sener

The stadium of the future.

"The new Colosseum"





AUTOMATED RETRACTABLE PITCH SYSTEM

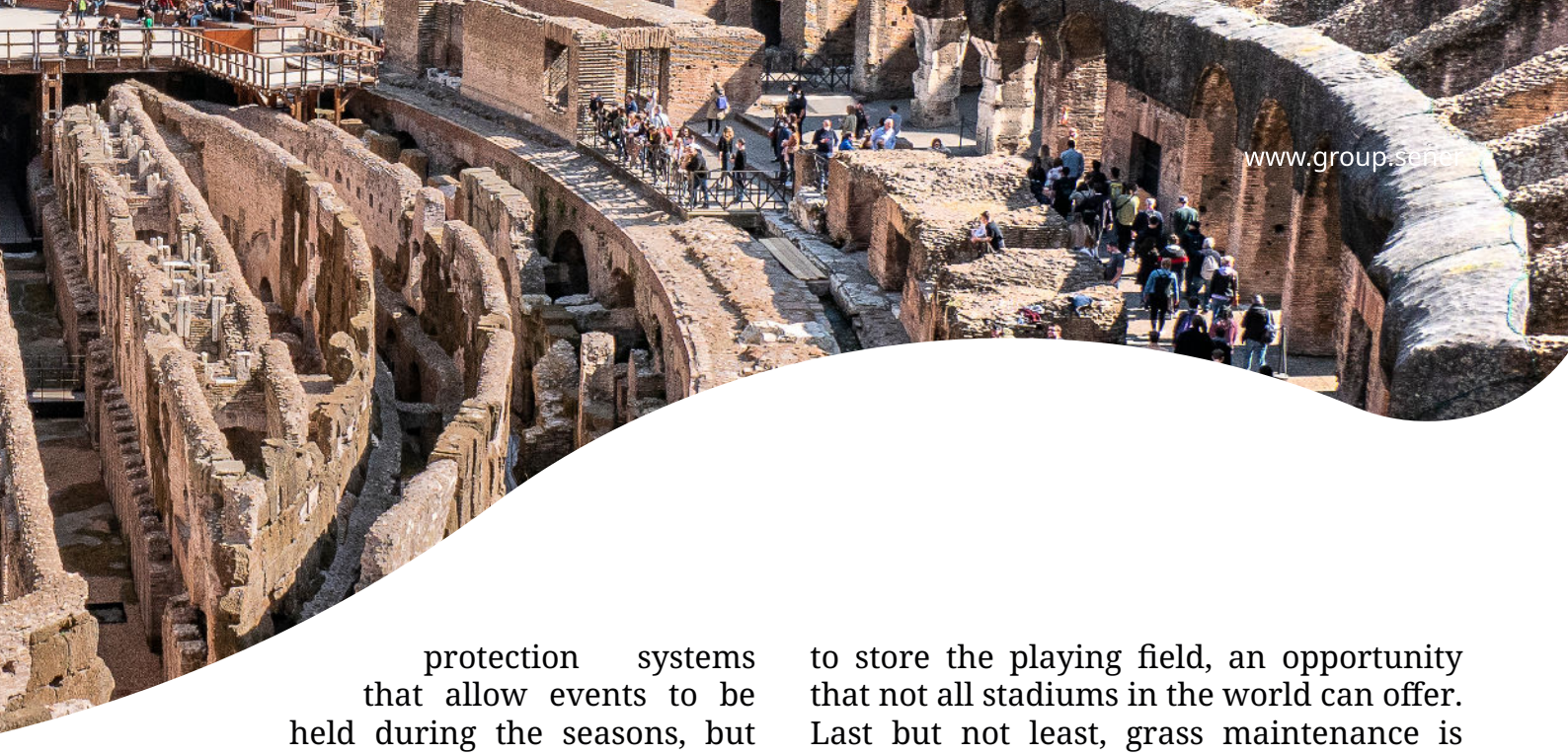
The intimate and beloved theaters of Ancient Greece, as well as the epic and massive Roman amphitheatres, masterfully exemplify how the architecture, engineering and cutting-edge technology of each era harmoniously merge in buildings conceived to efficiently host a wide variety of public events, while promoting social interaction and enriching the urban fabric. This fusion of design and technology, which ensures the creation of safe, flexible and adaptable spaces, is the key factor that has turned these buildings into perfect examples of success in architecture, with many of them still in use, even thousands of years old after its construction.

