Vall d'Hebron
Institut de Recerca

Vall d'Hebron
Barcelona Hospital Campus

La recerca d'avui, la medicina del demà.

2

Tender specifications for the restricted project tender, involving a panel, for the preparation services of the project for the new building of the Vall d'Hebron University Hospital Foundation – Research Institute (VHIR), as well as for a redesign proposal for the Vall d'Hebron Hospital Campus, integrating the VHIR building.

Amb el suport de:

Generalitat de Catalunya
Departament d'Empresa i Coneixement
Secretaria d'Universitats i Recerca

Unió Europea
Fons europeu
de desenvolupament regional

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PART 0: INTRODUCTION

0.1.- Institutional Presentations

After two months as Catalan Health Minister my first visit to a hospital in our country as a representative of the Government was to Vall d'Hebron Campus. Aware of its size and importance in the health system of Catalonia, I wanted to deepen in my knowledge of this institution. It was of great impact for me to know the quality and enthusiasm of the professionals who work there, the warmth of its people and their great determination to meet challenges both present and future.

I spent 11 hours visiting all the facilities, and I fully understood why many of their staff are among the world's best in their specialties. I understood the reason why Vall d'Hebron is much more than a hospital, and why the triad formed by their healthcare activity, together with research and training, has reached such levels of excellence.

My half-day stay was very profitable, also because I could hear personally some of the difficulties they face. And the main one, of course, the infrastructure. I could see, everyone can do it every day, that behind the doors of the boxes, operating theatres, laboratories, buildings and roads across the Campus are the best professionals. But, and this must also be admitted, I could see that the environment where patients, families, researchers and workers are is not at the level that should be necessary.

Vall d'Hebron needs to improve its external image, which can be seen by more than 40,000 people who pass through the campus every day, it is a must to tackle the excellence of the institution integrally. From the point of view of its physical structure, the hospital and its surroundings are not at the level of the quality of its healthcare activity, leader at the international level. The environment should be dignified to achieve an immediate benefit in patient care and to improve the working conditions of over 9.000 professionals who daily devote their lives to the institution. The environment should be at the same level of the work that is carried out.

Our citizens also judge the excellence of public institutions based on what they see: we must work with the aim that when citizens see the Vall d'Hebron Campus, its buildings and the hospital premises, they can corroborate that the activities done inside made of them one of the best hospitals in Europe.

It is in this context that I am pleased to present to you a project to improve the Vall d'Hebron Campus. An international architectural competition mainly intended for the construction of a new research building for the Vall d'Hebron Institute of Research (VHIR), which also will begin to imagine a development plan for the integral improvement of the whole Campus.

The new VHIR building will be the cornerstone of a project that will transform Vall d'Hebron.

A project with open spaces, designed to benefit society, patients and professionals working there. In other words, a project that will make evident the excellence of Vall d'Hebron and put the physical infrastructures at the same level of the healthcare activity that is developed.

Because VHIR's research, as well as Catalonia's research in general, goes beyond the walls of the laboratory and reaches the bed of patients of the hospital placed just a few meters away. It can't be otherwise, research and innovation in health are absolute priorities of our policies and this is so precisely because the research activity is a key determinant in the health of citizens.

A cutting-edge research, innovative, economically sustainable and the maximum exponent of one of the pillars of our public hospital system. Its researchers, like the whole country, need to work more and better together, add synergies to save time, create new research tools, look towards the future from a new space, more practical, more sustainable, more harmonious with the new times and visually and aesthetically at the same level of the great discoveries which have been and will be carried out inside.

Vall d'Hebron is and must be one of the symbols of the excellence of our country. As the first hospital and flagship of the public health system of the country which is ICS, it needs a transformation, an adjustment to what their patients and professionals need and demand. This contest will allow Vall d'Hebron to keep being among the best in healthcare, research and teaching in a much more favourable environment.

As the Minister of Health it is a pleasure for me to support a project such as this one we present, which will allow to take a leap forward into promoting Vall d'Hebron as a leading hospital campus in Europe. But it is also an obligation, because I am aware that it is a need, the need of our hospital, our research institute, of our patients, our society and our country.

Honorable Senyor Antoni Comín i Oliveres
Minister of Health. Generalitat de Catalunya

Some months ago we had the pleasure of publicly announcing the official foundation of the Vall d'Hebron Hospital Campus of Barcelona, in which I have been honoured with the position of Director of Vall d'Hebron University Hospital. I was accompanied at this announcement by the directors of the other institutions that form part of the campus: the Vall d'Hebron Research Institute (Vall d'Hebron Institut de Recerca- VHIR), Vall d'Hebron Oncology Institue (Vall d'Hebron Institut d'Oncologia - VHIO) and the Multiple Sclerosis Centre of Catalonia (Centre d'Esclerosi Multiple de Catalunya - CemCat). Four pillars united by a shared spirit of innovation and excellence and a common purpose: to improve the health and well-being of the public.

The Campus has been dedicated to this work for many years, and our contribution to society is to do what we do best: healthcare, research, education and innovation for the patients of today and tomorrow.

We are determined to continue serving our patients and to remain a leading institution, which means that we have to tackle new challenges as they appear. On one hand, creating a new facility for the Research Institute (VHIR) which will be an icon of the avant-garde, collaboration and excellence. On the other, improving the environment in which the brightest talents will work. The result of these needs is a new project to redesign the urban planning of the Vall d'Hebron Campus in order to create a more pleasant, accessible, healthier and sustainable environment at all levels, and one that is open to the city and each of the 50,000 people who use it every day.

It is the only way to ensure that we can offer a high-quality experience and a sense of well-being to the people working, training, visiting and staying in the Campus. We aim to become a key player in promoting integration and quality of life, open to other districts, the city as a whole, Catalonia and the world. From Barcelona, in Catalonia, with the modern, innovative and very humane spirit of the Mediterranean. This is what we are like, and what the Vall d'Hebron Hospital Campus is going to be like in the future.

This new urban project will reflect the unity of the Campus while expressing the individual nature of each of the participating institutions through the buildings they will be housed in. It needs to be an interconnected Campus, where the connection and integration between the different buildings and centres and the people who work in them needs to be as fluid as the generation of knowledge and solutions regarding healthcare that are taking place inside. It is a project that is positive for each professional collective working there, who will feel even prouder of working there after the transformation.

This new look for the Campus has to provide an environment that is more accessible, easier for the user to move around in, healthier, broader, more innovative and more

technologically capable. A space that is open to society, with new buildings that apply new energy and environmental policies, and appropriate security measures. The Vall d'Hebron Campus will place excellence within its environment in a way that is accessible to its professionals so they can continue to offer patients the best care in a way that is more up-to-date.

The transformation will be a new way of viewing the patient's situation and dealing with the challenges we face every day: fewer obstacles, more paths, fewer cars, more public transport, less contamination and a smaller carbon footprint, more energy savings, less noise, a better standard of living, fewer constructions, more green space, less bureaucracy and use of resources, more innovative technology. To sum up, we aim to improve the health and well-being of our professionals, patients, visitors and neighbours, using innovation to do away with the problems and the charmless views of the current Campus. This project will enable us to continue offering patients the best response and treatment, and to do so in the best setting possible.

We are planning for the next 20 years, during which we are determined to continue being leaders, so the new Campus will help us to retain the best professionals, attract new talent and investments to tackle the challenges of the future, to serve our patients better and ensure the prestige of the health service.

Dr. Vicenç Martínez Ibáñez
Director
Vall d'Hebron University Hospital
Vall d'Hebron Barcelona Hospital Campus

The institution I have had the honour of running for over 6 years, the Vall d'Hebron Research Institute (VHIR), promotes and carries out research, innovation and teaching in Biology and Health at the Vall d'Hebron Barcelona Hospital Campus.

Since it was set up, the VHIR has worked to convert yesterday's research into the medicine of tomorrow. Day after day, we dedicate our finest talents to researching, identifying and applying new solutions to the health issues of society and contributing to their application around the world. In over twenty years, we have achieved a leading role in biomedical research for hospitals in our country, and we are working to maintain and increase this reputation for excellence at European level, being competitive and outstanding in clinical research and its application in a university hospital.

But to continue advancing and excelling at international level we need to have new facilities that will be central to the future prospects of our Institute. The new Research Building (VHIR) will bring all our groups together, enabling a decisive improvement in communication and cooperation between researchers and with all the support personnel, driving internal collaborations that will enhance the results of our research work. The change from a variety of spaces to a single space means that our knowledge and experience can be shared, there will be more cross-department contact and we will be more united and better prepared to serve the public.

The VHIR of the future must drive the transformation of the Vall d'Hebron Hospital Campus. We want it to be a building with character of its own, a symbol of the Campus. A modern, futurist, disruptive and ambitious project. A centre that we can identify with at its unveiling and in the future. A building that will still be modern 20 years after its construction. An attractive, uplifting building like the people who work there now and in the future, the people in our city and country, that reflects the light of Mediterranean culture, the light that research can bring into people's lives.

This building will provide us with more space, innovation, functions, increasing our infrastructure and our environmental and architectural sustainability for the purpose of research. A new centre to nurture our talents and to attract more talent from home and abroad. The best researchers will at last have facilities that can enable them to reach even further. Those who have not been able to join our project will have more reason to do so. More and better spaces means attracting more investment and more excellence, more science, medicine, more health for our patients and more solutions to improve people's lives.

We hope that the Campus Hospitalari Vall d'Hebron, the new building of Vall d'Hebron Research Institute (VHIR) is a bridge head to the future of the Campus, with innovation and a more international role. The Building of the future will drive this commitment to our hospital, to our neighbours and our society, our city, our country and the world.

The new centre will be attractive from the outside and a source of excellence on the inside, placing us at an advantage for support for international projects. Our links to world-class excellence will be closer than ever.

VHIR is already a leader in personalised and precision medicine, with customised treatments, so our challenge now is to incorporate a Centre for Advanced Therapies that can modify genes and cells, and implant tissues designed in the laboratory to improve the health of patients who will continue to receive the medicine of the future.

We have been working closely with the industry for many years, and have signed contracts with biotechnology companies. Our partners deserve the best environment to continue as our allies. The new building will support our researchers as they seek to transfer their knowledge through the creation of businesses, and to attract biotechnology and pharmaceutical companies who want to boost their activities by working together with our research groups.

