FINAL PROJECT BACHELOR

BUILDING ENGINEERING

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Build report object

Depintelaan 207-209 GENT

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Erasmus In Gent

Gent is a city located in the Flemish region of Belgium. This is the capital and the biggest city of the East Flanders.

The city started as a settlement at the confluence of the Rivers Scheldt and Lys and in the Middle Ages became one of the largest and richest cities of northern Europe.

Gent is a small but very charming city where you can where you can spend hours walking through the streets and contemplating the beauty of the city and discovering its secrets. You can find architectural interest, museums, many shops, restaurants and exciting nightlife with numerous concerts.

Some of the most representative places of Gent are:

The castle served as the seat of the Counts of Flanders until they abandoned it in the 14th century. The castle was then used as a courthouse, a prison and eventually decayed.

Historical centre of Gent – from left to right:

Old post office, Saint-Nicholas Church, Belfry and Saint Bavo Cathedral

Graslei

When the good weather starts, it is usual to see amounts of people near the river sunbathing or drinking beer with a group of friends.

If you follow the river you will discover very beautiful places and you can observe the typical house architecture from the country.
Much of the city's medieval architecture remains intact and is remarkably well preserved and restored.

Gent has established a nice blend between comfort of living and history museum. You can find lot of different kinds of museums. The important museums in Gent are The Museum voor Schone Kunsten, The SMAK or Stedelijk Museum voor Actuele Kunst, The Huis van Alijn, The Museum voor Industriële Archeologie en Textiel or MIAT and The STAM.

When you have been living here for some time you realize that Gent is a lot more than a nice place to go on holidays. I actually think that is a perfect city for students. You can move with your bike all over the city without having problems with car, buses… you can do a lot of things such as going to jazz concerts at night, drinking a beer with your friends in Graslei and going to Overport to have party and finishing the night with the typical bikiburger and fries. In addition, there are a lot of places to practice sport and you can also go to "the beach of Gent" and to spend there the whole day…. It is not just a city that at 6 is closed!

Furthermore, if you find that Gent is too small you can always catch the train and go to visit other cities like Brussels, Bruges or Antwerpen. This is another advantage, this city is very well located.

VALENCIA

Valencia is the third largest city in Spain, after Madrid and Barcelona with a population of 809,267 in 2010.

This city is integrated into an industrial area on the Costa del Azahar. Its main festival, the Falles, is known worldwide as well as it is its traditional dish, `the paella´.

The city contains a dense monumental heritage, including the Llotja de la Seda (World Heritage Site since 1996), but its landmark is undoubtedly the City of the Arts and Science an avant-garde and futuristic museum complex.

La Llotja de la Seda

City of the Arts and Science

A truly mind-blowing confection of some of Europe's most awesome architecture, the City of Arts and Science in Valencia is fast becoming one of Spain's top tourist attractions.

This futuristic 'city within a city' must surely rank as one of the world's most exciting and imaginative millennium projects. The entire complex, designed to celebrate the arrival of the 21 st century, looks as though it might have been beamed down to earth from another planet.

And it is a down to earth approach which really defines this space age cultural complex because it is all about firing the masses with enthusiasm for the arts and science. The breathtaking structures are enough in themselves to lure visitors in their millions. You don't have to be an opera buff or science boffin to enjoy a day out here - in fact if you're on a tight budget you can just wander round this incredible 'city' without even buying an entrance ticket.

Santiago Calatrava, who master-minded most of the complex, says *'I am proud of the fact that people can walk through and around the main buildings without paying. It is a city to be discovered by promenading.'*

You can promenade for more than seven kilometres around the complex thanks to the vision of this internationally acclaimed architect, artist and engineer who allowed his imagination free rein when it came to designing one of the most ambitious projects ever undertaken by his native city.

Buildings in the City of Arts and Science are the **'Hemesferic'**, **Planetarium**, the **Principe Felipe Science Museum**, the**Oceanarium** and the **Reina Sofia Arts Palace**.

One of the most famous designs of Santiago Calatrava is Liège Guillemins Station. This Station links two very distinct areas of Liége, previously divided by the railway tracks, the north side towards the city, a typical run-down 19th century urban area, and the Cointe Hill to the south, a landscaped residential area.

