

SGS INTRON BULLETIN

SEPTEMBER 2019

This biannual bulletin contains articles about our activities, customer testimonials, developments and regulations in the construction industry.



**ROUND TABLE
DISCUSSION ABOUT
CIRCULARITY**

**METAL RESEARCH: NEW
TEST LABORATORY AND
NDT BUNKER**

**SUSTAINABLE SOIL
STABILISATION:
MAMMOET HEAVY DUTY
PAVEMENTS**

SGS

COLUMN



RON LEPPERS

CIRCULAR CONSTRUCTION = INNOVATION

Dutch politicians have decided to move towards a circular economy, meaning getting rid of gas. This is a clear and courageous policy proposal that will be worked out in all kinds of measures. The timeline for the whole of the Netherlands runs from now until 2030, and subsequently 2050. Everyone must participate and provide opinions. This is consensus decision making at its best, as is only possible in the Netherlands. In my opinion, it is a good thing.

There is, however, criticism from many sides, because this won't be easy to accomplish. What if everyone starts driving electrically and heating electrically? This would require the thorough modification of 200,000 residential units per year, with all buildings being recyclable and made from reusable materials. What does this mean for our current infrastructure, our current earnings models, what is the chance we will end up in the cold, and similar questions?

Providing simple answers to these questions is not always possible, but we must ask these questions to be able to take the next step. No one says it will be easy and, besides, 'Rome wasn't built in a day'.

You can look at this political decision in different ways. My main thought: let us lead the way with innovation when it comes to the issues that lie ahead of us. There are a lot of opportunities to be grasped, which is good for the Netherlands, its companies and people.

In our field, this means we can focus on developing new forms of recycling, new types of binders, new types of aggregates, new types of refrigerants for air conditioners and heat pumps, new measurement methods, and much more. I argue in favour of high-quality research, good life-cycle analyses, sound quality assurance and correct evidence. We can lead the way in Europe, as we already do in the processing of our construction and demolition waste. There are plenty of opportunities in this changing world: we just need to want to see them!

ROUND TABLE DISCUSSION WITH SGS INTRON EXPERTS ABOUT CIRCULARITY

"WE HAVE BEEN INVOLVED FOR YEARS IN INNOVATIONS FOCUSED ON CIRCULAR CONSTRUCTION"



(Continued from p.2)

Circularity, everyone is talking about it. It is one of the government's core policies. New initiatives are emerging but there are also lots of discussions and questions. What exactly is circularity, and how can we best put it into practice? It is clear we have to make a start because central government has stated that it wants to move towards a fully circular economy by 2050. The National Raw Materials Agreement is a very important first step in the right direction. It brings together the Government and the business community in an agreement to use fifty percent fewer primary raw materials by 2030, followed by one hundred percent reuse in 2050.

ONE HUNDRED PERCENT REUSE? "AT SGS INTRON WE HAVE MADE A START ON IT ALREADY"

Creating a circular economy is now on the horizon and it is up to the market to respond and implement this policy. It will happen. "As an independent and expert party, we can contribute ideas and support", says Director Ron Leppers, the person ultimately responsible at SGS INTRON. "We have actually been working on circularity for a long time. Our specialist materials knowledge means we are involved in all kinds of projects related to circular construction and innovation: research, product development, advice and certification." How do the SGS INTRON experts involved look at the subject? A round table discussion about continuing to dream and just get things going.

"AS AN INDEPENDENT AND EXPERT PARTY, WE CAN CONTRIBUTE IDEAS AND SUPPORT"

Director Ron Leppers

FOCUSING ON CIRCULAR DESIGN?

"Thinking about how we can do better in the future, provides all of us with loads of energy," notes Ron Leppers. "In the Netherlands, there is a lot of attention on circular design: the design of structures that we will be able to dismantle like Lego in about thirty years' time, to reuse the separate materials in construction without much loss. I am a strong proponent of industrial, flexible and demountable design, so that buildings can easily be adapted for future functions. At the same time, there are already an enormous number of buildings in the Netherlands that we will have to deal with, because they will be rebuilt or demolished within the next 30 years. What are the options for the mineral building materials, metals, insulation materials and plastics that will be released as a result? Materials that cannot be reused, one-on-one? At SGS INTRON, we are good at finding solutions for these materials and I would like to focus more on that."

WHAT IS HIGH-QUALITY REUSE?

"Making new high-quality building materials out of residual and waste materials is really what circularity is all about for me," says former director-owner Gert van der Wegen. "I am involved in the development of a circular viaduct. Apart from that, I focus primarily on projects related to mineral building materials and the search for useful, high(er) quality or wider applications for residual or waste materials. I rather disagree with the Netherlands' linear structure for reuse. At the top, as the most high-quality form, there is reuse at the building level, followed by reuse at the building component level. Reuse at material level is right at the bottom. In my opinion, though, which solution is the most meaningful and valuable, depends on the situation. Also, partly due to changing wishes and requirements, reuse at building or building component level is not always possible or desirable."



HOW DO WE KNOW IF WE ARE USING THE CIRCULAR SYSTEM CORRECTLY?

"When reusing building components at another location, the extra environmental impact of transport will soon start to make an impact, which becomes visible in the total life cycle analysis (LCA)," responds Senior Consultant Ulbert Hofstra, who is an expert in this area. "For me, circularity is mainly about measuring it. I participate in a working group about circularity, an initiative of Ministry of Infrastructure and Water Management and the Central Government Real Estate Agency. Our goal is to create a detailed system to measure circularity within a year. I am in favour of an integral method that is in line with what is already there. Such as LCAs, with which we have been working for a long time.

Fewer primary raw materials are needed for a circular product. This is positive for the outcome of the LCA. But the idea that a product will enjoy several life cycles during its lifespan, is something we do not include in the traditional life cycle analysis. To make circularity measurable and to judge products more fairly, you could perform LCAs over multiple life cycles. The challenge is, we do not know what will be possible in terms of recycling in the future. And we want to make as few assumptions as possible in LCAs."

SO WE NEED TO THINK MORE BROADLY: IN LARGER CYCLES AND NEW APPLICATIONS?

"Yes, that is necessary to find solutions," thinks Gert van der Wegen. "Not just making new concrete from old concrete, which we can already do very well, for example, using the "smart crusher". We need to also look outside our own cycle and sector, for example at waste streams from other sectors. And look for new ways to use these in the best way possible as secondary raw materials. SGS INTRON consultant Huub Creuwels is working on this: "For example, with the help of research, I look at the environmental aspects of materials that enter a second life as circular building materials. Not only mineral residues, but also plastics, for example. Plastics from the automobile demolition industry, for example. By doing tests, we identify important parameters, after which we can help our customers to make choices for applications. Plastics can be turned into cladding for waterways, for example. But possibly also into fuel. How do you do this in a good way and what about other aspects, such as microplastics

and sustainability, when you start to use recycled plastics (again and again)? If you put a circular product on the market, this also needs to include quality assurance and possibly a quality mark. We also think about that".

HOW DO YOU DO THAT IN PRACTICE: PROVIDING OLD MATERIAL WITH A NEW LIFE?

"Within SGS INTRON, there are many great examples of how to deal with the past in a circular way," notes Gert van der Wegen. "A development in which I am personally involved is the plasma reactor. That concept, which is still in its infancy, allows for the complete reuse of all materials at (household) landfill sites. First, we remove the metals that are of value to the metal industry. Then we sort out the rubble that can be used, among other things, as aggregate in concrete. We then treat the large amount of organic and mineral substances that remain with our modern plasma technology. During this process, high-quality gases are released. Two thirds of these can be used as energy. With the other gases,

all the mineral material, even asbestos, can be dissolved. In this way, we can make a slag that is excellent for use as a cement substitute/binder in concrete. We are going to place the reactor at a landfill site in Genk, which contains twenty million tons of household waste. The idea is that we will completely eliminate this waste mountain in twenty years, which alone will yield four to five million tons of binder. If the technology develops well, in the long-term we can solve a major waste problem. Because there are landfill sites everywhere in the world."

ARE THERE ANY OTHER WASTE PROBLEMS THAT YOU CAN HELP TO SOLVE?

"I see it as a challenge to put the circular economy into practice," says SGS INTRON Consultant Natalie Carr. "To actually make new materials and products from waste streams from different industries. For example, I am working on the development of a secondary raw material made from waste glass. We collect a lot of glass, but it is not always possible to make new glass from it. We are currently investigating various treatment methods to give the waste from glass waste



optimum reactive properties, so that this material can also be used as a cement substitute in concrete. In the future, we will have fewer and fewer coal-fired power stations and therefore also less fly ash: an alternative binder on which we are currently quite dependent. Before that starts to become a problem, we must look for alternatives. It is a bonus if you can also solve a waste problem at the same time".

