

TIMBER

Multi-storey Timber Buildings



ARKITEMA
ARCHITECTS

COWI

ARKITEMA & COWI TIMBER

Arkitema and COWI are among Scandinavia's leading architecture and engineering companies. We work strategically with sustainability and we have formed an advisory team of specialists within timber construction - Arkitema & COWI Timber

Our focus is to deliver high quality solutions and design modern timber constructions. We consider timber to be the building material of the future. Timber buildings have a small CO₂ footprint, they are durable, fast to build and above all, healthy for people to live in.

Our Scandinavian collaboration is leading the way within architecture and timber technology. We are able to offer the latest knowledge and solutions that future generations will benefit from.





VISION OF A SUSTAINABLE BUILDING

Our goal is to create the best framework for quality of life, and actively contribute to a green transformation within the building industry. With a construction made of timber, we can realize the vision of CO₂ reduction, increased productivity and a more sustainable building culture.

Arkitema & COWI see modern multi-storey buildings in timber as the future due to their architectural, technical and environmental qualities. Wood is a renewable resource that grows using solar energy and we consider it to be one of the most environmentally friendly materials to build with today. Our aim is to create buildings that are durable, healthy to live in and beautiful.

TIMBER CONSTRUCTION

It is fast and easy to assemble structures in timber, which results in a significantly shorter construction time.

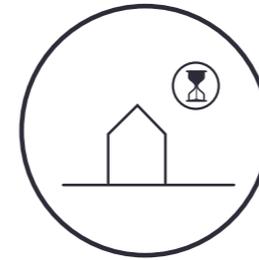
The low weight of timber allows use of larger elements, fewer lifts during assembly, lighter foundations and a substantial decrease in the amount of transports to and from the building site. Moreover, timber contributes to a healthier work environment with less pollution and noise.

The development of solid wall and floor slab elements e.g. in CLT (Cross laminated timber) has made it possible to build higher and safe with timber. Multi-storey buildings can now be built with a load-bearing timber construction. Arkitema & COWI have experience in designing 10+ storey timber buildings.

BENEFITS OF TIMBER

Timber stands out from other building materials as it requires considerably less energy to manufacture. Wood grows on solar energy and the CO₂ emission from timber structures is low compared to other building materials.

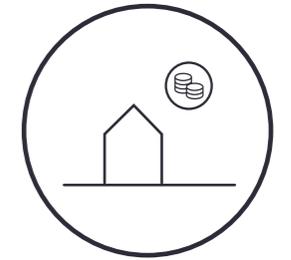
A modern timber building has load-bearing timber structures that are protected from the weather and require no maintenance. The facade materials can be chosen with great freedom and we apply quality assured solutions for fire and moisture protection.