The new VHIR will be an incubator for new ideas, talent and new solutions. It will enable us to remain at the forefront and keep expanding, here and around the world. It will make public-private collaborations easier, with more spin-offs, investors and businesses, creating wealth and returning knowledge to our society. Talent attracts talent. We will attract new companies and researchers from our own courses, with more and better spaces for our Master's course students. Providing space for the best to work in will bring us the best talent in the future.

We owe this to society. This new multi-functional building with its multi-purpose spaces will allow us to promote our science and activities better. There will be spaces for congresses, courses and press conferences where innovation, technology and humanity meet and interact. New spaces in which to tell human stories of scientific progress. An incubator for knowledge that serves society and the general public. Everything we do, we do for people, for their health. This is why we want them to see us, to visit us, and meet the people who are going to help them and the place that makes it possible. Biomedical research will be within people's reach in an open building, connecting research and society.

As we at Vall d'Hebron like to say, the future of the Campus is in the new VHIR building, where the medicine of the future will be researched. The future is research, and VHIR is the way that biomedical research in Barcelona and Catalonia will reach the world.

Dr. Joan Comella
Director
Vall d'Hebron Institut de Recerca (VHIR)
Vall d´Hebron Barcelona Hospital Campus

PART I: OBJECTIVE OF THE TENDER

1.1.- Objective of the tender

- To select the best team to design a research centre of exceptional architectural and functional quality, as a reference for innovation, sustainability and digitisation.

- To select the best urban planning proposal for redefining mobility and the use of open spaces inside the Hospital Campus Vall d'Hebron with emphasis on humanity, sustainability and digitalization.

1.2.-Functional Objectives

1.2.1. Building VHIR

To satisfy the requirements of VHIR, the building must offer a response to the functional programme included in this document.

The complexity of these requirements and the constant modifications in the needs of the research teams lead us to imagine a building that allows for modifications and changing compartments with the needs of the teams and the Foundation.

The new research building (VHIR) is a clear strategic decision that will bring many benefits for the researchers that currently form part of VHIR, but will also be an opportunity to capture and retain new talents, boost alliances between the public and private sectors and a benchmark for research with cutting-edge techniques.

GENERAL REQUIREMENTS FOR THE VHIR BUILDING

Access:

- Ensure good access to the research building for users, visitors, patients and services.
- The new building must also enable direct connection with the existing traumatology hospital building through its car park, to make access easier for patients of that hospital who arrive by car.

Integration at the campus level:

- Integration and relation between the activity centres of the VHIR research building and open spaces to create areas where researchers can relax and think.
- Propose solutions adapted to the culture and climate of the Mediterranean, with open spaces that can be used all year round.

Visual transformation and identification of the place:

- Improve the aspect of the enclosure by enhancing the visibility of the building, as an icon for innovation that identifies and distinguishes the hospital campus.

Incorporation of areas for professionals to relax and think

- Quiet zones for thinking.
- Relaxation zones where colleagues can have coffee and share experiences and the results of their research.
- Meeting places for professionals from different areas to encourage knowledge across disciplines.

Bringing research closer to society

- Areas where research results can be displayed and explained for visitors and schools.

Spaces that encourage a creative state of mind for researchers

- Comfortable spaces with natural light.
- Spaces that respect the working areas of researchers, ordered and open-plan.
- Spaces that encourage relations between researchers from different areas.

Comfort

- Flexible spaces that enable groups of professionals to vary in accordance with the research they work on.

A sustainable building:

- The building must be a benchmark in sustainability through a LEED Platinum Certificate.

A Digital Native building:

- Conceived and built to allow its users to engage intensively with Information and Communication Technologies (ICT). It must offer advanced telecommunications solutions and services, smart automation of installations and integrated services.

1.2.2 Hospital Campus Vall d'Hebron

The construction of the new VHIR building offers us an opportunity to meet the needs of the Campus with a solution that fits into its functional programme.

The complexity of the current layout of the campus forces us to make ambitious demands of the architectural and urban planning.

GENERAL REQUIREMENTS OF THE NEW CAMPUS

The proposals and ideas for the new campus must take the following concepts as priorities:

Access

- Improving the conditions for access to the hospital buildings, especially those which at present suffer significant limitations of access for users, visitors, patients and services, taking the best access points for public transport into consideration (Pg. de la Vall d'Hebron).
- Improve access for the whole enclosure, making the north-south connection easier (Pg. de la Vall d'Hebron and c. Natzaret) providing adapted access to the middle platforms and levels to make better use of them. The use of hollowed construction elements, according to the master plan, will make the building more accessible and permeable, allowing people to move freely around the enclosure.

Integration with the city:

- At city level, improve the access to the enclosure for better connections with the neighbouring areas so that it can be used as a public space, possibly removing the boundary fences and extending the public road network.

Free spaces for integration and relations between centres of activity:

Activation of the north sector, currently residential, by creating walking spaces that connect with the area of the hospital, teaching and research buildings. Improvement of the landscape through gardening and urban furniture to create a setting that encourages walks and areas for relaxing.

- Encouragement of exchange and relations between different campus groups and users by creating areas where users, visitors, patients, researchers and healthcare workers can relax inside the enclosure.
- Propose solutions adapted to the culture and climate of the Mediterranean, with open spaces that can be used all year round.
- Rationalisation and simplification of ground-level circulation by excluding private vehicles and parking areas at ground-level. Traffic must be restricted to service vehicles, public transport, ambulances, etc.

Visual transformation and identification of the place:

- Improve the image that characterises and identifies the hospital campus.
- Unified treatment of the elements that make up the image of the enclosure, while allowing the different functional areas to be distinguished, so that users can find their way around, with the construction of the VHIR building as the first step in the transformation of the Vall d'Hebron Hospital Campus.

Sustainable campus:

The building must be a benchmark in sustainability through a SITES Certificate and by promoting circular economy.

A Digital Native building:

Conceived and built to allow its users to engage intensively with Information and Communication Technologies (ICT). It must offer advanced telecommunications solutions and services, smart automation of installations and integrated services.

PART II: GENERAL INFORMATION

2.1.- Context: The Vall d'Hebron Hospital Campus

HISTORICAL SUMMARY.

The Hospital Universitari Vall d'Hebron, (which was initially called the Residència Sanitària Francisco Franco) opened six decades ago, in 1955. It was a building thirteen stories high that had no permanent medical staff, despite its function as a surgical facility. Its name was not changed to Hospital Universitari Vall d'Hebron until the end of the dictatorship and the transition to democracy (1975–1979).

Three new specialist centres were built in 1966: Traumatology, Paediatrics and Obstetrics and Gynaecology, which meant an expansion of the Hospital General, which would be extended again in 1975. These specialised centres went on to acquire prestige that they have maintained to the present day in their provision of treatment for spinal injuries, cerebral palsy, paediatrics and obstetrics.

A new nursing school was set up at the same time to train nurses to the specifications of the centre.

The first paediatric ICU was opened in 1968, and the first paediatric haemodialysis unit in 1970 and both were the only ones of their kind in Spain. In 1981 and 1985, respectively, they carried out the first paediatric liver and kidney transplants in the country.

In 1971 the hospital was attached to the Universidad Autònoma de Barcelona as a teaching facility.

The Institut Català de la Salut (ICS), or Catalan Health Institute was set up in 1983 to run the public health centres and services of Catalonia, and the Servei Català de la Salut (SCS), or Catalan Health Service, in 1991. In 1992 they signed their first contract, in a decisive move towards a more entrepreneurial management model.

The Surgical Clinic Adrià - no longer extant and replaced by the Outpatient Surgery Unit of the Parc Sanitari Pere Virgili - was added to the Hospital Vall d'Hebron as a satellite centre in 1988.

In 1990 and 1994, successively, the unit carried out the first lung and multi-organ liver and lung transplants on adults.

The Foundation for Biomedical research and teaching in the Vall d'Hebron Health and Research Unit was created in 1994 to coordinate all biomedical research and teaching at the Vall d'Hebron Campus site.

The Geriatric health interdisciplinary functional unit (UFISS) opened in 1997 as a way of seeking alternatives to hospitalisation.

The Catalan Pharmacological Institute Foundation (Fundació Institut Català de Farmacologia) was created in 1998, associated with both the Vall d'Hebron University Hospital and the Universitat Autònoma de Barcelona.

A stroke unit with a home-treatment unit was set up in 2002, and a neonatal programme was started.

The building for the Research Institute, the Institut de Recerca (VHIR) was opened in 2003, and the Oncology Institute (VHIO) in 2006.

The Molecular Therapy Research unit was created in 2010 to focus on personalised medicine, using innovative equipment (PET) to analyse molecular and oncological illness.

2011 saw the inauguration of the best paediatric ICU unit in Europe in terms of technology and organisation.

The new building for the Multiple Sclerosis Centre of Catalonia (CEMCAT), opened in 2013 equipped to specialise in this neurodegenerative disease with an independent laboratory, and a simulator of conventional living spaces for adapting to the changes that this incurable disease brings with it.

In 2015, Vall d'Hebron Hospital was the leader in organ donation in Catalonia, with a 30% increase in the figures from 2014.
On 19th September of this year, the new Surgery Block opened, a building with 3,000m2 attached to the General Hospital. It is equipped with advanced technology that enables new work processes to be added while keeping our focus on the patient.
At present, despite the changes in organisation and economics, we continue to look forward, committing ourselves to innovation and proposing constant improvements. We all know, however that the one thing that must never change, year after year, is our mission *"THE PATIENT ALWAYS COMES FIRST".*

With this in mind, we want to make a sustainable Vall d'Hebron Hospital Campus, consisting of the Research Institute (Institut de Recerca, or VHIR), Oncology Institute (Institut d'Oncologia, or VHIO), the Multiple Sclerosis Centre of Catalonia (Centre d'Esclerosi Múltiple de Catalunya, or CEMCAT) and the Hospital itself. We believe that the creation of friendlier, more welcoming setting for our patients, where medicine and research combine with engineering, architecture and sustainability will assist the work of the hospital. This new area of work will open up the hospital enclosure, connecting both parts of the Ronda in a single space and eliminating barriers to improve access and altering the general architectural plan for the whole Campus.