"THE BIGGEST CHALLENGE? KEEP DREAMING. PROVE THAT REUSE IS POSSIBLE"

"Where I think I can make a difference in the field of circularity, I try to set up projects with European subsidies such as Horizon 2020", says Natalie.

"For example, in the area of recycling textile waste. This is a major problem, because our clothing consists largely of plastic fibres. With composting, it takes more than two hundred years for these plastics to break down, while many greenhouse gases are released from natural fibres. Removing the different fibres from the textiles for reuse is not always possible with the complex mixed textile types of today. For textiles that cannot be reused in any way, I therefore try to find new applications in the construction industry. By burning it under the right conditions, we can create a binder. But in addition, the textile can also act as formwork material or for reinforcement. I want to show that it is possible. Reusing is useful and possible. The circular economy is our future."

SGS INTRON HAS THE KNOWLEDGE, EXPERIENCE AND CONTACTS IN THE MARKET. WHAT'S THE NEXT STEP?

"Getting all the partners in the chain to support this philosophy", thinks Gert van der Wegen. "So that circular thinking will spread like an oil slick. All parties have the same challenge, and being an independent "bridge builder", SGS INTRON can help them achieve their goals". "We are already receiving questions from around the world", says Huub. "Even other European countries are looking at us, the Netherlands. We are at the forefront when it comes to putting circularity into practice". "That is our strength", agrees Ron. "We are already working on it".

"WE CONTRIBUTE AT THE FRONT END, WHERE CIRCULARITY IS DISCUSSED FOR THE FIRST TIME, AND AT THE BACKEND WHEN IT COMES TO APPLICATIONS. OUR CUSTOMERS CAN BENEFIT FROM THAT KNOWLEDGE AND EXPERIENCE"

Sr. Consultant Ulbert Hofstra

GOVERNMENT POLICY: CIRCULAR ECONOMY IN 2050

Dutch companies, Government, knowledge institutions and social organisations are all working together towards a circular economy in 2050. That means a society without waste, in which raw materials are (re)used again and again. The Government-wide Circular Economy programme states what is needed to make raw materials, products and services more economical and smarter. In 2017, 180 parties (from Government and business) signed the National Raw Materials Agreement. This contains agreements aimed at reducing the use of primary raw materials, such as minerals, metals and fossil fuels. There must be a reduction of 50 percent by 2030 and, by 2050, the Dutch economy must run entirely on reusable raw materials. MVO Nederland (Corporate Social Responsibility in the Netherlands) plays a leading role in policy development around the circular economy and has drawn up some important principles. The construction sector is one of the five sectors that, according to the Government, must be the first to be fully circular.

SGS INTRON VISION

SGS INTRON plays an active role as an independent service provider in the field of circularity. We support the widely held vision that building methods must be strongly innovated and that Building Information Models (BIM) play an important role. As a result, there will be far fewer residual flows in the future and reuse can increase. At the same time, we see an increase in the number and size of residual flows of building materials, in particular in the coming decades, for which new applications must be sought. Not everything can be processed as a subbase material under the road. We are in favour of a pragmatic approach to these residual flows, by recording the value of these "new raw materials". This value is determined by several factors, such as processing method, employability, technical and ecological impact and lifespan. A good value system, for example in the form of a passport, will promote suitable applications: based on objective and well-founded choices in the context of circularity. It is precisely in these areas, that SGS INTRON has a great deal of knowledge and experience. A lot of innovation will be required and we are already fully engaged in supporting the market with research, advice and certification.

FPC CERTIFICATE NORWEGIAN SAND STONE QUARRY **ARRANGED SURPRISINGLY QUICKLY**

MORE INFORMATION: ANDRÉ HOFFMAN ANDRE.HOFFMAN@SGS.COM

"SGS INTRON has been providing all SPC and Soil Quality Certificates for our production location in Amsterdam for years", says Pieter-Jos Blokzijl of Graniet Import Benelux B.V. "There we process sandstone and granite from Norway and Scotland into building materials, by washing, screening and breaking the material. I knew that SGS INTRON would be willing and able to move quickly. But the fact that auditor André Hoffman was able to come to Norway within one week to get our sandstone quarry FPC certified there, was even a surprise to me".



LARGE QUARRY IN THE MOUNTAIN

"The quarry in question, on the Bre-manger fjord, is very large and relatively young", says quality and sales manager Pieter-Jos Blokzijl. "No less than one billion tons of sandstone is in stock here. The quarry is owned by the Dutch family company Bontrup. Graniet Import is part of the Bontrup group. We purchase our Bestone® here: high-quality sandstone, non-slip and very homogeneous. A material that is widely used in the Netherlands in asphalt coatings and as rail ballast material. We are market leader in those areas."

BEING THE BEST

"With a name like Bestone® you should always try to be the best", says Blokzijl. "That is why we constantly test ourselves and our material. Customers can also come to us to test and sample products. We are very transparent and think it is important to be a leader. We contribute as much as possible about innovations with contractors. We consider certification important because the market demands it. Until now, certification of the quarry was not necessary, because we first processed all the products that we marketed in Europe in Amsterdam or Antwerp".

FOR A GERMAN CLIENT

But now Graniet Import is increasingly supplying European projects directly from the quarry. "We already did that in Russia, Africa and South America. We have six of our own self-unloading sea-going vessels and a floating loading system in the fjord to load the ships directly from the quarry. We are currently running a major project in Germany to which we deliver directly. Our German customer wanted to see an FPC certificate in advance and needed it within one month".

ASSESSMENT OF PROCESS AND MATERIAL

It was therefore lucky that André Hoffman from SGS INTRON had room for an audit in Norway that same week. "A Factory Production Control is part of CE marking", André explains. "The FPC certificate shows that the procedures and inspections meet the European standard. To this end, I assessed the civil engineering quality of the stones on site and the entire treatment process in the quarry. Which is quite impressive because of the enormous dimensions and location: in the middle of the high mountain alongside the fjord. They make clever use of gravity here. Explosives blow material away from the top of the quarry, which then falls 200 metres down through a vertical tunnel. The stones are broken down further afterwards, first in a jaw crusher and then in a rotating crusher. Finally, a 1.5 km long descending conveyor belt transports the stones out of the mountain to the fjord. The force of gravity ensures that the belt can quickly run without power. On balance, they even produce green energy here".

"WITH A NAME LIKE BESTONE® YOU SHOULD ALWAYS TRY TO BE THE BEST"

Pieter-Jos Blokzijl

WELL ORGANISED

André concluded that Bontrup has things well organized. "I also looked at the method of sampling, stock storage and the laboratory. The equipment was calibrated and there already was a quality manual available." "With André's help, we were able to easily modify this to an FPC handbook", says Pieter-Jos Blokzijl. "André really understands what we do and is very pragmatic. Because our flight was delayed due to snowfall, we managed to dot the last i's at the airport". After which André immediately gave a positive recommendation with regard to granting the certificate. "We received it within two weeks. And a week later we were already unloading the first ship in Germany".



COMPLETELY EQUIPPED FOR METAL RESEARCH, WITH **NEW TEST LABORATORY AND NDT BUNKER**

MORE INFORMATION: MARIO DELAMBOY MARIO.DELAMBOY@SGS.COM AND
PATRICK BOERENKAMP PATRICK.BOERENKAMP@SGS.COM

"Increasingly, our customers are asking for all-in solutions. For that reason we offer both highly specialised and broad services, backed with constant investment in the latest equipment and research facilities. We have recently added a comprehensive new metal testing laboratory and bunker for X-ray examinations, where non-destructive testing (NDT) of metals can take place. By combining SGS solutions and expertise, we can now offer a complete package of services in the field of metals."

ALL TYPES OF METAL TESTS

Business Development Manager Mario Delamboy has personally made the case for the new metal testing laboratory at SGS INTRON. He sees plenty of opportunities once the new research facilities are fully operational next year. SGS colleague Roel van der Linden, Key Account Manager responsible for innovation projects and NDT, is also enthusiastic: "We can carry out all types of metal research, both in the laboratory, in the bunker and at the customer's facility. For this, we have a wide range of complementary destructive and non-destructive techniques. Few parties in the Netherlands can offer full-scale metal research in combination with material's advice, a strong knowledge sector for SGS INTRON. Within SGS, we currently mainly use NDT techniques to test whether products meet the customer's requirements and/or the standard. At SGS INTRON the focus is much more on solutions for the customer. That is what I aim for with our NDT organisation too".

NDT OF NEW CONSTRUCTION COMPONENTS

"The intention is for our NDT metal research to reach not only customers in the south of the Netherlands, but also those in parts of Belgium and Germany. We mostly work for the new construction market, testing new metal construction elements, such as the structural welds that hold up roadside messaging signs, both before and during construction. In almost ninety per cent of cases, we utilise X-ray testing as part of this process."



