



4 x 21000 T Grain
Rouen - France - 1991

Our Company



PIRS SA has always been closely related to innovation. At its beginning in 1984 **PIRS** was one of the first companies in France specialized in new techniques for roofing. These included spray foams and coatings, specialty resins and PVC sheets. Throughout the years, **PIRS** began specializing in the construction of reinforced concrete domes using the inflatable structure technology. In 1988, **PIRS** was the first European company to build one of these domes in Europe.

Since then **PIRS** has continued to innovate in this industry by building more than 75 domes ranging from traditional bulk storage complexes to state-of-the-art architectural buildings.

OUR OBJECTIVE

Our objective is to bring our client's ideas to a technically feasible realization taking into consideration the specifications of the "**DômeConcept Agridôme**" technology. You can be sure that if today's technology allows us to proceed with your needs, **PIRS** will find the best and most economical solution for you.

In order to answer to our clients demands and/or local legislations, **PIRS** has structured itself commercially to be able to undertake a project either as a turnkey supplier, a general contractor or a subcontractor.



Our first goal is to provide our clients with the basic elements necessary to build a dome using the "**DômeConcept Agridôme**" technology:

- Technical Assistance, Training,
- Engineering, Design and Plans,
- Custom made ready to inflate PVC membrane,
- Vethane foam,
- Tabs,
- Special equipment,
- Warranty,
- Book of Qualities.

Contractors wishing to construct domes using the "**DômeConcept Agridôme**" technology must be approved by **PIRS**. **PIRS** then supplies to this Contractor the Technical Assistance and the Training as well as the critical elements described hereabove.



"DÔMECONCEPT" and "AGRIDÔME" are PIRS realizations..



3 x 15000 T - Grain
Saintes - France - 1989 & 1990

Main Uses



Depending on the needs, "**DômeConcept Agridôme**" structures allow the realization of volumes which can be used for a variety of purposes.

INDUSTRIAL AND AGRICULTURAL USES

This is the most common use particularly for the storage of bulk material, as:

- cereals, grains
- soya beans
- sugar
- chemical fertilizers
- cement, coal, clinker
- alumina
- nickel or copper concentrate
- salt
- fruits and vegetables
- air conditioned rooms
- (refrigerated rooms, controlled atmosphere)



3 x 15 000 T - Grain
Saintes - France - 1989/90

BUILDINGS FOR VARIOUS ARCHITECTURAL APPLICATIONS

The important volumes erected or the large free span areas allow the implementation of all sorts of installations, such as:

- sports complexes, polyvalent rooms, swimming pools, gymnasiums, hockey arenas, interior ski centers
- entertainment complexes: circus, public aquariums, Imax theaters, discotheques
- schools, hotels

- religious grounds: churches, mosques, temples
- conference rooms, amphitheatres, laboratories
- individually isolated houses or grouped as a complex
- aircraft hangars, shelters
- shelters for military equipments
- vehicle storage or public works heavy equipment
- maintenance or repair workshops
- covers for sewage reservoir and water treatment plants, manure pits or basins.



Cover for water treatment plant
Height 13,50 m and diameter 40 m
Houplin Ancoisne - France - 1992



The combination of spherical and cylindrical forms are also foreseeable but necessitate particular studies.



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30 000 T - Sugar
Souppes sur Loing - France - 1995

Agridôme Advantages

COST EFFECTIVENESS

Even with all its inherent qualities, domes remain as one of the most cost effective storage infrastructures. The true challenge is to innovate by reducing costs and domes fulfill those exact requirements by remaining **the most competitive solution for the storage of large volumes of bulk material.**

All the advantages listed here below have as a goal to provide the **most adapted structure to your needs** but as you will see, our concern for cost savings is at the very heart of the "**DômeConcept Agridôme**" technology.



40 000 T - Copper concentrate
Rayong - Thailand - 1997

RAPIDITY IN CONSTRUCTION

Once the airform is inflated all the **work is carried out inside the dome.** No framework is necessary. All the **materials are spray applied** except for the steel rebars.

The construction time is very rapid since we have **no down time due to exterior environmental factors** such as rain, wind, and daylight.



