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Guggenheim Museum (B)

"Next Sunday we're going to Santa Monica; my secretary already has the tickets. I'll meet you at a quarter to six in the international terminal at Sondika airport." Fernando Querejeta, IDOM's general manager, had just informed José María Asumendi, director of the Guggenheim Project, that IDOM had been chosen to manage the project. Querejeta and Asumendi would be accompanied by a small group of people from IDOM to start work in Frank O. Gehry's studio in California.

It was only a few hours previously that Felipe Prósper, IDOM's President, had received the news. At the beginning of December 1992, Juan Ignacio Vidarte, the director of the Guggenheim Bilbao Project Consortium, had let him know that IDOM had been selected to take on the management of the Bilbao Guggenheim Project.

IDOM's team

Before knowing whether it would be chosen for the project, IDOM had already earmarked certain members of the company to take charge of particular areas. When the decision was announced, the people who would lead each team were selected.

This case was prepared by Cristina Pallàs, Research Associate, under the supervision of Professor Pedro Nueno, as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. March 1999. Revised in May 1999.

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The initial project leader would be José Mª Asumendi, one of IDOM's most experienced and respected professionals. Asumendi had already successfully headed many industrial projects more complex than the proposed museum. IDOM's plan was to have two people heading the project who would complement one another. One would be Asumendi, and the other, Luís Rodríguez, a young Basque doctor of industrial engineering and Deusto Unversity MBA who also had considerable experience in computer systems. Luis would hold the post of General Project Coordinator. The post of General Architectural Coordinator would be taken by César Caicoya, an architect whose work had earned him a solid reputation in Bilbao and who had worked with IDOM on many previous occasions. For the Consortium it was essential to have an experienced and recognized local architect involved in the project. César had won various architectural awards that underpinned his prestige. As it was important to get started on the project, Rodríguez and Asumendi put together a multidisciplinary team based on experience and availability. The project had been split up into different parts which could be executed in succession, each constituting what was referred to as a contract "package". IDOM decided to structure its team in line with these packages. To take charge of each package, it selected a professional who was a specialist in that particular area.

Armando Castroviejo was chosen to manage the area of structures. An engineer with extensive experience in the field of metal and concrete structures, Castroviejo described his impression in the following terms: "I fell in love with the project. I was facing the biggest challenge of my career." For the area of installations, Rodríguez and Asumendi selected Rogelio Díez, a dynamic young engineer they considered ideal for the job. Javier Arostegui, an electrical engineer with 15 years' experience in IDOM, took charge of the electrical installations and safety package. The area of the outer shell or envelope and claddings was to be headed by Manuel Pérez, a young architect recently graduated from the University of Navarra, with only one year's experience but with a great capacity for hard work. Asumendi and Rodríguez chose Javier Aja, a young professional who had just successfully completed constructing a sports complex, as head of interior architecture. The post of works manager went to José Manuel Uribarri, an engineer with 30 years' experience in IDOM, who would be responsible for managing the team on site, supervising the work of more than 1,000 people. These were the people who would be in control of their respective "packages" and lead their teams in a flexible manner, increasing or reducing the size of the team as the needs of the project dictated at any given moment. **Exhibit 1** shows the management structure of the project.

The first meetings

The first meeting with the FOG/A team took place in Santa Monica on Monday, December 14, 1992. This meeting was also attended by Gehry's consultants for structures and installations, Skidmore, Owings & Merrill (SOM) and Consentini & Associates, respectively. Gehry trusted them. They had successfully carried out other projects together, and for Gehry it was important to know he had efficient teams behind him. From that day on, there began a series of working sessions that lasted all week; but at no point were they attended by either Gehry or any representative of the Consortium.

The discussions at these meetings centred around technical aspects of the project, pre-project planning, and working methods. But the atmosphere in the meetings was cold. The members of Gehry's teams did not seem to have much faith in IDOM's capacity, nor in that of the Spanish contractors.

