

RESTORATION OF THE NUMBER 2 BLAST FURNACE AT SAGUNTO: RESTORING VESTIGES OF IRON AND STEELWORK

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ABSTRACT: *The Number 2 Blast Furnace is the most significant remains of what was the major iron and steelwork industry of the Mediterranean basin. Besides its powerful imagery and commemorative nature, its educational potential was a determining factor in preventing its demolition in 1984. In 1992, the Valencia Community Foundation for Sagunto's Industrial Heritage proposed the restoration of the Blast Furnace for it to become the centrepiece of the Industrial Archaeology Museum of Sagunto.*

This article includes the vicissitudes of this restoration work since the authors took charge of it in 1996 to the present day when this work will resume after being paralysed for more than eight years.

KEYWORDS: restoration, reuse, industrial architectural, heritage

1. INTRODUCTION

The singularity of the blast furnace as an industrial relic derives from both its specificity as an element which makes the iron and steel industry possible (in which human ingenuity shows its ability to master nature) and its own values which make its conservation desirable: its commemorative nature of what is now a historic industrial era, its educational potential and, of course, its powerful imagery.

It is precisely this singularity that determines intervention possibilities: a blast furnace is not a container for which a more or less new use can be found that suits its spatial characteristics and its original purpose. Instead it is a huge machine, an artefact which was built and modified for specific resources, a purpose and, above all, with a very different attitude to that which encourages us to conserve it.

Furthermore, work undertaken in old iron and steel areas focus on one of these two options:

- restoring the area as building land for new uses and respecting a small number of industrial ruins
- creating urban parks in which nature symbolically conquers an industrial environment whose elements, which are mainly respected, take on a basic landscaping role.

The case of the Port de Sagunto is included in the first option. The Number 2 Blast Furnace is the most interesting element that has been conserved of an industry which led to the creation of a complete population centre, a city in which the social and urban fabric completely depended on the Mediterranean Blast Furnace factory complex. Its closure in 1984, after more than sixty years' operation, and the demolition of practically all of the complex, was a traumatic rupture with the past, and gave rise to a human and urban crisis in

which the most important reference for the population disappeared, whose conserved remains are scarcely able to transmit their true significance offering a decrepit if not ruinous aspect.

In this situation, the work at the Number 2 Blast Furnace is responsible for restoring a past with which this furnace is virtually the only link as a cultural feature. To this end, work is being undertaken whose objectives are:

- structural consolidation of the furnace, a 64 m-high metal tower which has been abandoned and not maintained for more than fourteen years, and is located in an aggressive marine environment.
- restoring its image by undertaking an optimistic intervention which helps the furnace to recover the aspect it had after one of the periodical reconstruction works it underwent when it would have been ready for a new operation campaign.
- fitting it out functionally, this being of an essentially educational nature, by making its interior visitable and by creating a route that offers access to the highest levels. To improve this educational aspect, we have planned the construction of a reception pavilion equipped with audiovisual media where, before the visit, and by the virtual restoration of the parts that no longer exist, the position of a blast furnace in the iron and steelwork process may be appreciated and its correct operation as a machine for producing cast iron can be understood.

2. THE FURNACE BEFORE ITS RESTORATION

In the 13 years since the closure of Plant IV until the drafting of the Restoration Project in 1997, the Number 2 Blast Furnace has been subjected to the elements in the marine environment of Port de Sagunto. Since then, however, it has not been exposed to high temperatures and mechanical demands to which it was subjected



Figure 1. View of the Number 2 Blast Furnace before its restoration



Figure 2. View of one of the barrel platforms. In the foreground, the cooling unit is covered in rust



Figure 3. Industrial estate plant. The Number 2 Blast Furnace, marked with stripes, is enclosed on the roundabout

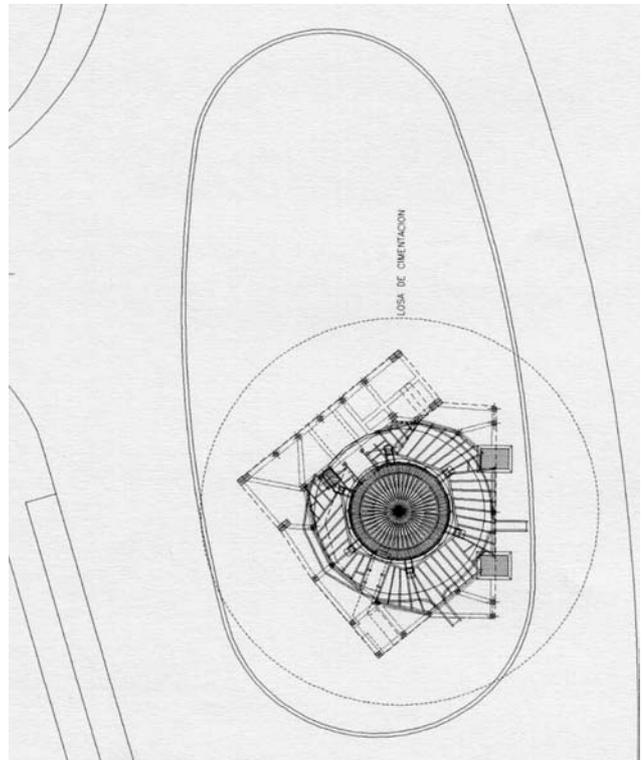


Figure 4. Elements conserved from the Number 2 Blast Furnace as they were left on the traffic roundabout

during its normal operation period. The lack of maintenance during this period has implied a thorough overhaul to consolidate its physical state and guarantee its stability before it could be put to use again.

