

SGS

INTRON

BULLETIN

SEPTEMBER 2021

Collaboration on a range of innovative circular projects with Dutch Government

Discussion with three experts on safe construction

First recycled content declarations for manufacturers



SGS

Construction-Related Questions that are Crying Out for an Answer

A little disclaimer before we start: this column contains a lot of questions, and not very many answers. It's only fair to tell you this in advance. Maybe you'll have questions of your own, or maybe you're a person who can come up with answers. Either way, you're important – because we need one another to make progress.

Picture the scene: the year is 2035. For most of us, it should be easy to imagine 15 years into the future, when you will hopefully still be alive and in good health. Close your eyes and imagine your surroundings. Have you got it? Great, now here come my questions. How do you heat your home here, in the future? Do you use gas, hydrogen or electricity? And where does this energy come from? Land, sea or a faraway country? Is it generated by the sun or the wind, or from nuclear, wood or fossil sources? And while we're talking about your house – how are houses built these days? Is it all prefabricated modules and sustainable materials? Is concrete still permitted, or does wood dominate? Of course, geopolymers will probably have really taken off, and we'll have low carbon dioxide cements which we use to construct 3D printed buildings – or is that a step too far? Have we built enough new homes in the past few years that are both circular and suitable as homes for life? And what's the deal with recycling? Is this still a marginalized topic? Do we still think that the other 7 Rs are more important, and how have we managed our existing building stock over the past 15 years? By

recycling less and reusing more? Has all the microplastic been fished out of the oceans? And what's our nitrogen deposition like? I'm also curious to find out if we learned anything from all the collapses that we witnessed in the first 20 years of this century. Has the Dutch Safety Board been rendered obsolete? Is the Quality Assurance in Construction Projects Act still in force? And what about that mandatory inspection for existing buildings that we all thought was so essential?

As you can see, there are lots of challenges awaiting us over the next few years. It doesn't matter who is in government; what matters is the speed of these developments. I think that our course is already set. The materials and energy transition can't be stopped. Eventually, the ship will turn with the tide.

I think we should spend the next few years experimenting, innovating and working together – rather than in endless debating and finger-pointing. We can't predict the future, but we can shape the future we want. We can make the best of what we have – because future generations deserve a decent living environment too.

COLUMN



RON LEPPERS



Rijkswaterstaat
Ministry of Infrastructure
and Water Management

Dutch Directorate-General for Public Works and Water Management Stimulates Circular and Climate-Neutral Construction with Innovative Projects

The Dutch Directorate-General for Public Works and Water Management and SGS INTRON are collaborating on a range of innovative circular projects. In this series of articles, we share what these projects are about and show that circular infrastructure developments and a reduction in CO₂ emissions go hand in hand for a sustainable future.

Photo credits: Jeroen Berends / Revolte Studio

The Dutch Directorate-General for Public Works and Water Management has great ambitions for circularity and CO₂ reductions. "Our goal is to achieve 100% climate neutrality and circularity in all infrastructural project tenders by 2030," explains innovation manager Eize Drenth. "For concrete, we've committed to a 49% CO₂ reduction by 2030 in the Dutch Concrete Agreement, even though the target is only 30%. We're going to do everything we can to meet these goals, with the help of the innovation budget we've been awarded from the government's Klimaatenvolop initiative."

Leading the way as the first client

The Directorate-General is keen to help the industry move closer to these targets by encouraging market players to come up with innovative proposals and by giving these market players opportunities in projects. "The market won't manage this transition on its own," says Eize Drenth. "It simply doesn't have the resources. And circularity is quite an abstract concept for most people. What does circularity actually mean? And what do we need to do to really make that transition to

circular and climate-neutral ways of working and building?" To tackle these challenges, the Directorate-General is assuming the role of 'launching customer', and will be the first client to procure circular and environmentally friendly innovations.

Investing in innovations and procurement frameworks

"In practice, this means that we will be investing millions of euros from the Klimaatenvolop in pioneering



Photo credits: Hans de Vries, FWS GPO

projects and pilots that will help us gain experience with new circular or CO₂-saving materials, products and techniques,” explains Eize Drenth. We’re investing in technology and looking at what is technically possible and feasible. We are also creating procurement frameworks, such as procurement protocols that state what information a contractor must obtain to reuse materials in the best possible way following a demolition project. This is a really important element, since this is what shows the market how circularity and climate neutrality can be used as models that generate revenue.”

Criteria first

“We like to achieve our objectives in projects,” Eize Drenth continues. “We work closely with the technical departments at the Directorate-General as well as with independent experts like the team from SGS INTRON. If we want to make our operations fully circular and climate-neutral, a procurement strategy alone won’t be enough. We also need technical expertise to verify the relevance and technical feasibility of innovative proposals. We started by formulating criteria: what is climate-

neutral and what is circular, and how do we plan to manage projects so that we achieve these things? SGS INTRON helped us with that process, including by developing the Circularity Index, which is a score for circularity. Read more on page 7. We’re now gaining experience in using this index in a wide range of projects. We’re working with existing tools, such as the results we’ve generated through the circular construction platform CB’23, and are quickly identifying what is relevant to us by applying it in our pilots and projects.”

Projects that get people talking

One of the organization’s unique – and very important – projects is the Afsluitdijk concrete mix pilot, which is discussed in more detail on page 5. “There are many other projects that are also getting a lot of attention,” says Eize Drenth enthusiastically. “We’ve got one pilot with TNO, the Netherlands Organization for Applied Scientific Research, where geopolymers cement – which has a significantly smaller CO₂ footprint – has been used in surfaces such as paving stones. In another

geopolymer concrete pilot, we’re working with the contractor Mobilis, who used a reinforced version of this concrete in a subway under a rail track. SGS INTRON took care of all the monitoring tasks and environmental cost assessment for this project. They are also involved in another key project looking at an innovative concrete demolition technique. We want to encourage the use of this technique because it can be used to reclaim sand, fine gravel, some of the cement and even the finest fraction of the material, the filler – all of which can then be reused. This brings us closer

**EIZE DRENTH**



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Groundbreaking Concrete Pilot at Afsluitdijk

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Usually, it takes years of development and seemingly endless laboratory testing before any new innovation is ready for market rollout and application on a wider scale. But what if you want to accelerate that process to meet ambitious CO₂ reduction and circularity targets? Simple: you go directly to the source of promising innovations and give them the chance to prove themselves in a major project – before they've completed the traditional development trajectory. This is exactly what the Dutch Directorate-General for Public Works and Water Management is doing in the Afsluitdijk dam pilot, where large 'Levvel blocs' made of thirteen innovative concrete mixes are being installed on the main dam for at least ten years. In this fascinating and unique project, the Directorate General is relying on the expertise of SGS INTRON.

Making concrete more sustainable

Innovation manager Eize Drenth from the Directorate-General explains why the Afsluitdijk pilot is so important: "Of all the construction materials out there, concrete has the largest environmental impact and the greatest effect on circularity. This is primarily because of the cement component; cement is linked to very high CO₂ emissions. Concrete is the most frequently used construction material in the world, and it's responsible for around seven percent of all CO₂ emissions. In order to meet our target of 100% circularity and climate neutrality by 2030, we need to make concrete more sustainable. That's what this project is all about."