2.2.- Urban Context: The district, a history of the neighbourhood

The district of Horta-Guinardó is the third largest in Barcelona, with a surface area of 1,192 hectares that represents 11.9% of the total municipal area

It is located in the north-east quadrant of the city, between Gràcia and Nou Barris, and bordered to the south by the Eixample, Sant Andreu and Sant Martí, and to the north by the Collserola hills, and the towns of Sant Cugat and Cerdanyola.

The internal structure of Horta-Guinardó is made up of diverse smaller neighbourhoods which are only weakly linked together. The main territories are Guinardó, Can Baró, Font d'en Fargas, Carmel, Teixonera, Horta, Vall d'Hebron, Sant Genís dels Agudells, Montbau and la Clota.

The Vall d'Hebron Hospital Campus is located in the Montbau area, which is named after the stream running through it. It lies on the hillside where small houses were first

built some 56 years ago, for the people in service and maintenance industries, and farm labourers.

If we go back to the medieval period, the land formed part of the ancient town of Sant Joan d'Horta and Can Barret, Can Frares and Can Gallart. These belonged to different families and took up the whole space between the three hills, Tres Turons, and the Collserola hills, forming a valley: the *"Vall d'Hebron"*.

The Montbau neighbourhood was linked to the "*monastery of Sant Jeroni de la Vall de d'Hebron de Coll* de *Cerola*" of the Hieronymite order, founded on 18th October 1393, at the end of the 14th century, by Violant of Bar, the wife of King Joan I of Aragón. The monastery began to function in 1398, and Violant of Bar obtained the annexation of the parish of Sant Genís dels Agudells to the church through Pope Benet XIII of Avignon. This is why the parish is so closely tied to today's neighbourhoods of Vall d'Hebron, Horta and la Clota. They all used to belong to the same owner, so the parish boundaries and municipal properties all came to form part of the municipal area of San Joan d'Horta.

The Collserola hills, removed from the medieval city of Barcelona, was an ideal area for hermits and the spiritual retirement of the monks. The hills also had plenty of water, making it possible to herd sheep, cultivate and grow crops, economic activities that provided a means to live.

The Monastery was the link that in the past bound all these parts of Barcelona together that today belong to the District of Horta Guinardó. These neighbourhoods had different ways of life and were more like separate towns placed in the same district, cut off from the ancient medieval city of Barcelona.

In 1808, French troops set fire to it and burned it to the ground, including its library, which still held a manuscript by Ramon Llull.
The neighbourhood of Montbau was built in two stages, from 1961 between three streams that flowed down the side of Collserola to form the Marcel.li river, on land that was steeply sloped, stony and highly eroded by water. These conditions had made movement and day-to-day life in this area difficult for its inhabitants.

60% of the area was built inside the Collserola area, and the other 40% was made up of houses promoted by Municipal Housing Board, the Patronat Municipal de la Vivenda, and built in 1959. Even today, it is a point of reference for the way it was built, which was organised by cooperatives, and the sociological approach to organising the residential population, which has resulted in an area that is still lively today.

On the eastern side is the area of Llars Mundet, which used to be the site of an alms house and was later turned into schools by the Diputació de Barcelona, and a University Campus surrounded by public parkland and an old Mansion, the *"Palau de les Heures"*.

The western part was the site, in 1955, of the new *"Residència Sanitària Francisco Franco"*, which today is the Vall d'Hebron University Hospital Campus, located in the woodland next to the hermitage of Sant Cebrià and Les Cases de Can Carlets and Can Ribó.

The farmhouse of Can Gausachs was sold in the 18th century, in 1722, with all its lands, to the monks of the Monastery of Sant Jeroni de la Vall d'Hebron, who renamed it *"la Granja de Sant Jeroni"* and extended it by buying another property, which stood on the site where the Vall d'Hebron Hospital Campus is today, calling it *"la Granja Nova", or "New Farm"*.

Today's neighbourhood of Vall d'Hebron was founded in 1968 with the construction of the residential area on the land of the old site of Can Travi Vell, Can Travi Nou, Can Marcet, which today is the College of San Joan Bosco, of the Salesian congregation, Can Brasó and Can Rosell which belonged to the old Horta district.

The district came together through the integration of old remains and new buildings, like the Pavelló de la República, sports facilities and parks that blended in with the apartment blocks already built. In 1992, with the Olympic Games of Barcelona, the district grew with the addition of a new area with sports facilities and housing, to take some of the many tourists and participants in the games, which were seen around the world.

In front of the Hospital are the neighbourhoods of la Clota and la Teixonera, the first on the flat land and the second on the hillsides of Creueta del Coll. These areas have progressed very differently over time.

La Clota is semi-rural and one of the oldest centres in the district, with cottages and small houses among the old farms, and which has grown only slightly, hampered by fragile services which are in bad condition in many places.
La Teixonera, in contrast, began as a summer retreat, known as *"Colònia Taxonera"*, with smaller houses, and it was not until the 1960s, after the Civil War, when the whole side of the hill was developed with one and two storey houses, many with gardens.

The massive influx of immigration at the end of the 1940s and the building of the *"Residencia Sanitària Francisco Franco"*, which employed large numbers of labourers,

and the speculation fostered by a second wave of immigration saw the construction of saturated housing projects that were complicated by the uneven topography.

This diversity of landscapes results in an urban environment dominated by slopes, very steep slopes in many cases, that make movement and building very difficult. On the other hand, we can consider the neighbourhood to be privileged in terms of its environmental conditions, so that residential use and leisure can be easily combined whenever the development is undertaken properly.

If we analyse the neighbourhoods that border Vall d'Hebron, we find ourselves with some demographic figures:

NEIGHBOURHOOD	POPULATION	AGING	BIRTH RATE*	SURFACE AREA	UNEMPLOYMENT
MONTBAU	5.070 h.	2,66%	4,2‰	359.380m2	9,40%
V.D´HEBRON	5.613 h.	1,97%	6,4‰	125.972m2	8,80%
SANT GENIS	6.693 h.	2,30%	5,7‰	83.617m2	9,20%
CLOTA	568 h.	1,07%	19,2‰	10.337m2	5,40%
TEIXONERA	11.322 h.	1,67%	7,3‰	71.155m2	8,30%

If we observe its history to the present day, we see an area where the geographical features, past uses and recent demographic movements have all made their marks, creating a district that is mixed, diverse and plural.

2.3.- Urban Planning Context: Current and proposed plans

2.3.1. Area of action and parameters for construction

VHIR BUILDING

This is located within the Vall d'Hebron Hospital Campus, on the site where the laundry building now stands. It lies to the north-east of the Traumatology Hospital.

The internal connections with the different centres of the hospital enclosure are to be retained and a new access that will connect Avinguda Jordà with carrer Arquitectura is to be created.
The Vall d'Hebron enclosure already has all the facilities required, such as water, power and air-conditioning. The new building will therefore be connected to the services of the Hospital.

The new building will be adapted to the parameters set out in the Special Plan for the University Hospital Vall d'Hebron. Annex 2, document 2.

The occupation of the area will be limited by the polygon marked out by the PEVH, and will be no larger than **2,773m2** and building above ground level will be limited to **12,825** m2. The maximum regulated height is 25.50 m (Ground Floor +6), distance between supports will be 4.5 m on the ground floor and 3.5 on floors 1 to 6.

Construction above ground must respect the heights indicated and minimum separations between the neighbouring plots, which is 5m. Floors below ground can use the full space.

VALL D'HEBRON BARCELONA HOSPITAL CAMPUS

This is located in the Horta-Guinardó district, at the site bordered by the streets carrer Arquitectura, Carrer Nazaret, Avinguda del Jordà and Ronda de Dalt. See Technical Annex.

PART III: FUNCTIONAL PROGRAMMES

3.1.- Functional programme for VHIR building

3.1.1. Introduction.

NOTE FOR BIDDERS

The functional programme of the stage corresponding to the VHIR building, which is included in the annex here, is part of a preliminary design developed prior to the decision to make an international call for tenders for the drafting of the executive project of the new VHIR building. The bidders will have to use it as a reference for the uses and floor areas of the different functional units that the new building will hold.

The bidders must be aware that the objective of the competition is to select the most functional, architecturally creative and interesting proposal, and that the functional units defined in the "Functional Programme" below must be reconfigured and distributed with coherence in relation with their architectural proposal.

Bidders are free to propose their own interpretation of these recommendations should they consider that a partial deviation from them could offer improved function and better architectural quality to the whole project.

The functional programme of the new VHIR FEDER building, of 5,227.85 m2, is given in the section **"Phase I Functional Programme of the new building"** and must be respected as a specific amount of FEDER funds has been assigned to it.

The functional programme for phases I, II and III are included in the "Functional Programme of the New VHIR building" for the complete building of 15,995m2, plus 8,000m2 of underground parking space.

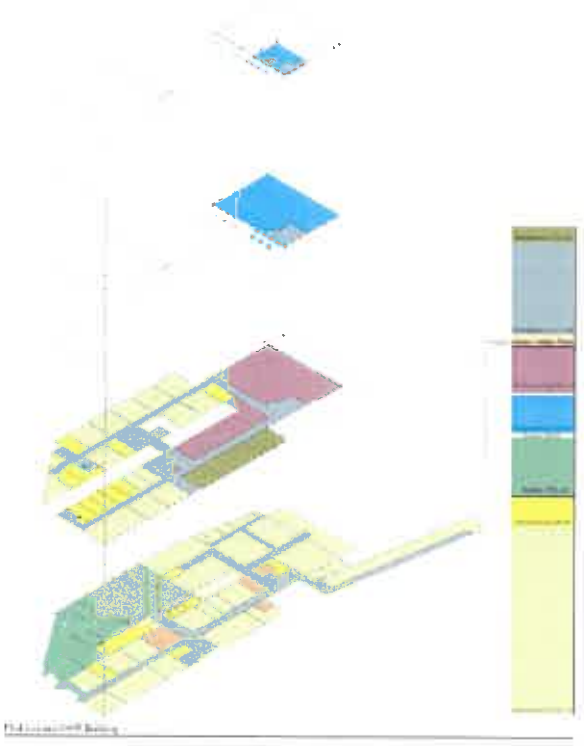
3.1.2. Present situation of the VHIR Buildings

The objective of the new VHIR building is to unite all the research units that are currently dispersed in different buildings within the hospital enclosure (Mediterrània and Collserola buildings, Floor 13 of Maternoinfantil and the VHIR modules), as well as increasing the capacity for research by increasing the number of laboratories, an experimental operating theatre and a new Biobanc centre.