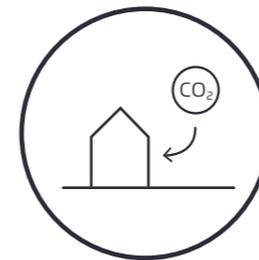
Long lasting



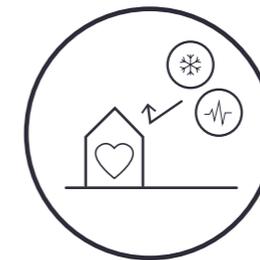
Renewable resource



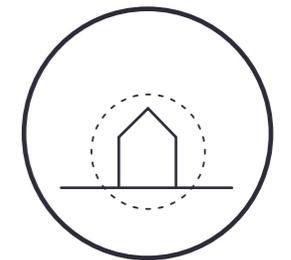
Life-cycle cost benefits



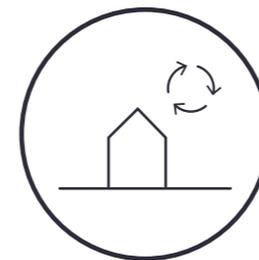
Low CO₂ emission



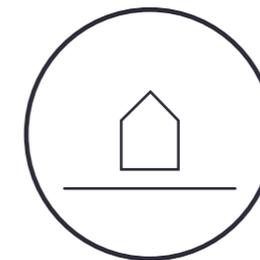
Healthy indoor climate



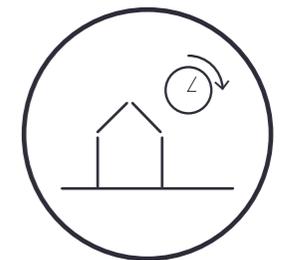
Safe



Recyclable



Light-weight



Fast to assemble



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TIMBER IS ONE OF THE MOST SUSTAINABLE BUILDING MATERIALS. WOOD IS A RENEWABLE RESOURCE THAT GROWS ON SOLAR ENERGY AND IS REGENERATED IN THE FOREST DURING A BUILDING'S LIFETIME.

— Kasper Kristensen, Senior Specialist, Timber construction, COWI (DK)



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Ör center will be a vibrant, modern and inclusive area, and one of the world's biggest timber housing blocks.

KRISTINA PETERS

Partner, Arkitema Architects (SE)

ÖR CENTER, SUNDBYBERG, SWEDEN

From the beginning, timber was an obvious choice for both the clients and the municipality, due to its environmental qualities.

The architecture of Ör Center consists of six different volumes that vary in height between 4 and 10 storeys. The timber frame is reflected in the design of the facades.

The area will have a mixed housing typology (condominiums, rental and senior housing), making the quarter socially sustainable.

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Timber was a natural choice for our client from the early stage of the project, due to the sustainable properties of the material.

OLA GÖRANSSON

Partner, Arkitema Architects (SE)

RIBBINGS VÄG, SOLLENTUNA, SWEDEN

The buildings are erected with a timber construction. A large communal roof terrace, plenty of balconies and stairs located on the outside create good conditions for a social and safe living environment.

With a total area of 5000 m², Ribbings väg consists of small and efficient 30-60 m² student apartments.



TIMBER AS MATERIAL

For Arkitema & COWI Timber, the right solutions within building technology and construction details are crucial. We have in-depth experience in designing and building in wood with the latest knowledge about wood building systems.

We encourage our clients to choose certified wood from sustainable forestry that protects biodiversity and ensures forest growth. For the load-bearing structures, softwood species such as spruce and scotch pine as well as other Nordic wood species like larch and douglas fir are preferred. Softwood is suited to load-bearing structures due to its dimensional stability, and being both light and strong material.

The low weight of timber allows use of large elements, e.g. CLT elements (Cross laminated timber) which are available in up to 3 m x 16 m today. The elements are suitable for load-bearing interior and exterior walls, as well as floor slabs and roofs and come with a cut-out for installations, doors and windows.

BUILDING SYSTEMS IN TIMBER

All building systems are prefabricated with a high degree of detailing and efficient assembly. Building systems in timber include elements such as:

- CLT panels (walls, floor slabs, roof slabs)
- Glulam (columns, beams, trusses, arches)
- LVL (columns, beams, trusses)
- Solid timber (columns, beams, trusses)

Timber buildings are often a combination of different timber building systems where their properties have been used strategically. Hybrid solutions are also very common, where steel and concrete have been added to achieve specific structural properties.



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We are really happy to win this project. The municipality has a focus on building a school for the future. Our main focus was to create a school that fits well with the nature and the surroundings.

ASTRID CHARLOTTE SEEBERG

Associated Partner, Arkitema Architects (NO)

**SOPHIE RADICH SCHOOL,
LILLESTRØM, NORWAY**

Sophie Radich School in Lillestrøm will be constructed in timber and have space for 720 pupils. The school will have a distinctive architecture shaped as a four-leaf clover. With a strong focus on the surrounding nature, the students will experience an interaction between the indoor and the outdoor environment.

The new school will be visible in the area and be an attractive and inviting meeting place that evokes curiosity and pride. It will be open to the local community and serve as a gathering place in the area.





