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MQP RP AAD7

Alternative Design in Brazil

A Major Qualifying Project submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements of the
Degree of Bachelor of Science by:

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Abstract

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Structural design practices, design codes, construction technologies, building processes, and construction costs were compared between the U.S. and Brazil. Cost estimates were proposed for both the original structural masonry design and the proposed reinforced concrete alternative.

Acknowledgements

There were several people involved in the realization of this project who we would like to recognize. We would like to acknowledge and thank the architects and engineers from Pass Arquitetura and Auera Engenharia for giving us the opportunity to collaborate on the design of their residential building, and for their assistance in providing the necessary documents and information for our research. They include: Nivaldo Callegari, Andra Callegari, Clodoaldo Callegari, Douglas Facina, and Liliane Azarias. We also thank Milena Merlo, a private cost estimator from Jundiai, for helping through a great portion of this study.

We also thank our advisors Professors Leonard Albano and Professor Roberto Pietroforte for their overall guidance and advice throughout this project. Professor Tahar El- Korchi, Head of the Civil Engineering Department, for his supervision and administering this project to be conducted in Brazil. Lori Glover Assistant Vice President from Corporate Engagement for managing the legal documents necessary and working with Pass Arquitetura. Professor Richard Vaz Director of IGSD for his enthusiasm of this interchange with Brazil. Anne Ogilve Director of Global Operations for her guidance in preparing for departure.

Authorship Page

This project was broken down into two main components in which each member in this project completed and documented in the report, the structural and cost analysis. Both Team members contributed to the Introduction and Background section equally. The final report including appendices was organized and completed by both members.

All of the structural design information was completed by Deborah Silva. This includes structural elements calculation, structural analysis for the reinforced concrete building, the Revit model of the structural masonry and the reinforced concrete alternative building. The analytical Revit model used to conduct simulated forces was also made by Deborah Silva. The Software section in the Background chapter was done by Deborah. Deborah wrote all the sections of the reinforced concrete structure in the methodology and results section. The conclusion was written by her as well.

The cost analysis and cost comparison was conducted by Janneth Velazquez and with the support of Deborah Silva. Janneth Velazquez assisted in the *Revit* model in regards to materials categorization and exporting quantity data. Sections in the report relation to construction technologies were completed by Janneth Velazquez with corroboration of Deborah Silva.

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Deborah Silva

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Janneth Velazquez Rosales

Capstone Design Statement

This Major Qualifying Project (MQP) is a presentation of academic coursework to engineering practices. In this MQP project, capstone design requirements were met through studying a four-story structural masonry building in Jundai, Sao Paulo Brazil. This project focused on adopting the use of reinforced concrete frames as an alternative for masonry wall systems, and creating a cost estimate that would allow the group to complete a comparative analysis of the existing and alternative design. The project consisted of a seven week residency in Sao Paulo during which we proposed design changes and made cost estimates for our sponsors. Our efforts focused on a 4-story residential building in a complex, using it as a baseline to compare structural design practices, design codes, construction technologies, building process, and costs between Brazil and the United States. In order to meet the specific requirements for a capstone design experience, this project addressed certain constrains. These constraints include economic, safety, and social interaction.

Economics

Costs have a great impact on the selection of a building type. By studying the differences in materials, labor, construction technologies and costs between a reinforced concrete and structural masonry building helped identify the most economical design to choose. The economic constraints were addressed by looking at the effects of the alternative design through a technology and cost perspective. A cost estimate was created to compare the two designs. The project also looked into the construction technology differenced from Brazil and the U.S.

Safety

This project also addressed safety constraints through the alternative design. The alternative design used the American Concrete Institute (ACI), *Building Code Requirements for Structural Concrete and Commentary*, and *ASCE 7-10* as the primary references for structural design provisions and specifications. The alternative design also used the Brazilian standards from the Association of Brazilian Technical Norms (ABNT), and Design of Structural Concrete-Procedure (NBR 6118) to study the codes and specifications and considered it in the design. These codes addressed the standards that establish health and safety practices.

Constructability

The next constraint studied was constructability. This project looked at how feasible it would be to have an alternative design for the structural masonry system used in Brazil. Similar floor plan was used to ensure that the design was comparable constructability to the original design. Construction of the alternative design used the same costs for labor, equipment and material as the structural masonry system. This approached allowed for constructability.

Social Interaction

All aspects of this MQP addressed social impacts. The social impacts of the structural masonry system in Brazil were primarily established by having one of the team members reside in Brazil (Pass Arquitetura) for seven weeks. Having one of the group members on site in Brazil, helped to better understand the differences in construction technologies. Having both members of this project work from opposite sides of the country, made communication and organization a crucial task for this project. Daily Skype team member meetings were scheduled in order to maintain communication and have this project moving forward. Weekly advisor meetings were also schedule with both team members in order to go over questions and any information that was gathered for that week. Having one of team members work on this project from WPI, also helped with addressing comments and questions that the advisors had in a timely manners. While having the other team member in Brazil helped gather information much faster from engineers, architects and cost estimators. It was challenging to have both members work on this project from different countries. Hard work, dedication, patients, organization and communication were skills that were highly enforced and developed.

Table of Contents

List of Figures

List of Tables

1.0 Introduction

Brazil is the world’s fifth largest country, both by geographical area and by population with over 193 million people. Within Brazil, the City of Sao Paulo is the largest city in the southern hemisphere and the Americas. It is the world’s seventh largest city in population and is ranked as the second most populous metropolitan area in the Americas.

Pass Arquitetura is currently developing many projects, one being the construction of an eighteen-story residential building complex named Textile. Pass Arquitetura and Eurea Engenharia is the project sponsor for this MQP. Pass Arquitetura Company is located in Jundiai Sao Paulo. Jundiai is a city and municipality in the State of Sao Paulo, Brazil, with a population of approximately 370,126. The City of Jundiai is said to have grown in population in recent years. One cause for this sudden growth population is said to be by a shift of residents from the metropolis of Sao Paulo, in search of better living conditions. Pass Arquitetura and Aurea Engenharia focus on housing units around the country of Brazil. This Major Qualifying Project (MQP) addresses one of Pass Arquitetura’s 18-story building on a residential complex. While the actual building has a masonry structure, this MQP considers the design of a four-story concrete structure that retains the original layout of a typical floor. The remainder of this chapter describes the characteristics of the original project and the activities that were undertaken to complete the MQP. Figure 1 shows a nearly completed complex in the state of Bahia.

Figure 1 Structural Masonry Complex in Bahia, Brazil

The actual buildings are made of concrete masonry blocks, utilizing a structural masonry system design, and comprise a residential building complex for upper class society in the Jundai area. Figure 2 shows the site view plan locating Towers 1-6 in the building complex. Note that Tower 3 is the tower that this MQP is focusing on. Also note that Towers 3, 5, and 6 are all the same. The first floor layout consists of the building entrance and multi-functional rooms. All the above floors consist of typical floor layouts, allowing for simplicity in construction and typical design. Each floor consists of six apartments with a total floor area of $497m^2$ for the entire floor. Figure 3 shows the layout of the six apartments in a typical floor. Apartments 1, 2, 4 and 5 are a mirror of each other with an area of $59m^2$. Apartments 3 and 6 are a mirror of each other with an area of $70m^2$ each, with a similar layout of the other apartments. As shown in Figure 4, there are two elevators in every floor of the building. The depiction of this elevator shaft can be seen in Figure 4 but note that the elevator shafts are to be constructed out of concrete blocks. Figure 4 and 5 show the details of the masonry structural walls that are spanned by precast concrete floor slabs. The slabs are poured into forms at a precast plant, transferred and erected on the job site. Due to the high cost of forms, the steel forms are to be reused multiple times. This arrangement reduces the cost of each panel. In pre-cast concrete the electrical paths, the shafts and plumbing are designed ahead of time. Sometimes these slabs are cast at the job site, depending on the site of the job. Figures 6 and 7 show the factory casting and the erection of the slabs. Figure 8 shows the overall elevations of the buildings and Figure 9 shows the building cross section.

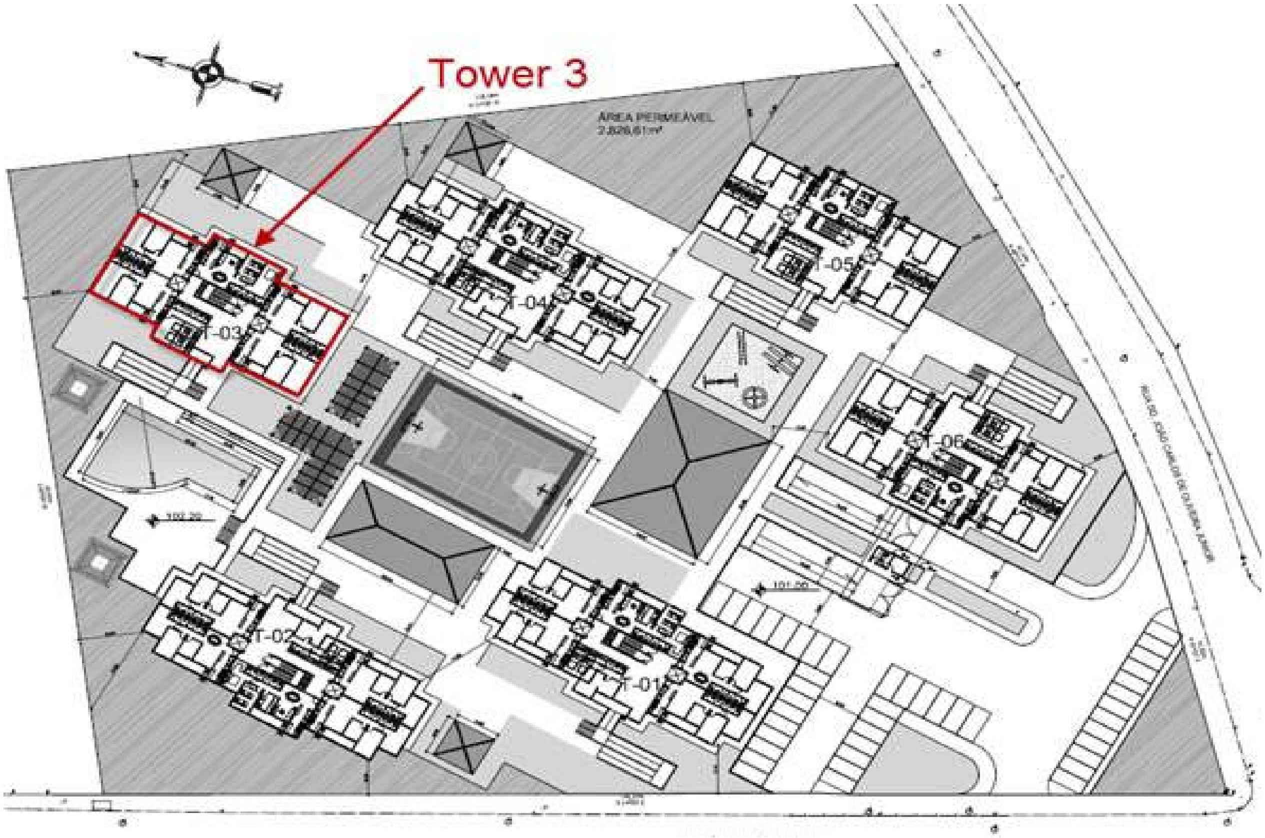

Figure 2 Site View

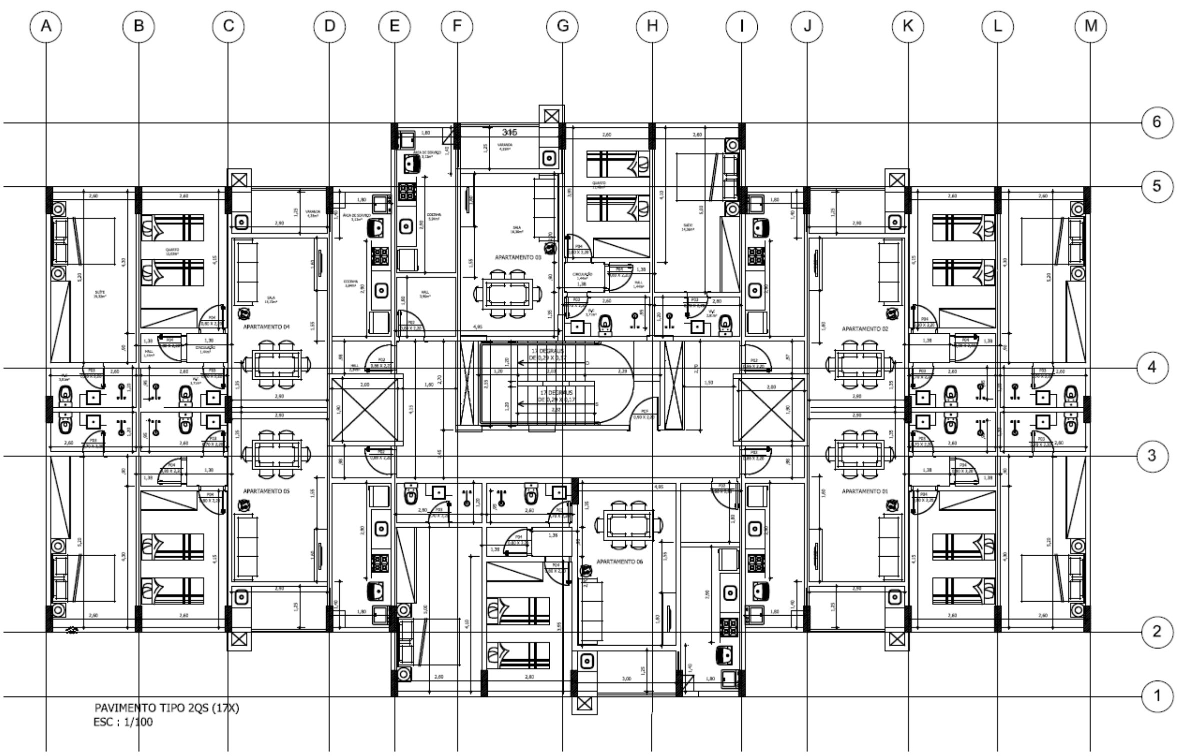

Figure 3 Architectural Floor Layout

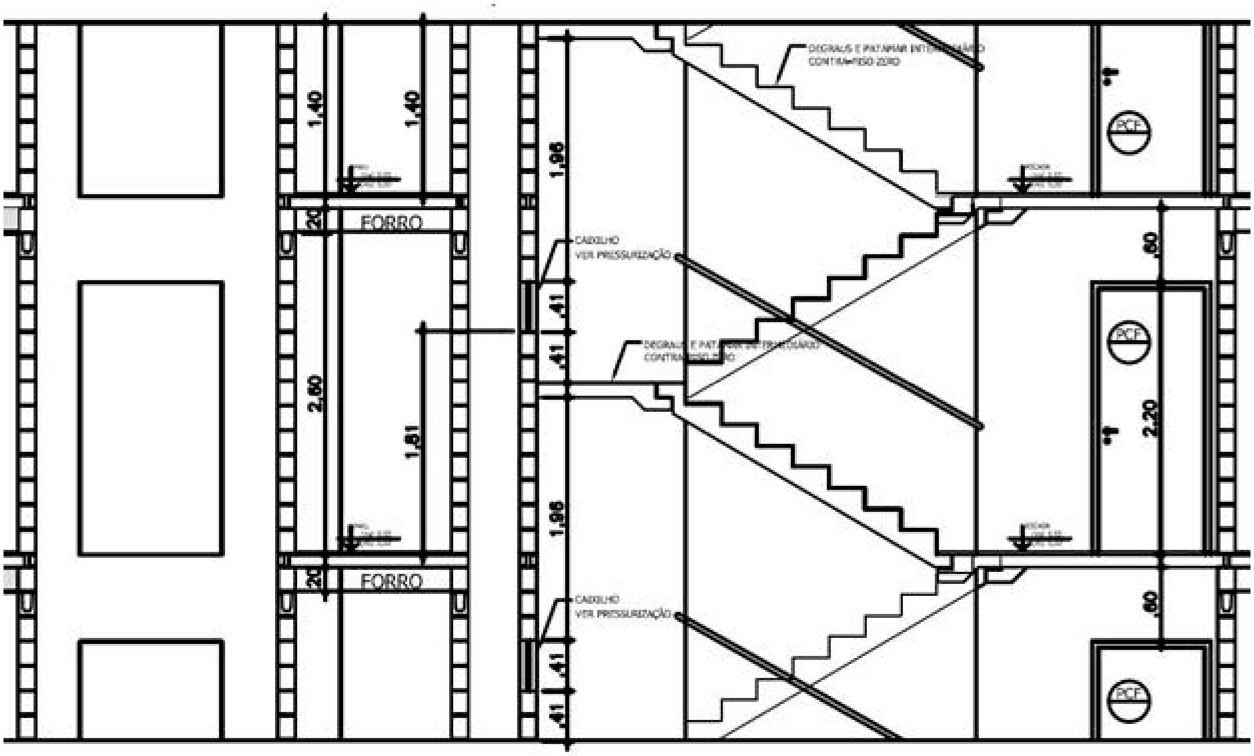

Figure 4 Typical elevator and stair case interior section view

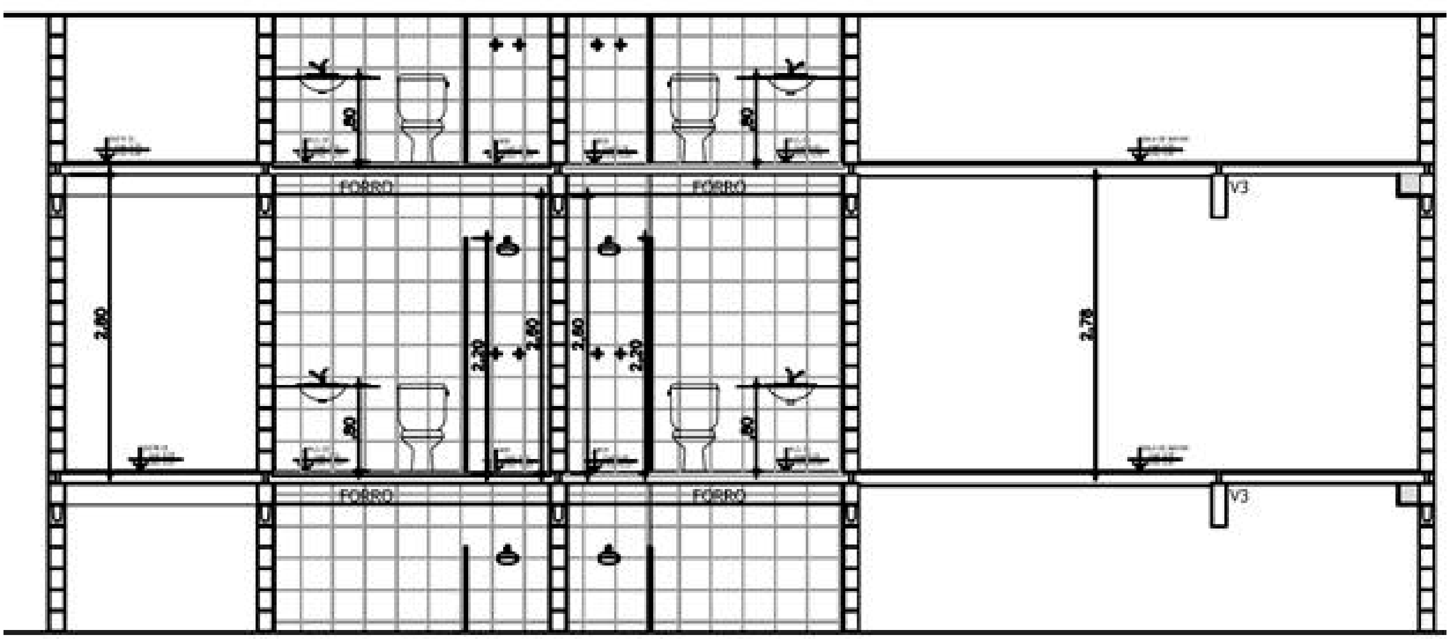

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Figure 5 Typical Apartment Interior Section View

Figure 6 Pre-cast Concrete Slab Erections (Callegari, 2012)

Figure 7 Pre-cast Concrete Forms (Callegari, 2012)

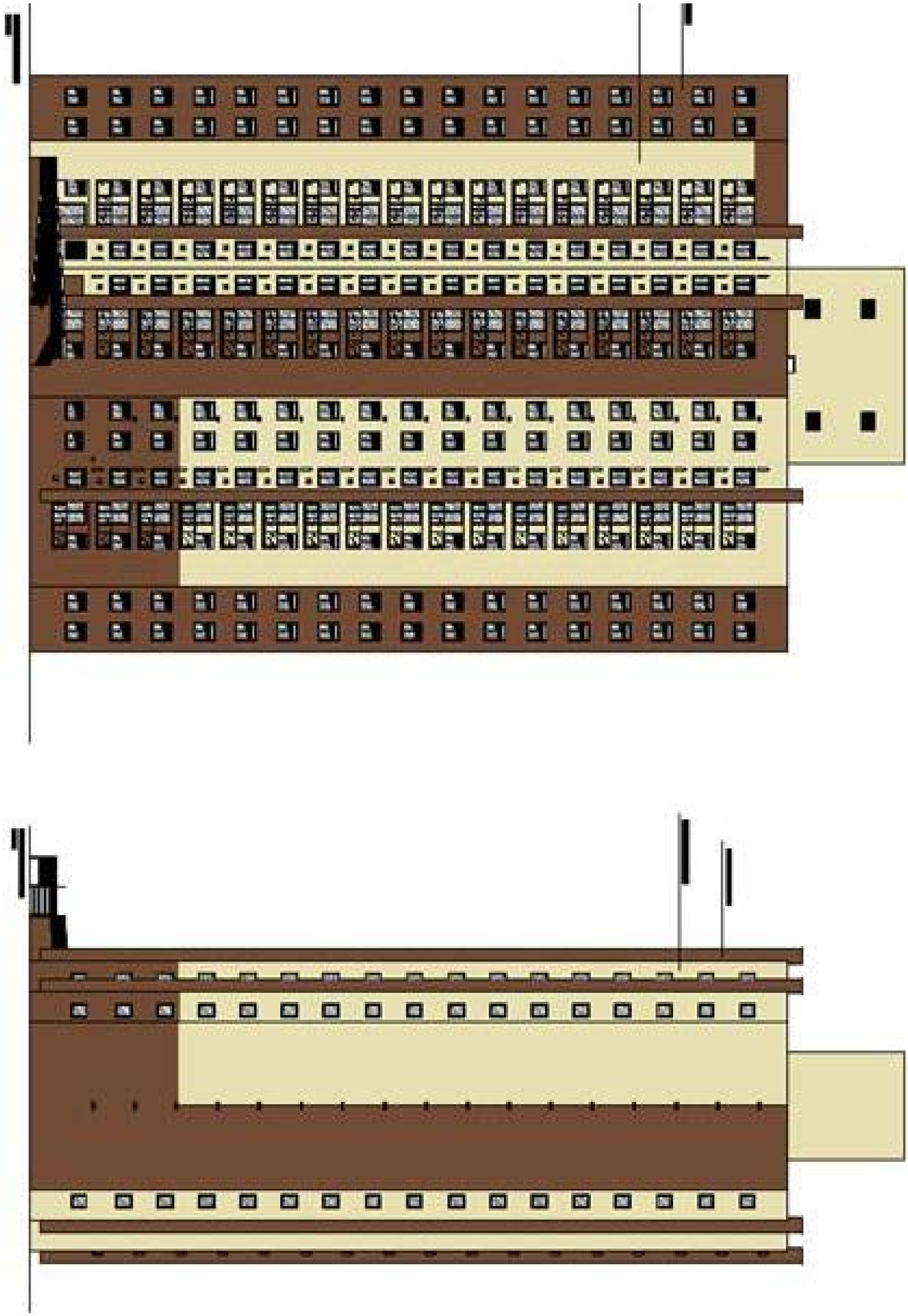


Figure 8 Structural Masonry Elevation

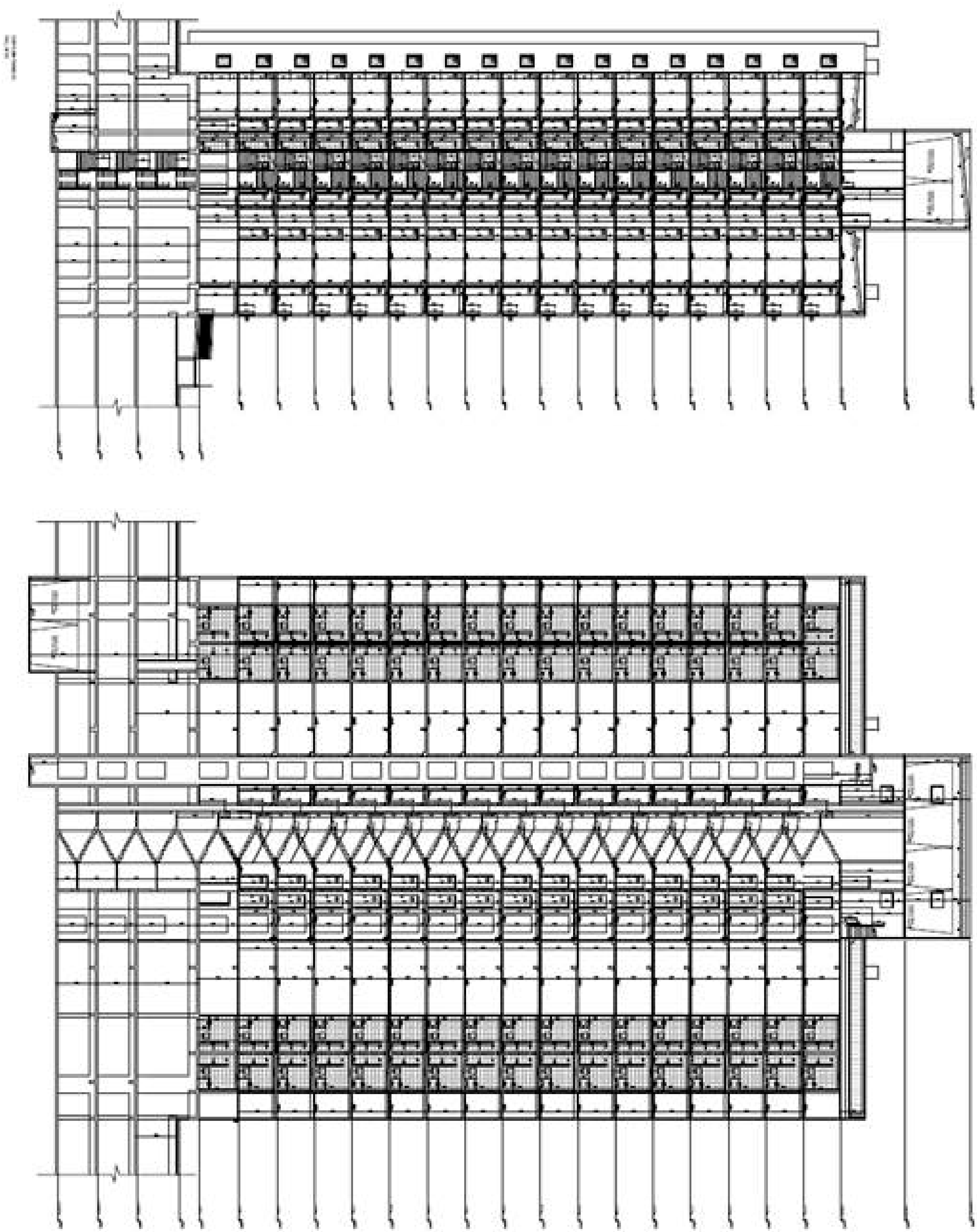


Figure 9 Building Cross Section Elevation

1.1 Activities undertaken in MQP

With the use of all the architectural drawings that Pass Arquitetura had provided an alternative of a reinforced concrete building was designed. The analysis of a four-story concrete structure was completed and compared to a structural masonry system of similar size. The main technologies of the two considered designs, cast-in-place concrete, concrete blocks and finishes of exterior and interior walls, were analyzed and compared according to their applications in the U.S.A and Brazil. The design of the reinforced concrete structure was then completed. The last part of the report contains a cost comparison of the two considered structures (reinforced concrete and structural masonry blocks). The alternative structure was visualized with *Revit 2013*. Lastly recommendations for the most beneficial alternative to use were proposed at the end of the report.

2.0 Background

This chapter will introduce the historical and technical information needed to establish a foundation for the knowledge and skills necessary to complete the work and reason about the findings. An overview of the differences between the U.S. and Brazil in software, culture, building development and economics will be introduced.

2.1 Brazil Development

An article from the website *Grandes Construcoes Magazine* reveals that construction companies are trying to revise their tools and technologies in order to leave the handicraft era behind and change Brazil's construction culture. Firms such as SH (Servicon-Hunnebeck) in Brazil want to create a new generation were higher productivity is ensured. While requiring less man power and addressing today's lack in skilled labor and workforce. SH is a leader in the provision of formworks, metal scaffolding, and shoring for the market construction in Brazil. The commercial director of SH Formas says, "Civil Construction in Brazil will only be able to overcome the great challenge that lies ahead providing the country with the infrastructure needed for sustainable growth and meeting the increasing repressed demand of several decades – if it puts an end to the handicraft cycle and lives up to its title of Construction Industry" (Grandes Constucoes 2011). Moving on to a whole new Brazilian culture in construction will help reduce labor, material wastes, and produce a great amount of cost savings.

According to an article, "Brazil economic growth has been starting to get in conflict with the lack of qualified workforce in the country" (World Maps 2013). The lack of quality workforce is not a new problem in Brazil since the issue was identified back in 1942. Industries realized in 1942 that there was a need for qualified professionals so they decided that they would train students themselves. However, the lack of qualified workforce still continues. Brazil is not only undergoing progress of building infrastructure, sustainable buildings, telecommunication technology, petroleum research, economic growth, construction development, and hosting two famous sporting events but it's also introducing new programs and technologies that could soon change Brazil to a new era in advance construction practices. The lack of quality workforce and the dependency on empirical methods has prevented Brazil from adapting new construction technologies and moving on from to a new era.

2.1.1 Building Development

With innovative technologies, Brazil is the "most urbanized region in the developing world" (Seth 2012). Brazil has been undergoing many plans to improve their economic system by making improvements to their transportation system, sustainable practices, and their building development sector. With these improvements Brazil can soon go through new construction technologies. But before any of this happens, it is important that one understands the difference on technologies and the basics of the planning and analysis phase.

The process of designing a building consists of a Pre-Construction Planning Phase. During this phase the site must be well understood in order to later determine how the building designing phase, is approached. Zoning requirements, soil investigation, the selection of a building design, and building permit approvals are important items that are investigated through this pre-construction planning phase. All these items are important to know because they help identify the scope of the site plan, zoning requirements, building height requirements and existing site conditions. After this Pre-Construction Phase the building structure can then be analyzed and designed.

The next step is the Design Phase; this is the development of architectural drawings for the building. The process of designing a building consists of making assumptions in order to start with basic schematics of the building design. Although not all site information can be gathered prior to the design, conceptual schematics will be developed based on the given information and assumptions made. Understanding the construction method used can help determine the structural system. In this project the architectural building having been design leave a small range to change the structural design.

During the design phase the structure will studied to solve problems related to analysis such as developing design and load analysis that will meet the requirements of the current state of the project. The essential process of the structural analysis is to gather all the loads that are being applied to the building, and determine the forces that are being transferred between parts of the building in order to determine the correct structural members and components dimensions. All these analyses help develop a design that meets the requirements of the project.

2.2 Considered Construction Technologies

In this chapter, the technologies of reinforced concrete, concrete block walls, and finishes of exterior and interior walls are illustrated. Comparison between U.S and Brazilian work procedures within these technologies are presented.

2.2.1 Reinforced Concrete and Structural Masonry Designs

Reinforced concrete became popular in Brazil after World War II, architects like Oscar Niemeyer and Les Corbusier revolutionized reinforced concrete with in their architectural styles. Structural masonry was later introduced causing the reinforced concrete system to disappear in Brazil during the 1970’s. Since then, structural masonry has been increasingly used in high rise buildings. In the 1990’s the construction industry leaned back into reinforced concrete as a way to push for modern architecture. As a result the use of both construction systems are used today.

Reinforced concrete is a concrete mixture made of coarse (stone or brick chips) and fine (generally sand or crushed stone) aggregates with Portland cement. When mixed with a small amount of water, the cement hydrates to form microscopic solid crystal webs condensing and securing the aggregate into a rigid structure. A typical concrete mix has a high resistance to compression stresses. However, any substantial tension will break the microscopic solid web, in which will later result in cracking and separation of the concrete. For this reason, typical non-reinforced concrete must be well supported to prevent the development of tension.

Reinforcing bars and or other types of reinforcement are integrated to improve one or more properties of the concrete. If a material with high strength in tension, such as steel, is placed in concrete, then the combined material, reinforced concrete, resists not only compression but also bending and other direct tensile forces. In order to support the considerable weight and fluid pressure of wet concrete without excessive deflection (in which case would require temporary supports) the poured concrete system requires the construction of strong formworks. For the beams and slabs, these formworks serve as a temporary working surface during the construction process and as the temporary means of support for reinforcing bars. The construction is described to be more labor-intensive and time consuming due to the curing process that has to be completed before any additional work is done. In the reinforced concrete design the formwork surfaces that are in contact with concrete are coated with something called a form release compound such as an oil, wax, or plastic that prevents adhesion of the concrete to the form. In order to support the forms in the structure to prevent collapse while the cast-in-place concrete is being cured, shoring is necessary. These forms are usually made of braced panels of wood or metal. Another alternative in forms include precast concrete forms, which the concrete is poured into forms at the industrial plant, transferred and erected on the job site. Due to the high cost of forms, manufactured reusable steel forms can be reused multiple times became important because it reduced the cost of forms.

A typical reinforced concrete building is a rigid frame made of structural elements such as beams, girders, columns, and slabs. These members work together to support the applicable loads that are transferred through load paths in the structure to the foundation members. This system uses shear walls in order to resist the lateral loads. It is also use to resist an equal amount of the compression in concrete columns and beams (whose height must be reduced for architectural reasons) and as a form to prevent buckling of vertical reinforcing in columns. The system is also used to withstand the cracking that might possibly be caused by curing shrinkage and thermal expansion in slabs and walls. As for the foundation, studying the soil mechanics on the site location can impact the type of foundation used in the project. In this project due to the lack of information for the soil, a concrete footing was located. Freeze thaw is not a phenomenon of concern in Brazil. Therefore the foundation is one meter below ground level. Depending on the amount of floors of a building a greater reinforced foundation such as piles may be necessary. In this project piles were not considered because it is a low-rise building.

On the other hand, structural masonry is a system that is commonly used in Brazil for the past decades. The system is popular for its aesthetic appearance, the durability and the simplicity of the stacking of technique. This system has no beams, girders or columns. Instead the system consists of bearing walls that support gravity and lateral loads. The system is grouted and reinforced with steel bars. Structural concrete blocks of 6Mpa (strength) are also use with a failure occurring in the mortar prior to the block. One disadvantage in the structural masonry system is the concrete block strength used. As mentioned the structural masonry uses a 6 and 4Mpa strength block, whereas the reinforced concrete only uses 4Mpa strength blocks. Masonry concrete has no useful tensile strength, but its compressive strength is considerable, and when combined with steel reinforcing, it can be used for every type of structure. Using one system versus the other requires a thorough thought of which material is most suitable for the time being and place of the project. Therefore understanding the differences in technology is an understanding on how these factors play a role in costs, labor, and country preferences. The construction technologies that both systems are using are very different and through these differences an analysis is made to determine what design is more convenient to use.

2.2.2 Masonry block walls

As mentioned earlier a masonry system is a construction process with the use of walls as the main building structural support, through the integration of concrete masonry blocks that are reinforced with grout and steel. Pass Arquitetura has mastered this technique of a high-rise building fully constructed with blocks reinforced by rebar and grout. This technique allows a transition from structural masonry to cast–in-place concrete foundation which helps disperse the loads. For the structural masonry systems there is a difference between the concrete block used for the interior and exterior enclosures. For exterior enclosures a higher resistance block is used to resist lateral forces, therefore the material is more expensive, whereas an interior block serves as only a partition and does not need such resistance. Another difference in the structural masonry design is that the CMU's are grouted and reinforced which increases the square meter price for the concrete blocks. In this project a 4MPa resistance block was used. Figure 10 shows the types of blocks used for the masonry wall system. A 14 x 19 x 34 cm, 14 x 19 x 39 cm, and 14 x 19 x 19 cm hallowed masonry blocks were used for this system as shown in Figure 10. Figure 11 is a wall detail showing how the blocks are interlocked at the corners. This is gives good understandings of how the blocks are laid down by alternating the positions to ensure a secure connection.

Figure 10 Masonry concrete block (Callegari, 2012)

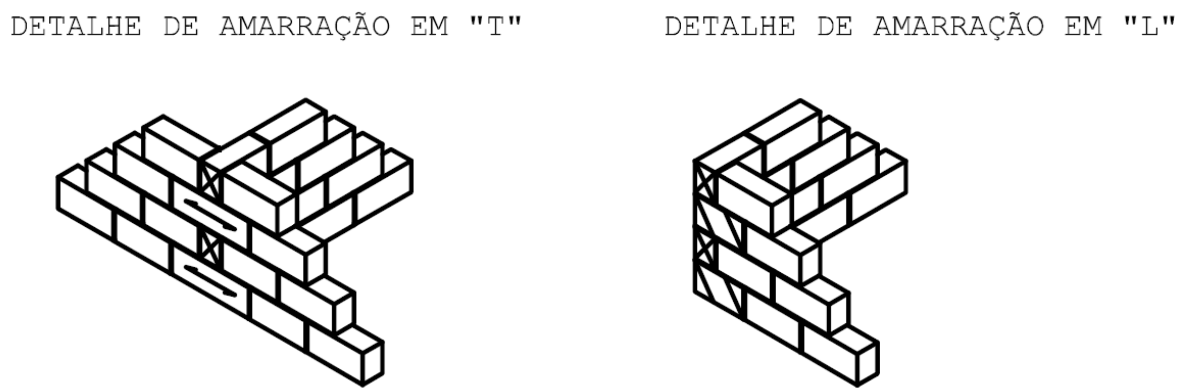


Figure 11 T and L Block Wall Corner (Callegari, 2012)

Concrete blocks are not only popular and long lasting in Brazil because of the years of existence but they also require low maintenance. As mentioned in a sustainability web site, “The permanence of a cement based product is making concrete blocks a preferred choice in rural areas as well”, which explains why it is so widely used in the rural areas of Brazil (Clark 1999). Concrete blocks offer flexibility by allowing the blocks to hold in heat longer in the winter and keep cool air inside longer in the summer. A concrete block structure creates a tight seal between each block, therefore minimizes wall leaks and often reduces insulation. But regardless of the season, the location in which the design is being build is also an important factor.

An important factor in structural masonry is the accurate placement of the first layer of block according to the construction drawings. In Brazil, the quality control for placement of the first layer is major. Some tools of leveling for the construction site are predominately used in Brazil because of the development of the structural masonry system in the country. Figure 13 shows a leveling tool that is located at each corner of the building to ensure a right angle corner.

Figure 12 Leveling tool for right angle corners (Callegari, 2012)

However in the U.S, prior to building a reinforced concrete wall, the foundation must be clean so that the mortar can adhere to it. The first step to laying out the wall is to take measurements from the floor plan and transfer them to the foundation (footing or floor slab). Once the measurements are established a chalk line (either corner to corner or corner to opening) is marked to show the face of which the block will be laid. Starting with the corners of the walls, the first level of block is laid without mortar; this is to check that the dimensions on the floor plan match the actual looks. When several courses of reinforced concrete blocks have been laid, a second section is connected to each of the corresponding vertical rods. This second section is connected to each of the corresponding vertical rods. A dry run is then done to help determine where adjustments such as cuts need to be made in order to fit any opening. As for the leveling, it is not predominate to have such precise leveling in the construction as it is in Brazil. The reason for this is because masonry is not use as a structural element in the U.S. especially in reinforced concrete buildings it is only for enclosure therefore leveling tools are not as crucial as they are in Brazil. This can affect the cost and the reason why this affects the cost of construction is because the importance of the foundation of the bricks will ensure a rapid process of brick laying. Once leveling is completed, a 3/8” piece of wood is placed between the block during the dry run. This is performed in order to develop an idea of the difference the mortar would make if it was applied. Once this is completed a steel square is used to mark the exact location and angle of corners. Then reinforcing steel bars are fully embedded in Portland cement grout and all the cells containing reinforcement are filled solidly with grout.

On the other hand, reinforced masonry walls rely on their mass for their strength and durability. Compared to the structural masonry system, the reinforced concrete structure interior and exterior partitions do not vary in resistance because they only serve as enclosure, therefore providing a saving in cost for the reinforced concrete system. However, when the cost of labor to lay the block is added, and the cost of extra steel to reinforce the block, along with the added expense of pouring the block are sum an issue in cost expensiveness is reached. Not to mention that the time consuming in laying the blocks also plays an important role in the labor cost. In Figure 13 a detail of the corner wall is shown, which illustrates the non-structural masonry blocks, the mechanical shaft and the sections in which the mortar is applied. Also note that Figure 13 shows that the only reinforced concrete applied in a masonry system in Brazil is the column structure.

Figure 13 Corner Wall Detail (Callegari, 2012)

2.2.3 Exterior wall finishes in Brazil and the U.S.

Exterior wall finishes are different in both Brazil and the U.S. Technologies like these help compare the construction differences in countries. In Brazil, exterior finishes are applied by having workers go up the side of the building on scaffolding to clean the exterior surface by brushing, washing or sand blasting any grout. In order to facilitate the adhesion of the finishing coats it is necessary to clean any dirt, mud, and or grease. The next step is to go down the scaffolding and cut any rebar which may be extended out of the building. During this step leveling tools are crucial. These leveling lay out throughout the building in order to insure unity in each layer of coat applied. Once the surface is smooth, workers go up the building a second time to apply 5 mm of roughcast to the concrete blocks. Roughcast is a mixture of cement, mortar, and sand that is applied to interior and or exterior walls. This mixture can be applied manually, as an industrial spray and or with a roller applicant. Depending on the surface roughness of concrete blocks roughcast is then needed in order to apply a second layer of mortar.

Again the workers proceed down the building and apply a single layer of mortar which is composed of cement, lime, aggregate, water, and hardening additives. The mortar is supplied in a premixed bag, for which water is only needed. Its adhesion characteristics vary with its composition. The most common way to apply the mortar is to use a trowel for a thickness of 2 cm. An industrialized spray applicant is another option to use for a quicker mortar application, however it is very costly. Finally one last time is traveled up the building for inspection of the exterior finish produced and later for a final coat of decorative paint. Figure 14 shows the Brazilian system of scaffolding.

Figure 14 Brazilian System of Suspended Scaffolding (Callegari, 2012)

In the U.S applying exterior finishes are different from those in Brazil. Workers are to clean the exterior surface by brushing and or washing. Then once the walls are checked that they are in in good condition basic scaffolding is built to complete exterior finishes. Instead of having the Brazilian way of scaffolding, the U.S usually uses a modular system of metal pipes or tubes for basic scaffolding. The key elements of the scaffolding are standards, ledgers and transoms. The standards are vertical tubes that transfer the entire mass of the structure to the ground where they rest on a square base plate to spread the load. Transoms are horizontal tubes that connect between the standards. Transoms are placed next to the standards because they hold the standards in place and provide support for the boards. Figure 15 show a basic scaffolding system in the U.S.

Figure 15 Typical scaffolding in the U.S. (Hunt, 2005)

Once the scaffolding is completed exterior finishes can then be applied. Stucco is usually applied in two to three layers. In the U.S stucco is a material made of aggregate, binder, and water. Stucco is applied wet and is used as a decorative coating for walls and ceilings.

The differences amongst stucco, plaster, and mortar are based on their composition. Throughout the nineteenth century, it was common that plaster, which was used inside a building, and stucco, which was used outside, would consist of the same primary materials: lime and sand (which are also used in mortar). Animal or plant fibers were often added to both the stucco and plaster for additional strength. In the latter nineteenth century, Portland cement was added to improve the durability of stucco. At the same time, traditional lime plasters were being replaced by gypsum plaster. Traditional stucco is made of lime, sand, and water. Modern stucco is made of Portland cement, sand, and water. Lime is added to increase the permeability and workability of modern stucco. Sometimes acrylics and glass fibers are added to improve the structural properties of the stucco. This is usually done with what is considered a one-coat stucco system, as opposed to the traditional three-coat method (Patent, 2001).Lime stucco is a hard material that can be broken or chipped by hand without too much difficulty. The lime itself is usually white. However, Portland cement stucco is very hard and brittle and can easily crack if the base on which it is applied is not stable. Typically its color was gray, from the innate color of most Portland cement, but white Portland cement is also used. Today stucco is manufactured in a range of colors that can later be mixed in the finished coat.

When stucco is applied, the first layer is about 3/8 inches thick and is known as a ”scratch” layer because it is said that once it is applied the surface is scratched providing to applied a second layer. The second layer is scratch, referred as the “brown” 3/8 inch thick. The last layer is about 1/8 inch thick which can be colored to give a final appearance. Figure 16 shows that before the first layer is applied it is important to dampen the masonry because this will help prevent the blocks from pulling moisture out of the stucco too rapidly, which can cause cracking.

Next, the mortar mixture is placed on a builders hawk pushing some mortar onto the area until 3/8 inches of thickness have been achieved as shown in Figure 16. At this point the mortar should be left to harden for at least two hours and scored in a crisscross pattern until it is about 1/8 in deep, as shown in Figure 16. The first layer should be left to harden from 24 to 36 hours. It is important to remember that the layer should not be left to dry out, instead it should damped by misting it with water. The second scratch layer should be applied in the same manner as the first layer was applied. The final layer has to be 1/8-inche thickness. Any desired a texture can be applied after hardening has occurred (usually after two hours).

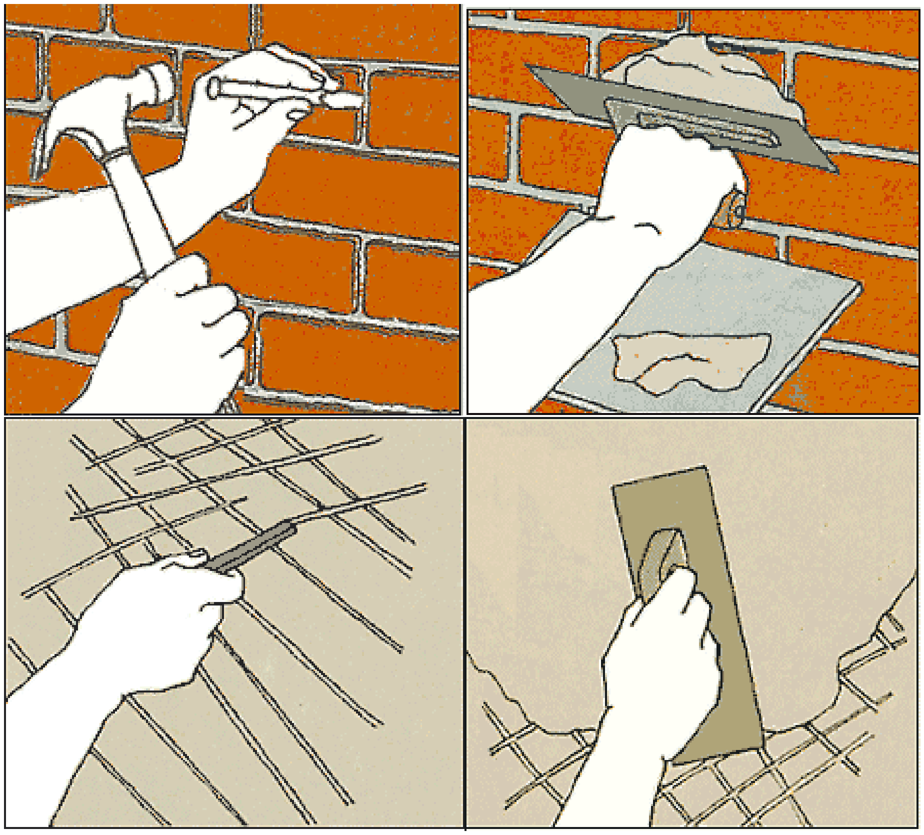


Figure 16 U.S. Steps for Exterior Finishes (Siegel, 1999)

Some of the major differences from U.S and Brazil are the number of coats applied for exterior finishes. In stucco three layers are applied versus with mortar there is only one layer. In the US where stucco is used, the last layer is the decorative coloring, whereas in Brazil the coloring is included in the mortar. Roughcast is also applied in Brazil as an adhesive material for the exterior surfaces. Another major difference is the scaffolding system where the U.S uses the modular system of metal pipes and or tubes for basic scaffolding and Brazil uses suspended scaffolding as. Figure 18 shows the Brazilian scaffolding system and Figure 17 shows the U.S scaffolding system.

Figure 17 U.S Metal pipe scaffolding (Hunt, 2005)

Figure 18 Brazilian suspended scaffolding (Callegari, 2012)

2.2.4 Interior Wall Finishes in Brazil and the U.S.

In Brazil, workers are to first work down the dry areas of the interior walls such as the living room bedrooms etc. The interior wall is washed and brushed down, removing any nails or rebar. Any electrical or pipe openings must sealed off. For internal lining of plaster, the vertical joint is not grouted instead it is filled with sealing compound prior to the plaster application. In order to apply gypsum plaster (PVA or acrylic) to the walls, the wall must present an adequate surface of good adhesion. The worker can then apply the gypsum plaster using a trowel directly to the wall. Gypsum plaster is applied with level strips in which help ensure line surfaces. This plastering layer is applied up to three times with a thickness of 5 mm. After seven days the paint coating can then be applied. The running plaster is applied in accordance to the steps shown below. Figure 19demonstrates the steps that are taken in order to complete the interior wall finishes. The steps that were taken in Figure 19 are listed as “A-I” where “A” shows that before the running plaster is applied, and application of roughcast rolled is executed on the slab. Then for part "b" the substrate (base) is cleaned, followed by "c" where preparation of plaster is then completed after 72 hours. Next, ceiling work with movements back and forth is executed by using a trowel PCV. Then starting with the top half walls, paste is applied to the trowel in the horizontal direction and then applied to the wall. Each range overlaps the previous layer between 1mm to 3mm overlap. An aluminum ruler is then used to withdrawal any excess amount of material in the wall or ceilings. A steel trowel is also used to clean the surfaces in order to eliminate any imperfections. Finally, a new layer of gypsum is also applied to fill in voids and ensure the final thickness of the coating.

Figure 19 Process of applying finishes to interior wall (Callegari, 2012)

In the US interior and exterior finishes are an important aspect in the construction phase. The cost of labor increases with the amount of hours that a worker needs to complete these finishes in which creates an impact in the total cost and the scheduling part of the project. The work of plasters and stucco masons is physically demanding in the sense that employees spend most of the day on their feet, either standing, bending, or stretching. One major difference in the application of interior wall finishes is that in Brazil there is an unwritten rule to limit the amount of surface area for interior finishes. If a column intersects into a room the projecting corner of the column must also be covered by plaster; therefore, subcontractors will charge per linear meter of plaster applied. This issue often increases the overall cost of interior finishes. It is custom that for interior finishes 60% of the cost is for material and 40% is for labor (Callegari, 2012). This issue often increases the overall cost of interior finishes something that the U.S does not have a rule for.

2.2.5 Software

Building Information Modeling (BIM) is a process of using computer generated programs as means to share information and represent the physical model. The use of BIM comprises the use of several software applications by sharing information through interoperability, in order to make reliable decisions. The main software used in this project was from Autodesk and it included: *Auto CAD 2013, Revit Structures 2013, and Auto CAD Structural Detailing 2013*.