Mediterrània Building

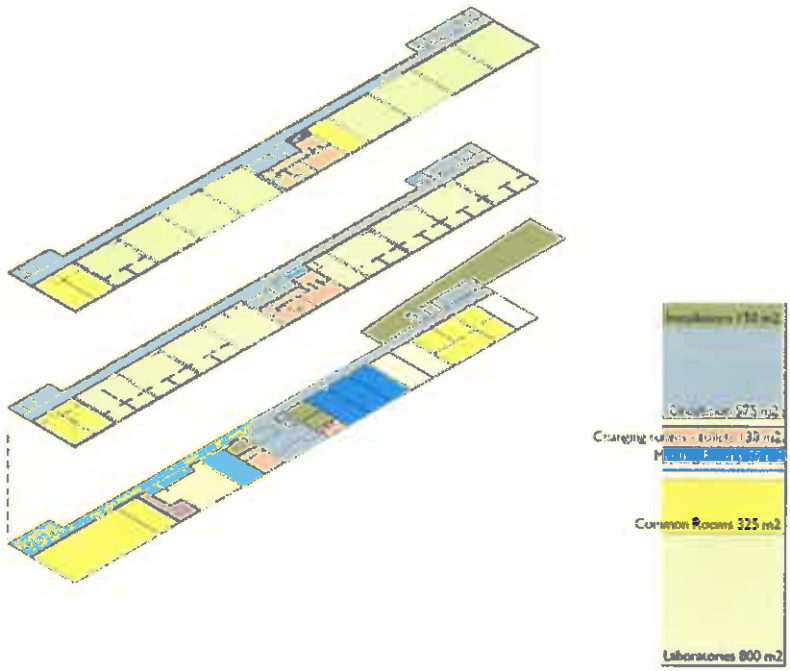
Located next the General Area of the Hospital, the Mediterrània Building (2004) has 4,600 m2 (more than 4,000 m2 for laboratories and 500 m2 for offices, management and meeting rooms).

This building also houses the Animal Experimentation Service (SEA), Statistics and IT (UEB) and the High Technology Unit (UAB).



Collserola Building

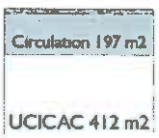
The Collserola Building (2010), is located at the top of the campus, close to the hills. It has 2,300m2 containing 16 laboratories, culture labs, common rooms and support areas.



Collserola VHIR Building

13th Floor Maternoinfantil

The 13th floor of the Maternoinfantil building was renovated in 2013 to house the Clinical Research Support Unit (USIC) in an area measuring 610m2.



Floor 13 of the Maternoinfantil Building

3.1.3. Spatial distribution of the VHIR Building

The ground floor will contain the reception area and rooms that require ease of access from the outside (conference and training rooms, library and canteen etc.)

The next floors will house the research facilities: laboratories, auxiliary rooms and administration offices-

The basement level -1 will be used for storage and technical rooms such as the operating theatres for animal experiments (experimental surgery), UAT (High Technology Unit), Biobanc, cleaning and sterilisation equipment, low-temperature storage and waste room, which can all be reached through the interior network, with road access from the outside that links to the hospital enclosure.

Other subterranean levels will be used only for parking, with access from Avinguda Jordà.

There will be access to the Traumatology Hospital from level -2 of the underground car park.

3.1.4. Main areas of the VHIR Building

General Service Areas and Access

The building must have a series of general spaces that provide services to the whole building and can be used for everyday activities or external to the building.

These spaces will be the conference room, with space for 120 people and direct access to reception, a library with space for study desks, classrooms and meeting rooms. There will also be utility rooms and storage. A leisure area for all the users of the building is also necessary.

The access area must also have changing rooms, showers and lockers for visitors.

Administrative Area

The administrative services required by the Vall d'Hebron Research Institute (VHIR) will carry out by its administration department. This will consist of individual offices, working areas and meeting rooms.

Teaching Area

The teaching area will have multi-purpose rooms with space and technical resources adapted to the organization of scientific events, meetings, joint projects, seminars, conferences, publication of knowledge and above all, to improve and extend the scope of post-graduate education at VHIR and promote awareness of science (outreach).

Laboratory Area and shared research rooms

The upper floors will house laboratories and the common rooms (culture labs, centrifuges, shared equipment, development rooms), as well as spaces for meetings and classes, and a small leisure area on every other floor.
The laboratory will have capacity for 650 researchers, who must have access to working space in both the laboratory and the offices.
The overall layout will be open-plan, except for some research groups whose work requires them to work in closed spaces, which will be placed at the ends of the building, such as Cardiology and the Advanced Therapy Centre.

Scientific-Technical Area

The underground levels are reserved for uses that need highly controlled climatic and environmental conditions, such as the experimental surgical theatres, UAT (High Technology Unit), Biobanc and UEB (BioComputing and Statistics Unit).

Parking

The parking area will be underground and can be accessed from the vertical nuclei of the building, to serve the users of the building as well as the Hospital, with some spaces reserved for local people.

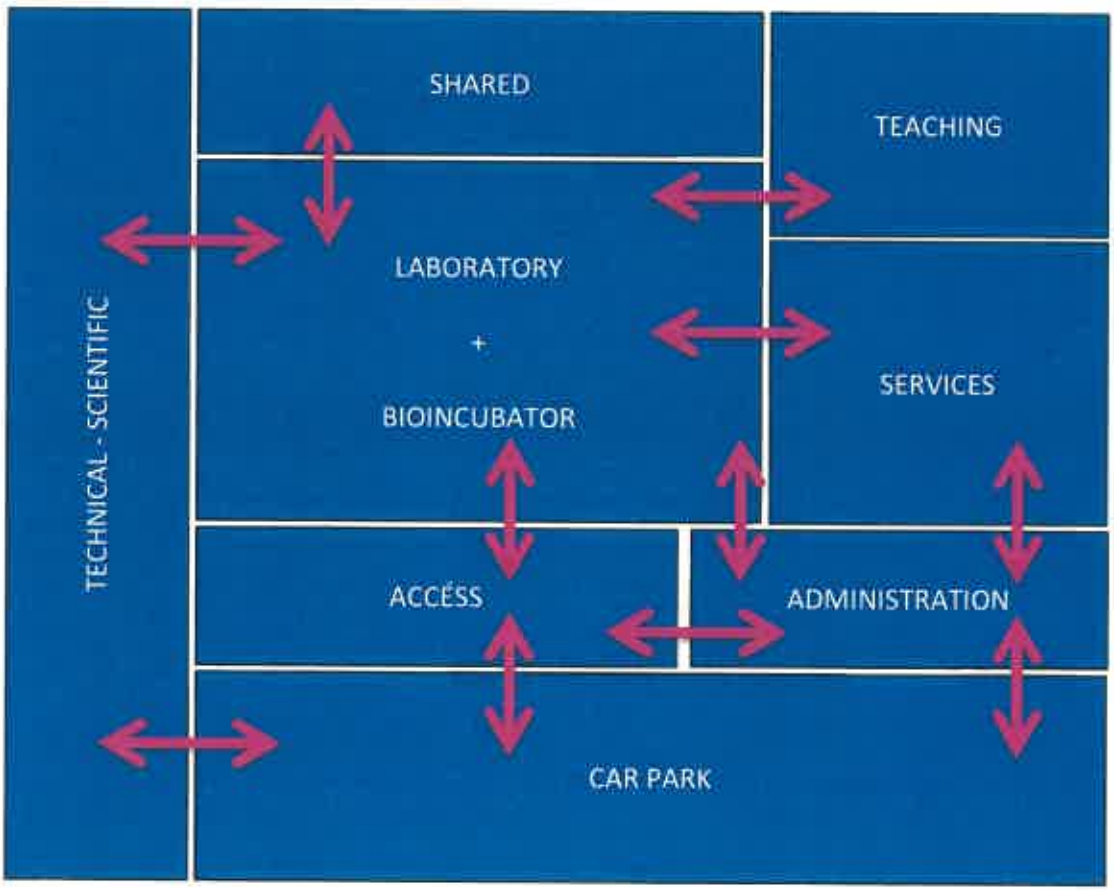
The car park will have approximately 20 places which are at least 2.4m wide with the corresponding number of adapted places, and will be located on floors -2 and -3, centred on the main evacuation nucleus. The circulation lanes will be 5m at least wide.
It will have four vertical communication nuclei. The main nucleus will offer access to Avinguda Jordà, while a second will lead to the Traumatology Hospital, a third will connect with the VHIR building by lift only, while the fourth will access the hospital enclosure.

The proportion of surface area for the whole of the building will be:

	%	SURFACE AREA
GENERAL SERVICES	10%	2.400 m2
ADMINISTRATION	5%	1.200 m2
TEACHING SERVICES	5%	1.200 m2
LABORATORIES	35 %	8.400 m2
TECHNICAL-SCIENTIFIC	10%	2.400 m2
CAR PARKING	35%	8.400 m2
TOTAL AREA ABOVE AND BELOW GROUND LEVEL	100 %	24.000 m2

These percentages will be reviewed when the executive project is drafted.

