THE KING'S SCHOOL IN MACCLESFIELD

VINCI CONSTRUCTION UK

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NEWSLETTER

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THE NEW ACADEMIC BUILDING TAKING SHAPE

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WELCOME

John Roberts - Regional Director at VINCI Construction

Welcome to the fourth installment of VINCI'S King's School Project Newsletter. While you have been away on holiday and having a well earned rest with friends and family, the site team have been busy delivering your new campus.

The site is progressing really well with the installation of the Swimming Pool and completion of the main steel works to the academic building.

This month's edition focusses on the Environment, something on everyone's minds at the moment, and the environmental features of your new school. Carbon Consultant, Phil Godfrey from A&B Engineering is interviewed on pages 3-4. This special focus will hopefully give you an insight into what your new school will do to help improve sustainability. Phil also gives some handy tips we can all follow to help reduce our carbon emissions.

We also look at the great new facilities that will be available in your new Science Department. VINCI's James McGlynn is featured in this issue, talking about Engineering on the new campus.

We also highlight what else VINCI is doing elsewhere in the world with a focus upon the Chernobyl safe confinement project.

We hope you find interest in our newsletter, as always we welcome any feedback you may have.

John

THE ENVIRONMENT AND YOUR NEW SCHOOL

When it comes to Carbon and the Environment, Phil Godfrey from A&B Engineering is a specialist. He has been working on your new school's design and how it can have as little impact on the environment as possible.

Here, Phil talks about all the amazing features your new school will have and why:

PHIL TALKS TO YEAR 4 PUPILS ABOUT FOSSIL FUELS

What is carbon?

Carbon is a non-metal element. Every living thing on earth contains carbon, even you contain carbon - about 20% of the human body is carbon. Carbon dioxide is made up of carbon and oxygen. We often see this called CO2. Plants and trees take in CO2, they keep the carbon bit and give away oxygen. Animals and humans breathe in oxygen and breathe out carbon dioxide. Plants and Animals depend on each other and this has worked out well for hundreds of millions of years.

Fossil Fuels

Many years ago, when animals and plants died, their remains were buried under the surface of the earth and over time turned into fossil fuels like oil, coal and gas. We burn fossil fuels every day in our cars, houses and other buildings. We also burn a lot when we manufacture things such as bags and plastic.

What is the problem with fossil fuels?

When we burn fuels like petrol and gas, we produce three main things: heat, water and CO2. All that CO2 is released into our atmosphere and that is changing our planet quite quickly, heating it up. Quicker than it ever has before.

It took millions of years to make the fossil fuels and we are currently using large volumes over a relatively short period of just a few hundred years.

Climate Change

CO2 helps our atmosphere trap heat from the sun, without it, the earth would be a big ball of ice. So CO2 and other greenhouse gases are good, but it's important we don't have too much. Greenhouses are used to grow plants, and they stay warm all year because they trap the heat from the sun's energy. Gases in our atmosphere such as carbon dioxide trap the heat just like a greenhouse, and that's what keeps our earth cosy. However, burning fossil fuels is changing nature's greenhouse effect, slowly changing our planet which scientists say is warming up the earth's atmosphere.

Sustainability

We need to work together to reduce the amount of CO2 we are releasing into the atmosphere from using fossil fuels. Our cars and buses use fossil fuels, our houses and buildings use electricity and gas, and most electricity is made using fossil fuels. To reduce carbon emissions, we need to cut the demand for electricity, reduce the fuel burned by power stations, vehicles and industry.

Your current school buildings were designed a long time ago and are not very efficient when it comes to heating and lighting. They use a mixture of lights, some old and some new. The older lights use lots more energy and cost lots more to run. In your new school, the lighting is all extremely low energy and therefore far better for the environment.

THE ENVIRONMENT AND YOUR NEW SCHOOL

How can we **reduce energy** even more?

How about not using the lights at all? Your current school uses switches to turn lights on and off, this means that its really easy to leave them on accidentally and that uses energy.

Your new school buildings have sensors which turn the lights on and off automatically when a person is in the room. The sensors will also turn the lights off if it's bright enough in the room because of the natural daylight. This is very efficient.