The disruptive idea, patented by Sener, of integrating a retractable grass buried in a football stadium is much more than an innovative strategy for the exploitation of a large space, until now dedicated almost exclusively to scheduling sporting events and the occasional concert a year. It is much more than reinventing a building, an icon of many cities and countries, and sharing it with everyone who wants to come and enjoy it, offering multiple offers of leisure, restaurants, shops, in short, infinite entertainment possibilities. In this way, it will be possible to guarantee that the investments derived from the construction of these infrastructures, public or private, are economically sustainable over time, without forgetting their potential as drivers of urban transformation and revitalization, generating a wealth multiplier effect. In short, it is much more than a *coup d'état* in the world of professional sports played on natural grass.

It is, for us, architects and engineers, proof of the success of a holistic vision of a challenge and its solution through close interaction between technical teams from multiple disciplines, the incorporation of space technologies in a very "earthly" environment and the integration of the most innovative engineering in agronomy.

Until now, the strategy followed by almost all stadiums in the world to host alternative events to sports, such as concerts, had always been the same. Basically, the holding of this type of event was limited to temporary windows outside of sports competitions, which limited the number of this type of event to one, at most 2 each year.

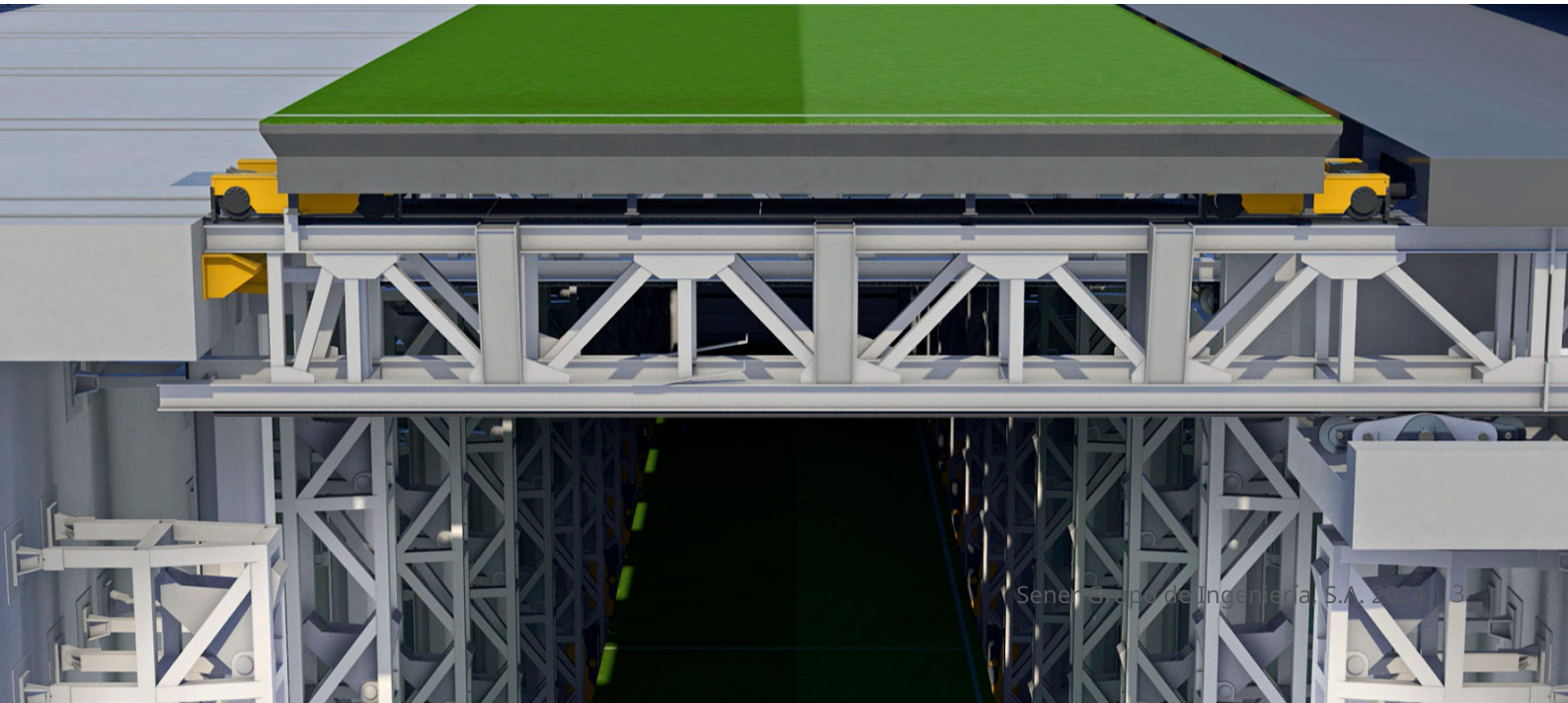
However, in recent decades, some companies have developed grass



protection systems that allow events to be held during the seasons, but that substantially limit their time (maximum 1 day), and that require grass recovery tasks, which can be very difficult or even impossible, depending on the latitudes or needs.