It was difficult for IDOM's representatives to know how to approach such a famous architect. They did not understand why Gehry worked only with models, why he made such daring designs that seemed so difficult to execute, and why he did not put in an appearance at the meetings. Gehry's usual procedure was to propose ideas to the members of his team and then let them help him develop the ideas.

At that time, the project was no more than a preliminary study. Gehry's ideas needed to be developed and adapted in order to prepare a pre-project plan that could be presented one month later in Bilbao. Up until then, the design of the new museum existed only in Gehry's mind. The materials, forms, dimensions and specifications had not been defined. All they had were vague and approximate indications in various documents. **Exhibit 2** shows some of the initial models for the museum.

In these working sessions, the two sides agreed on the need to modify certain aspects of the project and revise IDOM's initial budget, which amounted to 16,043 million pesetas. It was agreed that IDOM would prepare a Cost Model, using a format that FOG/A had found effective in earlier projects. Also, the February meeting in Bilbao would be an opportunity for some of the local contractors that were possible candidates for inclusion in the project to attend and make themselves known to FOG/A.

The Cost Model

The cost model had to be delivered to FOG/A before January 15, 1993. Before that date, IDOM's representatives had their first meeting with the Consortium since being awarded the project. The IDOM team introduced itself and reported the conclusions from the first meetings with FOG/A in Santa Monica. Juan Ignacio Vidarte, representing the Consortium, was keen to make it clear that the visual and aesthetic design of the museum was the exclusive responsibility of Frank O. Gehry. Besides performing its role as Project Manager, IDOM should "do everything it could to get the most out of Gehry" and get the best result in terms of design. This did not mean achieving the cheapest possible building, but the best possible building within the constraints of the project budget.

Asumendi and Rodríguez established the broad outlines of the cost model by adhering to the criterion of "being realistic, using prices we felt comfortable with, and not forgetting anything", said Rodríguez. IDOM used the data it had available plus its own experience to estimate the prices; but there were some elements which, because they were so unusual, required provisional data, which was supplied by FOG/A.

IDOM did its work and sent the Cost Model to the Consortium and Gehry's office by the agreed date. Two days later Asumendi and Rodríguez had to travel to Santa Monica to revise and update it. Juan Ignacio Vidarte, who also attended the meeting, told them

that the Consortium did not have the resources to meet their proposed budget. Members of the FOG/A team took the opportunity to highlight what they considered to be bad estimates by IDOM. They felt that IDOM did not fully understand the project and was overcautious, and so had exaggerated the costs and included a large provision for contingencies (20%).

At this critical juncture, Asumendi and the rest of IDOM's representatives around the table refused to make changes based solely on the opinions of FOG/A and the Consortium. The discussions went on for several days, as IDOM thought it essential that they study the budget together (item by item) in order to pinpoint the reasons why each could be said to be excessive. In the end, both sides gave way and the following agreements were reached:

- Reduce the provision for contingencies to 8%.
- Reduce the floor area of the museum, which was currently above the target of 24,000 m^2.
- Redistribute part of the budget for materials to other items if cheaper materials had to be substituted for those originally planned.
- Obtain the stone and steel cladding at a lower cost than projected.
- Exclude the cost of the building permit, including it in other items of the Consortium's budget.
- Allocate 335 million pesetas to furniture and equipment.
- Exclude the costs of personnel training, including them in other items of the Consortium's budget.

As a result of these agreements, at the last meeting, FOG/A, IDOM and the Consortium reached a consensus around an estimated cost of 14,028 million pesetas. This would be the benchmark figure for the project. (**Exhibit 3** shows the agreed budget.) Once these meetings were concluded, a further agreement was reached: to go and have dinner together.

Managing the project

Once the Consortium had approved the Cost Model at the end of January, IDOM became responsible for monitoring the estimated cost of the project as the design process advanced. A division of roles was established to foster smooth collaboration: IDOM would concentrate on evaluating and managing, while FOG/A would focus on designing.