3.1.5. Functional diagram of the VHIR Building



3.1.6. Functional plan for services of the VHIR Building

GENERAL SERVICE AND ACCESS AREAS

Access Area

- Reception
- Changing rooms
- Toilets
- Visitors' cloakroom

Common services

- Library
- Relaxation rooms
- Facilities for the functional area

Storage Area

- Storage of consumable material
- Storage for different uses

ADMINISTRATIVE AREA

Administration

- 7 individual offices
- Working area for 60 people
- 4 adaptable meeting rooms
- Toilets
- Archive

TEACHING AREA

- Modular multi-purpose classrooms
- Conference room for 150 people

RESEARCH LABORATORY AREA AND SHARED RESEARCH ROOMS

Research laboratories

- Working space for 650 researchers (1.5 metres of desk space in the laboratory and a work space in the office)
- 1 extractor hood for chemicals for every 50m2 of laboratory
- 1 magnetic resonance zone

Shared research services

- 15 culture labs with level 2 biosafety
- 2 culture labs with level 3 biosafety
- 10 rooms with shared equipment
- Waste room (basement)
- 2 cleaning rooms with sterilising equipment
- Rooms for 140 -80ºC freezers, with a total of 450m2
- 2 cold rooms (-4ºC)
- 1 laboratory for handling radioactive isotopes
- Modular multi-purpose classrooms
- 3 cryo-preservation rooms, 2 of 40 m2 and 1 of 10 m2

CTAB (Centre for Advanced Therapies and Biomedicine) and Cardiology

- Closed laboratories with controlled atmospheres and specific installations.

SCIENTIFIC-TECHNICAL AREA

Administration

- Shared administrative room for 20-25 people to work in individual offices
- Meeting room for 12-14 people

Animals/Experimental Operating Theatres

- 3 operating rooms of 35m2
- 1 operating room of 45m2
- Pre-operating area
- Loading bay: entrance for animals and removal of cadavers. If located on floor -1, ensure sufficient clearance for the type of lorries involved.

- Drainage system for washing pens
- Take animal waste into consideration for the sewage system.
- Distinguish the circuits for animals, people and facilities.
- Outside area measuring 15 m2 for assessing large animals and for exercise.
- Natural light for animal comfort, to simulate natural habitat as closely as possible.

Animal pen area

- Pens for 20 pigs
- Pens for 20 mini pigs
- 2 post-operating boxes for pigs/mini pigs
- Pens for 20 sheep
- Exterior pen space (minimum 15 m2)
- Pens for rabbits

Biobanc

There are different points to take into consideration:

- 2 rooms measuring 80 m2 for -80º freezers for the 2 Biobancs (Biobanc HUVH, Biobanc groups)
- A 20 m2 room for cryo-preservation
- Archive adapted to regulations for data protection.
- Laboratory space for collecting samples (20 m22).

UEB (Biocomputing and Statistics Unit)

- Central server area and computer installations

UAT (High Technology Unit)

- Laboratory work room of 150 m2
- Culture labs (level 2 biosafety)
- Possible independent regulation of temperature with precision (different equipment has different requirements, they are not permanently turned on, some equipment can raise the ambient temperature).

- Suspended electric fittings which are highly visible and can be easily moved to connect devices. The power supply for these devices must be very stable. Additional connection to a UPS.
- Connection points to the intranet/internet.
- Installations prepared to avoid vibrations (very important for rooms with microscopes).
- Store room

3.1.7. Construction features of the VHIR Building

- Capacity for 650 researchers.
- Minimum width for the main corridors is 2m.
- Minimum opening width for doors is 90 cm.
- Spaces must be wide and designed with the equipment that will go there in mind to enable easy movement and comfort in the researchers work area.
- They must also be equipped with sufficient storage space.
- There must be a distinction between the researchers' areas of movement and those of the general public to ensure the required level of hygiene.
- The minimum width of the sliding laboratory doors is 1.20 m, consisting of a door of 90cm and a swinging side panel of 30 cm.
- The distribution of the laboratories will be mainly open and in modules.
- The structural design of the building must ensure that there is no transmission of vibrations.
- Minimum ceiling height in the laboratory is 2.71 m.
- Height between floor beams is 3.50 m.
- Surfaces must be smooth and washable, with rounded edges.
- The laboratory floors must be anti-slip
- The laboratory work surface for each person must be at least 1.5 m long.
- Closed laboratories for groups that require this.
- The culture labs must comply with regulations for isolated spaces for biosafety levels 2 and 3.
- The experimental operating theatres must meet all current legal requirements and those of the institution.
- The operating theatres of the animal experimentation area require a clearance height of 4 metres.

- Light, temperature, humidity and access control, medical gases and treated water are all essential in the UAT laboratory area.
- The alarms for the -80ºC freezer areas must be guaranteed, and the power supply secure and free from interruptions.
- Closed offices with translucent walls that allow communication in specific circumstances.
- Administrative work areas open for researchers.
- Materials and closures must ensure minimal ambient noise.
- The energy efficiency of the building must be ensured through insulation and solar protection, matching of energy produced to demand, automated control of facilities and use of renewable energy.
- General natural lighting of spaces.
- Comfortable conditions of ventilation, temperature and humidity must be guaranteed.
- Extraction of air from some shared areas of the laboratory to absorb the thermal load produced by the equipment, to ensure efficiency and that they operate correctly.
- Decalcified water necessary for laboratories, UAT and operating theatres.
- Light fittings must use LED lighting that guarantees different levels of illumination for each zone.
- Sufficient power for the laboratory equipment.
- Installations of medicinal gases in all laboratory areas, UAT, operating theatres, biobanc and shared areas.
- Control of access to all restricted area, loudspeaker and anti-intruder elements.
- The work area of each researcher must have electricity and IT connections to carry out their work.
- All Industrial Safety Standards and Fire Protection regulations must be followed.
- A bunker will be available for storing chemicals outside the building.
- A space must be prepared outside the building for storing the medicinal gases.

3.1.8. Construction phases of the VHIR Building

The building will be raised in 3 construction phases. Considering that the building must be functional in each phase of the construction, and will be operating when the next phase is being built.

The construction phases will be:

PHASE 1	Underground car park	8.000 m2
	Basement VHIR building	4.500 m2
	FEDER* building	5.500 m2
PHASE 2	Laboratories and General Services	3.000 m2
PHASE 3	Laboratories and General Services	3.000 m2

*Functional Plan for FEDER building, specifications in Annex 2. Document 4.

Total VHIR Building 16,000 m2

Total underground car park 8,000 m2

3.1.9. Features of the VHIR Building

Compliance with CTE and other regulations and provisions.

The projected building must have a series of qualitative and quantitative characteristics that can be objectively identified and which determine its suitability for compliance with the basic requirements of the Technical Building Code (CTE).

The Basic Documents of the CTE establish limits for the values or levels that buildings, or parts of buildings must possess. These values or levels are used to define the basic requirements and are quantifiable inasmuch as the technological and technical development of the building work allows this (Article 3 of Part I of the CTE).

The features that the building must possess to comply with these basic requirements will depend on the scope of the project (the building's use, type of intervention, etc.), the general area of application of the CTE and the specifications of each Basic Document.

The area of application will be considered when seeking compliance with other regulations. If the project includes Documents that are already acknowledged, they must be referenced.

PART IV: SUPPLEMENTARY TECHNICAL DOSSIER OF THE TENDER

This information will apply only to the winner of the tender

4.1.- General requirements for Building Information Modelling

Introduction

The Vall d'Hebron Hospital has decided that the projects to be carried out in the enclosure will use BIM methodology throughout the life cycle of the installations that it promotes and maintains.

To comply with this objective, it is essential that all the architecture, engineering, building and operations companies, and all those working on new projects define, manage and develop their part of the project as part of an integrated BIM process.

For this reason, the Vall d'Hebron Hospital will appoint its own BIM Management Team, who will manage and audit the different BIM processes and models that are prepared by the others to ensure compliance with the requirements listed in this document. This will in no way detract from the work of the BIM Project Management Team assigned to the project, who will monitor compliance with the other requirements assigned to the project.

All participating companies are assumed to have sufficient knowledge of project design, execution and maintenance with BIM, and that the *BIM requirements of the Vall d'Hebron Hospital* were prepared with the following objectives:

To offer the information required for the other agents in the project to be able to prepare for developing the BIM in accordance with the expectations of future users and managers of the hospital.

Serve as a starting framework for later development of the *BIM Execution Plan* This document will be drafted and maintained jointly by the Vall d'Hebron BIM Management Team and the coordinators of the different teams that take part in the project, in accordance with the final specifications and work flow peculiar to each group. This will allow the objectives of the final project to be aligned with the needs of each participating agent, the software specification they use and other variables.

It is therefore essential that all those taking part in the project: the owners, project managers, architects, engineers, building technicians, contractors, manufacturers and facility managers all carry out their own BIM processes following these requirements.

In order to guarantee that all the key participants in the project possess the necessary BIM skills to reach the objectives and specifications described in this document, the capacity of all the agents who take part in the project must be assessed to ensure that they are prepared to comply with these requirements. The Vall d'Hebron Hospital will establish the method and criteria for this assessment.

Final notes

The *BIM Requirements of the Hospital Vall d'Hebron* are expressed in sentences that use the auxiliary verb "*must*". Recommendations are expressed with the verb "*should*" Finally, the use of "*can*" indicates, depending on context, that something is technically possible, or that permission must be sought in order to do it.

BIM Objectives applied to the project

The BIM Management Team of the Vall d'Hebron Hospital must define and agree on the target of the BIM process with the other agents in the project. The BIM objective in the first phase of the project will be documented through a ***BIM Objective and Responsibility Matrix*** like the one in the table below. A team responsible for the achievement of each objective must be appointed. This responsibility can change in the different stages of the project life cycle, and must be revised at each key point. Each of the agents who take part in the BIM process must ensure that their teams are committed to achieving these objectives.

The BIM Management Team of the Vall d'Hebron Hospital will monitor the creation and maintenance of this matrix, and that it achieves the objectives set out in it. Responsibility for its creation, however, lies with the agents who take part in each phase of the project, led by the BIM Management Team.

OBJECTIVE DEFINITION FOR CONCEPT DESIGN			MAIN RESPONSIBLE					
N	OBJECTIVE DESCRIPTION	REQ.	ARC	STR	MEP	QS	CON	FM
1	USE BIM MODELS FOR MASTER PLAN SITE	X	X					
2	CREATE ARCHITECTURALDESIGN	X	X					
3	MAINTAIN AND UPDATE ARCHITECTURAL BIM.	X	X					
	...							

Example of a BIM Responsibility Matrix for the Conceptual Design Phase

Requirements of the Building Information Model

These BIM Requirements of the Vall d'Hebron Hospital apply to the production of BIM models in the design, construction and operating stages of the project. The models must include all the architectural and structural elements of the installations and everything related with other areas of expertise needed to work on a completely digital building to the extent specified in this document.