Supervising production and ten years of monitoring

The Directorate-General is financing the Afsluitdijk pilot from the Klimaatenvolop budget (which is discussed in more detail in another article in this bulletin). SGS INTRON was asked to supervise the production of the Levvel blocs and to monitor and inspect them for a period of ten years once they were installed on the Afsluitdijk. "We want to have an independent expert by our side in this process," explains Eize Drenth. "We needed a partner with a lot of knowledge and experience. We found what we were looking for in SGS INTRON, and specifically in senior consultant Gert van der Wegen, who is doing a fantastic job of helping us."



HANS DE VRIES



Foto's Jeroen Berends / Revolte Studio



Important role for SGS INTRON

Hans de Vries, a technical specialist for concrete constructions and materials from the Directorate-General's major projects and maintenance department, agrees: "SGS INTRON is adding a huge amount of value to this project with their knowledge of concrete and life cycle analyses (LCAs). But also because they're taking care of many aspects of the project on our behalf. Inspecting and monitoring bloc production, for example, is quite a major task. Right now (in March), the supplier is producing two or three 2.5 cubic-meter Levvel blocs a week with a single mold using a number of different formulas, some of which are brand new. This is all happening at a permanent site in Zaandam, with the pilot participants, the concrete engineers on site and the SGS INTRON experts all working together."

From conservative to experimental

The concrete mixes used for the blocs vary from conservative – for the reference mixes – to extremely innovative.

"We selected the five reference mixes," says Hans de Vries. "These are mixes made of 100% Portland cement and mixes with a normal to very high level of furnace slag as a binding agent. We also have mixes that are innovative because they are made from reused raw materials: sand, gravel and cement from concrete rubble that we can reuse in concrete thanks to an innovative demolition technique. Our second series of concrete mixes is innovative because they use different raw materials: they

contain geopolymers (inorganic binding agents) or are made with fly ash (from coal-fired power stations) and/or furnace slag as a replacement for cement. We already use these mixtures regularly in the Netherlands, but we still need more evidence of their service life. Finally, we are also using some concrete mixes with raw materials that are still very experimental and that only just meet our requirements for technical readiness level 6. This includes mixes with calcined clay and other, non-furnace slags to replace part of the cement content."

Minimum requirements for durability

The parties participating in the Afsluitdijk pilot were required to demonstrate that their concrete met or exceeded the performance standards that apply to the regular blocs. "The most important parameter is density," says Hans de Vries. "These Levvel blocs are exposed to the same forces and conditions as other Levvel blocs in the main dam. They need to weigh around 6,000 kg and must be able to cope with the aggressive conditions they will encounter on the Afsluitdijk. The most innovative participants conducted all kinds of last-minute tests to show that they could meet our requirements for durability and service life."

Easy access for inspection

The team was aiming to have all 32 Levvel blocs for the pilot – two for each mix – ready by the start of April, so that they could be left to cure for a month

before being installed on the Afsluitdijk in early May. The pilot location is easily accessible to facilitate SGS INTRON's annual inspections. Every other year, SGS INTRON will also drill into the blocs to take samples for testing in the laboratory. "We want to track how the compressive strength changes over time and to what extent CO₂ and chlorides penetrate the material; if they get in, they could cause the reinforcement to corrode," explains Hans de Vries. "We've decided to monitor the blocs for ten years," adds Eize Drenth. "This will allow us to prove that the innovative concretes can also withstand the elements, so we can be confident of their durability."

Monitoring period of at least ten years

"Ten years is the minimum monitoring period," says Hans de Vries. "Concrete damage usually occurs over a long period of time, and this is certainly true when the conditions are mild. This is why we looked for an area where the concrete would be exposed to frost, salt and both wet and dry conditions. In these conditions, ten years should be enough for us to separate the wheat from the chaff. Innovative concretes that perform well on the Afsluitdijk and that maintain this performance over time will also be able to cope with milder conditions, so there will also be opportunities to use them in other projects, such as bridges and viaducts – perhaps even within the next ten years."



Rijkswaterstaat
Ministry of Infrastructure
and Water Management

Procurement Protocol for Concrete: What Information is Required for Recycling?

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By 2030, the Dutch Directorate-General for Public Works and Water Management wants to operate with fully climate-neutral and circular processes. To enable the organization to reuse and recycle as much construction material as possible in the future, the teams working on the construction projects of today must maintain records of what materials are used and where. The material and building passport provides a framework for recording this information, and Dutch organization Platform CB'23 is currently conducting pilots on the use of passports in the construction industry. But what information actually needs to be included in a building passport? What does a client or purchaser need to ask a concrete supplier to ensure that concrete used now can be reused in the most efficient way in fifty years' time? On behalf of the Directorate-General, SGS INTRON set out to answer these questions and has summarized its findings in a set of 'Purchasing protocol guidelines'.

Input from the entire circular construction chain

SGS INTRON consultants Agnes Schuurmans and Gert van der Wegen compiled the procurement protocol for the Directorate-General. "Our work is

helping to flesh out the requirements for the material passport for concrete," says Agnes. "What's new about our approach is the fact that we've involved the entire circular construction chain: not just the concrete manufacturers but also the parties who are going to have to process this concrete in the future – the recyclers and demolition contractors.

We've had detailed discussions with these parties, too, because it makes no sense to compile meticulous records about which concrete has been used and where if you can't separate those types of concrete for recycling when the building is demolished."

Focus on the best possible recycling result

When working out what information a concrete supplier needs to provide, SGS INTRON focused on recycling the material in the best possible way. "To recycle old concrete effectively and turn it into raw material for new concrete, you need a lot of data," explains Agnes. "This includes the environmental category, the type of cement and cement content, the composition of the binding agent and any aggregates, fillers and fibers used in the mix. The contractor also needs to provide a 'handover file' that describes where each type of concrete or concrete building product has been used during construction. We thought carefully about

which pieces of information would be really necessary and useful. We didn't want the protocol to create unnecessary extra work."