The most spectacular sign of the furnace's dereliction was the degree to which it had rusted. However, the most worrying types of damage detected, and which apparently could jeopardise the stability of the furnace, were the deterioration found on the concrete work platform because of the aggressiveness of the marine and industrial environment it is located in, and the cracks which had opened up in the hearth plate.

As far as the image of the Number 2 Blast Furnace is concerned, the absence of the original overhead cranes was a significant change in its characteristic silhouette, while the disappearance of elements

such as cooling units and bustle pipes affected its look close up. The lack of important elements on the work platform, such as tapholes and the drilling machine, further reduced the educational potential of the remains.

Furthermore, the situation in which the furnace remained within the complex was another determining factor to be borne in mind when drawing up the intervention proposal. When dismantling the iron and steel plant, the Sagunto Industrial Estate was planned in 1991 on the land it had occupied, and the corresponding urbanisation works have already been carried out in the vicinity of the furnace. Among these works, the furnace represented a landmark, with a certain monumental and decorative character within the whole set up, and it was located on a small-sized roundabout. This situation,

which required the demolition of all the technical elements (ovens, dust collector, skip hut, etc.) and even some parts of the furnace itself (projecting platforms of the two upper travellers, sloping plane of the skip, part of the work platform, etc.) which projected on the ground plan of the planned roundabout, meant that any chance of relating the blast furnace to the surrounding plots was lost, and made pedestrian access difficult because lanes of traffic would have to be crossed. Furthermore, the new highway had been built so close to the furnace that it went over its foundation slab in an area where traffic is expected to be heavy, which entails the consequent danger of transmitting vibrations to an element whose original strength had been weakened. So, the furnace had been kept purely as a sculpture only intended to be given a fleeting glance, and the possibility of it being visited and restored as an educational tool had been totally wiped out. It was precisely these two factors, the dereliction of the furnace and its location within the industrial estate, which finally determined the restoration process to be set in motion. Indeed, its degree of deterioration determined that the road on the industrial estate where it was located be closed to traffic, with the consequent damage to traffic and the neighbouring plots.

3. THE RESTORATION PROPOSAL

In accordance with the objectives outlined, a series of actions were proposed that are described below, and have been grouped according to the type of objectives.

3.1. Structural Consolidation: the stability of the furnace

When initiating our work on the Number 2 Blast Furnace, we had a previous Technical Study available which centred on the structural aspects of the furnace and protection against its corrosion. Although this study put forward some solutions for its repair, on the whole they went against the desire to restore the furnace with an educational aim in mind because they introduced elements which were alien to this purpose or which made visiting even more difficult. On the other hand, the furnace strength calculations done showed that the stresses in its load-bearing elements were far from the maximum admissible ones, consequently its stability was not in danger. Based on this study and the data collected in situ, a series of actions were planned which, by improving the stability of the furnace, halting its deterioration and preventing its causes, did not interfere with its perception nor diminish its educational potential. These actions focused on three aspects: structural stability (repairing detected damage), corrosion protection (preventing this damage from reoccurring) and rainwater drainage (action against one of the main causes of its deterioration).

Structural stability of the furnace was improved with:

- Repairing the cracks in the hearth by cutting open the shell plates, partially removing the fill and its replacement and welding.
- Reinforcing the support stanchions in which steel plates and staples were welded to restore the original sections.
- Restoring the functional nature of the original gas pipe supports by removing the emergency reinforcements which had been put in place in the past and which interfered with the look of the furnace.
- Repairing the concrete of the work platform by replacing the corroded steel reinforcement and using high-strength concrete made with cement that withstands the aggressiveness of the marine environment and the sulphates detected in the ground water.
- Repairing the metal plate in the immediate vicinity of the furnace work platform by replacing the deteriorated plates and profiles.
- Repairing the original support elements of the hot blast main which enables the removal of the reinforcement supports which had been put in place after closing the blast furnace

Corrosion protection, to be achieved by mechanical cleaning, chipping and sandblasting to remove rust, and by applying a protection system with three coats of paint to all the metal parts, similar to that normally used to protect steel structures in marine environments.

Removal of rainwater which aims to eliminate those points where water gathers by sealing joints in which, given their narrowness, the protection system could not be applied, and by expelling the water entering the throat to prevent it accumulating inside the furnace, which had been happening since the factory closed. This latter operation required restoring the operation of the throat bells which have been set in the closed position and, finally, draining.