Heating & Ventilation

Most of the rooms in your new school use natural ventilation, which will make it a nice, pleasant place to spend your days. The best thing about natural ventilation is that this uses no energy and burns no fossil fuels so that's great for the environment. As well as natural ventilation, the buildings also incorporate mechanical heat recovery ventilation (HRV) in some of the rooms. The HRV will recover 80% of the heat which would otherwise be lost with conventional systems.

Your new school uses the latest technology and best insulation in the walls, windows, floors and the roof. The insulation acts just like a thick sleeping bag around the building. We have designed the new school to use the lowest amount of energy as possible, so even though we are using gas to heat the school, we aren't wasting any.

Remember the greenhouse effect? Well your new school is like an amazing greenhouse, any heat we use to make the building nice and warm is held in the building to reduce overall fueld consumption

Solar panels and self sufficiency

The new school building also has Photo-voltaic panels on the roof. These are more commonly known as 'solar panels' and use the sun's energy to generate electricity. On a sunny day, the new school will have enough power from the solar panels to supply about 1,230 of the new lights in the building. That's one light powered by the sun for every pupil we have at the King's School. The solar panels mean the school will use a lot less electricity and that means reducing our deman for fossil fuels, which means less CO2 generated.

INTRODUCING... YOUR NEW SCIENCE DEPARTMENT!

The new campus has been designed to provide generous accommodation for our Science Department.

In total there are **15 science labs** consisting of four Biology labs, four Physics labs, five Chemistry labs and two additional General Science labs.

The design of the classrooms takes into consideration the differing subject matters and reflects their uses.

The Biology department has been located on the ground floor so that access is provided to outdoor learning spaces such as gardens, woodland and hopefully a greenhouse too. This will give students the opportunity to grow their own plants and vegetation as part of an interactive and hands on learning experience.

The Chemistry department is located on the uppermost floor of the science block to ensure experimental fumes are exhausted straight up and out through the roof-mounted extract units.

Adopting a design strategy of stacking labs above one another was helpful in terms of co-locating the three science subjects whilst also creating efficiencies such as minimising ductwork routes. New fume cupboards will be provided to ensure maximum efficiencies in running costs, safety and also help to maintain excellent air quality.

Each laboratory is designed to have an island teaching unit is located centrally with any associated lab furniture sat around the perimeter of the room.

Each subject also has its own generously sized dedicated science prep rooms, which help aid the delivery of teaching behind the scenes. Internal doors connect the labs with the prep rooms.

All labs are fully air conditioned with mechanical heat recovery ventilation (HRV). The HRV will recover about 80% of the heat which would otherwise be lost with a conventional extract system.

The air conditioning systems are more than 400% efficient: this means for every 1kw of energy input the system is capable of exceeding 4kw of heating and cooling.

Although not strictly required, additional opening windows have been provided to each science lab to help aid user comfort levels.

The adoption of Building Information Modelling (BIM) has helped to maximise efficiencies and work out aspects such as ductwork runs ahead of getting to site. This has helped to speed up the construction process and will ensure the opening date of May 2020 will be achieved.

INTERVIEW WITH VINCI'S JAMES MCGLYNN, SENIOR ENGINEER

For this quarter's Newsletter, VINCI's Lauren Banks met up with James McGlynn for an interview. James is currently working on the new campus as a site enginee. He talks a little about his role and how he got to where he is today.

What is the most interesting thing about working on the new King's site?

This is the first time I have worked on a site with such extensive earthworks. The campus is an 80-acre site and most of this is given over to sports pitches and external green spaces. The site will be stunning when finished, but it will also be rather different from when we arrived, as we have moved 200,000 tonnes of earth around the site to achieve level plateaus for the buildings and playing fields. We have used a digital terrain model and GPS controlled machines to profile the site to the correct levels. It is the first time that I have worked with this system, and it has been great to see how technology can really help to improve the accuracy and the efficiency of our work.

What do you love and hate most about your job?

I love meeting new people every day. I enjoy the dynamic and challenging nature of working on multi-million-pound construction projects. I don't particularly enjoy waking up at 5.30am and sitting in traffic on the M6 for my daily commute. However, it is a really great project to work on.

If you could be anything other than an Engineer, what would you be?

Professional FIFA player and YouTube star.

Have you always been a site engineer? And how did you come to be one?