Revit was used to obtain information such as quantity take offs. With these programs information such as volumes, areas, dimensions, and types of materials were collected. BIM saves time and provides exact and correct information of the type of item that is selected. Keep in mind that BIM will only work if the building design has been assigned the right properties to the right elements on the design drawing, Once all the items have been assigned the right properties such as which are the exterior and interior walls in the building, which are columns and which are beams, what type of material each item is and dimensions then a schedule of a quantity take-off is conducted. Once the schedule has all the information that is needed it is then exported as a project to then be opened in excel. Through the use of BIM less time is needed in calculating length dimensions for every wall, beam and column. Once again preliminary calculations were done by hand to check that our personal calculations matched those that BIM provided.

3.0 Methodology

This chapter will introduce the steps that were taken to develop and evaluate an alternative design for Pass Arquitetura. The first phases of the MQP involved analyzing the architectural drawings that were given by Pass Arquitetura as well as previous projects they had done in order to understand the thought process and building technologies behind these structural and architectural drawings. With the analysis of the architectural drawings, basic information was gathered such as the location, climate, the construction materials, and the basic layouts of their previous residential projects. There are a total of six apartments in every floor of this 18-story residential building, and they all mirror one another from one side of the building to the other side.

Pass Arquitetura's main expertise is in structural masonry design a method used construction building system. Structural masonry construction building system was used in this project having the walls as the basis for structural support in the architectural plans. The concept of constructing an 18-story building fully made from masonry blocks is unheard of in the United States. Such technology would be very difficult to do because of structural and architectural concerns such as the seismic activity, high wind forces, constructability, available labor and expertise. The focus for this project was to investigate the adoption of a reinforced concrete frame, including consideration of design changes and construction costs.

Due to time constraints, it was decided that focusing this MQP on the first four floors of this building would allow sufficient time to give a complete analysis of the second alternative. The framing and design calculation for the four stories would define key structural aspects of the building and provide a context for exploring other aspects of the project. The following sections will describe the process to execute the structural design and cost comparison.

3.1 Structural Schematics

The challenge in this project as a reinforced concrete building was to understand how the actual building worked and to develop an alternative structural system that would support its functions. It became an integrated design problem and started with few guidelines, versus textbook problems analyzing individual components as separate entities. In a typical building an architect will supply a set of limitations for columns sizes, girder lengths, and floor heights. Once the architect supplies this information, the structural engineer then decides which path to take in order to complete the design. In the actual construction of this project, the structural masonry system uses the walls as a means of load path instead of interior framework of columns and girders. The switch to reinforced concrete came with identifying the locations of girders and columns in a systematic way that would fit the architectural plan.

A structural drawing of a sample building using structural masonry design is shown in Figure 20. This drawing is a typical floor drawing of the first layer of blocks. The entire walls are shown and each block on the exterior enclosure and interior partitions. The darkened shaded blocks show area of the wall that should be grouted and reinforced with rebar. Critical areas of reinforcement are the building corners, wall connections and the interior shaft area.

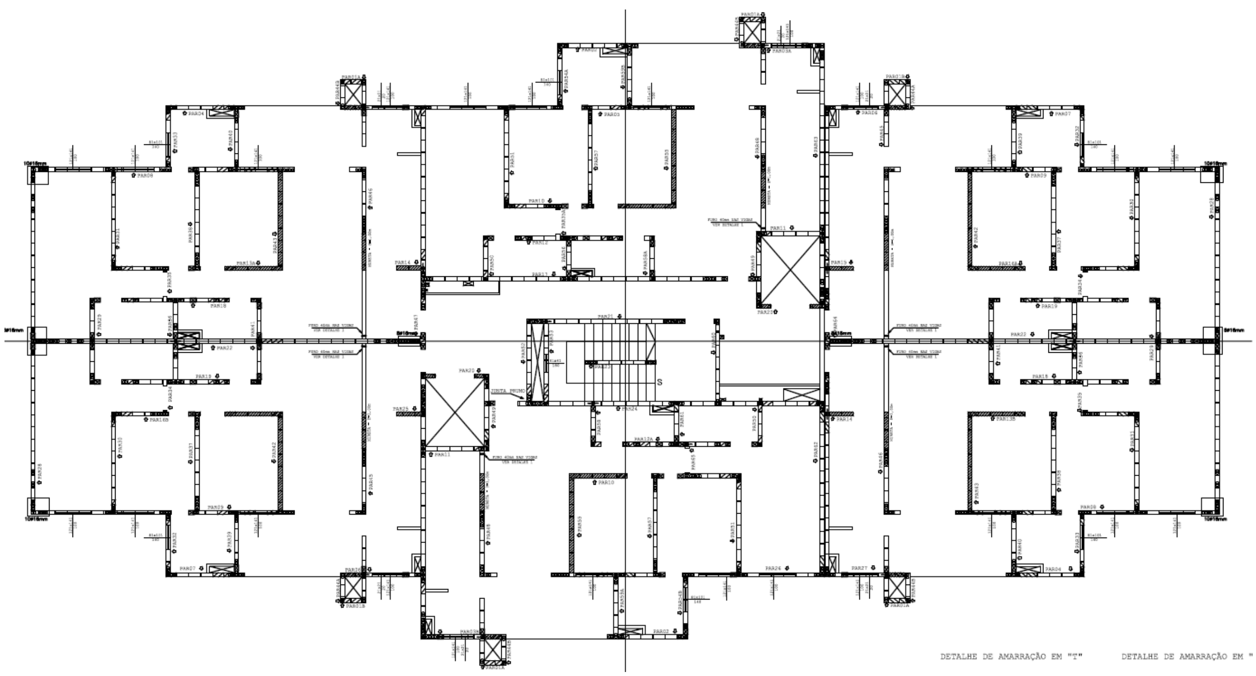


Figure 20 Structural Drawing of Typical Floor

Pass Arquitetura supplied us with structural drawings shown in Figure 21 of the transition plan from masonry to reinforced concrete. In order to transfer the discrete forces from all 18 levels to the foundation it is necessary to include a transition sub-level frame in the foundation which is made of cast-in-place reinforced concrete. In a structural masonry design building all the loads are carried through the walls therefore there is greater concentration of uniform loads applied to the reinforced concrete foundation frame. For this reason it is necesarry to include shorter spans for girders and beams in the transition level frame, to support the load. In a building complex such as this project parking garages are usually underground. This allows the foundation frame to have a useful function for the building. As seen in Figure 21 the beams and columns are located in the exact same positions as each wall, which was shown in Figure 20.

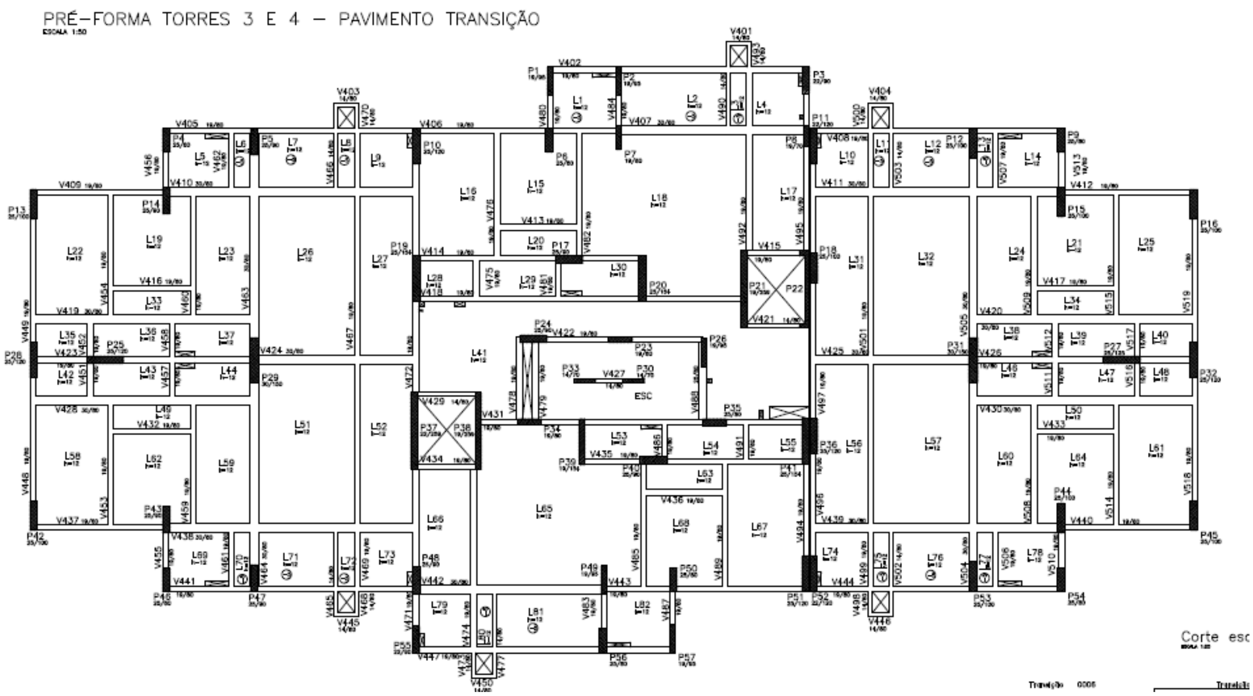


Figure 21 Structural Transition Level in Structural Masonry Design

Figure 22 Schematic Section showing Transition and Sub Levels of Structural Masonry to Reinforced Concrete Foundation Structure

Ultimately in a structural masonry sytem the levels are as follows; reinforced structural blocks to a transition level, then sub-levels and finally footings or piles for foundation.

When the structural drawings were received it was understood to be drawing of a reinforced concrete building with a similar floor layout. This information was taken as a basis to start developing the reinforced concrete schematic and proposed Schematic I shown in Figure 23. After a closer analysis of the building it was then recognized the basis for this assumption was mistaken and needed to be revised. As a result because it was based on a different building mechanism the structural frame needed to be rearanged for this alternative project design.

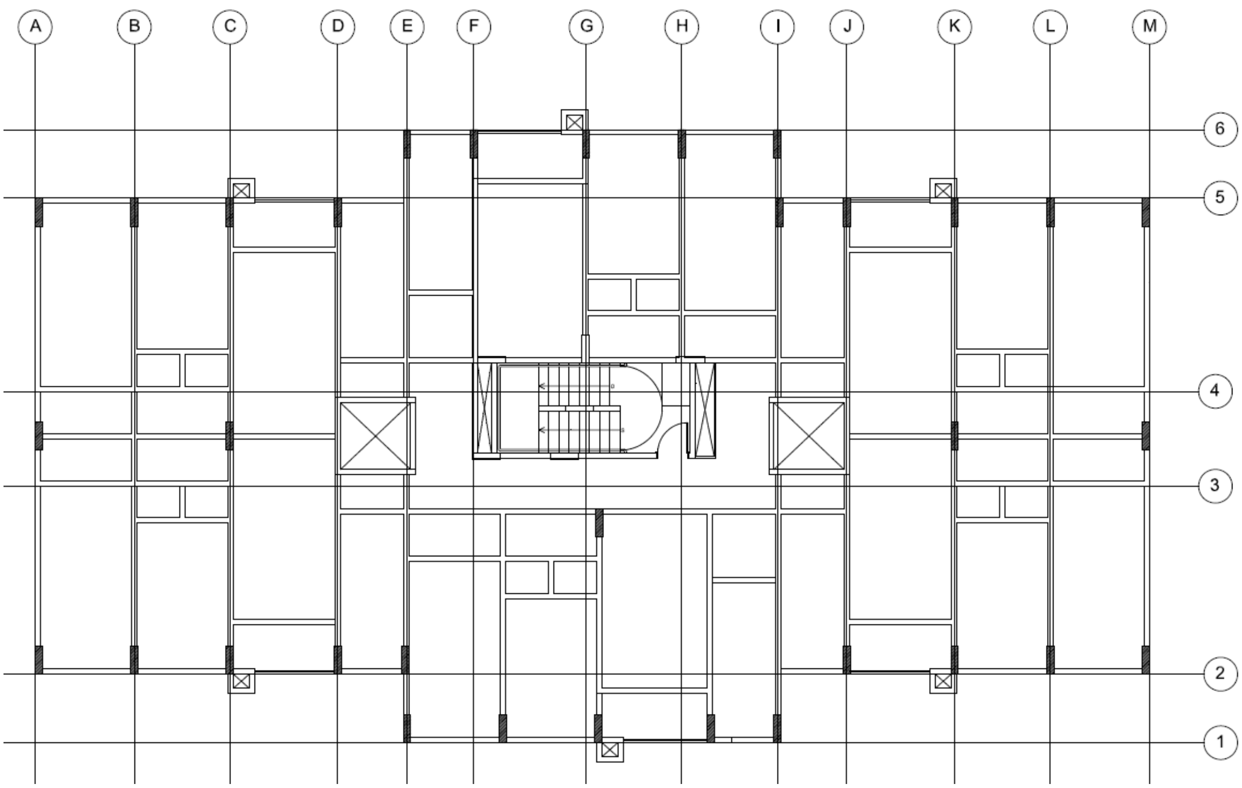


Figure 23 Preliminary Schematic I

After this analysis it was re-evaluated where to locate each of the beams and columns the final schematic was created in. From the systematic approach to constructability of creating the formwork, there is a benefit from the building's symmetry and dimensional consistency. Decisions were made in the locations of the columns considering particularly the architectural layout. Understanding why the architects would prefer to have columns in certain sections allows for a better understanding in choosing the right approach. Multiple layouts were made where some columns were removed, specifically in the center of the building where the stairs are located. After the placing of the elements, comparison with the architectural drawing revealed that some of the beams or columns were located in the middle of a hallway, or in an inappropriate location. Therefore some revisions were done to avoid such problems. The problem areas were locations like the connections from one apartment to another in Grids line E and K. The slabs transfer the loads from the edge of the building to the elevator shaft in the center of the building. For this reason the process of trial and error was done in order to identify which columns would be most critical.

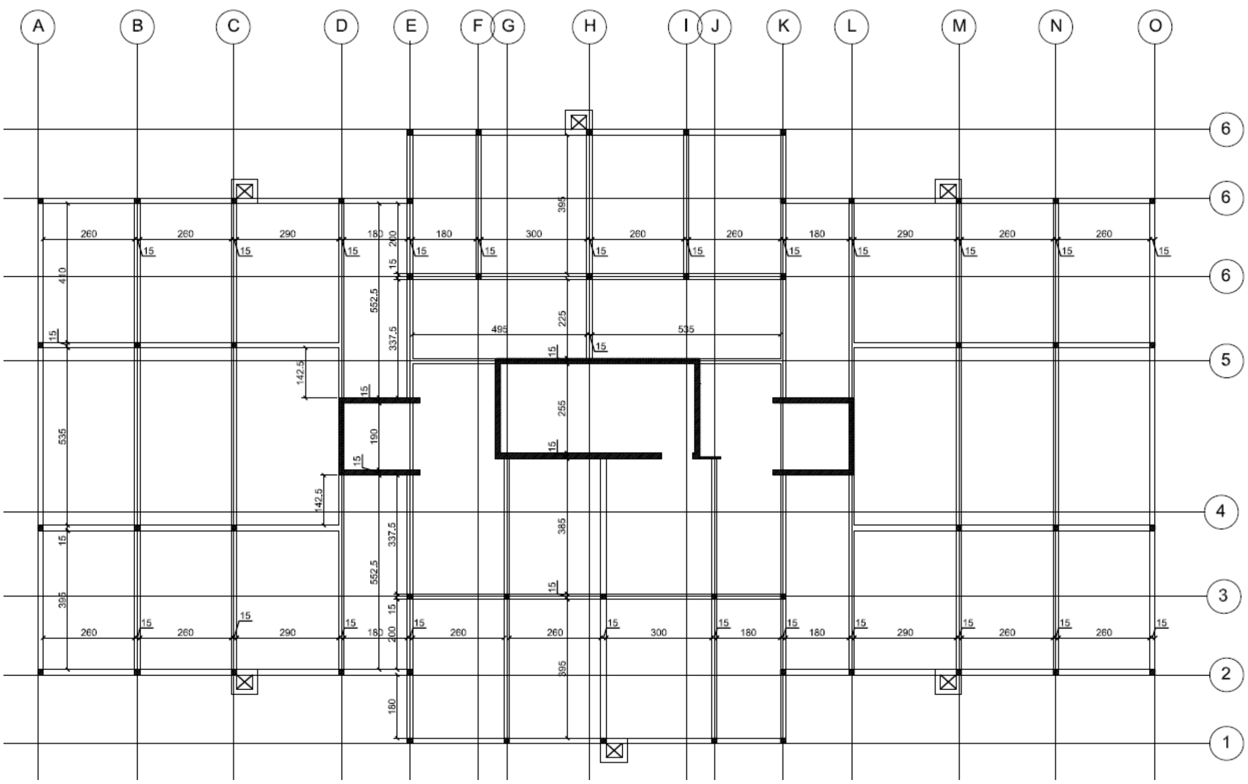


Figure 24 Final Schematic

3.2 Structural Design Parameters

Prior to arriving in Brazil some assumptions needed to be made in order to continue with the design. The many assumptions are as follows:

- Take dimensions from interior of columns, assuming simple supported connections.
- Only one floor of the building would be considered for gravity design, as the residential floors are typical for the whole building.
- Monolithic T-beams were considered as rectangular beams for ease of analysis.

- The moment of inertia was calculated based on rectangular beam; this was to simplify calculations and maintain the design on the conservative side.
- Deflections should not exceed L/360 for Roof and L/240 for Beams.

After arriving in Brazil the final properties were defined. By confirming the parameters used by the structural engineer a more accurate comparison between the two design systems could be made. From the structural drawings for the original structural masonry design, the concrete material properties were as shown in Table 1.

Table 1 Concrete Material Properties

Symbol	Value	Unit	Notation
E =	29910	$[MN/m^2]$	Young's modulus
f'c =	35	MPa	Compressive Strength of Concrete
fy =	420	MPa	Specified yield Strength of Reinforcement
Q =	23600	$[kg/m^3]$	Unit weight
w/c =	0.6		Water to cement ratio
	90-122	mm	Slump ratio

Table 2 shows the standard factors used in the ACI Code in order to calculate the resistance of the structural elements. Under tension the reduction factor will be 0.75 according to ACI 9.3.2 for compression controlled section and 0.90 for tension. The coefficient of friction is 1.4 because of concrete placed monolithically during construction of the elements. According to ACI 11.6.4.3 it is necessary to use high values of the coefficient of friction in the shear-friction equations so that the calculated shear strength will be in reasonable agreement with test results. The modifier factor reflects the lower tensile strength of concrete, which can be used to reduce shear strength used in shear calculation. In this design the modifier will not reduce the shear design for normal weight concrete.

Table 2 ACI Code Factors

Symbol	Value	Notation
		Strength Reduction Factor
φ =	0.90	Tension Members
	0.75	Compression Members
λ =	1	Modification Factor
μ =	1.4	Coefficient of Friction

The interior and exterior walls shall be enclosed by non-structural concrete masonry unit (CMU) blocks. Using Brazilian Standard for concrete block sizes Family 39 concrete blocks shall be used (NBR 6136). Figure 25 depicts the shapes and nominal dimension of the blocks to the nearest centimeter. The density of the CMU is 1.4 Kgf/m^3 which equals 14 kN/m^3.

Figure 25 Concrete Block Sizes (Callegari, 2012)

3.3 Loads

The following sections describe the intended loads application in this design. The primary load forces of concern are vertical which include gravity loads and lateral which consist of wind and seismic loads. In the methodology chapter it will describe the steps taken in order to obtain the loads used for calculation of the structural elements. ASCE standards were used as the main bases for design. Whereas, some considerations for the Brazilian Standard were studied and implemented in this project, so that this building can meet standard requirements.

3.3.1 Vertical

The structural analysis followed the load combination for Load Resistance Factor Design (LRFD). Although the National Brazilian Standards have alternative design load combinations, the factored loads combinations were used per ACI 318-08 9.2.1:

- Pu= 1.2 x Dead Load + 1.6 x Live Load
- Pu= 1.2 x Dead Load + 1.6 Wind Load + 0.5 Snow Load

  *as self-weight was included in the dead load
- Snow load is not applicable as it is not part of the climate in Brazil.

As Figure 26 shows the tributary area was taken to determine the design load values for capacity to the structural elements. For simplicity the largest tributary area was used to proportion all of the beams. For dormitories, living rooms, kitchen and bathrooms 2 kN/m^2 was used according to NBR 6120-2.2.1.2. For pantry, laundry room and service area, 2 kN/m^2 was used. Considering the tributary width of 2.75 *m*, the linear un-factored live load is 5.50 *kN/m*. Given the self-weight of the concrete and the weight of the partitions the dead load is 4.65 *kN/m*. The total factored load is 14.4 *kN/m*.

Table 3 Uniform Design Load Values NBR 6120

Dormitories, living rooms, kitchen bathrooms	2.00 kN/m^2
Pantry, laundry room and service area	2.00 kN/m^2
Weight of the partitions	4.65 kN/m
Live load	5.50 kN/m

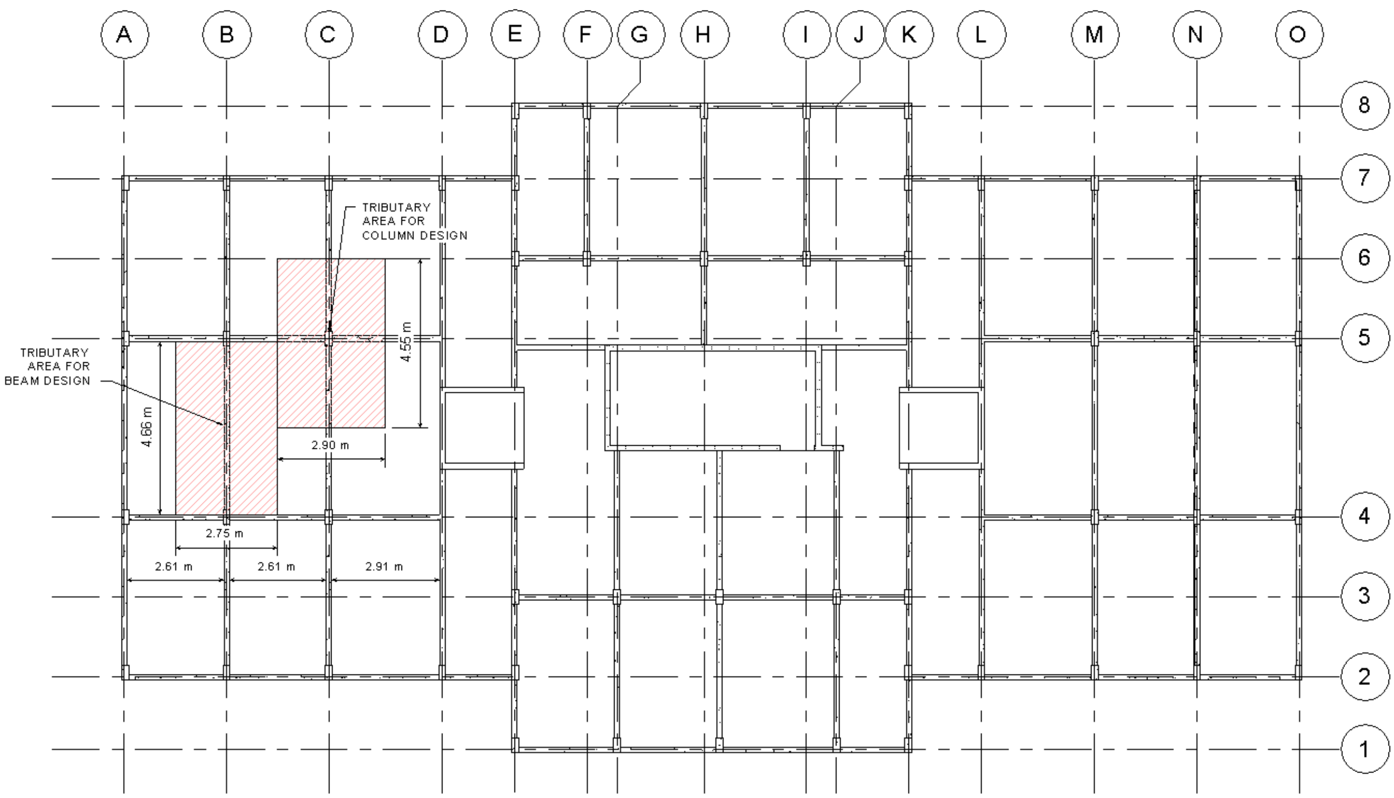


Figure 26 Tributary Area for Girder and Column Design

Figure 27 is a depiction of the dead and live uniform loads applied to Grid Line 2 facing the South of the building. Although in actuality loads would not be simultaneously applied on all areas of the building; for simplicity in calculations the loads are applied the same throughout the building floors. This is standard practice in Brazilian structural design.

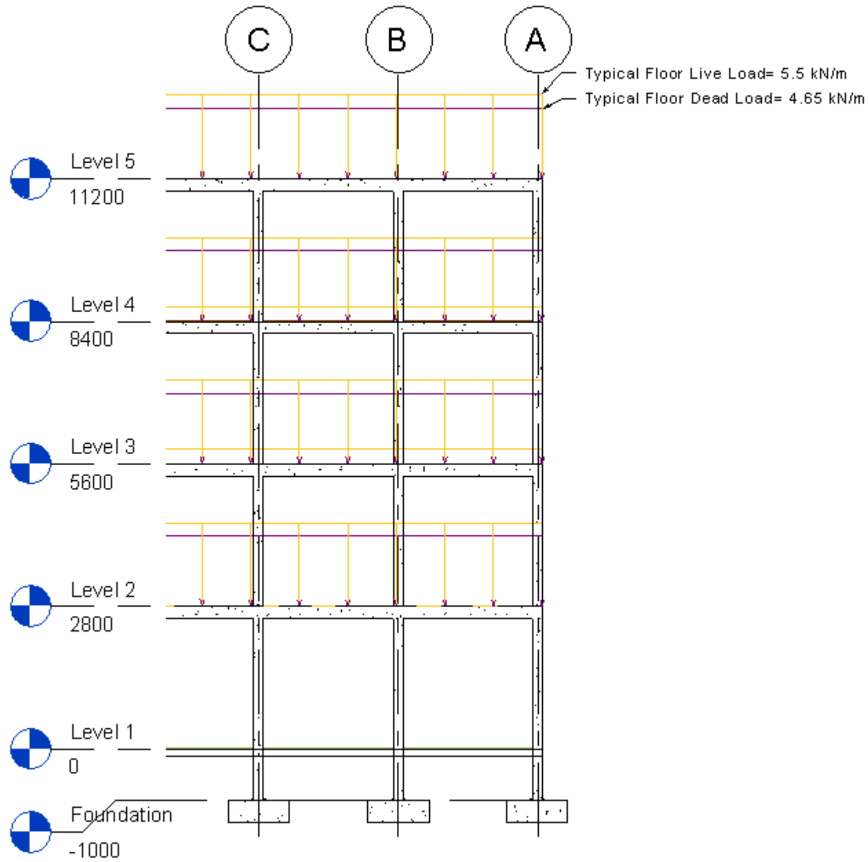
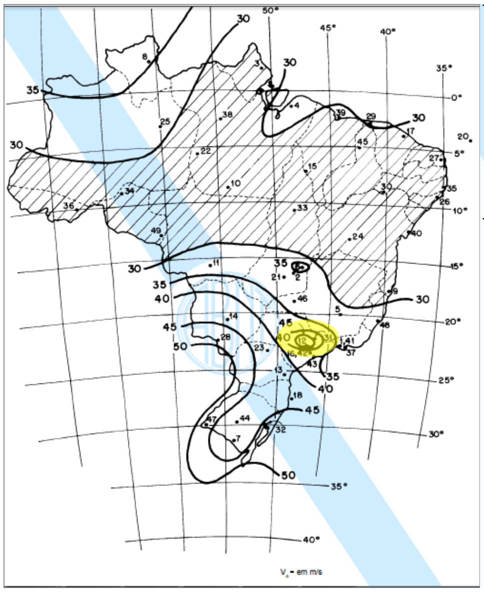


Figure 27 Gravity Loads Applied to Grid Line 2

3.3.2 Lateral

MECA Wind Software Demo (Program)was used to calculate the wind load. The *ASCE 7-10* is the basis for the calculation of wind load. In the Main Menu the structural parameters included the wind speed of 40 *m/s*. To acquire the K Directional Factor first an interpolation was made from the Brazilian Wind Map taken from NBR 6123 for the Sao Paulo area, shown in Figure 28 which falls between the 45 *m/s* and 40 *m/s.* From the site location examined in Google Earth the building fell under Category III Class A. In NBR 6123 K Directional Factor equal S2, in Figure 28 it seen that z stands for the height of the building. By interpolating the Table under Category III and z parameter 1.04 is the value for K. The Exposure in *MECA Wind* was set to C Category and the Type of Structure was set to Rigid Structure. Also the option for Enclosed Building and Diaphragm Building were set before defining the load.



z (m)	Categoria I Classe A	I B	I C	II Classe A	II B	II C	III Classe A	III B	III C
≤ 5	1,06	1,04	1,01	0,94	0,92	0,89	0,88	0,86	0,82
10	1,10	1,09	1,06	1,00	0,98	0,95	0,94	0,92	0,88
15	1,13	1,12	1,09	1,04	1,02	0,99	0,98	0,96	0,93
20	1,15	1,14	1,12	1,06	1,04	1,02	1,01	0,99	0,96
30	1,17	1,17	1,15	1,10	1,08	1,06	1,05	1,03	1,00
40	1,20	1,19	1,17	1,13	1,11	1,09	1,08	1,06	1,04
50	1,21	1,21	1,19	1,15	1,13	1,12	1,10	1,09	1,06
60	1,22	1,22	1,21	1,16	1,15	1,14	1,12	1,11	1,09
80	1,25	1,24	1,23	1,19	1,18	1,17	1,16	1,14	1,12
100	1,26	1,26	1,25	1,22	1,21	1,20	1,18	1,17	1,15
120	1,28	1,28	1,27	1,24	1,23	1,22	1,20	1,20	1,18
140	1,29	1,29	1,28	1,25	1,24	1,24	1,22	1,22	1,20
160	1,30	1,30	1,29	1,27	1,26	1,25	1,24	1,23	1,22
180	1,31	1,31	1,31	1,28	1,27	1,27	1,26	1,25	1,23

Figure 28 Wind Map and S Factor NBR 6123

Figure 29 is a screen shot to show the input the location and building type information. This is a necessary input step in order to acquire the wind load forces.

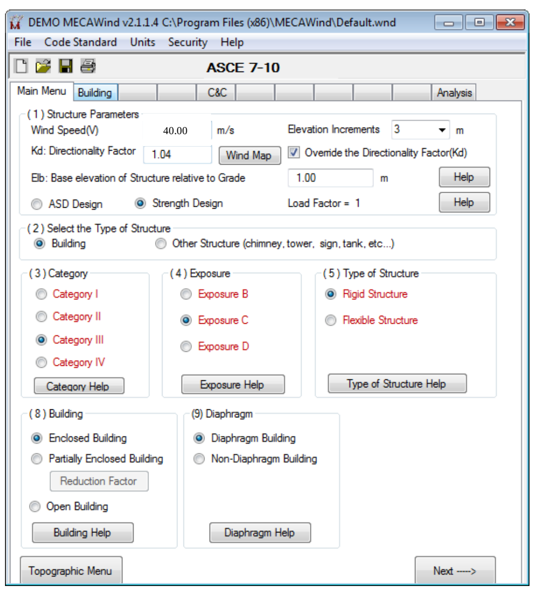


Figure 29 MECA Wind Building Location Parameters Snapshot

Because of the limitations of the Demo settings for this software the exact dimensions could not be defined. The building was considered a rectangular building 42 X 100 *m* plan dimensions. Also with a flat root to allocate the lowest allowable for this software slope a parapet height of 3m was used. In order to accommodate the building's geometry the Zone Span were set to the given dimension from the building, Figure 30 shows these parameters.

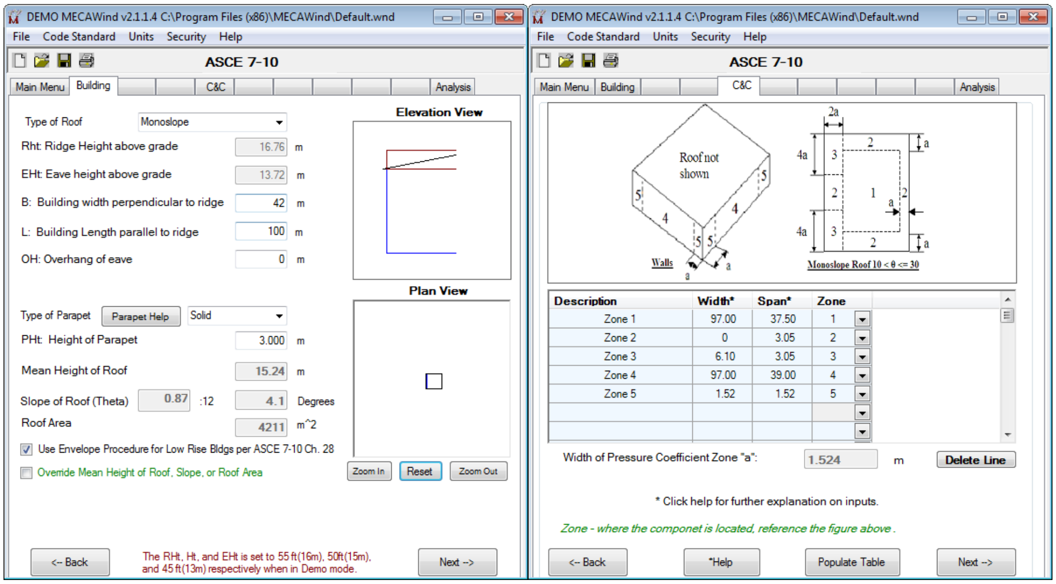
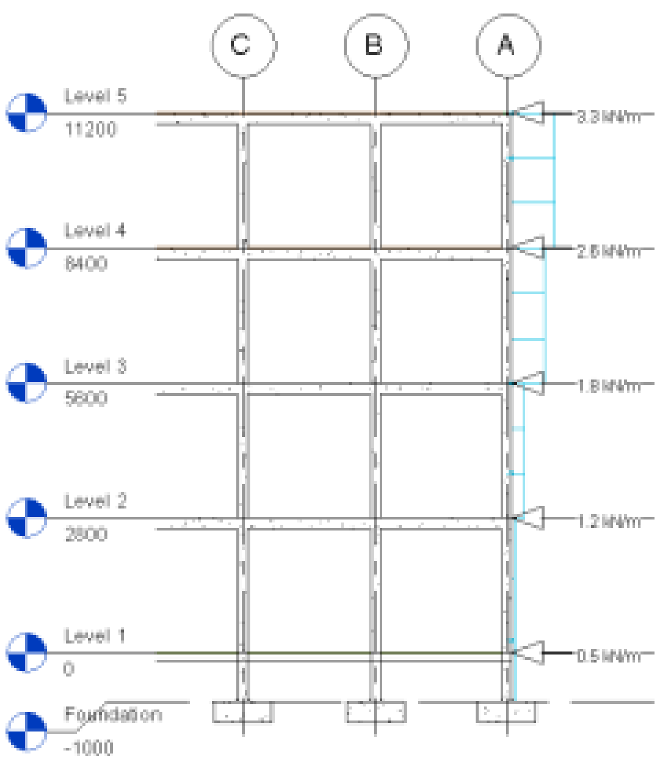


Figure 30 MECA Wind Building Type Parameters Snapshot

Another reference for the lateral loads for this design was given per direction of the structural engineer notes in the structural drawings. The observations are as follows:

- Winds loads on the faces X (90°) Y (0°), respectively, do not occur simultaneously
- The evaluation of any efforts due to soil buoyancy imbalance between the sides of the border of the site location, will be evaluated after the consulting a soil engineer
- Conventions: Wind Loads and signs of Mx and My



This picture shows the convention used for design. Based on the information compiled from the structural drawings and *MECA Wind* calculations a lateral wind load diagram is made seen in Figure 31. As seen in the figure the wind forces increase the higher the building level.

Figure 31 Lateral Loads applied to building

3.4 Reinforced Concrete Elements

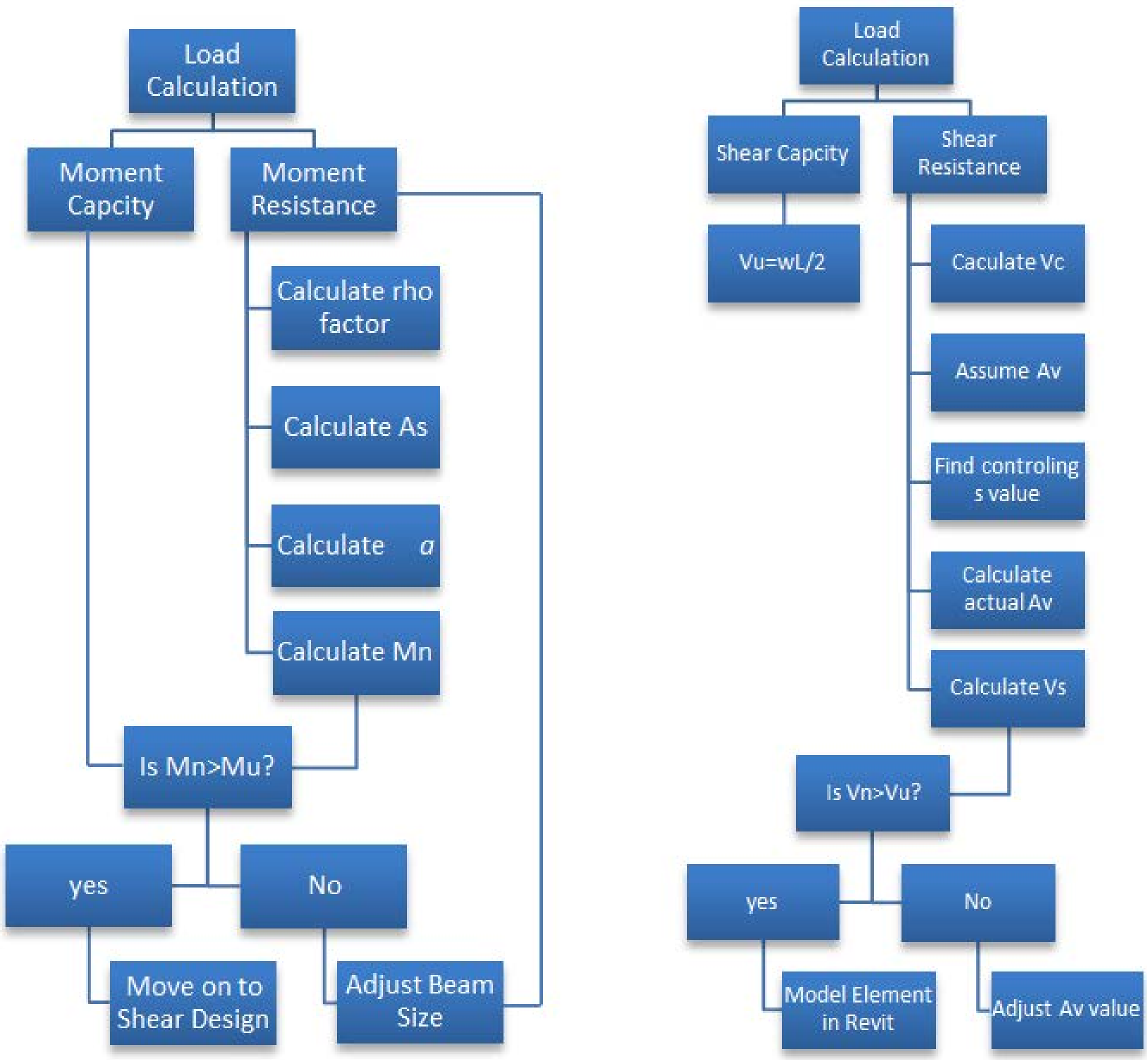
The following sections will describe the process taken to size the reinforced concrete structural elements. The elements include: beam, girder, slabs, column, and shear wall. An Excel Worksheet was devised to facilitate the calculations for each structural member. The calculation from the Excel sheet can be found in Appendix I. Prior to finalizing the member sizes, and having Schematic I of the reinforced concrete design, a *Revit* Structural model was created this helped conceptualize how the building would look, it also facilitated in the design process. Technical structural drawings were formulated from *Revit* using the *Revit Extension Tool* which permits the model to be exported to *AutoCAD Structural Detailing 2013*, thus creating the sectional drawings of elements. The next sections will also illustrate the manner in which the building was design.

3.4.1 Beam

Given the first schematic design shown in Figure 24 and the assumptions made prior to going to Brazil, some initial design constraints were made for structural elements. To have a preliminary template for analysis, preliminary the structural elements shapes and sizes for the structural elements were considered. The assumptions for beam proportioning were based on ACI Code guidelines for design as shown in Table 4. For this project analysis the goal was to compare the two systems therefore the NBR Code was considered in the columns dimensions.

Table 4 Minimum Thickness of Nonprestressed Beam ACI Table 9.5(a)

Simply supported	L/20
One end Continuous	L/24
Both ends continuous	L/28



a) b)

Figure 32 a) Moment Calculation Flowchart b) Shear Calculation Flowchart

After having the accurate material and load properties from the structural engineer in Brazil the calculations parameters were revised. The flow diagram in Figure 32 a shows the steps taken descripted in this paragraph. Having assumed the size of the beam the moment could then be calculated using $Mu=wL^2/8$. In order to find the minimum area of reinforcement A_s for the beam the reinforcement ratio rho was determined. The equations with the relationships between ratios are shown in Appendix D. Given the predetermined beam dimension and rho factor, A_s was found. A calculation of the depth of the stress block was made; from this information the actual area of reinforcement was found, and the size and number of steel rebar were defined. The resisting moment capacity for the resulting section was evaluated: if the resisting moment capacity was less than the calculated moment, then a revision was made in the beam dimension and the steps were repeated until this was true.

To determine the shear strength of the beam simple supports and Vu=wL/2 were assumed. Minimum shear reinforcement is exempt from this design because the beams are constructed from “normal concrete with f’c not exceeding 6000psi, h not greater than 24 in, and Vu not greater than 2sqrt[f’c*b_w*d].”(ACI 11.4.6.1.f) Area of reinforcement was calculated based on the controlling limit of A_v=d/2 according to ACI 11.4.5.1. Nevertheless other provisions were checked, ACI 11.4.6 requires at least a minimum area of web reinforcement equal to Av=0.062sqrt(f’c)(b*s/fy). Equation Av=0.75*sqrt(fc')*((b*s)/fy) was also considered. The controlling equation was used. From this information the Shear of the steel was calculated. The total resisting shear must be greater than the shear capacity, if this was not true the area of steel was revaluated and the steps were repeated. The flow diagram in Figure 32.b. shows the steps taken descripted in this paragraph.

A structural model was designed while the structural analysis was made. Given the assumed element properties and dimensions a preliminary structural model was constructed. This model also assisted in the visualization process in understanding frame reactions to the applied loads. By importing the Final Schematic *Auto CAD* file from created during the design process, into Revit, a structural model was constructed for analysis. After the dimensions were defined from the analysis the building details needed to be edited to reflect the values calculated from the structural analysis. A comparison was made from the hand calculations to the Revit model made.

In addition to the calculations made through an Excel worksheet, Revit 2013 Extension Tool was used for structural analysis. The Revit 2013 software version has combined structural analysis into the programs which allows for simple load analysis. The regional settings were set to Brazil Standards, as for the reinforcing bars were taken from the ACI 318-08 Metric settings. This tool takes the information from the analytical model to analyze the elements. It was important to not only model the building using the design parameters, but also to refine the details of the analytical model which is a mathematical model to help predict how the building will behave structurally. The Revit 2013 Extension Tool is convenient because there is no need to export the model to different structural design software, to analyze the frame. This version of the software analyzes directly in Revit and supplies the resulting loads, deflections and different results. To design details of the structural reinforced concrete model Auto CAD Structural Detailing 2013 was utilized. The structural model was exported and detailed reinforcement drawings were generated using the Revit 2013 Extension Tools.

3.4.2 Slab

For the slab design the center slab between the smaller apartment in Grid Line B to C and 4 to 5 was used for analysis. This slab was chosen because it is a critical slab in the design. Due to its location, the slab carries the loads from the surrounding members from all its sides. In Brazil it is uncommon to have a concealed ceiling; therefore the bottom of the slab serves as the ceiling of the floor underneath. For this reason it is preferred to have a thin slab, also this reduce the height of the building and reduce concrete used.

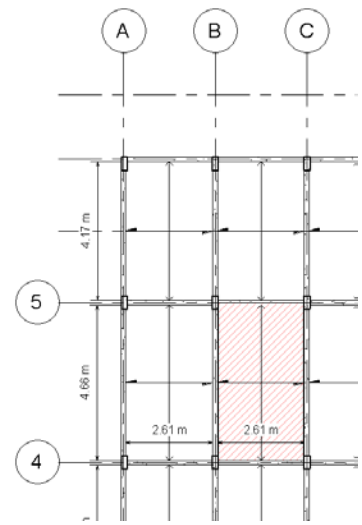


Figure 33 Slab used for analysis

In order to design the concrete floor slabs, the span length had to be analyzed to accommodate the gravity loads. Refer to the following flow chart, this shows the process to determine the capacities for moment and shear. In one side the main point is to calculate the moment resistance and if it is greater than its moment capacity then the size of the member is adequate. The same goes for shear on the other side, if shear resistance is greater than the shear capacity the size and reinforcement meets its requirement.

Slabs were considered to be divided in sections between the beams. The longest span slab was considered for analysis to accommodate all possible and lighter slab sections.

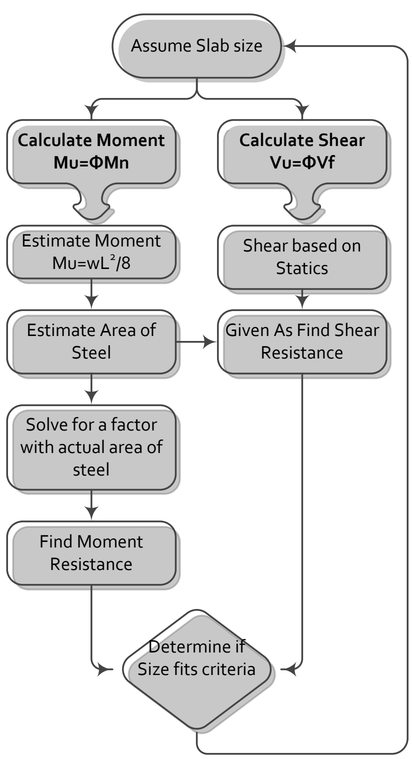


Figure 34 Flow Chart for Slab Design

Table 5Minimum Thickness of Nonprestressed One-Way Slab ACI Table 9.5(a)

Simply supported	L/16
One end Continuous	L/18.5
Both ends continuous	L/21

The preliminary step was to identify a thickness for the slab, and this was considered using Table 5. In this analysis of reinforced concrete, elements were evaluated different than a frame analysis. The approximate moment was based on, 1) if there were two or more spans, and 2) if the spans equal a larger of two adjacent spans not greater than the shorter by more than 20% (Section 8.3.3). With this information a list of applicable moments were evaluated to find the controlling moment equation, Table 6 shows this list.

Table 6 Moment Equations

Negative moments at Interior Support	$wL^2/11$
Negative moments at midspan for members built integrally where support is a column	$wL^2/16$
Positive moment at and spans with discontinuous end exterior Support	$wL^2/11$

Next the reinforcement ratio rho was calculated in order to find the distance from extreme compression fiber to centroid of longitudinal tension reinforcement, d. Given the allowed moment capacity with the rho factor and d, this was back tracked to find the area of steel, A_s.

First to calculate the shear capacity Vu=1.5wL/2 was used. From there the shear of the concrete and steel combined must be greater than the required capacity. If concrete shear is greater than the shear capacity the steel shear does not need to be calculated.

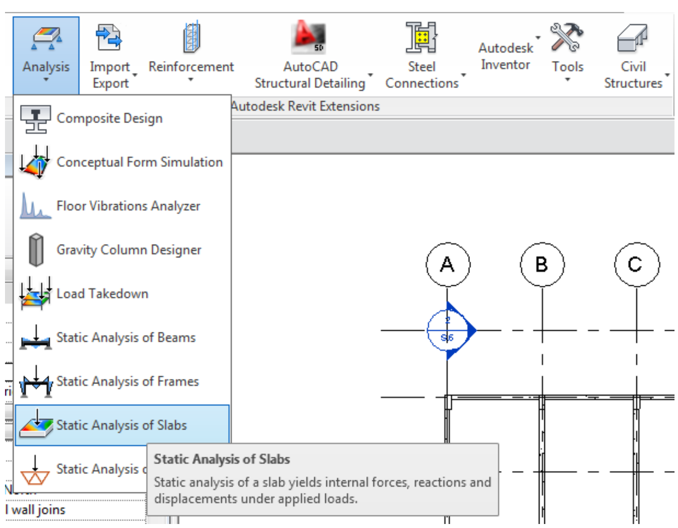


Figure 35 Flow Chart for Slab Design

After having defined dimensions for the slabs, the Revit model was adjusted to match the calculated results. It was critical to adjust the analytical edges to align with the structural model or else the final analysis would not be accurate. The following picture shows function tool to analyze the statics of the slabs. In this process it calculates the resulting forces, reactions, and displacement.

3.4.3 Column

Because the load patterns that produce critical values for moments in columns of frames differ from those for maximum negative moments in beams, column moments were evaluated separately (R8.3.3). In order to determine the method of analysis for the column design the slenderness ratio is a critical deciding factor. If the column was determined to be slender there are several different criteria that would need to be calculated. After calculating the slenderness ratio the conclusion was that the column was considered not slender. This simplified the hand calculations. The moment capacity was then calculated. Next the reinforcement of flexural members was calculated to determine the resisting moment. Similar steps to that of the beam and slab design was used to evaluate the shear resistance of the column. According to NBR6118 the minimum dimension for columns is 19 cm for a 2.8 m level height.

3.4.4 Shear Wall

Revit structure was the main method used for the shear wall design. The elevator shafts, the stairway enclosures and interior shafts act as the shear walls for this building. The discrete forces gathered by the floor system at each level are transmitted by diaphragm action to each lateral load resisting wall. The lateral load resisting walls serve to provide resistance in the North-South or East-West direction; therefore lateral load resisting systems are needed in the two directions. For this reason reinforcement were applied in the horizontal and vertical directions. In proportion to the building the lateral load walls have essentially the same stiffness, each resists an e proportion of the total force at each floor level. For the analysis, the story forces are applied at each level of the lateral system, since the lateral load resisting system must be investigated for overturning effects as well as horizontal shear.

The design basis for shear walls according to ACI 11.9 is of the same general form

Vu< ΦVn. For walls subject to vertical compression equation Vc=0.17*λ*sqrt(f'c)h*d. The nominal shear strength Vs provided by horizontal wall steel is Vs=(As*fy*d)/s. The minimum permitted shear ratio is ρ=0.0025 and the maximum spacing is not to exceed L/5, 3h, or 450mm.(Nilson et al. 2010)

To determine the lateral forces at each story level depends on the nature of the loading. For wind, the wind pressures acting across the exposed face of the building in the North-South and East-West direction are determined separately. The corresponding story force due to wind was explained in Section 3.3.2. Since the architectural layout was a constrained plan it would not be possible to change the dimensions of the shear wall. To increase the resistance to lateral loads the reinforcements was the controlling factor. Revit Structure provided a function to calculate the required amount of steel reinforcement needed in the lateral load resisting wall. From this information it was then compared to the lateral loads applied from static analysis of the frame to confirm if the applied forces would not exceed the wall capacity. Overturning moments and shear resistance results from Revit were analyzed to understand whether the building would support the loads.