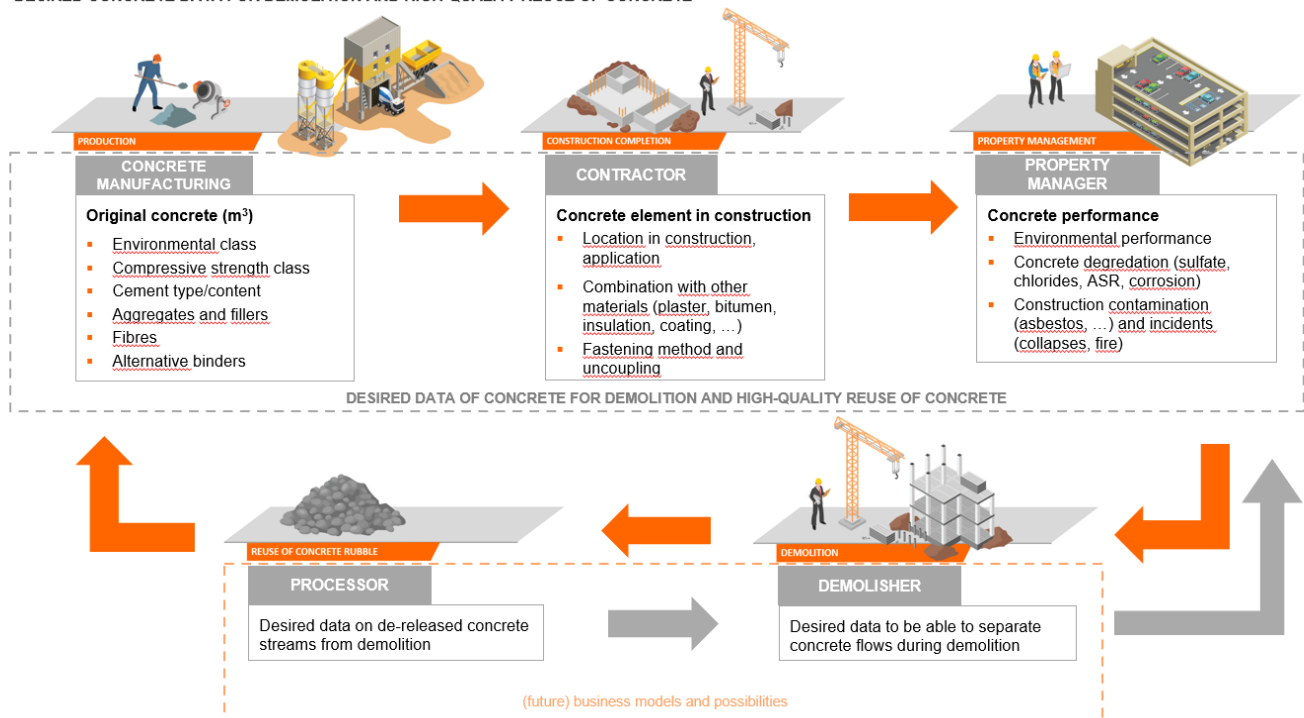
Alignment with material passport initiatives

In spite of this careful consideration, it will take some time for all parties involved to get used to working in this way. The protocol asks for all kinds of data that concrete suppliers don't currently provide as standard, some of which may be confidential. Contractors aren't used to precisely recording exactly what materials they have used and where. However, all signs suggest that this is where we are headed; the new

Dutch Quality Assurance in Construction Projects Act also requires contractors to complete a handover file. The SGS INTRON procurement protocol requires the same information as this handover file; the protocol has been designed to align with existing initiatives, like the material passport. In the near future, the Directorate-General is keen to raise awareness of the protocol and promote discussion of the initiative in the wider market. The organization hopes to drum up support for the change and to encourage market players to consider how their companies could adapt their revenue models for a circular economy. The procurement protocol may also be put to the test in pilot projects to see how workable and feasible the idea is in practice.

Circular construction chain for high-quality reuse of concrete

DESIRED CONCRETE DATA FOR DEMOLITION AND HIGH-QUALITY REUSE OF CONCRETE



Roof Material Fire testing For $B_{\text{roof}}(t1)$ Classification Now Available in In-House Laboratory

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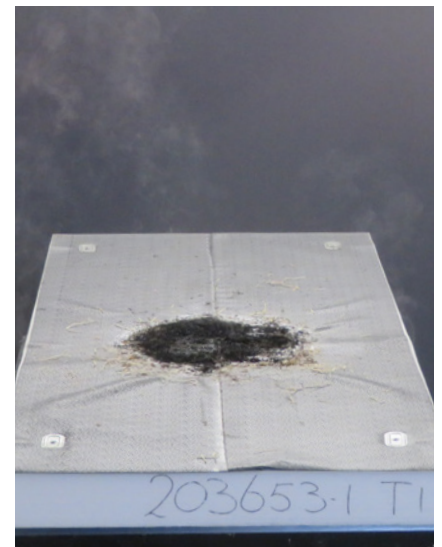
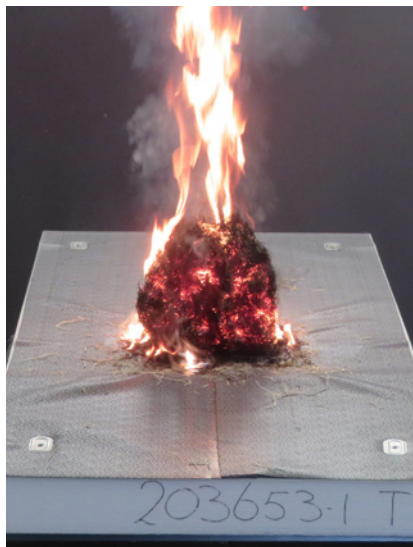
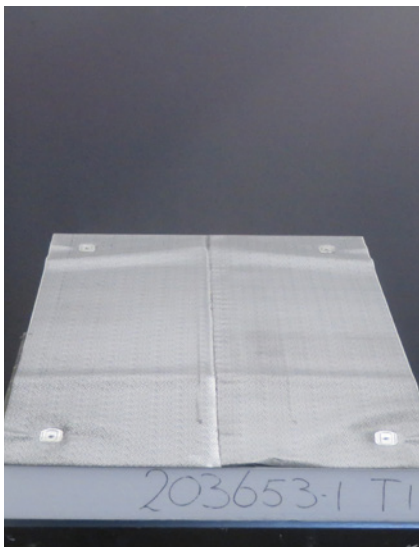
Our material laboratory performs a range of tests on roof materials, including bitumen, plastic and rubber sheeting, insulation materials and films. We recently added roof material fire testing for $B_{\text{roof}}(t1)$ classification to our portfolio of in-house tests. As we can now conduct these tests in our own laboratory, we can provide results even faster.

Fire safety is an incredibly important consideration during the construction of any part of any building, including the building envelope. The fire tests that we conduct on roof materials form part of the KOMO® certificate and product certificate for BRL 1511 – Lane-shaped

roofing systems. This certificate refers to NEN 6063 – Test method for external fire exposure to roofs, which uses NPR 1187 Methods for determining the performance of roofs to external fire exposure.