I decided to study Civil Engineering at university as I wanted to be an architect, but I couldn't draw. I was good at maths and physics, so it seemed like a good choice.

My university offered a sponsorship scheme which I was successful at getting a place on, so I worked for a construction company during the summers as well as completing a year working in the industry as part of my degree. After university I started on site as a graduate engineer and have been doing it ever since.

What was your favourite subject at school and why?

PE because I enjoy sport and being out of the classroom.

Have you ever needed to use your engineering skills outside of work and why?

I have extensive experience in putting up pictures and shelves... sometimes they're even level.

What part of the King's School campus are you most excited to see develop and why?

I've been looking at fields of mud for nearly a year now. I can't wait for the grass to start growing on the new sports pitches and for the external areas to start taking shape.

CHERNOBYL NEW SAFE CONFINEMENT

Chernobyl

How can the Chernobyl site be cleaned up in complete safety? Our team of engineers has devised a prototype arch to confine, sort, store and stockpile radioactive waste materials – while ensuring maximum protection for workers on site. The arch-shaped confinement structure designed to enable the dismantling of the old sarcophagus and the remains of the damaged reactor consists of a metal frame weighing 36,000 tonnes (fully equipped), measuring 105 metres in height and 150 metres in length, with a span of 257 metres. The structure is large enough to cover the Stade de France or the Statue of Liberty. The arch is as tall as a 30-storey building.

BACKGROUND

Following the explosion on April 26, 1986 of reactor number 4 of the Chernobyl Nuclear Power Plant, Ukraine launched a design contest for a confinement shelter to isolate the nuclear reactor and minimise all potential risk.

The contest was won by a European consortium led by Campenon Bernard SGE (VINCI Construction). The strength of our proposal was that we would design and implement a structure to confine, sort and store short-lived radioactive waste and stockpile non-disposable waste.

The contract was signed on September 17, 2007 with the NOVARKA consortium led by VINCI Construction Grands Projets; and work began in 2010.

TECHNICAL OVERVIEW

The foundations were built with 400 piles that are one metre in diameter and 19 metres deep. These were located in proximity to the sarcophagus where concrete beams to support the arch in its final position were built. The weight of the arch was to be distributed evenly on these two concrete beams, thereby providing support for the considerable mechanical forces exerted by the structure.

Protection from radioactivity was a key requirement in developing construction methods for the project. Since exposure is lower at ground level, ground-level works were preferred to construction tasks at height. Consequently, the first half of the arch was assembled on the ground just west of the damaged reactor and raised in three successive lifting operations. The same process was used to assemble and raise the second half of the arch. The two arches were then literally bolted together using 600,000 bolts, measuring 15 cm in length and weighing more than 1 kg each, to create an unprecedented structure.

The confinement arch is equipped with devices and systems designed for the dismantling of reactor number 4. This future operation can be carried out in the best conditions in terms of flexibility and safety, while minimising direct human intervention.

The arch is designed to withstand temperatures ranging from minus 43°C to plus 45°C, but also a Class 3 tornado (which occurs once every million years) and an earthquake measuring 6 on the Mercalli scale (which occurs once every 10,000 years).

"We maximised the amount of work carried out far from the reactor in efforts to protect our teams from radiation, while building the most effective confinement structure possible."

Marc Wastiaux, VINCI Construction Grands Projets, and Technical Director of the NOVARKA consortium

IMPACT

Since the site was in a high-risk location, the main challenge was to deliver a certain level of quality while ensuring maximum safety. That is why design and construction were governed by the ALARA (As Low As Reasonably Achievable) principle. This principle is an extension of the precautionary principle applied in the field of radiation protection: individuals working with toxic hazards cannot be exposed beyond a set maximum dose. Consequently, for certain tasks, especially in close proximity to the sarcophagus, personnel must work behind concrete or lead screens. The arch-assembly and lifting areas were decontaminated, and workers wear protective clothing. A team of 60 people is entrusted with the task of protecting employees from radiation.

To carry out this unprecedented project, we had to recruit talent from around the world: more than 25 nationalities are present on a permanent basis at the site. As a result, the project also required considerable multicultural management skills.

SPAN
257 m
HEIGHT
108 m
LENGTH
162 m