SAFELY IN THE BUNKER

"The fact that we have this facility is a big plus for the market", says Roel. It allows us to comply with legislation and regulations, which do not permit the use of X-rays in unsuitable places, if another technique can be applied or testing in a safe environment, such as the bunker, is possible. Good X-rays of thick metal objects require more intensive radiation than, for example, the imaging of a human body. Because we want to be the most innovative NDT company, we believe it is important to be at the forefront and meet all requirements. That is why we have built a thick concrete bunker, with lead in the joints and door, so that radiation will not leak into the environment. Our staff are also specially trained with extra safety measures. In this way we want to avoid radiation at the construction or assembly location, which carries more risk."

COMBINING TECHNIQUES

SGS will also use NDT techniques for inspections of existing structures. "We mainly inspect welds, but also other metal parts, in the petrochemical industry, but also increasingly in the automotive, food industry and construction sectors", says Roel. "The structural inspection of the train station building in Leuven is a good example of how we can complement each other in terms of techniques and expertise", agrees Mario. "We assisted SGS INTRON with the inspection of the roof structure", explains Roel. "With NDT we can make the invisible visible, such as cracks in welds that cannot be seen with the naked eye".

GOOD INSIGHT OR EXTREME ACCURACY?

"In this way, many beautiful combinations are possible", Roel and Mario think. "Many structures contain concrete, the area of expertise at SGS INTRON, but also steel which we can investigate together", clarifies Mario. "We are able to assist each other in damage investigations. NDT usually provides good insights into where defects are located. If further or more precise research is required, this will be done in our laboratory, where we also test many new products. Our ambition is to be market leader in the Benelux in the field of metal research. Usually our laboratory's highly sensitive equipment we can accurately determine all relevant material properties".



THE BEST SOLUTION WITH MINIMAL DAMAGE

It is often very attractive to combine destructive and non-destructive testing. "Having samples carefully examined in the laboratory, and then investigating in the field using NDT to verify if the materials are in the same condition, can result in considerable cost savings," notes Roel. "Demand is also increasing with regard to re-use," says Mario. "For example, when steel H-beams of unknown quality become available for reuse. It may not be desirable to mill a large section of the beam, and so we look for other solutions. These may include NDT or whether we can work with smaller samples, so that we can still determine the metal's yield value. This is an important parameter for the load capacity."

The SGS INTRON inspectors also make extensive use of NDT, for example when inspecting concrete structures, coatings and masonry.

DESTRUCTIVE TESTING IN THE NEW METAL TEST LABORATORY

Our new metal testing laboratory is currently undergoing ISO 17025 certification and we have invested in various new devices:

- A universal tensile testing machine of up to 1500 kN to measure, among other things, stiffness, yield value (the moment of permanent deformation), maximum tension/force, elastic deformation, constriction and elongation.
- An Charpy impact tester for measuring toughness/brittleness up to 750 J.
- A fully automated Vickers (micro) hardness meter.

In addition, SGS INTRON uses an electron microscope (SEM) and light microscopes to identify errors in the crystal structure, contaminants, and determine chemical composition.

NON-DESTRUCTIVE METAL TESTING (NDT)

SGS uses both conventional and (extremely) advanced techniques:

Surface surveys:

- Visual inspections.
- Magnetic examination: for example, a magnetic field increases the view of cracks.
- Penetrant examination: a penetrant (removable paint layer) reveals any cracks.

Volumetric examinations:

With these investigations we look into the material, examining composition, wall thicknesses, deep-lying cracks/defects or corrosion. We usually perform these investigations on location with mobile devices. The SGS Special Research department is developing highly advanced equipment for specific projects. We use the following techniques:

- X-ray examination
- Ultrasonic examination
- Optical Emission Spectrography (OES)
- Laser Induced Breakdown Spectroscopy (LIBS)
- TOFD
- Phased Array

NEW MEGA PROJECT FOR SGS INTRON: QUALITY ASSURANCE FOR NEW TERNEUZEN LOCK IN CHINA

MORE INFORMATION: ROBERT HAVERKORT ROBERT.HAVERKORT@SGS.COM

SGS INTRON is currently assisting the Sasseevaart construction consortium in the construction of lock gates and bridges at the Nieuwe Sluis Terneuzen lock. Two SGS employees operate in China for a period of two years, supporting the local Sasseevaart team in matters of quality control and the supervision of quality control with the manufacturer. Frank van Eijnatten and John Nijssen from SGS INTRON will assist our client with this challenging project. This is not the first lock gate project for either man or SGS INTRON.

FOUR MAJOR LOCK GATE PROJECTS FOR SGS IN A ROW

Frank has already been involved in the Kieldrecht lock or Deurganckdok lock project in the Waasland port in Antwerp, for which the doors were built in China. At the time, SGS INTRON worked on behalf of the client, the Flemish Govern-

ment, to supervise the manufacturer's quality control in Shanghai. In addition to a number of Belgian and Dutch colleagues, a team of local (Chinese) inspectors was also deployed on location.

Prior to the Kieldrecht lock project, SGS was involved in the manufacture of the sea lock doors for the widening of the Panama Canal. The doors were produced in Italy and a team of Italian colleagues was involved. In Panama, SGS took care of the quality control for all concrete work and monitored the project.

Following the Waasland port project, the OpenIJ consortium approached us to undertake quality assurance of the lock gates at the IJmuiden lock. After the contract was awarded, Frank and John spent two years working in South Korea. This was completed to the satisfaction of OpenIJ and the Ministry of Infrastructure and Water Management, who jointly supervised the quality controls in Mokpo, South Korea.

NIEUWE SLUIS TERNEUZEN: THE FIGURES

We are now starting a new lock gate project; for the third time in a row for SGS INTRON and the fourth in a row for SGS. The Nieuwe Sluis Terneuzen will ensure better access and smoother flow from the Westerschelde to the Ghent-Terneuzen Canal and beyond. The Nieuwe Sluis will be 427 metres long, 55 metres wide and more than 16 metres deep. The lock is expected to be suitable for sea-going vessels up to 366 metres long, 49 metres wide and 15 metres deep. The Nieuwe Sluis will be just as large as the locks in the Panama Canal.

Many different materials are needed to complete construction of the lock. The most important ones: 300,000 m³ of concrete, 32,000 tons of reinforcing steel, 60,000 tons of steel for tubular piles, sheet piling and the doors and bridges.

All in all, the Nieuwe Sluis Terneuzen is another mega project in which the customer relies on the expertise and experience of the people at SGS INTRON.



Impression of the lock, not the final design



MULTI-YEAR RESEARCH INTO POWDERED FLY ASH CONCRETE:

"CERTIFIED CONCRETE SUITABLE FOR ONE HUNDRED YEARS OF USE IN CONSTRUCTIONS WITH A CHLORIDE LOAD"

MORE INFORMATION: MICHEL BOUTZ MICHEL.BOUTZ@SGS.COM

For more than twenty-five years, we have been widely using concrete with a combination of cement and fly ash (pulverized fuel ash) as a binder, the so-called "certified concrete", in the Netherlands. Yet until recently there was still discussion about the resistance of this concrete to chloride penetration. Has this been sufficiently demonstrated in the long term? And is certified concrete also suitable as an alternative to blast furnace slag cement concrete for use in structures with chloride loads that have to last a hundred years? "Yes", concludes SGS INTRON after five years of research commissioned by the Vliegassunie (Fly ash Union) and KEMA.

LONG-TERM RESEARCH

"Never before has laboratory research been conducted over such a long period into the chloride penetration of fly ash concrete in relation to its lifespan", says Michel Boutz of SGS INTRON. "Using various test methods, we have collected a large amount of data on cements and fly ashes that are often used in the Netherlands".

MULTIPLE METHODS

Dozens of concrete cubes of five different concrete mixes with fly ash, plus a reference mix with blast furnace slag cement, have been investigated

for five years at regular intervals using two methods: Rapid Chloride Migration (RCM) and the Two Electrode Method (TEM). The concrete is stored outside during the entire period. "We have had it hardened under practical conditions", explains Michel Boutz. "The speed at which chlorides penetrate the concrete cover (the chloride migration coefficient) was determined using the RCM method. This can be done within 24 to 96 hours, because with this method we use an electrical voltage that "pulls" the chlorides into the concrete. With the Two Electrode Method we determine the electrical resistance of the concrete, which is inversely proportional to the RCM value".