This section sets out the procedures and methods that must be used to develop the models involved in the project processes during the whole life cycle.

This section is divided into the following parts:

3.1. Configuration of the Models.
3.2. Level of Definition.
3.4. Output extracted from the BIM
3.5 Protocols for collaboration.
3.6 Quality controls.

Configuration of the Models.

Strict directives must apply when starting the BIM. They must be set up by the BIM Project Management Team together with the BIM Management Team of the Vall d'Hebron Hospital at the start of the project and continued in the collaboration with the different areas of expertise that are involved in the project.

Software specifications

The programmes use by the different BIM equipment will be agreed on before the project starts. The models must be created using appropriate BIM software applications that enable the creation of data-rich models, but also the elaboration and verification of traditional outputs. On the other hand, to make it possible for the different agents to work together, the BIM modelling creation tools must be fully compatible with the JFC 2x3 format.

The work flow exchanges used by the different equipment must be documented and tested beforehand to anticipate any future issues of compatibility. This process of prior configuration is very important because it would be very difficult to get the systems to work correctly at a later date, once the project is underway.

The process of quality testing must be carefully prepared, both for the automated and manual exchanges of data, in order to ensure that coordination of the project.

Coordinates

Because the project is based on different models, it is vital that the same system of spatial coordinates are used, so we can make a global model out of the partial models, and add and modify these without causing errors and misalignments.

The following point must therefore be followed with maximum rigour.

Model Coordinate System: At the start of the project, a reference point will be marked on the map as the origin of the model. This point must coincide with the origin of the

internal coordinates of each model made. In other words, all the models must have an objective reference that will ensure the correct overlapping of the models.
A three-dimensional marker will be places at this point to clearly identify it when any of the models are exported, to check correct correspondence with the origin point. The form of this marker and its name will be agreed at the start of the project.
Geo-referenced Model Coordinates System: Once the models have been spatially coordinated in relation with a common origin point, any that require geo-references can obtain them, checking to ensure that this action does not modify the coordination of the models. If it does, the problem must be studied until a solution is found. The creation of special geo-referenced sub-models into which the coordination models created by each group can be inserted has been suggested as an alternative.

Model units

All the units used in the BIM model are based on International System of Units (SI) defined by the BIPM (Bureau International des Poids et Mesures).
The coordinators of each team must ensure from the beginning that there are no problems with the interpretation of the different units used in each model.

Division of the Model

The project will be divided into parts and the resulting models will be linked to one another through a logical hierarchy for an optimal and user-friendly management of each of the parts. The division of the model will be carried out following easy to understand criteria that allow other members of the design and construction team to collaborate on the development of the model without the need to resort to a complicated introduction regarding the methodology of the project.
For the division of the model it is recommended that the following guidelines are followed:
These areas of construction should be in separate models:

- Façades.
- Interior partitions.
- Car park.
- Urban planning and external structures.
- Underground infrastructure.
- Structure.
- Facilities.

If other divisions of the model are necessary, they will be made using clear references as to the limits of the different zones.
Information on only one discipline will be contained in the model file. This means that there will be several models for each area of the building.
Other types of geometrical segregation may be necessary in order to ensure that the model files can work in the hardware available.

It is necessary to have Container Models. Their function is to link the various parts together in order to form a coordinated unit. For example, a portion of the building with all the facilities and the structure.
It will be necessary to document the ownership of each part of the model. That is, who is responsible for their authorship and who is responsible for maintaining it in coordination with the others.
The ownership of each part may change during the course of the project.
The methods of the division must be agreed upon and documented as soon as possible by the BIM Project Management Team, the Vall d'Hebron Hospital Management Team and the coordinators of each team involved in each phase of the project. This division will have to be documented in the implementation plan of the BIM.

Owner's Models
The Owner's Models are the models with which each team works internally, each team can use the tools and formats that it believes to be most suitable in order to develop their tasks, as long as it is able to deliver Coordination Models which can be read by other agents.

Coordination Models
The *Coordination Models* allow the geometry and data from other models to be used as a reference in another project. They are, by definition, models exported from the *Owner's Models.* This is useful when it comes to managing parts of the project that are too large to be managed in a single file or when using information from another discipline or team.
For this reason it is very important to make sure that all Coordination Models that are generated share the same model origin. In this way, each team will be able to incorporate whatever it considers necessary into their own Coordination Models in order to coordinate its work with that of the others. These Reference models must be validated by their coordinators before being made available to the other teams. Therefore, it is essential that each team makes sure that the delivery complies with the requirements set out in this document and what is agreed in the BIM Implementation plan.
On the other hand, the Vall d'Hebron BIM Management Team exclusively undertakes the monitoring of the Coordination Models of the project in IFC 2x3 format. Therefore, it is necessary to ensure right from the start that all the agents involved can generate reference models in this format.

Nomenclature
Each definition of item, product type, layer or metadata will have to follow the criteria documented in the BIM Implementation Plan, although it is recommended that annexes are added to this plan, given the extent that these kind of specifications usually have.

The criteria may be specific to each team, but it will be necessary to agree on shared aspects such as the naming of different levels or floors or the shared metadata which will be needed to be delivered in the said Coordination Models.

Classification of the models' elements

Without detriment to the use of other systems of classification, a common classification system will be used for all models generated by all the teams.

Given that this project will be promoted by a public entity, it is recommended to use the classification system which Infraestructures.cat currently employs.

This classification code is placed in metadata specially dedicated for this purpose, called *InCat-Class-Gen.*

File management

The names of the BIM models files should follow the same criteria. This criteria will be agreed and documented as soon as possible by the BIM Project Management Team and the Vall d'Hebron BIM Management Team.

Shared data will be deposited in a Common Data Environment accessible to all parties. The BIM Project Management Team will propose a system for all interested parties and will ensure that they will be able to access it and understand how it works.

An incident management system will also be set up which may refer to the models and will be accessible online.

Furthermore, the BIM Project Management Team will ensure that regular coordination meetings are scheduled in which specifically created Coordination Models will be handed out in order to provide support for the discussion of the points set forth in the agenda for each meeting. This way, models that have been discussed and decided at each meeting can be tracked.

Revision management

The BIM Project Management Team will establish a management system for any revisions of the model, which is recommended to be based on the file's own nomenclature to allow different versions of the same model to be compared.

The model will evolve rapidly during the various stages of the project. Any changes must be consecutive and simultaneously documented, especially when the task of creating the model is divided into different packages and is managed by various consultants or contractors.

Level of Definition (LOD)

The BIM project models will range from preliminary design to As-Built models and maintenance (Facility Management), following some Levels of Definition (LOD) in accordance with the different phases and stages of the project. The LOD tables have proven to be an effective method of communicating the scale of development of the BIM model, which is needed throughout the life cycle of the building project, allowing

clients, architects, engineers, contractors, builders and facility managers to identify what the scope of the BIM models for each stage of the project is. The LOD specification allows the authors of the BIM model to establish to what extent the information of the models is reliable and/or definite and also allows other agents understand the usefulness and limitations of models they receive.

The BIM Project Management Team will coordinate the creation of a Responsibility Chart on the LOD in order to document what the scope of the modelling of each team is. Although any reference can be used, the use of the definitions developed by the American BIM Forum or English NBS is recommended. However, you can use any other tabulation system for the Levels of Definition, if considered appropriate. In any case, a system to establish each Level of Definition as well as the amount of a specific Level of Detail (lod) and a certain Level of Information (loi) must be used in order to generate LOD Responsibility Charts which allow different levels of lod and loi for each element or construction system to be specified.

Moreover, it should be understood that it is not necessary to establish a direct link between the different LODs and phases of design and construction. For example, the structural system design may precede the design of interior partitions and dividers. In this case, by the end of a preliminary draft, the model may include many elements in LOD 200, but also include others in LOD 100, as well as some in 300. Therefore, the Level of Definition of models will depend on the objectives of the BIM project defined for each stage of the project.

LOD Responsibility Chart

The *LOD Responsibility Chart* indicates what *LOD* is expected for each element of the model to the conclusion of each phase of the project. The BIM Project Management Team will set up a table similar to the example below in order to guarantee that the needs of the project are attained. The teams involved in each stage will have to develop its content under the supervision of the BIM Project Management Team and the Vall d'Hebron Hospital BIM Management Team.

LIST OF ELEMENTS WITHIN THE MODEL	PLANNING			BASIC PROJECT			EXECUTIVE PROJECT			CONSTRUCTION			AS-BUILT		
	RESP.	LOD	LOI	RESP.	LOD	LOI	RESP.	LOD	LOI	RESP.	LOD	LOI	RESP.	LOD	LOI
TOPOGRAPHY	GS	100	100	GS	200	300	AR	300	300	CN	500	100	CN	0	0
SURROUNDINGS	GS	100	100	GS	200	200	GS	200	300	GS	200	500	GS	200	500
GEOLOGICAL MODEL				GE	200	200	GE	300	300	GE	300	500	GE	300	500
ETC.															

Example of an LOD Responsibility Chart

Amb el suport de:
Generalitat de Catalunya Departament d'Empresa i Coneixement Secretaria d'Universitats i Recerca
Unió Europea Fons europeu de desenvolupament regional

Metadata Specification

All non-geometric information contained in BIM objects for each of the models will be defined in accordance with the Level of Information (loi) established in the LOD Responsibility Chart in order to make the information needed for each stage of the project available, and therefore ensure the proper transmission of this knowledge to the involved parties.
However, it will be necessary to specify what information in particular is included in the models to be shared with other agents. It should be kept in mind, however, that this information needs to be kept to a minimum, as each team coordinator will be responsible for ensuring that the data their team includes in the models provided are correct.
The Vall d'Hebron Hospital BIM Management Team will supervise the creation of tables which specify what kind of information each object in each phase of the project should contain, who will be responsible for their maintenance, and where this information is stored.