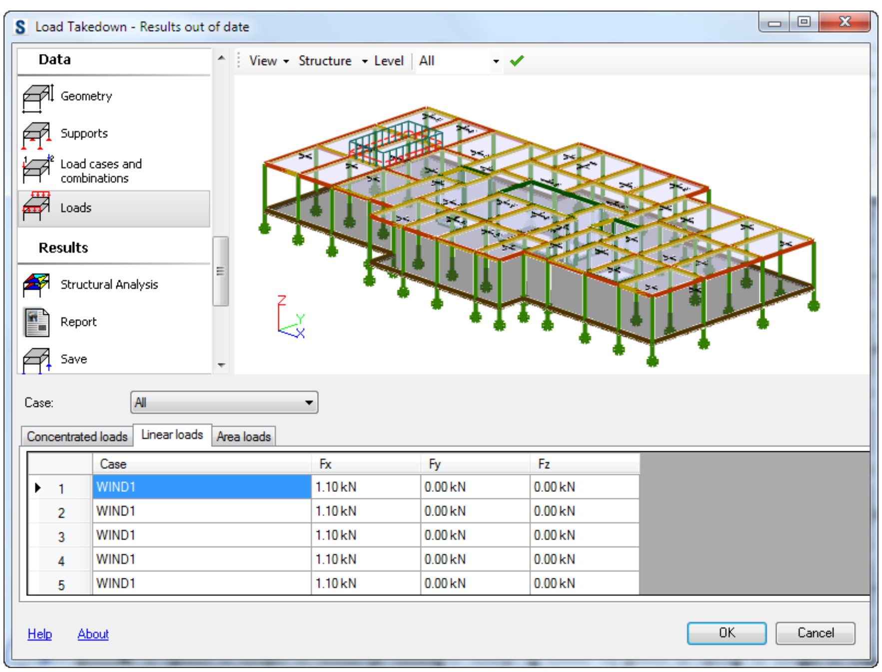


Figure 36 Revit Structural Analysis Load Takedown

To facilitate the modeling of the reinforcement of the structural elements Revit 2013 was utilized. This tool was able to quickly implement the desired geometry shapes, reinforcement sizes, spacing distances for reinforcing steel and stirrups, and all element parameters.

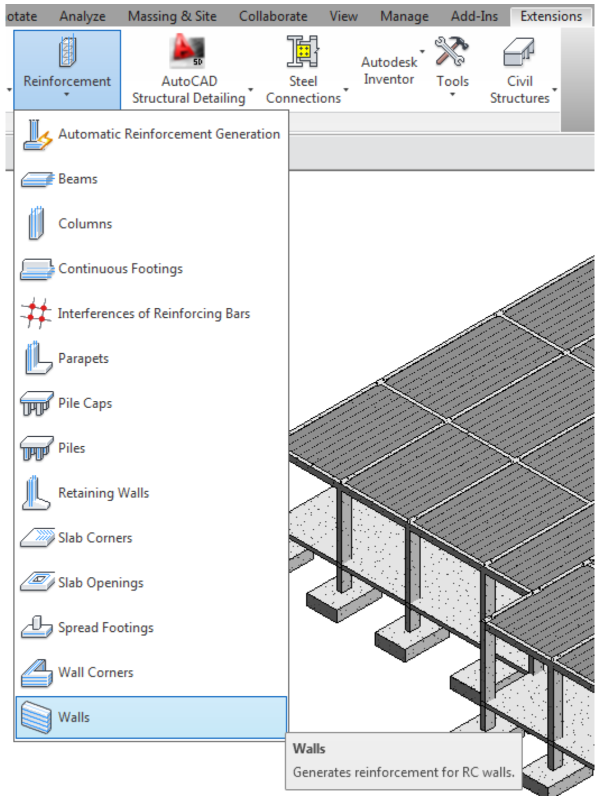


Figure 37 Shear Wall Revit Model Design Tool

3.5 Technology

It was important to understand the history behind Brazilian constructions before comparing which system was more convenient to use. Because of the country's taxation history in importing materials, technology, labor, local resources and techniques, it became custom to utilized concrete blocks and manpower of laying brick(Lobo and Wildt 2003). This is where construction technology played an important factor in this project. Understanding the differences in construction technologies from both countries would help compare both systems and understand the differences in costs.

Having one of the members attend Brazil helped understand the differences in construction technologies. A project architect from Pass Arquitetura was able to supply some information on the methods of construction; a consultant cost estimator also guided in techniques utilized in the job site practices. The cost estimator was able to supply reference information for the cost analysis. The Tables of Composition of Prices and Budgets (TPCO), is a Brazilian version of the RS Means cost reference widely used in the U.S. book, was used as a reference in costs as well as other periodicals which have published regional cost estimates(PINI). In order to compare the two methods, reinforced concrete and structural masonry, of construction systems a complete cost estimate of a structural masonry building was necessary. Milena Merlo the cost estimator supplied this group with a similar project constructed in 2011 in Sao Paulo. The building complex included two towers with nine floors and had a typical floor layout of 490 meter square. In order to have an approximation of comparison, it was necessary to both scale the 2011 reference building to this project's design and adjust the cost from 2011 dollars to 2013 dollars. Adjustment to the amount of reinforcement and concrete strength were also made.

In a reinforced concrete construction the foundation is an important aspect of the frame of the structure. Studying the soil mechanics on the site location can impact the type of foundation used in the project. In this project due to the lack of information for the soil, a concrete footing was located. Freeze thaw is not a phenomenon of concern in Brazil. Therefore the foundation is one meter below ground level. Depending on the amount of floors of a building a greater reinforced foundation such as piles may be necessary.

Identifying the difference between the concrete block for the interior and exterior enclosures in the structural masonry design was important. For exterior enclosures a higher resistance block is used to resist lateral forces, therefore the material is more expensive, whereas an interior block serves as only a partition and does not need such resistance. Another difference in the structural masonry design is that the CMU's are grouted and reinforced which increases the square meter price for the concrete blocks. In this project a 4MPa resistance block was used. In a reinforced concrete system the interior and exterior partitions do not vary in resistance because they only serve as enclosure.

Formwork was another element that was discussed. The cost of the labor to erect the formwork was included in the cost of the reinforced concrete construction. To determine the formwork, the exposed surface areas of all the reinforced concrete elements were calculated. In order to incorporate the cost of placing the concrete, an equipment price was included. In the structural masonry system the contractor will construct the pre-cast slabs on site. This will minimize the cost of transportation and may limit the problems unseen if it was constructed at a manufacturing plant.

Later in the results section a summary of the unit cost is presented which shows the information presented in this section. These were important factors that needed to be understood because as much as one design may be more time consuming and/or higher in cost, the historical style plays an important role as to why a country chooses to use the method they use. For Brazil, masonry designs have been around for years and this has made this design customary to the country. Adapting a new system of construction will affect factors in the costs such as the labor since reinforced concrete is not commonly used; it is a method that not many know how to perform or have familiarity. As the study is analyzed an assumption can be made that there’s the possibility that when calculations are made the reinforcement system may be more expensive for Brazil. Having to understand this will help better understand what are the key elements that increase the costs in one system versus the other and the underlying reasons.

3.6 Cost Comparison

There are several different levels of estimates that can be used to establish project construction costs. Each method is named differently and has its own purpose. The method that was chosen to conduct this construction project cost analysis was a quantity take-off. Since the model was built in Revit it was reasonable to use the software for a quantity take-off cost analysis. A quantity take-off list is not just a list of materials, but a list of measurements separated into categories to which unit prices are applied. Figure 38 is a flow chart of the process that was used to estimate results.

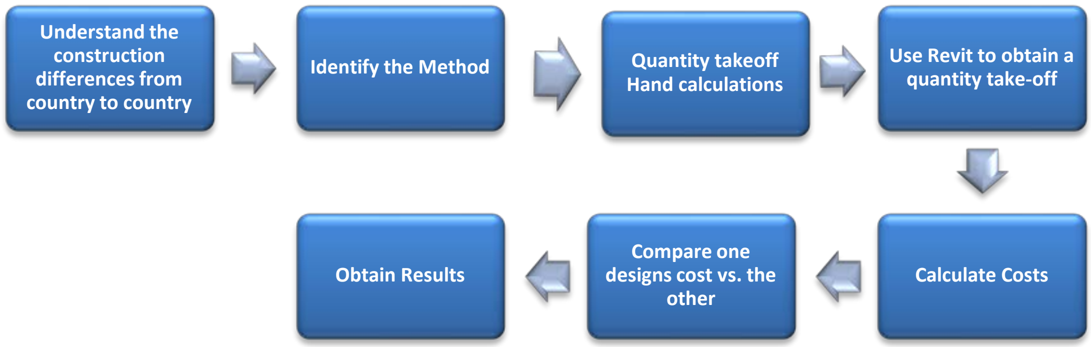


Figure 38 Scheduling Flow Chart

As the flow chart above shows the next step was to conduct a quantity take-off by doing hand calculations. This was done in order to make sure that Revit was providing the correct information. An EXCEL sheet was developed with the name of the building components labeled as description, followed by their dimensions, such as the lengths, widths, depths, heights and the quantity items that were taken off of the design. The quantity take-off was done in the order of construction starting from the footings upward. When the hand calculations were completed, dimensions were then checked through printed drawings to scale. After making sure that the process of conducting a quantity take-off was well understood and that the information in terms of dimensions was accurate to those in the Revit files, the use of Revit then proceeded.

3.6.1 Material Quantities

The Revit architectural model was then checked to make sure that the walls were adjusted to exact sizes given the location of beams. Once that was completed the Revit structural and architectural files were then linked in order to label information and enable the export of information from the model. It was important to make sure that the correct information was labeled for the beams, columns, slabs, walls and foundation. In order to make sure the information was accurate, the element in the Revit file was selected and its properties were viewed as shown in Figure 39. If the information was incorrect under the “Properties” palette, then changes were made.

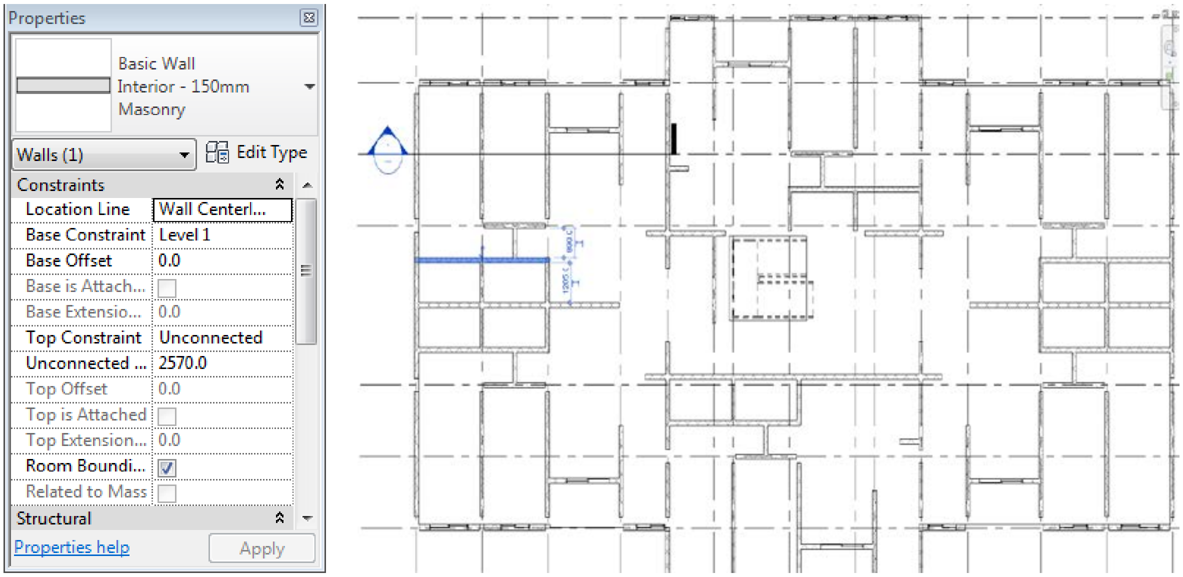


Figure 39 Properties Palette

Once the structural and architectural files were linked, and the key information was labeled, a schedule quantity take-off was conducted for input to the cost calculations. Below are the steps that were taken in order to conduct a quantity take off schedule in Revit.

STEP #1

To begin, the “View” tab on the top of the work screen was selected, then on the right hand corner the “Schedules” function was selected, and under the tab the “Material Takeoff” was selected. Figure 40 is a representation of the first step in setting up a Material Takeoff Schedule in Revit.

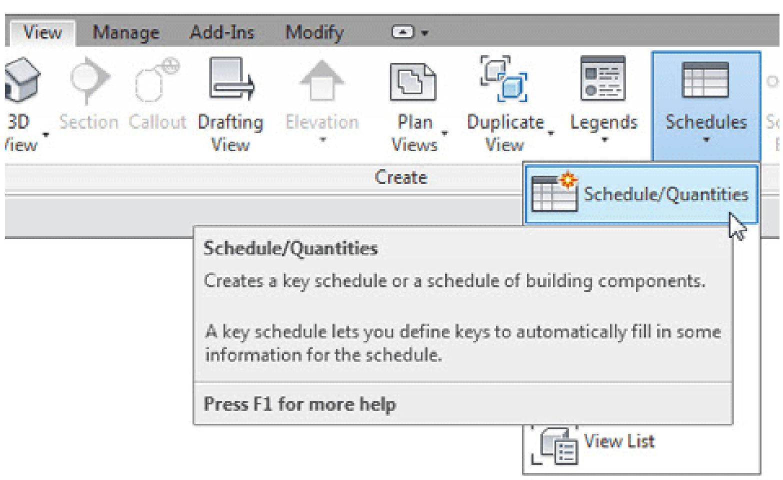


Figure 40 Revit Quantity Take off Tool

STEP #2

Next, after the "New Material Take-off" dialog box is shown, a field must be selected under the category section. This was done for the beams, columns, slabs, foundations and walls. Figure 41 shows this step.

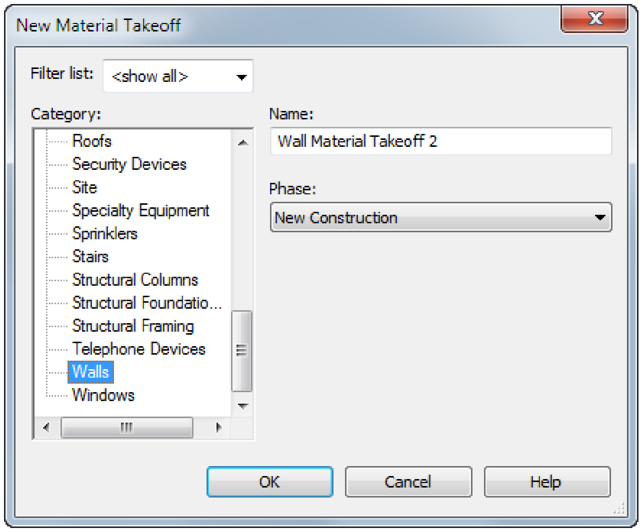


Figure 41 Category Section Palette

STEP #3

Then, under the "Available fields" menu, all the fields that contain important information were selected. Figure 42 shows the types of information that was needed such as the material name, area, volume, family and type, and cost.

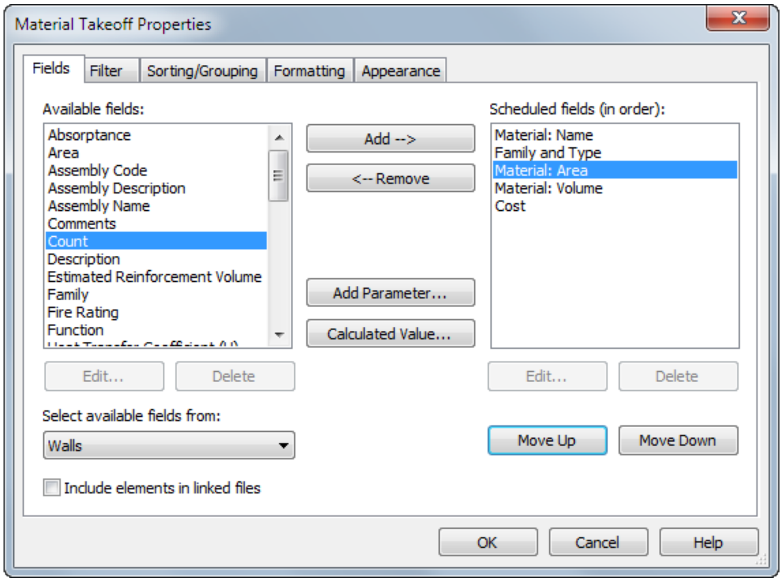


Figure 42 Material Takeoff Properties

STEP #4

After clicking "OK", a table must appear that shows the content of the model, grouped with the criteria that were selected with the corresponding descriptions. Figure 43 below shows a part of quantity take off wall schedule with all the information that was later exported into EXCEL.

Schedule: Wall Material Takeoff - 0B0Da3JDfMu0hOXRTNIBsekoxcE0?e=download

Wall Material Takeoff

Family and Type	Material: Name	Material: Area	Material: Volume	Material: Cost
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.56	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.59	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.35	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.39	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.35	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.41	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.40	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.40	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.36	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.36	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.68	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.39	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.39	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.36	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.36	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.56	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.59	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.35	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.39	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	10	1.35	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.41	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.60	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	4	0.55	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	3	0.40	0.00
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	5	0.69	0.00

Figure 43 Schedule of Material Takeoff

After the quantity take offs were completed for all the walls, beams, columns, foundations, and slabs, the information was then exported into EXCEL where the total costs were calculated and compared with a structural masonry design.

3.6.2 Material Cost Comparison

At this point the information had already been extracted from the Revit file and imported into an EXCEL file. A cost reference was obtained by Milena, and Table 7 shows the unit cost data that was used to compile the total costs of materials for this design.

Table 7 Components Costs

Description	Material's	Cost ($)	Unit
REBAR	Material	$2.70	kg
	Labor	$1.70	kg
	Cut & Bent	$0.40	kg
CONCRETE	Labor	$400.00	m^3
	Material	$230.00	m^3
	Pumping	$40.00	m^3
FORMS	Material	$30.00	m^2
SHORING	Material	$10.00	m^2
MORTAR	Material	$220.00	ton
	25kg mortar/m^2 of masonry		
Masonry Blocks 4MPa	Material	$55.00	m^2
	Labor	$35.00	m^2
Exterior Finish: Mortar	Material		
	Labor	$30.00	m^2
Interior Finish: Plaster	Total (Material 60% Labor 40%)	$15.00	m^2
Floor Tiles: Bathrooms/Kitchen	Material	$30.00	m^2
	Labor	$30.00	m^2
Interior mortar before tiles	Material		
	Labor	$18.00	m^2
Flooring:	Material	$30.00	m^2
	Labor	$30.00	m^2

With the cost data of Table 7 it was not only easier to calculate costs but it was also easy to see the differences in price per item. Aside from this table, further research on exterior and interior finishes was undertaken. To understand Brazilian construction methods and to later use as a comparison in prices between Brazil and the U.S. Wall drawings for the masonry construction were collected from Pass Arquitetura in order to establish the cross sections. Due to the lack of information, it was then discussed that further information was needed as to what were the details of a typical interior and exterior wall finishes.

In order to develop an assemblies cost, Brazil details on interior and exterior wall construction were discussed. These details were needed to compare with U.S. construction. Information was also gathered as to the details of the masonry design that was going to be used to make the comparison. Since the masonry design was a nine-story building it was discussed that some adjustments had to be made in order for it to be a reasonable design to compare to the four-story reinforced concrete design. Once all the steps to conducting the cost analysis were completed and information was gathered results were then discussed.

4.0 Results

4.1 Structural Design

After structural analysis was completed and the proper dimensions for the structural elements were defined, a model of the structural framing system was established in Revit. Drawing S.1 is the Foundation Level of this building; it shows the concrete footings and their locations relative to the Grid Lines. Drawing S.2 is the Level 1 plan, and this shows the final columns locations and the foundation slab. In drawing S.3. the beams and girders spans are shown and dimensioned. This drawing also shows the elevator and stair case shafts. The following drawings S.4 and S.5 are North and East elevations. Figure 44 is a depiction of the reinforced concrete structure of the alternative building design. Figure 45 shows how the skeleton of the building will look without any slabs or masonry.

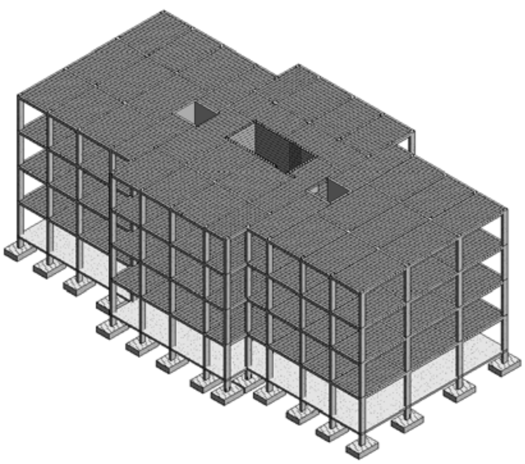


Figure 44 Reinforced Concrete Structural Model

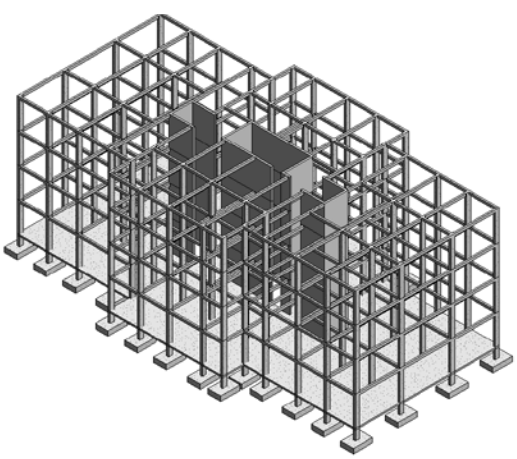


Figure 45 Structre Frame no slab shown

The following drawings showing the reinforced concrete system is a great difference to the structural masonry system. The skeleton of the building is its main support for resistance to loads; whereas; in the structural masonry system the shell of the building carries of the loads. Although concrete blocks were used this overall process of this building it was only used as an enclosure. This difference in systems allows for the use on non-structural masonry blocks which have a lower resistance is has the means of only acting as an exterior barrier.

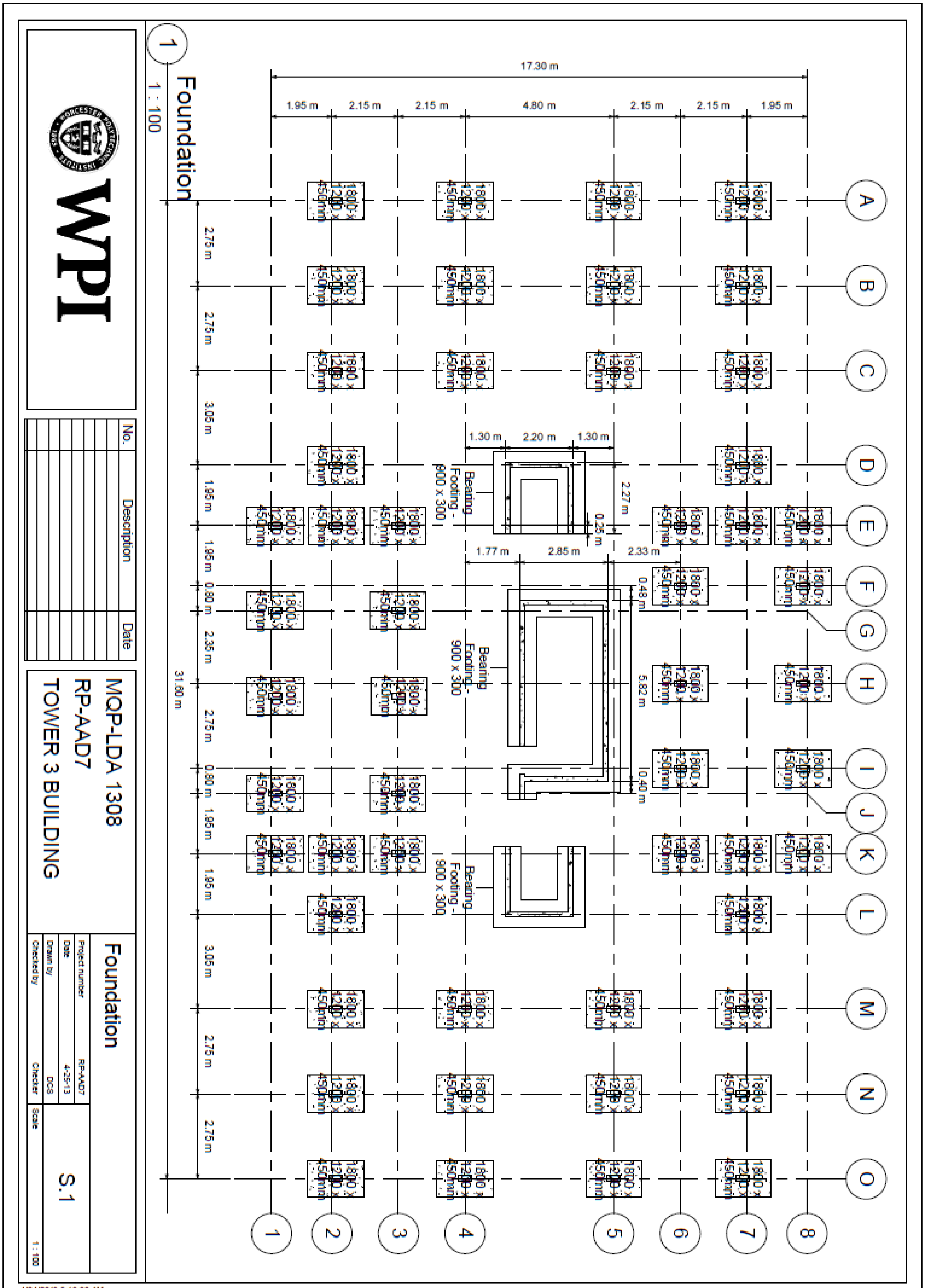


Figure 46 Foundation Footings

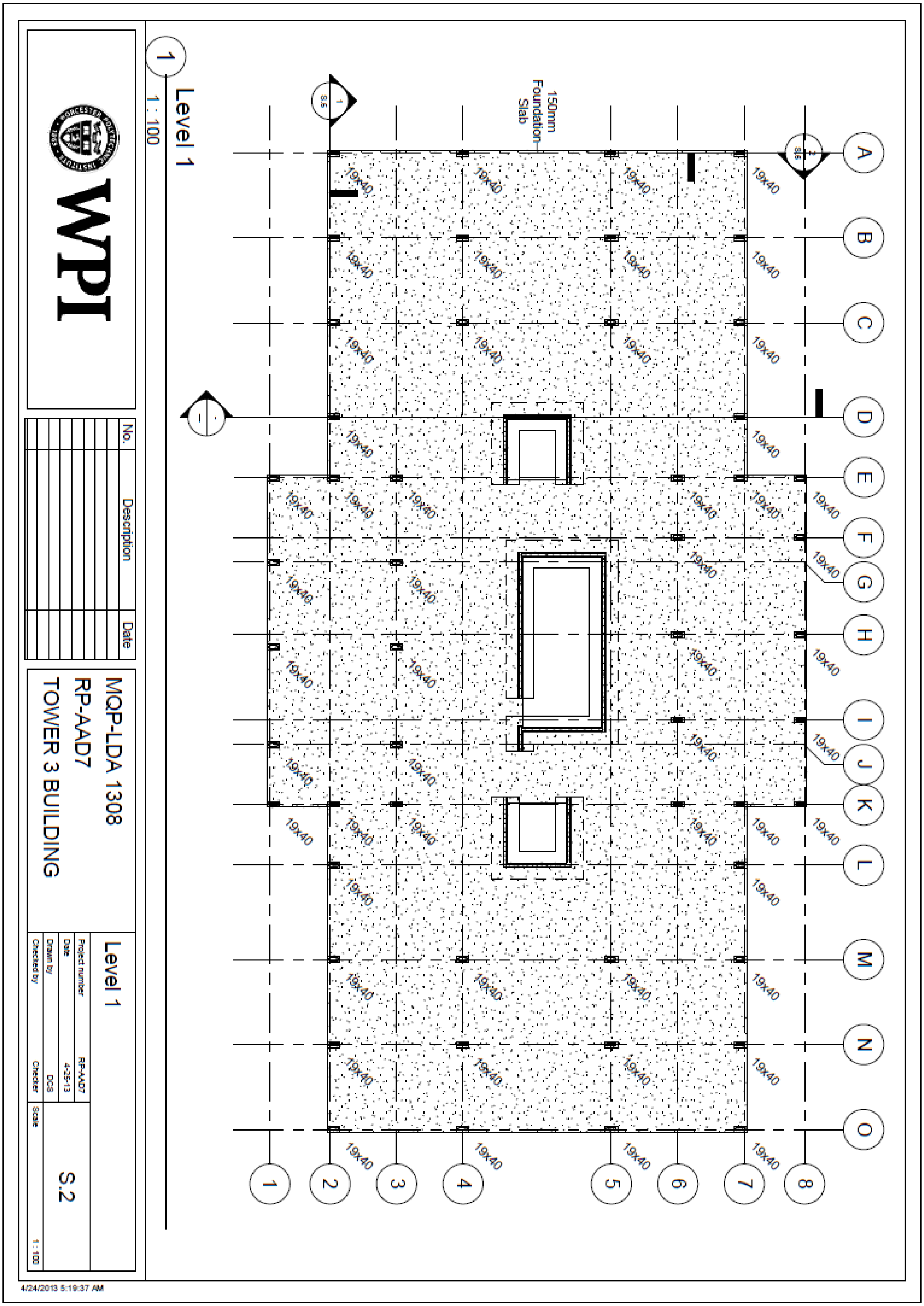


Figure 47 Level 1 Drawing

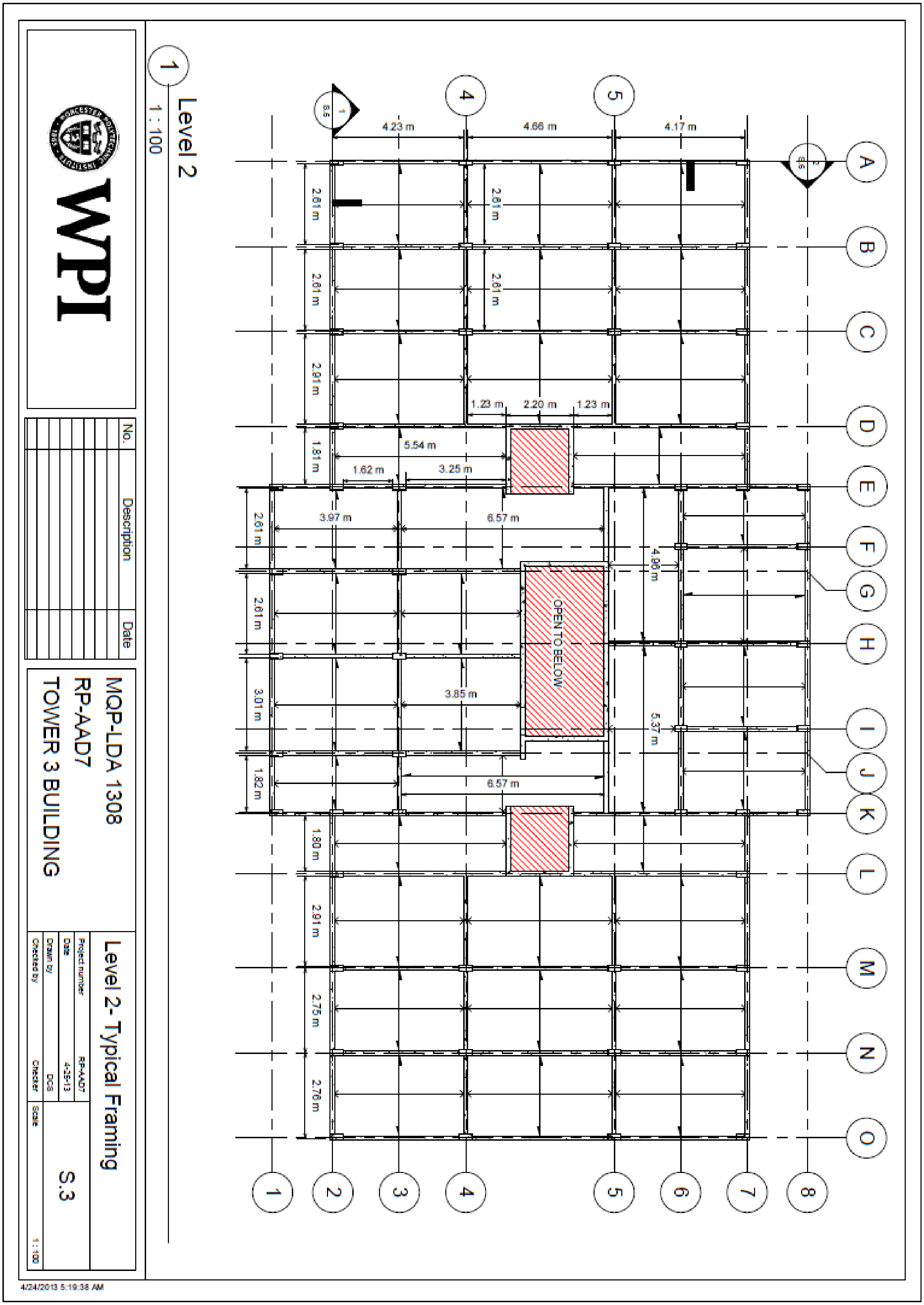


Figure 48 Typical Structural Framing

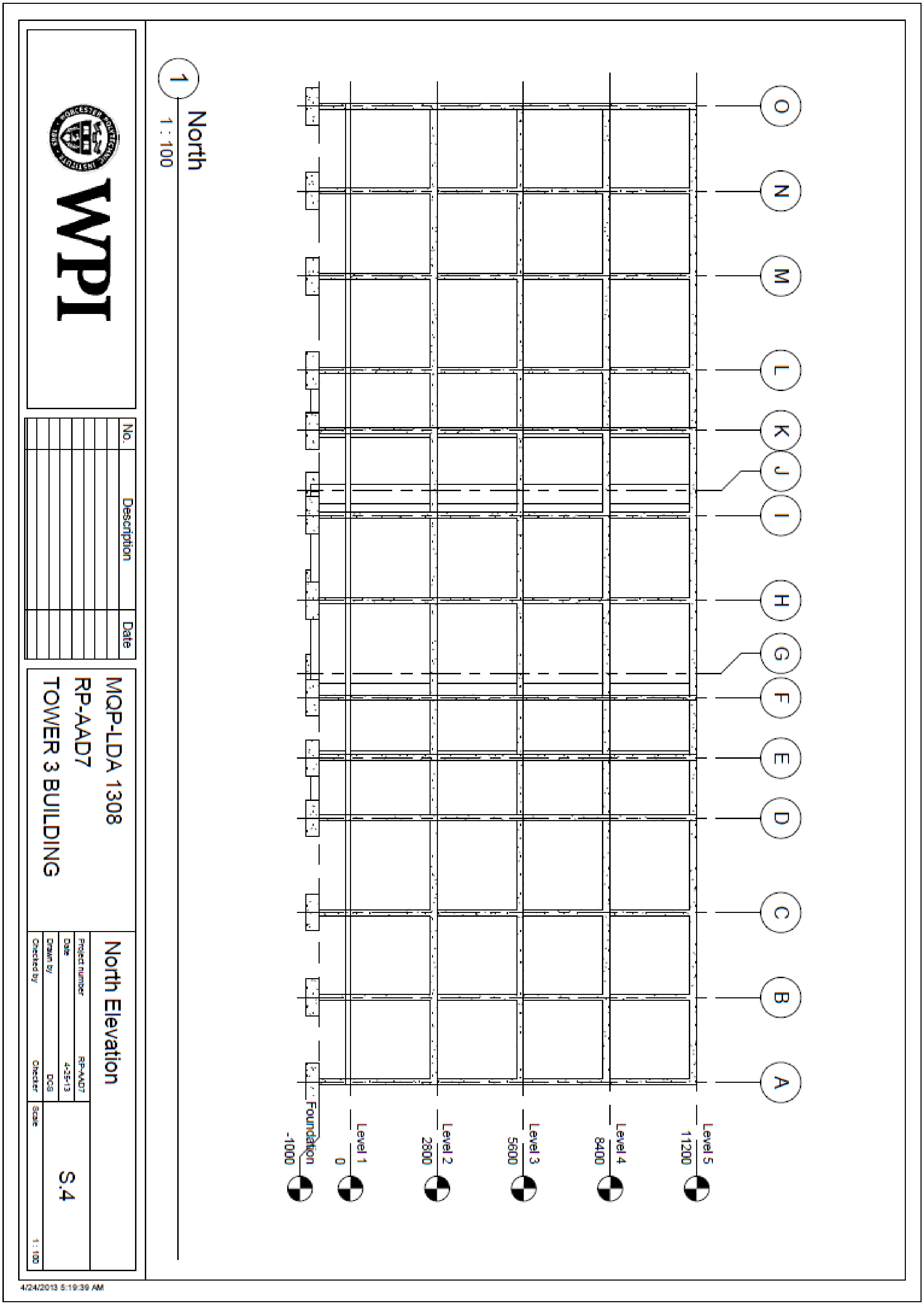


Figure 49 North South Elevation

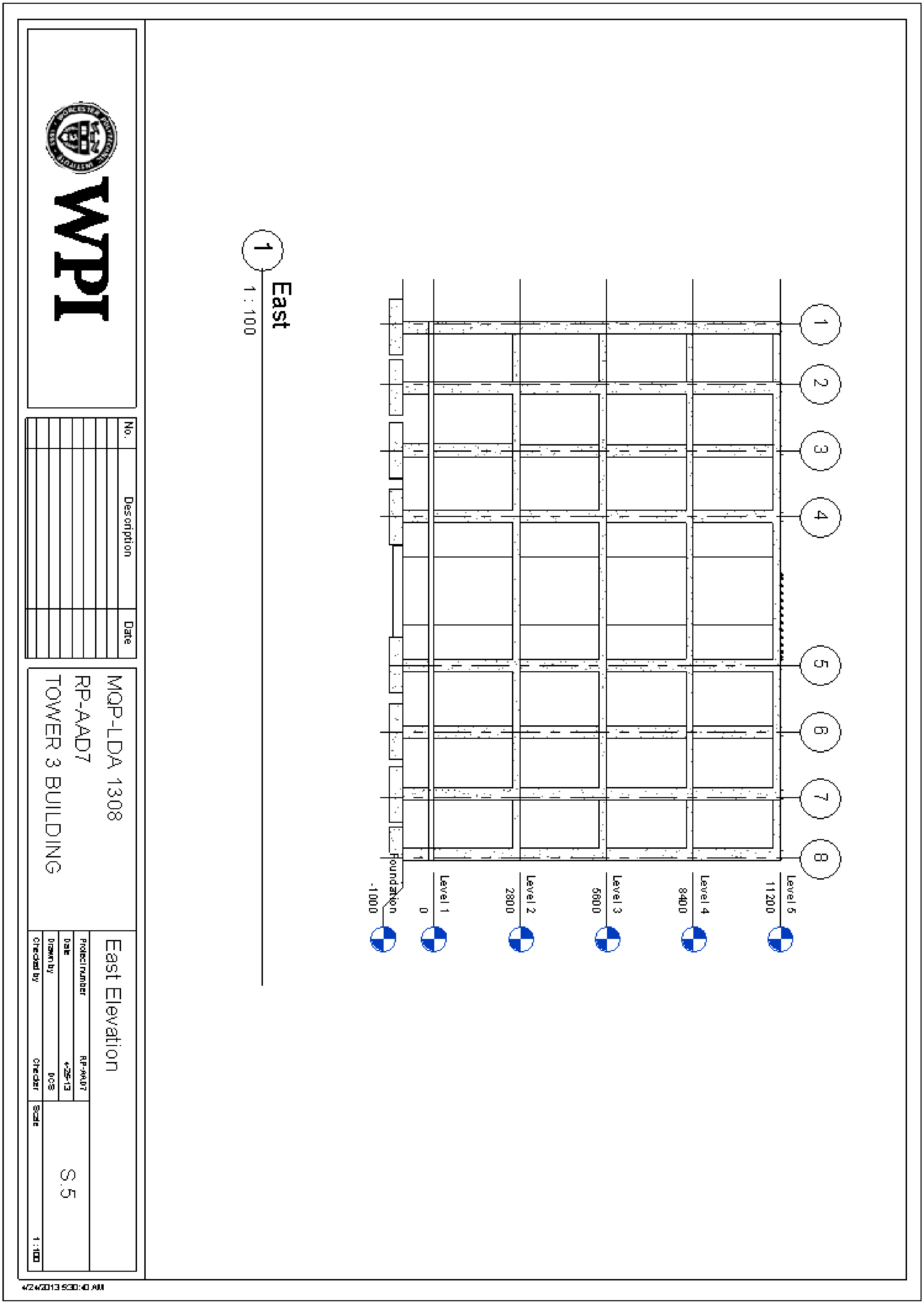


Figure 50 East-West Elevation

4.2 Loads

The table below shows the forces used for this design. The Live Load was distributed across the floor slab from Levels 1 to 4 and the dead load included the self-weight of the floor slabs and structural framing and the weight of wall partitions. The wind load was applied as shown in the Figure 51. Wind loads were applied to the on the East and North face of the building. Critical sections on the building due to wind loads were Grid lines E and 4. This is due to the major load capacity in that part of the building and the transition from the members to the shear walls.

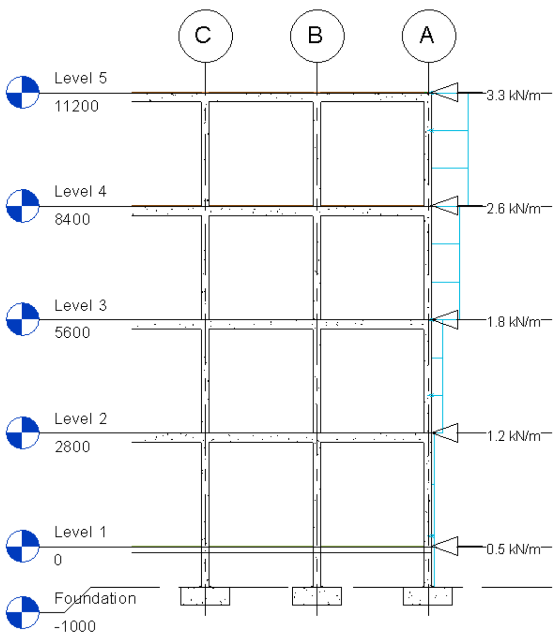


Figure 51 Lateral Loads

Table 8 Gravity Loads

	Name	Nature	Load
1	DL1	Dead	4.65 kN/m
2	LL1	Live	5.5 kN/m

The following Table 9 Resulting Forces shows the extreme values of the reaction forces within the structural members. It shows the maximum and minimum resulting forces acting on the members.

Table 9 Resulting Forces

Symbol	Element	Value	Case
Fx Max	Columns 19x40	854.34 kN	Factored Loads
Fx Min	Columns 19x41	19.94 kN	Factored Loads
Fx Max	Shear Wall 120mm	0.00 kN	Factored Loads
Fx Min	Shear Wall 120mm	0.00 kN	Factored Loads
FZ Max	Spread Footings	854.34 kN	Factored Loads
FZ Min	Spread Footings	0.00 kN	Factored Loads

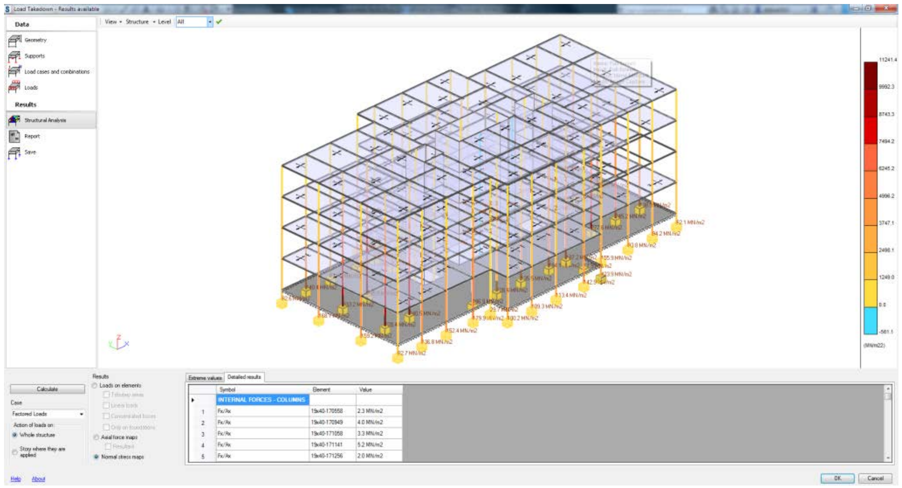


Figure 52Axial Forces

The previous picture shows the axial forces acting on the columns.

The following tables show the extreme results for the Lateral Load Analysis. For this analysis the nodes were assumed pinned in order to allow for deflection analysis. The lateral resistance is provided by the shear walls and so frame action in the girders and columns was not desired. Revit Structural Analysis Extension only supplies a simple frame analysis. For this project the critical frames were analyzed for displacement, forces and reactions. A detailed report of Frame Analysis can be found in the Appendix F and G.

Table 10 Displacements in Structural Members

Symbol	Value	Node	Case
Ux_{min}	-1.21 cm	36	WIND1
Ux_{max}	0.02 cm	36	Factored Loads
Uz_{min}	-0.09 cm	9	WIND1
Uz_{max}	1.21 cm	34	WIND1
$Deflection_{min}$	-0.09 cm	9	WIND1
$Deflection_{max}$	0.10 cm	18	WIND1

Table 11 Internal Forces

Symbol	Value	Node	Case
N_{min}	-6.03 kN	19	Factored Loads
N_{max}	12.32 kN	27	WIND1
Q_{min}	-4.91 kN	1	WIND1

Q_{max}	8.36 kN	18	Factored Loads
M_{min}	-5.35 kN*m	18	WIND1
M_{max}	13.80 kN*m	1	WIND1

Table 12 Reactions Forces

Symbol	Value	Support	Case
Rx_{max}	9.82 kN	1	WIND1
Rx_{min}	0.00 kN	5	Factored Loads
Rz_{max}	19.53 kN	13	Factored Loads
Rz_{min}	-2.72 kN	14	WIND1
Rm_{max}	0.23 kN*m	3	Factored Loads
Rm_{min}	-27.60 kN*m	1	WIND1

The following pictures shows the lateral wind loads applied to the concrete diaphragm section on Grid Line A NS direction, along with the nodal displacement. As mentioned in the lateral load section in the methodology the limit in sway is The next picture shows the reaction forces and the nodal constraints.

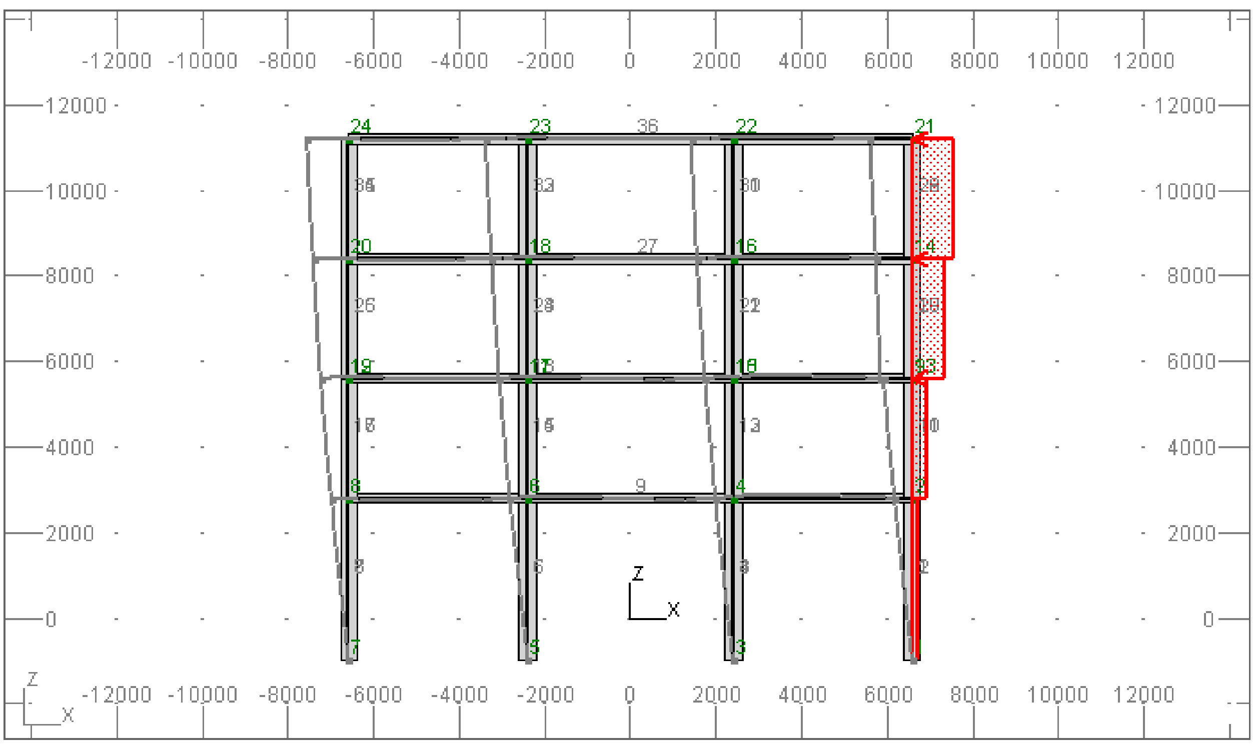


Figure 53 Lateral Forces and Frame Sway

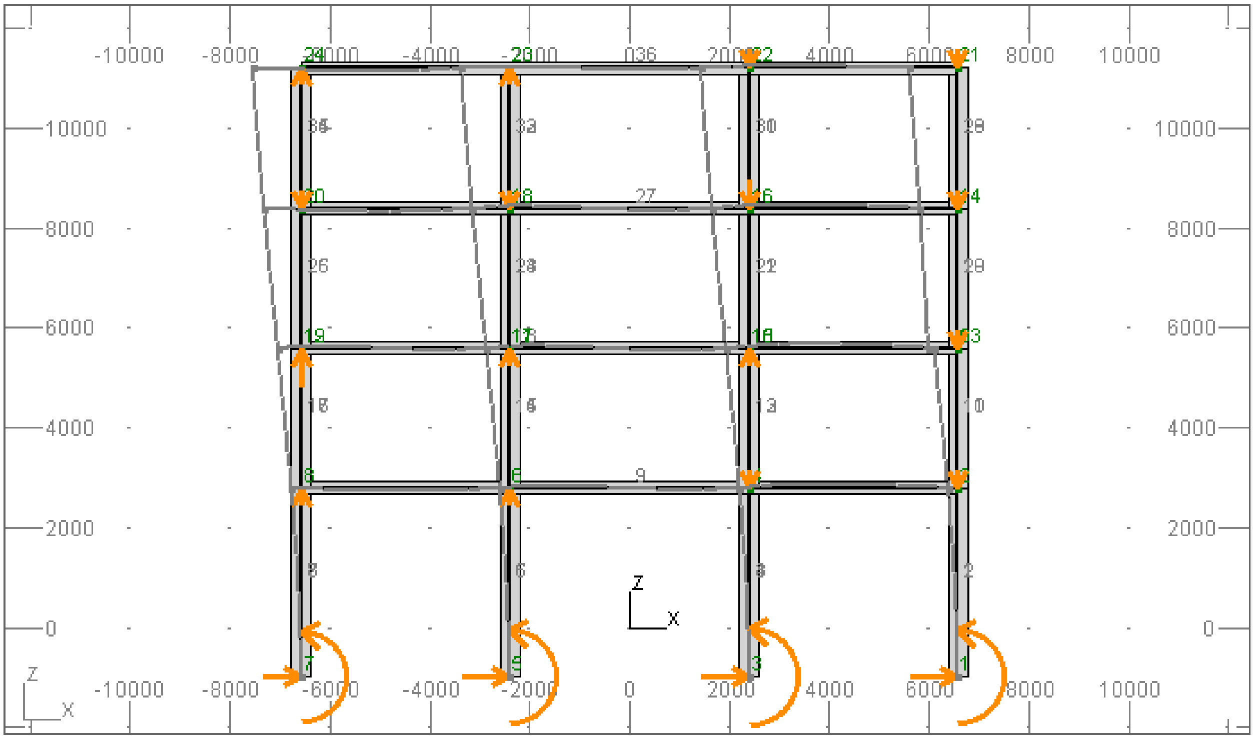


Figure 54 Reactions Forces and Constraints

4.3 Reinforced Concrete Elements

After structural calculations were made the elements dimensions were finalized. This allowed for the final design of the reinforced concrete structure. The following sections describe the overall geometry of the structural framing elements, as well as supply detailed drawing of cross sections and reinforcement. This section also shows the use of Revit Tools to facilitate the structural model design.

