
# Environmental Brochure

## Providing Solutions for Sustainable Habitat

Gyproc
SAINT-GOBAIN

SUMMARY

# Sustainable Habitat is our future. It starts now!

Buildings have a massive impact on the environment, with both their construction and use contributing significantly to the environmental issues we face today. For this reason, **sustainable construction methods are becoming increasingly important.** In Saint-Gobain Gypsum, we have developed a sustainable approach to our business which helps our partners in the construction industry (architects, contractors, installers to name but a few) deliver innovative solutions and services to their customers and clients.

**Claude-Alain Tardy**
Director of the Gypsum Activity
at Saint-Gobain

Our commitment is to **minimise the impact of our products and systems on the environment** and we achieve this in a number of ways:

- We are located all over the world with **manufacturing facilities as close as possible to the main construction hotspots,** ensuring that our response is prompt, and that our materials are local to minimise transportation.
- Our products help provide **comfort, security and health** to the occupiers and users of buildings.
- After the construction of a building, we recycle construction site waste.
- The environmental impact of our products is monitored vigilantly during production and also over their whole life cycle. This requires transparency and the vigorous use of widely-accepted **Life Cycle Assessment (LCA)** techniques to produce meaningful data which our customers can compare to ensure an optimised approach is taken in line with **the requirements of LEED, ESTIDAMA or BREEAM.**

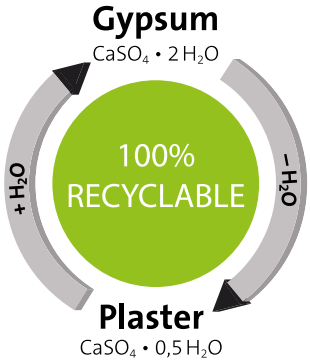
Looking to the future, **Saint-Gobain is introducing a strong "Eco-innovation" strategy** to ensure that the environmental impact of a new product is considered right at the beginning of the innovation process. By using this mind-set and methodology, we will increasingly deliver product, system and service innovations to improve the environment and comfort of our installers and end-users. As you read this document, I hope you will appreciate the depth of our approach, and our total commitment to making it work in practice.

Gypsum has many environmental qualities:
- → Sustainable material
- → Fire resistant
- → Contains no hazardous substance i.e. non-toxic
- → Infinitely recyclable

# Plaster, the most modern of old materials

Gypsum is a natural resource, a mineral rock, embedded in the ground. It has been widely used in construction for over five thousand years and has proved to be not only durable but also easy and safe to use. Ancient Egyptians used gypsum to build the pyramid of Cheops and the material was also used as arabesque decoration-stucco in Alhambra.

Alhambra Palace, Spain




Gypsum is an inherently sustainable material as it can be completely recycled an infinite number of times. Removing water from gypsum rocks through dehydration produces a plaster powder scientifically known as calcium sulphate. This process is totally reversible: adding water reproduces gypsum.

Samiriya Tower,
Doha, Qatar

## Drywall versus traditional solutions

A comparison between plasterboard and conventional brick walls solutions clearly favours our gypsum solutions.

- → Lightweight
- → Fewer natural resources per $m^2$
- → Low energy consumption in production
- → Low $CO_2$ emissions over whole life cycle
- → Time-saving during installation
- → Performance ranges according to the application
- → Flexible design
- → Recyclable

# Description of plasterboard manufacturing process steps

**0**

Gypsum (either from a natural, synthetic or recycled source) is crushed and dehydrated at around 160°C to produce the plaster powder.