3.2. Restoring the image of the blast furnace

In accordance with the instructions in the Specifications for this work, the aspect of the Number 2 Blast Furnace had to be controlled and dealt with from three sight lines: distant, close and immediate.

When it came to drawing up the project, we found we had to choose between two conflicting options as far as the final look of the blast furnace was concerned, depending on the alternative chosen. On the one hand, we had the initial look of the furnace: an impressive metal 64m-high completely rusted monolith whose shape evidenced an initially impenetrable industrial origin. On approaching the barrel, its surface seemed completely covered by the deteriorated cooling system with the characteristic texture which the peeling of thick coats of rust bestowed it. The sight of the furnace in this state was one of utter dereliction and yet romantic beauty, in which the industrial origin of the artefact made it look like the delirious work of an exasperated expressionist artist.

Faced with this object, our first intention was that of attempting to maintain and manage this seductive image. However, this gave rise to some problems:

- This image of deterioration was not suitable for the educational purpose for which the conservation of the furnace was to serve.
- With normal resources it was impossible to maintain this image, to freeze it in such a way that the deterioration would stop advancing and, at the same time, guarantee the visitable aspect of the furnace under safe conditions.

Therefore, the intervention option chosen was an attempt to restore to the furnace its aspect shown in the photographs after its latest rebuild. Restoring this image, achievable using relatively simple means, will also improve the educational possibilities and the visitable aspect of the furnace. Although this option avoids maintaining the beautiful plasticity behind the ruinous look of the furnace, it offers better guarantees of success when implementing an intervention in which the final look, the visitable nature and the educational value of the Number 2 Blast Furnace can be controlled. We studied the look of the furnace from three possible sight lines: distant, close and immediate.

In the *distant sight* line of the furnace, the determining issue was its colour. Although it appeared to have darkened by rust after years of dereliction, it had several colours while it was in use, as seen from the historical photographs. From these pictures, we adopted the following colour combination by matching that seen in the photographs and the remaining paint on the furnace itself: barrel, hearth, throat, hot blast main, structural elements, platforms and staircases in bluish grey or telegrey (RAL 7046 for platforms, staircases and the rest of the auxiliary structures; and RAL 5014 for the barrel, hearth and throat) stacks in RAL 9006, a paint which is similar to natural aluminium; handrails in signal white (RAL 9003) and signal red (RAL 3001). The hot blast main has been painted with the same white aluminium (RAL 9006) as the stacks.

In this section, it is appropriate to reflect on the nighttime image of the furnace. For an element which looks like a monolith at a traffic junction where, at night, there would be very little movement,



Figure 5. The Number 2 Blast Furnace after rebuilding in 1974. The travellers bestow a characteristic directionality on the whole complex. The colouring of some of the elements can be seen, in particular the safety signs of the handrails

whose educational units would be closed and which is not suitable for visiting outside daylight hours, no exterior lighting seemed necessary to illuminate its shape in great detail, which is often the case with city monuments. In this case, it seemed more appropriate that the platforms should have their own subdued illumination by using invisible lighting from the ground so that the soft glow at different levels hints at the volume and structure of the furnace without completely revealing them.

In the close sight line of the furnace, the smaller elements of its surface texture (which almost disappear from a distance) take on greater importance. So as not to distort the original look of the furnace, all the elements which no longer existed or had been destroyed by corrosion, such as the bustle pipe, the nozzles, the slag and pig iron outlets and the cooling system with its minor parts, will be reconstructed.

Regarding the *immediate sight line* of the furnace, the tectonic values which the surface treatment to be applied will provide the furnace and transmit to the visitor are those of the smooth texture of a thick coat of protective paint: the look of a recently-finished industrial facility ready for operation. The small parts provide an image of complexity of great plastic interest, which visitors will understand from the educational signs placed along the route.

3.3. Functional fitting out: visitability and educational nature of the intervention

In a work such as the Number 2 Blast Furnace, the relationship between these two aspects of the proposal mean they cannot be separated: the definition of the routes and visitable areas, their treatment and the work carried out on them, must all serve the dual purpose of guaranteeing accessibility and safety of the visitable areas, highlighting their educational interest.

As regards access, the roundabout has been developed, and an information and control pavilion built. The visitable routes define, mark out and improve safety. The last visitable platform has been fitted out as an observation point. Alternatives are available for visiting the interior of the furnace. The proposed work is described below.

3.3.1. Access and reception pavilion

The project contemplates an enlargement of the roundabout on which the furnace is situated as a basic necessity, which allowed us to:

- Reconstruct part of the auxiliary elements which had been mutilated (work platform, slag and pig iron outlets, projecting platforms, etc.).
- Distance the highway from the furnace thus reducing the risk of objects (whether part of the construction or brought by visitors) falling on to the road.
- Distance the highway from the foundation slab of the furnace, thus eliminating the danger of vibrations.
- Enlarge the surface area of the roundabout to include a service and maintenance area and a reception pavilion inside it.
- Resize the roundabout constitutes an access square on which the blast furnace no longer appears confined and blends in functionally with the rest of the proposal from a compositional viewpoint.