4.3.1 Beam

Figure 54 and Figure 55 shows the beam dimensions and reinforcement in a typical span. The beams have 23 cm height and 14 cm width. With the 14 cm width, the beams are integrated into the wall with no extrusions. To simplify the design all beams have the same dimension. The depicted beam is on Grid Line 3 in the EW direction. The stirrups uses for the beams are 10M bars with 135 degrees hook ties in the ends, and the rebar material is set according to ASTM A61. The cover setting is to interior framing of 40 mm. The stirrups are distributed evenly throughout the beam with a spacing of 150 cm. The top and bottom bars are also 10M with an overhang of 150 cm. These drawings were produced with Revit Extension Tool and processed to AutoCAD Structural Detailing.

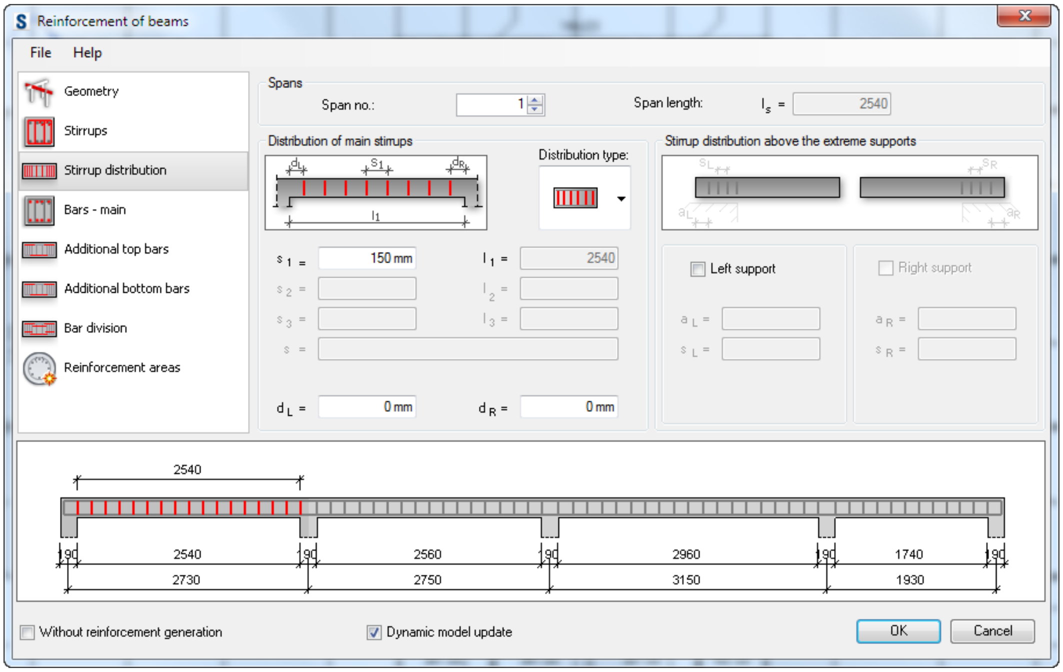


Figure 55 Stirrup Distribution on Revit Model

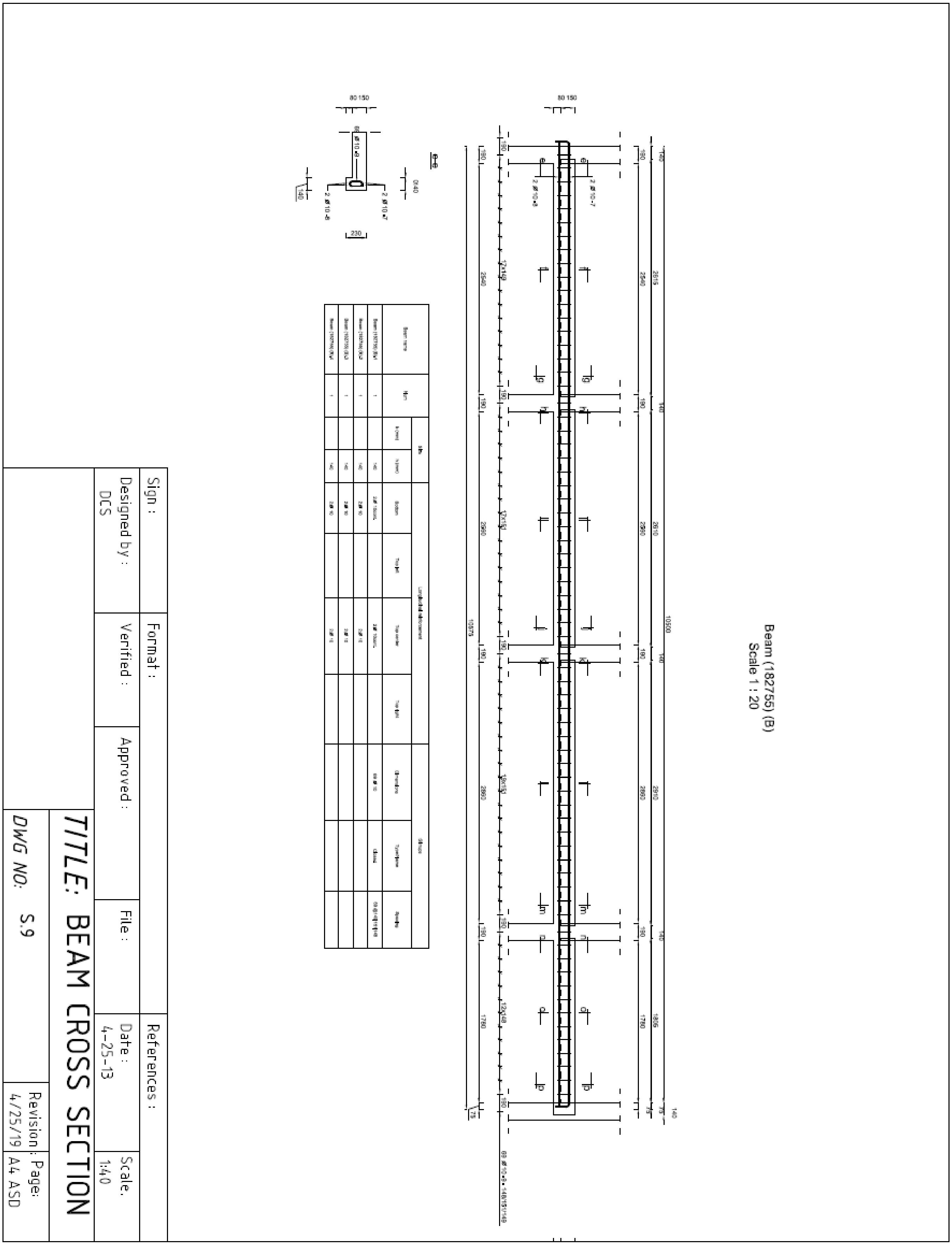


Figure 56 Beam Cross Section

4.3.2 Concrete Columns

Gravity loads were used to establish the design with lateral loads also taken as consideration of the design parameters. To adjust for lateral loads the major axis was oriented in the NS direction because that the face of the building that is subjected to greater wind loads due to the exposed surface area. All exterior columns had a greater stiffness due to a higher reinforcement value of 13M, interior columns had 10M rebar. The columns are integrally connected to the beams through the concrete pouring and the reinforcement into to the columns. In concrete design punching shear is a major factor of failures; in this design due to the incorporation of the NBR Code the columns were over design and therefore more than able to resist the lateral loads.

The column design was under the allowable deflection for a short column. Through the use of simple displacement parameters the calculated deflections are show in Table ____. Figure 57 shows the reinforcements parameters under the Revit Extension Tool. An extended report of the calculations for the concrete columns can be found in Appendix F and G.

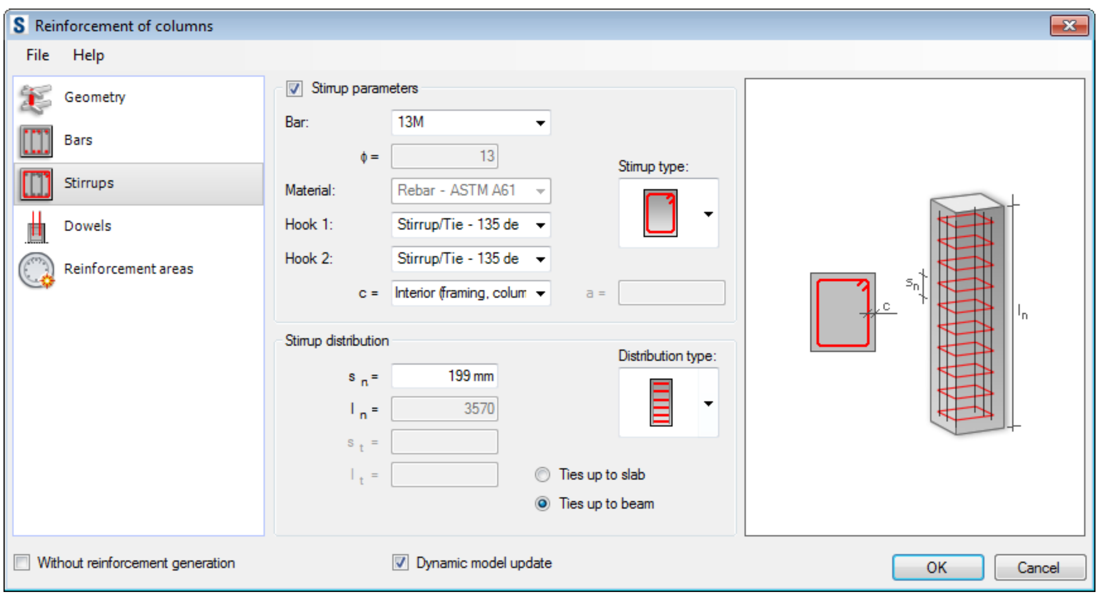


Figure 57 Stirrups in Columns Revit Snapshot

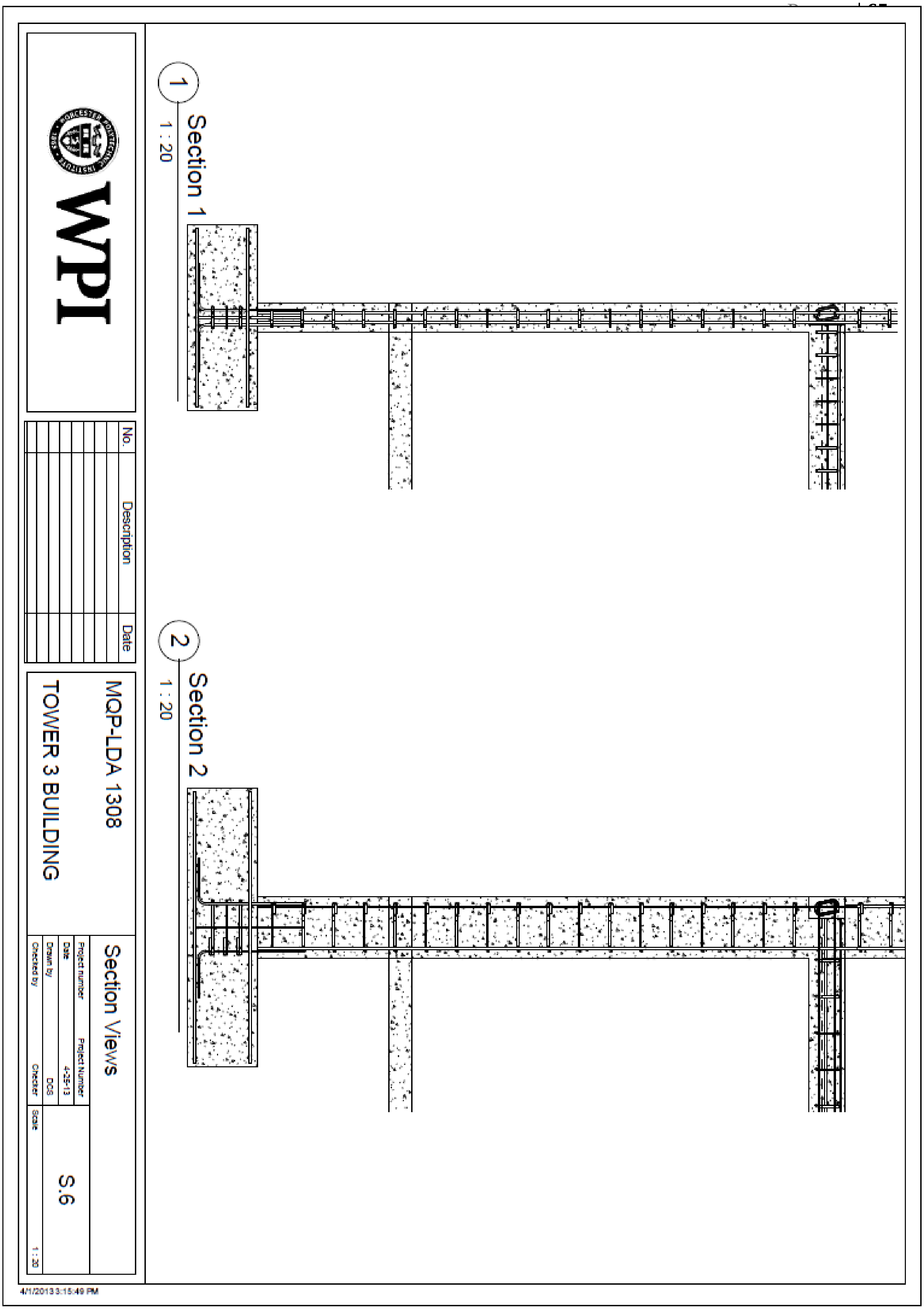


Figure 58 Column Section View

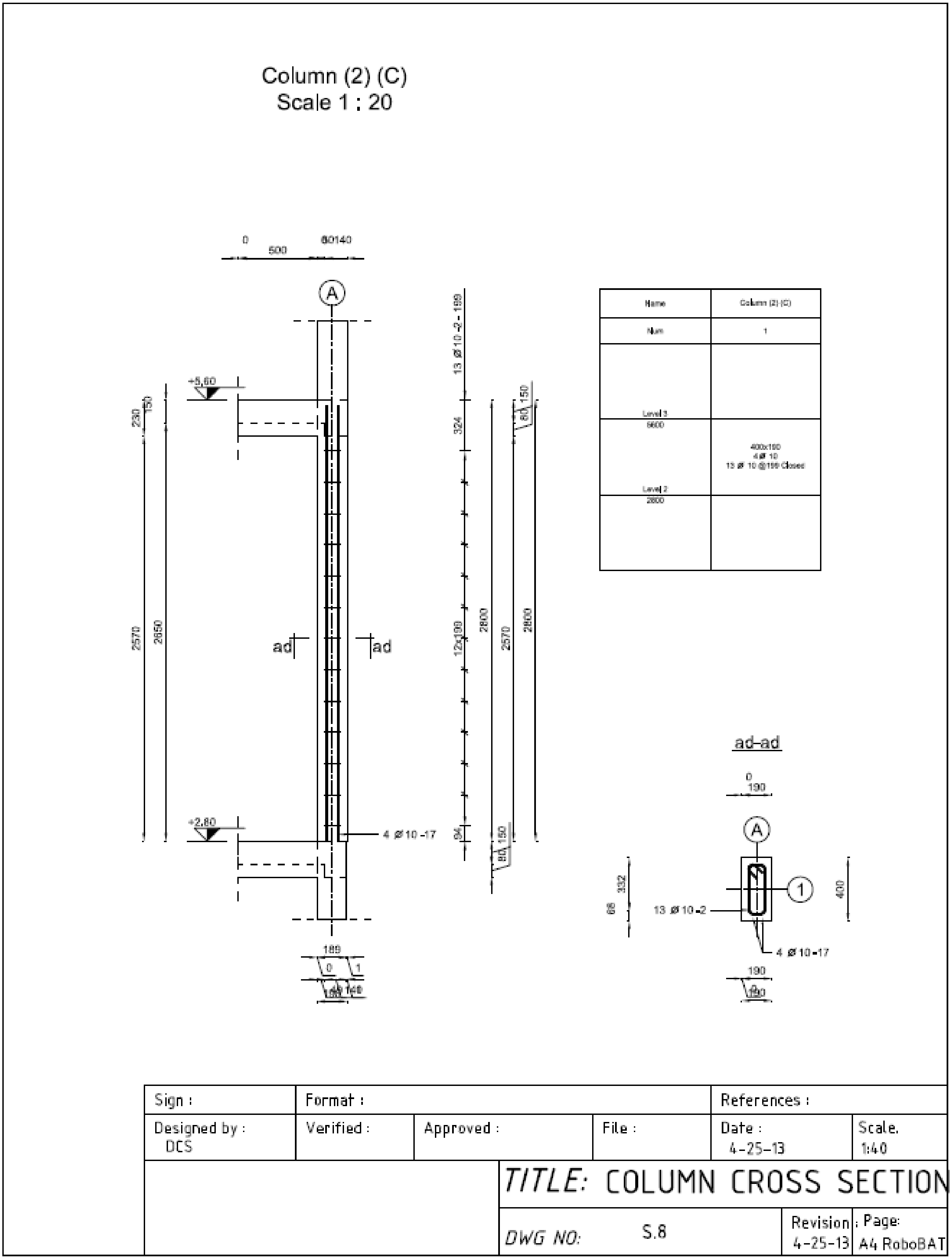


Figure 59 Cross Section

4.3.3 Concrete Slab

The reinforced concrete design produced longer slab spans than the structural masonry system. Due to the difference in design to structural masonry and reinforced concrete in the lengths of the concrete slabs, it was important to take a closer look at the slabs to ensure stability and limit sag. Moments are taken from different sections of the slab, a full report of the moment reactions can be found Appendix H. Although it was calculated to use four 10M bars a greater number was used due to the expansion and contraction of concrete while it is being cured. To quickly design the slab section another tool was used, Figure 61 displays the structural reinforcement area function. Figure 60 shows the rebar reinforcement connection of a typical columns, beams and slabs. The rebar placement can get easily crowed, so it is important to allow for radii bend, human error, and concrete expansion and contraction. Figure 62 Drawing 1 shows a structural plan view of the slab design. Figure 62 Drawing 2 shows the cross sectional views of the first floor with column, beams, and reinforcement.

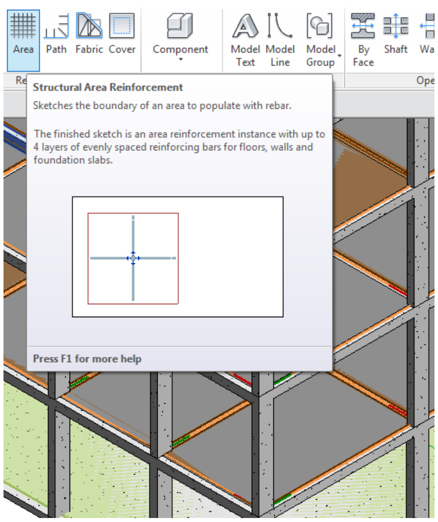


Figure 61 Rebar Connection

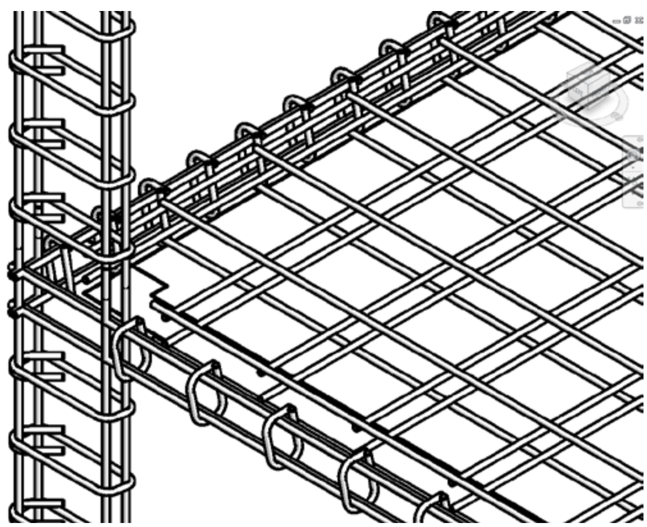


Figure 60 Reinforcement Area

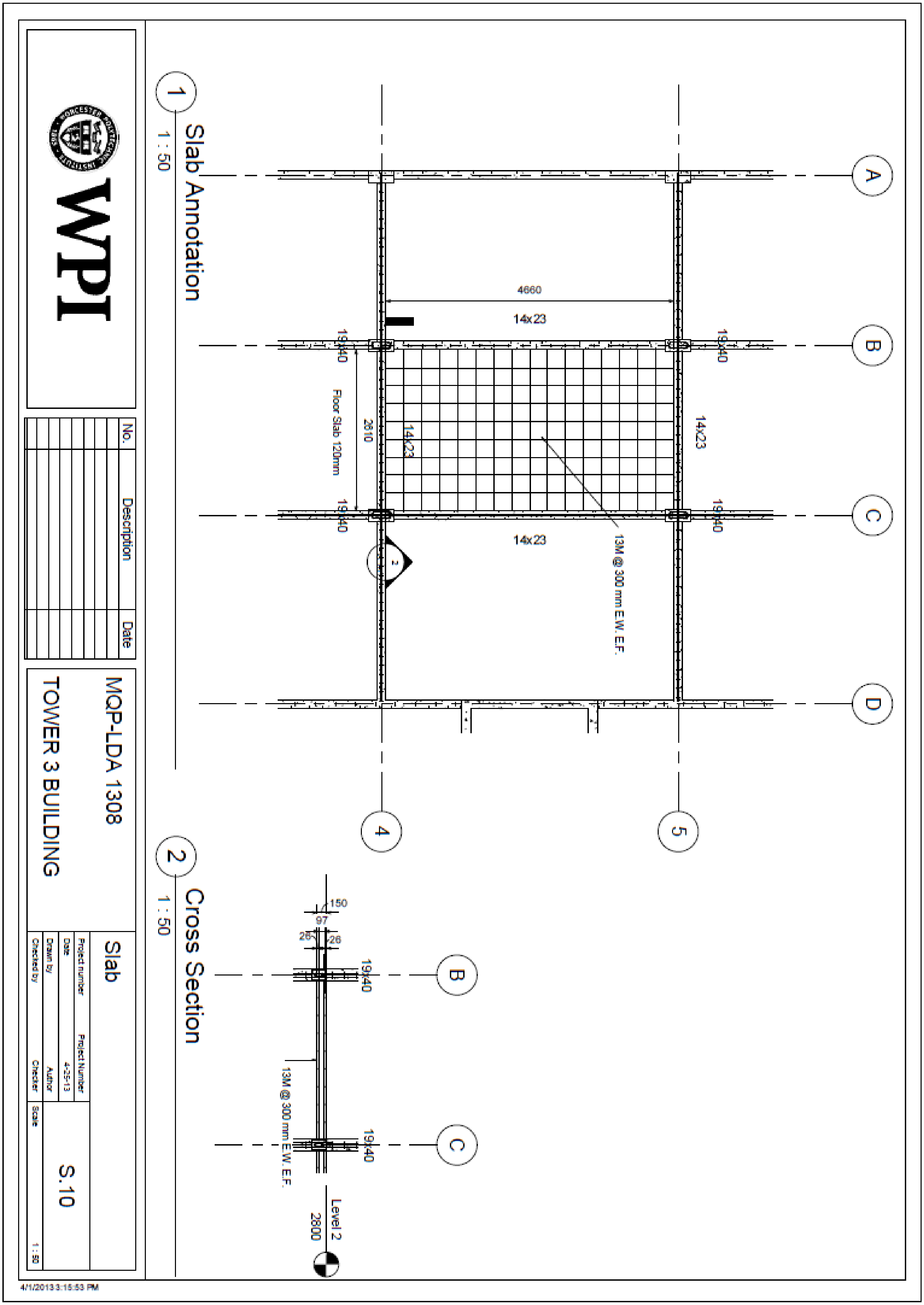


Figure 62 Slab Reinforcement

4.3.4 Shear Wall

As explained in the Methodology, it was not possible to change the dimension of the shear wall to the architectural layout. The lateral loads are transferred through the slab into the shear wall, so it was necessary to stiffen the wall with reinforcement. With the Reinforcement of wall tool the distribution of the rebar placement in the wall is shown in Figure 63. Although vertical bars are mainly needed due to the wind forces horizontal bars assist with the axial reactions as well as provides flexibility to the concrete. To determine the forces applied a separate analysis was done from the structural frame system. The resulting forces were determined and then applied to the wall. Figure 63 and Figure 64 presents the wall on Grid Line G on the NS direction. This same layout distribution is used in the other stair walls and elevator shafts, which all act a shear walls.

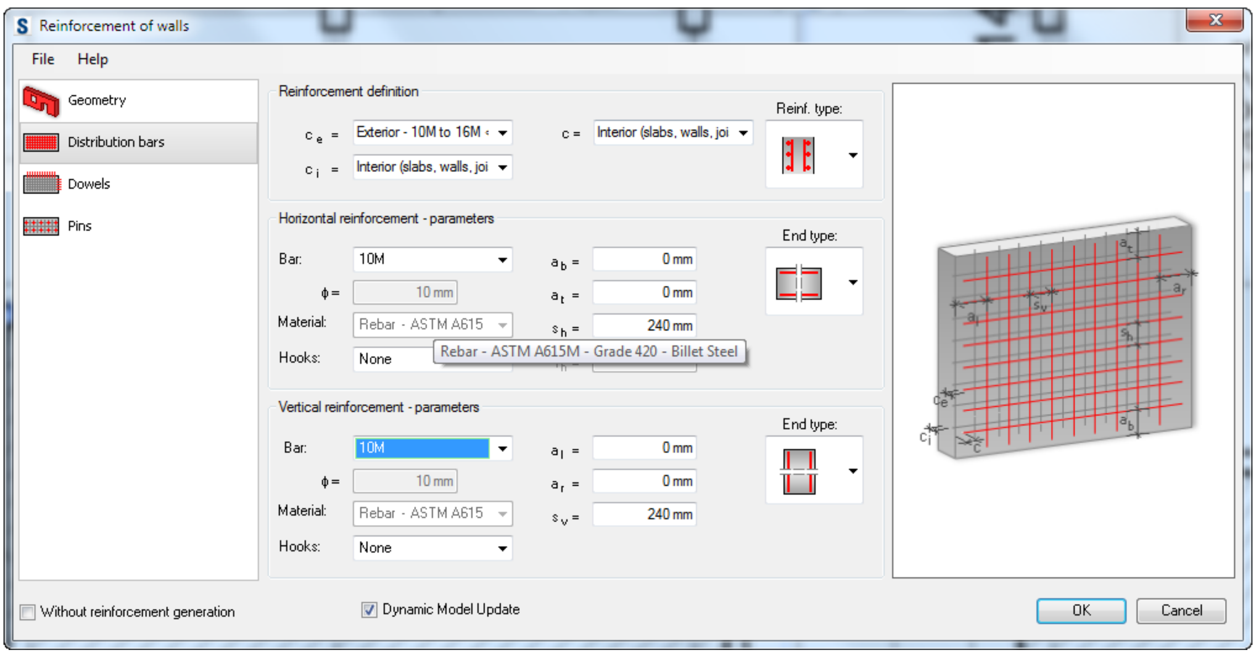
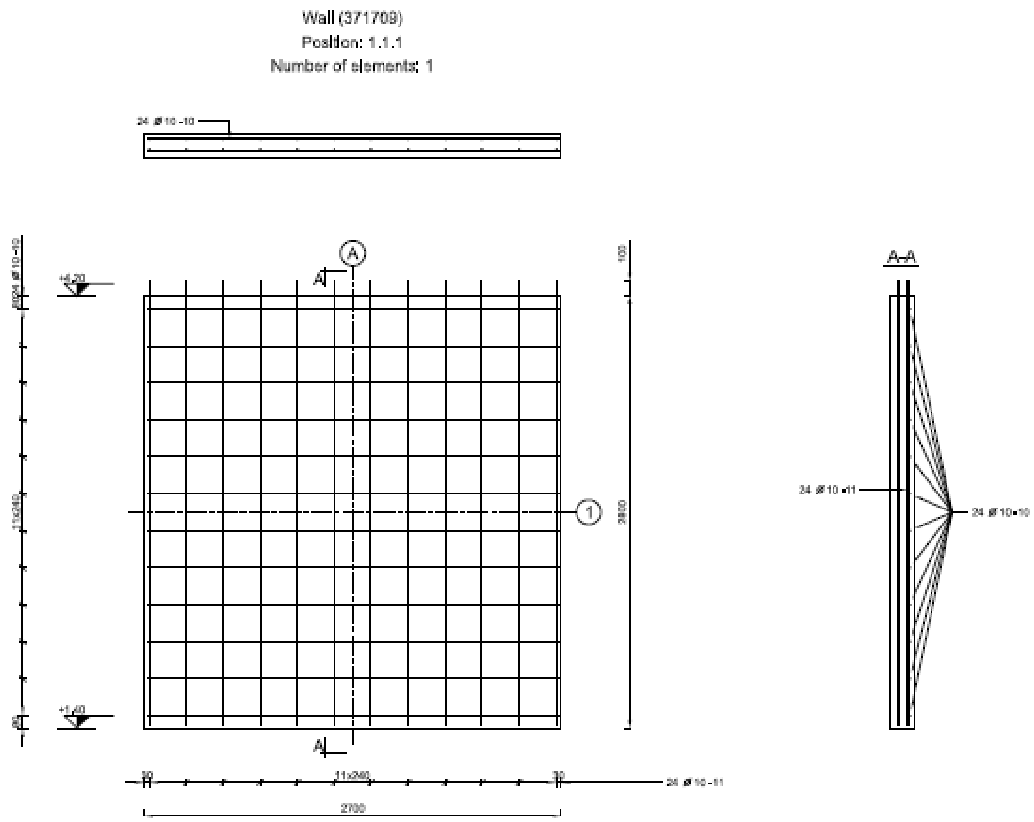


Figure 63 Revit Snapshot of Shear Wall Design



Elements		Position	Diameter	Length (mm)	Number		Total length (mm)	Mass (kg)	Total mass (kg)
Name	Number				In the element	total			
Wall (371709)	1	10	10	2660	24	24	63840	38.75	74,46
		11	10	2880	24	24	69120	35.71	

Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40
			TITLE: WALL CROSS SECTION		
			DWG NO: S.12	Revision : 4-25-13	Page: A4 RoboBAT

Figure 64 Wall Cross Section

4.3.5 Concrete Footing

Due to the lack of information of the specific soil characteristics for the site, the scope of the foundation design was limited to supporting the axial forces transferred to the footing. As simple 180 x 120 x 45 cm concrete footing was used at the base of every column. Reinforcement was determined using the Revit Reinforcement Tool, by analyzing the sizes of the element and proportioning the reinforcement accordingly. This is useful because although a low number of reinforcement may be required in the structural aspect, a greater amount will actually be used for shrinkage issues. In the analytical design it was also important to place fixed connections as a setting for the footings so that the analysis will be performed correctly. Figure 65 and Figure 66 shows the cross section and plan view of the concrete footing with the rebar spacing and sizes.

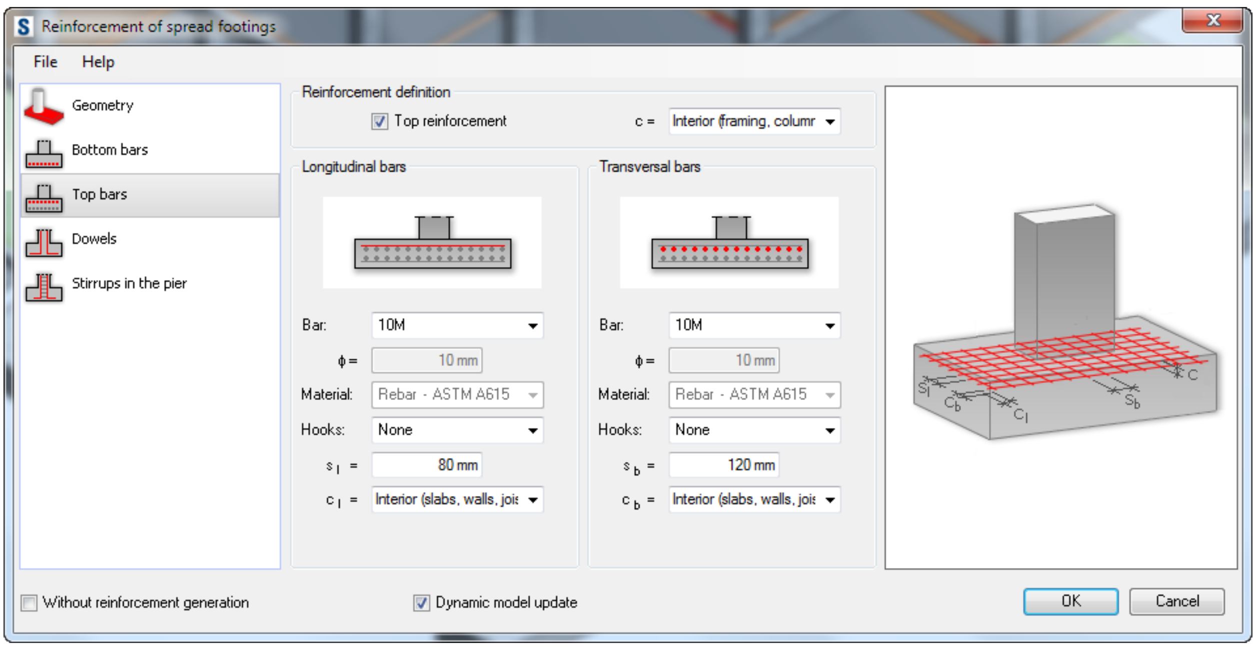
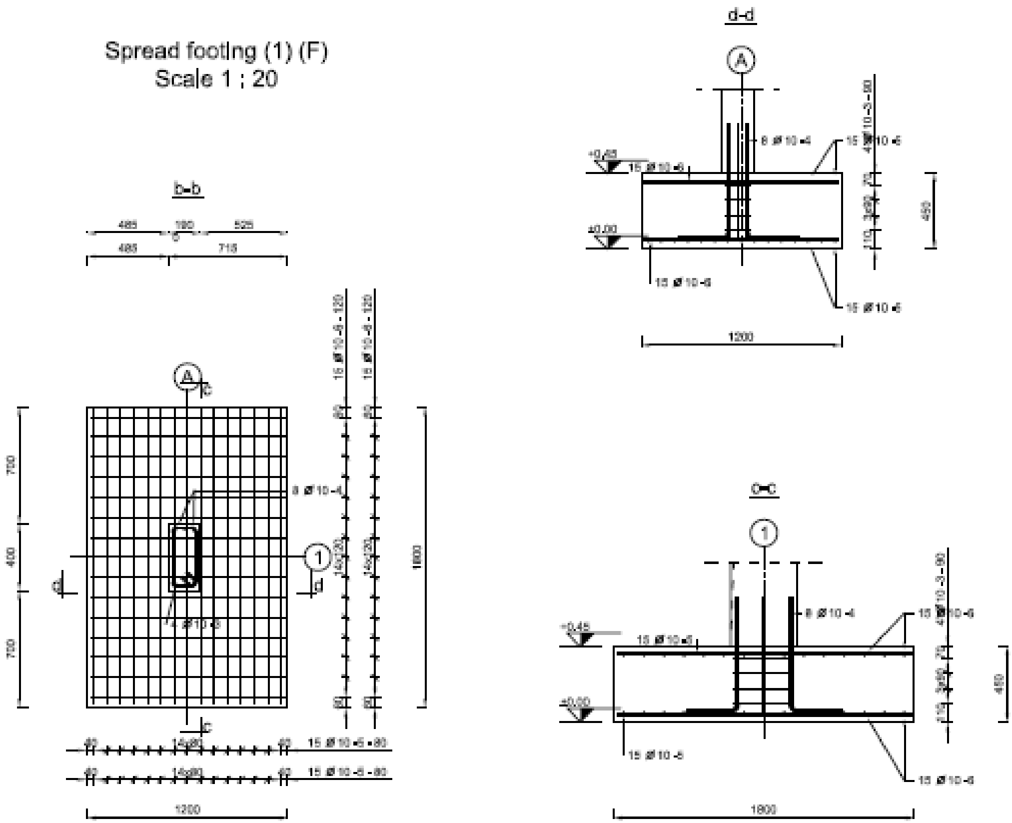


Figure 65 Revit Snapshot of Column Design



Elements		Position	Diameter	Length (mm)	Number		Total length (mm)	Mass (kg)	Total mass (kg)
Name	Number				In the element	total			
Spread footing (1) (F)	1	3	10	1130	4	4	4520	2,53	55,93
		4	10	970	8	8	7760	4,35	
		5	10	1760	30	30	52800	29,57	
		6	10	1160	30	30	34800	19,49	

Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40

TITLE: FOOTING CROSS SECTION

DWG NO: S.7	Revision : 4-25-13	Page: A4 RoboBAT

Figure 66 Footing Cross Section

4.4 Cost Comparison of Concrete and Masonry Technologies

The analysis of the low rise reinforced concrete building structure was completed and compared to the structural masonry system. This analysis was limited to the first four stories of the considered residential building. Each floor, with an area of 472 square meters, consisted of six apartments. Figure 67 shows the floor plan for the reinforced concrete design and Figure 67 show the actual four-story building. Three important technologies were considered in order to conduct a cost comparison of designs: the cast-in-place structure, the non-structural concrete masonry for exterior and interior walls, and exterior and interior wall finishes. Once the cost comparison was completed, recommendations of the most beneficial design to use were developed.

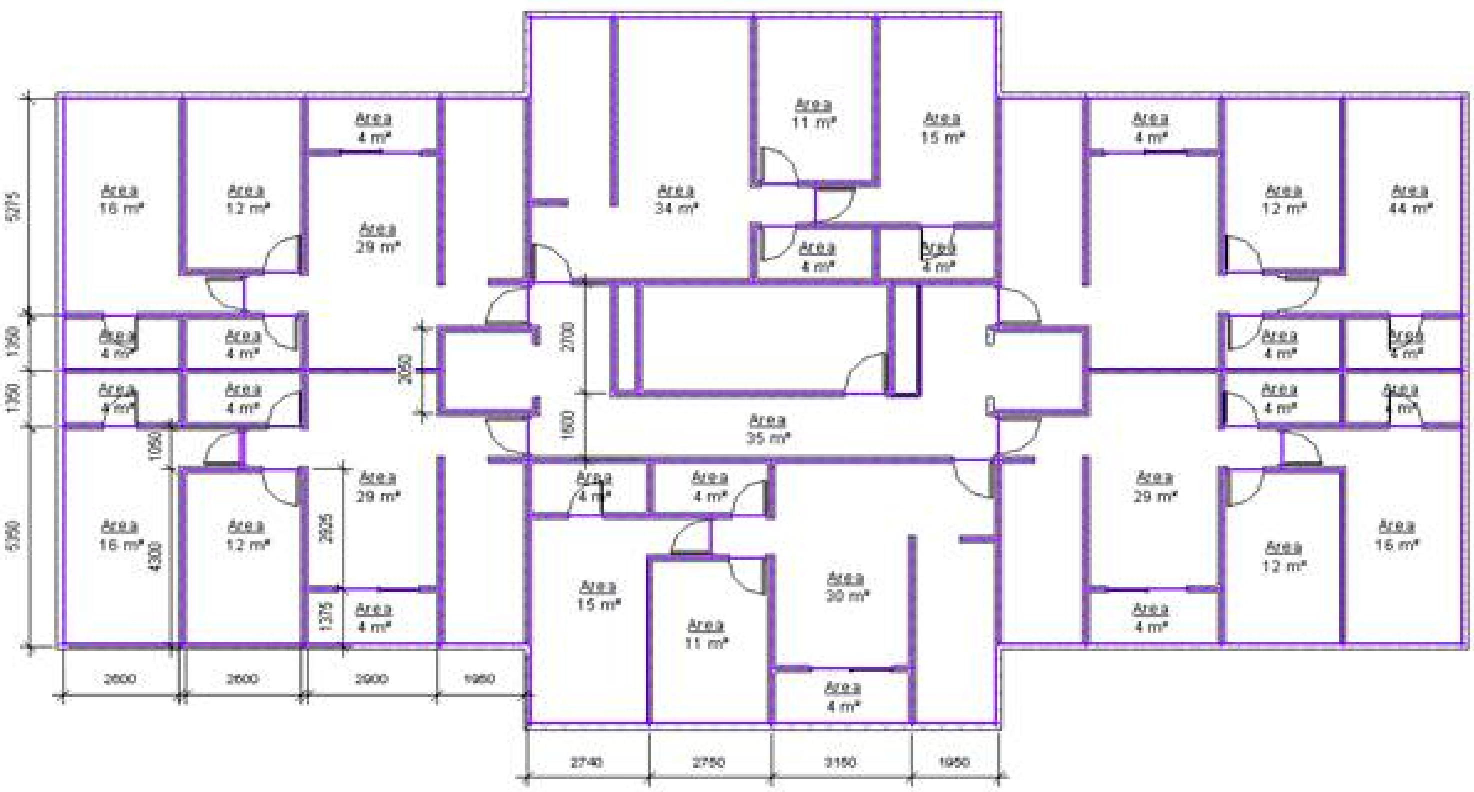


Figure 67 Floor plan for the reinforced concrete design

Figure 68 Reinforced concrete design

4.4.1 Material Quantities

Through the use of Revit, quantity information was extracted and exported into EXCEL files in order to develop the cost estimate. Table 13 shows the quantities sum of concrete related work, exterior and interior walls. The data are limited to the consideration of a single floor. It is assumed that every floor in this building is exactly the same. The quantities of Table 13 were later scaled to the total amount of floors for the cost comparison shown in Table 15. The masonry blocks section contains concrete blocks of the same size (14 x 19 x 39 cm). In the finishes section the quantity of plaster results from the area of interior walls multiplied by two and then added to the total exterior.

Table 13 Summary of quantities per floor

DESCRIPTION	UNITS	QUANT
CONCRETE		
BEAMS	m3	8.65
FLOOR SLAB	m3	48.49
COLUMNS	m3	15.02
SHEAR WALLS	m3	12.30
STRUCTURTE TOTAL	**m3**	**75.81**
REINFORCEMENT		
BEAMS	kg	0.21
FLOOR SLAB	kg	0.02
COLUMNS	kg	0.21
SHEAR WALLS	kg	0.22
TOTAL	**kg**	**5173.15**
FORMS		
FLOOR SLAB	m2	404.04
COLUMNS	m2	1040.00
BEAMS	m2	203.93
SHEAR WALLS	m2	164.22
TOTAL	**m2**	**1812.19**
MASONRY BLOCKS		
INTERIOR MASONRY	m2	460.00
EXTERIOR MASONRY	m2	148.00
TOTAL	**m2**	**608.00**
FINISHES		
INTERIOR PLASTER	m2	1068.00
EXTERIOR MORTAR	m2	148.00
TOTAL	**m2**	**1216.00**

Table 14 shows the total quantities of the foundation that were used in the reinforced concrete design. Under the foundation section the concrete quantity was the sum of the footing and slab for a total of 118.04 m^2. The weight of reinforcement steel was calculated to be 11,241*kg*. The forms of the foundation slab and footing were a total of 815.69 m^2.

Table 14 Foundation Quantities Summary

FOUNDATION		
CONCRETE FOUNDATION		
FOOTING	m3	50.44
CONCRETE FOUNDATION SLAB	m3	67.60

TOTAL		**118.04**
REINFORCE FOUNDATION FOOTING	kg	5306.60
REINFORCE FOUNDATION SLAB	kg	5934.60
TOTAL		**11241.20**
FORMS FOUNDATION FOOTING	m2	365.04
FORMS FOUNDATION SLAB	m2	450.65
TOTAL		**815.69**

4.4.2 Cost comparison of materials

The final cost of the reinforced concrete design of four floors was estimated to be $1.33 million, as shown in Table 15. Table 15 lists the materials, quantities, material costs, labor costs, equipment costs, and the total cost for both the reinforced concrete and structural masonry designs. Table 15 is broken down into five sections (foundation, concrete structure, masonry, interior finishes and exterior finishes). The quantities for all the items in Table 15 were calculated by using the scaled quantities determined in Table 13. In order to calculate the overall cost (balance), quantities were measured and then multiplied by the unit costs of material and labor. The interior masonry used in the structural masonry system does not necessarily mean the interior blocks, it stands for non-structural masonry which are non-load bearing. Note that if an item is not applicable to one of the designs an N/A is shown under that section.

Table 15 Reinforced Concrete and Structural Masonry Cost Estimate

DESCRIPTION	UNIT COST			REINFORCED CONCRETE			STRUCTURAL MASONRY		
	MATERIAL	LABOR	EQUIPMENT	UNIT	QUANT	BALANCE	UNIT	QUANT	BALANCE
FOUNDATION						$ 133,425			$ 35,160
CONCRETE 35 MPA	$ 250.00	$ 400.00	$ 40.00	m3	118.0	$ 81,448			N/A
REINFORCING STEEL	$ 3.10			kg	11,241.2	$ 34,848			N/A
FORMS	$ 21.00			m2	815.7	$ 17,129			N/A
STRIP FOOTING	$ 820.00	$ 400.00					m2	490	$ 5,880.00
FOUNDATION FOOTING	$ 7.75	$ 4.25					m3	54	$ 29,280
CONCRETE STRUCTURE						$ 532,942			$ 260,084
FORMS	$ 21.00			m2	7,248.8	$ 152,224	m2	2,418	$ 50,773
SHORING	$ 10.00			m2	7,248.8	$ 72,488	m2	2,418	$ 24,178
CONCRETE 35 MPA	$ 250.00	$ 400.00	$ 40.00	m3	303.2	$ 209,236	m3	212	$ 146,280
REINFORCING STEEL FOR GENERAL STRUCTURE, CA-50, FOLDED AND BENT	$ 3.10			kg	31,933.8	$ 98,995	kg	12,533	$ 38,853
MASONRY						$ 136,192			$ 385,333
NON-STRUCTURAL MASONRY	$ 30.00	$ 26.00		m2	2,432.0	$ 136,192	m2	467	$ 26,133
STRUCTURAL MASONRY	$ 55.00	$ 35.00				N/A	m2	3,991	$ 359,200
INTERIOR FINISHES						$ 433,698			$ 296,551
COAT OF PLASTER	$ 9.00	$ 6.00		m2	4,272.0	$ 64,080	m2	2,237	$ 33,560
CERAMIC TILES	$ 30.00	$ 30.00		m2	3,198.8	$ 191,928	m2	1,422	$ 85,301
INTERIOR CERAMIC FLOOR TILES	$ 30.00	$ 30.00		m2	1,616.2	$ 96,970	m2	1,616	$ 96,970
FLOORING MILLWORK	$ 5.00	$ 15.00		m2	4,036.0	$ 80,720	m2	4,036	$ 80,720
EXTERIOR FINISHES						$ 71,651			$ 30,070
ROUGH CAST APPLIED TO MASONRY BLOCKS	$ 1.00	$ 3.00		m2	813.6	$ 3,254	m2	530	$ 2,120
ROUGH CAST APPLIED TO REINFORCED CONCRETE STRUCTURE	$ 1.80	$ 1.80		m2	813.6	$ 2,929	m2	25	$ 90
STUCCO COAT OF EXTERNAL WALLS	$ 12.00	$ 30.00		m2	221.6	$ 9,307	m2	530	$ 22,260
DECORATIVE DETAIL		$ 6.00		m	9,360.0	$ 56,160	m	933	$ 5,600
TOTAL						$ 1,307,907			$ 1,007,199

In the foundation section, the labor cost for concrete includes the labor for forms and reinforcement. In the concrete structure section, the equipment price includes the concrete pump service. Under the masonry section, the reinforced concrete design only used non-structural masonry of 4 MPa. Structural masonry was not considered in the reinforced concrete design, due to this reason an N/A is placed under that section. Now in the interior finishes, the coat of plaster was calculated by summing the surface area of the interior walls and multiplying by four. The interior ceramic floor was determined by using the total area of floors. Interior ceramic floor tiles were used in both designs (reinforced concrete and structural masonry) as a cooling system for the entire floors, for this reason the quantities for both designs are the same. The flooring millwork was calculated by calculating the total parameter of every room in each floor and then multiplied by the height. In the exterior finishes section, rough cast for a structural masonry and reinforcement structure design is shown. Roughcast is a mixture of cement, mortar and sand that is applied to interior and or exterior walls. Rolled on roughcast is a mixture of cement and adhesive base made by acrylic, which is applied to the concrete structure. The quantities of roughcast were calculated by multiplying the area of the exterior masonry by four. Rolled on roughcast for reinforced concrete was calculated by using the quantities from the columns and beams. This was calculated this way because the exposure surface area of the concrete structure needed to be found.

The structural masonry design is also shown in Table 16. The total quantities for every item in Table 15 for the structural masonry design were provided by a cost estimator. The pre-cast slabs were accounted for in this design under the Concrete Structure Section. For the masonry section, the structural masonry design uses masonry blocks of both 6Mpa (for exteriors) and 4Mpa (for interior). Also note that the masonry section does not show any data about grout and steel reinforcement that is used only in the structural masonry design.

Once both design costs were obtained, costs of both the reinforced concrete and the structural masonry design were compared. Note that the description on how all these elements were calculated and how they affected the cost will further be explained in histograms 21-26. All the information in this table is a mirror of the reinforced concrete design, but the differences in total costs of each used material are notable.

4.5 Cost Comparison of Considered Technologies

In this section a series of histograms will present the resulting cost comparison between the actual and alternative design. The figures will be divided by different sections of importance as shown from Table 16. By using the data of Table 16 a series of pair wise cost histograms were developed for each considered categories of work. The histograms show that the foundation, concrete structure, interior and exterior finishes is more expensive in the reinforced concrete design alternative. As shown in Figure 69, the foundation cost comprises the cost of concrete, reinforced steel, and forms. Figure 69 shows that, the cost of foundation in reinforced concrete structure is 73% higher than that of the structural masonry alternative.

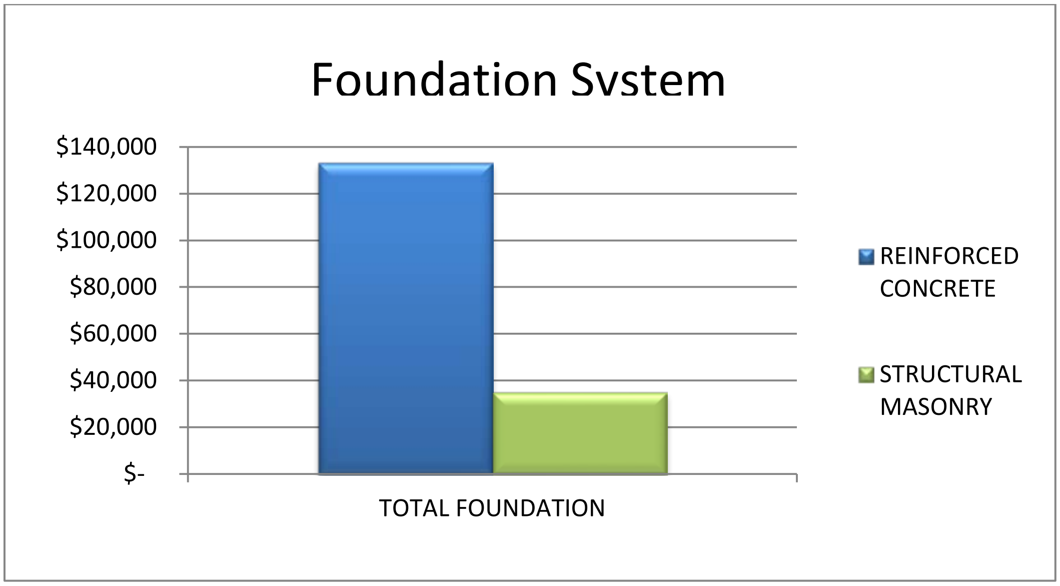


Figure 69 Cost of foundation according to the two design alternatives

The concrete work in Figure 70 includes forms, shoring, concrete and reinforcing steel. Figure 70 demonstrates that the total cost of the concrete in the reinforced concrete structure is 50% higher than that of the structural masonry. One reason why the cost is higher in the reinforced design is because this system uses more concrete than the structural masonry system. The structural masonry system uses concrete for the slabs and foundation. Another reason is that the higher the increased in stiffness of the concrete structure the higher the cost, therefore making the reinforced concrete structure more expensive.