**0**

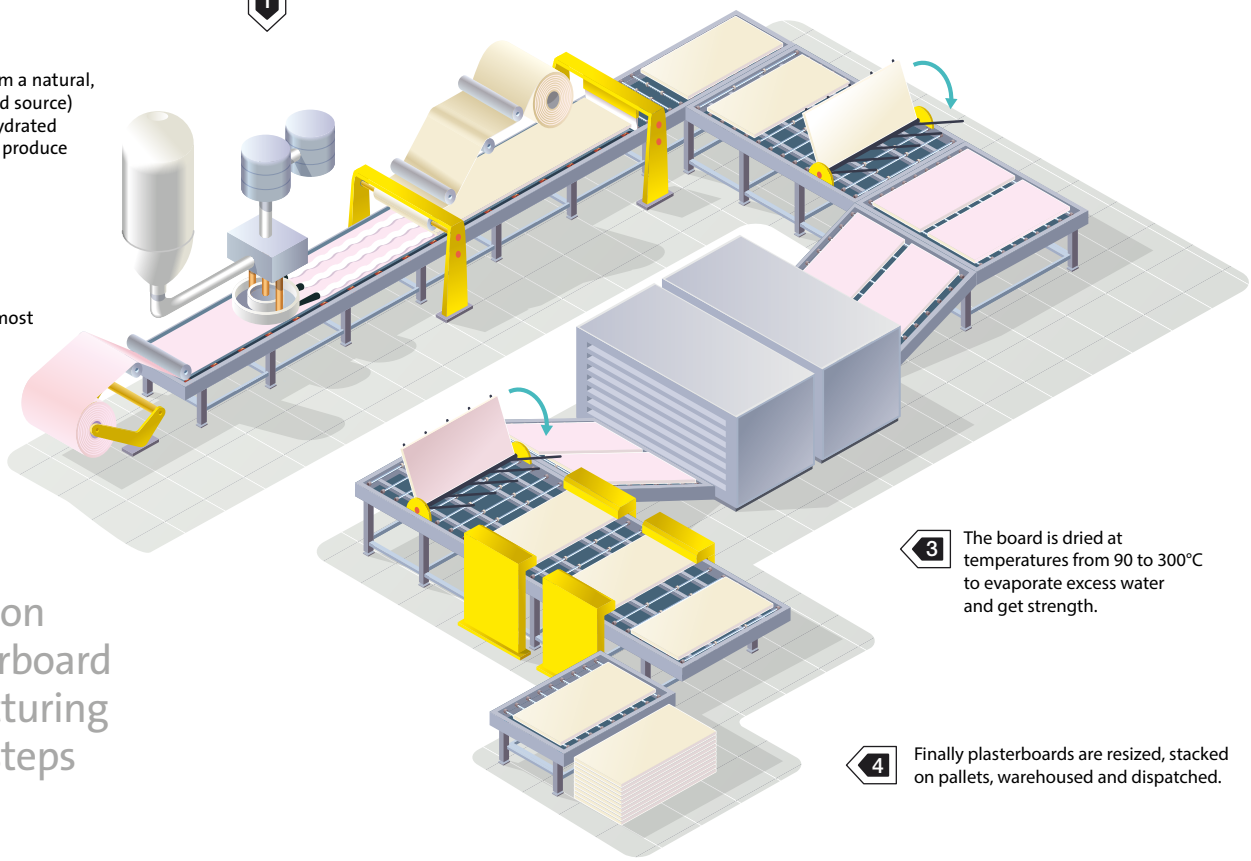
Paper used for our plasterboards is almost 100% recycled.

**1**

The plaster powder is mixed mainly with water and starch to create a paste (slurry) which is introduced between two layers of paper. Glue is not necessary as starch is acting as a binder between both materials.

**2**

After rapid setting, plasterboards are able to be pre-cut before entering the dryer.



**3**

The board is dried at temperatures from 90 to 300°C to evaporate excess water and get strength.

**4**

Finally plasterboards are resized, stacked on pallets, warehoused and dispatched.

# In Saint-Gobain Gypsum, we are very proud to contribute to a more sustainable habitat.

We have been working in the plaster and plasterboards fields for years and are committed to maintain a strong position thanks to our innovative and sustainable products and services. Sustainability is a core value for Saint-Gobain Gypsum and we follow this long-term vision to deliver benefits for people and their environment.

Hyatt Capital Gate, Abu Dhabi, UAE

## Buildings have a huge impact on the environment

**12%**
OF ALL WATER CONSUMPTION

**40%**
OF ALL ENERGY USE

**30%**
OF GREENHOUSE GAS EMISSIONS

**40%**
OF SOLID WASTE GENERATION

International data source: UNEP SBCI *2011*

We believe that it is our responsibility to offer innovative products and solutions that will decrease these environmental impacts. By offering more environmentally-friendly products, we believe this can be achieved.

## Transparency can make the difference

Our strategy is based on transparency and openness. By providing accurate data on environmental aspects of our products, we give our customers the information they need to make an informed choice. This information takes the form of externally validated Environmental Product Declarations and our Sustainable Development Report.

## Our goal: being exemplary in our actions

Setting a good example is part of our role as market leader in gypsum products. We try to do the best in all our actions: increasing the recycled content of our solutions, continuously restoring our quarries, finding alternative means of transport to minimise our $CO_2$ emissions, proposing recycling services on jobsites...

Abu Dhabi Future Schools, Abu Dhabi, UAE

# Eco-innovation is the future

Eco-innovation refers to Saint-Gobain's policy to develop innovative products and solutions that help reduce the environmental impact of buildings and infrastructure over their whole life cycle. Our eco-innovative products and solutions help reduce the operational use of resources (particularly energy and water) in buildings and infrastructure and/or have reduced environmental impacts over their own life cycle.

**12,000**

Our 12,000 employees worldwide are locally committed to building a more sustainable habitat.

Gyproc, Abu Dhabi Plant, UAE

**135**

We are an integrated business with 75 gypsum quarries and 135 manufacturing facilities.

**We act as a global actor but also operate locally in almost each country where we are present.**

**53**

Saint-Gobain Gypsum is present in 53 countries on all 5 continents.

# In Saint-Gobain Gypsum we think that a life cycle approach is a key factor

Not only do we want to offer products with high levels of performance in use but also products that respect the environment throughout their whole life cycle, from raw material extraction through to recycling.