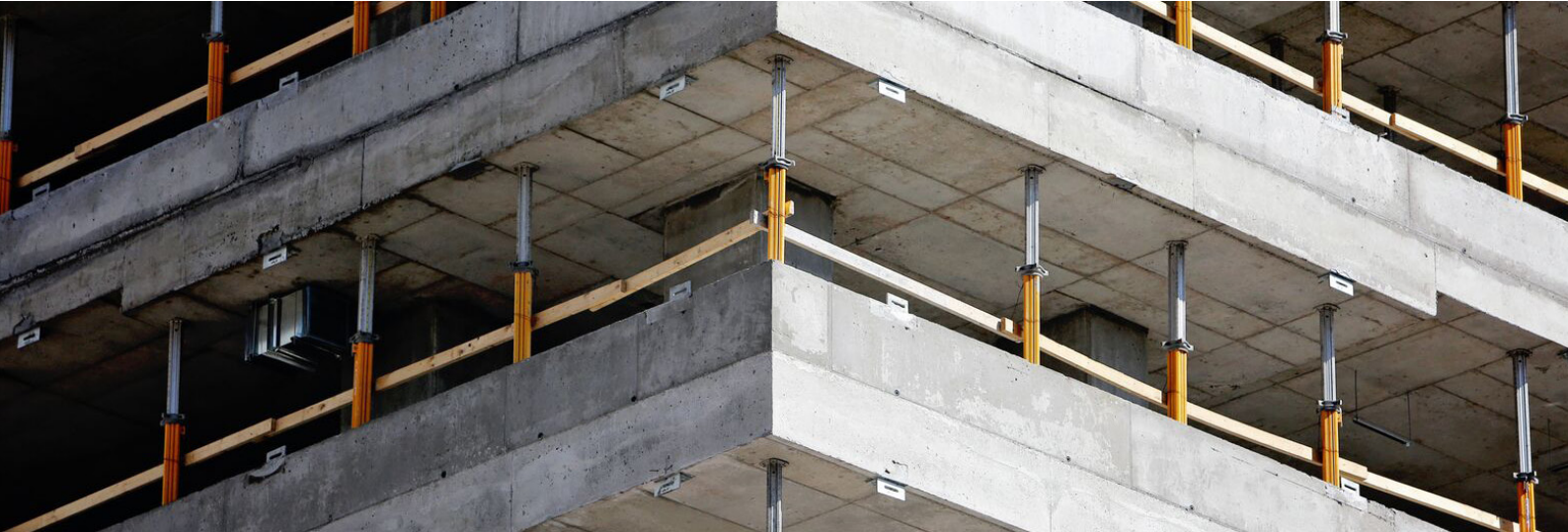
In the fire test required by this standard, the material must prevent the

development of secondary fires on the roof by preventing holes in the roof seal or by preventing fire from spreading across the roof surface. If the result of the test is positive, the material is awarded $B_{\text{roof}}(t1)$ classification.



Three experts on safe construction:

“Regular inspections could prevent collapses”



From time to time, we see or hear reports that part of a building has collapsed. But why does this still happen in the Netherlands today? We're all familiar with some of the more well-known cases: the balconies in Maastricht (2003), the car park beneath the Bos en Lommerplein square (2006), the walkways at the Antillenflat apartment building in Leeuwarden (2011), the under-construction car park at Eindhoven Airport (2017) and the roof of AZ Alkmaar's home stadium (2019). Each incident is followed up with a thorough technical investigation, often involving the Dutch Safety Board. We're learning from mistakes we've made – but this doesn't seem to be enough. How can we prevent these kinds of incidents from happening in the future? We organized a constructive discussion with SGS INTRON director Ron Leppers, VNconstructeurs director Bob Gieskens and Rudi Roijackers, the ABT senior advisor who compiled the protocol for the 'Assessment of the construction safety of stadiums for ticketed football matches'.

Buildings don't just collapse

Ron Leppers kicks off the conversation: "As professionals, we think that something really needs to be done about this issue. "SGS INTRON has been investigating building damage for over thirty years. We investigated many of the examples we've already mentioned. We're astounded that we keep coming across the same construction errors. We can also see that when major issues arise, the building often deviates from the initial calculations and specifications in the architectural plans. When you realize that, you know that more problems are in the pipeline. And we have a duty to try and prevent these problems."

Socially responsible building

"Those observations tie in with our mission as a professional association," Bob Gieskens responds. "Our strategy for the next few years focuses on 'socially responsible buildings'. For a building to be socially responsible, it has to be safe. But it also has to be built at the lowest possible cost to society and the client, and allow the party constructing it to make a fair return in a sustainable way."

Fragmented responsibility

"As a professional group and as individual companies, we are responsible for ensuring that buildings are safe," says Rudi Roijackers in agreement. "And when we construct new buildings, we mustn't create problems for future generations. In recent decades, construction work has become extremely fragmented. Rather than two or three parties, you can now have twenty contractors working together to construct a safe building."

I think there's a lot to be gained from placing that responsibility back into the hands of a smaller number of parties. Clarifying the role of the new-style construction coordinator is already an important impetus and step in the right direction. The process – working together to do things properly – has a huge impact on the final quality of the build. But unfortunately this has not yet been incorporated into the new Dutch Quality Assurance in Construction Projects Act (Wkb)."

Quality Assurance in Construction Projects Act: A final safeguard for new buildings

"The Quality Assurance in Construction Projects Act, which comes into force on January 1, 2022, is a kind of final safeguard," explains Bob Gieskens. "The Act prescribes a number of checks that have to be carried out, primarily during the construction process itself, to ensure that the new building is constructed in line with the plans. This by no means guarantees that the building will be of good quality. But it does significantly reduce the risk of major incidents."

Mandatory inspections for swimming pools and walkways work

"In the new-build sector – the building stock of the future – the processes are already significantly better and complete construction files exist for every building. All future modifications to an existing building covered by the Wkb give us greater assurances about any changes to that building. But that still leaves the majority of building stock out of the picture," says Ron Leppers. "We don't know enough about lots of properties. Building owners are, of course, responsible for maintaining their property and checking for damage. But not everyone can or will do that, even though the consequences of a building collapse can cause major issues for business continuity, as we saw with the heavy snowfall in February. This is why I would support regulations in this area, like the ones that we already have for swimming pools and walkways. In these areas, mandatory inspections lead to significant improvements."



RON LEPPERS



BOB GIESKENS



RUDI ROIJACKERS

Mandatory inspections for large public buildings

"It's important that we start where the risks (probability x consequence) are the greatest," says Rudi Roijackers. "In large public buildings like stadiums and concert halls, there can be serious consequences if something goes wrong. For these kinds of buildings – category CC3 public buildings – we are taking the first steps toward implementing mandatory statutory inspections. The Dutch Minister of the Interior has already indicated a desire to move in this direction, based on the recommendations of the Dutch Safety Board."

Make inspection tools available to all building owners

"This is a great development," agrees Bob Gieskens. "We've been campaigning for regular mandatory inspections in high-risk buildings for years. The Minister has also responded positively to the Safety Board's recommendation of issuing guidance for these regular inspections to building owners before the legislation comes into force. She also supports the development of a Dutch Technical Agreement (NTA) by standardization institute NEN, which would state how building inspections should be conducted. The protocol on the 'Assessment of the construction safety of stadiums for ticketed football matches' may be used as an example. Without the NTA, which is an excellent tool, there is no point in implementing legislation. I agree with the Safety Board that it would be a good idea to promote this tool to all building owners, even those whose buildings will not be covered by the new obligations."

Start where the risks are greatest

"I completely agree," responds Ron Leppers. "But in the longer term, it would be great if the mandatory statutory inspections also applied to CC2 buildings such as offices, apartment blocks, schools and libraries. Research has shown that issues often arise in these kinds of buildings too." Rudi Roijackers agrees: "The consequences of a problem in these kinds of buildings might not be as serious as those in a large stadium. But there are a lot more of these buildings in the country, and it's possible that they aren't looked after quite as well. Making all buildings subject to mandatory inspection laws isn't feasible or sensible. We should prioritize buildings where the risks are greatest: CC3 buildings and other types of buildings that are known to be problematic, like swimming pools, projecting balconies and concrete slab flooring. And we should also make sure that the inspection tool is suitable for and available to everyone. This will enable building owners to inspect their own buildings and they can then consult an expert for advice if they spot that something might be amiss."