Sofemyr School, Norway

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MOST OF THE MATERIAL IS IN THE LOAD-BEARING STRUCTURE. THERE IS A GREAT POTENTIAL TO REDUCE THE ENVIRONMENTAL IMPACT BY CHOOSING TIMBER CONSTRUCTION.

— Birger Hauge Lundgård, Senior Specialist, Building structures, COWI (NO)



FACADE SOLUTIONS

The facades of a timber building do not need to visually reflect a building in timber but can be made out of masonry, painted or covered in sheet metal or glass.

When we talk about timber buildings, we mean buildings where the load-bearing structures are mainly made of timber.

Our services within facade solutions include:

- *Facade design and materials*
- *Surface finishing (color, patina, durability)*
- *Structural design and fire safety*
- *Ventilation and moisture control*
- *Acoustics*
- *Operation and maintenance*
- *Energy and indoor climate*
- *Daylight and shading*



SWEDISH DESIGN
AWARD 2018
NOMINEE

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Timber is an excellent material in school and preschool environments. Children absorb what is around them, they are close to the surfaces and experience the physical space in a different way than adults. The sensory experience becomes important with scent, feeling, sound, warm and visually interesting surfaces. In addition, wood is durable, which is of great interest to our clients.

BRITTA FORESTIER

Associate, Arkitema Architects (SE)

**LUSTIGKULLA PRESCHOOL,
KNIVSTA, SWEDEN**

Lustigkulla preschool was completed in 2018, it is a passive house certified building and was nominated for the Swedish Design Award 2018.

The building does not have a timber load-bearing construction but timber has been used extensively in both the exterior and the interior. Exposed timber creates a pleasant warm and tactile preschool environment for the children, with good indoor air quality and acoustics. In addition, the surfaces require less maintenance than white painted plaster walls as minor wear becomes part of the material's natural color variation.

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Modellvillan is beautifully integrated in the surrounding architecture and has a modern design language.

OLA GÖRANSSON

Partner, Arkitema Architects (SE)

MODELLVILLAN, STOCKHOLM, SWEDEN

Modellvillan consists of two buildings with 15 apartments and is a renovation and extension project of an existing property in southern part of Stockholm.

The existing property dating back to 1920s has been completely renovated and expanded with a new extension in timber. The project is a good example of a gentle development in connection with existing buildings. The roof and the facade in larch board will age well and get a silvery shade over time.



STOCKHOLM
BUILDING OF THE YEAR
2018 AWARD
WINNER



Modellvillan, Stockholm, Sweden



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Viktor Hanson's concept houses are based on the need for an economically accessible housing for a broad target group. The economic efficiency is achieved through a serial produced construction in cross-laminated timber that cuts both construction costs and construction time.

KRISTINA PETERS

Partner, Arkitema Architects (SE)

**VIKTOR HANSON'S KONCEPT HOUSES,
STOCKHOLM, SWEDEN**

The use of a cross-laminated timber construction reduces the concept houses' environmental footprint and shortens the construction time. The shorter construction time and the serial production compensate for the higher material cost of timber. An important aspect of the project is that the architectural quality should not be compromised. The new houses will have facades in brick or slate and higher ceilings on the ground floor. In addition, extra effort was given to the design of courtyards and common facilities.

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We see the main building as a bookcase with open and flexible shelves that can be rearranged easily according to the current needs.

BRITTA FORESTIER

Associate, Arkitema Architects (SE)



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NYA KUNGSBERGET, LINKÖPING, SWEDEN

The new building has a pillar-beam frame in solid wood which is combined with a rational building shell that lets in a lot of daylight. The design is highly energy efficient with an external building shell which exploits and channels passive energy supplements in form of heat and cooling. The roofs also have space for solar panels and / or solar cells to minimize the amount of purchased energy.



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Trondheim Station will be a landmark and a continuation of Trondheim’s proud tradition of timber buildings. At the same time, the station center will serve as an example of climate-friendly urban development and green mobility.

