Exceptional reliability and durability of fixing
You will mainly come across the deep anchorage solution in the following three cases: building extension works (e.g. extending walls, columns, balconies, and adding foundations), connecting a new element with an existing structure (e.g. adding stairs or joining walls), or reinforcing older structures with new elements (e.g. building floor slabs, reinforcing and upgrading bridges, concrete topping). Depending on the type of the existing structure and its reinforcing elements, you can apply two methods, namely post-installing bonded rebars or lap splicing them with the existing structure’s rebars. In both cases, there are powerful allies that come to your aid, namely the physical forces affecting the elements bonded.

Durable bonding
When post-installing bonded rebars, the force they generate is transferred directly to the concrete by way of adhesion. In the unlikely event of a bond failure, it typically assumes the form of rebar breaking or concrete cone failure in the subsurface part, or the rebar being pulled out of the resin (or together with the resin) out of the concrete. The load capacity of a rebar depends on
a number of factors, such as concrete class, anchoring depth, rebar spacing and distance between rebars and the fixture edge. What this technique provides, when applied in an appropriate manner, is durable bonding of elements (typically concrete with concrete) by transferring tensile loads. When lap splicing new rebars with those of the existing structure, the force produced by the rebar is transferred through concrete to the primary reinforcement. Assuming that the original reinforcement has been properly developed, the distance from the edge at which fixing is performed is not as crucial as in non-reinforced elements, as the destructive forces are transferred through resin and rebars directly to concrete. To sum up, with the deep anchorage technique in use, having prepared deeper holes you can fix both at smaller distances to the fixture edge and with denser spacing of rebars. This applies to all applications of the deep anchorage technique, whether you replace a balcony slab (also a composite slab) in standard residential buildings, extend outer structural elements or add the missing reinforcing components.

For professionals only
The above detailed description of the deep anchorage system and its advantages, which prove crucial for particular applications, clearly shows that this construction technique is not merely a reliable and secure choice, but actually a necessity in numerous cases. However, as with all highly specialised solutions, it also entails specific limitations. First and foremost, it is absolutely prerequisite that each hole should be cleaned most thoroughly before filling it with resin, which itself not only requires considerable time, but also very detailed verification of the cleaning results. What is more, resin dispensing can also pose some problems. Firstly, inaccurately measuring out the resin quantity usually means that too much has been applied, and this translates into considerable material waste. Secondly, using standard dosing guns when handling numerous holes is not only inefficient but also exhausting to the operator, and again – it significantly reduces the overall performance. Rawlplug’s specialists who work closely with professionals representing all segments of the construction industry have thoroughly explored the full spectrum of both advantages and (from the user’s practical point of view) disadvantages of this system. And being an acclaimed construction expert, the brand builds a portfolio of products whose job is not only to meet the highest reliability standards, but also to maximise working comfort, efficiency and (which comes as a logical consequence) safety of their use by contractors. The deep anchorage technique is nothing new in itself, but there never was a comprehensive and fully reliable system of inherently complementary elements available in the market. At least not yet.
Three steps to safety
Rawlplug’s three-step system of deep anchorage accessories effectively fills in the market gap which used to make this construction technique complicated to a very high degree, regardless of how reliable it is. So the brand’s engineers focused on maximum simplification of every fixing step, while maintaining all the unique advantages of the system at the same time. All the activities involved as well as the related accessories have been divided into three major parts: cleaning of deep holes, resin dispensing, and the portfolio of professional resin products, the available variants of which are intended to make the optimised choice of the bonding agent as simple as possible.

Precision in service of reliability
The first step is cleaning the hole and preparing it for resin application, which matters greatly in the deep anchorage technique from the perspective of safety and reliability of fixing. Even the tiniest mistake made when performing this activity may affect the bonding of resin and concrete, and consequently reduce the efficiency of anchoring when fixing in inappropriately or hastily cleaned hole. This may significantly increase the human factor related hazard, and it is common knowledge that people are as irreplaceable as they sometimes are fallible. In order to maximise the hole cleaning precision, Rawlplug’s system of deep anchorage accessories provides you with two recommended options depending on the number of holes to fix in: a manual cleaning system for fixing in individual holes, and an automatic cleaning system dedicated to anchoring in series. Both of them include the R-BRUSH-EXT extension piece in different variants, enabling you to adapt the element’s length to the hole depth, and the tip-mounted R-BRUSH-TC brushes intended to thoroughly clean the hole. In the manual system, the cleaning itself is performed by blowing through the hole with compressed air delivered to the right depth. It is possible to perfectly adapt the system components using the SP-CE-DE-1M adjustable tubes or the R-NOZ-EXT flexible hoses that can reach to the depth of as much as 3 metres. The hose is terminated with the R-NOZ-ADAPTER cleaning adapter which guarantees that compressed air is delivered to the hole end and can clean it thoroughly. The automatic system, on the other hand, provides for improved removal of drillings from the hole end thanks to the R-BRUSH-EXT-H extension tool. The entire set is connected with a drill to suck the drillings out as the work proceeds. Also in this case, the right combination of adjustable extension pieces, namely hoses manually cut to length as needed, identical to those of the manual cleaning system, allows you to adapt the length of the entire system.