QUICKLY BECOMING MORE DENSE

"Based on the measured RCM and TEM values, we got a clear picture of the aging coefficient, which reflects the decrease of the RCM value over time. This aging coefficient is needed to perform service life calculations. The higher the coefficient, the faster the concrete's resistance to chloride penetration increases. Fly ash concrete is known to initially have a low resistance to chloride penetration, but that resistance is increasing rapidly. We have now demon-

strated, with the help of research, that this process is indeed very fast: with fly ash from various power stations, there is a high aging coefficient. After about 1.5 years, the resistance to chloride penetration of certified concrete is comparable to that of blast furnace slag cement concrete".

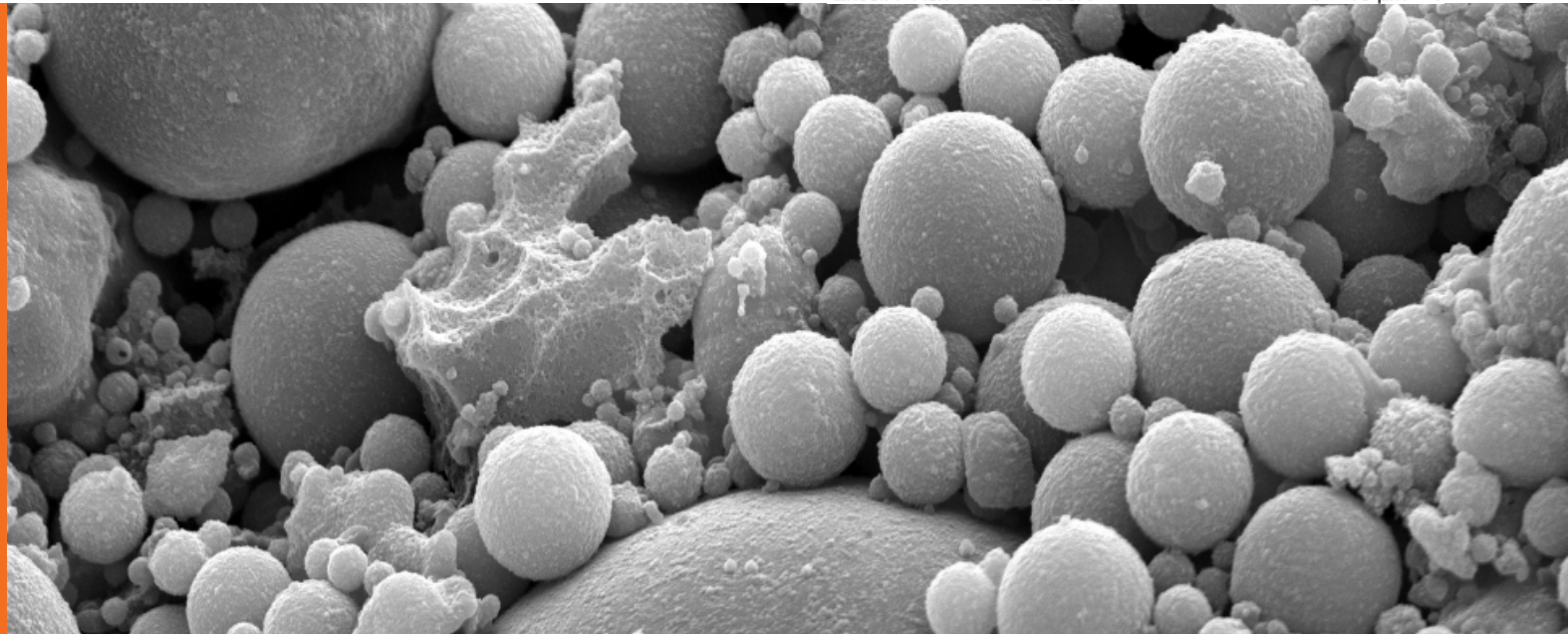
AT LEAST COMPARABLE WITH BLAST FURNACE CEMENT

That trend continues. "This has to do with the fact that the fly ash will only contribute to the concrete becoming denser after a while", says Michel Boutz. "The cement must first hydrate. The fly ash reacts with the lime that is released. That reaction continues for years. After three years the certified concrete was already so dense that we could hardly measure it with the RCM method. The natural diffusion test in accordance with NEN-EN 12390-11 that we conducted after three years on one fly ash concrete and the reference concrete confirms that result. After 90 days of immersion in saltwater, the chloride profiles showed that the resistance to chloride penetration of certified concrete is at least comparable to that of blast furnace slag cement concrete".

Excell F Ash

2000X

10 µm



REPORT ON SECOND HEXAVALENT CHROMIUM CONFERENCE: **AN EXTENSIVE FILE IN A SHORT TIME**

MORE INFORMATION: MURSEL SAHIN MURSEL.SAHIN@SGS.COM

Just 6 months after the first, it was time for the second Hexavalent chromium Conference at Mereveld in Utrecht. With over 300 people in the room, representing all segments of society, it promised to be an inspiring afternoon. hexavalent chromium; a topic about which there is plenty of discussion currently.

The opening address was given by Udo Waltman, director of SGS Search and chairman of the conference. Impressed by the large attendance and interest in the conference, he called hexavalent chromium a special file that is constantly evolving. "A file that has quickly become extensive". Much is still unclear in the area of hexavalent chromium. The purpose of this afternoon was to share and retrieve knowledge. Searching for answers together, working together for a safe living and working environment.

THE HUMAN PART IS THE WEAK LINK

Egbert Stremmelaar, director of ION, opened his presentation with his position; Hexavalent chromium is carcinogenic but not dangerous. The substance is blamed for things it has not been responsible for. Hexavalent chromium is safe to process and, incidentally, is often no longer included in the end product. Only when you deal with hexavalent chromium in the wrong way do dangers come into play. Water is also a toxic and suffocating substance; but when used as intended, everything is fine. Until you stay under water for 10 minutes. There are plenty of safety measures to utilise for this, such as warning signs, swimming lessons and proper supervision, comparable to what is needed for hexavalent chromium". Stremmelaar: "There is hexavalent chromium paint on thousands of objects. That paint is bound and harmless. It only becomes dangerous during processing. Many of those objects can be treated properly within a company. But you cannot remove bridges and buildings, you have to remove the paint on site. That is the challenge. And in those cases too,

human action is the weak link".

DIFFICULTY IN SEARCHING FOR ALTERNATIVES

Herman Terryn, Professor of materials sciences and engineering at the University of Brussels and TU Delft, was unable to be present during the conference. In a video interview, he discussed the difficulty of finding alternatives to hexavalent chromium. Hexavalent chromium has many strong points and the problem with alternatives is that it is still unknown to which situation the substances react as well as hexavalent chromium. It seems that we have to look for a specific replacement for each specific application of hexavalent chromium. The research is costly and time-consuming and once we have found a technically well-performing product, the question remains whether it is toxicologically better.

THINGS MUST BE DIFFERENT WHEN IT COMES TO HEXAVALENT CHROMIUM

Teus de Wit, director of business organisation Bouwend Nederland, was the last to speak before the break. In the past they have gained a lot of experience with tar containing asphalt, asbestos and other hazardous substances. If they have learned anything, it is that things must be different with hexavalent chromium. In the Netherlands, there are an enormous number of structures, all of which will soon need maintenance. These include bridges, viaducts, etc. It must be determined which structures have priority to be repaired, and which of these contain hexavalent chromium. The concerns of Bouwend Nederland: "There is a lot of work to be done, but we hope that this will be spread evenly. What measures do we need to take to perform work safely outdoors? Much uncertainty still remains, and there is a need for reliable research methods".





RELIABILITY OF HEXAVALENT CHROMIUM INSPECTION AND ANALYSIS

SGS colleagues Wil Klarenaar (materials researcher) and Thomas Hazenberg (laboratory manager) discussed the reliability of inspections and analyses of hexavalent chromium. They open the presentation with good news: two weeks ago, the Handheld XRF method from SGS was placed on the list of accredited methods. This is the "quality mark" for the reliability and quality of the method.

On the basis of a 4-step plan, the men explained how a hexavalent chromium study works; from the determination of chrome in a paint layer in step 1, to a detailed microscopic examination to map the paint composition in step 4. In addition, there are various distortions that can occur. Complex situations with many layers of paint applied over each other and layers with metal paint can influence an investigation. The combination of the 4-step plan with the knowledge and experience of the inspector on site leads to the reliability of the result. The presentation ended with a call to the group; let's work together and share results, so that we gain more insight into the occurrence of exposure risks in certain activities. Based on this we can determine the right measures in different situations to prevent exposure.

REMOVAL TECHNIQUES IN PRACTICE

Jan van Loon and André van Ginkel, of the Van Ginkel Groep, then explained the origins and working methods of the ChroNo64 to delegates. This innovative blasting method converts hexavalent chromium directly into trivalent chromium. A simple workable method, with the approach at the source. It must also be affordable and workable for competing colleagues, so that everyone can use it easily and safely.