THOMAS GRAVE-LARSEN
Associate, Arkitema Architects (DK)

TRONDHEIM STATION, NORWAY

Trondheim Station will be the first building in a major over site development to link the city center with the harbor. In addition to a large public transport terminal, the building will also house a large office building.

The new station will have a timber load-bearing structure. Timber gives a low carbon footprint and adds identity and aesthetic qualities. The building will be a clear landmark and a continuation of Trondheim’s proud traditions of timber buildings. At the same time, the station center serve as an example for climate-friendly urban development and green mobility.

Trondheim Station will be a multimodal transport hub that strengthens the city’s identity and creates attractive experiences for both passengers and citizens.

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Kringsjå is a true showcase project. It is Oslo's most sustainable student accommodation, and one of the blocks is the city's tallest solid timber construction.

JON GRINDAHL

Vice President, COWI (NO)

**KRINGSJÅ STUDENT HOUSING,
OSLO, NORWAY**

Kringsjå consists of two blocks of 9 to 11 floors with 349 student homes. The buildings are constructed as solid timber passive houses, which makes them almost energy-neutral and self-sufficient regarding heating and hot water.

Kringsjå is a FutureBuilt project that has obtained an outstanding reduction in CO₂ emissions.

The project includes climate measures such as solid timber CLT panels for the load-bearing structure, use of renewable energy (solar cells and geothermal heat), focus on local rain-water management, focus on choice of materials in relation to greenhouse gases and indoor climate, new pedestrian and bicycle paths and bicycle repair workshops.





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There is a number of reasons to choose timber for the student housing: timber contributes to a healthy indoor environment, it is a renewable resource, and it can take carbon out of the atmosphere.

BIRGER HAUGE LUNDGÅRD
Senior Specialist, COWI (NO)

BJØLSTAD STUDENT HOUSING, NORWAY

The new student accommodation is constructed in solid timber in extension of the existing student housing. The u-shaped building contains single rooms as well as shared accommodation for eight people, organized around a common hallway. There are several common features such as a study and a common room, as well as outdoor sheds and bicycle parking. The project is a 5-storey CLT structure presenting exposed wood on the inside and on the facade.

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The use of timber is a natural choice for the Municipality of Trondheim. The load-bearing structures, walls and ceilings are made in solid timber, and the fire safety is therefore documented through fire engineering analyses.

PETTER MÅLØY

Vice President, COWI (NO)

ÅSVEIEN SCHOOL, TRONDHEIM, NORWAY

The school is a new primary school for the youngest pupils up to 7th grade. In addition to regular classrooms, the new school houses a sports hall, canteen and auditorium. The school is 11.000 m² with space for 630 children.

Åsveien School is a FutureBuilt project aiming for a 50% reduction in CO₂ emissions. The project demonstrates an extensive use of timber and re-used materials. The school is a passive house and one of Norway's most climate-neutral schools.



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The building is constructed with a large seven-storey atrium, which violates the requirements for fire safety in the Norwegian TEK10 guide. Therefore, extensive fire engineering analyses of fire and evacuation processes were carried out in order to verify that the fire solutions have a level of safety that corresponds to the fire engineering performance requirements.

PÅL ANDREAS DAHL

Senior Specialist, COWI (NO)

FINANCIAL PARK, STAVANGER, NORWAY

The new SR-Bank head office is a new landmark in Stavanger totalling 22.500 m². With seven floors above ground and three floors below, it is one of Europe's largest commercial buildings built in timber.

The main structure of the 13.500 m² over ground is made of timber. Concrete was used for the stabilizing staircases and the 9.000 m² underground structure. Facades are primarily glass structures and the roof is a green roof. The project is BREEAM Excellent certified.



Architect: SAAHA + Helen & Hard
Photo: Sindre Ellingsen



BREEAM
EXCELLENT CERTIFIED

”

The client wanted a highly sustainable building, and with the use of solid timber constructions and solar panels the coffee factory has reached the certification level BREEAM Excellent.