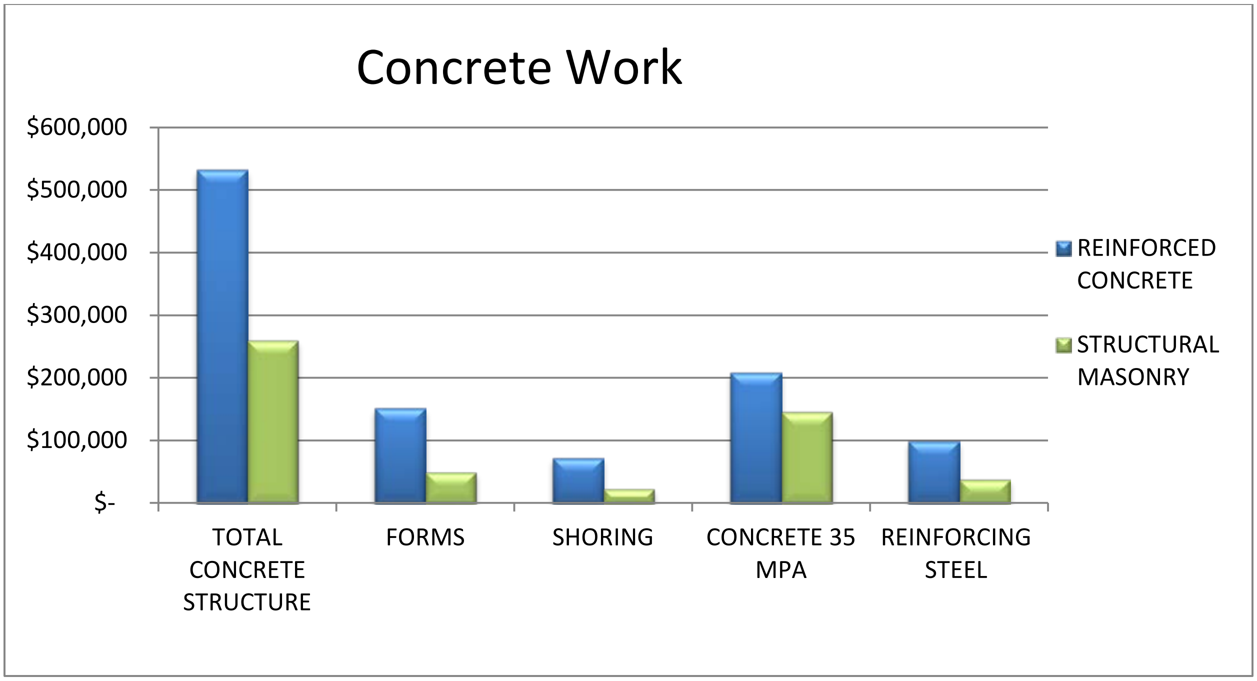


Figure 70 Cost of concrete work according to the two design alternatives

As shown in Figure 71, demonstrates that the total cost of the structural masonry design is 75% higher in masonry than that of the reinforced concrete. For the reinforced concrete system non load bearing concrete masonry blocks are used in all of the enclosures and wall partitions.. In the structural masonry system there is greater amount of structural masonry than non-structural masonry, which explains the reason why the cost is higher. The structural masonry design uses both 6MPa and 4MPa blocks opposed to the reinforced concrete design that uses a 4MPa block. The histogram is comparing structural masonry against non-structural masonry which has a difference in resistance factors.

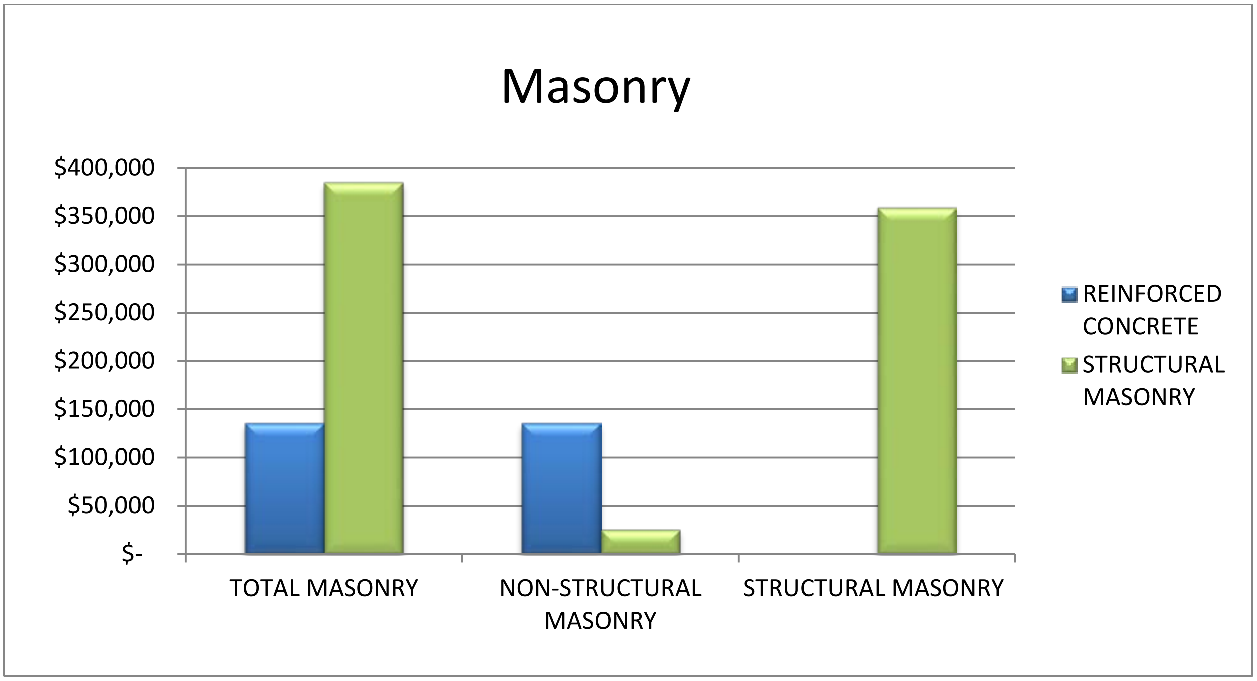


Figure 71 Cost of masonry according to the two design alternatives

The interior finishes as shown in Figure 72 consisted of the total cost of coat of plaster, ceramic coating, interior ceramic floor, and flooring millwork. The histogram shows that the coat of plaster cost is higher by 47% in the reinforced concrete design than that of the structural masonry. The ceramic coating was calculated by taking the surface area of all the bathrooms and kitchen areas. Interior ceramic floor tiles were used in both designs; therefore the quantities for both designs are the same. This explains why there is no percentage difference under this section for both designs. Once again there is no difference in cost for the flooring millwork since the price and parameters are both the same.

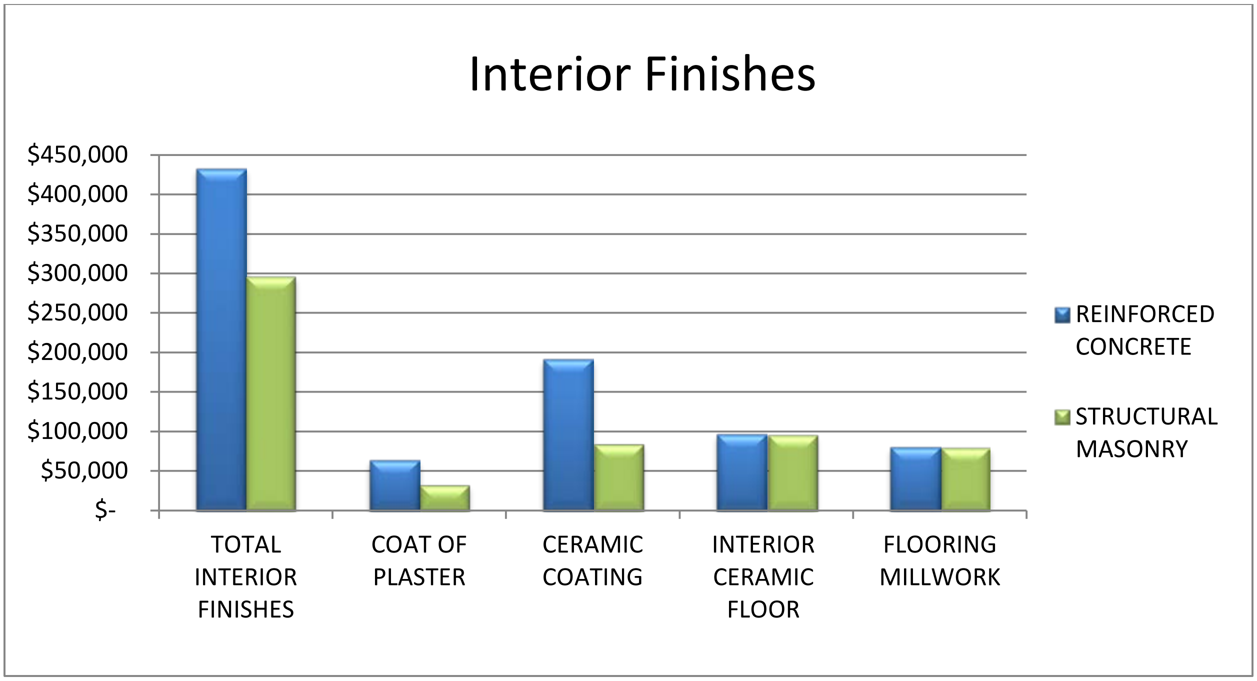


Figure 72 Cost of interior finishes according to the two design alternatives

Figure 73 shows the differences in cost for exterior finishes. The exterior finishes consist of the coat for external walls, roughcast, and decorative detail. The histogram shows that the coat of external walls cost is 35% higher cost in the reinforced concrete than that of the structural masonry design. The roughcast applied on the concrete structure has a 94% cost difference between designs. The reason for this is that the masonry design has less surface area of concrete structure to be applied than that of the reinforced concrete design. The cost of the decorative detail (in the reinforced concrete design) is 90% higher than that of the masonry concrete design. The reason for this is because there is a higher quantity in the reinforced concrete. Figure 74 is a graph of the cost comparison between the structural masonry and the reinforced concrete design.

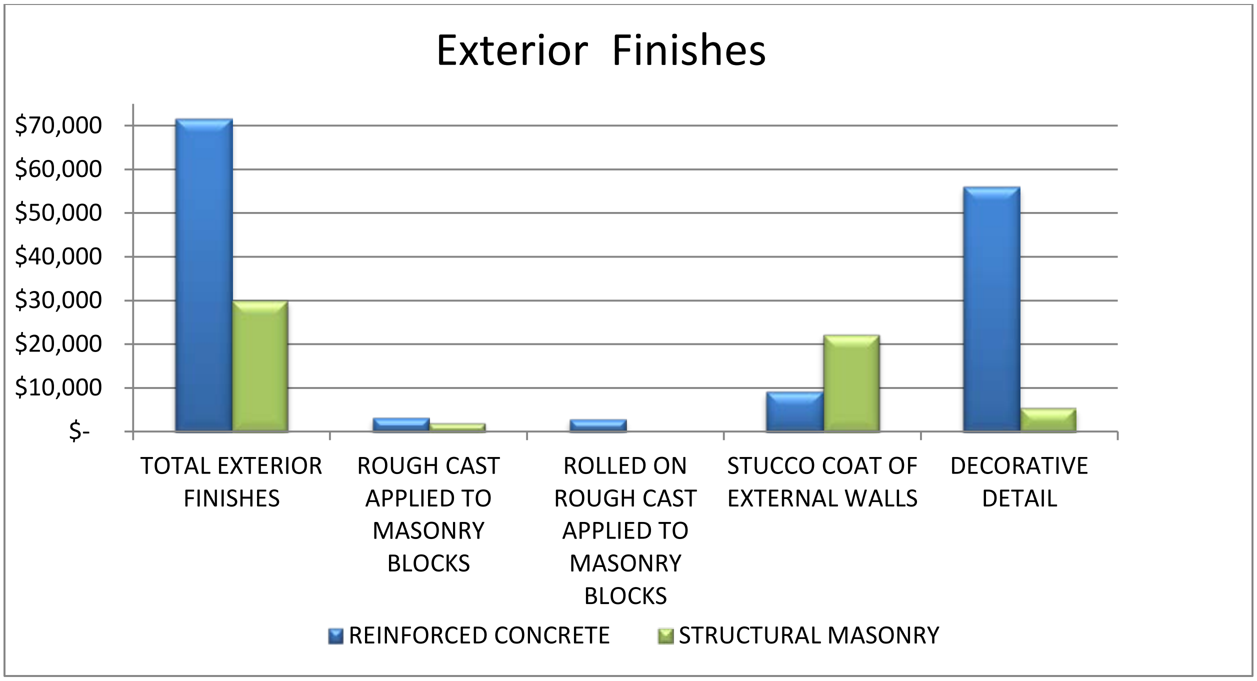


Figure 73 Cost of exterior finishes according to the two design alternatives

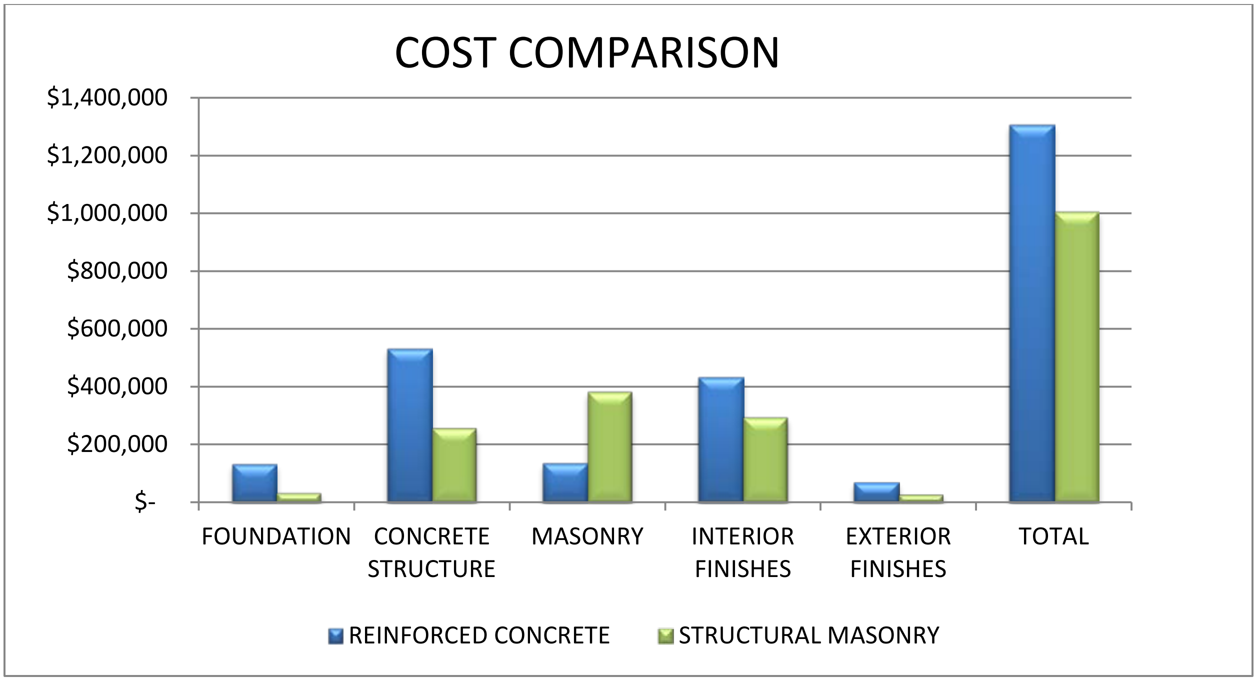


Figure 74 Summary of Cost Comparison

5.0 Conclusion and Recommendations

The objective of the capstone design included the analysis of the reinforced concrete structure. Another objective was to gain a better understanding of the structural behaviors, and present an analytical models and methods of analysis relevant to a multi-story frame building. In the structural design of the building, having the beams run on the long span (on the East West direction) would cause a problem with the beams crossing the living areas. The goal was to keep the architects intent and avoid the interruption of aesthetic appeal such as beams running across the room of citizens living areas. For this reason beams were run in the short span from North to South and girders from East to West. The hand calculations made through *Excel* and the structural model made through *Revit* accomplishes this goal. The structural model provided a basis how the construction technologies should be used in the design.

The important aspect of this capstone design was the examination of construction technology impacts in the super structure of the building. The envelope enclosure commonly used in Brazil of the building played a crucial role in terms of finding an alternative technology system which could be implemented in that region. In order to keep true to the architects' design of the building the objective was to compare the design with the least amount of variables, thereby focusing on the problematic practices which could further be investigated.

The cost comparison showed that the reinforced concrete structure was more expensive than the structural masonry design, therefore making the structural masonry design the best option for Pass Arquitetura to use. While reviewing exterior and interior finishes, a higher cost in the reinforced concrete design was shown. This made an impact on the cost and the reason why the exterior finishes were higher was because the reinforced concrete structure was applied with more decorative detail than the masonry. It was clear that the construction technology differences had an influence in the cost, therefore making the structural masonry design a better choice for Pass Arquitetura to use. If a construction schedule for the amount of days taken to complete one design versus the other would have been produce, then there would have been a more detailed cost comparison.

One example of these common regional practices is the use of non-integrated slab systems where the bottom of the slabs acts as the subgrade for the finish ceiling. Considering a drop ceiling design widely used in America could possibly allow for a wider flexibility in mechanical, electrical, and plumbing and also address an acoustical problem between floors with concrete slabs. The drops ceilings can be used to run conduits without being constrained to a small shaft, whereas with the design used the electrical wires were embedded in the slabs and shafts in order to size to fit the aesthetic appeal. This system can account for the margin of error in quality control in the site and permit a wider range of error.

Another major difference in the construction technology is the use of concrete blocks for the building envelope and interior wall partitions. There are several problems with this mechanism of wall system, which include: added weight, stiffness, acoustics, labor intensiveness and thermal conductivity. In a structural point of view having the added weight of the wall partitions using concrete blocks was a 50% increase to the force per square meter. An alternative system can include gypsum drywall for interior partitions and precast panels for exterior enclosure. Even though drywall is starting to be used in buildings in Brazil, it lacks the “sturdy feel” which is the common pre-assumption that having not solid wall means the building is not safe. Precast panels can be molded for aesthetic appeal: its light weight can address the common social perception of what a building should be.

A future recommendation is to use plastic forms in reinforced concrete construction system. Plastic modular forms can be reused up to 6 times which in turn will save money in the overall cost of the concrete structure. Reinforcing bars are places within the cavity of the formwork panels and can be used for desired wall width of 150 mm (Moladi, 2012).

The major difference between the American Code ACI and the Brazilian Code NBR is the factor of safety. From the structural calculation a conclusion can be made that the Brazilian Code Standard is causes the final building to be 3 times overdesigned. This causes the building to have more reinforcing material and concrete than actually needed compared to American standards. The greater amount of material not only increases the weight of the building but also the final cost. From the discussions with the structural engineer from Auera Engenharia in Brazil, it is inferred that the Brazilian standards are big in mass and overdesign to compensate for quality control in the job site. In Brazil there aren’t as many skillful labors compared to the US, therefore quality control needs to be over sought carefully during the design phase, thus the factor of safety margin is greater. Brazil has not developed the research that the US has in controlled experiments in the construction and the structural market, data is lacking. It is the hope that Brazilian government agencies, who fund the federal university research, can invest more in the infrastructure, so that Brazil can advance into more innovative technologies in the construction industry.

One issue noticed with the construction in Brazil is the emphasis on empirical methods of design. Since structural masonry has been the traditional way of building, this method will continue to be used as a standard and is a more efficient method because of its availability. This way of construction can hinder implementation of new technologies, therefore limiting the market growth to one particular area. Also, there is a major reliance on the project contractor to deliver and perform some functions which an architect would in the US. Contractors tend to drive how the elements are put together as well as choosing the materials, and methods of constructions. Project logistics are a responsibility of the contractor thus removing the greater interaction between parties. This way of practice promotes the reliance on customs; it is only when engineers can synthesize on new technology and encourage new practices that can the industry move towards a diverse market.

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APENDIX A Project Proposal

Brazil Project

Major Qualifying Project Proposal

Prepared by: Deborah Silva, Corey Fisher, Janneth Velazquez

Advisors: Leonard Albano, Roberto Pietroforte

9/10/12

Table of Contents

Introduction

This proposal demonstrates the study of an independent project in Civil Engineering as a Major Qualifying Project. The goal of this project is to provide the company with consultation services as WPI students will work side by side exchanging information. This document features an MQP that will be conducted at a Brazilian office in 2013. The purpose of the document is to show the objective of this off-campus MQP project and to show the types of deliverables that are expected. Students will work with a Pass Arquitetura Company at Jundiai, Sao Paulo Brazil and with WPI advisors.

The scope of this project includes civil engineering areas of expertise such structural engineering, construction project management, with sustainable solution as a component. Architectural components will also be studied in this project. Topics will be selected based on student interest and the project from the Brazilian office.

Background

The students are not enrolled in any credit activity during A-Term, but will maintain contact via conference calls, meetings and e-mails with both WPI advisors and sponsors. During B term, the students will be enrolled in a PQP (Preliminary Qualifying Project). This is a formal instructional period where the students are advised on how to develop a scope of work, develop a time-schedule (tasks and time requirements) and conduct literature reviews. Students are expected to observe routine office hours.

The project team has been in contact with the WPI Project Center in regards to the correct methods of accommodating the students off campus as well as the paper work required. The sponsors have helped us find a housing location close to their office. They have visited the location as well as filled out the Housing Check-list Form. Pass Arquitetura’s attorney, Liliane Azarias has contacted Lori Glover in the Corporate Business Office to develop a sponsor agreement. Currently a verbal agreement has been made between the two parties; it is only a matter of time to sign these documents.

The reason to do an off campus project in Brazil is to expand the students perspective of civil engineering in different environment. Having an opportunity to work hand in hand with an architectural/engineering firm will give the students hands-on career experience. Understanding the localized climate, work environment, work ethics and philosophy will help us to determine what their priorities are in order to make future recommendations. The contact made with our sponsor can lead to future projects if WPI has interest. As this contact is made with this company and other organizations or firms we can then build a good base for future a project center in Brazil.

Project Description

Pass Arquitetura and Aurea Engenharia are the project sponsors and this firm focuses on housing units around the country of Brazil. The sponsor has supplied a residential building for our team to research on. The project scope is reasonably general at this time. The building will be made of concrete masonry block, utilizing structural masonry. This building is very typical and conventional building the first floor design consist of the building entrance and multi-functional rooms. All the above floors have same floor layout, this allows for simplicity in construction and typical design. Any structural element will be mirrored in every floor and all the dead and live loads will be distributed to the foundation, which is cast in place. This building is expected to be in the design phase throughout the time of the MQP. Architects and structural engineers of the sponsor will be available for the students to interact and discuss project topics.

Structural

First we will analyze load requirements for a building system based on the schematics of the building. These load restrictions are based on Building Codes. We plan to design the building in the American Standard Building Code and then design the same building in the Brazilian Code. Once both are completed we will then analyze the differences between one code to another in order to identify any suggestions for modifications if the research shows it is appropriate. We will compare the Factor of Safety of the Brazilian Building Code with those of the American Code to identify differences in their approaches to finding the factors of safety. We can reference the ASCE manuals for methods of models. Another strategy is to examine the wind loads for the location of the building. Studying the Brazilian model of wind speed will give us an understanding of how the wind loads are determined.

The next step is to determine the amount of reinforcement required for the concrete walls. This process is done by calculating the total area of reinforcement required to support the given loads. Minimum and Maximum distance of rebar are important for the Shear and Moment forces. We should also look into the Concrete Mix Design for the cast in place concrete, and this plays an effect on the resisting capacity. Alternatively we will research the difference from using concrete blocks versus cast-in-place concrete. This evaluation will be based on a cut-off point of height requirement. A low rise building has different effects versus a high rise building depending on the type of material.

Management

The economics of the project will be an important part in identifying which alternative should be used. The type of materials and cost as well as the cost of labor for each alternative will play an effect on the final alternative choice. Methods of research in cost analysis will be the use of RS-Means. We will also find appropriate resources for the market cost in Brazil. The time management process of this project will entail the factor in finding which alternatives are constructed in the shortest amount of time. Due to the large immobilization boom in Brazil, the optimum choice for construction is the shortest construction time. Along with the choice of materials, recycling of unused materials is way to reduce waste in sustainable efforts.

Architectural

This project will consist of an Architectural Engineering component. The objectives will include to design a building system, or process that meets desired need within realistic constraints such as sustainability, economics, functionality, health and safety, constructability. This will also consist an understanding of the building design process and the ability to develop engineering design solutions, which will include multidisciplinary aspects within architectural constraints.

Methodology

The goal of this project is to provide Pass Arquitetura with an analysis of their design of a multi-family residential building. The building, to be constructed in Sao Paolo, Brazil, will be analyzed for the ability to sufficiently support the dead and live loads, including, but not limited to, the self-weight of the structure, as well as wind loads and seismic forces. As the building is consistent with the description of a high rise, the analysis of the lateral force resisting system is paramount. The design will also be analyzed for compliance with the local building codes of Brazil. The goal of the project is also to provide an architectural analysis of the design which may include sustainability, functionality and constructability. This analysis can compare to the requirements for a building to become LEED Certified with the Green Building Council Brazil. Lastly, the project management aspect of the project will be analyzed. This analysis will include the planning, estimating and scheduling phases of the project. The analysis of these three aspects will provide for fulfillment of the capstone design criteria of the project.

Deliverables

The deliverables for this project will consist of sustainable solutions, civil and structural engineering, architectural, project management, and building information modeling. A range of Civil Engineering as well as Architecture will be covered in the project. Under the architectural design phase the development of engineering design solutions must be met. The architectural design phase will consist of floor plan layouts with all the components under electrical, mechanical, plumbing, acoustical and human comfort. The structural component will consist of an analysis under building design, statics, building codes, fire protection and concrete/steel materials. This project will also have the project management aspect where the scheduling, site logistics, estimating, and cost benefit analysis will be done. We will utilize design modeling software such as Primavera, Auto CAD, and Revit Architectural and so on.

A formal presentation of this project will be presented to the advisors and the school after our return from Brazil. The presentation will consist of the project description, along with recommendations to the company on any future improvement on the design as well as the best design options for the company needs. The presentation will demonstrate how architectural, structural engineering and construction project management were all incorporated in the project.

Aside from the formal presentation a report for this MQP will be submitted. The MQP report will provide background information, methodology, results, and a conclusion; everything will be submitted to Worcester Polytechnic Institute (WPI) before our returns to WPI from Brazil. This report will meet the company and advisor needs in which will explain the best design option. This report will also consist of a shorter translated version from the full report. This translated version will be submitted to the company advisors in Brazil so that there is a better understanding of the research and recommendations that were found throughout the project.

Outline of Pre-Departure Administrative Work

This gives a plan for pre- departure for students before they leave WPI. The dates used are for this coming academic year (2012 –to- 2013).

Jun-Aug: Before project has begun, project topics are suggested and students' backgrounds are provided.

Project Initiation-

Topic Selection

Project Topic Refinement- Interactive process between the student groups, advisors and Pass Architecture

Aug 7th Proposal Outline Draft Submit to Advisors

Aug. 24th Meeting with Advisors

- Due at meeting:
- Revised Proposal
- Housing Checklist
- Acknowledgement Release
- Transcript Judicial Release
- Student Agreement Release

Sept 3th-Proposal made to Provost Office-submit for approval

The final deliverable of the PQP is the Scope of Work document

- Scope of Work- Identify tasks and develop a time-line.

Sept 10th- Proposal to Provost Due

Oct’12-Dec’12: A series of conference meetings and e-mail exchanges occur during a seven week pre-project period (called a Pre-Qualifying Project or PQP). The PQP focuses on developing a scope of work, establishing communications with the academic and Pass Arquitetura advisors and developing a student teams.

Oct 8th-Completed ISRP form submit to IGSP

Oct 25th-Completed ISRP due

Nov 26th Meeting with Advisors

- Due at meeting:
- Travel info Form
- Health Records

Dec 5th Completed Health & Travel Forms due to IGSP

Outline Off-Campus Schedule

The Timeline table gives an overview of steps taken when conducting an off- campus MQP

Jan'13-March'13: While at a Brazil Company Office, students maintain communications with their academic advisors through weekly conference calls, e-mails and file transfers. We will work during normal business hours and maintain communication with their Brazil Company advisors during appropriate office hours. During the term, we will be setting up weekly meetings or conference calls with the advisors and sponsors to track our progress. At the conclusion of their seven- week stay, the students give an oral presentation of their results (MQP Presentation) and deliver a Final MQP Report.

- Building Codes
    - Analyze the design, and building plans to determine if the design is up to code, including but not limited to; Height and Area requirements, Occupant Loads, Means of egress, fire protection systems, and accessibility
- Fire Protection
    - Design of fire protection systems required by the code for the structure.

Week 1-Week 4

Floor Plan Layout Analyze floor layout

- Quality Management:
    - Identify different concrete and steel materials which could be used for the design.
    - Ensuring that building codes and construction standards are being met.
- Static Analysis
    - Analyze the structure to determine if the design can withstand the live loads and dead loads including wind loads and seismic loads.

Week1-4

- Project Management:
    - Finding Resources for Brazilian methods of construction
    - Estimate Construction Method duration of facilities using modern tools- including information technologies and information systems.
    - Defining the project objectives and the require methods to reach these objectives.
    - Time Constraints
    - Economic Measures
    - Analyze the costs and benefits of each to determine the best possible materials
- Building Performance
    - Analyze the potential building systems to optimize building performance and create the most energy efficient design.

Week5

- Energy Conservation
    - Identify products which can be used to conserve energy. Look at alternative methods such as wind power and solar power.
- LEED
    - Look for the use of sustainable products to have the structure LEED certified. Look at other options such as natural lighting, green roofs, and energy conservation.
- Concrete/Steel Materials

Ongoing

- Analysis Report
    - Report outlining the loads associated with the structure, compliance with building codes and fire protection systems.
- Primavera

- AutoCAD
- Structural Analysis Software (TBD)

Week 5

- Cost Management: Estimating the final cost of the project as well as determining if project is under or over budget.
- Time Management: Developing a project schedule for all aspects of the project in order make sure that the final project is delivered on time.

Week 5

- FP: Safety Management: Develop a safety management report or methods to reduce/prevent the number accident on site.

Week 6

- Deliverables: The Poster Session is part of a formal poster session held at the WPI campus and the end of each academic year. An electronic copy of the poster is sent to the Brazil Company Office.
- Power Point Presentation
- Poster Presentation

List of Contacts

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List of Forms

Transcript Judicial Release (10/25)
Participant Statement of Agreement (10/25)
Individually Sponsored Residential Project (10/25)
Housing Checklist (10/25)
Travel info Form (12/5)
Health Records (12/5)
Acknowledgement Release (12/5)
ATC Form (12/5)
Onsite Travel*
Incident Report*
Budget Summary Request Form
Financial Commitment Letter of Intent
Student Agreement Release
Faculty Agreement
Sponsored Student Project Agreement Release
Mutual Confidentiality Agreement

Executive Summary

Tuesday, May 08, 2012
5:05 PM

WPI Global Perspective Program Independent Study
World Cup 2013 Sao Paulo, Brazil

Background

On October 20, 2007 Joseph S. Blatter FIFA President announced to the world that the 2014 World Cup will be hosted in Brazil. Brazil and its cities in the past years have gone through great development and progress in infrastructure, sustainable buildings, telecommunication technology, petroleum research and many others industrial fields.

On August 4, 2010 the Local Organizing Committee of FIFA (COL) recommended to the host cities to adopt a certification for environmental sustainability LEED *(Leadership in Energy and Environmental Design)* for any new construction pertaining to the World Cup. The seal is awarded by the U.S. GBC *Green Building Council* for buildings with existing systems that reduce waste and prioritize the comfort of users. Sao Paulo is the largest city in Latin America one of the host cities for the cup.

This is a brief summary of the intent of this independent study project. The goal of this project is to provide the company with consultation services as WPI students will work side by side exchanging information. The scope of this project includes civil engineering areas of expertise such as architectural services, structural engineering, construction project management, with environmental awareness as a component.

Recently, I spoke with some key people that are involved with this new project. WPI President Denis Berkey is aware of this plan and is fully on board with its realization, and Professor El-Korchi CEE Department Head is very much excited about this proposal. CE Advisors have also been established as Guilermo Salazar and Roberto Pietroforte, as well as two project partners Janneth Velazquez and Corey Fisher. Extending WPI's Global Perspective Program into Brazil is a great initiative for a new project base, not only for this project but for many others.

Proposal

This document features MQP that will be conducted at a Brazilian office in 2013. The purpose of the document is to illustrate the process of conducting an off-campus MQP and to show the type of deliverables that are expected.
Students will work with a Brazilian company at a Sao Paulo office and WPI faculty advisor at the WPI Campus. Project topics will cover the full range of Civil Engineering focus areas including sustainable solutions, civil engineering and structural engineering. Topics will be selected based on student interest and project at the selected Brazilian office.

1. The project topic can be fairly general at this time. The sponsor is not expected to pre-determine the specific projects that will be conducted 6+ months into the future. The purpose of this action is to give the students and the company engineers' a chance to exchange ideas about the technical nature of project topics (structural analysis, pollution assessment, soil mechanics … etc.). A number of topics that would be of interest to the students can be suggested by Brazilian company.

2. The student groups (two groups) will identify a topic (or topics) that they would like to be involved with. A primary purpose of this activity is to give the students and company engineers a chance to meet and to exchange ideas.

3. The students are not enrolled in any credit activity during Term A, but will maintain contact via conference calls, meetings and e-mails with both WPI advisors and sponsors.

4. During B term, the students are enrolled in a PQP (Preliminary Qualifying Project). This is a formal instructional period where the students are advised on how to develop a scope of work, develop a time-schedule (tasks and time requirements) and conduct literature reviews.

5. Students are expected to observe routine office hours. Their office work may include site visits to project locations and other offices.

The **Timeline** table gives an overview of steps taken when conducting an off- campus MQP. The dates used are for this coming academic year (2012 –to- 2013).

- Jun'12-Aug'12: Before project has begun, project topics are suggested and students' backgrounds are provided.
- Oct'12-Dec'12: A series of conference meetings and e-mail exchanges occur during a seven week pre-project period (called a Pre-Qualifying Project or PQP). The PQP focuses on developing a scope of work, establishing communications with the academic and Brazil Company advisors and developing a student teams. The final deliverable of the PQP is the **Scope of Work** document
- Jan'12-March'12: While at a Brazil Company Office, students maintain communications with their academic advisors through weekly conference calls, e-mails and file transfers. We will work during normal business hours and maintain communication with their Brazil Company advisors during appropriate office hours. At the conclusion of their seven- week stay, the students give an oral presentation of their results (**MQP Presentation**) and deliver a **Final MQP Report.**
- The **Poster Session** is part of a formal poster session held at the WPI campus and the end of each academic year. An electronic copy of the poster is sent to the Brazil Company Office.

Deadlines for Completion of Forms	C Term
Proposal made to Provost's Office	September 10th
Completed ISRP form submitted to the IGSD	October 25th
Completed Health & Safety Forms for each student submitted to the IGSD*	December 5th

Project Scope

The project scope entitles aspects which students should have the ability to do which including:

Architectural

- Design a building system, component or process that meets desired need within realistic constraints such as sustainability, economics, functionality, health and safety, constructability
- Understand the building design process and the ability to develop engineering design solutions which include multidisciplinary aspects within architectural constraints
  - Floor Plan Layout
  - Electrical
  - Mechanical
  - Plumbing
  - Acoustical
  - Human Comfort

Structural

- Demonstrate the ability to set up experiments, gather and analyze data, and apply the data to practical engineering problems
- Analysis and design of buildings, understanding of mechanics, and the engineering properties of construction
  - Statics Analysis
  - Concrete/Steel Materials
  - Building Codes
  - Fire Protection

Project Management

- Plan, estimate, schedule and manage the construction of engineered facilities using modern tools- including information technologies and control systems.
  - Site Logistics
  - Scheduling
  - Estimating
  - GMP
  - Cost Benefit Analysis

Sustainability

Social and Economic Impacts
Energy conversation
Building Performance
Sustainable construction
LEED

Building Information Modeling

Utilize the use of BIM in the design process, such as:

Primavera
Auto CAD
Revit Structures
Revit Architectural
Revit MEP
Naviswork
Robot

Deliverables

Power Point Presentation
Poster Presentation
Analysis Report

Budget

Below is an estimated expenses budget for the Brazil Project. Costs are subject to change due to exchange rates. As shown the most costly items are air travel and housing arrangements.

Project Trip Budget						
Target trip budget	$ 10,000.00					
						Total
Airfare	Total cost of tickets	$ 750.00	for	1	ticket(s)	$ 750.00
	"	$ 750.00	for	1	ticket(s)	$ 750.00
Hotel	Cost per night	$ 75.00	for	50	night(s)	$ 3,750.00
	"	$ -	for	0	night(s)	$ -
Food (Groceries)	Cost per day	$ 12.00	for	50	day(s)	$ 600.00
Local Transportation	Cost per day	$ 8.00	for	50	day(s)	$ 400.00
Dining out	Amount	$ 150.00	for	7	night(s)	$ 150.00
Sight Seeing	Amount	$ 500.00				$ 500.00
Miscellaneous	Amount	$ 100.00				$ 100.00
Total cost of the trip						**$ 7,000.00**
You're under budget by						**$ 3,150.00**

Travel

Housing: Once sponsors are finalized preceding steps will be to establish housing arrangements relatively close to its location. Suggested options are to establish connection with nearby university to provide housing.

Suggested Contacts

1. Richard Vaz (Dean of Projects Program), vaz@WPI.EDU, 508 831 5344 (office)
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Prepared by; Deborah Silva *Credit to Professor Hart*

APPENDIX B EXECUTIVE SUMMARY

Alternative Design in Brazil

Executive Summary

By: Deborah Silva CE ’13, Janneth Velazquez CE ’13

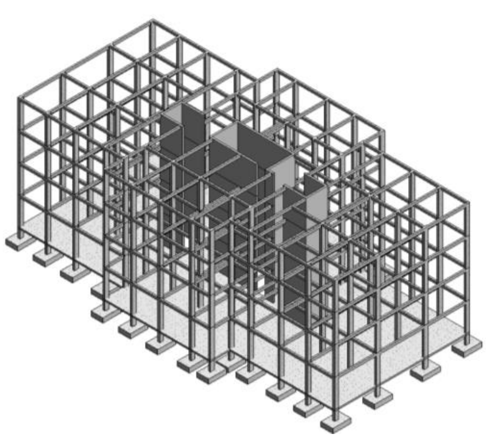
Advisors: Leonard Albano and Roberto Pietroforte

Sponsors: Pass Arquitetura and Aurea Engenharia

The objective of this Major Qualifying Project was to investigate adopting the use of reinforced concrete frames as an alternative for masonry wall systems in a planned residential building complex in Jundai, in Sao Paulo state of Brazil. The project consisted of a seven week residency in Sao Paulo during which we proposed design changes and made cost estimates for our clients. Our efforts focused on a 4-story residential building in a complex, using it as a baseline to compare structural design practices, design codes, construction technologies, building process, and costs between Brazil and the United States.

The actual building will be made of concrete masonry block, utilizing a structural masonry system design. The first floor was laid out to accommodate the building entrance and several multi-function rooms. All the above floors have a uniform layout, allowing for simplicity and repetition in design and construction activities. In order for all the dead and live loads to be distributed to the cast-in-place concrete diaphragm the structural elements were mirrored in each floors layout, ensuring stability.

In addition to the structural design and analysis of this residential building, a 3D model was created using Revit 2013. By comparing the data from our Revit structure model, vertical and lateral load reactions to our hand calculations we were able to verify the accuracy of our modeled load distribution and be confident of our analysis. Revit also provided us with a material take off of the building components, including the superstructure, interior and exterior enclosures. We then used the Revit data to calculate the breakdown of the square metric cost of concrete, masonry, form work, finishes and labor. After the cost analysis was completed the differences between the proposed reinforced concrete building and the actual structural masonry building were compared to one another.



The following drawing shows the reinforced concrete system which is different from the structural masonry system. The concrete skeleton provides the main support for resistance to loads. In the reinforced concrete design the discrete lateral forces are gathered by the floor system at each level and transmitted by diaphragm action to each lateral load resisting walls. The elevator shafts, the stair cases and interior shafts act as the shear walls for this building. The lateral load resisting walls serve to provide resistance; therefore lateral load resisting walls were needed in the two directions. In a structural masonry design building all the loads are carried through the walls; for this reason there is greater concentration of uniform loads applied to the foundation frame. Reinforced concrete was chosen as an alternative structural design material because of the common avalibity of concrete material in Brazil. Although masonry blocks were used in both designs, the blocks were only used as an enclosure for the reinforced concrete structure. This difference in systems allows for the use on non-structural masonry blocks which have a lower resistance acting only as an exterior barrier.

The estimated cost of the reinforced concrete building was $580,000, (or 1,150,000 Brazilian Reals) while the cost of the structural masonry was less expensive $530,000 (or 1,040,000 Brazilian Reals) a savings of 9%. One of the major contributors to this difference is the cast-in-place concrete which runs 35% more expensive when used in the same design as the structural masonry. For using concrete masonry blocks the cost was 65% more than in structural masonry system versus in the reinforced concrete design; this is due to the reliance of concrete blocks for the building's structure in structural masonry design. Another major difference in cost for both systems was the wall finishes, in the reinforced concrete structure it was 35% more expensive, due to the extensive wall detailing where columns intersect into the rooms. Another important difference is the stucco used as a finish surface for masonry and the last layer as the decorative coloring in the United States; whereas in Brazil, the coloring is included in the mortar. As a conclusion it was discovered that the original design of structural masonry was more cost effective to build in Brazil.

By having one of the group members on site in Brazil we were better able to understand the differences in construction technologies. Brazilian tariffs, technology, labor, local resources and techniques, all contribute to conditions making concrete blocks and manually laying bricks the norm in Brazil. Understanding which types of materials would have a higher price in one design versus the other was important to develop the comparisons of both systems. Material and construction costs vary by location as a result choosing which types of materials and construction methods becomes a job specific task.

APPENDIX C Brazil History

On October 20, 2007 Joseph S. Blatter FIFA President announced to the world that the 2014 World Cup will be hosted in Brazil. Brazil in the past years has gone through great development and progress in infrastructure, sustainable buildings, telecommunication technology, petroleum research and many others industrial fields. Brazil has become one of the most powerful countries in South America in economic terms. As well as the hosting of the 2014 FIFA World Cup and the Olympic Games in 2016 have given Brazil a boom in the real-estate market. The right to host two major international sporting events attracted investors to the emerging regional powerhouse and has successfully made Brazil grow as a powerful country. With these two major international sporting events, many companies such as Pass Arquitetura are undergoing construction projects such as building more hotels and residential buildings. As mentioned before Sao Paulo is the largest city in Latin America, and being one of the host cities for the cup we found that this would be a great opportunity to focus on building construction distinctions in Brazil and to those of the U.S.

Cultural Differences

Brazil is a country that stands alone in the world. According to an article by Amish Midget, “The country’s diverse immigration history has created a vibrant cultural that reveals the United States as a melting pot” (Midget 2009). Like any other country, Brazil too has its differences in culture that makes this country different than the United States. Some differences are less drastic than others. One difference in culture is the way people interact with each other. For example, in America people have become less social to strangers in modern times, meaning that it is strange for Americans to say hello to passing strangers. Brazilians on the other side are exactly the opposite. Despite the rising in crime and violence throughout the country, Brazilians are known to be very friendly people who are quite possible to pick up a friend to walk with and most likely to say hello even if they do not know the individual. The way Brazilian’s interact to friends, family and or acquaintances are by kissing both cheeks. People in Brazil are much more open with hugging, handshaking and kissing on the cheeks opposed to how Americans are. Here in the U.S it is very rare to see Americans kiss both cheeks as a way of greeting one another, instead it is very common to make direct eye contact to show respect oppose to Brazilians in which as respect they avoid direct eye contact. Individuals in the U.S value their personal space, in other words it is respectful to keep about three feet of distance between the people whom you would be talking to. In Brazil it is very common that Brazilians will stand about one foot apart from one another when talking.

Driving in America is a daily life need to get from one place to another even if the destination is relatively close. As described by the website International Movers, “More and more Americans try to stay indoors where they control the climate instead of outdoors where nature is in control” (IntlMove 2010). On the other side Brazilians are almost always people that are outside walking along the streets or playing soccer; the nation’s favorite sport. Brazilian’s choose to walk for exercise while others walk by the incapability to afford the luxury of a car. Although both countries are differently in cultural, that is what makes them unique from each other both being great places to be around.

Economics

Today, Brazil has become one of the most powerful countries in South America in economic terms. An article posted on a website called Global Property Guide, mentioned that “With large and growing agricultural, mining, manufacturing and services sectors, Brazil’s economy ranks highest among all the South American countries, and it has also acquired a strong position in global economy”(Global Property Guide 2012). Although the country was hit by global and internal economic crises, Brazil’s economy did not collapse. Brazil’s economy has said to been undergoing a continuous growth and development from 2004 which led to a rise in employment and real wages.

The hosting of the 2014 FIFA World Cup and the Olympic Games in 2016 gave Brazil a boom in the real-estate market as well infrastructure, construction, and engineering markets. These two major international sporting events attracted investor to the emerging regional powerhouse. An article published by the Global Property Guide mentioned that “Massive infrastructure spending combined with increase demand for housing, both for owner occupancy and rental, is expected to boost the real estate market for several years” (Global Property Guide 2012). House prices in Sao Paulo rose by 18.8% from the beginning of the year to July 2012, but the increase did not stop there. Prices increased even more in Rio de Janeiro, with gains of up to 19.8% (13.9% in real terms) during the same period. With its successes Brazil also has its economic weaknesses due to debts. As the Global Property Guide mentioned, “Economic prosperity ushered in by President Lula da Silva's government led to rising incomes and lower unemployment. Financial market reforms created a new housing finance system, allowing households to turn their higher incomes into mortgage payments. Under his watch, the economy grew by an average of 4.7% from 2004 to 2008" (Global Property Guide 2012). The right to host major international sporting events has served economic recovery and success having Brazil grow as a powerful country.