Robert Lunenburg then talked about the passion of SealteQ; to breathe new life into familiar situations. Not really an innovation, but rather improvements to already known techniques. He discussed the induction and sponge blasting methods and the effects of both. For example, induction releases zero percent dust, which means there is no risk to people or the environment, but it is very labour-intensive. Sponge blasting releases 2-5 percent dust. It is being investigated whether this creates risks for people or the environment. Sponge blasting is applicable in the event of an explosion hazard.

A number of specialist hexavalent chromium disposal companies indicated that they had joined forces in an expertise collective to work together for a standard approach and coordinated working methods.

ENSURING SAFE WORKING IS TOP-CLASS SPORT

Finally, Marc Kuipers, Inspector General at the Inspectorate SZW, was introduced by Udo Waltman. Udo expressed his appreciation for the work of the inspection service and for being present at the conference.

In a clear speech, Kuipers highlighted the most important points of the Inspectorate. The Inspectorate stands for healthy, safe and fair work in the entire Dutch economy. According to Kuipers, an important point is that being competitive should never stand in the way of safe working. Anyone who starts his or her work healthily has the right to end the working day healthily. Hexavalent chromium is getting huge publicity, there is increasing concern about health risks. Consequences that can seriously affect the quality of life. Kuipers: "Ensuring safe work is top-class sport, as an employer and employees you always have to work

hard." This fits in well with the motto which the Inspectorate carries, because safe working is paramount always and everywhere.

"For situations in which processing of materials containing hexavalent chromium takes place, there is no generally applicable approach that guarantees a healthy and safe workplace. This requires customization. The establishment of safe working methods at branch or client level can offer a good solution here. It is precisely this specific attention to detail that will lead to the avoidance of occasional risks. The focus with hexavalent chromium is now on finding good alternatives. But this takes time; after all, every situation is different. Where there are no alternatives, safety measures must be taken. Preferably these will be technical measures, not just personal protective equipment. Many companies are working on this. I would like to call on them to meet each other, to share experiences and expertise and to strengthen each other in order to arrive at safe working methods as quickly as possible".

THE NEXT CONFERENCE

The conference was an inspiring afternoon with a lot of attention to the inventory, exposure and removal techniques of hexavalent chromium. At a subsequent conference, the assurance and final inspection of hexavalent chromium will also play a greater role. Verification is currently not mandatory, but we are increasingly receiving this question from clients, to provide certainty and a feeling of safety. In anticipation of this, we have created an inspection plan. It contains the different degrees in which, in our opinion, a final check can be carried out; from a light to a strict regime.

SUSTAINABLE SOIL STABILIZATION FOR MAMMOET'S LARGEST PROJECTS

Mammoet is the global market leader when it comes to lifting and transporting heavy objects. With giant cranes and heavy transport equipment, Mammoet contributes to large installations, oil refineries and wind farms all over the world. But they have a much broader range of services. Mammoet also relieves the customer of tasks such as planning, engineering and subsurface. Daughter company Mammoet Heavy Duty Pavements is responsible for the latter. Director Ronald Kleinjan: "For optimization of substrates that have to bear heavy loads, we use the expertise of SGS INTRON, among others".

HEAVIER MATERIAL ON WEAKER SOIL

"Mammoet is bringing increasingly heavy equipment to increasingly weak surfaces", says Ronald Kleinjan. "Wind farms, for example, are often planned in delta areas. For the construction of factories, locations are also regularly chosen where the soil is naturally less firm. In Nigeria, for example, they are now building a large oil refinery on a piece of land that was recently reclaimed inside a lagoon. Mammoet Heavy Duty Pavements has been involved in this project from the start. That is also what we want, because then we can make a difference for the customer. That difference includes ensuring a substrate with the correct bearing capacity everywhere. No superfluous luxury with this project, because this is the largest single-line refining process in the world".

MEGA PROJECT IN NIGERIA

"We are utilising all our cranes to build the huge installation in Nigeria. Even the largest, the PTC200 DS, which was used on site. Such deployment of equipment is still impressive and special, even for Mammoet. In addition, we design and create safe and stable crane positions for all these types of cranes, using an innovative method for soil stabilization that we call "Enviro-Mat". In the same way, we provide a stable surface where access roads and parts storage areas are planned. Very important in this case, because huge items will be placed on the storage sites. Such as a 3000-tonne regenerator, the heaviest item that has ever been transported across public roads in Africa. This part of the installation is already on location. We have taken care of the transport and created a surface that can handle the pressure of the weight without problems".



SGS INTRON'S SOIL EXPERTISE

How does Mammoet Heavy Duty Pavements do this? "In the past three years we have built up and gathered around us a lot of expertise in the field of subsurface and soil stabilization. In the Netherlands and internationally we involve experienced parties, such as engineering firms, soil laboratories and milling companies, who can help us in offering this new service. SGS INTRON is a very important partner for us. Even globally, the specialism that they have in the area of soil is not easy to find. We also use SGS's international network to find local agencies that can support us. The fact that SGS INTRON already had experience with the kind of stabilization techniques that we use is also an advantage. What we are actually doing is upgrading the local soil by adding cement and an additive. This creates a load-bearing capacity which ensures that fewer or in some cases no baffles are needed to safely transport, lift or park heavy objects".

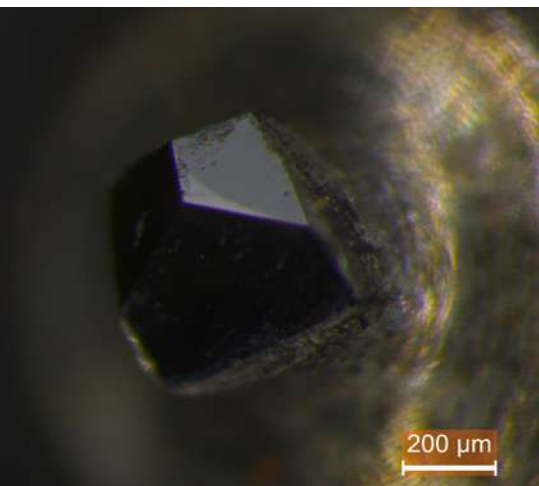
ENVIRO-MAT: A SOLID BASE

"We are committed to safety and want to assume our responsibility in that area", explains Ronald Kleinjan. "For our customers and our own people. We would prefer to send every soil type that needs to be stabilized to the SGS INTRON Laboratory for preliminary research, including for strength. So that the engineering firms with which we collaborate can calculate, on the basis of the exact strength parameters and load, how thick the Enviro-Mat layer needs to be at a certain location. But importing soil is difficult because of all kinds of restrictions. That is why we have instructed SGS INTRON to perform a "benchmark" of all types of soil: clay, peat, gravel, sand, etc. They have determined the strength parameters, so that with a similar soil type we know within which bandwidths the material is likely to perform. SGS INTRON also helps us to optimize the recipe for a specific application and, if they are logistically capable, they test the bearing capacity of the applied layer."

SUSTAINABLE FOUNDATION

In Nigeria, 300,000 m² of sea sand has now been stabilized with the help of Enviro-Mat. "Fortunately, we were able to use the sand from this location in the SGS INTRON Laboratory. Carrying out a thorough preliminary investigation for the stabilization layer was therefore no problem. But for a good design, we also had to know exactly where paved areas would be needed and what the subsurface there looked like, in an area of 25 km². That is why we have had a local company carry out soil drilling. We now know exactly which loads are expected to be placed and the first crane stands are ready. A 140,000 m² storage area has been created especially for placing heavier objects such as the generator, with a 35 cm thick layer of Enviro-Mat. The customer has chosen to leave this solid and sustainable stabilization in place everywhere. After all, it is an excellent foundation. However, if the customer decides to remove the Enviro-Mat, he can reuse the broken-up material on site, without risk to the environment. This is because there is no longer any unhydrated cement in the Enviro-Mat. SGS INTRON has also demonstrated this for us in previously projects, by means of leaching tests. With this method we therefore not only ensure a safer construction site, but also reduce the ecological footprint of projects. All the more so because we use the local land, which means that fewer alternative primary raw materials and transport movements are needed. That often makes our solution economically attractive as well".





NOW WE DO **NANO** AS WELL AS **MEGA**

MORE INFORMATION: BAS BRUINS-SLOT
BAS.BRUINSSLOT@SGS.COM

This bulletin contains an article about the possibilities and applications of our new (mega) tensile testing machine. At the other end of the scale we have recently installed a nano-indenter in our laboratory in Sittard.

WHAT IS NANO INDENTATION?