BUILDING ELEMENT		CONCRETE STRUCTURAL COLUMNS / COLUMN SURVEYS / TIE RODS	CODES	CL / CS / TV	Nº	001	
IFC BUILDING ELEMENT		IFCCOLUMN/IFCCOLUMN/IFCTIEROD					
GENERAL REQUIREMENTS		[...]					
REQUIRED INFORMATION		[...]					
PROPERTY SET							
	FIELD	DESCRIPTION	UNITS	TYPE	OWNER	LOC	RQ	OPT
STRUCTURAL INFORMATION	CONCRETE COMPRESSION RESISTANCE	CONCRETE COMPRESSION RESISTANCE	N/MM^2	REAL	***	CMS	X	
	STEEL TENSILE STRENGTH	STEEL TENSILE STRENGTH	N/MM^2	REAL	***	DB	X	
	INFORMATION SOURCE	INFORMATION SOURCE		STRING	***	DB	X	
	REINFORCEMENT AREA SIDE 1	REINFORCEMENT AREA SIDE 1	MM^2	REAL	***	DB	X	
	REINFORCEMENT AREA SIDE 2	REINFORCEMENT AREA SIDE 2	MM^2	REAL	***	DB	X	
	REINFORCEMENT AREA SIDE 3	REINFORCEMENT AREA SIDE 3	MM^2	REAL	***	DB	X	
	REINFORCEMENT AREA SIDE 4	REINFORCEMENT AREA SIDE 4	MM^2	REAL	***	DB	X	
	TOTAL REINFORCEMENT AREA (SUM OF ABOVE)	TOTAL REINFORCEMENT AREA (SUM OF ABOVE)	MM^2	REAL	***	DB	X	
	TECHNICALDATASHEET	TECHNICALDATASHEET	-	PDF	***	CMS	X	
_BD_OBJECT NOMENCLATURE	01 ZONE			STRING	***	DB & IFC	X	
	02 TYPE			STRING	***	DB & IFC	X	
	03 AXIS			STRING	***	DB & IFC	X	
	04 POSITION			STRING	***	DB & IFC		X
	05 ELEVATION			STRING	***	BD / IFC		X
	06 NOTES			STRING	***	BD / IFC		X

Example of a Metadata Table applicable to certain concrete structural elements.

Amb el suport de:
Generalitat de Catalunya Departament d'Empresa i Coneixement Secretaria d'Universitats i Recerca
Unió Europea Fons europeu de desenvolupament regional

Deliverables extracted from the BIM

The deliverables will be provided on the dates specified at the start of the contract and set out in the design and construction plan. The following documents, models, drawings and deliverables of data may be provided during the BIM process.

Owner's BIM Models

The owner's BIM Models are those which have been created and maintained using various BIM editing software programmes. Those in charge of the design will develop these BIM models primarily during the stage of the project. These BIM models will be delivered to the Vall d'Hebron Hospital so that it can manage the subsequent updates during the implementation phase of the works.

BIM models in IFC format

The owner's BIM models will also be compiled and published in IFC format during all phases of the project, in order to allow all members of the Vall d'Hebron Hospital BIM Management Team to access the information contained in them and monitor the progress of the project and the implementation of the works by the team.

It is important to point out that the BIM teams from each and every discipline involved in the project will have to ensure that whatever software is used in the creation of the BIM model, all the geometric information and metadata required will remain in *IFC* format when it is delivered.

Moreover, each team coordinator will ensure that the IFC models which are generated are spatially coordinated using the independent display platform which will be chosen at the beginning of the project.

Other Deliverables

The BIM creation software has to be used to produce 2D drawings obtained from the Owner's Models. As a general rule, the section of floor plans and elevations will be set to a scale of 1:50 and will come from this model. However, it is understood that part of the content of these plans may not come directly from the models, being overlays of CAD drawings or text which is not linked to the information contained in them. In this case, it will be necessary to identify and document which information comes from the model and which doesn't.

The same applies to other documents which under the contract must be delivered to the owner and other agents, especially those containing measurements. At all times it is necessary to specify the source of the information, i.e. from the models or other sources.

This specification will be documented in the BIM Implementation Plan.

Collaboration Protocols

The BIM Project Management Team will appoint a BIM manager within their team who will take on the role and tasks of the *BIM Project Manager.* This person will be the

spokesperson communicating with other teams in the drafting of the project, with construction and with the Vall d'Hebron Hospital.
This *BIM Manager* must establish and concur with their team and with the Vall d'Hebron Hospital BIM Management Team the minimum requirements for the proper modelling and implementation of the BIM project.

Collaboration between Teams
It is vital for the project that the teams collaborate with each other in order to obtain the best possible result. Therefore, we must establish a cooperation protocol that enables this to happen. This protocol must be aimed towards the various professionals involved in each stage of the project (including construction and operation) so they can align their objectives and help one another. The BIM Project Management Team will organise sessions in advance to align the objectives so as to establish a joint strategy for the development of the project. Once this strategy has been agreed, corresponding coordination meetings will be scheduled, synchronising them with the expected development of the drafting of activities of the project and construction.
Moreover, each of the Team Coordinators involved in each stage will have to share, link and exchange plans and BIM models with the other participants in the project. In addition, each team authoring a part of the model should be able to link or reference the Coordination Models of other disciplines, regardless of the software they or other teams might use. For this reason, the *IFC* will be the main coordination format used. The owner's BIM formats are also allowed for coordination purposes, as long as they are also delivered in IFC format.
The BIM Project Management Team will have to schedule regular meetings to allow for the validation of aspects which cross over various disciplines of the project from a multidisciplinary point of view. These meetings should be focused on making decisions using Coordination Models available in the CDE. Therefore, each team will have to develop their activities so that they can deliver the appropriate models to be discussed in each meeting's agenda.
In this regard, it is recommended that the planning is prioritised to detect clashes which are highlighted at the beginning of the project (see point 3.4.2), so that aspects of the project requiring spatial coordination can be resolved as a priority in advance.
During the construction phase, it is expected that the contractor will manage the BIM models that are generated by subcontracts. Having said this, the BIM Management Team should establish from the start who will be responsible for its implementation. In other words, whether in the end it will be the faculty management, the contractor, any of the subcontractors or a combination of these.

Responsibilities of the Team Coordinator
Apart from developing their own discipline, the BIM Coordinator for each team that is involved in the project or the construction will also contribute to the development of the tasks relating to the BIM.
This responsibility includes:

- Developing the BIM Implementation Plan relating to activities they coordinate.
- Aroviding all the information requested by the BIM Project Manager.
- Acquiring the necessary hardware and programmes to follow these specifications.
- Coordinating their team's work with that of the others. Therefore, if you any problems are found in the Coordination Models, they should be noted in the Incident Management system so they can be discussed at the next meeting.

The Team Coordinator will also be responsible for the coordination of its own production along with those involved in it, having authority for their decisions as reflected in the BIM Objectives and Responsibility Chart, the LOD Responsibility Chart and the Metadata Tables.

Project Coordination and Clash Detection

The Coordination Models from the various teams will attend Clash Detection sessions at agreed times, allowing the involved parties to resolve potential clashes in advance and avoid costly works and delays during the construction phase. Before these sessions, each team coordinator must ensure that the models to be used are correct and contain the appropriate information to carry out the trials.

In the Clash Detection process, elements should be grouped appropriately according to the specific classification criteria, in order to:

- Reduce the time and resources used in the detection of false positives.
- Filter elements that are not necessary in the process of coordination, for example, the known issues that need to be resolved in the later stages of the project; elements that do not affect the cost when they change places, etc.
- Elements which are particular to a group for a specific type of coordination process, for example the formation of groups between roofing elements and the fire services model during shock analysis.

The BIM Project Manager will establish the clash detection process, which software will be used for the project, the scope of the analysis at each stage and be responsible for carrying out and communicating the results. Each Clash Detection session will be accompanied by a coordination meeting in which managers of the conflicting elements will discuss how to resolve the incident.

However, the clash detection process does not exempt teams from collaborating with each other and coordinating their strategies for project development in order to prevent such incidents occurring. For example, those responsible for the development of the facilities will coordinate with other teams so as to establish areas for thoroughfares between the said facilities.

In this regard, the BIM Project Management Team will develop a Clash Detection chart which will enable teams to explain which kind of clashes they seek to minimise or completely eliminate. In this respect, it is recommended to use Infraestructures.cat which currently makes this available as part of its requirements. If this is used, the

elements must be coded according to their classification system, since this chart identifies them this way.
Example of a Clash Detection between the facilities path and a structure.

Quality Control

The Quality Control is based on the premise that each team is responsible for delivering quality to the other members of the project. The best way to guarantee this is to use processes and protocols which ensure that the product obtained complies with the requirements established by the owner and the other agents taking part in the project.

Quality Control of the Owner's Models

Each team coordinator will inform the BIM Project Manager about the internal quality controls performed in order to ensure that the Coordination Models are of sufficient quality to be used as a medium for Collaboration and Coordination.
This internal habit benefits all the teams involved in the project because it will solve most of the issues related to the project with their own models before the coordination sessions take place.
Therefore, the architectural teams and those of all the other disciplines must have an internal quality control system for the owner models they generate and for the project that is developed by them.

Quality Control of the Coordination Models in IFC format

The BIM Project Management Team will establish procedures for quality control to check that all Coordination Models are compatible in format with these requirements to ensure that efforts in the coordination and collaboration between the parties contribute to the success of the project. Moreover, the Vall d'Hebron Hospital BIM Management Team will carry out their own checks without detriment to that established by the BIM Project Manager,
The Vall d'Hebron Hospital BIM Management Team will verify at least the following aspects:

- Coordination of the origin of the models.
- Coordination at the level of clashes following the Clash Detection Chart.
- IFC compatibility with their internal information management system.
- Nomenclature of the Ifc Type Products and the layers.
- Assignment of the Ifc Types to the elements.
- Naming IfcBuildingStories (floors) and their allocation to the various elements of the models.
- Classification of all of the elements.
- Content of the elements as regards information.

Each of the BIM Teams' authoring each model will be responsible for ensuring that their Coordination Models in IFC format fulfil these requirements.

Quality Control of the Project

The Coordination Models in IFC format are likely to be used by the Vall d'Hebron Hospital BIM Management Team in order to carry out an audit and ensure themselves of the quality of the project.