This proposal makes it possible to restore the blast furnace as an object which is more than just something to look at, make it visitable and reconstruct it in the space provided, thus enhancing its historical and educational value. The treatment and arrangement of the elements within the access square respond to the visitable and educational nature and the safety of the project. They may be analysed, as we shall see below, from several points of view.

For their functional organisation, all the elements to be reconstructed on the roundabout have been put together, based on the order emanating from the original arrangement of the tracks along which wagons used to collect the cast iron and slag. The secant line to the roundabout, which divides it into two different parts (service, maintenance and parking area and the base of the furnace), is the only compositional element which does not rest on the tracks. So in this way, a more suitable division of the space in terms of the functional needs that we have set out can be achieved: the proportion of the open space between the furnace and the pavilion will be improved and a suitable position for access to the parking area will be achieved which, not being directed at any of the lanes of road traffic, will prevent traffic from interfering, therefore place the parking area in a secondary position in relation to road traffic which suits its use as a service parking area not to be used by visitors. The elements involved in these organisational aspects are:

- Car park. The roundabout is divided by a secant line into two parts with unequal surface areas. The smaller part facing the sea will be set aside for service and maintenance parking facilities which will be linked to the pavements by zebra crossings.
- Reception pavilion. The main access to the reception and information hall starts a diagonal axis which crosses the tracks perpendicularly to join the pavilion inside and stretches visually to the outside. From inside the pavilion, a ramp and a staircase go down to the base of the furnace while another staircase goes up to the work platform. In this way, access to all levels of the blast furnace can be controlled.
- On the rest of the roundabout, the original level of the furnace base, lower than that of the current street layout, will be restored so that the latter will now rise from an archaeological crater in which some elements no longer in existence will be reconstructed and restored, for example, pig iron outlet, tracks, wagons, locomotive, etc.

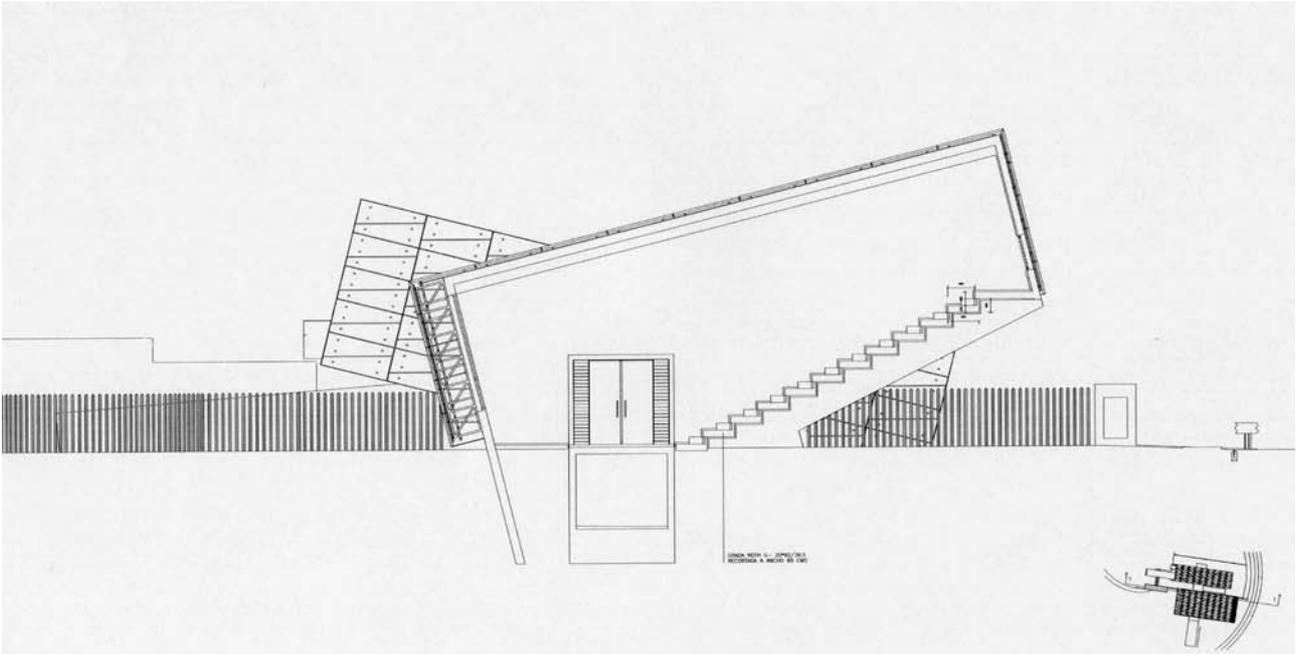


Figure 8. The cross section of the reception pavilion through the multi-purpose hall. Its sloping volume corresponds to the inclination of the stands which are set against the inclination of the access and the toilets (behind). The central corridor acts as pivotal axis for both volumes