KETIL ARMANN HANSEN
Senior Project Manager, COWI (NO)

COFFEE FACTORY, VESTBY, NORWAY

The new coffee factory is the first factory in Norway built in solid timber. It is built in cross-laminated-timber (CLT) and glulam frame structures and includes a production building, warehouse, and packaging and delivery facilities. 1.280 solar panels are located on three sides of the factory building as part of the facade elements.

A factory building with ceiling heights of up to 35 meters and a total area of 11.500 m² made of solid timber is challenging and a lot of time was spent on ensuring safe and risk-free installation during construction.



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Wood is a combustible material, but COWI has the competence to design fireproof solutions using timber in complex buildings. At Romsdal High School the fire engineers have documented satisfactory fire safety through extensive fire analyses in the early planning phase.

PÅL ANREAS DAHL

Senior Specialist, COWI (NO)

ROMSDAL HIGH SCHOOL, MOLDE, NORWAY

The new Romsdahl High School is the largest school in Scandinavia built in solid timber. It has floorage of 12.000 m² and room for 950 pupils.

The school is a business school and contains traditional class rooms in connection to special subject rooms as well as a new canteen. It is a passive house with an exposed timber structure on the inside and a wooden facade.

The main purpose of the use of timber was to reduce the CO₂ emissions and to encourage the use of sustainable forestry in the construction industry. 11.000 trees, half a cubic metre each, for this construction project. The trees were used entirely - nothing was wasted.

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The science center is constructed from new global technology with spectacular environmental benefits. The entrance building is a modern barn, “the wooden ship”, with free spanning glulam beams providing an uninterrupted floor space of 800 m² with a free height of four meters and one-meter installation zone. It is a highly flexible space where most of the hands-on experiments of the science center are located.

MAGNUS NILBER

Vice President, COWI (SE)

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**UNIVERSEUM SCIENCE CENTER,
GÖTEBORG, SWEDEN**

The Universeum’s mission is to stimulate young people’s thirst for knowledge and encourage them to get actively involved in science and technology. The main materials are wood, glass and concrete; all chosen with future recycling in mind. The building is to act as a model of good environmental practice in every possible way; its energy consumption is low and the energy used in its day-to-day running is, as far as possible, to be harnessed in the building itself. The vertical joints of the opaque glass screen are covered with wooden frames making the building appear all wood from the main approach.



Architect: Wingårdhs
Photo: Åke Lindman

CONSULTING & DESIGNING TIMBER BUILDINGS

We provide locally based consulting services within architecture and sustainable construction throughout Scandinavia, and work for private and public clients.

At Arkitema & COWI Timber, we have specialists in timber technology, fire safety, acoustics and building physics. We are familiar with the nature of wood and have the experience and expert knowledge needed in order to build in timber.

Our expertise includes both new construction, renovation, cultural restoration, infrastructure, bridges and high-rise buildings. Through our projects and strategic collaborations with the timber industry and universities, we have created a Scandinavian network of specialists who can ensure safe, profitable and future-proof projects.

CONSULTING & DESIGNING TIMBER BUILDINGS

We advise in all architecture and engineering disciplines, including:

- *Architecture*
- *Timber technology*
- *Life Cycle Assessment - LCA*
- *Sustainability certifications e.g. DGNB, BREEAM, LEED*
- *Facade engineering*
- *Fire safety*
- *Acoustics*
- *Structural design*
- *MEP building services*
- *Energy strategy*
- *Indoor climate*

METHOD

We work cross-disciplinary to ensure the right total solutions for our clients. We have specialists with many years of experience within timber construction at our Scandinavian offices in Denmark, Sweden and Norway.