The concept for the design was transparency and an urban dialog with the city. Transparency is translated by the monumental vault, constructed of glass and steel, with its soaring canopies extending 145 meters over the five platforms. The huge glass building replaces the traditional facade and establishes a seamless interaction between the interior of the station and the city.

The station is organized vertically: Towards the Place de la Gare the rail platforms and the access footbridge stack over 3 levels. Towards Cointe Hill, ten meters above, there are five levels; three parking levels, a vehicular access deck linking with the footbridge, and a raised pedestrian walkway.

At the Place de la Gare level, reinforcing the urban streetscape, is a continuous strip of commercial units. Pedestrian bridges and walkways under the tracks allow for fluid communication between the two sides of the station. The grand Passenger Hall and the SNCB ticketing area are located on the main axis.

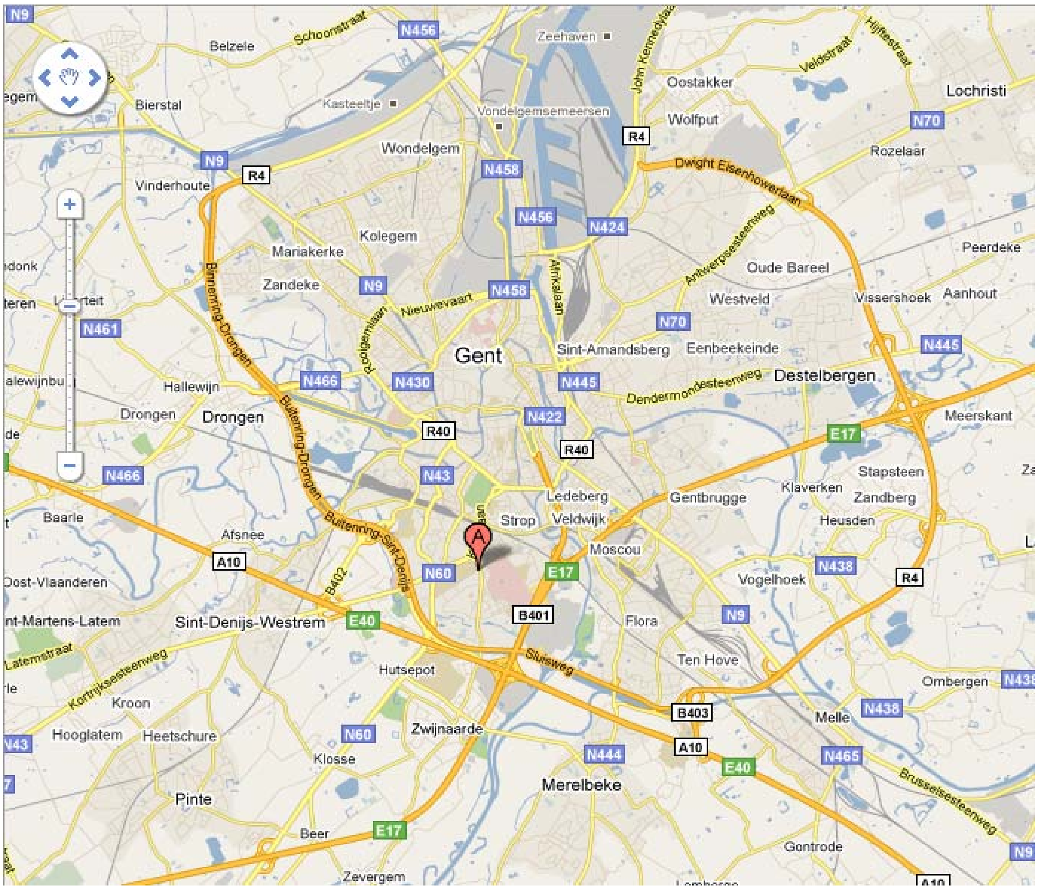
The **Polytechnic Universit of Valencia** (UPV) is a Spanish university located in Valencia, with a focus on science and technology. It was founded in 1968 as the Higher Polytechnic School of Valencia and became a university in 1971, but some of its schools are more than 100 years old.