In tune with these protection systems, other stadiums have devised mechanical systems capable of moving the natural grass playing field from its central position in the stadium to an outdoor space for its conservation. However, these types of systems require three circumstances. The first is that their construction definition is aligned with the definition of the building itself, that is, they are systems included in the design of new stadiums, impossible to include in already constructed buildings. The second is that there must always be an outdoor space in the vicinity of the stadium to store the playing field, an opportunity that not all stadiums in the world can offer. Last but not least, grass maintenance is carried out outdoors, a fact that apparently makes sense but loses it when that outdoor space is located in the Nevada desert or in northern regions of Russia, locations with extreme climates, contrary to the efficient maintenance of a natural wordclass grass.

The system developed by Sener represented a radical change in concept based on two basic principles. On one hand, a system was conceived whose construction space is limited to the footprint of the playing field itself, with no or minimal impact on the surrounding stands depending on each stadium. This allows it to be a valid system for any existing, under construction or future stadium while also making it valid for those stadiums located in congested urban spaces. On the other hand, the system moves the playing field through



a series of precision mechanisms to an underground chamber equipped with the highest technology that will guarantee the maintenance of the playing field for long periods of time. At this point, it is worth highlighting the contribution of the Real Madrid CF technicians, especially Groundsman Paul Burges, to the project that the concept should be expanded to "only" extracting the pitch on match days, that is, eliminating the "save the grass for events" to "take out the grass only to play games". This turn of screw meant a greater degree of depth in the development of agronomic systems and interior spaces to guarantee maintenance. These circumstances make the stadium transform into a true multifunctional machine whose function goes far beyond hosting sports matches.

The stadiums of the future will be able to host... even soccer matches.

DESIGN

The objective of the invention is to safely move the playing field from its central position in the stadium bowl to a lateral or lower chamber equipped with the necessary facilities and systems to generate an artificial environment capable of maintaining the grass in safe conditions. Perhaps, better for its conservation than it would have to face if it were always located outdoors. This maintenance chamber must have total independence with respect to the functioning and operation of the stadium, that is, access to agronomic material and equipment, as well as the agronomy team itself must be guaranteed regardless of the event that the stadium may be hosting at any given time.

The invention divides the playing field into a series of longitudinal or transverse sections - depending on the layout of each stadium - composed of a lower metal structural frame that supports a metal tray that contains the complete agronomic section including the natural part, its embedded facilities for game-mode (irrigation, soil heating/cooling, soil aeration, etc.) and its bottom drainage. These sections or trays are moved horizontally towards the maintenance chamber in a precise manner by a series of fully automated bogies that, one by one, lift and move the sections guided by a series of rails embedded in a concrete slab at the bottom (under the trays). This background slab is defined structurally and geometrically in such a way that it can serve as base for any type of event.

Depending on the layout of the stadium where it is included, the maintenance chamber may be lateral (under a stadium stand at the back or side), buried under the footprint of the playing field itself, generating a single open space or,

exceptionally, buried under a lateral where the trays will be stacked vertically one after another as is the case of the implementation of the system at the Santiago Bernabéu Stadium. In these last two cases, the system will require a lifting mechanism for its vertical movement, as well as a storage structure in the specific case of the implementation in the Santiago Bernabéu.

Adjacent to the chamber, the system will require spaces to locate the agronomic rooms for equipment and material, as well as rooms for the agronomic equipment and systems and facilities that will allow the playing field to be maintained. All these rooms must have access routes from the outside that guarantee the total independence of the system.

Each of the possible arrangements of the system allows it to be installed in existing stadiums. The construction process will be adapted to the possibilities that each situation may offer, from temporary windows between sports seasons to situations in which the continuous closure of the stadium is allowed, which substantially reduces construction and implementation times.

The design of the system will always seek the least possible impact on the structures of the existing stadiums, which will ensure a project whose construction will be faster, simpler, and more cost-effective.