Learning from mistakes

"That would be a good start," say Ron Leppers and Bob Gieskens. The discussion has brought the three experts closer together and given them some important new insights. There's a lot more to learn from collapses, near-collapses, identified issues and from one another: "By being more open and sharing our knowledge, we can uncover new opportunities to do things better."

Purified Metal Company Turns Hazardous Scrap Steel Into Clean Raw Material

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Purified Metal Company's new recycling plant produces steel with 75 percent less energy and CO₂ – as well as reusing large amounts of otherwise unusable steel waste. Its environmental efforts caught the attention of Dutch King Willem Alexander, who personally opened the Delfzijl plant at the end of September. "We're the first company in the world to transform hazardous steel waste into a clean, premium raw material for the steel industry in an environmentally friendly way," says CEO Jan Henk Wijma enthusiastically. "And what's really special is that we do so cost-effectively: we're reducing the cost to society. The material we process no longer needs to end up in a landfill."



JAN HENK WIJMA

From landfill to reuse

As Wijma himself found out when he worked at a steel foundry, steel manufacturers are prohibited from processing scrap steel that is contaminated with hazardous substances such as asbestos, hexavalent chromium, mercury or lead. If the materials cannot be cleaned up, the only option is to send them to landfill. But Wijma wasn't happy with this solution; couldn't things be done differently? Together with his current team – initially just Nathalie van de Poel, who was later joined by Bert Bult – he secretly started to collect the pieces of the puzzle that would eventually form the solution. "We put together existing, tried-and-tested technologies to create a unique and fully automated process."

Export product

Wijma believes that his team is sitting on a gold mine. "Our process is an export product for the Netherlands. We've been able to secure patents in Europe, the US, Australia and Japan. Many western economies with strict environmental legislation are facing more or less the same problem as we are. In the past, steel has been used in combination with hazardous materials that seemed useful at the time, perhaps because they prevented corrosion or wear. When a building reaches the end of its useful life and that steel becomes scrap, we are left with a problem. Cleanups can cost a lot of money and if they fail, the material still needs to be disposed of. In the Netherlands alone, 60,000 to 80,000 tons of steel and asbestos are sent to landfill each year. The volumes are even larger in larger economies; Germany, for example, has eight times as much of this type of waste to dispose of."



100% clean

When designing a plant that could process scrap steel with asbestos, Wijma and his team knew that the steel could also contain other contaminants such as hexavalent chromium, mercury or lead. "This is a common occurrence. Our plant is designed to remove all contaminants. Heavy metals are separated from our product during the steel smelting process. In theory, the only thing that could be left over is asbestos. But the hazardous asbestos fibers also disappear: our process converts them into a non-hazardous mineral. We wanted to have this process certified by a well-known organization like SGS INTRON Certification to safeguard it."

Trustworthy certificate

For Purified Metal Company, the fact that SGS is a global player is an important factor. "To be regarded as credible in the market, you need to forge links with well-known organizations. SGS INTRON Certification has the expertise and quality that we needed." Before commissioning, a team of SGS INTRON Certification consultants visited the recycling factory. Detailed inspections were performed on each part of the process, including the area that is usually off-limits due to the hazardous substances present. The aim of these inspections was to determine the critical parameters that SGS INTRON Certification will use to assess the (asbestos-free) quality of the product and the process during audits. "We opened up everything to the inspectors," says Wijma. "We are only going to supply products that are free of asbestos, but we want this to be independently confirmed. During the site visit, the expertise of the SGS INTRON Certification consultants was evident. They were critical in a positive way; they asked questions, looked at everything carefully and didn't allow themselves to be fobbed off. Ultimately, their goal is to issue a certificate that can be trusted."

In demand

The Purified Metal Company plant primarily focuses on the Dutch market. "That's an important decision," says Wijma. "From 2021, the Netherlands is banning the disposal of asbestos-contaminated steel in landfills. As we can also process steel contaminated with other substances, such as hexavalent chromium, this can easily add up to 100,000 tons of scrap steel a year. We turn this steel into Purified Metal Blocks™ or PMBs. These blocks weigh in at a maximum of 10 kg and are a premium raw material that the steel industry can

use instead of iron ore to make new products, such as packaging steel or car components. We can produce 20-ton batches of material that are completely clean and homogeneous. What's more, the blocks are compact for easy transport. All of these aspects help steel processing companies to reduce their emissions at source, which means that our product is very much in demand." There has also been a great deal of interest in the process. "We've already taken a few thousand tons of scrap steel from Belgium, Germany and Greece. I think we need more plants like this all over the world."



"SGS INTRON Certification will help us to prove that our products are completely free of asbestos fibers"

SGS INTRON Helps First Manufacturers With Recycled Content Declaration

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The concepts of circularity and material reuse are being heavily promoted in all sectors, including construction. In fact, the Dutch Directorate-General for Public Works and Water Management and the Central Government Real Estate Agency are aiming to be fully circular by 2030 – so circularity is increasingly giving contractors a decisive advantage in tender procedures. But what exactly is circularity? And how can producers of construction materials demonstrate their contribution to circularity? Business development sustainability manager Agnes Schuurmans set out to answer these questions – and developed the system that SGS INTRON Certification recently used to issue the first Recycled Content Declarations to manufacturers Soudal and UNILIN.

Consulting with Italian colleagues

“Circularity is a very broad topic,” says Agnes Schuurmans. “I looked at which elements would lend themselves to certification. As we’re experts in materials, verification of material composition was the most obvious answer. In Italy, there is a legal requirement to issue a declaration stating the amount of recycled material in construction products. I had discussed this topic with our Italian SGS colleagues in the past. And SGS INTRON Certification issued a similar declaration to one of its customers, an aluminum company, back in 2013. So when Belgian manufacturer Soudal was looking for an independent party to confirm the increased recycled material content in its products, SGS INTRON Certification was able to assist immediately and develop a new certification protocol.”

In line with global standards

The Italian version was used as the starting point for the new protocol. “We looked closely at how the protocol was structured,” explains Agnes. “Just like the Italian version, our protocol is based on ISO standard 14021, which is the global standard for these kinds of environmental declarations. We’ve noticed that many of the companies that need a Recycled

Content Declaration are exporting to Italy. But we expect many more manufacturers to want independent certification in the very near future.”

Independent confirmation of claims

“If we want a circular economy, then we need to recycle a lot of material and also use that recycled material. The Recycled Content Declaration allows manufacturers to prove that they really do this, and that the percentage of recycled material that they claim is in the product is accurate. SGS INTRON verifies these claims using data on secondary raw material procurement and the production process.”

Soudal helps to shape circular solutions

For Soudal – a global leader in energy-efficient construction – sustainability has been on the strategic agenda for 30 years. “Under the motto of ‘Build The Future – Sustainability’, we want to help shape a smart future based on circular solutions. For example, Soudal’s R&D department has developed the first assembly adhesive made from upcycled post-industrial waste transformed into a top-quality product. The Recycled Content Declaration is visual proof of our contribution to circularity.”