As the name suggests, a dent (indent) is made in a material on a nanoscale. With nanometres and micronewtons per second, a diamond point is pressed into a material. Photo 1 shows such a point under our light microscope. Such a three-sided pyramid-shaped point is called a Berkovich tip. The deeper the point is pressed into a material, the more force it takes. Critical material data can be calculated from the force/displacement diagram of such a test. This concerns, for example, the stiffness, hardness, scratch resistance and fracture sensitivity.

WHAT IS NANO INDENTATION USED FOR?

Together with sister companies SGS Subsurface Consultancy and SGS ARQS from Canada, we have entered into a partnership to map the mechanical properties of shale rock based on old samples with a unique combination of techniques and analysis methods.

Old drill samples, or even the drill cuttings, are resin-hardened and polished by SGS ARQS. After this, the surface is scanned with a QEMSCAN. With this technique, the mineralogy and petrography are mapped for each particle that is approximately as large as a grain of sand. Some representative grains are selected based on the mineralogy. The mechanical properties

of these granules are then measured using the nano-indenter. In photo 2, 16 indents are visible on a grain of 0.5 mm. SGS Subsurface Consultancy processes the data from the QEMSCAN, nano indication together with other information about the rock into a depth profile. This depth profile indicates where the probability is greatest that gas and oil are present in the rock and also where it can be mined.

Until now, such an analysis was limited to the use of drill cores. This is very expensive because the drilling is very expensive. With our new method we will offer comparable results based on old drillings and/or the stored drill cuttings.

ARE THERE ANY OTHER APPLICATIONS?

In addition to geomechanical research with SGS ARQS and SGS Subsurface Consultancy, we see many more applications for our new nano indenter. Determining mechanical properties on a small scale is eminently suitable for nano-indentation.

An example is determining the hardness and stiffness of coatings before and after aging in our climate chambers. We are also exploring the possibilities for taking measurements of concrete. For example, we can determine the mechanical properties of the cement matrix in the cover and in the deeper concrete. Perhaps the degree of after-treatment, or damage after fire, can be measured on small test pieces.

Do you have a smart idea or interesting case for nano indentation? Do not hesitate to contact us!

	NANO-INDENTER	TENSILE TESTING MACHINE (STEEL)
Type	KLA Tencor Nano Indenter G200	INTRON 1500KPL9963 (1500KPX)
Forces	Max. 500 mN (~50 gram) Accuracy: 50 nN	Max. 1,5 MN (~150.000.000 gram) Accuracy: 3-7 kN
Displacements	Max. 1,5 mm Accuracy: < 0,01 nm	Max. 610 mm Accuracy: 0,13 mm

THE PROGRESS OF EUROPEAN LEACHING TESTS

FOR MORE INFORMATION: ULBERT HOFSTRA ULBERT.HOFSTRA@SGS.COM

The leaching tests from the Soil Quality Decree, the column test (NEN 7383) and the diffusion test (NEN 7375) are being replaced by new European leaching tests. The development of these tests in the European Standards Committee CEN/TC 351 has taken years. In fact, so long that little seemed to have happened. But appearances deceive.

COMPLETION OF STANDARDS FOR THE NEW COLUMN AND DIFFUSION TEST

The column test – Horizontal up-flow percolation test, CEN TS 16637-3 – and the diffusion test – Horizontal dynamic surface leaching tests, CEN TS 16637-3 – are now final. The inter-laboratory validation turned out to be a time-consuming step. This is now completed for both tests for inorganic components. The relevant documents are now being converted to EN standards. For the time being, this applies to inorganic components. If inter-laboratory validation is ready on time, it will also apply to the organic components. It is expected that the EN standards will be available by the end of this year.

PRELIMINARY RESEARCH IN PREPARATION FOR CHANGES

Several companies and branches have already had research carried out to assess the differences in the results between the tests, according to the existing and the new standard. For the diffusion test, no major differences are expected between the new and old results. However, for the column test there will be. The flow in the column test has become considerably higher and the size of the particles in the column can be larger: at least 45% < 4 mm, instead of 100% < 4 mm. It is important to know the effect on the results and thus the probability of approval and rejection and the minimum control frequencies.

In addition to the leaching tests, new standards have also been issued for the analysis of the content of substances in construction products and for the analysis of the concentration in eluates. These standards will also replace the existing ones in the Soil Quality Decree.

AP04 AND INDEPENDENT QUALITY ASSURANCE

Several important points about the implementation are still to be decided. These are not particularly in relation to the content of the tests, but more to do with their implementation in regulation.

In the Netherlands we know the AP04 accreditation for laboratories performing tests in the framework of the Soil Quality Decree. It defines, among other things, the minimum performance characteristics that laboratories should achieve on these tests. In addition, rules have been laid down for the implementation of internal and external quality control. This has greatly contributed to the comparability of results from different laboratories. Foreign laboratories that carry out tests on behalf of the Soil Quality Decree can also obtain accreditation. The system of AP04 accreditation is now in danger of being lost because the results of non-AP04 accredited laboratories, that will appear on the declaration of performance of construction products, still need to be accepted by the Dutch Government. Through an active position of the Netherlands in the CEN TC 351, we try to maintain this additional quality assurance, for example through a parallel EN standard.

Another problem is the role of independent quality assurance. In the Netherlands, currently 95% of construction products are certified with a NL-BSB certificate. This demonstrates compliance with the Soil Quality Decree. Soon, the leaching properties for CE-marked products are to be included in the product's declaration of performance. The Netherlands must accept this. Depending on the so-called AVCP level, a Notified Body – a certification institution – may or may not be involved. The current working method with NL-BSB certificates corresponds to AVCP level 1 +; external checks on the production control and external measurement of the properties.

In addition, other issues include:

- Can the column test be simplified with analysis of one mixed eluate instead of seven separate eluates?
- How should the results of the leaching tests be declared on the declaration of performance?
- Can the statistically controlled production control – k-value system – remain intact?

It is very important that the Netherlands is active in these areas in Europe and that this is taken into account in the evaluation and reorganisation of the Soil Quality Decree. The Soil Quality Decree has been a huge stimulus for the circular economy in recent years, partly because of the equal treatment of primary and secondary construction products. It is therefore very important to maintain this in line with the current policy on circular construction.

CEN/TC 351 CONFERENCE IN OCTOBER

In October 2019, CEN/TC 351 is organising a conference on the results of the work that has been carried out in recent years. Everyone is welcome to make an active contribution. The conference will take place from October 16 to 18, 2019, in Vilnius (Lithuania).



MATERIAL INVESTIGATION ON BEHALF OF THE DUTCH SAFETY BOARD AFTER **COLLAPSE OF PARKING GARAGE EINDHOVEN AIRPORT**

MORE INFORMATION: MICHEL.BOUTZ@SGS.COM OR BAS.BRUISSLOT@SGS.COM

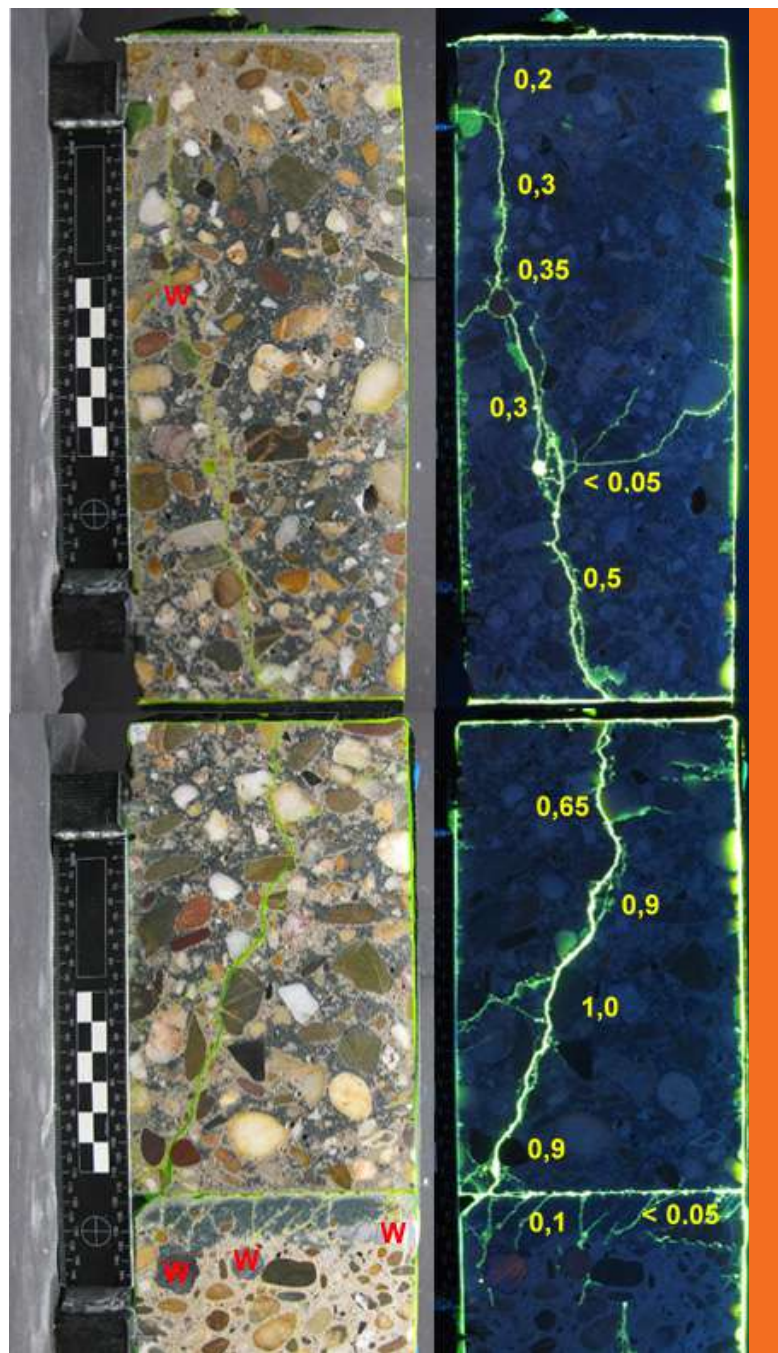
On October 18, 2018, the report "Building construction safety" was published by the Dutch Safety Board, an independent authority that investigates the cause of disasters and major accidents in the Netherlands on its own initiative. The report contains lessons from the collapse of the Eindhoven Airport parking garage and is based on extensive research. SGS INTRON was one of the two external parties that supported the Dutch Safety Board in this process. Due to our specific expertise in the field of concrete, we took responsibility for the material part of the research.