However, the initial design stage was behind schedule. In February 1993, only some thirty drawings had been completed, which was not enough considering that more than 1,000 were needed for a project of this size and that the museum had to be

inaugurated in 1997. Everything seemed to indicate that the construction work would not start before 1995.

To resolve this problem, the following methodology for controlling the project management was adopted:

- Plan the commissioning of the building work in stages, allowing an overlap between design and execution as the project advanced. Elements would be designed in the same order as they were to be constructed. Once the design of a given module was complete, that module would be commissioned and the corresponding building work would start. Meanwhile, other modules would be designed. Design and construction would move ahead in parallel.
- Freeze the design for each stage as far as possible once it had been commissioned in order to reduce late changes at the construction stage.
- Set up a cost control mechanism that would make it possible to monitor and track the actual cost of the construction at any given moment and adapt it to the budgeted cost (14,028 million pesetas).
- Include a flexible provision for any contingencies that might arise during the project.

Planning

The planning of the project was conditioned by a number of factors. The building work had to be started as soon as possible, if only for reasons of public image. In some circles there was scathing talk of multi-billion-peseta projects that never actually got off the ground.

Also, it was important to ensure continued political support for the project, and for this reason the elections to the Basque Government due to be held in autumn 1994 were a serious concern. It was also vital that there should be no interruptions to the construction work once it was under way, given the commitment to inaugurate the building in 1997 and the fact that there was no room for delays. **Exhibit 4** shows the timetable for the execution of the project

Cost control

The decision to allow design and construction to proceed simultaneously required great coordination and control. It was very important that any changes that were made to the building did not entail changes in costs or completion date.

César Caicoya, IDOM's General Architectural Coordinator, put it this way: "The building has to be completed in five years. As Frank O. Gehry produces the designs, we translate his designs into definitive plans, which we then hand over to construction management, which in turn tranforms them into budgets and timetables". If there was a cost overrun, Gehry's office would have to redesign the element in question or

propose ways of saving the necessary money in other areas. Conversely, if there was money to spare, it could be used to improve other aspects. This method would make it possible at regular intervals to analyse the project as a whole, transferring budget allocations from one item to another and making changes as the design required.

Preparing the ground

Before demolition work could begin on the site where the future museum was to be built, the Bilbao City Council had to issue the necessary compulsory purchase orders. Based on the preliminary design, the load-bearing points of the foundations and their levels would be defined. With these data, IDOM would design the foundations, while FOG/A and SOM went on to design the structure. When IDOM finished designing the foundations, it would commission a company to build them and begin execution of the work.

Once the design of the structure was complete, IDOM would prepare the bid package and put it out to tender, even though the envelope, the interiors and the installations were not yet fully defined.

However, the project management was obliged to comply with the laws binding public authorities. The Consortium, as proprietor, was keen to adhere to the regulations, as it was funded from public money. According to current legislation, any building job put out to tender by public institutions could only be awarded to a single contractor. This did not fit well with the complexity of a project as exceptional as the Guggenheim Museum Bilbao. To find a solution, the heads of the Consortium (Vidarte and Iturriaga) and of IDOM (Asumendi, Rodríguez and Caicoya) met with the Public Works Deputy of the Basque Government to argue the need to divide the construction work up into various “packages”. IDOM and the Consortium explained that this was the only way they could possibly implement the agreed planning method.

In the end, the Public Works Deputy granted their request, but demanded that the number of packages be as small as possible. For this reason, it was agreed that interiors and installations should be treated as a single package.

The proposal was approved with the following definitive packages:

- Demolition
- Foundations
- Steel and concrete structure
- Envelope and claddings
- Interiors and installations
- Exterior works
- Equipment and furniture

Once this legal obstacle had been removed, the project’s managers had the task of selecting the contractors who would be responsible for each of these packages.

Selecting the contractors

As Executive Architect, IDOM had to meet the Consortium's requirement that the museum be constructed in Bilbao by local contractors. IDOM established procedures to analyse and study all the solutions that were proposed in order to ensure that the museum could be built in Bilbao and obtain the best possible result. The best way to achieve this objective seemed to be through the participation of the contractors themselves.