SGS Assists With Dismantling of Thermphos Phosphorus Plant

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At the start of 2013, Thermphos in Vlissingen – the last phosphorus plant in Europe – was declared bankrupt. Contrary to initial expectations, the plant was never recommissioned, and dismantling the site was the only remaining option. Contractor Van Citters Beheer was tasked with performing the cleanup operation and was instructed to ensure that the large amounts of materials on the site – some of which were hazardous – were handled appropriately. If any material could not be sold or reused, the contractor would need to arrange for its safe disposal. “It was an enormous and challenging task,” says chemical and waste manager Willem Schipper from Van Citters Beheer, recalling the project. “But we’ve almost reached the finishing line.”



A challenge of huge proportions

The element phosphorus is produced by exposing phosphate ore to high levels of heat. “The chemical processes that occur in a phosphorus plant are comparable to those that take place in a furnace,” explains Willem Schipper. “Thermphos was a huge plant and it was decommissioned quite unexpectedly. As a result, the site was abandoned with tons of raw materials, half-finished products, finished products, byproducts and waste all over the place, including

inside the plant itself and across the hundreds of hectares of land. A lot of this material was slightly radioactive. Radioactivity is specific to phosphorus production: the raw material – phosphate ore – is naturally slightly radioactive, and this radioactivity builds up in certain process flows and parts of the plant. Phosphorus is also a spontaneous combustion risk, which was a challenge in itself when deciding how to tackle it safely. My role was to look at each flow of residual material separately to determine what our options were in each case.”



WILLEM SCHIPPER

Construction material, raw material or waste?

Naturally, this process involved a great deal of research and analysis. SGS was the only company in the Netherlands that could investigate and test the slightly radioactive material at the Thermphos site in the desired way. "We are familiar with the material and accredited for sampling and batch inspections in accordance with BRL SIKB 1000, plus we have our own radioactivity expert, Erik Malta," explains project manager Ulbert Hofstra. "He explained the required safety measures to our accredited samplers Mark Bakker and Robert Voncken, and told the team in our laboratory what they would need to do to ensure their safety when handling the radioactive material. Some of the materials at the Thermphos plant were analyzed on site to determine whether they were suitable for use as a raw material for concrete. The leftover phosphorus slag can be used as a bulk construction material, so we're conducting standard construction material tests on that. The batch inspections we're performing on the waste streams are highly comparable. These inspections allow us to determine what type of material we're looking at and whether or not it constitutes hazardous waste."

Removing all waste streams separately

"The batch inspections are crucial to the disposal of our waste material," says Willem Schipper. "The hazardous waste disposal site also requires us to state exactly what it is that we're disposing of. I'm a chemist, so I had a good idea of the types of materials we might find at the Thermphos site. But we did sometimes come across waste and deposits that we hadn't expected to see in the plant. We collected all the materials, keeping the streams separate at all times. Then we asked Mark Bakker from SGS INTRON to come and take samples. The collaboration was very smooth throughout."

A joint cleanup effort

Mark agrees: "I enjoy coming here. The material is always ready and waiting for me either inside or outdoors. Normally I take two random composite samples. On one occasion I took my sample from 100 tons of material in bulk bags; another time it was from a 20,000-ton mountain of phosphorus slag that was the size of a house. Van Citters Beheer always checks the radioactivity of the material in advance. Usually it's well

below the limit value of 100 becquerel per gram. In such cases, I can take the samples and there aren't any real safety risks. But I always take the smallest possible amount of material and label it with a special sticker. I talk to the laboratory in advance to find out the minimum amount of material they need to conduct their analyses. Of course, I also have to make sure that I comply with Assessment Guideline 1000, protocol 1002: Sampling of bulk construction materials, which specifies a minimum sample size." At Thermphos, a large board proclaims that 'Cleanups are a joint effort'. "Our joint cleanup has been successful," says Mark. "It is great to be able to contribute to ensuring that all waste materials from the site are properly disposed of."

"SGS is the only contractor able to sample and test slightly radioactive material in the correct way"



As-built testing for project-specific LCAs

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The ECI (Environmental Cost Indicator) is gaining ground as a selection criterion in project tenders in the rail and civil engineering sectors. This indicator – which combines all of the environmental effects of a project into a single score expressed in euros – often requires contractors to submit project-specific life cycle analyses (LCAs), which allow them to demonstrate what the ECI value of a project is. In major road construction projects, these LCAs primarily relate to asphalt and concrete, but they can also cover sheet pile walls, noise insulation screens and a whole host of other products. But how do you know that the product supplied actually possesses the environmental profile promised in the LCA? This is where the as-built test comes in.



What is an as-built test?

Project-specific LCAs are methodically reviewed at the client's request. A recognized reviewer checks whether the LCA satisfies all of the relevant requirements of the core product category rules for environmental declarations for construction products and services. These checks rarely verify whether the product that has been delivered actually matches the LCA calculation. Was the concrete mixed with the right cement? Were the indicated percentages of secondary materials used? Were the construction products transported using the eco-friendly vehicles indicated in the LCA? This test is known as an as-built test. It is important to assure clients that they have got what they paid for, and to maintain an equal playing field between manufacturers.

SGS INTRON compiles as-built test protocol

On behalf of the Dutch Directorate-General for Public Works and Water Management and the Dutch National Environment Database Foundation (NMD), SGS INTRON has compiled an as-built test protocol. The protocol was drawn up with the input of two broad focus groups with representatives from across the asphalt and concrete sectors. The resulting test protocol describes the roles of the LCA author, the client, the inspector performing the verification and the recognized expert who is consulted in the event of any doubt. The report includes comprehensive checklists for checking project-specific LCAs for asphalt and concrete.

The NMD is expected to publish this document on its website, where it will be accessible to the public. Clients will be able to use the document on launch, and future versions will incorporate lessons learned from practical experience.



More Sustainable Choices for the A16 Rotterdam

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Between Terbregseplein and the A13, Dutch construction consortium De Groene Boog (or “the green turn” in English) is building the new A16 Rotterdam – the world’s first energy-neutral stretch of highway with a tunnel. Solar panels along the route will provide all of the energy required for lighting and other installations. The consortium is also opting for materials with the lowest possible environmental impact, and is working to minimize CO₂ emissions. “We are constantly challenging ourselves, our suppliers and our subcontractors to make sustainable choices. The more we focus on this aspect, the more ideas we get and the greater results we achieve,” explains CSR manager Sjoerd Gijzen. For De Groene Boog, sustainability is not just about being “green”; it’s something to be proud of.

ECI encourages use of environmentally friendly materials

De Groene Boog – a consortium made up of Besix, Dura Vermeer, Van Oord and TBI companies Croonwolder&Dros and Mobilis – is building the A16 Rotterdam on behalf of the Dutch Directorate-General for Public Works and Water Management. Together, the members have already been awarded the ‘Duurzame Parel’ sustainability prize for their unique application of the Green Deal for civil engineering in this project. As sustainable choices are rewarded during the tender phase, De Groene Boog immediately decided to set a high standard in that area. “We were awarded points based on three aspects of sustainability: use of materials, energy consumption and steps to reduce CO₂ emissions,” explains Gijzen. “With careful selection of construction materials, we were able to promise a

low environmental impact, expressed as an Environmental Cost Indicator (ECI) of 30 million euros for the entire project with an assumed service life of 100 years.” If De Groene Boog comes in below that figure, it earns a bonus. Conversely, a higher environmental impact will incur a fine – which could add up to a significant sum, given the large amounts of materials used in this project.