All the above advantages of individual accessories forming the Deep Anchorage System from Rawlplug clearly evidence the fact that using them already at the first stage of works significantly increases fixing reliability. However, Rawlplug is never contented with half measures, for our goal is invariably to deliver holistic solutions. This is why our branded Deep Anchorage System also contains products dedicated to the next step of works performed.
Before applying resin inside the hole, dispense to waste at least 10 cm of the product until even colour is obtained.

Adjust the diameter of the Piston Plug dosing plug to the diameter of the drilled hole by cutting.

Attach the piston plug to the extension and insert into the hole, all the way to the bottom.

Start dispensing the resin: the dosing plug will now start to be pushed out of the hole by the resin (piston action).

After filling the hole with resin, insert the rebar or rod and leave it until the resin cures.

using the deep anchorage technique, namely resin dispensing into holes. It is an extremely important stage of works if – besides safety – you consider two other major criteria: cost optimisation and working comfort. What does that mean?

Perfectly tailored to your needs

The holes in which rebars are installed using the deep anchorage technique may vary in depth, and one of the System’s advantages is that the user can freely adapt it, strictly according to the requirements of the given project and design calculations. However, the very name of the technique implies that the common characteristic of the holes is precisely their depth (which is considerable compared to other applications). Given the relatively small hole diameter, which is typically the case, this may pose an issue with high-precision application of the right amount of resin, and the contractors who dose the agent can basically rely only on their intuition. It translates into two rather obvious shortcomings of the solution. One is that it is impossible to precisely fill the hole with resin, which will ultimately exert a considerable impact on the fixing’s operating safety. The other is an opposite case, where too much resin in injected into the hole, causing material waste and unnecessarily increasing investment costs. In order to eliminate the above drawbacks, the Deep Anchorage System from Rawlplug comprises accessories dedicated to the resin dispensing stage: the R-NOZ-EXT flexible hose for deep resin application and the SP-CE-E-1M mixer extension piece. Importantly, it is extremely easy to adjust the length of both items to the depth of individual holes, as one only needs to cut the hose to the right dimension. At this point, you can surely notice how meticulously the Deep Anchorage System has been designed, as both these accessories have already been mentioned in the hole cleaning stage section. This means that some of the System’s components are universal and can be used in different ways, like the hose and the extension piece that come in handy when cleaning the hole as well as filling it with resin. An integral element of the set of accessories intended for the resin dispensing stage is the PISTON PLUG dosing plug attached to the tip of a fully-assembled system set. Mounted to the extension hose tip, it functions as a buffer and a device for signalling the extent to which the hole has already been filled with resin. Once the hole has been driven, it is enough to insert an assembly of extension pieces adjusted to the depth of the hole and terminated with the PISTON PLUG. You can start dispensing resin when the tip touches the end of the hole. Thanks to the unique shape of the PISTON PLUG, it ensures uniform distribution of the right amount of resin inside the hole, prevents formation of air bubbles which reduce anchoring quality, and provides the user with full control over the degree to which the hole is filled with resin. This means that using Rawlplug’s system you will dose exactly the amount of the bonding agent which the given hole requires – no more and no less. It’s just perfect. What is more, similarly to the other elements of the Deep Anchorage System,
the PISTON PLUG can be easily adapted to your specific needs, as its diameter can be adjusted by simply cutting it to the hole diameter.

As much as you need
The deep anchorage technique is based on the use of a specific product category, namely bonded anchors. They comprise diverse kinds of highly specialised resins which require utmost application precision in order to make the most of their potential and ensure adequate fixing strength. One of the activities which determines the anchoring quality from the very beginning is the right mixing, and for that purpose, the Deep Anchorage System provides you with professional mixers dedicated to different resins. The applicator nozzles available in the market differ in terms of the mixer type and total mixer nozzle length. Each of these characteristics ultimately influences the proportions in the mixture of the bonded anchor components, and consequently its quality. This is why, to supplement the extensive portfolio of the brand’s resins, Rawlplug has designed three mixers that make up the deep anchorage accessory set, and they are: the R-NOZ (used in combination with the R-KEM and R-KER bonded anchors), the R-NOZ-KER-II (recommended for perfect mixing of the R-KER-II hybrid resin) and the 16-element R-NOZ-KEX-II used in professional applications with epoxy resin. Using the right applicator nozzle with the matching resin guarantees the highest quality of the mixture, which translates into top performance of the fixing thus produced.