Brazil is not only hosting events that will serve as an economic recovery but President Dilma Roussef made an announcement on April 15, 2012 where he revealed a plan to raise $65.5 billion to improve Brazil's infrastructure and spur economic growth. Fox News Latino says that this plan will involve awarding private firms concessions for the construction of nearly 7,500 kilometers of highways and 10,000 kilometers of railways, aiming to improve areas of the country. This announcement was made at a ceremony at the presidential palace attended by executives of more than two dozen large construction companies, "Brazil has barely invested in infrastructure over the past 20 years and therefore this "mega-package" will be fantastic for the country and for business leaders" Batista said. Government and infrastructure growth is making Brazil be an even more powerful country with its expansion in improvements

APPENDIX D Structural Analysis Load Calculation

BEAM LOAD CALCULATIONS

I. Design Loads

PASS-PRE-PE-T_1_5-003-MOD_TIPO-R02.dwg

Density of Concrete	24.52	kN/m^3	2500		Kgf/m^3
Density of Blocks	13.73	kN/m^3	1400		Kgf/m^3
NBR 6120-2.2.1.2					
Dormitories/livingrooms/kitchens/bathrooms	5.5	kN/m		2	kN/m2
Pantry/Laundry Room/Service Room	5.5	kN/m		2	kN/m2

Wind Load

Seismic Load

Self Weight	0.76	kN/m
Weight of Slab + Partitions+service load	3.89	kN/m
Dead Load	4.65	kN/m
Live Load	5.50	kN/m

II. Design Load Combinations

ACI 318-08 9.2.1.9-4	Pu=1.2D+1.6L		
	U	14.38	kNm

III. Structrual Material Properties

Reinforced Concrete

fc'	35	MPa

Concrete Blocks

Steel Reinforment

fy	420	MPa

Beam Dimensions

L=	4.8	m
b=	0.14	m
h=	0.22	m
d=	0.19	m

make bigger because of constraints in bend of rebar, base it on total height of 35 cm -12 cm of slab

Reinforcement of Flexural Members

ACI 318-8 10-5	As=-0.31(L/#steel)		
	As=+0.60(L/#steel)		
	As=ρbd	0.001	
	a=As*fy/(.85*fc'*b)	0.113	m

	ρ=(3sqrt(fc'))/fy			0.042
IV.Moment Estimate				
ACI 318-8 3-3	Mu=ϕMn=ϕAs*fy[d-a/2]			
	Mu=wL^2/8	41.4046	kNm	
	ϕMn=ϕAs*fy[d-a/2]			
		56.64882	kNm	
	set Mu=ϕMn			
	As=	0.003	m	check
Shear Reinforcement				
Assume No 10 bar	Av=	0.071		
	s=Av*fyt/(0.062*sqrt(fc')*b)			
		0.581		
	s=ϕ*Av*fyt/Vu-ϕVc			
		1.066916		
	s=Av*fyt/(0.35*b)		smax=d/2	
		0.609	0.095	
	Av=0.75*sqrt(fc')*((b*s)/fy)			
		0.000859		
	Av'=ϕ*Vs*s/fy	0.00356		
X. Shear Estimate				
ACI 318-8 11.4.6	Vu=ϕVf=ϕAs*fy*μ*λ			
	Vu<ϕVn=ϕVc+ϕVs			
	Vu=wl/2	44.567	kN	
	ϕVc=0.2*λ*sqrt(fc')*b*d*ϕ			
		23.605	kN	
	ϕVs=Vu-ϕVc	20.962	kN	
	ϕVs= ϕ*Av*fy*d/s			
		44.730	kN	
	Vn=ϕVc+ϕVs	68.335	kN	
	φ=	0.9		
	λ=	1	normal concrete weight	
	μ=	1.4	monolith	
	ϕ=	0.75		
	L	3.95		
	TA=	2.75		
	Concrete Block	0.15	2.8	

SLAB LOAD CALCULATIONS

I. Design Loads

PASS-PRE-PE-T_1_5-003-MOD_TIPO-R02.dwg

Density of Concrete	24.52	kN/m^3	2500	Kgf/m^3
Density of Blocks	13.73	kN/m^3	1400	Kgf/m^3
NBR 6120-2.2.1.2				
Dormitories/livingrooms/kitchens/bathrooms	2	kN/m2		
Pantry/Laundry Room/Service Room	2	kN/m2		
MEP/HVAC	0.5	kN/m2		
Wind Load				
Seismic Load				
Self Weight	2.94	kN/m2		
Weight of Partitions	0.45	kN/m2		
Dead Load	3.89	kN/m2		
Live Load	2.00	kN/m2		

II. Design Load Combinations

ACI 318-08 9.2.1.9-4	Pu=1.2D+1.6LU	7.87	kN/m^2

III. Structrual Material Properties

Reinforced Concrete			
	fc'	35	MPa
Steel Reinforment			
	fy	420	MPa
Modulus of Elasticity			
	Ec	33	Gpa

Slab Dimensions

L=	4.8	m
b=	2.60	m
h=	0.12	m
d=	0.09	m

IV.Moment Estimate

At interior support	M=1/11*wl^2	16.48501108	kNm/m
At midspan	M=1/16*wl^	11.33344512	kNm/m

	2		
	M=1/11*wl^		
At exterior support	2	16.48501108	kNm/m

Reinforcement of Flexural Members
ACI 318-8 10-5

$$\rho_{0.005} = 0.85\beta_1 \frac{fc'}{fy} \frac{\in u}{\in u + 0.004}$$

0.026

	d'=	41.492	mm		
	less than minimum allowable				
	d=	95.000	mm		
	As'	459.125	mm		
	a'=	6.482			
	As1	475.279			
	a=a'*As1/As'	6.261			
midspan	As2	326.362			
	round to	400	use 4 # 10 bars		100
			126.676869		
esterior support	As3	474.709	8		
	round to	500	use 5 #10 bars	100	
	ϕMn=	17.363	> Mu		

X. Shear Estimate
ACI 318-8 11.4.6

Vu=ϕVf=ϕAs*fy*μ*λ		
Vu<ϕVn=ϕVc+ϕVs		
Vu=1.15*wl/2	28.058	kN
ϕVc=0.2*λ*sqrt(fc')*b*d*ϕ		
	67.887	kN
φ=	0.9	
λ=	1	normal concrete weight
μ=	1.4	monolith
ϕ=	0.75	
TA=	2.75	
Concrete Block	0.2	14.8

COLUMN LOAD CALCULATIONS

I. Design Loads

PASS-PRE-PE-T_1_5-003-MOD_TIPO-R02.dwg

Density of Concrete	24.52	kN/m^3	2500	Kgf/m^3
Density of Blocks	13.73	kN/m^3	1400	Kgf/m^3
NBR 6120-2.2.1.2				
Dormitories/livingrooms/kitchens/bathrooms	5.5	kN/m	2	kN/m2
Pantry/Laundry Room/Service Room	5.5	kN/m	2	kN/m2
Wind Load				
Seismic Load				
Self Weight	1.86	kN/m		
Weight of Slab + Partitions	2.94	kN/m		
Dead Load	4.81	kN/m		
Live Load	5.50	kN/m		

II. Design Load Combinations

ACI 318-08 9.2.1.9-4	Pu=1.2D+1.6L		
	U	14.57	kNm

III. Structrual Material Properties

Reinforced Concrete

fc'	35	MPa

Concrete Blocks

Steel Reinforment

fy	420	MPa

Column Dimensions

L=	2.8	m
b=	0.19	m
h=	0.40	m
d=	0.37	m

Slenderness Ratio

kl/r	12.12	
kl=l/2	1.40	
r=	sqrt(I/A)	0.11547

I=b*h^3/12	0.001013333		
A=b*h	0.08		

Column is considered not slender

Reinforcement of Flexural Members

ACI 318-8 10-5

As=-0.31(L/#steel)	
As=+0.60(L/#steel)	
As=ρbd	0.003
a=As*fy/(.85*fc'*b)	0.221
ρ=(3sqrt(fc'))/fy	0.042

IV.Moment Estimate

ACI 318-8 3-3

Mu=ϕMn=ϕAs*fy[d-a/2]			
Mu=wL^2/8	14.275	kNm	
ϕMn=ϕAs*fy[d-a/2]			
	29.155	kNm	
set Mu=ϕMn			
As=	0.3	m	use #10 bars

Shear Reinforcement

Assume No 10 bar

Av=	0.071		
s=Av*fyt/(0.062*sqrt(fc')*b)			
	0.428		
s=ϕ*Av*fyt/Vu-ϕVc			
	-1.29808499		
s=Av*fyt/(0.35*b)		smax=d/2	
	0.448		0.185
Av=0.75*sqrt(fc')*((b*s)/fy)			
	0.00085887		
Av'=ϕ*Vs*s/fy	-0.00569		

X. Shear Estimate

ACI 318-8 11.4.6

Vu=ϕVf=ϕAs*fy*μ*λ		
Vu<ϕVn=ϕVc+ϕVs		
Vu=wl/2	45.156	kN
ϕVc=0.2*λ*sqrt(fc')*b*d*ϕ		
	62.385	kN
ϕVs=Vu-ϕVc	-17.229	kN
ϕVs= ϕ*Av*fy*d/s		
	44.730	kN
Vn=ϕVc+ϕVs	107.115	kN

φ=	0.9	
λ=	1	normal concrete weight
μ=	1.4	monolith
ϕ=	0.75	
L	3.95	
TA=	2.75	
Concrete Block	0.15	2.8

APPENDIX E MECA Wind Output

MECAWind Version 2.1.1.4 per ASCE 7-10

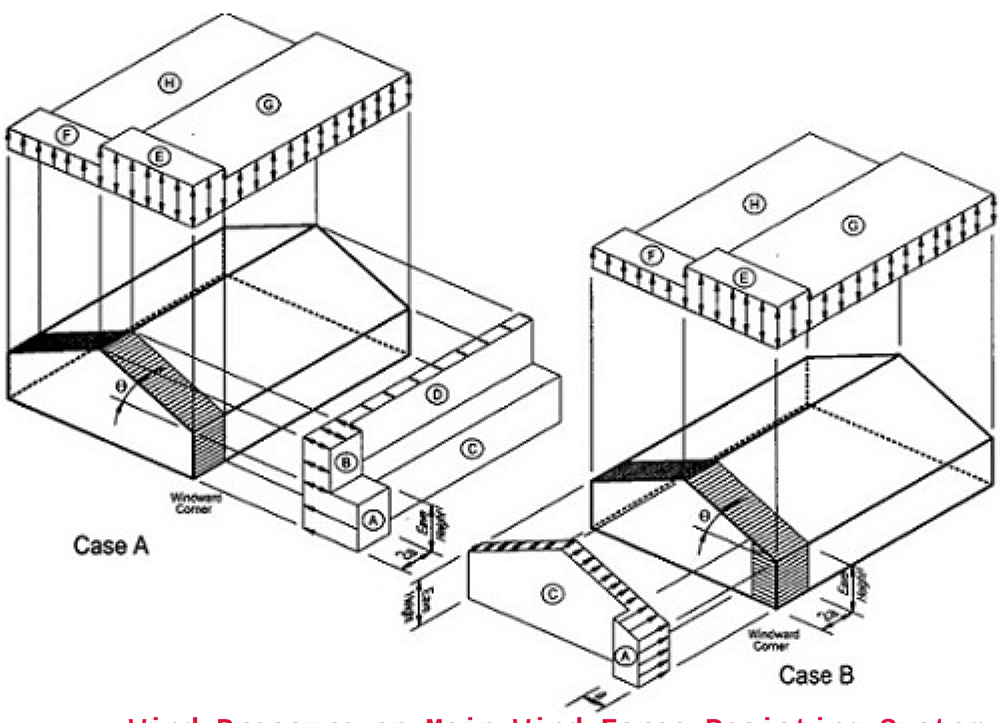
Developed by MECA Enterprises, Inc. Copyright 2013 www.mecaenterprises.com

Date	: 1/31/2013	Project No.	:
Company Name	:	Designed By	:
Address	:	Description	:
City	:	Customer Name	:
State	:	Proj Location	:

File Location: C:\Program Files (x86)\MECAWind\Default.wnd

Envelope Procedure for Diaphragm Buildings per Ch. 28 Part 2

V:	Basic Wind Speed	=	53.64 m/s
Cat:	Structural Category(I,II,III, and IV)	=	III
Exp:	Exposure Category(B,C, or D)	=	C
RHt:	Ridge Height	=	16.76 m
EHt:	Eave Height	=	13.72 m
Ht:	Mean Roof Height of Building	=	15.24 m
Theta:	Roof Angle	=	10.86 Deg
L:	Length of Building(If Gabled, along Ridge)	=	15.24 m
B:	Width of Building(Perpendicular to Ridge)	=	15.24 m
Kzt:	Topographic Factor	=	1.00
Lambda:	Adjustment Factor for Building Height and Exposure	=	1.56
I:	Importance Factor	=	1.00
a:	10% of Least Horiz Dim. or .4h, whichever is smaller	=	1.52 m
2a:	Length over which Zone A acts on Each Corner	=	3.05 m



Wind Pressure on Main Wind Force Resisting System (MWFRS)

Load Case	A KPa	B KPa	C KPa	D KPa	E KPa	F KPa	G KPa	H KPa	EOH KPa	GOH KPa
1.000	1.835	-0.728	1.216	-0.422	-1.911	-1.182	-1.328	-0.906	-2.677	-2.094
2.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

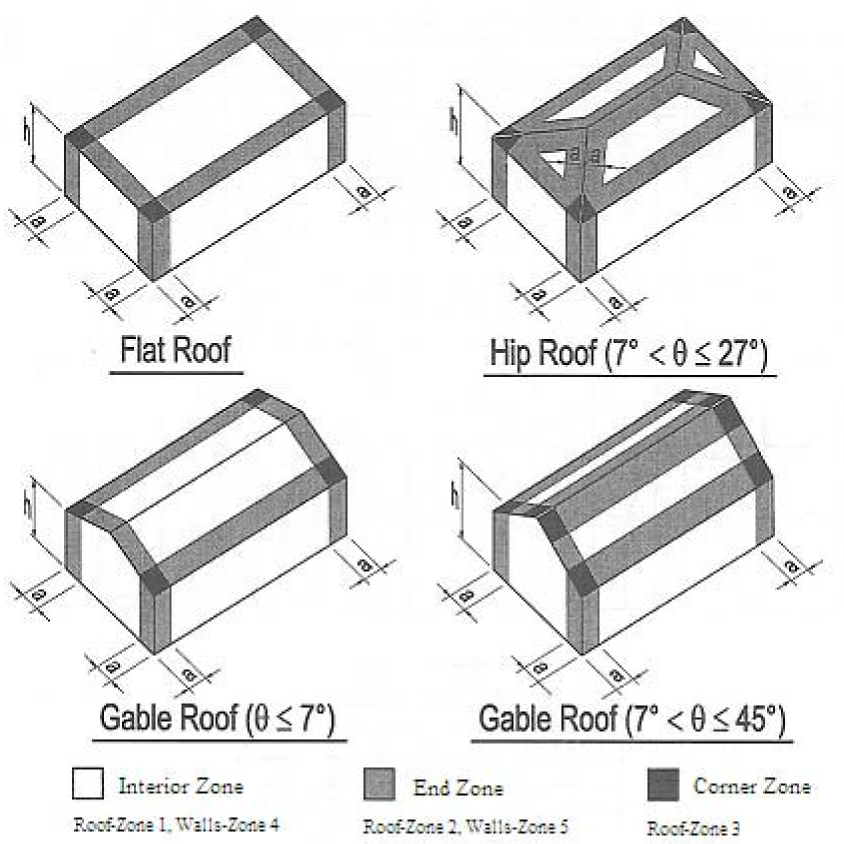
APPENDIX E MECA Wind Output C&C

MECAWind Version 2.1.1.4 ASCE 7-10

Developed by MECA Enterprises, Inc. Copyright 2013 www.mecaenterprises.com

Date : 1/31/2013 Project No. :
Company Name : Designed By :
Address : Description : City
: Customer Name : State :
Proj Location : File Location: C:\Program Files (x86)\MECAWind\Default.wnd

Simplified Wind Load Design - C & C - Method 1 per ASCE 7-10



Wind Pressure on Components and Cladding (Ch 30 Part 2)

All pressures shown are based upon STRENGTH Design, with a Load Factor of 1

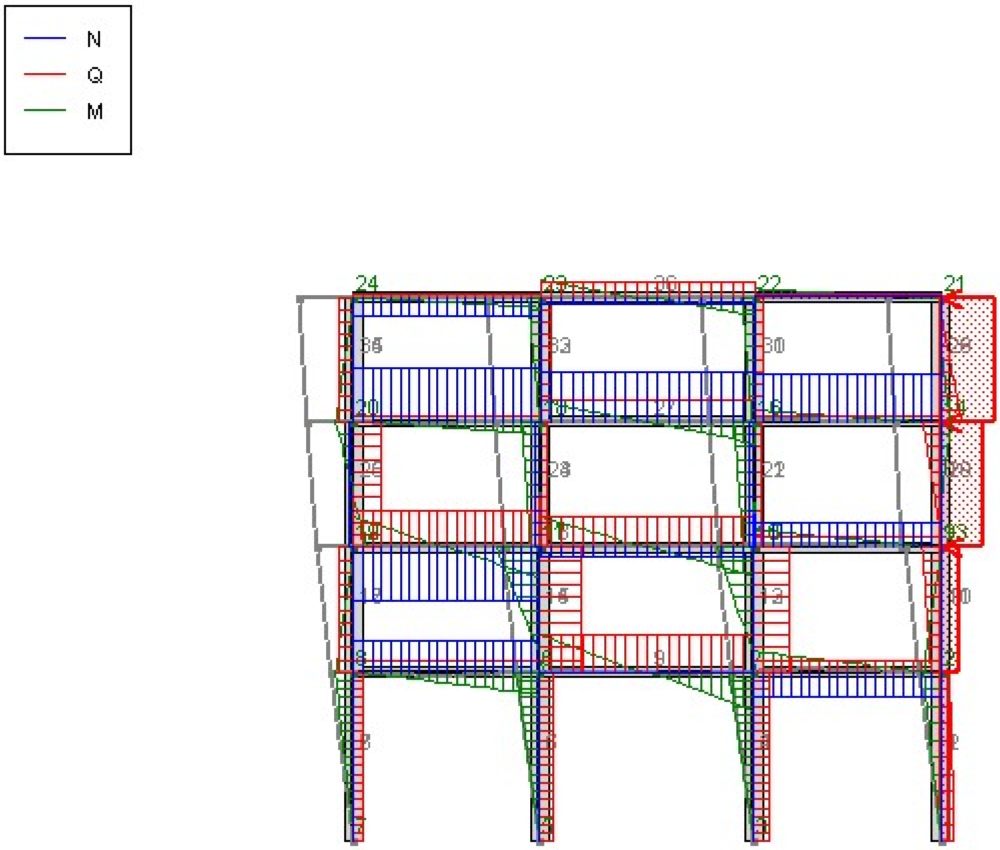
Description	Width m	Span m	Area m^2	Zone	Max P KPa	Min P KPa
Zone 1	97.00	37.50	9.3	1	0.78	-1.61
Zone 2	.00	3.05	3.1	2	0.96	-2.69
Zone 3	6.10	3.05	9.3	3	0.78	-3.58
Zone 4	97.00	39.00	46.5	4	1.44	-1.61
Zone 5	1.52	1.52	2.3	5	1.83	-2.38

Notes: 1) If Zone = "2H" or "3H" then MaxP will be zero per Figure 6-3.
2) Max P & Min P = pnet30(from Fig.30.5-1) * Lambda * Importance Factor * Kzt.
3) If Area<10 then Area=10 or Area>100 then Area=100 for Zones 1, 2, 3, 2H &

APPENDIX F Grid Line A – North South Lateral Load Test

Static analysis of frames

Revit Extensions for Autodesk Revit Structure - Static analysis of frames 2013.0



DATA

Geometry

MATERIALS

Name	Young's modulus	Unit weight
Concrete, Cast-in-Place gray	23250.0 MN/m2	23.6 kN/m3

CROSS-SECTIONS

Family	Type	Cross-sectional area	Moment of inertia
M_Concrete-Rectangular-Column	19x40	760.0 cm2	101333.33 cm4
M_Concrete-Rectangular Beam	14x23	322.0 cm2	14194.83 cm4

BARS

	Start node	End node	Material	Family	Revit Id
1	1	2	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	170558
2	1	2	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	170558
3	3	4	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	172562
4	3	4	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	172562
5	5	6	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175959
6	5	6	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175959
7	7	8	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	176026
8	7	8	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	176026
9	8	2	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	182972
10	2	9	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371597
11	2	9	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371597
12	4	10	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371627
13	4	10	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371627
14	6	11	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371671
15	6	11	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371671
16	8	12	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371673
17	8	12	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371673
18	12	9	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	371729
19	13	14	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375276
20	13	14	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375276
21	15	16	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375306
22	15	16	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375306
23	17	18	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375350
24	17	18	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375350
25	19	20	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375352
26	19	20	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375352
27	20	14	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	375408
28	14	21	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378637
29	14	21	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378637
30	16	22	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378667
31	16	22	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378667
32	18	23	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378711
33	18	23	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378711
34	20	24	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378713
35	20	24	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378713
36	24	21	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	378769

NODES

	X	Z
1	6575	-1000
2	6575	2800
3	2400	-1000

	X	Z
4	2400	2800
5	-2400	-1000
6	-2400	2800
7	-6575	-1000
8	-6575	2800
9	6575	5600
10	2400	5600
11	-2400	5600
12	-6575	5600
13	6576	5600
14	6576	8400
15	2401	5600
16	2401	8400
17	-2399	5600
18	-2399	8400
19	-6574	5600
20	-6574	8400
21	6576	11200
22	2401	11200
23	-2399	11200
24	-6574	11200

Loads

NODAL LOADS

	xA/l	xB/l	xA	xB	FxA	FxB	FzA	FzB	MA	MB	Case
1	0.00	1.00	0	3800	-0.50 kN/m	-0.50 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
2	0.00	1.00	0	3800	-0.50 kN/m	-0.50 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
3	1.00	1.00	3800	3800	-1.20 kN/m	-1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
4	1.00	1.00	3800	3800	-1.20 kN/m	-1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
5	0.00	1.00	0	2800	-1.20 kN/m	-1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
6	0.00	1.00	0	2800	-1.20 kN/m	-1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
7	0.00	1.00	0	2800	-2.60 kN/m	-2.60 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
8	0.00	1.00	0	2800	-2.60 kN/m	-2.60 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
9	0.00	1.00	0	2800	-3.30 kN/m	-3.30 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
10	0.00	1.00	0	2800	-3.30 kN/m	-3.30 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1

RESULTS

Extreme values

NODAL DISPLACEMENTS

Symbol	Value	Node	Case
Ux_{min}	-8.97 cm	24	WIND1
Ux_{max}	0.04 cm	22	Factored Loads
Uz_{min}	0.00 cm	13	DL1

Symbol	Value	Node	Case
Uz_{max}	0.00 cm	15	WIND1
Ufi_{min}	0.00 °	23	DL1
Ufi_{max}	0.60 °	3	WIND1

DISPLACEMENTS IN BARS

Symbol	Value	Bar	Case
Ux_{min}	-8.97 cm	36	WIND1
Ux_{max}	0.04 cm	36	Factored Loads
Uz_{min}	-0.70 cm	9	WIND1
Uz_{max}	8.97 cm	34	WIND1
$Deflection_{min}$	-0.70 cm	9	WIND1
$Deflection_{max}$	0.69 cm	9	WIND1

INTERNAL FORCES

Symbol	Value	Bar	Case
N_{min}	-34.19 kN	18	WIND1
N_{max}	34.05 kN	27	WIND1
Q_{min}	-16.35 kN	14	WIND1
Q_{max}	20.84 kN	18	WIND1
M_{min}	-49.50 kN*m	18	WIND1
M_{max}	35.62 kN*m	9	WIND1

REACTIONS

Symbol	Value	Support	Case
Rx_{max}	12.27 kN	4	WIND1
Rx_{min}	0.00 kN	5	Factored Loads
Rz_{max}	20.84 kN	11	WIND1
Rz_{min}	-14.33 kN	14	WIND1
Rm_{max}	0.00 kN*m	1	Factored Loads
Rm_{min}	0.00 kN*m	1	Factored Loads

Detailed results

NODAL DISPLACEMENTS

Node	Ux	Uz	Ufi	Case
1	0.00 cm	0.00 cm	0.00 °	DL1
1	0.00 cm	0.00 cm	0.00 °	LL1
1	0.00 cm	0.00 cm	0.59 °	WIND1
1	0.00 cm	0.00 cm	0.00 °	SNOW1
1	0.00 cm	0.00 cm	0.00 °	LR1
1	0.00 cm	0.00 cm	0.00 °	ACC1
1	0.00 cm	0.00 cm	0.00 °	TEMP1
1	0.00 cm	0.00 cm	0.00 °	SEIS1
1	0.00 cm	0.00 cm	0.00 °	Factored Loads
1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Min
1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.59 °|WIND1	Max
2	0.01 cm	0.00 cm	0.00 °	DL1

Node	Ux	Uz	Ufi	Case
2	0.00 cm	0.00 cm	0.00 °	LL1
2	-3.74 cm	0.00 cm	0.51 °	WIND1
2	0.00 cm	0.00 cm	0.00 °	SNOW1
2	0.00 cm	0.00 cm	0.00 °	LR1
2	0.00 cm	0.00 cm	0.00 °	ACC1
2	0.00 cm	0.00 cm	0.00 °	TEMP1
2	0.00 cm	0.00 cm	0.00 °	SEIS1
2	0.01 cm	0.00 cm	0.00 °	Factored Loads
2	-3.74 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
2	0.01 cm|Factored Loads	0.00 cm|Factored Loads	0.51 °|WIND1	Max
3	0.00 cm	0.00 cm	0.00 °	DL1
3	0.00 cm	0.00 cm	0.00 °	LL1
3	0.00 cm	0.00 cm	0.60 °	WIND1
3	0.00 cm	0.00 cm	0.00 °	SNOW1
3	0.00 cm	0.00 cm	0.00 °	LR1
3	0.00 cm	0.00 cm	0.00 °	ACC1
3	0.00 cm	0.00 cm	0.00 °	TEMP1
3	0.00 cm	0.00 cm	0.00 °	SEIS1
3	0.00 cm	0.00 cm	0.00 °	Factored Loads
3	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Min
3	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.60 °|WIND1	Max
4	0.01 cm	0.00 cm	0.00 °	DL1
4	0.00 cm	0.00 cm	0.00 °	LL1
4	-3.75 cm	0.00 cm	0.49 °	WIND1
4	0.00 cm	0.00 cm	0.00 °	SNOW1
4	0.00 cm	0.00 cm	0.00 °	LR1
4	0.00 cm	0.00 cm	0.00 °	ACC1
4	0.00 cm	0.00 cm	0.00 °	TEMP1
4	0.00 cm	0.00 cm	0.00 °	SEIS1
4	0.01 cm	0.00 cm	0.00 °	Factored Loads
4	-3.75 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
4	0.01 cm|Factored Loads	0.00 cm|Factored Loads	0.49 °|WIND1	Max
5	0.00 cm	0.00 cm	0.00 °	DL1
5	0.00 cm	0.00 cm	0.00 °	LL1
5	0.00 cm	0.00 cm	0.60 °	WIND1
5	0.00 cm	0.00 cm	0.00 °	SNOW1
5	0.00 cm	0.00 cm	0.00 °	LR1
5	0.00 cm	0.00 cm	0.00 °	ACC1
5	0.00 cm	0.00 cm	0.00 °	TEMP1
5	0.00 cm	0.00 cm	0.00 °	SEIS1
5	0.00 cm	0.00 cm	0.00 °	Factored Loads
5	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Min
5	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.60 °|WIND1	Max
6	0.01 cm	0.00 cm	0.00 °	DL1
6	0.00 cm	0.00 cm	0.00 °	LL1
6	-3.75 cm	0.00 cm	0.50 °	WIND1
6	0.00 cm	0.00 cm	0.00 °	SNOW1
6	0.00 cm	0.00 cm	0.00 °	LR1
6	0.00 cm	0.00 cm	0.00 °	ACC1
6	0.00 cm	0.00 cm	0.00 °	TEMP1

Node	Ux	Uz	Ufi	Case
6	0.00 cm	0.00 cm	0.00 °	SEIS1
6	0.01 cm	0.00 cm	0.00 °	Factored Loads
6	-3.75 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
6	0.01 cm|Factored Loads	0.00 cm|Factored Loads	0.50 °|WIND1	Max
7	0.00 cm	0.00 cm	0.00 °	DL1
7	0.00 cm	0.00 cm	0.00 °	LL1
7	0.00 cm	0.00 cm	0.59 °	WIND1
7	0.00 cm	0.00 cm	0.00 °	SNOW1
7	0.00 cm	0.00 cm	0.00 °	LR1
7	0.00 cm	0.00 cm	0.00 °	ACC1
7	0.00 cm	0.00 cm	0.00 °	TEMP1
7	0.00 cm	0.00 cm	0.00 °	SEIS1
7	0.00 cm	0.00 cm	0.00 °	Factored Loads
7	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Min
7	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.59 °|WIND1	Max
8	0.01 cm	0.00 cm	0.00 °	DL1
8	0.00 cm	0.00 cm	0.00 °	LL1
8	-3.74 cm	0.00 cm	0.51 °	WIND1
8	0.00 cm	0.00 cm	0.00 °	SNOW1
8	0.00 cm	0.00 cm	0.00 °	LR1
8	0.00 cm	0.00 cm	0.00 °	ACC1
8	0.00 cm	0.00 cm	0.00 °	TEMP1
8	0.00 cm	0.00 cm	0.00 °	SEIS1
8	0.01 cm	0.00 cm	0.00 °	Factored Loads
8	-3.74 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
8	0.01 cm|Factored Loads	0.00 cm|Factored Loads	0.51 °|WIND1	Max
9	0.02 cm	0.00 cm	0.00 °	DL1
9	0.00 cm	0.00 cm	0.00 °	LL1
9	-6.03 cm	0.00 cm	0.45 °	WIND1
9	0.00 cm	0.00 cm	0.00 °	SNOW1
9	0.00 cm	0.00 cm	0.00 °	LR1
9	0.00 cm	0.00 cm	0.00 °	ACC1
9	0.00 cm	0.00 cm	0.00 °	TEMP1
9	0.00 cm	0.00 cm	0.00 °	SEIS1
9	0.02 cm	0.00 cm	0.00 °	Factored Loads
9	-6.03 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
9	0.02 cm|Factored Loads	0.00 cm|Factored Loads	0.45 °|WIND1	Max
10	0.02 cm	0.00 cm	0.00 °	DL1
10	0.00 cm	0.00 cm	0.00 °	LL1
10	-6.02 cm	0.00 cm	0.39 °	WIND1
10	0.00 cm	0.00 cm	0.00 °	SNOW1
10	0.00 cm	0.00 cm	0.00 °	LR1
10	0.00 cm	0.00 cm	0.00 °	ACC1
10	0.00 cm	0.00 cm	0.00 °	TEMP1
10	0.00 cm	0.00 cm	0.00 °	SEIS1
10	0.02 cm	0.00 cm	0.00 °	Factored Loads
10	-6.02 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
10	0.02 cm|Factored Loads	0.00 cm|Factored Loads	0.39 °|WIND1	Max
11	0.02 cm	0.00 cm	0.00 °	DL1
11	0.00 cm	0.00 cm	0.00 °	LL1

Node	Ux	Uz	Ufi	Case
11	-6.03 cm	0.00 cm	0.38 °	WIND1
11	0.00 cm	0.00 cm	0.00 °	SNOW1
11	0.00 cm	0.00 cm	0.00 °	LR1
11	0.00 cm	0.00 cm	0.00 °	ACC1
11	0.00 cm	0.00 cm	0.00 °	TEMP1
11	0.00 cm	0.00 cm	0.00 °	SEIS1
11	0.02 cm	0.00 cm	0.00 °	Factored Loads
11	-6.03 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
11	0.02 cm|Factored Loads	0.00 cm|Factored Loads	0.38 °|WIND1	Max
12	0.02 cm	0.00 cm	0.00 °	DL1
12	0.00 cm	0.00 cm	0.00 °	LL1
12	-6.05 cm	0.00 cm	0.45 °	WIND1
12	0.00 cm	0.00 cm	0.00 °	SNOW1
12	0.00 cm	0.00 cm	0.00 °	LR1
12	0.00 cm	0.00 cm	0.00 °	ACC1
12	0.00 cm	0.00 cm	0.00 °	TEMP1
12	0.00 cm	0.00 cm	0.00 °	SEIS1
12	0.02 cm	0.00 cm	0.00 °	Factored Loads
12	-6.05 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
12	0.02 cm|Factored Loads	0.00 cm|Factored Loads	0.45 °|WIND1	Max
13	0.02 cm	0.00 cm	0.00 °	DL1
13	0.00 cm	0.00 cm	0.00 °	LL1
13	-6.63 cm	0.00 cm	0.22 °	WIND1
13	0.00 cm	0.00 cm	0.00 °	SNOW1
13	0.00 cm	0.00 cm	0.00 °	LR1
13	0.00 cm	0.00 cm	0.00 °	ACC1
13	0.00 cm	0.00 cm	0.00 °	TEMP1
13	0.00 cm	0.00 cm	0.00 °	SEIS1
13	0.02 cm	0.00 cm	0.00 °	Factored Loads
13	-6.63 cm|WIND1	0.00 cm|DL1	0.00 °|DL1	Min
13	0.02 cm|Factored Loads	0.00 cm|Factored Loads	0.22 °|WIND1	Max
14	0.03 cm	0.00 cm	0.00 °	DL1
14	0.00 cm	0.00 cm	0.00 °	LL1
14	-7.71 cm	0.00 cm	0.24 °	WIND1
14	0.00 cm	0.00 cm	0.00 °	SNOW1
14	0.00 cm	0.00 cm	0.00 °	LR1
14	0.00 cm	0.00 cm	0.00 °	ACC1
14	0.00 cm	0.00 cm	0.00 °	TEMP1
14	0.00 cm	0.00 cm	0.00 °	SEIS1
14	0.03 cm	0.00 cm	0.00 °	Factored Loads
14	-7.71 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
14	0.03 cm|Factored Loads	0.00 cm|Factored Loads	0.24 °|WIND1	Max
15	0.02 cm	0.00 cm	0.00 °	DL1
15	0.00 cm	0.00 cm	0.00 °	LL1
15	-6.02 cm	0.00 cm	0.39 °	WIND1
15	0.00 cm	0.00 cm	0.00 °	SNOW1
15	0.00 cm	0.00 cm	0.00 °	LR1
15	0.00 cm	0.00 cm	0.00 °	ACC1
15	0.00 cm	0.00 cm	0.00 °	TEMP1
15	0.00 cm	0.00 cm	0.00 °	SEIS1

Node	Ux	Uz	Ufi	Case
15	0.02 cm	0.00 cm	0.00 °	Factored Loads
15	-6.02 cm|WIND1	0.00 cm|DL1	0.00 °|DL1	Min
15	0.02 cm|Factored Loads	0.00 cm|WIND1	0.39 °|WIND1	Max
16	0.03 cm	0.00 cm	0.00 °	DL1
16	0.00 cm	0.00 cm	0.00 °	LL1
16	-7.69 cm	0.00 cm	0.28 °	WIND1
16	0.00 cm	0.00 cm	0.00 °	SNOW1
16	0.00 cm	0.00 cm	0.00 °	LR1
16	0.00 cm	0.00 cm	0.00 °	ACC1
16	0.00 cm	0.00 cm	0.00 °	TEMP1
16	0.00 cm	0.00 cm	0.00 °	SEIS1
16	0.03 cm	0.00 cm	0.00 °	Factored Loads
16	-7.69 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
16	0.03 cm|Factored Loads	0.00 cm|Factored Loads	0.28 °|WIND1	Max
17	0.02 cm	0.00 cm	0.00 °	DL1
17	0.00 cm	0.00 cm	0.00 °	LL1
17	-6.03 cm	0.00 cm	0.38 °	WIND1
17	0.00 cm	0.00 cm	0.00 °	SNOW1
17	0.00 cm	0.00 cm	0.00 °	LR1
17	0.00 cm	0.00 cm	0.00 °	ACC1
17	0.00 cm	0.00 cm	0.00 °	TEMP1
17	0.00 cm	0.00 cm	0.00 °	SEIS1
17	0.02 cm	0.00 cm	0.00 °	Factored Loads
17	-6.03 cm|WIND1	0.00 cm|DL1	0.00 °|DL1	Min
17	0.02 cm|Factored Loads	0.00 cm|WIND1	0.38 °|WIND1	Max
18	0.03 cm	0.00 cm	0.00 °	DL1
18	0.00 cm	0.00 cm	0.00 °	LL1
18	-7.67 cm	0.00 cm	0.28 °	WIND1
18	0.00 cm	0.00 cm	0.00 °	SNOW1
18	0.00 cm	0.00 cm	0.00 °	LR1
18	0.00 cm	0.00 cm	0.00 °	ACC1
18	0.00 cm	0.00 cm	0.00 °	TEMP1
18	0.00 cm	0.00 cm	0.00 °	SEIS1
18	0.03 cm	0.00 cm	0.00 °	Factored Loads
18	-7.67 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
18	0.03 cm|Factored Loads	0.00 cm|Factored Loads	0.28 °|WIND1	Max
19	0.02 cm	0.00 cm	0.00 °	DL1
19	0.00 cm	0.00 cm	0.00 °	LL1
19	-6.05 cm	0.00 cm	0.32 °	WIND1
19	0.00 cm	0.00 cm	0.00 °	SNOW1
19	0.00 cm	0.00 cm	0.00 °	LR1
19	0.00 cm	0.00 cm	0.00 °	ACC1
19	0.00 cm	0.00 cm	0.00 °	TEMP1
19	0.00 cm	0.00 cm	0.00 °	SEIS1
19	0.02 cm	0.00 cm	0.00 °	Factored Loads
19	-6.05 cm|WIND1	0.00 cm|DL1	0.00 °|DL1	Min
19	0.02 cm|Factored Loads	0.00 cm|WIND1	0.32 °|WIND1	Max
20	0.03 cm	0.00 cm	0.00 °	DL1
20	0.00 cm	0.00 cm	0.00 °	LL1
20	-7.65 cm	0.00 cm	0.31 °	WIND1

Node	Ux	Uz	Ufi	Case
20	0.00 cm	0.00 cm	0.00 °	SNOW1
20	0.00 cm	0.00 cm	0.00 °	LR1
20	0.00 cm	0.00 cm	0.00 °	ACC1
20	0.00 cm	0.00 cm	0.00 °	TEMP1
20	0.00 cm	0.00 cm	0.00 °	SEIS1
20	0.03 cm	0.00 cm	0.00 °	Factored Loads
20	-7.65 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
20	0.03 cm|Factored Loads	0.00 cm|Factored Loads	0.31 °|WIND1	Max
21	0.03 cm	0.00 cm	0.00 °	DL1
21	0.00 cm	0.00 cm	0.00 °	LL1
21	-8.96 cm	0.00 cm	0.26 °	WIND1
21	0.00 cm	0.00 cm	0.00 °	SNOW1
21	0.00 cm	0.00 cm	0.00 °	LR1
21	0.00 cm	0.00 cm	0.00 °	ACC1
21	0.00 cm	0.00 cm	0.00 °	TEMP1
21	0.00 cm	0.00 cm	0.00 °	SEIS1
21	0.04 cm	0.00 cm	0.00 °	Factored Loads
21	-8.96 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
21	0.04 cm|Factored Loads	0.00 cm|Factored Loads	0.26 °|WIND1	Max
22	0.03 cm	0.00 cm	0.00 °	DL1
22	0.00 cm	0.00 cm	0.00 °	LL1
22	-8.96 cm	0.00 cm	0.22 °	WIND1
22	0.00 cm	0.00 cm	0.00 °	SNOW1
22	0.00 cm	0.00 cm	0.00 °	LR1
22	0.00 cm	0.00 cm	0.00 °	ACC1
22	0.00 cm	0.00 cm	0.00 °	TEMP1
22	0.00 cm	0.00 cm	0.00 °	SEIS1
22	0.04 cm	0.00 cm	0.00 °	Factored Loads
22	-8.96 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
22	0.04 cm|Factored Loads	0.00 cm|Factored Loads	0.22 °|WIND1	Max
23	0.03 cm	0.00 cm	0.00 °	DL1
23	0.00 cm	0.00 cm	0.00 °	LL1
23	-8.96 cm	0.00 cm	0.23 °	WIND1
23	0.00 cm	0.00 cm	0.00 °	SNOW1
23	0.00 cm	0.00 cm	0.00 °	LR1
23	0.00 cm	0.00 cm	0.00 °	ACC1
23	0.00 cm	0.00 cm	0.00 °	TEMP1
23	0.00 cm	0.00 cm	0.00 °	SEIS1
23	0.04 cm	0.00 cm	0.00 °	Factored Loads
23	-8.96 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
23	0.04 cm|Factored Loads	0.00 cm|Factored Loads	0.23 °|WIND1	Max
24	0.03 cm	0.00 cm	0.00 °	DL1
24	0.00 cm	0.00 cm	0.00 °	LL1
24	-8.97 cm	0.00 cm	0.25 °	WIND1
24	0.00 cm	0.00 cm	0.00 °	SNOW1
24	0.00 cm	0.00 cm	0.00 °	LR1
24	0.00 cm	0.00 cm	0.00 °	ACC1
24	0.00 cm	0.00 cm	0.00 °	TEMP1
24	0.00 cm	0.00 cm	0.00 °	SEIS1
24	0.04 cm	0.00 cm	0.00 °	Factored Loads

Node	Ux	Uz	Ufi	Case
24	-8.97 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Min
24	0.04 cm|Factored Loads	0.00 cm|Factored Loads	0.25 °|WIND1	Max

INTERNAL FORCES IN BARS

Number	Nmin	Nmax	Qmin	Qmax	Mmin
1	-3.41 kN	3.41 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	-5.36 kN	-3.46 kN	-16.77 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
1	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.36 kN|WIND1	0.00 kN|SEIS1	-16.77 kN*m|WIND1
1	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.36 kN|WIND1	0.00 kN|SEIS1	-16.77 kN*m|WIND1
2	-3.41 kN	3.41 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	-5.36 kN	-3.46 kN	-16.77 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
2	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.36 kN|WIND1	0.00 kN|SEIS1	-16.77 kN*m|WIND1
2	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.36 kN|WIND1	0.00 kN|SEIS1	-16.77 kN*m|WIND1
3	-3.41 kN	3.41 kN	-0.01 kN	-0.01 kN	-0.02 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	-6.14 kN	-6.14 kN	-23.32 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
3	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-6.14 kN|WIND1	0.00 kN|SEIS1	-23.32 kN*m|WIND1
3	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-6.14 kN|WIND1	0.00 kN|SEIS1	-23.32 kN*m|WIND1
4	-3.41 kN	3.41 kN	-0.01 kN	-0.01 kN	-0.02 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	-6.14 kN	-6.14 kN	-23.32 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.03 kN*m
4	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-6.14 kN|WIND1	0.00 kN|SEIS1	-23.32 kN*m|WIND1
4	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-6.14 kN|WIND1	0.00 kN|SEIS1	-23.32 kN*m|WIND1

Number	Nmin	Nmax	Qmin	Qmax	Mmin
5	-3.41 kN	3.41 kN	0.02 kN	0.02 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	-5.80 kN	-5.80 kN	-22.05 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	-4.09 kN	4.09 kN	0.02 kN	0.02 kN	0.00 kN*m
5	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.80 kN|WIND1	0.02 kN|Factored Loads	-22.05 kN*m|WIND1
5	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.80 kN|WIND1	0.02 kN|Factored Loads	-22.05 kN*m|WIND1
6	-3.41 kN	3.41 kN	0.02 kN	0.02 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	-5.80 kN	-5.80 kN	-22.05 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	-4.09 kN	4.09 kN	0.02 kN	0.02 kN	0.00 kN*m
6	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.80 kN|WIND1	0.02 kN|Factored Loads	-22.05 kN*m|WIND1
6	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-5.80 kN|WIND1	0.02 kN|Factored Loads	-22.05 kN*m|WIND1
7	-3.41 kN	3.41 kN	0.00 kN	0.00 kN	-0.02 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	-4.48 kN	-4.48 kN	-17.02 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.02 kN*m
7	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-4.48 kN|WIND1	0.00 kN|SEIS1	-17.02 kN*m|WIND1
7	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-4.48 kN|WIND1	0.00 kN|SEIS1	-17.02 kN*m|WIND1
8	-3.41 kN	3.41 kN	0.00 kN	0.00 kN	-0.02 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	-4.48 kN	-4.48 kN	-17.02 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	-4.09 kN	4.09 kN	-0.01 kN	-0.01 kN	-0.02 kN*m
8	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-4.48 kN|WIND1	0.00 kN|SEIS1	-17.02 kN*m|WIND1
8	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-4.48 kN|WIND1	0.00 kN|SEIS1	-17.02 kN*m|WIND1
9	-0.03 kN	0.02 kN	-2.00 kN	1.97 kN	-1.71 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	-15.55 kN	21.11 kN	4.89 kN	14.86 kN	-35.72 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	-0.04 kN	0.03 kN	-2.39 kN	2.36 kN	-2.05 kN*m
9	-15.55 kN|WIND1	21.11 kN|WIND1	-2.39 kN|Factored Loads	14.86 kN|WIND1	-35.72 kN*m|WIND1
9	-15.55 kN|WIND1	21.11 kN|WIND1	-2.39 kN|Factored Loads	14.86 kN|WIND1	-35.72 kN*m|WIND1
10	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.03 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	4.31 kN	7.67 kN	-16.77 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.03 kN*m
10	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	7.67 kN|WIND1	-16.77 kN*m|WIND1
10	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	7.67 kN|WIND1	-16.77 kN*m|WIND1
11	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.03 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	4.31 kN	7.67 kN	-16.77 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.03 kN*m
11	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	7.67 kN|WIND1	-16.77 kN*m|WIND1
11	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	7.67 kN|WIND1	-16.77 kN*m|WIND1
12	-2.51 kN	2.51 kN	-0.02 kN	-0.02 kN	-0.07 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	-13.91 kN	-13.91 kN	-34.25 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	-3.01 kN	3.01 kN	-0.03 kN	-0.03 kN	-0.08 kN*m
12	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-13.91 kN|WIND1	0.00 kN|SEIS1	-34.25 kN*m|WIND1
12	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-13.91 kN|WIND1	0.00 kN|SEIS1	-34.25 kN*m|WIND1
13	-2.51 kN	2.51 kN	-0.02 kN	-0.02 kN	-0.07 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	-13.91 kN	-13.91 kN	-34.25 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	-3.01 kN	3.01 kN	-0.03 kN	-0.03 kN	-0.08 kN*m
13	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-13.91 kN|WIND1	0.00 kN|SEIS1	-34.25 kN*m|WIND1
13	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-13.91 kN|WIND1	0.00 kN|SEIS1	-34.25 kN*m|WIND1
14	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.11 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	-16.35 kN	-16.35 kN	-39.69 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.13 kN*m
14	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-16.35 kN|WIND1	0.01 kN|Factored Loads	-39.69 kN*m|WIND1
14	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-16.35 kN|WIND1	0.01 kN|Factored Loads	-39.69 kN*m|WIND1
15	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.11 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	-16.35 kN	-16.35 kN	-39.69 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.13 kN*m
15	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-16.35 kN|WIND1	0.01 kN|Factored Loads	-39.69 kN*m|WIND1
15	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-16.35 kN|WIND1	0.01 kN|Factored Loads	-39.69 kN*m|WIND1
16	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.02 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	6.08 kN	6.08 kN	-17.02 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.02 kN*m
16	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	6.08 kN|WIND1	-17.02 kN*m|WIND1
16	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	6.08 kN|WIND1	-17.02 kN*m|WIND1
17	-2.51 kN	2.51 kN	0.01 kN	0.01 kN	-0.02 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	6.08 kN	6.08 kN	-17.02 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	-3.01 kN	3.01 kN	0.01 kN	0.01 kN	-0.02 kN*m
17	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	6.08 kN|WIND1	-17.02 kN*m|WIND1
17	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	6.08 kN|WIND1	-17.02 kN*m|WIND1
18	-0.33 kN	0.02 kN	-1.88 kN	6.95 kN	-1.72 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	-34.19 kN	21.06 kN	3.89 kN	20.84 kN	-49.50 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	-0.40 kN	0.02 kN	-2.25 kN	8.34 kN	-2.07 kN*m
18	-34.19 kN|WIND1	21.06 kN|WIND1	-2.25 kN|Factored Loads	20.84 kN|WIND1	-49.50 kN*m|WIND1
18	-34.19 kN|WIND1	21.06 kN|WIND1	-2.25 kN|Factored Loads	20.84 kN|WIND1	-49.50 kN*m|WIND1
19	-5.02 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	7.28 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	-6.03 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	-6.03 kN|Factored Loads	0.00 kN|Factored Loads	0.00 kN|Factored Loads	7.28 kN|WIND1	0.00 kN*m|Factored Loads
19	-6.03 kN|Factored Loads	0.00 kN|Factored Loads	0.00 kN|Factored Loads	7.28 kN|WIND1	0.00 kN*m|Factored Loads
20	-5.02 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	7.28 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	-6.03 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	-6.03 kN|Factored Loads	0.00 kN|Factored Loads	0.00 kN|Factored Loads	7.28 kN|WIND1	0.00 kN*m|Factored Loads
20	-6.03 kN|Factored Loads	0.00 kN|Factored Loads	0.00 kN|Factored Loads	7.28 kN|WIND1	0.00 kN*m|Factored Loads
21	-2.53 kN	2.49 kN	0.06 kN	0.06 kN	-0.07 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	4.32 kN	4.32 kN	-2.86 kN	-2.86 kN	-20.11 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	-3.04 kN	2.99 kN	0.08 kN	0.08 kN	-0.08 kN*m
21	-3.04 kN|Factored Loads	4.32 kN|WIND1	-2.86 kN|WIND1	0.08 kN|Factored Loads	-20.11 kN*m|WIND1
21	-3.04 kN|Factored Loads	4.32 kN|WIND1	-2.86 kN|WIND1	0.08 kN|Factored Loads	-20.11 kN*m|WIND1
22	-2.53 kN	2.49 kN	0.06 kN	0.06 kN	-0.07 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	4.32 kN	4.32 kN	-2.86 kN	-2.86 kN	-20.11 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	-3.04 kN	2.99 kN	0.08 kN	0.08 kN	-0.08 kN*m
22	-3.04 kN|Factored Loads	4.32 kN|WIND1	-2.86 kN|WIND1	0.08 kN|Factored Loads	-20.11 kN*m|WIND1
22	-3.04 kN|Factored Loads	4.32 kN|WIND1	-2.86 kN|WIND1	0.08 kN|Factored Loads	-20.11 kN*m|WIND1
23	-2.53 kN	2.49 kN	0.09 kN	0.09 kN	-0.07 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
23	4.21 kN	4.21 kN	-2.64 kN	-2.64 kN	-18.24 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	-3.04 kN	2.99 kN	0.11 kN	0.11 kN	-0.08 kN*m
23	-3.04 kN|Factored Loads	4.21 kN|WIND1	-2.64 kN|WIND1	0.11 kN|Factored Loads	-18.24 kN*m|WIND1
23	-3.04 kN|Factored Loads	4.21 kN|WIND1	-2.64 kN|WIND1	0.11 kN|Factored Loads	-18.24 kN*m|WIND1
24	-2.53 kN	2.49 kN	0.09 kN	0.09 kN	-0.07 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	4.21 kN	4.21 kN	-2.64 kN	-2.64 kN	-18.24 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	-3.04 kN	2.99 kN	0.11 kN	0.11 kN	-0.08 kN*m
24	-3.04 kN|Factored Loads	4.21 kN|WIND1	-2.64 kN|WIND1	0.11 kN|Factored Loads	-18.24 kN*m|WIND1
24	-3.04 kN|Factored Loads	4.21 kN|WIND1	-2.64 kN|WIND1	0.11 kN|Factored Loads	-18.24 kN*m|WIND1
25	-2.54 kN	2.48 kN	-0.15 kN	-0.15 kN	0.02 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	3.48 kN	3.48 kN	-11.02 kN	-11.02 kN	-16.82 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	-3.05 kN	2.97 kN	-0.18 kN	-0.18 kN	0.03 kN*m
25	-3.05 kN|Factored Loads	3.48 kN|WIND1	-11.02 kN|WIND1	0.00 kN|SEIS1	-16.82 kN*m|WIND1
25	-3.05 kN|Factored Loads	3.48 kN|WIND1	-11.02 kN|WIND1	0.00 kN|SEIS1	-16.82 kN*m|WIND1
26	-2.54 kN	2.48 kN	-0.15 kN	-0.15 kN	0.02 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	3.48 kN	3.48 kN	-11.02 kN	-11.02 kN	-16.82 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	-3.05 kN	2.97 kN	-0.18 kN	-0.18 kN	0.03 kN*m
26	-3.05 kN|Factored Loads	3.48 kN|WIND1	-11.02 kN|WIND1	0.00 kN|SEIS1	-16.82 kN*m|WIND1
26	-3.05 kN|Factored Loads	3.48 kN|WIND1	-11.02 kN|WIND1	0.00 kN|SEIS1	-16.82 kN*m|WIND1
27	0.00 kN	0.29 kN	-2.00 kN	1.97 kN	-1.72 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	31.08 kN	34.05 kN	2.80 kN	8.48 kN	-20.37 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
27	0.00 kN	0.35 kN	-2.40 kN	2.36 kN	-2.06 kN*m
27	0.00 kN|Factored Loads	34.05 kN|WIND1	-2.40 kN|Factored Loads	8.48 kN|WIND1	-20.37 kN*m|WIND1
27	0.00 kN|Factored Loads	34.05 kN|WIND1	-2.40 kN|Factored Loads	8.48 kN|WIND1	-20.37 kN*m|WIND1
28	-2.51 kN	2.51 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	-8.26 kN	0.98 kN	-0.15 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	-3.01 kN	3.01 kN	0.00 kN	0.00 kN	0.00 kN*m
28	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-8.26 kN|WIND1	0.98 kN|WIND1	-0.15 kN*m|WIND1
28	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-8.26 kN|WIND1	0.98 kN|WIND1	-0.15 kN*m|WIND1
29	-2.51 kN	2.51 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	-8.26 kN	0.98 kN	-0.15 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	-3.01 kN	3.01 kN	0.00 kN	0.00 kN	0.00 kN*m
29	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-8.26 kN|WIND1	0.98 kN|WIND1	-0.15 kN*m|WIND1
29	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-8.26 kN|WIND1	0.98 kN|WIND1	-0.15 kN*m|WIND1
30	-2.51 kN	2.51 kN	-0.05 kN	-0.05 kN	-0.03 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	-3.12 kN	-3.12 kN	-12.83 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	-3.01 kN	3.01 kN	-0.06 kN	-0.06 kN	-0.03 kN*m
30	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.12 kN|WIND1	0.00 kN|SEIS1	-12.83 kN*m|WIND1
30	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.12 kN|WIND1	0.00 kN|SEIS1	-12.83 kN*m|WIND1
31	-2.51 kN	2.51 kN	-0.05 kN	-0.05 kN	-0.03 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	-3.12 kN	-3.12 kN	-12.83 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	-3.01 kN	3.01 kN	-0.06 kN	-0.06 kN	-0.03 kN*m
31	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.12 kN|WIND1	0.00 kN|SEIS1	-12.83 kN*m|WIND1
31	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.12 kN|WIND1	0.00 kN|SEIS1	-12.83 kN*m|WIND1
32	-2.51 kN	2.51 kN	0.06 kN	0.06 kN	-0.01 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	-3.87 kN	-3.87 kN	-13.03 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	-3.01 kN	3.01 kN	0.07 kN	0.07 kN	-0.01 kN*m
32	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.87 kN|WIND1	0.07 kN|Factored Loads	-13.03 kN*m|WIND1
32	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.87 kN|WIND1	0.07 kN|Factored Loads	-13.03 kN*m|WIND1
33	-2.51 kN	2.51 kN	0.06 kN	0.06 kN	-0.01 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	0.00 kN	0.00 kN	-3.87 kN	-3.87 kN	-13.03 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
33	-3.01 kN	3.01 kN	0.07 kN	0.07 kN	-0.01 kN*m
33	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.87 kN|WIND1	0.07 kN|Factored Loads	-13.03 kN*m|WIND1
33	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.87 kN|WIND1	0.07 kN|Factored Loads	-13.03 kN*m|WIND1
34	-2.51 kN	2.51 kN	-0.01 kN	-0.01 kN	0.00 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	0.00 kN	0.00 kN	6.01 kN	6.01 kN	-16.82 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
34	-3.01 kN	3.01 kN	-0.01 kN	-0.01 kN	0.00 kN*m
34	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.01 kN|Factored Loads	6.01 kN|WIND1	-16.82 kN*m|WIND1
34	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.01 kN|Factored Loads	6.01 kN|WIND1	-16.82 kN*m|WIND1
35	-2.51 kN	2.51 kN	-0.01 kN	-0.01 kN	0.00 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	0.00 kN	0.00 kN	6.01 kN	6.01 kN	-16.82 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
35	-3.01 kN	3.01 kN	-0.01 kN	-0.01 kN	0.00 kN*m
35	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.01 kN|Factored Loads	6.01 kN|WIND1	-16.82 kN*m|WIND1
35	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.01 kN|Factored Loads	6.01 kN|WIND1	-16.82 kN*m|WIND1
36	-0.10 kN	0.02 kN	-1.99 kN	1.97 kN	-1.70 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	-12.02 kN	1.96 kN	2.23 kN	6.84 kN	-16.50 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
36	-0.12 kN	0.02 kN	-2.39 kN	2.36 kN	-2.04 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
36	-12.02 kN|WIND1	1.96 kN|WIND1	-2.39 kN|Factored Loads	6.84 kN|WIND1	-16.50 kN*m|WIND1
36	-12.02 kN|WIND1	1.96 kN|WIND1	-2.39 kN|Factored Loads	6.84 kN|WIND1	-16.50 kN*m|WIND1