4.2 Technical specifications for drafting executive projects

All projects must have a title, which expresses clearly and unambiguously the product, work, facility and service or software (logistical support) related to it.

The project will consist of the following basic documents: a general index, a report, annexes, plans, a document specifying conditions, measurements, the budget and, if necessary independent studies. These documents must be presented in the order indicated.

Each basic document will be sectioned into individual documents, usually developed by one or several professionals. These individual documents will be called "folder".

Each page of the basic documents and each of the plans must contain the following information:

- Page or plan number.
- Project title or identification code or number of the Project.
- Title of the basic document to which it belongs.
- Number or identification code of the document.
- Edition number, and the date of approval where applicable.

The project will have to be drafted in such a way that it can be interpreted correctly by people other than its authors. It must contain clear and, accurate language and be free of vague and ambiguous terms, being consistent with the terminology used in the various chapters and sections of the various project documents and should be legible. The first time an acronym or abbreviation appears in the text, the words or the full text to be replaced should appear in brackets after the word. The use of the future tense indicates mandatory requirements and suggestions or "non-compulsory" proposals should be expressed through the use of the conditional or subjunctive forms.

1 GENERAL INDEX

The general index is one of the basic documents of the project. The purpose of this section is to enable a clear and rapid location of the contents of the project.

The general index must contain each and every index of the various basic documents of the project.

2 REPORT

The report is one of the basic documents that makes up the project and its main function is to serve as a link between all of them.
Its purpose is to justify the adopted solutions and, together with the plans and specifications of conditions, unequivocally describe the objective of the project.

The report must be clearly understandable, not only for professional specialists but also to third parties, particularly to the customer, especially in matters specifically related to the objective of the project. The alternatives studied, their advantages and disadvantages, and the reasons that led to the chosen solution.

In the following points the numbering, the title and content of the chapters and sections in which report of the project will be indicated.

Identifying pages:

A first sheet which will contain:

- The title of the project and its identification code. In the event that the objective of the project includes a specific geographical location, that location will be defined and, where appropriate, its UTM coordinates.

- Registered name of the person or entity that has commissioned the project and their Company Tax ID number (CIF), name and surname of their legal representative, Spanish National ID Number (DNI) addresses, telephone, fax, email and any other professional identification that may appear or exist, excluding those which it would not be legally appropriate to publish.

- Given Name and Surnames, qualification, association membership number, DNI and work address, telephone, fax, email and any other professional identifier that may appear or exist, excluding those which it would not be legally

appropriate to publish, of each one of the authors of the project and of those responsible for their verification, review and validation.

- Registered name of the entity or corporate body that has been commissioned to create the project ....., CIF, address, telephone, fax, email and any other professional identification that may appear or exist, excluding those which would not be legally appropriate to publish.

- Date and signature of the documents mentioned above.

Index page of the report.

In order to make it easier to use, this index will refer to each of the documents, the chapters and sections that make up the report.

1. Object: In this chapter of the report the purpose of the project and its justification will be indicated.

2. Scope: In this chapter the scope of the implementation of the project will be indicated.

3. Background: In this chapter, all aspects necessary for an understanding of the alternatives studied and the final solution adopted will be listed.

4. Standards and references: In this chapter only documents cited in the different sections of the report will be recorded

4.1. Laws and rules applied:

In this section all the laws (laws, regulations, decrees etc.) and non-binding rules that have been taken into account for the project will be covered.

4.2. Bibliography:

In this section all the books, magazines and other texts that the author deems interesting to justify the solutions adopted in the project will be covered.

4.3. Calculation Programs:

In this section, the list of programs, models and other tools used to develop different calculations of the project will be covered.

4.4. Quality management plan applied during the drawing up of the project:

In this section the specific processes to ensure quality during the project should be stated.

4.5. Other references:

In this section references which are not covered in the previous sections but are considered relevant to the understanding and realisation of the project should be included.

5. Definitions and Abbreviations:

This section of the report will cover all the definitions, abbreviations etc. that have been used and their meaning.

6. Design requirements:

This chapter of the report will be made up of a description of the bases and data as defined by the customer, and those derived from legislation, rules and applicable standards, the location and the socio-economic and environmental surroundings, studies conducted aimed at defining the adopted solution, the interfacing with other systems, or other external factors that affect the technical solutions of the project.

7. Solution Analysis:

In this chapter of the report the various alternatives studied should be indicated, including what paths led to them, the advantages and disadvantages of each one, along with the solution which was finally chosen and why.

8. Final Results:

In this chapter of the report the product, the works, installation, service or software (logistical support) depending on the chosen solution will be described, indicating what their defining characteristics are, and referring to the plans and other elements of the project which define them.

9. Planning

In this chapter of the report, and in relation to the process of realisation of the objective of the project, the different stages, goals or elements to be attained will be defined as well as the delivery terms and schedule and corresponding graphics programming.

10. Order of priority of the basic documents.

In this chapter of the report the author of the project will have to establish the order of priority of the basic documents of the project when facing possible discrepancies.

If not specified otherwise, the priority will be as follows:

1. Plans.
2. Specification of Conditions
3. Budget
4. Report

3 ANNEXES

The annexes make up one of the basic documents of the project. To make it easier to use, this document will start with an index which will refer to each of the documents and the chapters and sections that it is composed of.

It is composed of the documents which develop, justify or clarify specific sections of the report and other basic documents of the project. This document will cover the necessary annexes (as appropriate in each case) corresponding to:

- Initial Documentation. This annex must include documents that have been taken into account to establish the design requirements.

- Calculations: this annex is designed to justify the adopted solutions and, together with the plans and specifications of conditions, and to unequivocally demonstrate the objective of the project.

It will include the initial hypothesis, criteria and calculation procedures and the final results, the basic dimensions and approval of the different elements that constitute the object of the project.

Application Annexes in the context of the project, other than those specified in chapter 12 of this standard, such as:

- Safety.
- Environment.
- Location of the Project, Geotechnics, Hydraulics, Hydrologics, Rainfall climatology etc.

- Other documents that justify and clarify the concepts expressed in the Project. They may include:
- Catalogues of elements that make up the project.
- Listings.
- Information on logistical, magnetic, optical and other types of support.
- Miniature replicas or models.
- Any other documents deemed necessary.

4 PLANS

The plans make up of one of the basic documents of the project and are essential for its realisation. Their purpose, along with the report, is to unequivocally define the objective of the project.

The document which contains the plans will start with an index which must refer to each of one of them, indicating their location, in order to facilitate their use.

It will include the graphic, alpha numeric, code and scaling information necessary to understand them.

5 SPECIFICATION OF CONDITIONS

The specification of conditions is one of the basic documents of the Project.
The technical, economic, administrative and legal conditions have to be established so that the objective of the project can be realised in the specified conditions, avoiding other possible undesired interpretations.

To make it easier to use, the specification of conditions will start with an index which will refer to each of the documents, the chapters and sections that it is composed of.

It will include:

a) The specifications of materials and elements constituting the objective of the project, including:

- A complete list of these specifications.
- The minimum quality required for each of the constituent elements of the project, indicating the standard (if any) that is considered for each of the constituent elements of the project the material requested.
- The tests and trials to which they must be submitted, specifying:
- The standard to which they will be performed.

- The conditions of implementation.
- The minimum results to be obtained.

b) The applicable rules and regulations including non-mandatory recommendations or standards, which are considered necessary for implementing the project, according to the author.

c) Aspects of the contract that relate directly to the project and that may affect its objective, which may be:

- In the realisation phase.
- In the working phase.

It must include:

- Base documents for the contraction for carrying out the works. The work to be performed will be defined in:
- The plans.
- The measurements.
- The report.
- The specifications mentioned in the section - a).
- Limitations on the supplies, which clearly specifies when the responsibility for supply and assembly begins and ends.
- Criteria for measurements and payment.
- Criteria for modification to the original project, specifying the procedures for following them, accepting them and how they must be reflected in the final documentation.
- Tests and trials, specifying which conditions the supplies mentioned in section a) must be submitted as indicated in section a).
- Guarantee of supplies, indicating the scope, duration and limitations.

6 THE MEASUREMENTS

The measurements make up one of the basic documents of the Project.
Their purpose is to define and determine the units of each section or work unit which make up the whole product, works, installation, service and software (logistical support) and objective of the Project.
It must include the number of units and define the characteristics, models, types and dimensions of each item of the works or element of the objective of the project.
Preferably, the international system of units, according to UNE 82100 (Parts 0 to 13) will be used.
The concept of a lump item for those units of works in which it is not possible to reasonably itemise the details of the individual units.

To make it easier to use, the measurements section will start with an index which will refer to each of the documents, the chapters and sections that it is composed of.
It must contain a complete list of the items of works that make up the entire project.
It will be subdivided into different sections or sub-sections, corresponding to the most significant parts of the objective of the project.
It will serve as a basis for the implementation of the budget.

7 BUDGET

The budget is one of the basic documents of the project.

Its purpose is to determine the economic cost of the objective of the project.

It is based on the measurements and follows the same order.

To make it easier to use, the budget will start with an index which will refer to each of the documents, the chapters and sections that it is composed of.

The Budget will include:

- A table of unit prices of materials, labour and auxiliary elements that make up the items or units of the works.
- A table of unit prices of the units of work, according to the measurements with a corresponding breakdown of materials, labour and auxiliary elements.
- The budget should include the overall economic valuation, broken down and ordered according to the measurements.

The budget will set the price range, clearly indicating whether or not concepts are included, such as:

- General expenses and industrial profit;
- Taxes, fees and other contributions;
- Insurance;
- Costs of certification and visas;
- Permissions and licences; and
- Any other item that may influence the final cost of realisation of the objective of the project.

8 INDEPENDENT STUDIES

The independent studies constitute one of the basic documents of the project.

The purpose of this section is to include the documents needed for legal requirements. To make it easier to use, the basic document "Independent Studies" will start with an index which will refer to each of the documents, the chapters and sections that it is composed of.

This basic document shall include all those studies which must also be included in the project, for legal requirements.

It will include, among others, original material relating to:

- Prevention of Occupational Hazards.
- Environmental Impact.

4.3.- Barcelona City Council's Environmental Report

Barcelona City Council's environmental report is described in Annex 2. Document 16.