DID POURING CONCRETE AT LOW TEMPERATURES AFFECT THE STRENGTH?

"It was the fourth floor of the parking garage that collapsed on May 27, 2017," says project manager and senior consultant Michel Boutz of SGS INTRON. "It was very lucky that no people were killed. Earlier that day, people had still been working on the top floor. The floors consisted of two parts: prefabricated concrete bottom plate with a reinforcement mesh containing hollow plastic balls for the in situ cast concrete top layer. This top layer was poured at the end of January/ beginning of February 2017, when temperatures were around freezing. One of the Dutch Safety Board's questions that we answered was: did these cold conditions lead to insufficient strength development of the floor? Was it strong enough at the time of loosening the temporary supports?"

SIMULATION OF HEAT AND STRENGTH DEVELOPMENT IN THE FLOOR

"To be able to investigate this, we made a digital 3D model of the floor. We simulated the heat and strength development in the top layer under the prevailing ambient conditions at the time. The Dutch Safety Board ensured that we received the design and raw materials of the relevant concrete mix from the concrete supplier, so that we could determine the concrete properties that we needed in the simulation in our laboratory. With the model and associated software, we were able to determine that the floor had reached the required strength despite the low temperature during the hardening process, and that this was not the cause of the collapse".



INVESTIGATION OF COLLAPSED FLOORS

In addition, SGS INTRON also examined two parts cut out of the collapsed fourth floor for the Dutch Safety Board. "The investigations that the contractor and Eindhoven Airport had carried out shortly after the collapse did not include on-site inspections", says Michel Boutz. "It was not possible to enter the parking garage, for fear of further collapse of the building. When it was decided to demolish the building, the Dutch Safety Board took the opportunity to inspect the construction site under the supervision of the demolition company. On both sides of the seam between the two front floor sections, where the collapse began, two large sections were cut out. They were brought to SGS INTRON for material research. We looked at the concrete quality, mapped the cracks and determined the strength and stiffness of the slabs. Moreover, we investigated the adhesion between the top layer and the bottom layer, which was an important weakening factor in relation to the cause of the collapse." The Dutch Safety Board concluded in its report: the floor has collapsed due to a vulnerable floor design, the bulb plates having been rotated a quarter turn compared to what is common practice. Due to the too short joint reinforcement, the floor collapsed at the point with the largest momentum.

INTERESTING CLIENT

"It was interesting to work for a client like the Dutch Safety Board", says Michel Boutz. "It's a body with authority that is very thorough and transparent. The objective was not only to find out the cause of the accident. It was important to find out: how is it possible that, after previous major accidents in the Netherlands, something like this still happens? The Dutch Safety Board has seized on the collapse at Eindhoven Airport to show what is structurally going wrong in construction. The recommendations in the report must ensure that such calamities can no longer occur in the future." The full report, with the technical investigation in the appendix, can be found at:

www.onderzoeksraad.nl.





THROUGH PRINTED CONCRETE, BRUIL FOCUSES ON **SHAPE** **VARIATIONS IN FACADES**

MORE INFORMATION: GERT VAN DER WEGEN
GERT.VANDERWEGEN@SGS.COM

During the construction crisis, Bruil was the first concrete producer in the Netherlands to start using 3D concrete printing. “A moonshot”, Market & Innovation Manager Theo Voogd says, looking back on that strategic choice. “Our innovation has the greatest uncertainty, but also potentially with the greatest impact.” More than three years later, with the help of SGS INTRON, Bruil has demonstrated that it can produce high-quality printed concrete. “We are now investing in the first production line. There is even a prospect of a large project that perfectly matches our ambition: making design freedom in facades possible and affordable.”

FACADE WITH UNIQUE ELEMENTS

The project that Bruil is referring to is an apartment complex that will be given a completely new facade and identity with a few hundred printed prefab elements. “A wonderful example of what is possible with this innovative technology”, says Theo Voogd. “The now rather boring building is being provided with an attractive new facade, with a wide variety of shapes. The design contains more than a hundred differently shaped elements. Without 3D concrete printing, its execution would be too expensive because a separate mould would have to be made for each unique element. With the concrete printer, different forms are just a matter of adjusting the digital design, making challenging structures and shapes affordable”.

MORE DESIGN FREEDOM FOR ARCHITECTS

“Printed concrete can add value, especially in facades”, Theo Voogd knows. That is why Bruil focuses primarily on architectural applications. “Currently, architects are mostly tied to the standard systems available. With our new technology we give them much more freedom during the creation of their design”. “But the possibilities are of

course not infinite”, warns Research & Development Manager Benno van Dijk. “We are far from fully developed. But thanks to the tests that SGS INTRON has carried out for us, we are confident about the future of this innovation”.

INDEPENDENT PROOF OF QUALITY

Benno van Dijk: “What we make must be and remain is safe, sustainable and of high quality. To prove that to potential clients, we have asked SGS INTRON to thoroughly test the printed concrete that we have developed. We were happy to use their expertise, because everything about this product was new. We had to know what relevant tests did we have to do outside of the standard concrete tests? Ultimately, SGS INTRON performed tests on printed test specimens of various compositions for four months, with and without fibres, with a variety of printing speeds”.

EXCELLENT PERFORMANCE

“Among other things, we tested the Bruil specimens for strength, adhesion between layers and the effects of changing weather conditions”, explains Gert van der Wegen of SGS INTRON. “It turned out to be a very high quality product. The concrete printed by Bruil is resistant to weather, wind and frost, even when using de-icing salts. Readings have been achieved in this area that are not even feasible with conventional concrete. The impact resistance of the printed test specimens was also excellent, comparable to that of ceramic tiles. Moreover, using microscopic examination, the interface between the printed layers was no longer visible, which means that it had really become a single unit”.

ONWARDS TO PRINTED CONCRETE 2.0

“Naturally, we were very happy with those results”, says Benno van Dijk. “It was the impetus to start investing

in production capacity. But the report from an externally renowned party such as SGS INTRON has also definitely contributed to the fact that we now have a chance to win a major project such as the apartment complex. We have a reliable, sustainable product with which we can serve the market. But ultimately we want to go to a higher level, to printed concrete 2.0. We want to understand and control the printing process even better and we are looking for even more printing freedom. Shrinkage and creep are also points for attention. When drying out, the material shrinks more than traditional concrete, due to the high cement content in the printing mortar. Because we know exactly how much shrinkage there is, the manufacturer can take this into account. But for us it was an improvement point that we have since managed to address. We keep trying and optimizing, so that we can always take another step forwards”.

ON A NEW PATH, WITHIN THE REGULATIONS

The test results of printed concrete with fibres, for example, were promising. “But if you add these, you also introduce new difficulties into the process”, says Benno van Dijk. “Not only the mortar, but many other factors determine the print quality. That is our challenge. Given the collaboration that we now have with SGS INTRON, I expect that we will certainly involve them in further developments. Just like us, they are enthusiastic, open to new developments of this kind and eager to contribute ideas. In addition, SGS INTRON has all the equipment needed to test our material and extensive knowledge, including relevant regulations. When developing a new technology, you should not limit yourself. But in the end, we don’t achieve anything if we cannot comply with the regulations. Together with SGS INTRON, we can work very constructively in that field of tension: looking for innovative solutions and ultimately ensuring they will be accepted within the regulations.”