Timber construction has unique advantages when the material is applied and detailed correctly. This requires great technical knowledge from the consultants. In close cooperation with contractors, universities and manufacturers, we ensure that we can provide the best advice. At Arkitema & COWI Timber we are familiar with the properties of timber and we work with the nature and tectonics of it, both in design and detail. From an early sketch to the finished project, we have a strong focus on:

- Technically sound solutions (fire safety, acoustics, moisture)
- Total economy (construction process, maintenance, long-term value creation)
- Rational material choices (quality, environmental benefits, material life cycle)

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WE HAVE A UNIQUE SITUATION AT ARKITEMA & COWI, WHERE WE QUICKLY AND EASILY CAN CALL IN THE RIGHT SPECIALISTS FROM ANY DESIGN FIELD NEEDED, FROM ANY OF OUR OFFICES, IN ORDER TO FIND THE BEST SOLUTIONS FOR OUR TIMBER PROJECTS.

— Daniela Grotenfelt, Head of Sustainability, Arkitema Architects (SE)



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The municipality of Viborg has ambitious plans for future-proofing Overlund School, allowing us to come up with some of the most innovative solutions, where we really focus on creating the best learning environment not only for the students who will learn here in five years, but also for those who will be here in 50 years.

PERNILLE SVENDSEN

Associated Partner, Arkitema Architects (DK)

LYSNINGEN, VIBORG, DENMARK

We have named our proposal “Lysningen” - the clearing, which, combined with the use of timber, fits to the architectural principle of the building; a forest of green pillars, held together by plateaus of different heights - like tree crowns forming a roof over the forest floor.

The school is designed to provide many possibilities for its users. In the center there is an atrium around which different floor plateaus spread out. These form an interesting and dynamic central space where all floors are closely connected and create a natural flow throughout the building. Stairs that connect the different plateaus are also used as amphitheatres for teaching and gathering.





The vision for Erlev School is to create a model for future sustainable and playful school buildings.

PERNILLE SVENDSEN

Associated Partner, Arkitema Architects (DK)

ERLEV SCHOOL, HADERSLEV, DENMARK

The school will be a children's universe built in timber with space for 500 children.

By building the school primarily in timber, we get a beautiful and light architectural expression that in addition, is very sustainable. Timber has remarkable qualities that give a great opportunity to create a learning universe that undoubtedly will make a difference to the people using the school and the facilities around it, in the next decades. Both socially, economically and environmentally, the project has a high sustainability score.

Erlev school will be one of the first schools in Denmark built primarily in timber, and have a very low carbon footprint.





Erlev School, Haderslev, Denmark



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Skogskvarteret will be a balanced and cohesive neighborhood built in timber with a strong architectural identity and a focus on the social and environmental sustainability.

ELIN ANDREASSEN

Associate, Arkitema Architects (SE)

SKOGSKVARTERET, UPPSALA, SWEDEN

Timber was a natural choice for the ambitious clients, as it has a significantly lower climate impact than traditional steel and concrete constructions. Partly, due to less carbon dioxide emissions during construction and partly, because timber binds carbon dioxide throughout the life of the building.

Skogskvarteret will have a strong focus on the social sustainability with common spaces for spontaneous meetings between the residents. In addition, the apartments will consist of a mix of rental and condominiums as well as accessible living for people with disabilities.

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It's a highly flexible building built in timber with a natural meeting point for all associates. The new headquarter will be a modern office building in the Nordic spirit as part of the local community.

MICHAEL HEDEGAARD ANDERSEN
Lead Architect, Arkitema Architects (DK)

OFFICE HEADQUARTER, DENMARK

The new office building will be one of the largest office buildings in Denmark built in timber. The building is constructed with a four-storey atrium supporting the unity and flexibility of the building. Timber beams and columns are chosen for the load-bearing structure including CLT panels at floor levels, which allows for a light-weight structure and a low carbon footprint from the building. All consultancy services including leading experts within timber construction are provided by COWI and Arkitema.