The UPV is composed of 4 campuses (Camí de Vera, Blasco Ibañez, Gandia and Alcoy) and 14 schools and faculties: Faculty of Administration and Management, Faculty of Fine Arts, Higher Polytechnic School of Alcoy, Higher Polytechnic School of Gandia, School of Agricultural Engineering, School of Computer Science, School of Architecture, School of Building Management, School of Civil Engineering, School of Design Engineering, School of Engineering in Geodesy, School ofCartography and Surveying, School of Industrial Engineering, School of Rural Environments and Enology, and School of Telecommunications Engineering.

The University offers 48 Bachelor and Master, and 81 Doctoral degrees.

Building Site

The built object of the report is located in Depintelaan Straat, 207 – 209 in the city of Gent.



For the preparation of the ground, the layout will be made inside of the parcel, in the expected area, within the limits specified in the Ordinances, and adopting the security measures required in the corresponding regulations, it will begin the grading works and the emptying of the land up to reach the road surface. If necessary, there will be made the required drainages in order to leave the land in a position to build on them.

The building is composed of 4 floors and a basement.

Two adjacent buildings are also part of the building, but these will not be object of study.

The access to the basement is carried out by a ramp whose access in Depintelaan street. The basement has 12 parking spaces, with a room for bicycle storage.

La planta baja está destinada a uso comercial, en la que se va a instalar una ortopedia. Ésta cuenta con 3 probadores, 2 oficinas, 1 aseo y un baño adaptado para minusválidos.

The ground floor is for commercial use, where it will be installed a surgical aids shop. This has 3 dressing rooms, 2 offices, 1 toilet and a bathroom adapted for disabled guests.

The first floor consists of an exhibition hall and a small open kitchen.

The second floor has 6 studios with a bathroom and a small kitchen in each one.

The third floor consists of 2 apartments with a kitchen and a bathroom each one of them. From each one you can access to the two terraces located on the 4th floor. The building also has a water tank.

PRECAST CONCRETE

1 .Introduction

Precast concrete framed construction is well established as one of the principal construction methods in Europe. In Ireland, the precast industry has built a closeworking relationship with developers, offering practical advice and a range oftechnical services at design and construction stages.

Precast manufacturers have a critical role to play in the proper planning and executionof precast buildings. Involving the precaster at the early design stage is the best way to achieve the most economical building solution. Early involvement also allows themanufacturer to schedule production so as to maximise cost savings brought about by the use of standardised components and early completion.

Precast concrete buildings previously had an identifiable appearance. However, withadvances in technology and technique, precast buildings are now indistinguishable from those constructed using non-precast methods. Designers no longer work within tight constraints. Increasingly, the situation is that precasters are able to accommodate greater variety and complexity, effectively designing their elements to meet design requirements. Continuous investment and innovations have transformed the precast industry so that complex plan layouts and external treatments can now be accommodated.

Organic designs can be achieved using standardised precast components. The usage of standardised components does not imply a modular appearance. Nowadays,precast elements, including floors, stairs and wall panels combine seamlessly withnon-precast elements to produce free-flowing spaces. Curved precast panels witha variety of highly attractive and durable finishes can be manufactured to meet themost challenging design requirements.

Precast concrete can now be incorporated in every building type. Whether the building has a regular or an irregular shape, the entire structure or elements of that structure, such as frame, floors, walls, stairs or balconies, can all be precast. Precastconstruction is virtually unlimited in its application and is suitable for single and multi-storey construction. Offices and hotels are commonly constructed in precast, as are hospitals, schools, industrial units and multi-storey car parks, apartments andhousing. In fact, precast building elements should be considered as an option onevery construction project.

The most common error is to take an 'all precast or no precast approach' to design. In fact, a key issue for designers is to identify which construction method, or mix of construction methods and materials are the most appropriate for the specific requirements of the building.