**RAW MATERIALS** P. 10

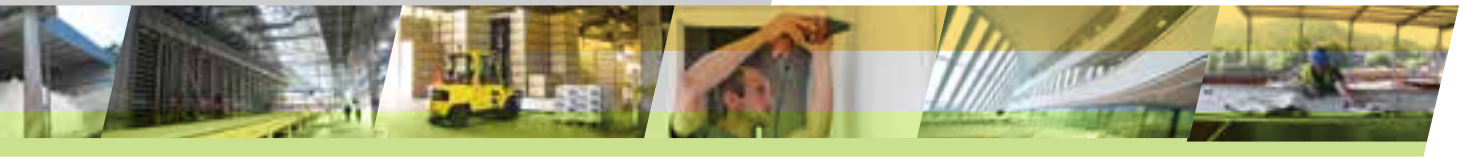
Gypsum, a sustainably extracted natural resource from quarries but also a by-product from power stations and a recycled waste from jobsites.

Gypsum is 100% recyclable, indefinitely.

**RECYCLING** P. 20

Easy to dismantle and recycle solutions.

**END-OF-LIFE** P. 20



# Life cycle approach

**MANUFACTURING** P. 12

A manufacturing process at low temperatures, with low emissions and measured water consumptions.

**LOGISTICS** P. 14

Local production in most countries we serve.

**INSTALLATION** P. 16

Flexible and lightweight solutions. Limited waste generation on jobsite.

Comfortable, efficient and healthy buildings.

**BUILDING LIFETIME** P. 18

# Limiting our impact on natural resources

## Paper sourcing

Through on-going work with our paper suppliers, in Europe we are able to provide plasterboard with **97.4%** to **100%** of recycled paper. In cases where the paper is not from a recycled source, we ensure that it comes from **sustainably managed forests in Europe.** One way to guarantee that commitment is the FSC label.

## Key assets

Here in Saint-Gobain Gypsum, we use either natural gypsum, synthetic gypsum (from desulphurising the flue gas of coal-fired power plants) or recovered gypsum from the waste-recycling chain.

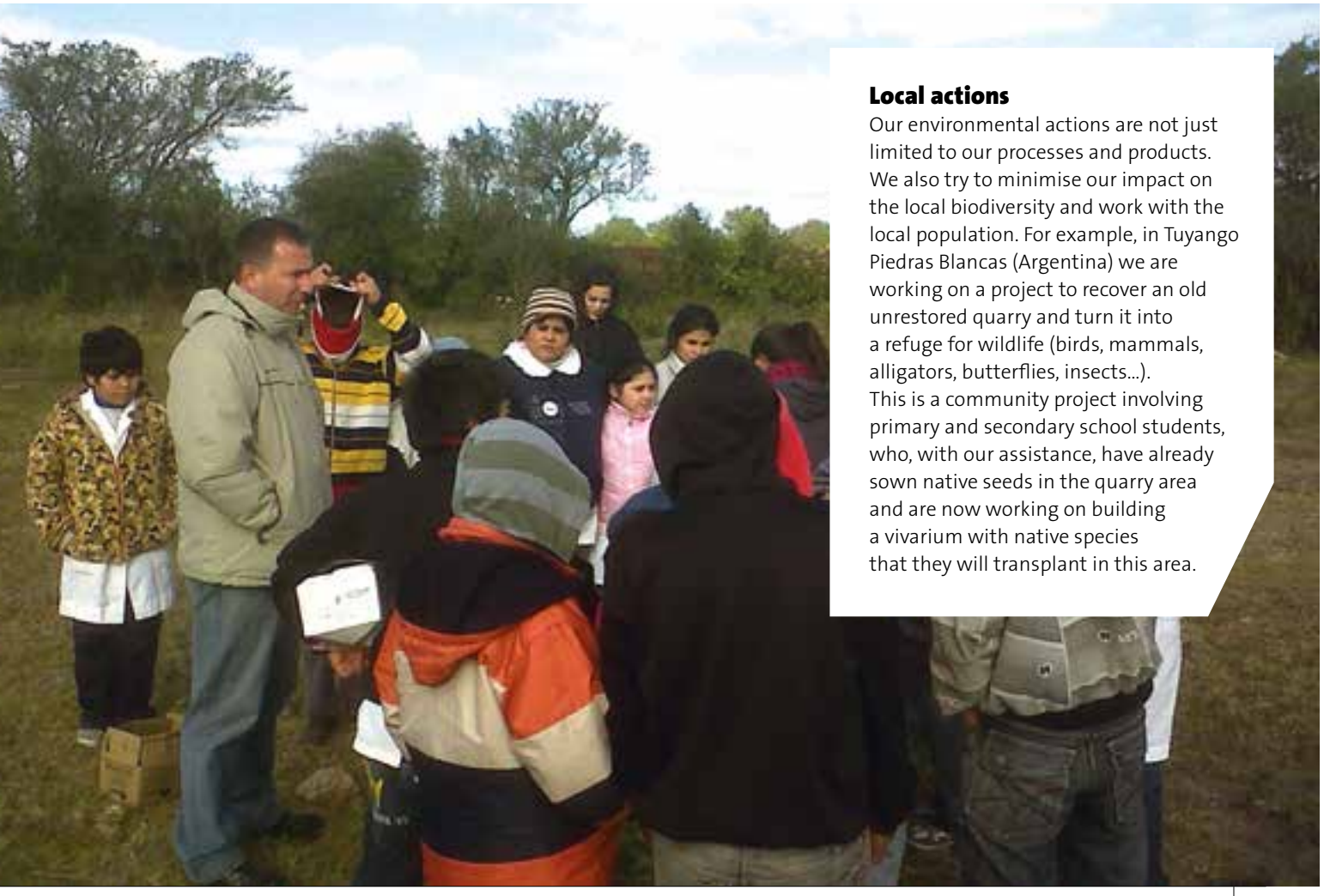
- Extracting **natural gypsum** does not require much energy. In addition, quarries in use are continuously restored in order to preserve the natural site and its biodiversity.
- We also work on the **effects of this exploitation on local communities and the environment**. This includes the visual impact of operations, dust, noise and vibration, added road traffic and any repercussions on the natural surroundings.
- At the same time, **the desulphurisation process** represents an opportunity to tackle natural resource depletion and decrease sulphur dioxide emissions.
- **Recycled gypsum** is an opportunity to preserve natural resources.
- Almost 100% of the paper used to manufacture our plasterboards is **recycled paper.**