Setting

The system will have two different types of facilities. On one hand, the **direct agronomic facilities** necessary for grass maintenance independently of the system itself, such as:

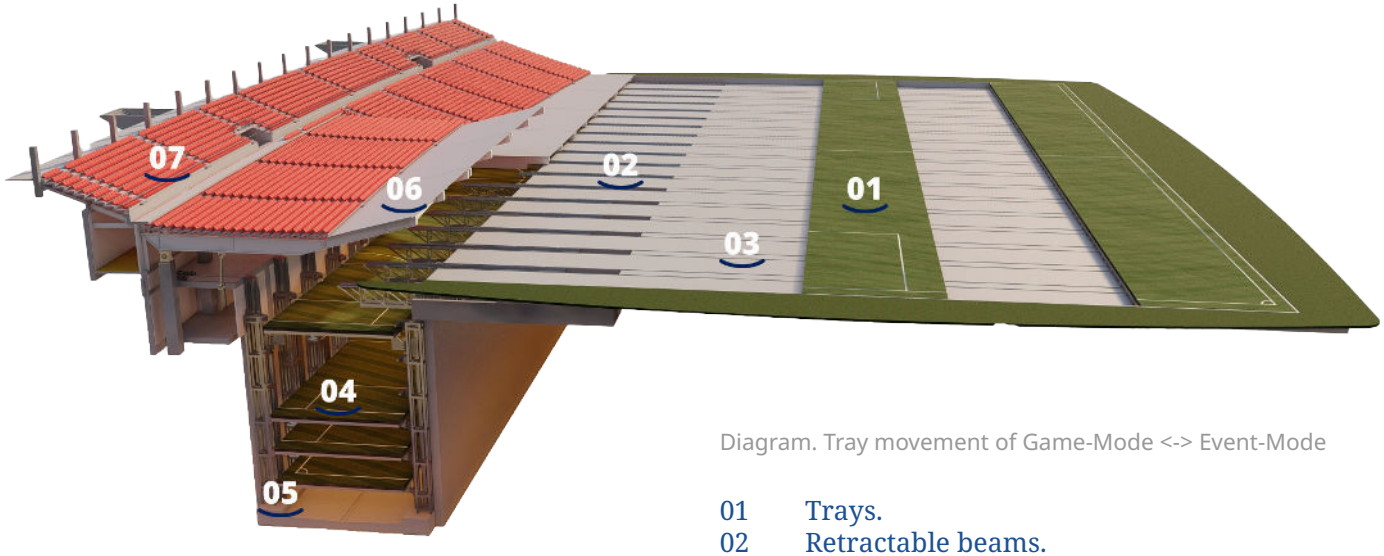


Diagram. Tray movement of Game-Mode <-> Event-Mode

01 Trays.
02 Retractable beams.
03 Slab.
04 Growth chamber – Hypogeum.
05 Lifting & Store System.
06 Bascule stands or lid.
07 Stadium tiers.

- Irrigation systems.
- Soil heating/cooling.
- Drainage.
- Growth lighting.
- Soil aeration.
- Fertigation.
- UV treatment.
- Surface ventilation (through fans).
- Control systems (sensors and control cameras).

As well as those **specific to the systems** strictly necessary to **keep the grass** in perfect condition in an artificial environment, among which the ventilation, air conditioning and treatment with gases.

The system will have two functions, event-mode and game-mode. Some facilities or others will operate in each of them.

From an agronomic point of view, it is important that the system allows all maintenance actions by the agronomy team to be carried out both in game-mode, with the sections located in the stadium bowl, and in event- mode, with the sections with the land inside the maintenance chamber, which will make the stadium operational at any time of the year.

NEW SANTIAGO BERNABÉU

One clear success story is the adaptation of the patent to the futuristic and spectacular stadium of Real Madrid, where the new stadium's business and operating plan will be exponentially improved thanks to this new grass treatment technology and the opportunities it offers.

"The Sener engineering and technology group, based on its patented system, is the technological mastermind behind the retractable pitch system of the Santiago Bernabéu stadium, which Real Madrid recently presented in its video (*https://www.youtube.com/watch?v=epef95O-EwY&t=93s&ab_channel=RealMadrid*), a project that was developed by Sener"

CONCLUSIONS

Extracting the pitch from the pit so that we can enjoy a nice football match on any given day and time is the disruptive idea. It's an inverse concept for operating a football stadium that involves the need to adapt and innovate the conventional technologies and systems for growing grass.

Improving on the natural effect that the sun, air and rain have on the growth of a living organism is the real challenge.

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Sustainability and HVAC.





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