DISPLACEMENTS IN BARS

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
1	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	3.74 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
1	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
1	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
2	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	3.74 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
2	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
2	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
3	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	3.75 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
3	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
3	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
4	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	3.75 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
4	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
4	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
5	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	3.75 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
5	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
5	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
6	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	3.75 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
6	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
6	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.75 cm|WIND1	0.00 cm|Factored Loads	0.0
7	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	3.74 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
7	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
7	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
8	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	3.74 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	0.00 cm	
8	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
8	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|Factored Loads	3.74 cm|WIND1	0.00 cm|Factored Loads	0.0
9	0.01 cm	0.01 cm	-0.04 cm	0.00 cm	-0.04 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	-3.75 cm	-3.74 cm	-0.70 cm	0.69 cm	-0.70 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.01 cm	0.01 cm	-0.05 cm	0.00 cm	-0.05 cm	
9	-3.75 cm|WIND1	0.01 cm|Factored Loads	-0.70 cm|WIND1	0.69 cm|WIND1	-0.70 cm|WIND1	0.6
9	-3.75 cm|WIND1	0.01 cm|Factored Loads	-0.70 cm|WIND1	0.69 cm|WIND1	-0.70 cm|WIND1	0.6
10	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	3.74 cm	6.03 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
10	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
10	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
11	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	3.74 cm	6.03 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
11	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
11	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
12	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	3.75 cm	6.02 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
12	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.02 cm|WIND1	0.00 cm|Factored Loads	0.0
12	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.02 cm|WIND1	0.00 cm|Factored Loads	0.0
13	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	3.75 cm	6.02 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
13	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.02 cm|WIND1	0.00 cm|Factored Loads	0.0
13	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.02 cm|WIND1	0.00 cm|Factored Loads	0.0
14	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	3.75 cm	6.03 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
14	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
14	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
15	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	3.75 cm	6.03 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
15	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
15	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.03 cm|WIND1	0.00 cm|Factored Loads	0.0
16	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	3.74 cm	6.05 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
16	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.05 cm|WIND1	0.00 cm|Factored Loads	0.0
16	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.05 cm|WIND1	0.00 cm|Factored Loads	0.0
17	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	3.74 cm	6.05 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	-0.02 cm	-0.01 cm	0.00 cm	
17	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.05 cm|WIND1	0.00 cm|Factored Loads	0.0
17	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|Factored Loads	6.05 cm|WIND1	0.00 cm|Factored Loads	0.0
18	0.02 cm	0.02 cm	-0.04 cm	0.00 cm	-0.04 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	-6.05 cm	-6.02 cm	-0.32 cm	0.55 cm	-0.32 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.02 cm	0.02 cm	-0.05 cm	0.00 cm	-0.05 cm	
18	-6.05 cm|WIND1	0.02 cm|Factored Loads	-0.32 cm|WIND1	0.55 cm|WIND1	-0.32 cm|WIND1	0.5
18	-6.05 cm|WIND1	0.02 cm|Factored Loads	-0.32 cm|WIND1	0.55 cm|WIND1	-0.32 cm|WIND1	0.5
19	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	6.63 cm	7.71 cm	-0.01 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
19	0.00 cm|Factored Loads	0.00 cm|Factored Loads	-0.03 cm|Factored Loads	7.71 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
19	0.00 cm|Factored Loads	0.00 cm|Factored Loads	-0.03 cm|Factored Loads	7.71 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
20	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	6.63 cm	7.71 cm	-0.01 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
20	0.00 cm|Factored Loads	0.00 cm|Factored Loads	-0.03 cm|Factored Loads	7.71 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
20	0.00 cm|Factored Loads	0.00 cm|Factored Loads	-0.03 cm|Factored Loads	7.71 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
21	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	6.02 cm	7.69 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
21	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
21	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.69 cm|WIND1	0.00 cm|Factored Loads	0.0
21	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.69 cm|WIND1	0.00 cm|Factored Loads	0.0
22	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	6.02 cm	7.69 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
22	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
22	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.69 cm|WIND1	0.00 cm|Factored Loads	0.0
22	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.69 cm|WIND1	0.00 cm|Factored Loads	0.0
23	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
23	0.00 cm	0.00 cm	6.03 cm	7.67 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
23	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
23	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.67 cm|WIND1	0.00 cm|Factored Loads	0.0
23	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.67 cm|WIND1	0.00 cm|Factored Loads	0.0
24	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	6.03 cm	7.67 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
24	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
24	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.67 cm|WIND1	0.00 cm|Factored Loads	0.0
24	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.67 cm|WIND1	0.00 cm|Factored Loads	0.0
25	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	6.05 cm	7.65 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
25	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.65 cm|WIND1	0.00 cm|WIND1	0.0
25	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.65 cm|WIND1	0.00 cm|WIND1	0.0
26	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	6.05 cm	7.65 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	-0.03 cm	-0.02 cm	0.00 cm	
26	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.65 cm|WIND1	0.00 cm|WIND1	0.0
26	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|Factored Loads	7.65 cm|WIND1	0.00 cm|WIND1	0.0
27	0.03 cm	0.03 cm	-0.04 cm	0.00 cm	-0.04 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	-7.71 cm	-7.65 cm	-0.40 cm	0.40 cm	-0.40 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
27	0.03 cm	0.03 cm	-0.05 cm	0.00 cm	-0.05 cm	
27	-7.71 cm|WIND1	0.03 cm|Factored Loads	-0.40 cm|WIND1	0.40 cm|WIND1	-0.40 cm|WIND1	0.4
27	-7.71 cm|WIND1	0.03 cm|Factored Loads	-0.40 cm|WIND1	0.40 cm|WIND1	-0.40 cm|WIND1	0.4
28	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	7.71 cm	8.96 cm	-0.01 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
28	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
28	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
29	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	7.71 cm	8.96 cm	-0.01 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
29	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
29	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Fa
30	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	7.69 cm	8.96 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
30	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
30	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
31	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	7.69 cm	8.96 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
31	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
31	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
32	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	7.67 cm	8.96 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
32	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
32	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
33	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	7.67 cm	8.96 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
33	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
33	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
33	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.96 cm|WIND1	0.00 cm|Factored Loads	0.0
34	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	7.65 cm	8.97 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
34	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
34	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.97 cm|WIND1	0.00 cm|Factored Loads	0.0
34	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.97 cm|WIND1	0.00 cm|Factored Loads	0.0
35	0.00 cm	0.00 cm	-0.03 cm	-0.03 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	7.65 cm	8.97 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
35	0.00 cm	0.00 cm	-0.04 cm	-0.03 cm	0.00 cm	
35	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.97 cm|WIND1	0.00 cm|Factored Loads	0.0
35	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.04 cm|Factored Loads	8.97 cm|WIND1	0.00 cm|Factored Loads	0.0
36	0.03 cm	0.03 cm	-0.04 cm	0.00 cm	-0.04 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	-8.97 cm	-8.96 cm	-0.32 cm	0.31 cm	-0.32 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
36	0.04 cm	0.04 cm	-0.05 cm	0.00 cm	-0.05 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	Deflec
36	-8.97 cm|WIND1	0.04 cm|Factored Loads	-0.32 cm|WIND1	0.31 cm|WIND1	-0.32 cm|WIND1	0.3
36	-8.97 cm|WIND1	0.04 cm|Factored Loads	-0.32 cm|WIND1	0.31 cm|WIND1	-0.32 cm|WIND1	0.3

REACTIONS

Support	Rx	Rz	Rm	Case
1	0.01 kN	6.82 kN	0.00 kN*m	DL1
1	0.00 kN	0.00 kN	0.00 kN*m	LL1
1	10.73 kN	0.00 kN	0.00 kN*m	WIND1
1	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
1	0.00 kN	0.00 kN	0.00 kN*m	LR1
1	0.00 kN	0.00 kN	0.00 kN*m	ACC1
1	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
1	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
1	0.02 kN	8.18 kN	0.00 kN*m	Factored Loads
1	0.00 kN|SEIS1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
1	10.73 kN|WIND1	8.18 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
2	0.01 kN	6.82 kN	0.00 kN*m	DL1
2	0.00 kN	0.00 kN	0.00 kN*m	LL1
2	8.96 kN	0.00 kN	0.00 kN*m	WIND1
2	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
2	0.00 kN	0.00 kN	0.00 kN*m	LR1
2	0.00 kN	0.00 kN	0.00 kN*m	ACC1
2	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
2	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
2	0.01 kN	8.18 kN	0.00 kN*m	Factored Loads
2	0.00 kN|SEIS1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
2	8.96 kN|WIND1	8.18 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
3	-0.03 kN	6.82 kN	0.00 kN*m	DL1
3	0.00 kN	0.00 kN	0.00 kN*m	LL1
3	11.61 kN	0.00 kN	0.00 kN*m	WIND1
3	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
3	0.00 kN	0.00 kN	0.00 kN*m	LR1
3	0.00 kN	0.00 kN	0.00 kN*m	ACC1
3	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
3	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
3	-0.04 kN	8.18 kN	0.00 kN*m	Factored Loads
3	-0.04 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
3	11.61 kN|WIND1	8.18 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
4	0.01 kN	6.82 kN	0.00 kN*m	DL1
4	0.00 kN	0.00 kN	0.00 kN*m	LL1
4	12.27 kN	0.00 kN	0.00 kN*m	WIND1
4	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
4	0.00 kN	0.00 kN	0.00 kN*m	LR1
4	0.00 kN	0.00 kN	0.00 kN*m	ACC1
4	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
4	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
4	0.01 kN	8.18 kN	0.00 kN*m	Factored Loads
4	0.00 kN|SEIS1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
4	12.27 kN|WIND1	8.18 kN|Factored Loads	0.00 kN*m|Factored Loads	Max

Support	Rx	Rz	Rm	Case
5	0.00 kN	13.05 kN	0.00 kN*m	DL1
5	0.00 kN	0.00 kN	0.00 kN*m	LL1
5	0.00 kN	-4.89 kN	0.00 kN*m	WIND1
5	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
5	0.00 kN	0.00 kN	0.00 kN*m	LR1
5	0.00 kN	0.00 kN	0.00 kN*m	ACC1
5	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
5	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
5	0.00 kN	15.66 kN	0.00 kN*m	Factored Loads
5	0.00 kN|Factored Loads	-4.89 kN|WIND1	0.00 kN*m|Factored Loads	Min
5	0.00 kN|Factored Loads	15.66 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
6	0.00 kN	15.68 kN	0.00 kN*m	DL1
6	0.00 kN	0.00 kN	0.00 kN*m	LL1
6	0.00 kN	-9.97 kN	0.00 kN*m	WIND1
6	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
6	0.00 kN	0.00 kN	0.00 kN*m	LR1
6	0.00 kN	0.00 kN	0.00 kN*m	ACC1
6	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
6	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
6	0.00 kN	18.81 kN	0.00 kN*m	Factored Loads
6	0.00 kN|Factored Loads	-9.97 kN|WIND1	0.00 kN*m|Factored Loads	Min
6	0.00 kN|Factored Loads	18.81 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
7	0.00 kN	13.02 kN	0.00 kN*m	DL1
7	0.00 kN	0.00 kN	0.00 kN*m	LL1
7	0.00 kN	4.93 kN	0.00 kN*m	WIND1
7	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
7	0.00 kN	0.00 kN	0.00 kN*m	LR1
7	0.00 kN	0.00 kN	0.00 kN*m	ACC1
7	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
7	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
7	0.00 kN	15.62 kN	0.00 kN*m	Factored Loads
7	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
7	0.00 kN|Factored Loads	15.62 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
8	0.00 kN	15.62 kN	0.00 kN*m	DL1
8	0.00 kN	0.00 kN	0.00 kN*m	LL1
8	0.00 kN	9.93 kN	0.00 kN*m	WIND1
8	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
8	0.00 kN	0.00 kN	0.00 kN*m	LR1
8	0.00 kN	0.00 kN	0.00 kN*m	ACC1
8	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
8	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
8	0.00 kN	18.74 kN	0.00 kN*m	Factored Loads
8	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
8	0.00 kN|Factored Loads	18.74 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
9	0.00 kN	6.23 kN	0.00 kN*m	DL1
9	0.00 kN	0.00 kN	0.00 kN*m	LL1
9	0.00 kN	-3.89 kN	0.00 kN*m	WIND1
9	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
9	0.00 kN	0.00 kN	0.00 kN*m	LR1
9	0.00 kN	0.00 kN	0.00 kN*m	ACC1

Support	Rx	Rz	Rm	Case
9	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
9	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
9	0.00 kN	7.48 kN	0.00 kN*m	Factored Loads
9	0.00 kN|Factored Loads	-3.89 kN|WIND1	0.00 kN*m|Factored Loads	Min
9	0.00 kN|Factored Loads	7.48 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
10	0.00 kN	13.85 kN	0.00 kN*m	DL1
10	0.00 kN	0.00 kN	0.00 kN*m	LL1
10	0.00 kN	0.90 kN	0.00 kN*m	WIND1
10	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
10	0.00 kN	0.00 kN	0.00 kN*m	LR1
10	0.00 kN	0.00 kN	0.00 kN*m	ACC1
10	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
10	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
10	0.00 kN	16.62 kN	0.00 kN*m	Factored Loads
10	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
10	0.00 kN|Factored Loads	16.62 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
11	0.00 kN	11.47 kN	0.00 kN*m	DL1
11	0.00 kN	0.00 kN	0.00 kN*m	LL1
11	0.00 kN	20.84 kN	0.00 kN*m	WIND1
11	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
11	0.00 kN	0.00 kN	0.00 kN*m	LR1
11	0.00 kN	0.00 kN	0.00 kN*m	ACC1
11	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
11	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
11	0.00 kN	13.77 kN	0.00 kN*m	Factored Loads
11	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
11	0.00 kN|Factored Loads	20.84 kN|WIND1	0.00 kN*m|Factored Loads	Max
12	0.00 kN	13.46 kN	0.00 kN*m	DL1
12	0.00 kN	0.00 kN	0.00 kN*m	LL1
12	0.00 kN	6.19 kN	0.00 kN*m	WIND1
12	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
12	0.00 kN	0.00 kN	0.00 kN*m	LR1
12	0.00 kN	0.00 kN	0.00 kN*m	ACC1
12	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
12	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
12	0.00 kN	16.15 kN	0.00 kN*m	Factored Loads
12	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
12	0.00 kN|Factored Loads	16.15 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
13	0.00 kN	16.28 kN	0.00 kN*m	DL1
13	0.00 kN	0.00 kN	0.00 kN*m	LL1
13	0.00 kN	-2.80 kN	0.00 kN*m	WIND1
13	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
13	0.00 kN	0.00 kN	0.00 kN*m	LR1
13	0.00 kN	0.00 kN	0.00 kN*m	ACC1
13	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
13	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
13	0.00 kN	19.53 kN	0.00 kN*m	Factored Loads
13	0.00 kN|Factored Loads	-2.80 kN|WIND1	0.00 kN*m|Factored Loads	Min
13	0.00 kN|Factored Loads	19.53 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
14	0.00 kN	13.93 kN	0.00 kN*m	DL1

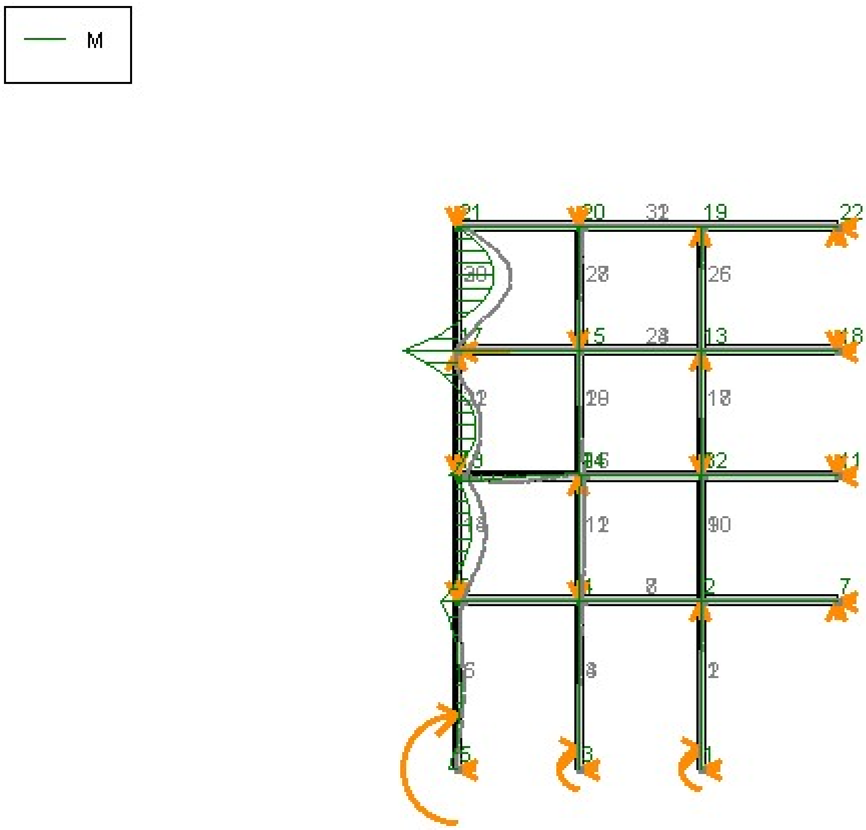
Support	Rx	Rz	Rm	Case
14	0.00 kN	0.00 kN	0.00 kN*m	LL1
14	0.00 kN	-14.33 kN	0.00 kN*m	WIND1
14	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
14	0.00 kN	0.00 kN	0.00 kN*m	LR1
14	0.00 kN	0.00 kN	0.00 kN*m	ACC1
14	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
14	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
14	0.00 kN	16.71 kN	0.00 kN*m	Factored Loads
14	0.00 kN|Factored Loads	-14.33 kN|WIND1	0.00 kN*m|Factored Loads	Min
14	0.00 kN|Factored Loads	16.71 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
15	0.00 kN	11.29 kN	0.00 kN*m	DL1
15	0.00 kN	0.00 kN	0.00 kN*m	LL1
15	0.00 kN	-4.16 kN	0.00 kN*m	WIND1
15	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
15	0.00 kN	0.00 kN	0.00 kN*m	LR1
15	0.00 kN	0.00 kN	0.00 kN*m	ACC1
15	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
15	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
15	0.00 kN	13.55 kN	0.00 kN*m	Factored Loads
15	0.00 kN|Factored Loads	-4.16 kN|WIND1	0.00 kN*m|Factored Loads	Min
15	0.00 kN|Factored Loads	13.55 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
16	0.00 kN	13.86 kN	0.00 kN*m	DL1
16	0.00 kN	0.00 kN	0.00 kN*m	LL1
16	0.00 kN	-2.75 kN	0.00 kN*m	WIND1
16	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
16	0.00 kN	0.00 kN	0.00 kN*m	LR1
16	0.00 kN	0.00 kN	0.00 kN*m	ACC1
16	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
16	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
16	0.00 kN	16.64 kN	0.00 kN*m	Factored Loads
16	0.00 kN|Factored Loads	-2.75 kN|WIND1	0.00 kN*m|Factored Loads	Min
16	0.00 kN|Factored Loads	16.64 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
17	0.00 kN	6.23 kN	0.00 kN*m	DL1
17	0.00 kN	0.00 kN	0.00 kN*m	LL1
17	0.00 kN	-2.23 kN	0.00 kN*m	WIND1
17	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
17	0.00 kN	0.00 kN	0.00 kN*m	LR1
17	0.00 kN	0.00 kN	0.00 kN*m	ACC1
17	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
17	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
17	0.00 kN	7.47 kN	0.00 kN*m	Factored Loads
17	0.00 kN|Factored Loads	-2.23 kN|WIND1	0.00 kN*m|Factored Loads	Min
17	0.00 kN|Factored Loads	7.47 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
18	0.00 kN	8.85 kN	0.00 kN*m	DL1
18	0.00 kN	0.00 kN	0.00 kN*m	LL1
18	0.00 kN	-4.61 kN	0.00 kN*m	WIND1
18	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
18	0.00 kN	0.00 kN	0.00 kN*m	LR1
18	0.00 kN	0.00 kN	0.00 kN*m	ACC1
18	0.00 kN	0.00 kN	0.00 kN*m	TEMP1

Support	Rx	Rz	Rm	Case
18	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
18	0.00 kN	10.62 kN	0.00 kN*m	Factored Loads
18	0.00 kN|Factored Loads	-4.61 kN|WIND1	0.00 kN*m|Factored Loads	Min
18	0.00 kN|Factored Loads	10.62 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
19	0.00 kN	6.20 kN	0.00 kN*m	DL1
19	0.00 kN	0.00 kN	0.00 kN*m	LL1
19	0.00 kN	2.29 kN	0.00 kN*m	WIND1
19	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
19	0.00 kN	0.00 kN	0.00 kN*m	LR1
19	0.00 kN	0.00 kN	0.00 kN*m	ACC1
19	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
19	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
19	0.00 kN	7.44 kN	0.00 kN*m	Factored Loads
19	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
19	0.00 kN|Factored Loads	7.44 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
20	0.00 kN	8.81 kN	0.00 kN*m	DL1
20	0.00 kN	0.00 kN	0.00 kN*m	LL1
20	0.00 kN	4.55 kN	0.00 kN*m	WIND1
20	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
20	0.00 kN	0.00 kN	0.00 kN*m	LR1
20	0.00 kN	0.00 kN	0.00 kN*m	ACC1
20	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
20	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
20	0.00 kN	10.57 kN	0.00 kN*m	Factored Loads
20	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
20	0.00 kN|Factored Loads	10.57 kN|Factored Loads	0.00 kN*m|Factored Loads	Max

APPENDIX G Grid Line 2 East West Lateral Load Test

Static analysis of frames

Revit Extensions for Autodesk Revit Structure - Static analysis of frames 2013.0



DATA

Geometry

MATERIALS

Name	Young's modulus	Unit weight
Concrete, Cast-in-Place gray	23250.0 MN/m2	23.6 kN/m3

CROSS-SECTIONS

Family	Type	Cross-sectional area	Moment of inertia

Family	Type	Cross-sectional area	Moment of inertia
M_Concrete-Rectangular-Column	19x40	760.0 cm2	101333.33 cm4
M_Concrete-Rectangular Beam	14x23	322.0 cm2	14194.83 cm4

BARS

	Start node	End node	Material	Family	Revit Id
1	1	2	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175483
2	1	2	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175483
3	3	4	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175904
4	3	4	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175904
5	5	6	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175959
6	5	6	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	175959
7	6	7	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	197151
8	6	7	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	197151
9	2	8	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371667
10	2	8	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371667
11	4	9	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371669
12	4	9	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371669
13	6	10	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371671
14	6	10	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	371671
15	10	11	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	371781
16	10	11	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	371781
17	12	13	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375346
18	12	13	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375346
19	14	15	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375348
20	14	15	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375348
21	16	17	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375350
22	16	17	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	375350
23	17	18	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	375460
24	17	18	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	375460
25	13	19	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378707
26	13	19	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378707
27	15	20	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378709
28	15	20	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378709
29	17	21	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378711
30	17	21	Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column:19x40	378711
31	21	22	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	378821
32	21	22	Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam:14x23	378821

NODES

	X	Z
1	-10300	-1000
2	-10300	2800
3	-13050	-1000
4	-13050	2800
5	-15780	-1000
6	-15780	2800
7	-7250	2800

	X	Z
8	-10300	5600
9	-13050	5600
10	-15780	5600
11	-7249	5600
12	-10299	5600
13	-10299	8400
14	-13049	5600
15	-13049	8400
16	-15779	5600
17	-15779	8400
18	-7249	8400
19	-10299	11200
20	-13049	11200
21	-15779	11200
22	-7249	11200

Loads

NODAL LOADS

	xA/l	xB/l	xA	xB	FxA	FxB	FzA	FzB	MA	MB	Case
1	0.00	1.00	0	3800	0.50 kN/m	0.50 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
2	0.00	1.00	0	3800	0.50 kN/m	0.50 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
3	1.00	1.00	3800	3800	1.20 kN/m	1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
4	1.00	1.00	3800	3800	1.20 kN/m	1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
5	0.00	1.00	0	2800	1.20 kN/m	1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
6	0.00	1.00	0	2800	1.20 kN/m	1.20 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
7	0.00	1.00	0	2800	2.60 kN/m	2.60 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
8	0.00	1.00	0	2800	2.60 kN/m	2.60 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
9	0.00	1.00	0	2800	3.30 kN/m	3.30 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1
10	0.00	1.00	0	2800	3.30 kN/m	3.30 kN/m	0.00 kN/m	0.00 kN/m	0.00 (kN*m)/m	0.00 (kN*m)/m	WIND1

RESULTS

Extreme values

NODAL DISPLACEMENTS

Symbol	Value	Node	Case
Ux_{min}	0.00 cm	16	DL1
Ux_{max}	0.00 cm	10	WIND1
Uz_{min}	0.00 cm	16	WIND1
Uz_{max}	0.00 cm	14	WIND1
Ufi_{min}	0.00 °	1	Factored Loads
Ufi_{max}	0.02 °	21	WIND1

DISPLACEMENTS IN BARS

Symbol	Value	Bar	Case
Ux_{min}	0.00 cm	15	Factored Loads
Ux_{max}	0.00 cm	15	WIND1
Uz_{min}	-0.03 cm	29	WIND1
Uz_{max}	0.00 cm	1	Factored Loads
$Deflection_{min}$	-0.02 cm	29	WIND1
$Deflection_{max}$	0.00 cm	1	Factored Loads

INTERNAL FORCES

Symbol	Value	Bar	Case
N_{min}	-4.09 kN	1	Factored Loads
N_{max}	4.15 kN	15	WIND1
Q_{min}	-4.50 kN	21	WIND1
Q_{max}	5.64 kN	29	WIND1
M_{min}	-2.87 kN*m	29	WIND1
M_{max}	1.96 kN*m	29	WIND1

REACTIONS

Symbol	Value	Support	Case
Rx_{max}	0.26 kN	11	Factored Loads
Rx_{min}	0.00 kN	1	SEIS1
Rz_{max}	20.19 kN	6	Factored Loads
Rz_{min}	-0.58 kN	8	WIND1
Rm_{max}	1.02 kN*m	1	WIND1
Rm_{min}	-0.12 kN*m	3	Factored Loads

Detailed results

NODAL DISPLACEMENTS

Node	Ux	Uz	Ufi	Case
1	0.00 cm	0.00 cm	0.00 °	DL1
1	0.00 cm	0.00 cm	0.00 °	LL1
1	0.00 cm	0.00 cm	0.00 °	WIND1
1	0.00 cm	0.00 cm	0.00 °	SNOW1
1	0.00 cm	0.00 cm	0.00 °	LR1
1	0.00 cm	0.00 cm	0.00 °	ACC1
1	0.00 cm	0.00 cm	0.00 °	TEMP1
1	0.00 cm	0.00 cm	0.00 °	SEIS1
1	0.00 cm	0.00 cm	0.00 °	Factored Loads
1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
2	0.00 cm	0.00 cm	0.00 °	DL1
2	0.00 cm	0.00 cm	0.00 °	LL1
2	0.00 cm	0.00 cm	0.00 °	WIND1
2	0.00 cm	0.00 cm	0.00 °	SNOW1
2	0.00 cm	0.00 cm	0.00 °	LR1
2	0.00 cm	0.00 cm	0.00 °	ACC1
2	0.00 cm	0.00 cm	0.00 °	TEMP1

Node	Ux	Uz	Ufi	Case
2	0.00 cm	0.00 cm	0.00 °	SEIS1
2	0.00 cm	0.00 cm	0.00 °	Factored Loads
2	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|DL1	Min
2	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
3	0.00 cm	0.00 cm	0.00 °	DL1
3	0.00 cm	0.00 cm	0.00 °	LL1
3	0.00 cm	0.00 cm	0.00 °	WIND1
3	0.00 cm	0.00 cm	0.00 °	SNOW1
3	0.00 cm	0.00 cm	0.00 °	LR1
3	0.00 cm	0.00 cm	0.00 °	ACC1
3	0.00 cm	0.00 cm	0.00 °	TEMP1
3	0.00 cm	0.00 cm	0.00 °	SEIS1
3	0.00 cm	0.00 cm	0.00 °	Factored Loads
3	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
3	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
4	0.00 cm	0.00 cm	0.00 °	DL1
4	0.00 cm	0.00 cm	0.00 °	LL1
4	0.00 cm	0.00 cm	0.00 °	WIND1
4	0.00 cm	0.00 cm	0.00 °	SNOW1
4	0.00 cm	0.00 cm	0.00 °	LR1
4	0.00 cm	0.00 cm	0.00 °	ACC1
4	0.00 cm	0.00 cm	0.00 °	TEMP1
4	0.00 cm	0.00 cm	0.00 °	SEIS1
4	0.00 cm	0.00 cm	0.00 °	Factored Loads
4	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|WIND1	Min
4	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Max
5	0.00 cm	0.00 cm	0.00 °	DL1
5	0.00 cm	0.00 cm	0.00 °	LL1
5	0.00 cm	0.00 cm	0.00 °	WIND1
5	0.00 cm	0.00 cm	0.00 °	SNOW1
5	0.00 cm	0.00 cm	0.00 °	LR1
5	0.00 cm	0.00 cm	0.00 °	ACC1
5	0.00 cm	0.00 cm	0.00 °	TEMP1
5	0.00 cm	0.00 cm	0.00 °	SEIS1
5	0.00 cm	0.00 cm	0.00 °	Factored Loads
5	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
5	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
6	0.00 cm	0.00 cm	0.00 °	DL1
6	0.00 cm	0.00 cm	0.00 °	LL1
6	0.00 cm	0.00 cm	0.00 °	WIND1
6	0.00 cm	0.00 cm	0.00 °	SNOW1
6	0.00 cm	0.00 cm	0.00 °	LR1
6	0.00 cm	0.00 cm	0.00 °	ACC1
6	0.00 cm	0.00 cm	0.00 °	TEMP1
6	0.00 cm	0.00 cm	0.00 °	SEIS1
6	0.00 cm	0.00 cm	0.00 °	Factored Loads
6	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|WIND1	Min
6	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Max
7	0.00 cm	0.00 cm	0.00 °	DL1
7	0.00 cm	0.00 cm	0.00 °	LL1

Node	Ux	Uz	Ufi	Case
7	0.00 cm	0.00 cm	0.00 °	WIND1
7	0.00 cm	0.00 cm	0.00 °	SNOW1
7	0.00 cm	0.00 cm	0.00 °	LR1
7	0.00 cm	0.00 cm	0.00 °	ACC1
7	0.00 cm	0.00 cm	0.00 °	TEMP1
7	0.00 cm	0.00 cm	0.00 °	SEIS1
7	0.00 cm	0.00 cm	0.00 °	Factored Loads
7	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
7	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
8	0.00 cm	0.00 cm	0.00 °	DL1
8	0.00 cm	0.00 cm	0.00 °	LL1
8	0.00 cm	0.00 cm	0.00 °	WIND1
8	0.00 cm	0.00 cm	0.00 °	SNOW1
8	0.00 cm	0.00 cm	0.00 °	LR1
8	0.00 cm	0.00 cm	0.00 °	ACC1
8	0.00 cm	0.00 cm	0.00 °	TEMP1
8	0.00 cm	0.00 cm	0.00 °	SEIS1
8	0.00 cm	0.00 cm	0.00 °	Factored Loads
8	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|DL1	Min
8	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|WIND1	Max
9	0.00 cm	0.00 cm	0.00 °	DL1
9	0.00 cm	0.00 cm	0.00 °	LL1
9	0.00 cm	0.00 cm	0.00 °	WIND1
9	0.00 cm	0.00 cm	0.00 °	SNOW1
9	0.00 cm	0.00 cm	0.00 °	LR1
9	0.00 cm	0.00 cm	0.00 °	ACC1
9	0.00 cm	0.00 cm	0.00 °	TEMP1
9	0.00 cm	0.00 cm	0.00 °	SEIS1
9	0.00 cm	0.00 cm	0.00 °	Factored Loads
9	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
9	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|WIND1	Max
10	0.00 cm	0.00 cm	0.00 °	DL1
10	0.00 cm	0.00 cm	0.00 °	LL1
10	0.00 cm	0.00 cm	0.01 °	WIND1
10	0.00 cm	0.00 cm	0.00 °	SNOW1
10	0.00 cm	0.00 cm	0.00 °	LR1
10	0.00 cm	0.00 cm	0.00 °	ACC1
10	0.00 cm	0.00 cm	0.00 °	TEMP1
10	0.00 cm	0.00 cm	0.00 °	SEIS1
10	0.00 cm	0.00 cm	0.00 °	Factored Loads
10	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
10	0.00 cm|WIND1	0.00 cm|Factored Loads	0.01 °|WIND1	Max
11	0.00 cm	0.00 cm	0.00 °	DL1
11	0.00 cm	0.00 cm	0.00 °	LL1
11	0.00 cm	0.00 cm	0.00 °	WIND1
11	0.00 cm	0.00 cm	0.00 °	SNOW1
11	0.00 cm	0.00 cm	0.00 °	LR1
11	0.00 cm	0.00 cm	0.00 °	ACC1
11	0.00 cm	0.00 cm	0.00 °	TEMP1
11	0.00 cm	0.00 cm	0.00 °	SEIS1

Node	Ux	Uz	Ufi	Case
11	0.00 cm	0.00 cm	0.00 °	Factored Loads
11	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
11	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
12	0.00 cm	0.00 cm	0.00 °	DL1
12	0.00 cm	0.00 cm	0.00 °	LL1
12	0.00 cm	0.00 cm	0.00 °	WIND1
12	0.00 cm	0.00 cm	0.00 °	SNOW1
12	0.00 cm	0.00 cm	0.00 °	LR1
12	0.00 cm	0.00 cm	0.00 °	ACC1
12	0.00 cm	0.00 cm	0.00 °	TEMP1
12	0.00 cm	0.00 cm	0.00 °	SEIS1
12	0.00 cm	0.00 cm	0.00 °	Factored Loads
12	0.00 cm|DL1	0.00 cm|DL1	0.00 °|DL1	Min
12	0.00 cm|WIND1	0.00 cm|WIND1	0.00 °|WIND1	Max
13	0.00 cm	0.00 cm	0.00 °	DL1
13	0.00 cm	0.00 cm	0.00 °	LL1
13	0.00 cm	0.00 cm	0.00 °	WIND1
13	0.00 cm	0.00 cm	0.00 °	SNOW1
13	0.00 cm	0.00 cm	0.00 °	LR1
13	0.00 cm	0.00 cm	0.00 °	ACC1
13	0.00 cm	0.00 cm	0.00 °	TEMP1
13	0.00 cm	0.00 cm	0.00 °	SEIS1
13	0.00 cm	0.00 cm	0.00 °	Factored Loads
13	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|DL1	Min
13	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|WIND1	Max
14	0.00 cm	0.00 cm	0.00 °	DL1
14	0.00 cm	0.00 cm	0.00 °	LL1
14	0.00 cm	0.00 cm	0.00 °	WIND1
14	0.00 cm	0.00 cm	0.00 °	SNOW1
14	0.00 cm	0.00 cm	0.00 °	LR1
14	0.00 cm	0.00 cm	0.00 °	ACC1
14	0.00 cm	0.00 cm	0.00 °	TEMP1
14	0.00 cm	0.00 cm	0.00 °	SEIS1
14	0.00 cm	0.00 cm	0.00 °	Factored Loads
14	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
14	0.00 cm|WIND1	0.00 cm|WIND1	0.00 °|WIND1	Max
15	0.00 cm	0.00 cm	0.00 °	DL1
15	0.00 cm	0.00 cm	0.00 °	LL1
15	0.00 cm	0.00 cm	0.00 °	WIND1
15	0.00 cm	0.00 cm	0.00 °	SNOW1
15	0.00 cm	0.00 cm	0.00 °	LR1
15	0.00 cm	0.00 cm	0.00 °	ACC1
15	0.00 cm	0.00 cm	0.00 °	TEMP1
15	0.00 cm	0.00 cm	0.00 °	SEIS1
15	0.00 cm	0.00 cm	0.00 °	Factored Loads
15	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|WIND1	Min
15	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Max
16	0.00 cm	0.00 cm	0.00 °	DL1
16	0.00 cm	0.00 cm	0.00 °	LL1
16	0.00 cm	0.00 cm	-0.01 °	WIND1

Node	Ux	Uz	Ufi	Case
16	0.00 cm	0.00 cm	0.00 °	SNOW1
16	0.00 cm	0.00 cm	0.00 °	LR1
16	0.00 cm	0.00 cm	0.00 °	ACC1
16	0.00 cm	0.00 cm	0.00 °	TEMP1
16	0.00 cm	0.00 cm	0.00 °	SEIS1
16	0.00 cm	0.00 cm	0.00 °	Factored Loads
16	0.00 cm|DL1	0.00 cm|WIND1	-0.01 °|WIND1	Min
16	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
17	0.00 cm	0.00 cm	0.00 °	DL1
17	0.00 cm	0.00 cm	0.00 °	LL1
17	0.00 cm	0.00 cm	0.00 °	WIND1
17	0.00 cm	0.00 cm	0.00 °	SNOW1
17	0.00 cm	0.00 cm	0.00 °	LR1
17	0.00 cm	0.00 cm	0.00 °	ACC1
17	0.00 cm	0.00 cm	0.00 °	TEMP1
17	0.00 cm	0.00 cm	0.00 °	SEIS1
17	0.00 cm	0.00 cm	0.00 °	Factored Loads
17	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|WIND1	Min
17	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Max
18	0.00 cm	0.00 cm	0.00 °	DL1
18	0.00 cm	0.00 cm	0.00 °	LL1
18	0.00 cm	0.00 cm	0.00 °	WIND1
18	0.00 cm	0.00 cm	0.00 °	SNOW1
18	0.00 cm	0.00 cm	0.00 °	LR1
18	0.00 cm	0.00 cm	0.00 °	ACC1
18	0.00 cm	0.00 cm	0.00 °	TEMP1
18	0.00 cm	0.00 cm	0.00 °	SEIS1
18	0.00 cm	0.00 cm	0.00 °	Factored Loads
18	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
18	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
19	0.00 cm	0.00 cm	0.00 °	DL1
19	0.00 cm	0.00 cm	0.00 °	LL1
19	0.00 cm	0.00 cm	0.00 °	WIND1
19	0.00 cm	0.00 cm	0.00 °	SNOW1
19	0.00 cm	0.00 cm	0.00 °	LR1
19	0.00 cm	0.00 cm	0.00 °	ACC1
19	0.00 cm	0.00 cm	0.00 °	TEMP1
19	0.00 cm	0.00 cm	0.00 °	SEIS1
19	0.00 cm	0.00 cm	0.00 °	Factored Loads
19	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|DL1	Min
19	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max
20	0.00 cm	0.00 cm	0.00 °	DL1
20	0.00 cm	0.00 cm	0.00 °	LL1
20	0.00 cm	0.00 cm	0.00 °	WIND1
20	0.00 cm	0.00 cm	0.00 °	SNOW1
20	0.00 cm	0.00 cm	0.00 °	LR1
20	0.00 cm	0.00 cm	0.00 °	ACC1
20	0.00 cm	0.00 cm	0.00 °	TEMP1
20	0.00 cm	0.00 cm	0.00 °	SEIS1
20	0.00 cm	0.00 cm	0.00 °	Factored Loads

Node	Ux	Uz	Ufi	Case
20	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|WIND1	Min
20	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 °|DL1	Max
21	0.00 cm	0.00 cm	0.00 °	DL1
21	0.00 cm	0.00 cm	0.00 °	LL1
21	0.00 cm	0.00 cm	0.02 °	WIND1
21	0.00 cm	0.00 cm	0.00 °	SNOW1
21	0.00 cm	0.00 cm	0.00 °	LR1
21	0.00 cm	0.00 cm	0.00 °	ACC1
21	0.00 cm	0.00 cm	0.00 °	TEMP1
21	0.00 cm	0.00 cm	0.00 °	SEIS1
21	0.00 cm	0.00 cm	0.00 °	Factored Loads
21	0.00 cm|DL1	0.00 cm|Factored Loads	0.00 °|DL1	Min
21	0.00 cm|WIND1	0.00 cm|Factored Loads	0.02 °|WIND1	Max
22	0.00 cm	0.00 cm	0.00 °	DL1
22	0.00 cm	0.00 cm	0.00 °	LL1
22	0.00 cm	0.00 cm	0.00 °	WIND1
22	0.00 cm	0.00 cm	0.00 °	SNOW1
22	0.00 cm	0.00 cm	0.00 °	LR1
22	0.00 cm	0.00 cm	0.00 °	ACC1
22	0.00 cm	0.00 cm	0.00 °	TEMP1
22	0.00 cm	0.00 cm	0.00 °	SEIS1
22	0.00 cm	0.00 cm	0.00 °	Factored Loads
22	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Min
22	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.00 °|Factored Loads	Max

INTERNAL FORCES IN BARS

Number	Nmin	Nmax	Qmin	Qmax	Mmin
1	-3.41 kN	3.41 kN	-0.04 kN	-0.04 kN	-0.10 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.02 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
1	-4.09 kN	4.09 kN	-0.05 kN	-0.05 kN	-0.12 kN*m
1	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-0.05 kN|Factored Loads	0.01 kN|WIND1	-0.12 kN*m|Factored Loads
1	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-0.05 kN|Factored Loads	0.01 kN|WIND1	-0.12 kN*m|Factored Loads
2	-3.41 kN	3.41 kN	-0.04 kN	-0.04 kN	-0.10 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.02 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
2	-4.09 kN	4.09 kN	-0.05 kN	-0.05 kN	-0.12 kN*m
2	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-0.05 kN|Factored Loads	0.01 kN|WIND1	-0.12 kN*m|Factored Loads
2	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-0.05 kN|Factored Loads	0.01 kN|WIND1	-0.12 kN*m|Factored Loads

Number	Nmin	Nmax	Qmin	Qmax	Mmin
3	-3.41 kN	3.41 kN	0.03 kN	0.03 kN	-0.03 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.04 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
3	-4.09 kN	4.09 kN	0.03 kN	0.03 kN	-0.04 kN*m
3	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	0.00 kN|SEIS1	0.03 kN|Factored Loads	-0.04 kN*m|Factored Loads
3	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	0.00 kN|SEIS1	0.03 kN|Factored Loads	-0.04 kN*m|Factored Loads
4	-3.41 kN	3.41 kN	0.03 kN	0.03 kN	-0.03 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.04 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
4	-4.09 kN	4.09 kN	0.03 kN	0.03 kN	-0.04 kN*m
4	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	0.00 kN|SEIS1	0.03 kN|Factored Loads	-0.04 kN*m|Factored Loads
4	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	0.00 kN|SEIS1	0.03 kN|Factored Loads	-0.04 kN*m|Factored Loads
5	-3.41 kN	3.41 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	-1.04 kN	0.86 kN	-0.86 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
5	-4.09 kN	4.09 kN	0.00 kN	0.00 kN	0.00 kN*m
5	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-1.04 kN|WIND1	0.86 kN|WIND1	-0.86 kN*m|WIND1
5	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-1.04 kN|WIND1	0.86 kN|WIND1	-0.86 kN*m|WIND1
6	-3.41 kN	3.41 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	-1.04 kN	0.86 kN	-0.86 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
6	-4.09 kN	4.09 kN	0.00 kN	0.00 kN	0.00 kN*m
6	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-1.04 kN|WIND1	0.86 kN|WIND1	-0.86 kN*m|WIND1
6	-4.09 kN|Factored Loads	4.09 kN|Factored Loads	-1.04 kN|WIND1	0.86 kN|WIND1	-0.86 kN*m|WIND1
7	-0.06 kN	0.03 kN	-1.28 kN	1.43 kN	-0.83 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	3.03 kN	3.07 kN	-0.02 kN	0.00 kN	-0.02 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
7	-0.07 kN	0.03 kN	-1.54 kN	1.72 kN	-0.99 kN*m
7	-0.07 kN|Factored Loads	3.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-0.99 kN*m|Factored Loads
7	-0.07 kN|Factored Loads	3.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-0.99 kN*m|Factored Loads
8	-0.06 kN	0.03 kN	-1.28 kN	1.43 kN	-0.83 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	3.03 kN	3.07 kN	-0.02 kN	0.00 kN	-0.02 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
8	-0.07 kN	0.03 kN	-1.54 kN	1.72 kN	-0.99 kN*m
8	-0.07 kN|Factored Loads	3.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-0.99 kN*m|Factored Loads
8	-0.07 kN|Factored Loads	3.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-0.99 kN*m|Factored Loads
9	-2.51 kN	2.51 kN	-0.13 kN	-0.13 kN	-0.17 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.01 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
9	-3.01 kN	3.01 kN	-0.15 kN	-0.15 kN	-0.20 kN*m
9	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.15 kN|Factored Loads	0.01 kN|WIND1	-0.20 kN*m|Factored Loads
9	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.15 kN|Factored Loads	0.01 kN|WIND1	-0.20 kN*m|Factored Loads
10	-2.51 kN	2.51 kN	-0.13 kN	-0.13 kN	-0.17 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.01 kN	0.01 kN	-0.01 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
10	-3.01 kN	3.01 kN	-0.15 kN	-0.15 kN	-0.20 kN*m
10	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.15 kN|Factored Loads	0.01 kN|WIND1	-0.20 kN*m|Factored Loads
10	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.15 kN|Factored Loads	0.01 kN|WIND1	-0.20 kN*m|Factored Loads
11	-2.51 kN	2.51 kN	0.06 kN	0.06 kN	-0.10 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.06 kN	0.06 kN	-0.04 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
11	-3.01 kN	3.01 kN	0.07 kN	0.07 kN	-0.12 kN*m
11	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.07 kN|Factored Loads	-0.12 kN*m|Factored Loads
11	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.07 kN|Factored Loads	-0.12 kN*m|Factored Loads
12	-2.51 kN	2.51 kN	0.06 kN	0.06 kN	-0.10 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.06 kN	0.06 kN	-0.04 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
12	-3.01 kN	3.01 kN	0.07 kN	0.07 kN	-0.12 kN*m
12	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.07 kN|Factored Loads	-0.12 kN*m|Factored Loads
12	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.07 kN|Factored Loads	-0.12 kN*m|Factored Loads
13	-2.51 kN	2.51 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	-1.37 kN	1.99 kN	-0.86 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
13	-3.01 kN	3.01 kN	0.00 kN	0.00 kN	0.00 kN*m
13	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-1.37 kN|WIND1	1.99 kN|WIND1	-0.86 kN*m|WIND1
13	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-1.37 kN|WIND1	1.99 kN|WIND1	-0.86 kN*m|WIND1
14	-2.51 kN	2.51 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	-1.37 kN	1.99 kN	-0.86 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
14	-3.01 kN	3.01 kN	0.00 kN	0.00 kN	0.00 kN*m
14	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-1.37 kN|WIND1	1.99 kN|WIND1	-0.86 kN*m|WIND1
14	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-1.37 kN|WIND1	1.99 kN|WIND1	-0.86 kN*m|WIND1
15	-0.18 kN	0.00 kN	-1.15 kN	3.94 kN	-0.84 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	1.37 kN	4.15 kN	-0.29 kN	0.05 kN	-0.17 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
15	-0.21 kN	0.00 kN	-1.37 kN	4.73 kN	-1.01 kN*m
15	-0.21 kN|Factored Loads	4.15 kN|WIND1	-1.37 kN|Factored Loads	4.73 kN|Factored Loads	-1.01 kN*m|Factored Loads
15	-0.21 kN|Factored Loads	4.15 kN|WIND1	-1.37 kN|Factored Loads	4.73 kN|Factored Loads	-1.01 kN*m|Factored Loads
16	-0.18 kN	0.00 kN	-1.15 kN	3.94 kN	-0.84 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	1.37 kN	4.15 kN	-0.29 kN	0.05 kN	-0.17 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
16	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
16	-0.21 kN	0.00 kN	-1.37 kN	4.73 kN	-1.01 kN*m
16	-0.21 kN|Factored Loads	4.15 kN|WIND1	-1.37 kN|Factored Loads	4.73 kN|Factored Loads	-1.01 kN*m|Factored Loads
16	-0.21 kN|Factored Loads	4.15 kN|WIND1	-1.37 kN|Factored Loads	4.73 kN|Factored Loads	-1.01 kN*m|Factored Loads
17	-2.52 kN	2.50 kN	-0.10 kN	-0.10 kN	-0.14 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	-0.04 kN	-0.04 kN	-0.06 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
17	-3.02 kN	3.00 kN	-0.12 kN	-0.12 kN	-0.17 kN*m
17	-3.02 kN|Factored Loads	3.00 kN|Factored Loads	-0.12 kN|Factored Loads	0.00 kN|SEIS1	-0.17 kN*m|Factored Loads
17	-3.02 kN|Factored Loads	3.00 kN|Factored Loads	-0.12 kN|Factored Loads	0.00 kN|SEIS1	-0.17 kN*m|Factored Loads
18	-2.52 kN	2.50 kN	-0.10 kN	-0.10 kN	-0.14 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	-0.04 kN	-0.04 kN	-0.06 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
18	-3.02 kN	3.00 kN	-0.12 kN	-0.12 kN	-0.17 kN*m
18	-3.02 kN|Factored Loads	3.00 kN|Factored Loads	-0.12 kN|Factored Loads	0.00 kN|SEIS1	-0.17 kN*m|Factored Loads
18	-3.02 kN|Factored Loads	3.00 kN|Factored Loads	-0.12 kN|Factored Loads	0.00 kN|SEIS1	-0.17 kN*m|Factored Loads
19	-2.51 kN	2.51 kN	0.04 kN	0.04 kN	-0.05 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.01 kN	0.01 kN	-0.03 kN	-0.03 kN	-0.08 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
19	-3.01 kN	3.02 kN	0.05 kN	0.05 kN	-0.06 kN*m
19	-3.01 kN|Factored Loads	3.02 kN|Factored Loads	-0.03 kN|WIND1	0.05 kN|Factored Loads	-0.08 kN*m|WIND1
19	-3.01 kN|Factored Loads	3.02 kN|Factored Loads	-0.03 kN|WIND1	0.05 kN|Factored Loads	-0.08 kN*m|WIND1
20	-2.51 kN	2.51 kN	0.04 kN	0.04 kN	-0.05 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.01 kN	0.01 kN	-0.03 kN	-0.03 kN	-0.08 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
20	-3.01 kN	3.02 kN	0.05 kN	0.05 kN	-0.06 kN*m
20	-3.01 kN|Factored Loads	3.02 kN|Factored Loads	-0.03 kN|WIND1	0.05 kN|Factored Loads	-0.08 kN*m|WIND1
20	-3.01 kN|Factored Loads	3.02 kN|Factored Loads	-0.03 kN|WIND1	0.05 kN|Factored Loads	-0.08 kN*m|WIND1
21	-2.54 kN	2.48 kN	-0.12 kN	-0.12 kN	-0.07 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
21	-0.06 kN	-0.06 kN	-4.50 kN	2.78 kN	-2.87 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
21	-3.05 kN	2.98 kN	-0.15 kN	-0.15 kN	-0.08 kN*m
21	-3.05 kN|Factored Loads	2.98 kN|Factored Loads	-4.50 kN|WIND1	2.78 kN|WIND1	-2.87 kN*m|WIND1
21	-3.05 kN|Factored Loads	2.98 kN|Factored Loads	-4.50 kN|WIND1	2.78 kN|WIND1	-2.87 kN*m|WIND1
22	-2.54 kN	2.48 kN	-0.12 kN	-0.12 kN	-0.07 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	-0.06 kN	-0.06 kN	-4.50 kN	2.78 kN	-2.87 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
22	-3.05 kN	2.98 kN	-0.15 kN	-0.15 kN	-0.08 kN*m
22	-3.05 kN|Factored Loads	2.98 kN|Factored Loads	-4.50 kN|WIND1	2.78 kN|WIND1	-2.87 kN*m|WIND1
22	-3.05 kN|Factored Loads	2.98 kN|Factored Loads	-4.50 kN|WIND1	2.78 kN|WIND1	-2.87 kN*m|WIND1
23	-0.02 kN	0.04 kN	-1.29 kN	1.44 kN	-0.84 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	-0.08 kN	0.07 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
23	-0.02 kN	0.04 kN	-1.54 kN	1.72 kN	-1.01 kN*m
23	-0.08 kN|WIND1	0.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-1.01 kN*m|Factored Loads
23	-0.08 kN|WIND1	0.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-1.01 kN*m|Factored Loads
24	-0.02 kN	0.04 kN	-1.29 kN	1.44 kN	-0.84 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	-0.08 kN	0.07 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
24	-0.02 kN	0.04 kN	-1.54 kN	1.72 kN	-1.01 kN*m
24	-0.08 kN|WIND1	0.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-1.01 kN*m|Factored Loads
24	-0.08 kN|WIND1	0.07 kN|WIND1	-1.54 kN|Factored Loads	1.72 kN|Factored Loads	-1.01 kN*m|Factored Loads
25	-2.51 kN	2.51 kN	-0.15 kN	-0.15 kN	-0.24 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.03 kN	0.03 kN	-0.05 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
25	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
25	-3.01 kN	3.01 kN	-0.18 kN	-0.18 kN	-0.29 kN*m
25	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.18 kN|Factored Loads	0.03 kN|WIND1	-0.29 kN*m|Factored Loads
25	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.18 kN|Factored Loads	0.03 kN|WIND1	-0.29 kN*m|Factored Loads
26	-2.51 kN	2.51 kN	-0.15 kN	-0.15 kN	-0.24 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.03 kN	0.03 kN	-0.05 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
26	-3.01 kN	3.01 kN	-0.18 kN	-0.18 kN	-0.29 kN*m
26	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.18 kN|Factored Loads	0.03 kN|WIND1	-0.29 kN*m|Factored Loads
26	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-0.18 kN|Factored Loads	0.03 kN|WIND1	-0.29 kN*m|Factored Loads
27	-2.51 kN	2.51 kN	0.10 kN	0.10 kN	-0.12 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.05 kN	0.05 kN	-0.08 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
27	-3.01 kN	3.01 kN	0.12 kN	0.12 kN	-0.14 kN*m
27	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.12 kN|Factored Loads	-0.14 kN*m|Factored Loads
27	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.12 kN|Factored Loads	-0.14 kN*m|Factored Loads
28	-2.51 kN	2.51 kN	0.10 kN	0.10 kN	-0.12 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.05 kN	0.05 kN	-0.08 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
28	-3.01 kN	3.01 kN	0.12 kN	0.12 kN	-0.14 kN*m
28	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.12 kN|Factored Loads	-0.14 kN*m|Factored Loads
28	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	0.00 kN|SEIS1	0.12 kN|Factored Loads	-0.14 kN*m|Factored Loads
29	-2.51 kN	2.51 kN	0.02 kN	0.02 kN	-0.07 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	-3.60 kN	5.64 kN	-2.87 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
29	-3.01 kN	3.01 kN	0.03 kN	0.03 kN	-0.08 kN*m
29	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.60 kN|WIND1	5.64 kN|WIND1	-2.87 kN*m|WIND1
29	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.60 kN|WIND1	5.64 kN|WIND1	-2.87 kN*m|WIND1
30	-2.51 kN	2.51 kN	0.02 kN	0.02 kN	-0.07 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	-3.60 kN	5.64 kN	-2.87 kN*m