IDOM launched a process to shortlist contractors, which would serve to inform contractors of the general characteristics of the project and attract their interest. From the initial shortlist, it then selected the offers that seemed most suitable from both a technical and a financial point of view.

The Consortium supported IDOM in offering all shortlisted companies the opportunity to collaborate in the project from the outset, so that they could contribute their experience and become acquainted with the project. This collaboration took the form of meetings in which the IDOM team informed prospective contractors of FOG/A's proposals and any developments. The contractors made comments and suggestions that were recorded, analyzed and sent to Gehry's studio. On occasion, representatives of the contracting companies even took part in meetings with members of the FOG/A team during their visits to Bilbao.

The Consortium issued a public invitation to tender in order to award each package to the company best qualified in its speciality. The design requirements of FOG/A and SOM meant that the contractors had only two weeks to prepare their offers. In this time, IDOM had to discuss with the companies the plans and documentation that had been prepared in Santa Monica, so that they had a clear enough idea of the project. **Exhibit 5** shows the contractors that were selected and the package each was awarded, as well as the subcontractors. **Exhibit 6** shows the timetable for the work of the main contractors.

The CATIA computer program

The contractors would have to adapt to the way Gehry worked. Gehry designed his buildings by making models of card and wood, which he would constantly modify and use to experiment with forms, volumes and spaces. When he had the definitive model, he would give the order for it to be transferred to a specialized, three-dimensional computer system. From that point on, the design process was done on computer. The surface coordinates of the models that Gehry had accepted were scanned and digitized using the CAD/CAM program known as CATIA.

CATIA was a software program that had been developed in 1980 by the French company Dassault for the aerospace, automobile and shipbuilding industry. It made it possible to geometrically define surfaces and forms by means of mathematical formulas. SOM and Consentini compared the results obtained by this method with the

original models in order to develop the descriptive information. Each of the resulting elements was given a figurative name (Fox, Chip, River, Potato, among others).

With CATIA it was possible to create the thousands of blueprints that would give shape to the building. Using three-dimensional computer images it was possible to model each and every one of the pieces that made up the outer cladding (titanium, stone and glass), so as to be able to cut them to shape, position them and assemble them more easily. **Exhibit 7** shows an example of a plan produced by CATIA.

Time zone difference

For Juan Ignacio Vidarte, the success of the project depended on establishing an excellent level of communication between FOG/A, the Consortium and IDOM. All possible means (fax, telephone, e-mail, courier) were made available to ensure a smooth flow of information (documents, blueprints) between the parties.

The time difference (9 hours) between Bilbao and Santa Monica meant that the two teams shared only a small part of their working day, which was the only time when they could communicate directly with one another. However, what initially seemed a difficulty soon became an advantage. In practice, IDOM and FOG/A managed to work together as a team 24 hours a day. When one team finished its working day, it would send information, comments and queries to the other; the other would then resolve queries and propose solutions which the former team would receive the following morning. In addition, they agreed to hold meetings (which could be intensive) every six weeks either in Bilbao or in California to monitor the progress of the project.

It was agreed that the language the two sides would use for communication would be English; the currency for budgeting purposes, the peseta; and the measurement system, the decimal metric system, so as to ensure uniform planning. For some members of IDOM, English was not a problem; for others, however, it meant having to learn it. César Caicoya started classes and in only three months could understand and speak the language fluently. He was even capable of giving talks, once the project was completed, without having any difficulty in expressing himself.

The building work begins

Construction began in October 1993 with the demolition work and the foundations. For Armando Castroviejo,the person in charge of structures, “it was a question of turning the models that IDOM’s team had examined in Gehry’s office in California into something real”.

The building work that IDOM set in motion was based on calculations made by SOM, despite the fact that the outer shell of the museum had not yet been designed. The envelope was offered for tender in May 1994 and building started one month later. By that time, there was already an overlap between project stages: the steel structure and the concrete construction had already been started.