"We work closely with the neighbourhood around our quarries, throughout their operational life, taking care to avoid any acoustic and visual pollution."

**Natural gypsum has an industrial alternative: FGD gypsum comes from the flue gas desulphurisation (FGD/DSG) process of the coal-fired power stations.**

**Biodiversity preservation**

The Vaujours quarry (France) is continuously restored in order to preserve biodiversity. We liaise with Ecosphere and its ecology specialists to restore the site throughout its exploitation. Over 200 hectares have already been restored around the industrial site with more than 130,000 trees replanted and a variety of ecosystems set up.



**Local actions**

Our environmental actions are not just limited to our processes and products. We also try to minimise our impact on the local biodiversity and work with the local population. For example, in Tuyango Piedras Blancas (Argentina) we are working on a project to recover an old unrestored quarry and turn it into a refuge for wildlife (birds, mammals, alligators, butterflies, insects...). This is a community project involving primary and secondary school students, who, with our assistance, have already sown native seeds in the quarry area and are now working on building a vivarium with native species that they will transplant in this area.

# Sustainably producing plaster and plasterboard

## Key assets

- Manufacturing plasterboard is a very **low energy-consuming process** as the calcination, transformation of gypsum into plaster, and drying stages only require low temperatures, 160°C and 300°C respectively.
- The other main plasterboard production input in the process is water. We strive to increase the percentage of **reused water** in our process (rainwater or steam).
- Even if on the whole this is a low consumption and emission process, we have a **threefold target** to reduce our energy consumption, $CO_2$ emissions and waste generation by 6%. We support Saint-Gobain's policy to purchase green electricity wherever possible and cost effective to do so.
- We have also introduced a **"zero landfill waste" policy** to avoid sending production waste to landfill and, at the same time, consume fewer primary raw materials by directly recycling scrap.
- In line with the Saint-Gobain objectives, we aim to increase the percentage of our **ISO 14001 certified sites** to more than 90% by the end of 2013*.

*Based on 2010 values.

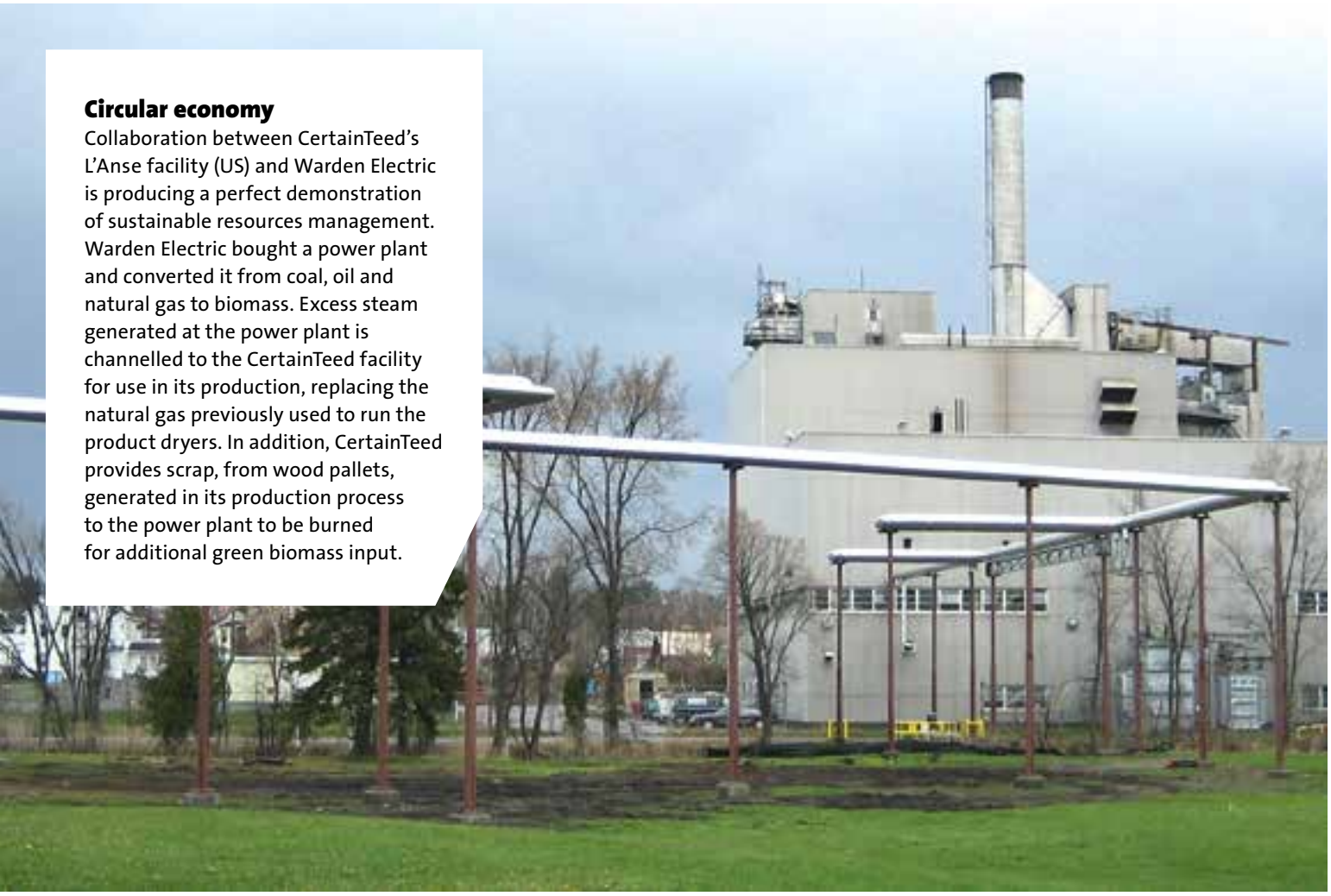
"Our environmental targets for 2013* are:
- Zero environmental accidents,
- Reduce $CO_2$ emissions by 6%,
- Reduce water withdrawal by 6%,
- Reduce landfill waste by 6%,
- Obtain ISO 14001 certification for more than 90% of our sites."