As regards the educational nature of the proposal, an enlargement of the existing roundabout allows certain elements to be reconstructed or incorporated:

- Part of the original work platform will be reconstructed to obtain a more even outline and a larger visitable area. The staircase ascending to the blast furnace will lead off from this level.
- The slag outlet will be reconstructed to include its original bifurcation and arrival at the transport wagons.
- The demolished part of the cast iron outlet and the two material transport tracks will be reconstructed in a simplified fashion.
- Diverse material relating to the industrial activity undertaken will be incorporated into the roundabout, the conservation of which will be carried out by the Foundation, in order to increase the educational value of the actions taken.

Similarly, a visit to the Number 2 Blast Furnace will make people aware of it and help them understand how it worked and its place in the iron and steelwork industry of Sagunto. For this reason, other than controlling access, the reception pavilion includes a multi-purpose hall which holds 100 people.

The volume of the whole complex has been the object of study of this project. As opposed to other intervention choices, such as the construction of the reception pavilion under the work platform, or the construction of a pure volume outside the base of the blast furnace, a decision was made to build a pavilion that was set in the terrain which, given its layout, would link the three lower levels: intermediate access level, furnace base and work platform. Thus, the composition of the building is based on the juxtaposition of two prismatic volumes linked by a perpendicular axis to the tracks to be reconstructed. The main section, which rests on the land plane, rising on a cantilever at the rear, contains the multi-purpose hall. The other section, a sloping prism which slants in the opposite way to the main section, houses the accesses to the furnace (a ramp and a staircase which descend to its base and a staircase which ascends to the work platform) and the toilets. With this volume, the pavilion has several levels of communication with the both blast furnace and the plane of the square:

- Surge of the terrain. Like the furnace, the pavilion can be seen on the square to be emanating from a lower plane. Its sloping projecting volume emphasises this aspect of its image.
- Adapting its volume to the shape of the furnace base. The scale of the pavilion matches that of the furnace, and its perceptibly horizontal layout acts as a compositional counterpoint to the vertical nature of the former.
- Mechanical concept of the building. Nowadays, it is impossible to reconstruct the original look of the former iron and steel works, but the unequivocal industrial language and material nature of the pavilion, and its volume, which is intentionally expressive of its functional nature, reminds us of the mechanistic images which industrial complexes usually transmit.

In the definition of *materials and textures*, building elements and systems have been chosen which, in both the building and associated development, reinforce the industrial character of the whole complex in which the furnace, square and pavilion come together as a single industrial artefact ready for the new operation which has been assigned to it. To achieve this, the following treatments have been chosen:

- The parking area will have an asphalt pavement with painted lanes.
- The lower level of the square will be paved with blast furnace slag and iron ore directly on the terrain. This material provides an interesting colour and texture from the educational point of view as well as plastic characteristics.
- In the area of the square between the main access and the parking area, the ground is unified with a covering of flagstones and flower beds in which plants of the area will be sown.
- The reception pavilion will be built using a prefabricated concrete enclosure in the form flakes of an unequivocally industrial kind. The elevations and roofing will be built with the same material.
- The work platform will be reconstructed using the original concrete structure and the flooring with refractory ceramic brick.

3.3.2. Visitable routes

The routes that are set up will conserve and reconstruct those elements which are necessary to understand both the structure of the furnace and the production process carried out in it. As for the organisational aspects of the visits, the following visitable areas have been contemplated:

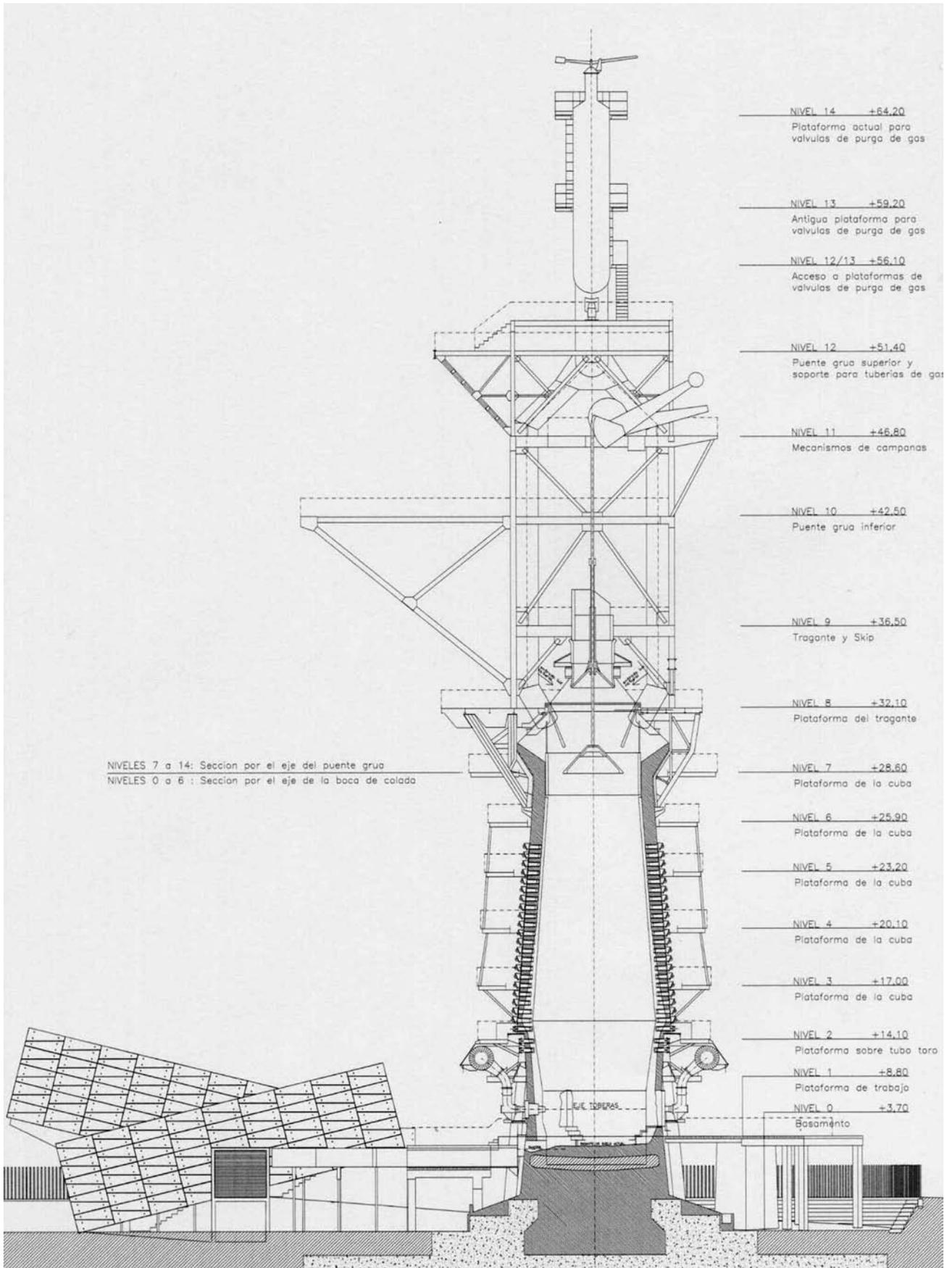


Figure 9.:Section of the Blast Furnace and its different levels



Figure 10. The work platform before intervention



Figure 12. Cleaning and consolidation work on the refractory coating inside the barrel