However, the method of executing the work in packages, allowing design and construction to overlap, as well as the deadlines, led on more than one occasion to difficult situations. When tenders were invited for the structural work, it was discovered that the weight of the structure had been significantly underestimated, which translated into a deviation from budget. The final cost of the structures package grew from the projected 2,274 million pesetas to 2,410 million pesetas.

The deviations were corrected in a series of sometimes stormy meetings, by reducing the characteristics of materials and forms, by using "cushion" items that would be executed only if money was available, and also by cutting the contingency fund.

In the final months of 1994, work began on the remaining packages, except on the exterior works, which was started in mid-1995. At all times, the Consortium, as the client, saw to it that the agreed deadlines were met and the goal of not going over budget was achieved.

Exhibit 1

Management Structure of the Bilbao Guggenheim Project

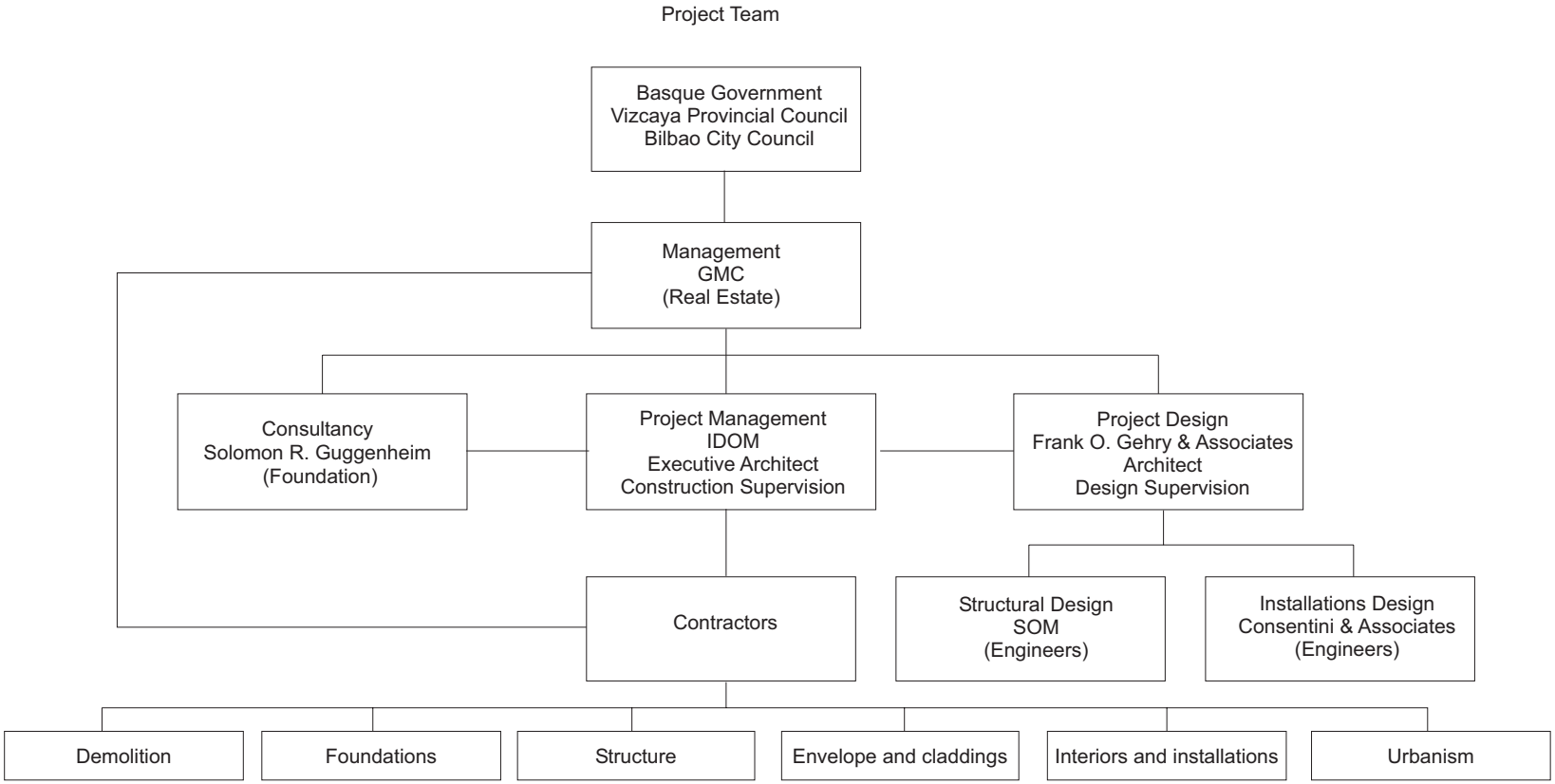
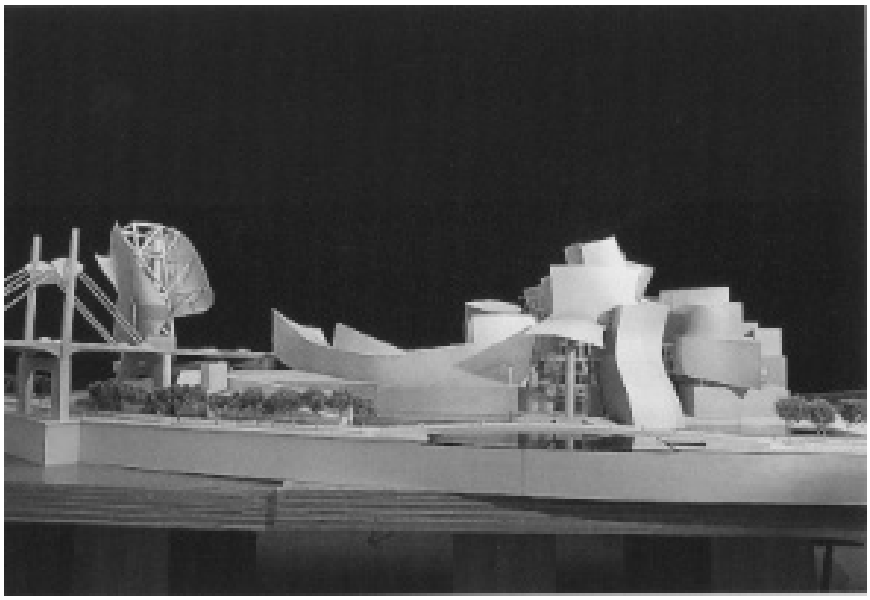