50000 T - Sugar
Jerez - Spain - 1996

Typically, for grain storage, we can build a 40 meter diameter half sphere (Volume = 16 750 m³) in 4 weeks or a 60 meter diameter half sphere (Volume = 56 500 m³) in 9 weeks

COST EFFECTIVENESS

RAPIDITY IN CONSTRUCTION

STRENGTH

INSULATION

WATERPROOFING

MAXIMUM UTILIZATION OF THE VOLUME

STRENGTH

For centuries the sphere has been considered as the toughest volume : egg shell, igloo, high pressure reservoirs. This shape is very adapted for **earthquake regions and high wind areas.** This feature lies in the very basic properties of the dome whereby the force applied on one point of the dome is evenly distributed to the whole of the structure itself.

Our dome is basically a double arch. Its properties allow it to **withstand very high compressive strengths and vertical loads.** The quantities of concrete and steel to be applied are calculated using finite element analysis and are designed on a case by case basis.

The maximum permissible **loads to be applied on the roof of the dome** are quite substantial (in the range of 70 tons) and depend on the geometry and usage of the dome. One of our recent projects was specially designed to allow over 400 tons of vertical load to be placed on the roof of the dome.

Domes that are built in regions of high winds or **abundant snowfall** are designed accordingly. Typically, these factors do not influence very much the required design strengths but must nonetheless be considered.

Our shotcrete formulation based on a dosage of CEM-1-42,5, app. 400 kg cement per m³, shows excellent properties. The conditions of high relative humidity in the dome are ideal for obtaining the required design strength of 35 Mpa and the necessary adhesiveness between layers.

MAXIMUM UTILIZATION OF THE VOLUME

Bulk material can possibly **occupy up to 95% of the generated volume** if the dome filling system is designed accordingly. This means that depending on the total tonnage that must be stored the dome can be optimally designed to allow no lost space.

The dome's ability to store bulk material piled high against the walls gives the possibility to **minimize the floor space required** for storing the desired capacity. As well, the dome can be shaped as a low profile (1/3 sphere) thus reducing the height of the dome and possibly allowing savings on fill conveying systems and other peripheral equipment.

The shape and the size of the dome have to be optimally chosen in order to consider the **cost savings on peripheral equipment** such as ; infrastructure, conveying systems, reclaiming systems, conditioning and dedusting systems. Our role is to determine the geometry of the dome most adapted to the product, the ground, and the exploitation.

Domes are ideally suited for providing you with a **completely automated complex**. Once the domes are filled to their maximum capacity, up to 70 % of the stockpiled material (depending on the material) can be reclaimed gravitationally through one or more galleries. The remaining percentage can either be reclaimed automatically by mechanical Archimedes screws, pneumatic systems or vibrating floors. The traditional method of using front end loaders is also very well suited for the dome.

INSULATION

Domes are the ideal solution for the storage of **bulk materials that are sensitive to temperature and humidity**. The application of 5 cm +/- 0,5 cm of Vethane foam on the inner surface of the airform gives the dome the quality of being equivalent to a **controlled atmosphere chamber**. Our Vethane foam which is specially formulated to increase adhesiveness on the PVC membrane has a density of 55 kg/m³ and a lambda specification of 0,030 Watt after aging. This means that domes are **ideal for the storage of perishable products** over long periods of time. Your products can literally hibernate in a dome and be as fresh as they were when they were first stored.

The use of **high density Vethane foam (55 kg/m³)** greatly enhances the intrinsic qualities of the dome.

Firstly, it acts as a **stabilizer of the inflated airform** in the initial stages of the construction. The compressive resistance of high density foam is between 3.5 - 4 kg/cm². Practically speaking, this means that a person can walk on top of the airform after the foam has been sprayed on the inner surface without any danger of the airform bending inwards.

Secondly, it slows down and in some cases eliminates the vapor movements that occur when the differences of temperature between the exterior and the interior are too high. This **practically eliminates the creation of condensation** inside the dome due to these night/day temperature differences. For example, a 25 degree difference in exterior temperature between night and day will not influence appreciably the interior temperature.