WHAT SHOULD WE DO ABOUT THE DUTCH QUALITY ASSURANCE ACT FOR CONSTRUCTION?

MORE INFORMATION: JAN-WILLEM GROOT
JAN-WILLEM.GROOT@SGS.COM

In this article, we will deal with the Dutch Quality Assurance Act for construction. Because many readers of this bulletin are suppliers of building materials, we mainly focus on the impact of the Act on them. These are mainly related to a verifiable demonstration of the quality of building materials to a contractor.

WHAT IS THE QUALITY ASSURANCE ACT ABOUT?

The key points in the Quality Assurance Act are:

- Assessment against Dutch Building Decree 2012 for new constructions and renovation in the authorization by the competent authority, often a municipality, expires. This is the most radical change.
- The competent authority checks whether a contractor works using an approved quality assurance method. This is in fact replacing the municipal assessment of the construction application.
- Private parties develop quality assurance methods to ensure that contractors adhere to the structural requirements of Building Decree 2012. In principle, the number of quality assurance methods is unlimited.
- An independent public admission organization considers whether a proposed quality assurance method meets the requirements.

Initially, low-risk constructions (Consequence Class 1, housing and small offices) will be covered by the statutory system. The law therefore focuses mainly on contractors and within them specifically on contractors in the construction and civil engineering who create housing and small offices.

WHEN IS THE QUALITY ASSURANCE ACT COMING INTO EFFECT?

Since the beginning of this century, there has been discussion about better methods of quality assurance in construction, utilizing some form of private quality assurance. Reform of the current Act has stalled since the most recent cabinet formation. The government has stipulated that the Act will come into effect together with the Dutch Environmental Act as from January 1, 2021.

WHAT ARE THE EFFECTS ON SUPPLIERS?

A number of quality assurance methods have already been developed by the market, such as the KOMO-KIK system and the Housing Guarantee Quality Assurance Instrument (WKI). In the trade journals, it is mainly the consequences for contractors that are highlighted. This is understandable, because the methods focus on the (certified) construction process of the Construction and Civil Engineering contractor. A large range of construction products is available for use by contractors. A number of these products is provided with a product certificate. There are also a number of processes, such as roofing, that can be certified. However, there will be no 100% certificate coverage. Therefore, we need to see if it is a problem if one or more products or processes are not certified.

DOES THIS MEAN THAT ALL CONSTRUCTION PROCESSES, CONSTRUCTION PRODUCTS AND RAW MATERIALS MUST BE CERTIFIED?

For suppliers, there are no particular requirements in the Quality Assurance Act. In any case, there is no obligation to certify the individual parts of the construction process. The starting point for the Act is the contractor.

The quality assurance methods are tailored to a specific field of application. In principle, the KOMO-KIK system focuses on all consequence classes, not only on the consequence Class 1 for which the law initially applies. Within this method, the potential risks of a project are indexed, and a quality assurance strategy is used as a base. People choose the processes, products, suppliers and the corresponding level of supervision, by quality guarantor and/or the competent authority, that is required. In short: the higher the guarantee by the contractor,



for example by certification, the lower the supervision. Certification therefore plays an important role. How certified or non-certified products relate to each other within the method is still being worked out.

The Housing Guarantee Quality Assurance Instrument (WKI) focuses more specifically on the Housing industry (Consequence Class 1) than KOMO-KIK. It focuses on the working methods and the recording of the quality of the contractor.

In short: For Consequence Class 1 (housing and small offices) there is, from the quality assurance methods of the contractor, no absolute necessity to certify construction raw materials, products and processes. However, measuring and demonstrating the quality of construction raw materials to the contractor will start to play a bigger role.

WHY THEN APPROVE AND CERTIFY?

There are a few substantial changes in the relationship of the contractor to his client in the Quality Assurance Act:

- There is a duty of information to consumers about whether, and if so, how the builder is insured or secured
- The definition of the hidden defect is adapted to the benefit of the consumer, so that the builder can be held liable more quickly

It could be argued that the main contractor's private liability is increasing. For the Construction and Civil Engineering contractor it is therefore of greater importance to "hedge" the quality of its subcontractors and the materials used. It is precisely in this guarantee that certificates and external tests of building raw materials and products can play an important role.





MORE STRUCTURAL PROBLEMS WITH PARKING GARAGES

MORE INFORMATION: MAARTEN SWINKELS
MAARTEN.SWINKELS@SGS.COM

In the Netherlands, a lot has been written lately about the structural (un)safety of parking garages. The reason for all this attention was the collapse of the parking garage at Eindhoven Airport, caused by the construction of the wide slab floors. This led to many questions about the safety of parking garages, where the focus was on much more than just the problems with wide slab floors.

TOO LITTLE ATTENTION PAID TO PARKING GARAGE CONSTRUCTIONS

It is not surprising that these problems first became apparent at a parking garage. Parking garages have received less attention within the construction industry for a long time. Structures are squeezed because there is too little attention on quality and maintenance and the aim is to have a minimum price per metre. This increases the risks. In addition, maintenance of existing older parking garages leaves much to be desired, which adds a number of risks.

DE-ICING SALTS AND CONCRETE SELECTION LEAD TO CORROSION OF REINFORCEMENT

An underestimated part of parking garages is the corrosion of reinforcement and prestressing by de-icing salts. De-icing salts are present in even the furthest corners of parking garages. They are brought in by cars covered in residual snow with de-icer. The wrong environmental class is often selected when choosing concrete for parking garage constructions. As a result, the concrete quality is too low, the coverage is too small and the cracks are too large. The reinforcement steel will rust because of the too thin concrete coverage and too low concrete quality. This will take place over many years, but can lead to a large reduction in the cross-section of the essential reinforcement. Because maintenance is often delayed for a long time, dangerous situations can arise.

PROBLEMS WITH CRACKS AND COATINGS

In the short term, wide and especially continuous leaking cracks are more dangerous. In these cracks, the reinforcement corrodes faster, sometimes without visible damage, so that the entire bar can suffer from rust perforation.

Cracks are caused by carelessly executed monolith floors, by shrinkage or by the use of prefab parts. For example, floors from channel plates above the plate seams almost always show cracks and wide cracks are often visible above the beams and between the columns. These can be prevented by a heavily reinforced pressure layer, which is often not present. The cracks cause leaks and increase the risk of corrosion of reinforcement and prestressing. Afterwards, these leaks can only be stopped with expensive crack-bridging coatings. And even then the risk remains. Applying a coating does not stop the corrosion process; it is slowed down at best.

But the use of coatings in the wrong way can sometimes also lead to dangerous or unpleasant situations. Common problems are a slippery floor or a floor that cannot be cleaned.

FLOORING SYSTEMS WITH PRE-TENSION WITHOUT ADHESION

In the past, innovative flooring systems have been used at a large number of parking garages, and these have been found to cause problems for several years. This concerns floors with pre-tension without adhesion. The pre-tension sometimes breaks due to stress corrosion and the chuck heads loosen due to corrosion. There are many such garages in use, many of which have not been thoroughly investigated.

WHY THESE PROBLEMS AT PARKING GARAGES?

The issues described above more often cause problems in parking garages, compared to other buildings. Parking garages are exposed to all weathers and all floors get covered with water and salts. Enough reason to be extra critical when looking at new construction and existing parking garages. Following the current concern, attention should not be limited to a few floor systems, but should also take a critical look at all garages before a new calamity occurs.

SGS INTRON can offer support in such efforts. We offer a fast check on possible structural risks. If we identify risks, a more extensive investigation can be conducted in which we determine the cause and offer advice on recovery options. In addition, we can assist you in choosing the right coating systems, supervise the implementation of repairs and the application of coatings, and inspect the end product.



SGS INTRON Bulletin is a publication of
SGS INTRON BV
nl.intron@sgs.com
www.sgs.com/intron

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Dr. Nolenslaan 126
6136 GV Sittard
PO Box 5187, 6130 PD Sittard
The Netherlands
T +31 88 214 52 04 / F +31 88 214 46 09
Venusstraat 2
4105 JH Culemborg
PO Box 267, 4100 AG Culemborg
The Netherlands
T +31 88 214 51 00 / F +31 88 214 46 09

FINAL EDITING

Ulbert Hofstra and Gert van der Wegen

EDITORS

Piek tekst & PR, Paul Cartigny,
Suzanne Sideris, Vertaalbureau Perfect

DESIGN

SGS

WWW.SGS.COM

WHEN YOU NEED TO BE SURE