Don’t compromise on working comfort – you no longer have to
Even though it is often disregarded, working comfort is in fact an extremely important aspect of each professional’s daily life. It proves particularly important when completing the job requires numerous repetitions of the same actions, which nearly by definition entails the user’s fatigue, and consequently makes the human error hazard more imminent. One of such actions is anchoring in series, which is often the case when using the deep anchorage technique. Repeated dispensing of the same amount of resin into a hole whose depth is typically larger than the standard one is not easy in itself, while on the other hand, it is absolutely crucial when expecting adequate results of this technique. This is why, in response to the actual needs of construction specialists, Rawlplug has extended its Deep Anchorage System with two tools that practically solve the above problems, namely the Akudose and Multigun resin dispensing guns. The former is a highly professional machine for special jobs. Our original Dual Drive Rod design guarantees accurate mixing of two-component resin in invariably correct proportions, while the high-performance lithium-ion battery and exceptionally robust casing ensure continuous work with up to fifty 600 ml cartridges without the need for charging. And last but not least, the memory function gives what’s absolutely crucial in the Deep Anchorage System, namely high-precision and repetitive resin dispensing. It allows the user to be sure that each hole made in a series will be filled with exactly the same amount of the bonding.

Components of the Deep Anchorage System for deep holes:

- **Akudose and Multigun dispensing guns**
- **Mixers** dedicated for each resin type
- **PISTON PLUG** dosing plug
- **Mixer extension** or flexible hose for deep resin dosing
- **Deep hole cleaning** with air adapter
product, and the fixings developed by that means will be reliable, secure and infallible, without any compromise to working comfort and regardless of the number of fixing operations to be completed. You can set the amount of resin to be dispensed using an adjustment knob. The Akudose gun from Rawlplug is compatible with different types of cartridges and mixers, which makes it a universal tool the user will certainly also find handy while performing different finishing jobs. The other accessory resin dispensing gun offered under Rawlplug’s Deep Anchorage System, i.e. the Multigun, is a remarkably universal solution. Its unique design makes it suitable for virtually any kind of cartridge. In other words, one Multigun can substitute three other dispensing guns! Not only does it reduce the number of tools a contractor must carry along, but it also cuts down on the costs of the necessary equipment. And the gun is not exclusively intended for resins – you can use it to apply acrylic putties, silicones, adhesives and sealants, making the Multigun welcome at each construction site.

**Bonded anchors – top-class strength**

The third, the last but definitely not the least important part of the Deep Anchorage System from Rawlplug is the portfolio of resins – each dedicated to slightly different professional applications. The category of bonded anchors is a special item in the brand’s offering, spanning a full range of various resin types which perform one of the key roles in the deep anchorage technique, as they are responsible for the durable bonding between rebars and concrete. The R-KER vinyl ester based mix is recommended for installation of curtain walls, balustrades, wiring and piping systems as well as fences, gates and railings. It is officially approved for anchoring to the depth of 1 m. The R-KER-II hybrid resin is a multi-purpose product of high load capacity, intended for dry, wet and even water-flooded substrates, certified for anchoring to the depth of 1.5 m. The R-KEX-II epoxy resin based bonded anchor is the strongest formulation among epoxy resins. Its impressive chemical resistance makes it suitable for application in places where it may be exposed to the impact of chemical agents, for instance in industrial or marine environments. The R-KEX-II is approved for anchoring to the depth of 2.5 m. All the above anchoring depth parameters have been verified and certified for compliance with the most demanding applicable standards. The Deep Anchorage System resins from Rawlplug have been prepared in accordance with the guidelines of Eurocode 2 – EN 1992-1, i.e. the set of principles followed while designing buildings and road structures to be built of reinforced and non-reinforced concrete. Eurocode 2 comprises stringent rules and requirements ensuring safety and long service life of structures. Additionally, on account of the fact that every resin included in the Deep Anchorage System must offer adherence at least to concrete or higher in order to ensure the system’s efficiency, the highest technical parameters of the resins dedicated to our System are certified for conformity with the TR023 report. To cut the long story short – no other solution compares when it comes to performance.

**Inherently complementary approach**

Rawlplug’s three-step system of accessories dedicated to the Deep Anchorage System is an absolute innovation. No other market player has ever approached the deep anchorage technique in a comparably holistic manner, encompassing all aspects of this solution in their product portfolio. In this respect, Rawlplug has simply adhered to its tradition of being innovative. After all, it is the brand to which the construction industry owes the first ever wall plug, the first mechanical anchor as well as many other breakthrough solutions. The latest item in Rawlplug’s portfolio, namely the Deep Anchorage System, draws abundantly from the guiding thought of the company founder, John Joseph Rawlings, but also from the contemporary achievements in engineering. Since the very beginning, the brand has always stayed close to its customers, mindful of their needs, issues and requirements. This is why we know exactly how to respond to them at this day and age, and by giving them the Deep Anchorage System, what we actually offer is the solution to all the most common and typical problems tackled by the contractors who use the deep anchorage technique. So whenever you buy Rawlplug, you buy more than just a product. You buy know-how and experience. You buy safety and reliability verified by testing. You buy a complete system instead of a fraction of one. What you buy is the support of an expert.