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**SUSTAINABLE REQUIREMENTS AND AMBITIONS
POSITIVELY CHALLENGE THE FIELD OF ARCHITECTURE,
RESULTING IN VALUABLE SOLUTIONS FOR
BOTH CITY DISTRICTS AND BUILDINGS.**

— *Kim Risager, Partner, Arkitema Architects (DK)*



Solhøy Housing | 12.000 m² | Fredrikstad | Norway | 2020-
Office Headquarter | 14.000 m² | Denmark | 2020-
Financial Park | 22.500 m² | Stavanger | Norway | 2019
Racehall CPH | 10.050 m² | Taastrup | Denmark | 2019
Romsdal High School | 12.000 m² | Molde | Norway | 2017
Nye Hopperen School | 6.800 m² | Hopperen | Norway | 2018
Coffee Factory | 9.450 m² | Vestby | Norway | 2018
Karlshus School | 2.900 m² | Karlshus | Norway | 2017
Kringsjø Student housing | 12.000 m² | Kringsjø | Norway | 2017
Lager 12 Office building | 10.800 m² | Fredrikstad | Norway | 2017
Preschool Rymarksvej | 1.000 m² | København | Denmark | 2016
Fantoft Housing and preschool | 10.000 m² | Bergen | Norway | 2016
Åsveien School | 11.000 m² | Trondheim | Norway | 2015
Bjølstad Student housing | 5.000 m² | Fredrikstad | Norway | 2015
Naturum Tåkern | 680 m² | Glänå | Sweden | 2012
Utzon Center | 2.900 m² | Aalborg | Denmark | 2008
Gigantium Sport Arena | 7.000 m² | Aalborg | Denmark | 2000 - 2010
Universeum Göteborg | 10.700 m² | Göteborg | Sweden | 2001
CASA NOVA Housing | 34.000 m² | 8 cities in Denmark | 2000 - 2002
Aalborg Airport | 6.000 m² | Aalborg | Denmark | 2000

Office Headquarter | 14.000 m² | Denmark | 2020-
Trondheim Station | 19.200 m² | Trondheim | Norway | 2020-
Lysningen | 10.800 m² | Viborg | Denmark | 2019-
Oksenøya Living and Treatment Centre | 18.400 m² | Bærum | Norway | 2019-
Oksenøya Preschool | 4.500 m² | Bærum | Norway | 2019-
Sofiemyr School | 20.000 m² | Sofiemyr | Norway | 2019-
Sophie Radich School | 11.700 m² | Lillestrøm | Norway | 2019-
Nya Kungsberget | 31.000 m² | Linköping | Sweden | 2017-
Ör Center | 16.400 m² | Sundbyberg | Sweden | 2017-
Tåsenhjemmet | 14.300 m² | Oslo | Norway | 2017-
Ribbings Väg | 5.000 m² | Sollentuna | Sweden | 2016-
Erlev School | 5.800 m² | Sønder Otting | Denmark | 2020
Kronborg Strandby | 15.000 m² | Helsingør | Denmark | 2018
Lustigkulla Preschool | 1.900 m² | Knivsta | Sweden | 2018
Bardufoss School | 7.500 m² | Målselv | Norway | 2017
Prästgården | 2.800 m² | Gustavsberg | Sweden | 2011
Nørre Vosborg | 4.000 m² | Vemb | Denmark | 2008
Skovhøj Seniorboliger | 5.300 m² | Hasselager | Denmark | 2003

ARKITEMA & COWI TIMBER

Arkitema & COWI Timber is a knowledge-based consulting group that provides specialized consulting services within architecture and sustainable construction, and solves tasks for private and public clients.

With experience from Denmark, Norway and Sweden, we have a large and well-founded base for knowledge in timber construction, which ensures the best results for our customers.

We focus on generating and spreading our knowledge about sustainable timber construction to our colleagues, customers and the external stakeholders. Our designers and timber specialists, with many years of experience, enable us to advise our clients in all aspects of a sustainable timber building; in design and construction and at a small and large scale.

Main locations with Arkitema & COWI Timber competences:



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