**160°C**

Plaster for plasterboards is made at 160°C maximum... almost the same temperature to bake a cake at home!

### Avoid waste energy

During the plasterboard manufacturing process, we use energy to calcinate gypsum. In Rigips Melnik (Czech Republic) we installed a system to reuse the heat lost to heat up the plant and adjacent offices (including hot water supply) instead of using a separate gas boiler. This allowed an annual saving of about 1,100,000 kWh.



## Circular economy

Collaboration between CertainTeed's L'Anse facility (US) and Warden Electric is producing a perfect demonstration of sustainable resources management. Warden Electric bought a power plant and converted it from coal, oil and natural gas to biomass. Excess steam generated at the power plant is channelled to the CertainTeed facility for use in its production, replacing the natural gas previously used to run the product dryers. In addition, CertainTeed provides scrap, from wood pallets, generated in its production process to the power plant to be burned for additional green biomass input.

## Rain water harvesting

Water is one of our major items of consumption and emission during the manufacturing process. To improve its usage, we have implemented systems to recover the water from our emissions (during dehydration and drying) and from rainwater. For example, in Gyproc Wada (India) rainwater is harvested (especially during the rainy season) and used to combat water scarcity in the plant.

# Minimising $CO_2$ emissions during transport

## Key assets

Many projects are already implemented to optimize our logistics and decrease transport-related carbon emissions.

- We **optimize truck loading** to avoid vehicles leaving our plants less than full.
- We arrange **different transport means** for our raw materials and finished products wherever possible. For example, boat transportation leaves less environmental impact than road freight. Quarry to plant electric strip conveyors enable us to take a large number of trucks off the road every year!
- We rely on our **local manufacturing facilities** to ensure that materials are produced as close as possible to the end-user.
- In our logistics centres, we work with haulage companies to **develop better transportation practices** (eco-drive training courses, natural gas...).

"Locating manufacturing facilities close to quarries minimises the transportation of gypsum for processing, just as working with our local distribution partners helps shorten the distance when shipping finished products to installers and building sites."

**24,000**

**Truck movements removed annually thanks to the installation of an electric strip conveyor between the quarry and the Vaujours plant (France)!**