The most economical solution might well consist of a mix of cast in situ and factory assembled units. Preliminary structural investigation may identify solutions such as beams and floor slabs fabricated off site being erected on cast in situ columns.These structural elements are then integrated as a composite structure when the floor screed is poured. The proper investigation of construction options at the early design stage is critical to optimising structural performance and delivering the most economical building package.

1.2 Benefits of Precast Structures

The considerable advantages of precast construction are combined with the inherent benefits of concrete to provide a superior construction product. These include:

Inherent Fire Properties

- Concrete has its own inbuilt fire resistance which is present during all construction phases. Fire resistance is typically achieved without the application of additional sprays or linings. This is an important inherent advantage over steel and timber solutions. Precast frames are generally designed for one hour inbuilt fire rating. This either totally eliminates or greatly reduces the need for additional fire protection and the associated costs.

Economies

Precast structures are generated through reduced requirements for formwork, access scaf folding and less reliance on wet trades. Reduced on-site supervision by the main contractor is also a saving. Compared to cast in situ concrete, the followingsavings can be expected:

FORMWORK 75% less
SCAFFOLDING 75%-90% less
WET CONCRETE 90& less

Health & Safety

- Once precast floor slabs are installed, they provide a safeworking platform for site operatives. Simultaneously installing precast stairs offerssafe and easy access between floors.

Reduced Construction Programme

Due to speed of construction, gives earlier return on investment, freeing up the project critical path and allowing earlier completion. It is estimated that a precast structure takes up to 20% less time toconstruct than a similar cast in situ structure.

Greater Project Control
From a completion/project management perspective and from a costing perspective.

Factory Production
Precast structures ensures increased accuracy and quality of finish anddecreases weather dependency. Compared with cast in situ structures, site labouris reduced by between 50% and 80% using precast. Work for following trades isreduced by between 30% and 50% depending on finishes.

Buildability
- Precast frames can greatly improve buildability because sensitive parts of the operation can be moved from the site to the factory.

Larger Clear Spans
- Reducing the number of columns is a critically important indevelopments such as sports stadia and car parks. Longer spans and shallowerconstruction depths can be obtained by using prestressed concrete beams andfloors.

Proven Designs and Methodologies
- Precast frame design incorporates proven designs and methodologies which have been developed over many years.

Sound Resistance
- Precast structures meet the highest standards for resistance to sound transmission. Test figures show the airborne sound insulation of a 150mm concrete floor is 50 db.

Composite Action
- Prestressed precast elements act compositely with an in situ structural screed (topping), combining the benefits of precast and in situ construction.

Less Wastage
- Precast systems significantly reduce the amount of wastematerials produced on site.

Loose Reinforcement
- The amount of loose reinforcement on site is reducedby between 80% and 90%.

Airtightness
- Air infiltration in precast buildings is minimal because of the relatively small number of joints in the construction. This factor combined with thethermal mass of concrete gives excellent thermal performance.

A Complete Service
From design to manufacture to installation is available

3 Health & Safety

IPCA members have developed a standard approach to facilitate the implementation of the highest Health & Safety standards. Member companies are now in a position to supply customers with standard procedures, outlining systems of work and theresponsibilities of each party.

Safe and successful precast installation requires teamwork. This means close co-operation and co-ordination of all participants, including the client, architect, engineer, precaster and the contractor. To achieve the desired schedule and results, the basic working relationship between these parties must be establishedat an early stage.

To achieve this end, the Irish Precast Concrete Association has published aPrecast Model Risk Assessment manual as part of the Irish Concrete Federation's Health & Safety Manual.

The manual identifies potential risks and suitable controls during the manufacture, transport and erection of precast products. The Responsibilities Check Listidentifies the Health & Safety requirements in relation to the precast concreteelements.

A typical Responsibilities Check List sets out suggested responsibility for managing each item either to the Contractor (the purchaser of the precast concrete product)or the Precaster (the supplier and erector of the precast components).

The Precast Model Risk Assessment is intended for use to assist all those involved in the manufacture, design, specification, use and erection of precast floors. The IPCA is currently working with the Health & Safety Authority to produce a code of practice for the installation of load-bearing structures.