LCAs for all construction materials used

For De Groene Boog, this arrangement serves as an additional impetus to choose the most environmentally friendly products that meet the project’s quality and planning requirements. “We use a lot of bulk materials, such as sand, soil, asphalt and concrete, but also prefabricated elements, sheet pile walls, crash barriers, noise insulation screens and temporary formwork. To show that

we are delivering on the promise we made in the tender phase, we now have to state the environmental impact (the ECI value) for each individual product and material. We are doing this by drawing up project-specific life cycle analyses (LCAs). Bob Roijen from SGS INTRON has been working on this for an average of 1.5 days a week since May 2019. Compiling LCAs is quite a tricky task.”



SJOERD GIJZEN



Insight into each product phase

Gijezen continues: “We work together to determine what information we need and how best to obtain it. We need to get a lot of data from our suppliers. Where do they get their raw materials from? How sustainable is their process? We also look at transport, how the product is installed, how it is maintained and how often, and how long the material lasts.” “We work well as a team when it comes to collecting information,” says Bob Roijen. “We often discuss things with suppliers together.” “Our suppliers are generally pleased to cooperate and are open about everything,” explains Gijezen. “The hardest thing was getting the information we needed from the project team in time. Sometimes, the data just wasn’t available yet – because the design hadn’t been completely finalized, for

example. At the same time, the project team often required information about our ECI calculations, so that they could work out which of the suitable concrete mixes was the most sustainable option. We were able to reduce the environmental impact of our sheet pile walls by thirty percent by opting for secondary steel. And the transition to biofuels for many of our transport processes made a huge difference too.” The team has now completed almost eighty percent of the required LCAs. “We are very hopeful that we’ll come in under the ECI of 30 million.”

A constant flow of new ideas and initiatives

Initially, the outlook wasn’t positive; the team was skeptical about whether it could achieve this goal. Will the planning process become too complex with all these sustainable choices? Will it cost



too much money? “Now we can see that we can achieve great results,” says Gijezen enthusiastically. For example, we’ve achieved CO₂ Performance Ladder Level 5, which requires you to innovate with experimental pilot projects. We did this by organizing monthly themed meetings on specific topics, such as the electrification of construction materials. These meetings gave us a constant flow of new ideas that we are now putting into practice. We’re going to use a number of electric diggers, a hybrid generator and a bucket loader and mini-digger powered by a formic acid generator.”

CSC Certification for Aggregates From the Sea

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A substantial proportion of the aggregates used in concrete, sand and gravel are taken from the sea. Until now, CSC approval could not be used to indicate that these materials had been sourced responsibly; sea sourcing was not included in the toolbox for CSC certification. But this is now set to change: Dutch industry association Betonhuis has organized the addition of a separate CSC module for sea sourcing and new certification schemes to the tool. SGS INTRON Certification helped plan these complex changes and participated in a pilot to gain experience of CSC certification for aggregates from the sea.



Identifying differences

SGS INTRON Certification quickly found companies interested in taking part in the pilot. Three manufacturers of aggregates sourced from the sea participated in the trial: SBV, De Hoop Bouwstoffen and Spaansen. Auditor Remy Zwerus worked through the entire CSC certification process with each of these companies, using the standard assessment format for aggregates to identify any areas of crossover with the existing CSC system and to highlight clear differences where land and sea sourcing would require a different approach.



Assessment against existing standard

CSC (Concrete Sustainability Council) is a global certification system that is used to demonstrate how environmentally, socially and economically responsible a business is. Remy explains: "The CSC toolbox covers everything from human rights to CO₂ reduction. I assessed the companies against the existing standard for all of these aspects. For topics like 'responsible land use', I looked at responsible use of the sea floor. There are a practical aspects that are very different for materials sourced from the sea, such as the use of ships and washing at sea. These are the kinds of areas where

the system will need to be modified. But the material itself can definitely be certified. Incorporating a sustainability certification is the right thing to do."

Bronze – for now

As agreed during the pilot, all three companies have been awarded a temporary bronze certificate. "When the new module is introduced in the near future, we'll assess the performance of each company against that," explains Remy. "Many companies will then probably be able to obtain an even higher level of sustainability certification." CSC provides scope for this upgrade, and the certification remains valid for three years.

Investigation into Formaldehyde Emissions at Herman Teirlinck Building in Brussels

The sustainably constructed Herman Teirlinck building in Brussels was completed in 2017 and commissioned by the Flemish Government in the same year. The Extensa Group – the developer and, at the time, the owner and lessor of the building – had taken the Flemish Government's stringent standards for office buildings into account during construction. The regulations state that emissions of formaldehyde – a hazardous substance that can be released from construction materials – must not exceed 10 micrograms (μg) per m^3 of air in interior spaces. However, almost as soon as the building was commissioned, it became clear that the limit value was being exceeded in a number of places. When the levels were measured for a second time in 2019, the amount of formaldehyde in the air had not gone down; in fact, it had actually increased. Bram Das from the Extensa Group called on SGS for help with further detailed tests and investigations into the source of the issue.



Photo credits: © Benjamin Struelens - Extensa

Partnership between SGS Belgium and SGS INTRON

"The previous formaldehyde measurements were carried out by an SGS competitor who, in our opinion, wasn't working in a proactive way," explains Bram Das.

"Via SGS Belgium in Melsele, who retested the levels of formaldehyde in the air, I was introduced to Wil Klarenaar from SGS INTRON. He was fully up to speed with the issue, knew where to look and what procedures he needed to follow to quickly track down the cause."



BRAM DAS

Common in construction materials

"Formaldehyde is a small molecule that shot to notoriety in the 1990s as the poisonous 'particle board gas', but it's actually present in many other construction materials too," says Wil Klarenaar. "It can form polymers and is very useful in adhesives and synthetic resins, and it's relatively cheap as well. This is why resins based on formaldehyde are still common, and are often found in walls, ceilings, furniture and flooring." Wil Klarenaar adopted a systematic approach to determine the cause of the excessively high concentrations in the Herman Teirlinck building. "Based on the information we were given by the Extensa Group, we made a list of the potential culprits, including materials that we knew may be a source of formaldehyde and materials that had been used a lot in the construction of this particular building. We then narrowed this list down to ten of the 'most likely suspects': the floor and wall panels, the desk tops, the floor plinths and a sound insulation panel.

Furniture: The number-one suspect

SGS INTRON took small samples from all of these materials. The samples were then prepared by the in-house laboratory in Sittard before being sent on to the SGS laboratory in Antwerp for analysis. Formaldehyde was found in most of the materials tested, but the highest concentrations were found in the desk tops. This wasn't necessarily a problem, because the most important consideration is how much formaldehyde the material actually emits into the environment. But we were immediately suspicious of the indoor furniture."