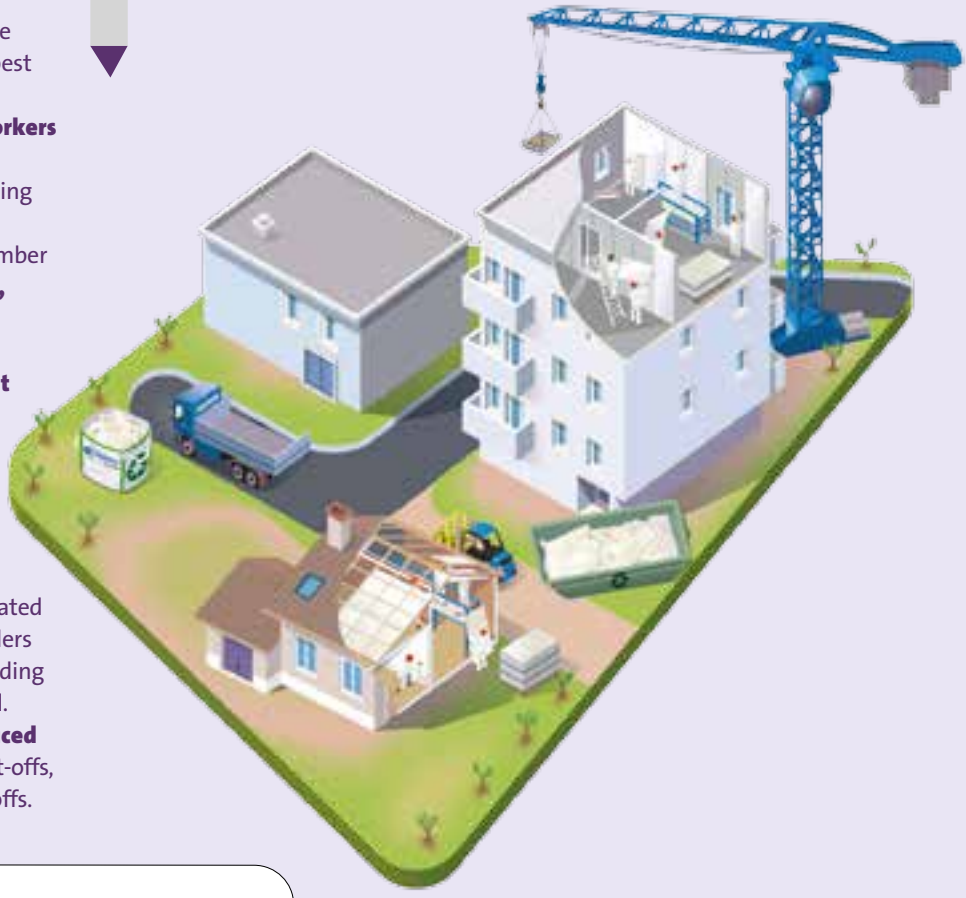
**Transport by ropeway**
In Rigips Austria, gypsum is not put on trucks to cover the 8.4 km from the quarry to the plant... it is loaded into cable cars which saves 23,000 trucks which means a reduction of 235 tons of carbon emissions a year.

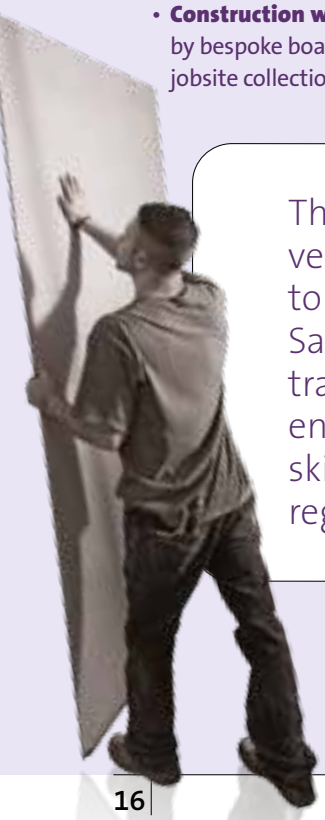
**Transport by boat**
Orders from Gyproc Netherlands supplied by our Belgium plant in Kallo were shipped to Amsterdam (Netherlands) by boat! In December 2012, the delivery of 90,000 m² of plasterboards replaced 35 truckloads, yielding a 35% reduction in carbon emissions when compared with truck transportation.

# Facilitating installation and reducing waste

## Key assets

- Saint-Gobain Gypsum works directly with installers to train them and ensure that our solutions are installed in the best conditions.
  Globally, there is a need for **trained workers skilled in sustainable products and technologies.** We can fulfil these training needs around the world.
- Gypsum solutions generally offer a number of **key benefits over traditional brick, block, sand and cement solutions.**
  - As a dry solution there is less mess on the jobsite and their **lightweight** (10 times lighter in the case of plasterboard partitions vs. traditional partitions) reduces transportation, crane activity and even the depth and material involved in foundation design.
  - This huge weight saving also translated into less manual handling by installers and less material weight in the building when it is eventually deconstructed.
- **Construction waste to landfill is reduced** by bespoke board sizes to minimise cut-offs, jobsite collection and recycling of cut-offs.





The building market is evolving very quickly when it comes to environmental issues. Saint-Gobain Gypsum provides training to its customers, enabling them to keep their skills up-to-date with the latest regulations and technologies.

### Minimising waste by design

During the design stage, Saint-Gobain Gypsum's specification team works with architects and consultants on the building design to minimise waste. Together, they review the location of doors, windows, etc. to define solutions with the right dimensions to fit the building layout. Thanks to this collaborative phase, off-cuts and waste are limited.


## Customer Showrooms

Gyproc Middle East have installed drylining display showrooms, for a selection of customers, demonstrating a range of high performance systems.

## Training on offer

Gyproc Middle East offer a wide range of training courses for installers, site supervisors or managers and distributors covering a variety of subjects:

- Basic system introduction for newcomers to drylining techniques.
- Advanced system installation for demanding constructions such as; high-rise multi-occupancy buildings and complex healthcare, education and hotel projects.
- Performance characteristics including; moisture, fire, acoustics, impact, mould and indoor air quality.
- Aesthetics in the form of curved partitions or perforated acoustic wall and ceiling systems.
- Finishing plasterboard systems though taping and jointing or skimming with gypsum plasters.
- Total install cost benefits and the sustainability measures achievable with drylining systems.
- Understanding our products and systems and how to sell them.