Domes have been efficiently used for the storage of products having very high temperatures (in the range of 110 degrees Celsius). **Agridome will maintain the initial temperature of the product during the storage.**

The isolation of the dome combined with the PVC membrane as the outer layer and the concrete as the inner layer truly gives you the ideal conditions for conserving your products. This will enable you to **save costs on ventilation, temperature control and energy.**



50000 T - Sugar
Berneuil sur Aisne - France - 1992

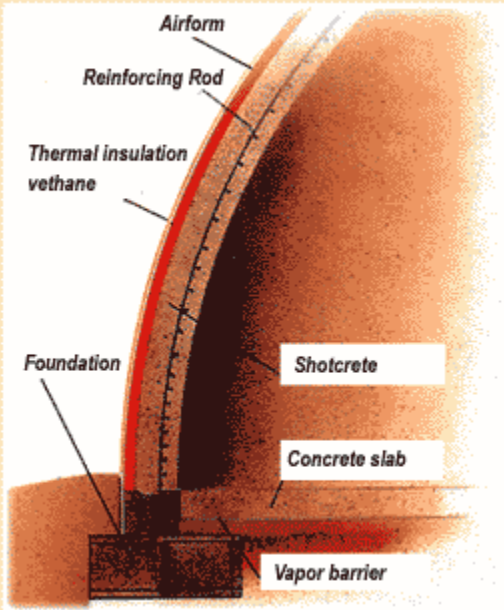
WATERPROOFING

A PVC **membrane** forms the waterproofing layer of our dome and acts as the initial framework for the application of foam and shotcrete. Opposite to what is usually done in traditional construction, **waterproofing is controlled at the very beginning of our process** once the airform is inflated. Furthermore, as the airform is under pressure, any leakage would be quickly located and fixed. This membrane added to the 5 cm layer of Vethane foam assures you that water will never leak inside the dome and spoil your product.

This membrane is designed and manufactured according to the geometric specifications of the dome to be built. It is assembled by dielectric welding in France and is **delivered on site ready to be inflated**.

The airform has good physical properties. The polyester reinforcement weighs 280 g/m², which is more than any building waterproofing material. It's flexibility will withstand practically all climates. The outside of the airform is **specially treated to help for self-cleaning, and has an excellent protection against U.V. rays**.

Our airform is legally insured for 10 years through major insurance companies, although its life expectancy is in the range of 25 years or more.



Construction Process

MATERIALS

The "**DômeConcept Agridôme**" technology uses materials that are commonly used in the construction industry. Nevertheless, the specifications of these materials are strictly defined in our Technical Specifications.



A UNIQUE CONSTRUCTION

From traditional materials, "**DômeConcept Agridôme**" innovates in the way these materials are applied together to create a large column free structure.



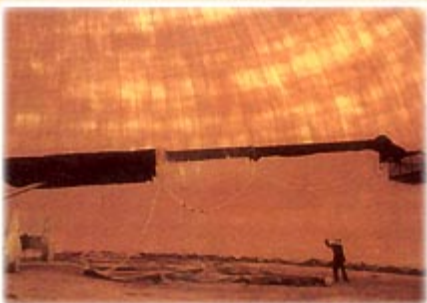
1. Ringbeam poured conventionally



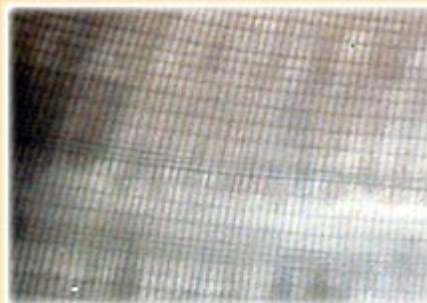
2. The airform is attached to the exterior of the ringbeam. The airform is prefabricated to the dimensions of the building and delivered on site ready to inflate.



3. The airform is inflated and the pressure inside is stabilized.



4. Vethane foam is sprayed on to the internal face of the airform. Tabs are embedded in the foam in order to receive the first steel rebars.



5. Steel rebar is fixed along the walls of the structure using the tabs.



6. Concrete is spray applied on the steel grid.



7. Once the rebar is totally embedded in concrete, we allow four days before turning the fans off. The openings, such as doors and windows are then cut through the structure.

8. Completion - Floor, painting, air conditioning...



Imax 360° cinema
Poitiers - France - 1989

Dôme Concept Advantages

SHAPES & SIZES

OPENINGS

COLORS

LOGOS

Domes have inspired wonder and amazement throughout many generations. Today, reinforced concrete domes truly provide architects and designers the versatility and flexibility necessary to create unique structures.

They bring that extra touch of magic to architectural realizations and have the quality of attracting people from all cultures.