Exhibit 2

Models of the Future Guggenheim Museum Bilbao



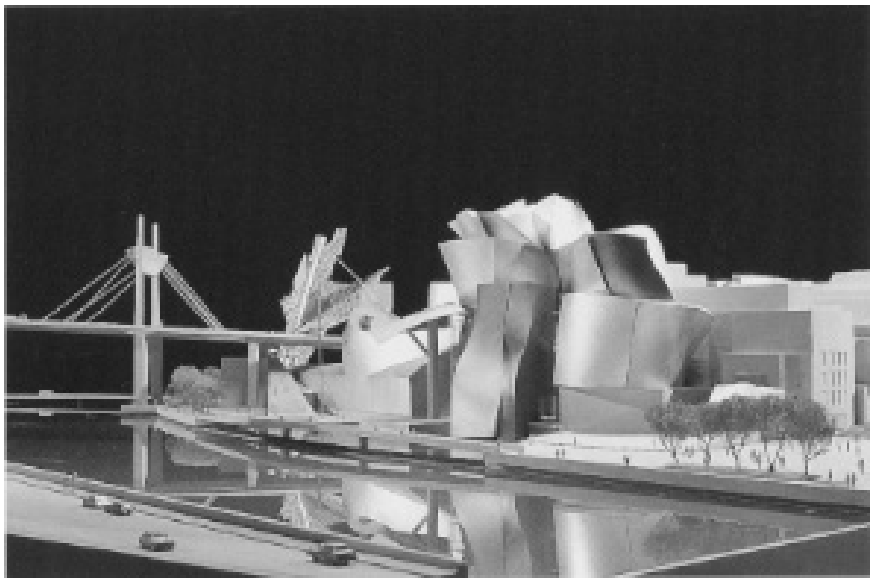


Exhibit 3

Budget Approved for the Guggenheim Museum Bilbao (in millions of pesetas)