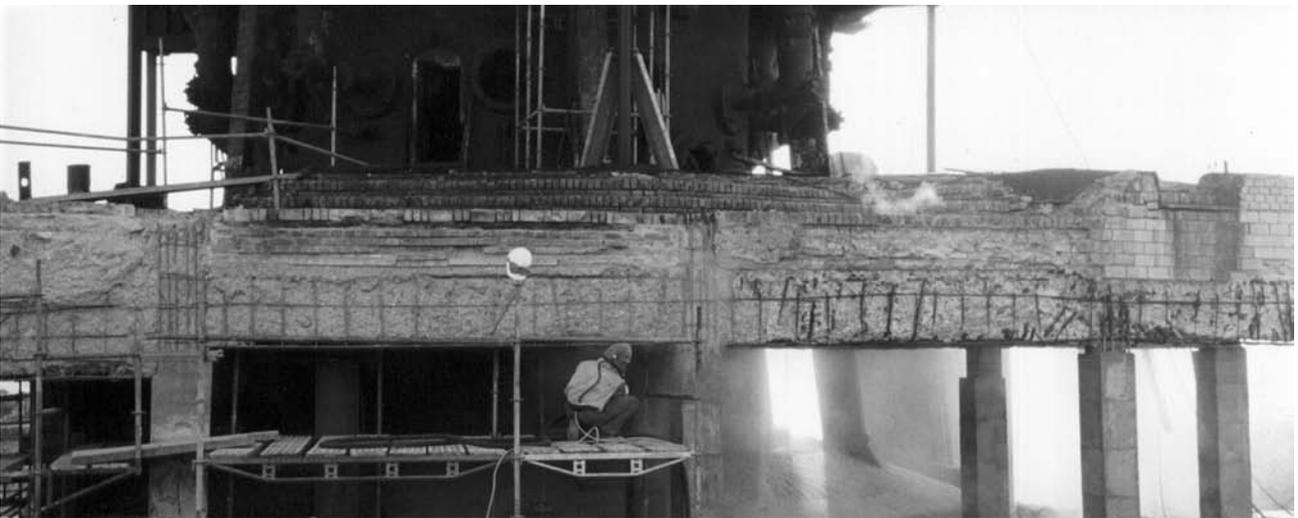


Figure 11. Repairs to the work platform

- The access square, from where visitors can see the furnace, the reconstructed track network, the locomotive and the wagons that transported the cast iron and slag, the iron ore which was used for charging the furnace, and the now scattered remains which have been conserved.
- The pavilion itself, with its educational content in the form of explanatory panels, plus the possibility of catering for talks and exhibitions.
- The furnace base from where the hearth and the pillars and the drainage system stem.
- The work platform, the first raised observation point, and the area from where the basic functioning of the blast furnace can be contemplated by accessing inside the barrel and, on the outside, the outlets and the cast iron and slag channels along with the air injection system via the hot blast main, the bustle pipes and nozzles can all be seen.
- The upper platforms of the blast furnace allow visitors to view its surface with its cooling system, its throat charging and gas recovery system. This area also offers excellent views of the sea and the surrounding districts.

From the reception pavilion (ACCESS LEVEL), access will be provided to the base of both the furnace (LEVEL 0) and the Work Platform (LEVEL 1), thus starting the visit on an ascent which continues as follows

LEVEL 0 +3.70 m (above sea level) Base

The outside of the hearth and the work platform supports will be seen from here.

ACCESS LEVEL+6.15 m Access square and reception pavilion

LEVEL 1 +8.35 and +8.80 m Work platform

This level will be the first observation point and, given its spaciousness, will allow access to more visitors. The mouths and the slag and cast iron channels shall be seen from here. In the upper part, or boshes, we will be able to see the first part of the cooling system made of electrolytic copper. The hot blast main and the bustle pipe, from which the hot air was blown into the hearth through the tuyere nozzles, will also be visible. The original staircase, deteriorated and located in an unsuitable position for the new function that the platform is to have, will be replaced with another new one which will lead to LEVEL 2 and will terminate at the start of the next staircase

LEVEL 2 + 14.10 m Platform over hot blast main

The first part of the smelting cooling unit will be viewed from here. The start of the barrel, at the bottom of which the mantle channel is located, was used to collect and remove the cooling water.



Figure 13. Consolidation work on the refractory coating inside the barrel

LEVELS 2, 3, 4 and 5 +14.10, +17.00, +20.10 and +23.20 m Barrel platforms

On these levels, the walls of the barrel will be covered by the cooling unit

LEVELS 6 and 7 +25.90 and +28.60 m Barrel platforms

The cooling units no longer exist and the braces on which the throat platform is supported will commence.

LEVEL 8 +32.10 m Throat platform

Given its spaciousness, it is the second observation point of the upward route. From here, the start of the four stacks will be viewed. Through the glass-protected peepholes, from which the charging of the furnace could be inspected, the inside of the throat will be observed along with the bells which controlled its opening.

LEVEL 9 +36.50 m Throat and Skip

The throat will be viewed from above, as will the bells which open and close, along with all the parts of the throat with the revolving cone whose function was to improve the distribution of the load.

LEVEL 10 +42,50m Lower traveller

At this level, the structure of the traveller will be reconstructed. This is for two reasons: to restore the original look of the furnace and to achieve a second observation platform for educational purposes. The structure will be reconstructed as it was originally, and the space between the beams will be paved with a welded galvanized grating to maintain its transparency for viewing from below.

LEVEL 11 +46,80m Bell mechanisms

From this platform, the mechanisms which control the opening of the throat by means of the bells will be on view.

LEVEL 12 +51,40m Upper traveller

On this level, its structure and the last flight of the staircase, which was removed when the traveller was demolished, will be reconstructed.

On the beams which support the stack shock absorbers, which meet at this point, another observation platform will be built.

The visitable route will reach this point. From this level onwards, the current route will be preserved, but will only be accessible for



Figure 14. State of the furnace on 2 November 2002

maintenance purposes; given its difficult access, it is not suitable for the public. The following levels are higher still:

LEVEL 12/13 +56.10 m Access to the gas vent valve platforms

LEVEL 13 +59.20 m Former gas vent valve platform

LEVEL 14 +59.20 m Current gas vent valve platform

Along all the visitable routes, safety conditions will be improved by implementing the following actions:

- Handrails to be installed on the work platform with a floor layout whose irregular shape will unequivocally demonstrate that it has been incorporated as a new feature of the furnace.
- The deteriorated or missing paving boards will be replaced on all the platforms.
- The existing handrails will be repaired and new ones installed on the edges wherever needed on all the routes.
- Skirting boards will be placed on all the staircase landings.
- On the travellers, the central well, which originally had no floor, will be closed off with welded galvanised grating.
- The safety warning signs which the blast furnace had when it

was last rebuilt will be restored by painting the profiles of the handrails in staggered red and white stripes.