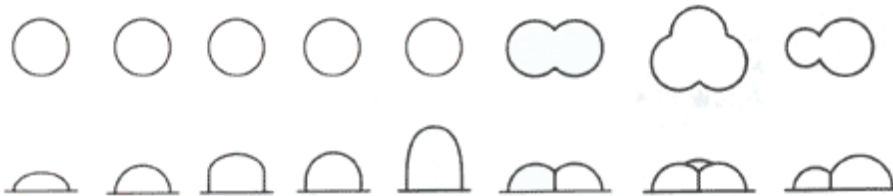
"The universal form"



Day- Night / Architectural layout for leisure park / Alvernia / Poland

SHAPES & SIZES

Traditional half spheres may vary from diameters of 6 m to 85 m. The most common shapes are hemispherical but we can also have hemicylindrical or any combination of these shapes.



Public Aquarium
length 72 m, maximum
height 12 m, maximum
width 30 m
Cabries - France - 1999

CREATIVITY



OPENINGS

Once our domes have attained their final solidity, practically any kind of opening is possible in them. We can build skylights, enormous doorways and windows of any shape, size or form.



Deicing Salt Storage
Choisey - France - 1998

COLOURS

PIRS can provide you with any color you need for your building.



Space Recreational Center - Geode
height 17 m and diameter at equator 21 m
Toulouse - France - 2000

LOGOS

We can install our client's logo and and/or their trademark on the exterior surface of the dome as they wish. By the dimensions and the aesthetical appearance of the dome, domes can truly be a great marketing tool for their owner.



30000 T - Sugar
Erstein - France - 1990





4 x 21 000 T - Grain
Rouen - France - 1991

Quality Insurance & Warranty

BOOK OF QUALITIES (TECHNICAL SPECIFICATIONS)

Our Book of Qualities is an evolutive document which is reviewed periodically to take into account the various technological, technical and economical developments. Our present edition has been examined by QUALICONSULT (an approved Technical Controller of Insurance Companies) on the 27th of August 1999. This is now the fourth edition since the first one was made in 1988 and it includes all the basic principles as well as our acquired knowledge and expertise .

The TECHNICAL SPECIFICATIONS are destined at establishing the basic conditions of conception and execution. This is accompanied by an annex to cover all special conditions specific to each project. This annex is given to the contractor responsible for the construction after receipt of a set of blueprints and copy of their insurance policy.

Any modification relating to the materials used in the construction system detailed in the TECHNICAL SPECIFICATIONS or in the implementation, must be submitted to QUALICONSULT for their review and are then the subject of a new edition of the TECHNICAL SPECIFICATIONS (CCT) after their approval.

Our Book of Qualities is a contractual document. Therefore, it is given a serial number corresponding to a specific project, which can only be given with the express authorization of PIRS SA.

ENGINEERING & DESIGN

All our engineering (calculations, plans, drawings & designs) are strictly performed by an independent engineering firm. This measure assures our clients that there is no possible conflict of interest between the minimum design requirements and the economical aspects of a project.

The engineering of each project is made on a case by case basis and takes into account every factor defining the project.

BOOK OF QUALITIES
ENGINEERING & DESIGN
SAFETY PROCEDURES
TEN YEAR INSURANCE
WARRANTY

SAFETY PROCEDURES

Safety of the personnel is at the very heart of our construction procedures and our training. The application of our materials require special safety procedures and we see that our recommendations are strictly followed and matched.

TEN YEAR INSURANCE **WARRANTY**

Our Quality Insurance program has enabled us to provide our clients with the possibility of obtaining a 10 year insurance warranty on the stability, solidity and waterproofing of our domes by major international insurance companies. This 10 year warranty remains optional for our international clientele but does give our clients the reassurance that our domes benefit from a great reputation.

Recent Projects

GRAIN BOARD OF IRAQ - GRAIN STORAGE - IRAQ

This project once finished will actually be the biggest dome storage complex ever built with 36 domes destined to store a total of 300 000 tons of grain. Each dome has a diameter of 35,7 m and a height of 17,85 m.

Presently under construction.



BROKER FM - LEISURE PARK- POLAND



This project is truly an architectural dream which brought to reality futuristic ideas. It is composed of 13 domes of all shapes and sizes that are all inter-related by connecting tunnels. The domes vary from segments spheres with diameters 13,6 m to 50 m to geodes with equatorial diameters of 13,6 m.