The installation of precast units should only be undertaken by specialists who aretrained, competent, and experienced in this work. IPCA members provide Health &Safety training to all personnel in the safe erection of precast units and associatedareas such as Safe Pass, Working at Heights, Slinger/Banksman, Mobile ElevatedPlatforms, Hoist, Crane, Power Tool, Manual Handling, Forklift, Abrasive Wheels,Role of the Supervisor, etc.

1.4 Quality & Accuracy

Precast concrete units are manufactured in factory conditions where strict manufacturing controls apply. This ensures that reinforcement bars are accurately located and that clients receive high quality products manufactured to control.

1.5 Speed of Construction & Buildability

Speed of construction and tight construction programmes are primary considerations in most building projects and this is where precast concrete excels. To maximise the advantage of precast, two critical factors should be taken into consideration:

- Design the building layout to maximise repetition of precast units

- Design construction details to maximise the number of standardized components

The importance of these two factors cannot be over emphasised. Adherence to good design practice will speed up the manufacturing process and make construction faster. Maximum efficiency can be achieved by rationalising designsin consultation with precast concrete frame manufacturers.

1.6 Choosing a Construction Method–Comparative Costs

In making cost comparisons between alternative systems, it is imperative that total like for like costs are considered. There are substantial savings to be made using precast construction which are not evident when a direct elemental cost comparisonis made with alternative construction methods. To get an accurate like for like cost, whole building costs must be estimated. To accurately assess whole building cost, each of the advantages of precast as listed in section 1.2 (pages 4 & 5) must beaccurately costed.

Savings through factors such as earlier completion dates, inbuilt fireproofing, reducedformwork, scaffolding, reduced wet trades and increased budget control can be significant. Also, fast-track procurement and construction may minimise capital costs by reducing financing costs and securing earlier rental income. The precast framepackage typically includes columns, beams, floors, wall panels, stairs, landings,balconies etc., all of which have an inbuilt minimum one-hour fire protection.

Specialist precast frame producers will assist design teams in evaluating the scopefor standardised precast components for a particular project. Budget costings anderection programmes can be prepared by the precaster on receipt of outline drawings and a list of performance criteria.

1.7 Sustainability

Most of the sustainable developments throughout Europe use concrete as the primary construction material. Concrete is long lasting and requires virtually nomaintenance or replacement and does not require the application of toxic paints or preservatives. Even highly exposed precast concrete units (such as box culverts) are virtually maintenance free and have a design life of 120 years.

Precast maximises the sustainable potential of concrete by reducing the amountof construction waste on site to almost zero. IPCA manufacturing plants are monitored on ongoing basis by a qualified Planning and EnvironmentalEngineer to ensure that each IPCA member implements an ongoing environmental programme

Because of its inherent fire and soundproofing properties, concrete (and particularly precast) lends itself to multi-storey, high density developments which greatlycontribute to a sustainable use of land and justifies investment in quality public transport. These types of precast concrete developments offer a sustainable andviable alternative to urban sprawl type housing.

Concrete is 100% recyclable and is generally supplied (in Ireland) within a 30 mileradius, with the resultant savings in transport costs and fossil fuels.

1.8 Thermal Capacity

The thermal capacity, particularly of exposed concrete, offers considerable energy savings.

Modern buildings have a tendency to overheat throughoutthe year. Ventilation and air conditioning equipment issometimes used as an expensive high energy solution to this problem. Using the inherent thermal capacity of concrete, particularly in combination with other passive systems, can either reduce or eliminate the capital and running cost of air conditioning.

Exposed concrete acts like a storage heater in absorbing heat. Daytime temperatures are reduced by 3˚C to 4˚C and peaks in temperature are delayed by up to sixhours. The exposed soffits of floor slabs and otherconcrete elements including beams and columns actas a passive system providing an effective cooling capacity of up to 25W/m2of surface area, which is more than adequate for the average commercial building. This principle is utilised by architects and engineers to bring about considerable energy savings.

Concrete has excellent sustainability credentials allowing for a reduction in the use of fossil fuels and greenhouse gases. By using concrete as a passive moderator, there are enormous potential savings as 90% of the energy consumed in the lifecycle of the building is attributable to heating and cooling.