Construction costs:	**10,106**
General expenses:	**1,099**
– Mobilization[1]	423
– Contingency (8%)	676
Fixed costs:	**2,823**
– Legal	12
– Fees	2,013
– Furniture and interiors	798
Total	**14,028**

[1]Mobilization expenses are those a contractor incurs before actually starting work on a building.

Exhibit 4

Project Timetable

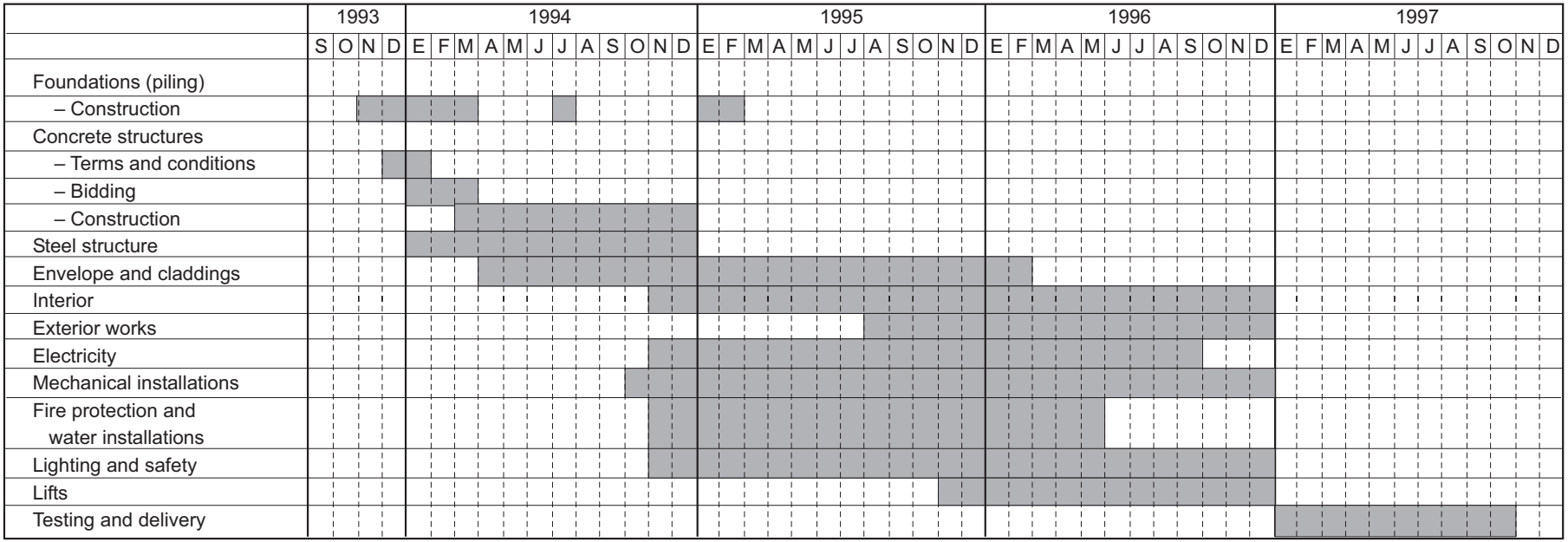


Exhibit 5
Main Contractors

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CONTRACTORS

Main Contractors

DERRIBOS PETRALANDA

CIMENTACIONES ABANDO

Foundations and piling

U.T.E. GUGGENHEIM (FERROVIAL, URSSA, LAUKI)

Contrete and steel structures

BALZOLA, S.A.