Construction began in July 2000 and was finished by November of the same year. *Have a bird's eye view of this incredible architectural planning - [Click here](#)*

ST-LAWRENCE STEVEDORING - ALUMINA STORAGE - CANADA

This is the first alumina dome storage ever built. This perfect half sphere of 60,4 meters diameter is able to store up to 59 000 tons of alumina. This dome was designed to store the alumina at an average temperature of 90 degrees Celsius and to support over 400 tons of vertical load on the roof.



Construction of the dome lasted 12 weeks from August to October 2000.

SETOMIP, RECREATIONAL SPACE CENTER - FRANCE

This geode demonstrates again the various architectural possibilities that can be attained with our domes. The geode has a diameter of 21 meters and a height of 17 m.

GRAIN BOARD OF IRAQ

BROKER FM

ST-LAWRENCE STEVEDORING

SETOMIP

IANSA

GROUPE DURAND ALIZE

BALTYCKA BAZA MASOWA

The projects referred to have been built either as:

- General Contractor,
- Subcontractor, or
- Supplier of Special Items,
- Training and Technical Assistance

depending on the various possibilities offered by the local legislations.



A study was conducted at the initial stages of the project development to determine the feasibility of providing the airform with this special 'ocean blue' colour. The steel sheets representing the continents were assembled and fixed to the dome after the dome was completely solid.

This dome was completed in 4 weeks.

IANSA - SUGAR STORAGE - CHILLAN - CHILI

This project consisted in building the world's biggest dome destined for refined sugar with a capacity of 60 000 metric tons. This perfect sphere of diameter 60 meters has a vertical wall of 7 meters. The interior of the dome was trowel finished and a special food approved epoxy paint was applied to the interior surface of the walls.



Over the years, PIRS has truly developed a specialty for sugar dome storages with over 400 000 tons of storage built for the refined sugar industry.

Construction of the dome lasted 12 weeks.

GROUPE DURAND ALIZE - PUBLIC AQUARIUM - FRANCE



This project was undoubtedly one of our most challenging. With a length of 72 meters, a maximum height of 12 meters and a maximum width of 30 meters, this structure was designed to take the shape of a fish. We had to adapt our DomeConcept technology to consider the array of moments that such a structure generated. It is definitely one of the most unique buildings built to date using this technology and demonstrates again the various forms that can be developed with our inflatable structures.

Construction of the dome lasted 10 weeks.

BALTYCKA BAZA MASOWA - FERTILIZER STORAGE - POLAND

This 4 dome complex comprises 2 domes with geometry 42 m × 25 m and 2 smaller domes with geometry 32 m × 20 m. They were designed to store 60 000 tons of fertilizers. The fertilizers stored in the domes are corrosive so a special anti-acid treatment was given to the concrete in order to avoid possible corrosion to the steel.



This turnkey project was finished by the end of 1999.



4 x 21000 T Céréales
Rouen - France - 1991

Contact Us



Do you have a project in mind?

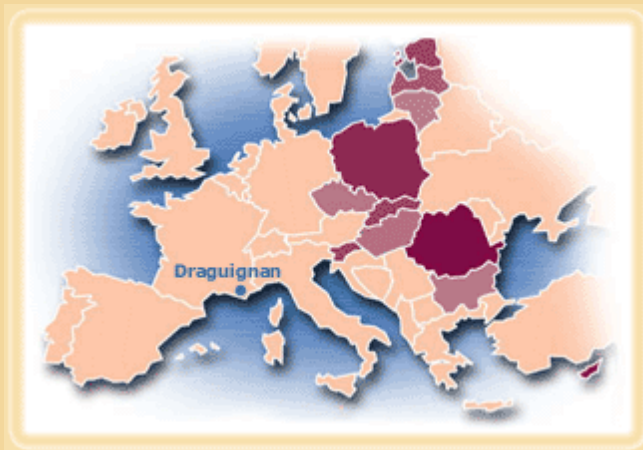
Are you planning to build a new storage infrastructure?

Do you want to expand your existing facility?

You want to know if your idea is economically feasible?

LET US ANSWER YOUR QUESTIONS

We believe innovation stems from ideas that are discussed and analyzed. Let us work with you in developing your project.



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