Very satisfied

"We had already wondered if the formaldehyde could be coming from the furniture," says Bram Das. "We were suspicious because we saw the concentration increase, and because there was a lot of furniture made from glued wood in the building. What's more, we had previously issued a specification for the construction materials that the contractors were permitted to use in the Herman Teirlinck building. All materials had to be class E0 or E1: materials in these classes are subject to the strictest requirements and their formaldehyde emissions must either be very low or zero. The furniture was installed by the Flemish Government." The Extensa Group immediately decided to remove all items of furniture from one of the offices and to thoroughly ventilate the space. Wil Klarenaar continues: "When our Belgian colleagues retested the air two weeks later, the formaldehyde levels had dropped below 10 µg/m³." "This meant that we met the set requirements," says Bram Das. "We are very satisfied – with the thorough work of SGS, the seamless communication and the comprehensive report on completion, detailing results that were, of course, exactly what we wanted."



Municipality of Rotterdam Applies Circularity Index to Tenders

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Rotterdam wants to become a sustainability hotspot. The city's ambitious Sustainability Compass sets out an integral approach to four policy areas: circularity, the energy transition, a healthy environment and climate resilience. "We want to make the most of the opportunities offered by contracts in these areas," says Léon Dijk, who is responsible for applying the policy in municipal tenders and contracts. "Our goal when we work with contractors is to promote and encourage the aspects of sustainability that we believe are really important. We don't want to put suppliers in a difficult position or give any advantage to suboptimal solutions." Ulbert Hofstra from SGS INTRON helped the municipality to incorporate circularity indicators into its tenders alongside the Environmental Cost Indicator (ECI).

ECI and circularity indicators

"Ideally we would only use the ECI to assess bids," says Léon Dijk, an expert on life cycle analysis (LCAs) – the method used to calculate the ECI. "The ECI brings together all environmental effects – including the circularity indicator for raw material use – in a single score, which is expressed

in euros. It's an integral assessment that takes all of the impacts along the production chain into account in a transparent way, and ultimately that's what we need. But we decided to start working with Ulbert Hofstra's circularity index because we have specific goals for circularity. We wanted to place more emphasis on these aspects and reward high performance in these areas separately."



LÉON DIJK

Encourage high-quality use of secondary raw materials

"Data on the use of secondary raw materials, reductions in the use of primary raw materials and the recyclable element of the product is available in the LCA, but the final LCA score (the ECI) does not provide a clear picture of performance in each of these areas," explains Léon Dijk. "This is why we asked Ulbert to produce a circularity index specifically for our tendering process for concrete bases for waste containers. This would enable us to gain experience of using circularity indicators in a contract, while also promoting quality by encouraging the market to use secondary raw materials in the best possible way. This is what the circularity index does; a high output flow quality means a higher score. For us, this was an interesting addition to the ECI." Ulbert Hofstra explains the mechanism: "The recycling percentage of concrete is already very high (98%), so quality becomes really important. There isn't much more to gain in quantitative terms. The quality factor of the material for recycling is determined by the (estimated) economic value of the product in the long term. This makes the circularity index method easy and transparent to apply."

Price is a good indicator of residual stream quality

The circularity index required quite a lot of adjustment before it was ready for the municipality of Rotterdam. Léon Dijk: "With Ulbert Hofstra's help, we were successful. In our tender, we clearly stated that suppliers could obtain all of the information required for the circularity index from the LCA, which they had to provide anyway."

The circularity index adds a quality factor; the suppliers were asked to provide invoices to demonstrate that they really were achieving the material qualities required for recycling or reuse. If a supplier claimed that it would be



able to effectively recycle or reuse the residual fraction of its product, it also needed to demonstrate that it could get a higher price for that product. Price is a very good indicator of reuse potential and therefore of circular quality."

Useful experience

"In general, the concrete manufacturers who submitted bids understood what we were asking of them," says Léon Dijk. "We did notice that they were sometimes quite creative in their calculations. There's no fixed calculation method for the circularity index, like there is for the LCA. This makes it harder to be certain that the scores are actually comparable. Weighing up the value of reuse against recycling was also difficult. You want to encourage reuse, but it is very challenging to demonstrate that it is actually possible. When this type of concrete base needs replacing, it's usually because there is a leak and reuse is no longer possible. Circularity is often about evaluating promises for the future. You need numbers so that you can reward as many indicators of a circular solution as possible. But you can't go any further than that, because then you'd be in risky territory. What often is possible is that the supplier can show that the raw materials can be

reused over a number of cycles. I think this should be more of a focal point. Circularity is about design, and making that measurable is not easy. We're not quite all the way there yet with the circularity index. But it's still a useful step toward implementing the concept of circularity in practice. Parties like SGS INTRON, who are experts in LCAs, environmental impact and material technology, are incredibly important partners. They help us assess whether circularity claims truly hold water and share ideas about how we can place more emphasis on circularity in LCAs by incorporating new indicators – so that eventually, we won't need a separate circularity index at all."



Pilot Project: Verification of Circular Demolition Project

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Demolishing a building generates large volumes of material. In partnership with the Dutch Safe and Environmentally Friendly Demolition Foundation (SVMS), a group of circular demolition and recycling pioneers has embarked on a pilot project. Named "Verification of circular demolition," the project was created in response to increased demand for circular development and aligns with the Dutch government's strategy to transition to a fully "Circular Netherlands" by 2050. It also allows demolition companies to contribute towards this vision.

Demolition companies with SVMS certification are independently assessed on their attention to safety and environmental protection during demolition projects. The pilot project represents yet another step toward circular demolition: The project's verification guidelines provide demolition contractors and clients with a far-reaching framework for circularity in the preparation and execution of demolition projects and the disposal of the materials generated during the demolition process.



The pilot project

Demolition clients are increasingly requiring their contractors to demonstrate that circular processes have been applied to their demolition projects. This must be verified independently by a certified organization. After verification, the project earns the title of "verified circular demolition project" and a certificate is issued as proof of this achievement. In 2021, SGS INTRON will verify the first project carried out by demolition contractor Vink from Barneveld in the Netherlands.

Recording approach and materials

In the pilot, the demolition contractor's main task is to compile a detailed record of the materials in the building, how these materials are secured and to what extent they can be reused or recycled – from items such as doors, which can be reused immediately, to processing materials like carpet for new applications. This record is known as a material inventory. The contractor uses a binding list of material flows

that specifies destinations for each material. For concrete, for example, the list differentiates between 'concrete rubble for aggregate in concrete' and 'other types of concrete', which further facilitates recycling. The contractor must then produce a separation plan to show how the results itemized in the inventory will be realized. This might include documents such as clear instructions for the demolition team as to how a material should be removed from the building, records of material volumes and justification if material volumes are lower than anticipated. Finally, the contractor must compile a materials statement that shows that the two steps above have resulted in the achievement of the previously set objective, or that the client's requirements have been met.

Conclusion

This way of working encourages the demolition contractor to look more closely at the material flows generated during demolition and the options for reuse or recycling, including sale. Of course, this process will also

involve some obstacles. In the future, building passports will help to provide demolition contractors with more information about the materials used in a building and their composition. Current regulations are not always geared toward reuse, either; according to today's building regulations, an attractive window frame installed less than 30 years ago is probably 20 centimeters too low. It is important to take the time to think about how to deal with these kinds of issues to close the circle of product reuse or material recycling.



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