GYPROC SITE TRAINING

**2000+**
**installers trained by Gyproc Middle East since 2011**

# Improving user's comfort, safety and health

## Key assets

During buildings' lifetimes, our solutions contribute to the comfort, safety and health of people living there.

- **The occupants' comfort** is associated with several benefits, which can be provided by our solutions:
  - **Acoustic comfort**: better sound insulation between spaces and enhanced sound absorption within a room;
  - **Thermal comfort**: insulation complex and high level of air-tightness;
  - **Hygrometric comfort**;
  - **Flexibility**: easy to install, to fit different heights and thicknesses and to be removed during lifetime;
  - **Easy maintenance**.
- **Visual comfort**: aesthetic ceilings solutions and smooth walls finishing.
- **Fire safety** is embedded in our products and we offer solutions with high fire resistance performance.
- Finally not only will our products not deteriorate the **building's indoor air quality** but, thanks to Activ'Air technology, our plasterboards can actually improve this indoor air environment by capturing and eliminating VOCs* (Volatile Organic Compounds) present in the air.

*formaldehyde

## Benefits from our solutions

**Indoor air quality:** Our products contain a very low quantity of VOCs and our Activ'Air system durably removes 70% of VOCs* in the air.

**Acoustic insulation:** A 100mm-thick drywall system can achieve up to Rw 50dB sound insulation, while a half-brick wall (plastered both sides) provides an average sound insulation of Rw 40dB.

**Speech intelligibility:** Our solutions can also be specified to improve sound absorption properties within a given space to improve speech intelligibility.

Saint-Gobain Multi-Comfort
House in Beaucouzé, France

ACTIV air

Knowing that people spend 90% of their time indoors, we think that our solutions should not only guarantee occupants a healthy environment but also contribute to improving indoor air quality, thanks to Activ'Air technology.

**Living today in tomorrow's habitat**

Living in a healthy, efficient, comfortable and affordable house is already a reality. The "Saint-Gobain Multi-Comfort House" projects show that this is possible. These energy-positive homes produce more energy than they consume, and involve every one of the Group's business sectors...

**Stability:** Our solutions can be specified for use in conditions exposed to mechanical stress in the building. They provide stiffness to statically loaded walls and are suitable for flooring elements.

**Impact resistance:** Our solutions can be specified to offer the highest level of impact protection in high traffic areas such as hospitals and schools. They will provide resistance against damage to walls over the building lifetime.

**Fire resistance:** Lightweight partition and ceiling systems using a range of different gypsum boards can be specified to provide excellent fire performance for up to 4 hours within all building types.

**Energy efficient:** Our solutions can help meet regulations regarding air tightness, the thermal performance of the building structure and help reduce the energy consumed.

**Easy maintenance:** Whether damage to the plasterboard system is minor or more extensive, the system can be easily repaired using gypsum products... and it always delivers an excellent finish.

**Moisture resistance:** Our systems can provide complete moisture resistance for the lifetime of the building and can be dedicated to wet areas (bathrooms, swimming-pools...).

# Avoiding landfilling and giving a new life to gypsum-based waste

## Key assets

- To **avoid gypsum waste landfilling,** either from construction or deconstruction jobsites, we propose recycling services to our contractors.
- **Recycling services** depend on the country and the project itself and basically follow the steps below:
  - First, big-bags or skips are made available on site either directly by us or through partners;
  - When filled with waste, the collection is organized and the scraps are sorted to meet recycling specifications;
  - Next, plasterboard scraps are sent to recycling units to obtain a recycled gypsum powder;
  - Finally, this powder is re-introduced into our process as raw material to manufacture new plasterboards.
- Thanks to these services, our contractors can **comply with their local regulations,** which are becoming more and more stringent, and also **fulfil building eco-label requirements.**

"Depending on the country and project size, Saint-Gobain offer different kind of recycling solutions. We provide bags, bins or skips to answer the specific needs of our contractors."

## Up to 25% of recycled content

To preserve natural resources, we are working to **improve the recycled content** of our products. First, our plasterboards use almost **100% recycled paper** (see p.10). Then the proportion of recycled gypsum depends on a variety of local parameters and ranges **from 10 to 25%**. To increase this proportion, the recycling sector for construction products needs to be developed locally, hence the reason why we are proposing more and more recycling services.

**Our recycling services close to local needs**
A recycling service is available in Austria, Belgium, the Czech Republic, Denmark, Finland, France, Italy, Malaysia, the Netherlands, North America, Sweden, Switzerland, the UK, Poland (pilot phase) and the UAE (pilot phase).

The Masdar HQ project is a mixed use commercial building, located within Masdar City, Abu Dhabi, United Arab Emirates. The building is targeting an Estidama 4 Pearl Rating (see page 23 for more information), whilst achieving the Masdar Sustainability Key Performance Indicators KPI's.

This translates in to an objective for Brookfield Multiplex to divert as much construction waste as possible from disposal in landfills and to incineration facilities with a diversion from landfill target of more than 90%.

New York University, Abu Dhabi, United Arab Emirates is a major project hosting a campus that occupies a site of approximately 15.4 hectares including academic space, accommodation and research areas.