4. THE WORK TO BE CARRIED OUT

When, at the end of 1998, the restoration of the Number 2 Blast Furnace started at Sagunto, all the parties involved were aware of the enormous difficulty that implementing this work would entail. Given its obvious technical complexity, the degree of uncertainty that intervention projects in the area of heritage usually imply, and the absence of references and previous experience, had to be all added to the tight budget covering the work involved. Neither the scales nor the type of interventions of the German works conducted at Duisbourg, Neuenkirchen or Völklingen are comparable to this being undertaken at the Number 2 Blast Furnace because, at the aforementioned German sites, the use of the iron and steelwork remains had already been established when the factories were closed. Therefore, a Works Monitoring Committee was set up which, besides having members of the Expert Management and the company awarded the work contract, had representatives of the Regional Ministry of Public Works (which was defraying the cost of the restoration work within the 1% margin of the cultural budget), and of the Regional Ministry for Culture (which had commissioned the project and acted as promoter of development), and others from the Valencia Community Foundation for Sagunto's Industrial Heritage. Throughout this restoration project, the commitment of all the parties was a determining factor for the work to be done which, by maintaining the criteria that inspired the drafting of the project, had to be adapted to the reality of actually having to implement the works.

Thus, the appearance of new elements and the criteria on the Foundation's part (the final recipient of the restored furnace and the party responsible for its maintenance and management), and the major definition of the role that the furnace will play in the future of the Industrial Archaeological Museum of Sagunto and its relationship with this museum (a possible link with a restored railway from the former Blast Furnaces), led to doubts being raised and, in some cases, meant having to modify some of the solutions for the project. Among these changes, the most significant in terms of their financial and building importance were:

- Demolition of the concrete in the foundations of the stoves of the iron and steelwork plant, which appeared in an area where the foundations of the reception pavilion had to be laid.
- Improvement of the land at the base of the pavilion foundation given the heterogeneity and poor strength of the ground.
- Improvement of the quality of the concrete because the tests on underground waters carried out showed considerable amounts of sulphates.
- Change in the type of treatment to the concrete structure of the work platform, because when proceeding to repair the

pillars and beams, the degree of deterioration discovered was considerably greater than that initially estimated.

Intervention on the inside of the furnace is worth mentioning separately because this was precisely where the most important change was made compared to the initial proposal. The original project envisaged work in line with what had been planned for the exterior, that is, to reproduce the look of the newly reconstructed furnace ready for operation by removing the remains of the interior and replacing part of its refractory lining. However, having opening the three projected accesses to the hearth and emptying the large amount of loose material it contained, that is charge mix, slag and pig iron, the powerful image of the inside of the barrel could be noted. On evaluating the state and the plastic and educational interest of the remains inside the furnace, the new action taken was as follows:

- The loose material inside the furnace was removed.
- The huge metal crusts bonded to the side of the refractory lining were removed as they were impossible to secure using normal means with any minimum safety guarantees given their weight and dubious stability.
- After removing these crusts, the surface refractory lining was cleaned by removing the loose parts.
- The loose plates of the inner side of the lining were secured with galvanized steel bars on the most solid part of the refractory blocks.
- Two stressed meshes of different gauges were placed near the bosh hoop to protect visitors from possible detachments of small pieces breaking or peeling off the refractory lining

Despite these modifications, the project has faithfully met the criteria which inspired its drafting. With approximately 70% of the volume of work carried out and the budget awarded all spent, a change of criterion at the Ministry of Public Works, led the execution of the approved modifications to be suspended. So work had to be temporarily stopped while the administrative formalities were resolved for their completion.

At the beginning of 2007, the need to open the Blast Furnaces Avenue to traffic involved the Sagunto Town Council having to deal with roundabout at its own expense, which gave rise to a renewed interest in completing the works. Thus, more than eight years after the temporary stoppage, and thanks to the determination of the Foundation, the Sagunto Town Council has financed the works that remain to finally deliver the project. In July 2008, the Foundation, with the support of the Regional Ministry of Culture, commissioned us to draft the project required to restore the Number 2 Blast Furnace to become, at last, a reality. Now having been approved, the project is at the public tender stage and we hope to begin work before the end of 2008.

Versión española

TÍTULO: *Restauración del horno alto nº 2 de Sagunto: la recuperación de un resto siderúrgico.*

RESUMEN: *El Horno Alto nº 2, es el resto más pregnante de lo que fue la primera industria siderúrgica del Mediterráneo. Además de su poderosa imagen y su carácter conmemorativo, su potencial didáctico fue determinante para evitar su destrucción en 1984. La Fundación de la Comunidad Valenciana de Patrimonio Industrial de Sagunto, se ha propuesto desde 1992, la restauración del Horno como elemento más relevante del futuro Museo de Arqueología Industrial de Sagunto. Este artículo recoge las vicisitudes de esta restauración desde que los autores se hicieron cargo de ella en 1996, hasta el momento actual en que las obras se van a reanudar después de una paralización de más de ocho años.*

PALABRAS CLAVES: *Restauración y reutilización del patrimonio arquitectónico-industrial*