a suitable diameter, to a depth as listed in the table below, through and into the concrete substrate. A steel 'dolly' is then glued onto the surface of the drilled core using *Sikadur® 30 or 31* and the maximum force required is measured to calculate the pull-off strength of the system. The failure should always be in the concrete and the mean adhesive tensile strength of the prepared concrete substrate must be according to the relevant standard.

A written test record for the engineers approval should be produced for every test on every project

Test Standard	**EN 1542**	**ACI 440.3 L.1**
Specimen shape	Round	Round or square
Diameter	50 ±1 mm	25-40 mm
Drill depth	15 ±5 mm	6-12 mm
Min. pull-off strength	**1.5 N/mm^2**	**1.4 N/mm^2**
Mean pull-off-strength	2.0 N/mm^2	-
Failure	Break 100% in concrete	Break 100% in concrete

The step by step procedure of this pull-off testing is illustrated in Document 810 4: "Description of Test Procedure: Surface Adhesion Strength of Concrete")

Air pocket check

To check the installed plates for air pockets / voids within the adhesive layer, or at the bond interfaces, they can be tapped with a metal bar (there are distinctly different sounds for fully bonded plate areas and any plate areas with air pockets / voids); alternatively this can be tested more precisely using ultrasonic methods. If a significant amount of air pockets / voids are found, then the load transfer will not be sufficient and the Sika CarboDur® plate needs to be replaced.

9 APPENDIX

9.1 INSTALLATION ON WOODEN SUBSTRATES

A wooden substrate must be prepared by planing, grinding or sanding. It must be flat, any dust and loose or friable particles must be removed by vacuum. Before applying the adhesive-coated Sika CarboDur® plate, the substrate must also be coated with a thin layer of the adhesive to prevent void formation at the interface. The application of the Sika CarboDur® plate is then performed as described above in Section 7.2.

Alternatively, embedding of the plates into the timber substrate is possible, so that they are confined from three sides. Please refer to the Method Statement "Sika CarboDur® Near Surface Mounted Reinforcement" for the step-by-step procedures of this method.

9.2 CONSTRUCTION RECORDS

Throughout the project, a record should be written and maintained that details all aspects of the works involved in the preparation, mixing and application, including:

- Surface preparation
- Materials delivery / batch numbers
- Mixing and application of adhesive
- Ambient conditions (ambient temperature, substrate temperature, humidity, dew point)
- Any possible contamination
- Details of all test samples and results
- Any significant vibration
- Any other points of note or concern on site

9.3 ON-SITE CHECKLIST: EQUIPMENT AND MATERIALS

The list below is a suggestion; please adapt it to your local needs:

- Brushes
- Vacuum
- Trowels / Spatulas
- Roof-shaped spatula
- Scraper tool
- Rubber roller
- Mixing container
- Mixing spindle
- Mixing paddle

- Grinding / blast cleaning equipment (dependent on substrate)
- Rotary cutter or hacksaw
- Suitable Masking and Sticky tape
- Clean white cloths
- Thermometer
- Moisture meter

- Sika CarboDur® plates
- Sikadur®-30 adhesive
- Sikadur®-30 LP adhesive
- Sika Colma® Cleaner (or an Isopropanol based cleaner)
- Safety goggles
- Safety hard hat
- Skin protection cream
- Protective gloves
- Nitrile gloves
- Clean water
- Eye wash kit

9.4 ON-SITE CHECKLIST: QUALITY ASSURANCE

Substrate preparation:	**YES**	**NO**
Have 3 pull-off tests been carried out?		
Average value measured on 3 locations: [MPa] (avg. should be 2.0 MPa, no value below 1.5 MPa.)		
Are there any cracks above 0.2 mm wide in the concrete?		
Has any damage to the structure been repaired?		
Have any cracks been injected?		
Is the concrete surface even? (see table in Section 6.3)		
Environment:		
Does the air and surface temperature exceed 5°C?		
The actual average temperature is: [°C]		
Is the ambient temperature at least 3° above the dew point?		
Is the average relative humidity on the concrete surface below 4%?		
Is there free moisture on the surfaces?		
Are the surfaces to be bonded clean?		
Is there any dust or other contaminants present?		
After installation:		
Has the bond been checked by tapping?		
Has the bond been checked with ultrasound equipment?		
Has the bond been checked with thermography?		
Are there any voids?		
Is there any adhesive with areas of discoloration?		
Have pull-off tests been carried out on test specimens?		
Average pull-off strength x3 specimens [MPa] (avg. should be 2.0 MPa)		
Have there been any deviations or changes from the initial specification and schedule?		
If Yes, please describe them below:		

10 LEGAL NOTE

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. in practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

FOR MORE SIKA® CARBODUR INFORMATION:

See the relevant PDS

11 KEY WORDS

CarboDur®, Sikadur®-30, structural strengthening, external strengthening, flexural strengthening, application instruction, CFRP plates, composite, carbon fibres

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