Envelope and claddings

U.T.E. MUSEO (FERROVIAL, NORFRIO, ESTUDIOS ARRIAGA)

Interior walls and installations

U.T.E. MUSEO, URBANIZACION (FERROVIAL)

Infrastructure and building envelope

Exhibit 5 (continued)

Subcontractors

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SUBCONTRACTORS

ABGAM	CATIA engineering
AISLAMIENTOS VASCOS	Moulded polyurethane
ALDAITURRIAGA	Auxiliary resources
ARTELU	Brickwork and masonry
AUXIMET	Climatization tubing/Fire protection/Plumbing
BEKEA	Metal assemblies
BEMARSA	Stonework
BETTOR	Products for concrete
BIKAIN	Mortar supplies
BOSCH TELECOM	Safety/Telecommunications/Fire protection
HORMIGONES CAVIA	Concrete supplies
CIMENTACIONES ABANDO	Foundations
COMPOSITES GUREA	Wood floors
CONAFE	Brickwork and masonry
CONS. BARACALDO	Ironwork
COOPERATIVA DUMPERES	Dumper
DILO	Metal assemblies
ELDU	Electricity
ELECNOR	Electricity
ERKOCH	Ironwork
ETXEGLASS	Glass
EXCAVACIONES ARTXANDA	Earth moving
EXCAVACIONES JOKIN	Earth moving
FERRALLA BATUMAR	Frameworks
FOLCRA	Curtain walls/Metal doors and windows
FONTANERIA Y CALEFACCION	Installations
HIPOLITO PURAS	Plumbing
HORMIGONES VASCOS	Concrete supplies
HORMIBAL	Formwork
IMPERLEIOA	Waterproofing
ININFOR	Topography
INSAVA	Plumbing
KABA	Ironwork
KOAL	Brickwork and masonry
LA BILBAINA	Façades
LA OLA	Carpentry
LIMPIEZAS BASAURI	Safety and hygiene
LIMPIEZAS IKUSGARRI	Safety and hygiene
MELCHOR LOPEZ	Paintwork
MYCA, S.A.L.	Metal stairs
OLABARRIETA	Waterproofing
PENINSULAR DE AISLAMIENTOS	Interior fibreglass insulation
PERFORACIONES Y SONDEOS	Piling/Foundations
PETRALANDA	Demolition
PINTURAS GALEAN	Paintwork
PISCITEC	Ponds
POSTENSA	Prefabricated concrete
PROTISA	Passive protection of metal structure
RASED	Tiling
SADEKOSA	Waterproofing

Exhibit 5 (continued)
Subcontractors

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SUBCONTRACTORS

SELLADOS ALGORTA	Sealing
SUESCO	Concrete floors
TALLERES LA CASILLA	Metal doors and windows
TEXSA	Waterproofing
THYSSEN BOETTICHER	Lifts
THYSSEN ROM	Climatization
TOLDOS REYBLAN	Weather protection sheeting
U.T.E. KOOPLAD DRYWALL	Plasterboard
ULMA	Scaffolding
UMARAN-PERMASTEELISA (U.T.E.)	Curtain walls/Metal cladding/Titanium
URSSA	Steel structures
VICENTE ALONSO	Piping
ZAZPI	Brickwork and masonry

Exhibit 6

Contractor Timetable

	Start	End	Contractor
Demolition	07/19/1993	10/31/1993	PETRALANDA
Foundations	10/15/1993	06/29/1994	CIMENTACIONES ABANDO
Concrete and metal structures	06/03/1994	11/30/1995	FERROVIAL-LAUKI- URSSA
Envelope and claddings	01/10/1995	07/31/1996	BALZOLA
Interiors and installations	07/01/1995	12/31/1996	FERROVIAL-ESTUDIOS A. RAMON VIZCAINO
Urban planning	01/01/1996	12/31/1996	FERROVIAL

Exhibit 7

CATIA Drawing of the Guggenheim Museum Bilbao