In three weeks 30 tonnes of plasterboard off-cuts were generated whilst a total of 1,400 tonnes of waste was returned to Saint-Gobain Gyproc Middle East for recycling over the entire build programme.

**60,000**

More than 60,000 tons of plasterboard were recycled in our plants in Europe in 2011.


Masdar Institute, Abu Dhabi, UAE

# A rigorous tool for assessing the environmental impacts of our products

Understanding the environmental performances of construction products is a growing expectation for professionals in the building chain.

In Saint-Gobain, we strongly believe that **Life Cycle Assessment is the most reliable tool available to assess the green credentials of construction products** and enables companies to communicate **credible, fact-based information about their products** to consumers. It is also a powerful tool for enhancing the environmental features of our products.

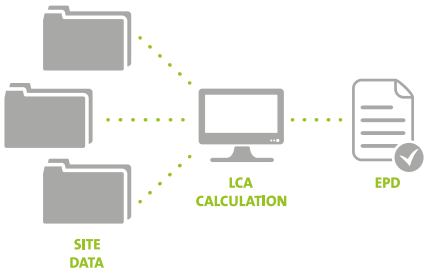
Consequently, Saint-Gobain Gypsum has decided to promote the use of LCAs in the building industry and to communicate actively on the LCA results of its products.

## Our "EPD verified" policy

When an Environmental Product Declaration has been checked by an independent third party, it is said to be "verified". This process ensures the quality and reliability of the results and that is why, here in Saint-Gobain Gypsum, **we are committed to have verified EPDs.** These EPDs can be easily identified thanks to our "EPD Verified" pictogram.

EPD VERIFIED

## What is a Life Cycle Assessment (LCA)?




LCA is a **comprehensive methodology to evaluate the environmental impacts of a product over its whole life cycle** according to specific ISO or EN standards (ISO 25930 and EN 15804).

- **Multi-criteria tool**: consumption of natural resources, air, ground and water emissions, waste generation, global warming potential...
- **Multi-step tool:** "from cradle to grave", meaning from the extraction of raw materials to the product's end-of-life.

The results of a LCA are presented in the form of an **Environmental Product Declaration (EPD)**, which is published.


## Our contribution to ESTIDAMA certification

| | | |
|---|---|---|
| LBi | Liveable Buildings: Indoors | |
| → LBi-2.1 | Material Emissions : Adhesives & sealants | 1 Point |
| → LBi-2.4 | Material Emissions : Ceiling Systems | 1 Point |
| → LBi-2.5 | Material Emissions : Formaldehyde Reduction | 1 Point |
| → LBi-3 | Construction Indoor Air Quality Management | 2 Points |
| SM | Stewarding Materials | |
| → SM-R1 | Hazardous Materials Elimination | Mandatory Requirement (no points are allocated) |
| → SM-R2 | Basic Construction Waste Management | Mandatory Requirement (no points are allocated) |
| → SM-1 | Non-Polluting Materials | 3 Points |
| → SM-3 | Design for Flexibility & Adaptability | 1 Point |
| → SM-6 | Design for Durability | 1 Point |
| → SM-9 | Regional Materials | 2 Points |
| → SM-13 | Improved Construction Waste Management | 2 Points |

## Our contribution to LEED certification*

| | | |
|---|---|---|
| → MR1 | Optimise energy performance | 1-19 points |
| → MR2 | Construction waste management | 1-2 points |
| → MR4 | Recycled content | 1-2 points |
| → MR5 | Regional materials | 1-2 points |
| → IEQ 4.6 | Low-emitting materials (LEED for Schools) | 1 point |
| → IEQ 7.1 | Thermal Comfort-Design | 1 point |
| → ID 01 | Innovation in Design | 1-4 points |

* "LEED 2009 for New Construction and Major Renovations"

## Our contribution to BREEAM certification*

| | | |
|---|---|---|
| → Hea 08 | Indoor air quality | 1 point |
| → Hea 09 | Volatile Organic Compounds (for ceiling tiles) | 1 point |
| → Hea 10 | Thermal comfort | 1-2 points |
| → Hea 13 | Acoustic performance | 1 point |
| → Ene 01 | Energy efficiency | 1-15 points |
| → Mat 01 | Materials Specification (Major Building Elements) | 1-4 points |
| → Mat 05 | Responsible sourcing of materials | 1-3 points |
| → Mat 07 | Designing for robustness | 1 point |
| → Wst 01 | Construction site waste management | 1-3 points |
| → Inn 01 | Innovation | 1-10 points |

* "BREEAM Europe Construction 2009"

### Why eco-innovate?

Thanks to LCA results we can identify opportunities of improvement at each stage of our products' life cycle. Next step is to **decrease and minimise as possible these environmental impacts.**

In order to help this process, we have launched **our "Eco-innovation" policy** which will help us to develop innovative products and solutions that:

- Help reduce the operational use of resources in buildings and infrastructures and/or,
- Have lower environmental impacts over their own life cycle.

**Our approach is to be transversal,** involving all of the relevant company functions.

PEFC
PEFC-01-31-83
The paper used for this brochure comes from PEFC mixed sources

Vegetable ink has been used in printing this brochure

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