Number	Nmin	Nmax	Qmin	Qmax	Mmin
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
30	-3.01 kN	3.01 kN	0.03 kN	0.03 kN	-0.08 kN*m
30	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.60 kN|WIND1	5.64 kN|WIND1	-2.87 kN*m|WIND1
30	-3.01 kN|Factored Loads	3.01 kN|Factored Loads	-3.60 kN|WIND1	5.64 kN|WIND1	-2.87 kN*m|WIND1
31	-0.12 kN	0.03 kN	-1.28 kN	1.42 kN	-0.80 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	3.51 kN	3.60 kN	-0.02 kN	0.00 kN	-0.03 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
31	-0.15 kN	0.04 kN	-1.53 kN	1.71 kN	-0.96 kN*m
31	-0.15 kN|Factored Loads	3.60 kN|WIND1	-1.53 kN|Factored Loads	1.71 kN|Factored Loads	-0.96 kN*m|Factored Loads
31	-0.15 kN|Factored Loads	3.60 kN|WIND1	-1.53 kN|Factored Loads	1.71 kN|Factored Loads	-0.96 kN*m|Factored Loads
32	-0.12 kN	0.03 kN	-1.28 kN	1.42 kN	-0.80 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	3.51 kN	3.60 kN	-0.02 kN	0.00 kN	-0.03 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	0.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN*m
32	-0.15 kN	0.04 kN	-1.53 kN	1.71 kN	-0.96 kN*m
32	-0.15 kN|Factored Loads	3.60 kN|WIND1	-1.53 kN|Factored Loads	1.71 kN|Factored Loads	-0.96 kN*m|Factored Loads
32	-0.15 kN|Factored Loads	3.60 kN|WIND1	-1.53 kN|Factored Loads	1.71 kN|Factored Loads	-0.96 kN*m|Factored Loads

DISPLACEMENTS IN BARS

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
2	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
2	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
3	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
3	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
4	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
4	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
5	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	
5	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
6	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	
6	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
7	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
7	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
7	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
7	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
8	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
8	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
8	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
8	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
9	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
9	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
10	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
10	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
11	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
11	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
12	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
12	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|WIND1	0.
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
13	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.
13	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
14	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.
14	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.
15	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
15	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
15	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
15	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
16	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
16	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
16	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
16	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
17	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
17	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
18	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
18	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
19	0.00 cm|SEIS1	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
19	0.00 cm|SEIS1	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
20	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
20	0.00 cm|SEIS1	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads
20	0.00 cm|SEIS1	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
21	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.00 cm|WIND1	-0.01 cm|WIND1
21	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.00 cm|WIND1	-0.01 cm|WIND1
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
22	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.00 cm|WIND1	-0.01 cm|WIND1
22	0.00 cm|WIND1	0.00 cm|Factored Loads	-0.01 cm|WIND1	0.00 cm|WIND1	-0.01 cm|WIND1
23	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
23	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
23	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads
23	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads
24	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
24	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm
24	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads
24	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
25	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
25	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
26	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
26	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	0.
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
27	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
27	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
28	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
28	0.00 cm|Factored Loads	0.00 cm|WIND1	0.00 cm|WIND1	0.00 cm|Factored Loads	0.00 cm|Factored Loads	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	-0.03 cm	0.00 cm	-0.02 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	

Number	Uxmin	Uxmax	Uzmin	Uzmax	Deflectionmin	
29	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
29	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|WIND1	0.
29	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|WIND1	0.
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	-0.03 cm	0.00 cm	-0.02 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
30	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|WIND1	0.
30	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.03 cm|WIND1	0.00 cm|Factored Loads	-0.02 cm|WIND1	0.
31	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
31	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
31	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
31	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
32	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	0.00 cm	0.00 cm	0.00 cm	
32	0.00 cm	0.00 cm	-0.01 cm	0.00 cm	-0.01 cm	
32	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	
32	0.00 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	0.00 cm|WIND1	-0.01 cm|Factored Loads	

REACTIONS

Support	Rx	Rz	Rm	Case
1	0.00 kN	6.82 kN	0.00 kN*m	DL1
1	0.00 kN	0.00 kN	0.00 kN*m	LL1
1	-1.72 kN	0.00 kN	1.02 kN*m	WIND1
1	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
1	0.00 kN	0.00 kN	0.00 kN*m	LR1
1	0.00 kN	0.00 kN	0.00 kN*m	ACC1
1	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
1	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
1	0.00 kN	8.18 kN	0.00 kN*m	Factored Loads
1	-1.72 kN|WIND1	0.00 kN|SEIS1	0.00 kN*m|SEIS1	Min

Support	Rx	Rz	Rm	Case
1	0.00 kN|SEIS1	8.18 kN|Factored Loads	1.02 kN*m|WIND1	Max
2	-0.05 kN	6.82 kN	0.07 kN*m	DL1
2	0.00 kN	0.00 kN	0.00 kN*m	LL1
2	-0.03 kN	0.00 kN	0.07 kN*m	WIND1
2	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
2	0.00 kN	0.00 kN	0.00 kN*m	LR1
2	0.00 kN	0.00 kN	0.00 kN*m	ACC1
2	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
2	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
2	-0.07 kN	8.18 kN	0.08 kN*m	Factored Loads
2	-0.07 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|SEIS1	Min
2	0.00 kN|SEIS1	8.18 kN|Factored Loads	0.08 kN*m|Factored Loads	Max
3	0.08 kN	6.82 kN	-0.10 kN*m	DL1
3	0.00 kN	0.00 kN	0.00 kN*m	LL1
3	-0.02 kN	0.00 kN	0.05 kN*m	WIND1
3	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
3	0.00 kN	0.00 kN	0.00 kN*m	LR1
3	0.00 kN	0.00 kN	0.00 kN*m	ACC1
3	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
3	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
3	0.10 kN	8.18 kN	-0.12 kN*m	Factored Loads
3	-0.02 kN|WIND1	0.00 kN|SEIS1	-0.12 kN*m|Factored Loads	Min
3	0.10 kN|Factored Loads	8.18 kN|Factored Loads	0.05 kN*m|WIND1	Max
4	0.00 kN	13.43 kN	0.00 kN*m	DL1
4	0.00 kN	0.00 kN	0.00 kN*m	LL1
4	0.00 kN	-0.02 kN	0.00 kN*m	WIND1
4	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
4	0.00 kN	0.00 kN	0.00 kN*m	LR1
4	0.00 kN	0.00 kN	0.00 kN*m	ACC1
4	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
4	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
4	0.00 kN	16.12 kN	0.00 kN*m	Factored Loads
4	0.00 kN|Factored Loads	-0.02 kN|WIND1	0.00 kN*m|Factored Loads	Min
4	0.00 kN|Factored Loads	16.12 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
5	0.00 kN	16.46 kN	0.00 kN*m	DL1
5	0.00 kN	0.00 kN	0.00 kN*m	LL1
5	0.00 kN	-0.02 kN	0.00 kN*m	WIND1
5	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
5	0.00 kN	0.00 kN	0.00 kN*m	LR1
5	0.00 kN	0.00 kN	0.00 kN*m	ACC1
5	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
5	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
5	0.00 kN	19.76 kN	0.00 kN*m	Factored Loads
5	0.00 kN|Factored Loads	-0.02 kN|WIND1	0.00 kN*m|Factored Loads	Min
5	0.00 kN|Factored Loads	19.76 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
6	0.00 kN	16.82 kN	0.00 kN*m	DL1
6	0.00 kN	0.00 kN	0.00 kN*m	LL1
6	0.00 kN	0.04 kN	0.00 kN*m	WIND1
6	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
6	0.00 kN	0.00 kN	0.00 kN*m	LR1

Support	Rx	Rz	Rm	Case
6	0.00 kN	0.00 kN	0.00 kN*m	ACC1
6	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
6	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
6	0.00 kN	20.19 kN	0.00 kN*m	Factored Loads
6	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
6	0.00 kN|Factored Loads	20.19 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
7	0.12 kN	1.78 kN	0.00 kN*m	DL1
7	0.00 kN	0.00 kN	0.00 kN*m	LL1
7	-6.13 kN	0.00 kN	0.00 kN*m	WIND1
7	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
7	0.00 kN	0.00 kN	0.00 kN*m	LR1
7	0.00 kN	0.00 kN	0.00 kN*m	ACC1
7	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
7	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
7	0.14 kN	2.13 kN	0.00 kN*m	Factored Loads
7	-6.13 kN|WIND1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
7	0.14 kN|Factored Loads	2.13 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
8	0.00 kN	11.85 kN	0.00 kN*m	DL1
8	0.00 kN	0.00 kN	0.00 kN*m	LL1
8	0.00 kN	-0.58 kN	0.00 kN*m	WIND1
8	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
8	0.00 kN	0.00 kN	0.00 kN*m	LR1
8	0.00 kN	0.00 kN	0.00 kN*m	ACC1
8	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
8	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
8	0.00 kN	14.22 kN	0.00 kN*m	Factored Loads
8	0.00 kN|Factored Loads	-0.58 kN|WIND1	0.00 kN*m|Factored Loads	Min
8	0.00 kN|Factored Loads	14.22 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
9	0.00 kN	14.37 kN	0.00 kN*m	DL1
9	0.00 kN	0.00 kN	0.00 kN*m	LL1
9	0.00 kN	0.55 kN	0.00 kN*m	WIND1
9	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
9	0.00 kN	0.00 kN	0.00 kN*m	LR1
9	0.00 kN	0.00 kN	0.00 kN*m	ACC1
9	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
9	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
9	0.00 kN	17.25 kN	0.00 kN*m	Factored Loads
9	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
9	0.00 kN|Factored Loads	17.25 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
10	0.00 kN	15.05 kN	0.00 kN*m	DL1
10	0.00 kN	0.00 kN	0.00 kN*m	LL1
10	0.00 kN	-0.08 kN	0.00 kN*m	WIND1
10	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
10	0.00 kN	0.00 kN	0.00 kN*m	LR1
10	0.00 kN	0.00 kN	0.00 kN*m	ACC1
10	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
10	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
10	0.00 kN	18.06 kN	0.00 kN*m	Factored Loads
10	0.00 kN|Factored Loads	-0.08 kN|WIND1	0.00 kN*m|Factored Loads	Min
10	0.00 kN|Factored Loads	18.06 kN|Factored Loads	0.00 kN*m|Factored Loads	Max

Support	Rx	Rz	Rm	Case
11	0.22 kN	1.77 kN	0.00 kN*m	DL1
11	0.00 kN	0.00 kN	0.00 kN*m	LL1
11	-8.02 kN	0.00 kN	0.00 kN*m	WIND1
11	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
11	0.00 kN	0.00 kN	0.00 kN*m	LR1
11	0.00 kN	0.00 kN	0.00 kN*m	ACC1
11	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
11	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
11	0.26 kN	2.12 kN	0.00 kN*m	Factored Loads
11	-8.02 kN|WIND1	0.00 kN|WIND1	0.00 kN*m|Factored Loads	Min
11	0.26 kN|Factored Loads	2.12 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
12	-0.33 kN	11.68 kN	0.00 kN*m	DL1
12	0.00 kN	0.00 kN	0.00 kN*m	LL1
12	-20.46 kN	0.12 kN	0.00 kN*m	WIND1
12	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
12	0.00 kN	0.00 kN	0.00 kN*m	LR1
12	0.00 kN	0.00 kN	0.00 kN*m	ACC1
12	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
12	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
12	-0.39 kN	14.01 kN	0.00 kN*m	Factored Loads
12	-20.46 kN|WIND1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
12	0.00 kN|SEIS1	14.01 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
13	0.00 kN	14.69 kN	0.00 kN*m	DL1
13	0.00 kN	0.00 kN	0.00 kN*m	LL1
13	0.00 kN	-0.02 kN	0.00 kN*m	WIND1
13	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
13	0.00 kN	0.00 kN	0.00 kN*m	LR1
13	0.00 kN	0.00 kN	0.00 kN*m	ACC1
13	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
13	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
13	0.00 kN	17.62 kN	0.00 kN*m	Factored Loads
13	0.00 kN|Factored Loads	-0.02 kN|WIND1	0.00 kN*m|Factored Loads	Min
13	0.00 kN|Factored Loads	17.62 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
14	0.00 kN	15.05 kN	0.00 kN*m	DL1
14	0.00 kN	0.00 kN	0.00 kN*m	LL1
14	0.00 kN	0.00 kN	0.00 kN*m	WIND1
14	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
14	0.00 kN	0.00 kN	0.00 kN*m	LR1
14	0.00 kN	0.00 kN	0.00 kN*m	ACC1
14	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
14	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
14	0.00 kN	18.06 kN	0.00 kN*m	Factored Loads
14	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
14	0.00 kN|Factored Loads	18.06 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
15	0.03 kN	1.76 kN	0.00 kN*m	DL1
15	0.00 kN	0.00 kN	0.00 kN*m	LL1
15	-0.15 kN	0.00 kN	0.00 kN*m	WIND1
15	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
15	0.00 kN	0.00 kN	0.00 kN*m	LR1
15	0.00 kN	0.00 kN	0.00 kN*m	ACC1

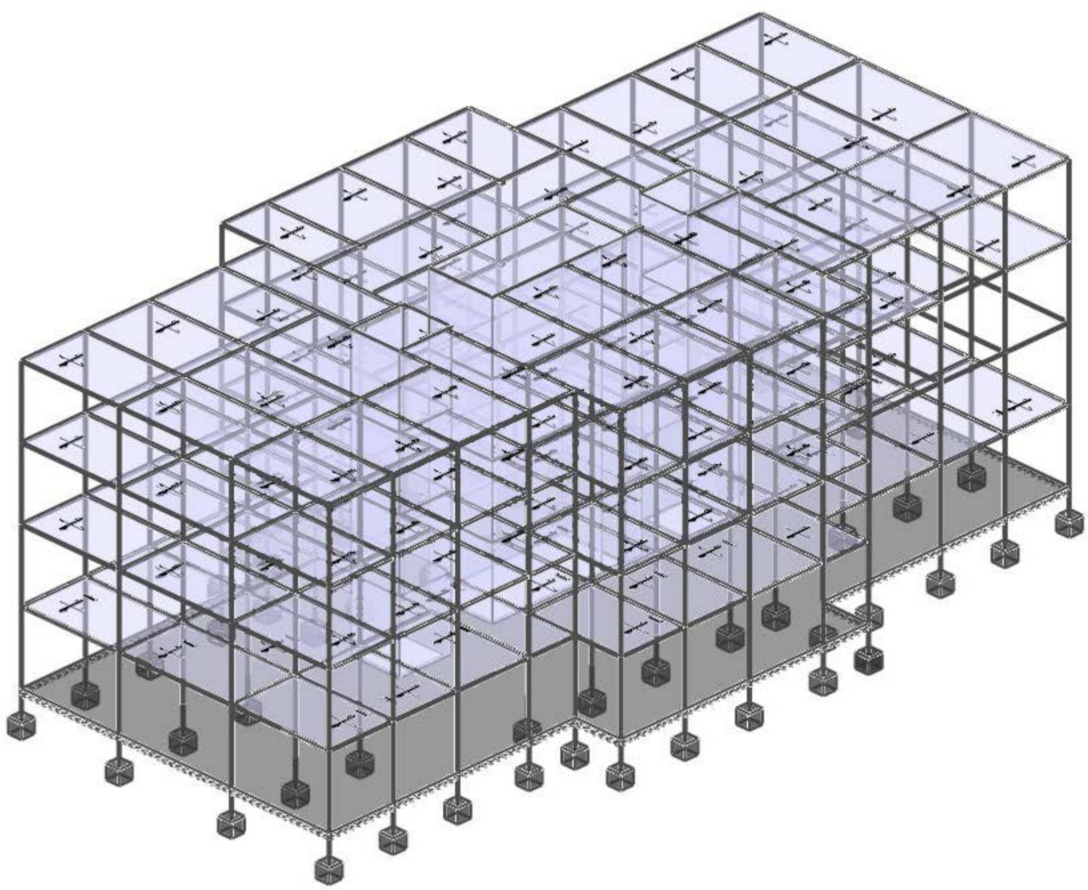
Support	Rx	Rz	Rm	Case
15	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
15	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
15	0.04 kN	2.12 kN	0.00 kN*m	Factored Loads
15	-0.15 kN|WIND1	0.00 kN|WIND1	0.00 kN*m|Factored Loads	Min
15	0.04 kN|Factored Loads	2.12 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
16	0.00 kN	6.62 kN	0.00 kN*m	DL1
16	0.00 kN	0.00 kN	0.00 kN*m	LL1
16	0.00 kN	-0.02 kN	0.00 kN*m	WIND1
16	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
16	0.00 kN	0.00 kN	0.00 kN*m	LR1
16	0.00 kN	0.00 kN	0.00 kN*m	ACC1
16	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
16	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
16	0.00 kN	7.95 kN	0.00 kN*m	Factored Loads
16	0.00 kN|Factored Loads	-0.02 kN|WIND1	0.00 kN*m|Factored Loads	Min
16	0.00 kN|Factored Loads	7.95 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
17	0.00 kN	9.62 kN	0.00 kN*m	DL1
17	0.00 kN	0.00 kN	0.00 kN*m	LL1
17	0.00 kN	-0.03 kN	0.00 kN*m	WIND1
17	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
17	0.00 kN	0.00 kN	0.00 kN*m	LR1
17	0.00 kN	0.00 kN	0.00 kN*m	ACC1
17	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
17	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
17	0.00 kN	11.54 kN	0.00 kN*m	Factored Loads
17	0.00 kN|Factored Loads	-0.03 kN|WIND1	0.00 kN*m|Factored Loads	Min
17	0.00 kN|Factored Loads	11.54 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
18	0.00 kN	10.01 kN	0.00 kN*m	DL1
18	0.00 kN	0.00 kN	0.00 kN*m	LL1
18	0.00 kN	0.04 kN	0.00 kN*m	WIND1
18	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
18	0.00 kN	0.00 kN	0.00 kN*m	LR1
18	0.00 kN	0.00 kN	0.00 kN*m	ACC1
18	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
18	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
18	0.00 kN	12.01 kN	0.00 kN*m	Factored Loads
18	0.00 kN|Factored Loads	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
18	0.00 kN|Factored Loads	12.01 kN|Factored Loads	0.00 kN*m|Factored Loads	Max
19	-0.06 kN	1.79 kN	0.00 kN*m	DL1
19	0.00 kN	0.00 kN	0.00 kN*m	LL1
19	-7.03 kN	0.01 kN	0.00 kN*m	WIND1
19	0.00 kN	0.00 kN	0.00 kN*m	SNOW1
19	0.00 kN	0.00 kN	0.00 kN*m	LR1
19	0.00 kN	0.00 kN	0.00 kN*m	ACC1
19	0.00 kN	0.00 kN	0.00 kN*m	TEMP1
19	0.00 kN	0.00 kN	0.00 kN*m	SEIS1
19	-0.07 kN	2.15 kN	0.00 kN*m	Factored Loads
19	-7.03 kN|WIND1	0.00 kN|SEIS1	0.00 kN*m|Factored Loads	Min
19	0.00 kN|SEIS1	2.15 kN|Factored Loads	0.00 kN*m|Factored Loads	Max

APPENDIX H Load Take Down

Load Takedown

Revit Extensions for Autodesk Revit Structure - Load Takedown 2013.0

Geometry



CASES

	Name	Nature
1	DL1	Dead
2	LL1	Live
3	WIND1	Wind

COMBINATIONS

	Name	Definition	State
1	Factored Loads	1.20*DL1 + 1.60*LL1	ULS

Extreme values

INTERNAL FORCES - COLUMNS

Symbol	Element	Value	Case
Fx Max	19x40-173321	854.34 kN	Factored Loads
Fx Min	19x40-378721	19.94 kN	Factored Loads

INTERNAL FORCES - WALLS

Symbol	Element	Value	Case
Fx Max	Retaining - 150mm Concrete 2-177865	0.00 kN	Factored Loads
Fx Min	Retaining - 150mm Concrete 2-177865	0.00 kN	Factored Loads

REACTIONS - SPREAD FOOTINGS

Symbol	Element	Value	Case
FZ Max	1800 x 1200 x 450mm-218552	854.34 kN	Factored Loads
FZ Min	1800 x 1200 x 450mm-218247	0.00 kN	Factored Loads

Detailed results

INTERNAL FORCES - COLUMNS

	Symbol	Element	Value	Case
1	Fx	19x40-170558	178.44 kN	Factored Loads
2	Fx	19x40-170949	303.16 kN	Factored Loads
3	Fx	19x40-171058	254.58 kN	Factored Loads
4	Fx	19x40-171141	393.35 kN	Factored Loads
5	Fx	19x40-171256	153.12 kN	Factored Loads
6	Fx	19x40-171319	172.59 kN	Factored Loads
7	Fx	19x40-171581	239.30 kN	Factored Loads
8	Fx	19x40-171644	294.27 kN	Factored Loads
9	Fx	19x40-171715	298.97 kN	Factored Loads
10	Fx	19x40-171882	188.72 kN	Factored Loads
11	Fx	19x40-171963	169.55 kN	Factored Loads
12	Fx	19x40-172022	437.03 kN	Factored Loads
13	Fx	19x40-172095	307.85 kN	Factored Loads
14	Fx	19x40-172180	256.50 kN	Factored Loads
15	Fx	19x40-172411	169.86 kN	Factored Loads
16	Fx	19x40-172562	363.16 kN	Factored Loads
17	Fx	19x40-173254	719.67 kN	Factored Loads
18	Fx	19x40-173321	854.34 kN	Factored Loads
19	Fx	19x40-173400	263.83 kN	Factored Loads
20	Fx	19x40-173613	341.46 kN	Factored Loads
21	Fx	19x40-173745	508.20 kN	Factored Loads
22	Fx	19x40-173780	406.74 kN	Factored Loads
23	Fx	19x40-173919	279.96 kN	Factored Loads
24	Fx	19x40-174090	803.99 kN	Factored Loads

	Symbol	Element	Value	Case
25	Fx	19x40-174283	790.82 kN	Factored Loads
26	Fx	19x40-174356	415.24 kN	Factored Loads
27	Fx	19x40-174413	300.03 kN	Factored Loads
28	Fx	19x40-174742	134.11 kN	Factored Loads
29	Fx	19x40-174947	529.60 kN	Factored Loads
30	Fx	19x40-175058	599.71 kN	Factored Loads
31	Fx	19x40-175117	203.48 kN	Factored Loads
32	Fx	19x40-175194	202.60 kN	Factored Loads
33	Fx	19x40-175249	336.70 kN	Factored Loads
34	Fx	19x40-175332	38.72 kN	Factored Loads
35	Fx	19x40-175377	404.34 kN	Factored Loads
36	Fx	19x40-175483	735.44 kN	Factored Loads
37	Fx	19x40-175904	709.24 kN	Factored Loads
38	Fx	19x40-175959	343.93 kN	Factored Loads
39	Fx	19x40-176026	178.53 kN	Factored Loads
40	Fx	19x40-176253	295.47 kN	Factored Loads
41	Fx	19x40-176312	329.24 kN	Factored Loads
42	Fx	19x40-176373	388.63 kN	Factored Loads
43	Fx	19x40-176468	64.25 kN	Factored Loads
44	Fx	19x40-176529	216.43 kN	Factored Loads
45	Fx	19x40-176653	236.15 kN	Factored Loads
46	Fx	19x40-176726	245.03 kN	Factored Loads
47	Fx	19x40-176773	308.67 kN	Factored Loads
48	Fx	19x40-176996	207.73 kN	Factored Loads
49	Fx	19x40-177148	292.63 kN	Factored Loads
50	Fx	19x40-177227	397.70 kN	Factored Loads
51	Fx	19x40-177431	277.82 kN	Factored Loads
52	Fx	19x40-177547	403.74 kN	Factored Loads
53	Fx	19x40-371597	144.96 kN	Factored Loads
54	Fx	19x40-371599	235.86 kN	Factored Loads
55	Fx	19x40-371601	188.02 kN	Factored Loads
56	Fx	19x40-371603	298.07 kN	Factored Loads
57	Fx	19x40-371605	123.78 kN	Factored Loads
58	Fx	19x40-371607	126.46 kN	Factored Loads
59	Fx	19x40-371609	199.37 kN	Factored Loads
60	Fx	19x40-371611	246.14 kN	Factored Loads
61	Fx	19x40-371613	210.57 kN	Factored Loads
62	Fx	19x40-371615	135.48 kN	Factored Loads
63	Fx	19x40-371617	133.10 kN	Factored Loads
64	Fx	19x40-371619	334.73 kN	Factored Loads
65	Fx	19x40-371621	236.82 kN	Factored Loads
66	Fx	19x40-371623	192.49 kN	Factored Loads
67	Fx	19x40-371625	133.96 kN	Factored Loads
68	Fx	19x40-371627	270.94 kN	Factored Loads
69	Fx	19x40-371629	542.67 kN	Factored Loads
70	Fx	19x40-371631	653.81 kN	Factored Loads
71	Fx	19x40-371633	217.70 kN	Factored Loads
72	Fx	19x40-371635	299.99 kN	Factored Loads
73	Fx	19x40-371637	354.22 kN	Factored Loads
74	Fx	19x40-371639	313.23 kN	Factored Loads

	Symbol	Element	Value	Case
75	Fx	19x40-371641	226.72 kN	Factored Loads
76	Fx	19x40-371643	610.63 kN	Factored Loads
77	Fx	19x40-371645	603.39 kN	Factored Loads
78	Fx	19x40-371647	321.38 kN	Factored Loads
79	Fx	19x40-371649	218.09 kN	Factored Loads
80	Fx	19x40-371651	96.55 kN	Factored Loads
81	Fx	19x40-371653	366.57 kN	Factored Loads
82	Fx	19x40-371655	419.26 kN	Factored Loads
83	Fx	19x40-371657	125.05 kN	Factored Loads
84	Fx	19x40-371659	127.05 kN	Factored Loads
85	Fx	19x40-371661	238.42 kN	Factored Loads
86	Fx	19x40-371663	38.72 kN	Factored Loads
87	Fx	19x40-371665	321.58 kN	Factored Loads
88	Fx	19x40-371667	559.43 kN	Factored Loads
89	Fx	19x40-371669	540.25 kN	Factored Loads
90	Fx	19x40-371671	262.20 kN	Factored Loads
91	Fx	19x40-371673	142.96 kN	Factored Loads
92	Fx	19x40-371675	221.55 kN	Factored Loads
93	Fx	19x40-371677	244.12 kN	Factored Loads
94	Fx	19x40-371679	292.21 kN	Factored Loads
95	Fx	19x40-371681	64.25 kN	Factored Loads
96	Fx	19x40-371683	177.20 kN	Factored Loads
97	Fx	19x40-371685	167.26 kN	Factored Loads
98	Fx	19x40-371687	169.87 kN	Factored Loads
99	Fx	19x40-371689	241.76 kN	Factored Loads
100	Fx	19x40-371691	174.50 kN	Factored Loads
101	Fx	19x40-371693	189.40 kN	Factored Loads
102	Fx	19x40-371695	312.76 kN	Factored Loads
103	Fx	19x40-371697	181.17 kN	Factored Loads
104	Fx	19x40-371699	308.99 kN	Factored Loads
105	Fx	19x40-375276	94.96 kN	Factored Loads
106	Fx	19x40-375278	154.50 kN	Factored Loads
107	Fx	19x40-375280	123.16 kN	Factored Loads
108	Fx	19x40-375282	195.27 kN	Factored Loads
109	Fx	19x40-375284	81.09 kN	Factored Loads
110	Fx	19x40-375286	82.85 kN	Factored Loads
111	Fx	19x40-375288	130.60 kN	Factored Loads
112	Fx	19x40-375290	161.24 kN	Factored Loads
113	Fx	19x40-375292	137.94 kN	Factored Loads
114	Fx	19x40-375294	88.76 kN	Factored Loads
115	Fx	19x40-375296	87.20 kN	Factored Loads
116	Fx	19x40-375298	219.29 kN	Factored Loads
117	Fx	19x40-375300	159.55 kN	Factored Loads
118	Fx	19x40-375302	130.37 kN	Factored Loads
119	Fx	19x40-375304	90.63 kN	Factored Loads
120	Fx	19x40-375306	177.52 kN	Factored Loads
121	Fx	19x40-375308	355.53 kN	Factored Loads
122	Fx	19x40-375310	428.35 kN	Factored Loads
123	Fx	19x40-375312	142.63 kN	Factored Loads
124	Fx	19x40-375314	196.56 kN	Factored Loads

	Symbol	Element	Value	Case
125	Fx	19x40-375316	232.08 kN	Factored Loads
126	Fx	19x40-375318	205.24 kN	Factored Loads
127	Fx	19x40-375320	148.53 kN	Factored Loads
128	Fx	19x40-375322	387.95 kN	Factored Loads
129	Fx	19x40-375324	383.60 kN	Factored Loads
130	Fx	19x40-375326	202.67 kN	Factored Loads
131	Fx	19x40-375328	180.21 kN	Factored Loads
132	Fx	19x40-375330	93.87 kN	Factored Loads
133	Fx	19x40-375332	289.93 kN	Factored Loads
134	Fx	19x40-375334	334.54 kN	Factored Loads
135	Fx	19x40-375336	122.37 kN	Factored Loads
136	Fx	19x40-375338	124.38 kN	Factored Loads
137	Fx	19x40-375340	195.52 kN	Factored Loads
138	Fx	19x40-375342	36.04 kN	Factored Loads
139	Fx	19x40-375344	211.23 kN	Factored Loads
140	Fx	19x40-375346	366.51 kN	Factored Loads
141	Fx	19x40-375348	353.95 kN	Factored Loads
142	Fx	19x40-375350	171.80 kN	Factored Loads
143	Fx	19x40-375352	93.67 kN	Factored Loads
144	Fx	19x40-375354	145.17 kN	Factored Loads
145	Fx	19x40-375356	159.96 kN	Factored Loads
146	Fx	19x40-375358	191.45 kN	Factored Loads
147	Fx	19x40-375360	42.09 kN	Factored Loads
148	Fx	19x40-375362	116.11 kN	Factored Loads
149	Fx	19x40-375364	109.59 kN	Factored Loads
150	Fx	19x40-375366	111.30 kN	Factored Loads
151	Fx	19x40-375368	158.42 kN	Factored Loads
152	Fx	19x40-375370	114.27 kN	Factored Loads
153	Fx	19x40-375372	124.08 kN	Factored Loads
154	Fx	19x40-375374	204.88 kN	Factored Loads
155	Fx	19x40-375376	118.69 kN	Factored Loads
156	Fx	19x40-375378	202.43 kN	Factored Loads
157	Fx	19x40-378637	44.98 kN	Factored Loads
158	Fx	19x40-378639	73.18 kN	Factored Loads
159	Fx	19x40-378641	58.34 kN	Factored Loads
160	Fx	19x40-378643	92.49 kN	Factored Loads
161	Fx	19x40-378645	38.41 kN	Factored Loads
162	Fx	19x40-378647	39.24 kN	Factored Loads
163	Fx	19x40-378649	61.86 kN	Factored Loads
164	Fx	19x40-378651	76.37 kN	Factored Loads
165	Fx	19x40-378653	65.33 kN	Factored Loads
166	Fx	19x40-378655	42.04 kN	Factored Loads
167	Fx	19x40-378657	41.30 kN	Factored Loads
168	Fx	19x40-378659	103.87 kN	Factored Loads
169	Fx	19x40-378661	77.76 kN	Factored Loads
170	Fx	19x40-378663	63.93 kN	Factored Loads
171	Fx	19x40-378665	42.95 kN	Factored Loads
172	Fx	19x40-378667	84.08 kN	Factored Loads
173	Fx	19x40-378669	168.40 kN	Factored Loads
174	Fx	19x40-378671	202.89 kN	Factored Loads

	Symbol	Element	Value	Case
175	Fx	19x40-378673	67.56 kN	Factored Loads
176	Fx	19x40-378675	93.10 kN	Factored Loads
177	Fx	19x40-378677	109.93 kN	Factored Loads
178	Fx	19x40-378679	97.21 kN	Factored Loads
179	Fx	19x40-378681	70.35 kN	Factored Loads
180	Fx	19x40-378683	177.75 kN	Factored Loads
181	Fx	19x40-378685	175.73 kN	Factored Loads
182	Fx	19x40-378687	95.93 kN	Factored Loads
183	Fx	19x40-378689	82.43 kN	Factored Loads
184	Fx	19x40-378691	47.53 kN	Factored Loads
185	Fx	19x40-378693	170.81 kN	Factored Loads
186	Fx	19x40-378695	184.82 kN	Factored Loads
187	Fx	19x40-378697	75.99 kN	Factored Loads
188	Fx	19x40-378699	77.31 kN	Factored Loads
189	Fx	19x40-378701	97.13 kN	Factored Loads
190	Fx	19x40-378703	20.00 kN	Factored Loads
191	Fx	19x40-378705	100.06 kN	Factored Loads
192	Fx	19x40-378707	173.60 kN	Factored Loads
193	Fx	19x40-378709	167.65 kN	Factored Loads
194	Fx	19x40-378711	81.37 kN	Factored Loads
195	Fx	19x40-378713	44.37 kN	Factored Loads
196	Fx	19x40-378715	68.76 kN	Factored Loads
197	Fx	19x40-378717	75.77 kN	Factored Loads
198	Fx	19x40-378719	90.68 kN	Factored Loads
199	Fx	19x40-378721	19.94 kN	Factored Loads
200	Fx	19x40-378723	54.99 kN	Factored Loads
201	Fx	19x40-378725	51.91 kN	Factored Loads
202	Fx	19x40-378727	52.72 kN	Factored Loads
203	Fx	19x40-378729	75.03 kN	Factored Loads
204	Fx	19x40-378731	54.22 kN	Factored Loads
205	Fx	19x40-378733	58.77 kN	Factored Loads
206	Fx	19x40-378735	97.04 kN	Factored Loads
207	Fx	19x40-378737	56.22 kN	Factored Loads
208	Fx	19x40-378739	95.88 kN	Factored Loads
209	Fx	19x40-170558	178.44 kN	Factored Loads
210	Fx	19x40-170949	303.16 kN	Factored Loads
211	Fx	19x40-171058	254.58 kN	Factored Loads
212	Fx	19x40-171141	393.35 kN	Factored Loads
213	Fx	19x40-171256	153.12 kN	Factored Loads
214	Fx	19x40-171319	172.59 kN	Factored Loads
215	Fx	19x40-171581	239.30 kN	Factored Loads
216	Fx	19x40-171644	294.27 kN	Factored Loads
217	Fx	19x40-171715	298.97 kN	Factored Loads
218	Fx	19x40-171882	188.72 kN	Factored Loads
219	Fx	19x40-171963	169.55 kN	Factored Loads
220	Fx	19x40-172022	437.03 kN	Factored Loads
221	Fx	19x40-172095	307.85 kN	Factored Loads
222	Fx	19x40-172180	256.50 kN	Factored Loads
223	Fx	19x40-172411	169.86 kN	Factored Loads
224	Fx	19x40-172562	363.16 kN	Factored Loads

	Symbol	Element	Value	Case
225	Fx	19x40-173254	719.67 kN	Factored Loads
226	Fx	19x40-173321	854.34 kN	Factored Loads
227	Fx	19x40-173400	263.83 kN	Factored Loads
228	Fx	19x40-173613	341.46 kN	Factored Loads
229	Fx	19x40-173745	508.20 kN	Factored Loads
230	Fx	19x40-173780	406.74 kN	Factored Loads
231	Fx	19x40-173919	279.96 kN	Factored Loads
232	Fx	19x40-174090	803.99 kN	Factored Loads
233	Fx	19x40-174283	790.82 kN	Factored Loads
234	Fx	19x40-174356	415.24 kN	Factored Loads
235	Fx	19x40-174413	300.03 kN	Factored Loads
236	Fx	19x40-174742	134.11 kN	Factored Loads
237	Fx	19x40-174947	529.60 kN	Factored Loads
238	Fx	19x40-175058	599.71 kN	Factored Loads
239	Fx	19x40-175117	203.48 kN	Factored Loads
240	Fx	19x40-175194	202.60 kN	Factored Loads
241	Fx	19x40-175249	336.70 kN	Factored Loads
242	Fx	19x40-175332	38.72 kN	Factored Loads
243	Fx	19x40-175377	404.34 kN	Factored Loads
244	Fx	19x40-175483	735.44 kN	Factored Loads
245	Fx	19x40-175904	709.24 kN	Factored Loads
246	Fx	19x40-175959	343.93 kN	Factored Loads
247	Fx	19x40-176026	178.53 kN	Factored Loads
248	Fx	19x40-176253	295.47 kN	Factored Loads
249	Fx	19x40-176312	329.24 kN	Factored Loads
250	Fx	19x40-176373	388.63 kN	Factored Loads
251	Fx	19x40-176468	64.25 kN	Factored Loads
252	Fx	19x40-176529	216.43 kN	Factored Loads
253	Fx	19x40-176653	236.15 kN	Factored Loads
254	Fx	19x40-176726	245.03 kN	Factored Loads
255	Fx	19x40-176773	308.67 kN	Factored Loads
256	Fx	19x40-176996	207.73 kN	Factored Loads
257	Fx	19x40-177148	292.63 kN	Factored Loads
258	Fx	19x40-177227	397.70 kN	Factored Loads
259	Fx	19x40-177431	277.82 kN	Factored Loads
260	Fx	19x40-177547	403.74 kN	Factored Loads

INTERNAL FORCES - WALLS

	Symbol	Element	Value	Case
1	Fx	Retaining - 150mm Concrete 2-177865	0.00 kN	Factored Loads
2	Fx	Retaining - 150mm Concrete 2-177956	0.00 kN	Factored Loads
3	Fx	Retaining - 150mm Concrete 2-178025	0.00 kN	Factored Loads
4	Fx	Retaining - 150mm Concrete 2-178359	0.00 kN	Factored Loads
5	Fx	Retaining - 150mm Concrete 2-178416	0.00 kN	Factored Loads
6	Fx	Retaining - 150mm Concrete 2-178489	0.00 kN	Factored Loads
7	Fx	Retaining - 150mm Concrete 2-178572	0.00 kN	Factored Loads
8	Fx	Retaining - 150mm Concrete 2-178635	0.00 kN	Factored Loads
9	Fx	Retaining - 150mm Concrete 2-178911	0.00 kN	Factored Loads
10	Fx	Retaining - 150mm Concrete 2-178978	0.00 kN	Factored Loads

	Symbol	Element	Value	Case
11	Fx	Retaining - 150mm Concrete 2-179035	0.00 kN	Factored Loads
12	Fx	Retaining - 150mm Concrete 2-371701	0.00 kN	Factored Loads
13	Fx	Retaining - 150mm Concrete 2-371703	0.00 kN	Factored Loads
14	Fx	Retaining - 150mm Concrete 2-371705	0.00 kN	Factored Loads
15	Fx	Retaining - 150mm Concrete 2-371707	0.00 kN	Factored Loads
16	Fx	Retaining - 150mm Concrete 2-371709	0.00 kN	Factored Loads
17	Fx	Retaining - 150mm Concrete 2-371711	0.00 kN	Factored Loads
18	Fx	Retaining - 150mm Concrete 2-371713	0.00 kN	Factored Loads
19	Fx	Retaining - 150mm Concrete 2-371715	0.00 kN	Factored Loads
20	Fx	Retaining - 150mm Concrete 2-371717	0.00 kN	Factored Loads
21	Fx	Retaining - 150mm Concrete 2-371719	0.00 kN	Factored Loads
22	Fx	Retaining - 150mm Concrete 2-371721	0.00 kN	Factored Loads
23	Fx	Retaining - 150mm Concrete 2-375380	0.00 kN	Factored Loads
24	Fx	Retaining - 150mm Concrete 2-375382	0.00 kN	Factored Loads
25	Fx	Retaining - 150mm Concrete 2-375384	0.00 kN	Factored Loads
26	Fx	Retaining - 150mm Concrete 2-375386	0.00 kN	Factored Loads
27	Fx	Retaining - 150mm Concrete 2-375388	0.00 kN	Factored Loads
28	Fx	Retaining - 150mm Concrete 2-375390	0.00 kN	Factored Loads
29	Fx	Retaining - 150mm Concrete 2-375392	0.00 kN	Factored Loads
30	Fx	Retaining - 150mm Concrete 2-375394	0.00 kN	Factored Loads
31	Fx	Retaining - 150mm Concrete 2-375396	0.00 kN	Factored Loads
32	Fx	Retaining - 150mm Concrete 2-375398	0.00 kN	Factored Loads
33	Fx	Retaining - 150mm Concrete 2-375400	0.00 kN	Factored Loads
34	Fx	Retaining - 150mm Concrete 2-378741	0.00 kN	Factored Loads
35	Fx	Retaining - 150mm Concrete 2-378743	0.00 kN	Factored Loads
36	Fx	Retaining - 150mm Concrete 2-378745	0.00 kN	Factored Loads
37	Fx	Retaining - 150mm Concrete 2-378747	0.00 kN	Factored Loads
38	Fx	Retaining - 150mm Concrete 2-378749	0.00 kN	Factored Loads
39	Fx	Retaining - 150mm Concrete 2-378751	0.00 kN	Factored Loads
40	Fx	Retaining - 150mm Concrete 2-378753	0.00 kN	Factored Loads
41	Fx	Retaining - 150mm Concrete 2-378755	0.00 kN	Factored Loads
42	Fx	Retaining - 150mm Concrete 2-378757	0.00 kN	Factored Loads
43	Fx	Retaining - 150mm Concrete 2-378759	0.00 kN	Factored Loads
44	Fx	Retaining - 150mm Concrete 2-378761	0.00 kN	Factored Loads

REACTIONS - SPREAD FOOTINGS

	Symbol	Element	Value	Case
1	FZ	1800 x 1200 x 450mm-218245	308.67 kN	Factored Loads
2	FZ	1800 x 1200 x 450mm-218247	0.00 kN	Factored Loads
3	FZ	1800 x 1200 x 450mm-218249	236.15 kN	Factored Loads
4	FZ	1800 x 1200 x 450mm-218251	216.43 kN	Factored Loads
5	FZ	1800 x 1200 x 450mm-218257	298.97 kN	Factored Loads
6	FZ	1800 x 1200 x 450mm-218259	239.30 kN	Factored Loads
7	FZ	1800 x 1200 x 450mm-218261	172.59 kN	Factored Loads
8	FZ	1800 x 1200 x 450mm-218354	437.03 kN	Factored Loads
9	FZ	1800 x 1200 x 450mm-218356	307.85 kN	Factored Loads
10	FZ	1800 x 1200 x 450mm-218358	256.50 kN	Factored Loads
11	FZ	1800 x 1200 x 450mm-218360	169.86 kN	Factored Loads
12	FZ	1800 x 1200 x 450mm-218362	178.44 kN	Factored Loads

	Symbol	Element	Value	Case
13	FZ	1800 x 1200 x 450mm-218364	303.16 kN	Factored Loads
14	FZ	1800 x 1200 x 450mm-218366	254.58 kN	Factored Loads
15	FZ	1800 x 1200 x 450mm-218368	393.35 kN	Factored Loads
16	FZ	1800 x 1200 x 450mm-218372	336.70 kN	Factored Loads
17	FZ	1800 x 1200 x 450mm-218374	202.60 kN	Factored Loads
18	FZ	1800 x 1200 x 450mm-218376	203.48 kN	Factored Loads
19	FZ	1800 x 1200 x 450mm-218378	134.11 kN	Factored Loads
20	FZ	1800 x 1200 x 450mm-218380	178.53 kN	Factored Loads
21	FZ	1800 x 1200 x 450mm-218382	295.47 kN	Factored Loads
22	FZ	1800 x 1200 x 450mm-218384	329.24 kN	Factored Loads
23	FZ	1800 x 1200 x 450mm-218386	388.63 kN	Factored Loads
24	FZ	1800 x 1200 x 450mm-218459	343.93 kN	Factored Loads
25	FZ	1800 x 1200 x 450mm-218461	709.24 kN	Factored Loads
26	FZ	1800 x 1200 x 450mm-218463	735.44 kN	Factored Loads
27	FZ	1800 x 1200 x 450mm-218465	599.71 kN	Factored Loads
28	FZ	1800 x 1200 x 450mm-218467	529.60 kN	Factored Loads
29	FZ	1800 x 1200 x 450mm-218469	300.03 kN	Factored Loads
30	FZ	1800 x 1200 x 450mm-218546	415.24 kN	Factored Loads
31	FZ	1800 x 1200 x 450mm-218548	790.82 kN	Factored Loads
32	FZ	1800 x 1200 x 450mm-218550	803.99 kN	Factored Loads
33	FZ	1800 x 1200 x 450mm-218552	854.34 kN	Factored Loads
34	FZ	1800 x 1200 x 450mm-218554	719.67 kN	Factored Loads
35	FZ	1800 x 1200 x 450mm-218556	363.16 kN	Factored Loads
36	FZ	1800 x 1200 x 450mm-218669	404.34 kN	Factored Loads
37	FZ	1800 x 1200 x 450mm-218671	397.70 kN	Factored Loads
38	FZ	1800 x 1200 x 450mm-218673	277.82 kN	Factored Loads
39	FZ	1800 x 1200 x 450mm-218675	403.74 kN	Factored Loads
40	FZ	1800 x 1200 x 450mm-218684	508.20 kN	Factored Loads
41	FZ	1800 x 1200 x 450mm-218686	341.46 kN	Factored Loads
42	FZ	1800 x 1200 x 450mm-218688	263.83 kN	Factored Loads
43	FZ	1800 x 1200 x 450mm-218690	279.96 kN	Factored Loads
44	FZ	1800 x 1200 x 450mm-218692	406.74 kN	Factored Loads
45	FZ	1800 x 1200 x 450mm-218808	292.63 kN	Factored Loads
46	FZ	1800 x 1200 x 450mm-218945	294.27 kN	Factored Loads
47	FZ	1800 x 1200 x 450mm-219211	169.55 kN	Factored Loads
48	FZ	1800 x 1200 x 450mm-219388	153.12 kN	Factored Loads
49	FZ	1800 x 1200 x 450mm-219929	64.25 kN	Factored Loads
50	FZ	1800 x 1200 x 450mm-219980	38.72 kN	Factored Loads
51	FZ	1800 x 1200 x 450mm-220059	245.03 kN	Factored Loads
52	FZ	1800 x 1200 x 450mm-224587	188.72 kN	Factored Loads
53	FZ	_233032	207.73 kN	Factored Loads

APPENDIX I Cost Analysis Guide

Guide for Starting Cost Estimating

Estimating beginning with the following assemblies

- Foundation
- Major structural elements
- Exterior closure
- Interior finishes

Assemblies broken down to major components:

- Structural system
- Exterior walls
- Roofing

The first step in any assemblies estimate is to understand the factors that affect the project cost such as:

- Loads,
- varying soils conditions

Order in which a building is constructed:

- A: Substructure
  - A10: Foundations: Standard Foundations, Special Foundations, Slab on Grade
  - A20: Basement Construction: Basement Excavation, Basement Walls
- B: Shell (Enclosure : Steel, Concrete, Cement, labor)
  - B10: Superstructure: Floor Construction Roof Construction
  - B20: Exterior Closure: Exterior Walls, Windows and Doors
  - B30: Roofing: Roof Coverings Roof openings
- C: Interiors
  - C10 Interior Construction: Interior Doors. Partitions, Specialties
  - C20 Stairs: Stair construction Stair Finishes
  - C30 Interior Finishes: Wall, Floor, & Ceiling Finishes

Things to know:

- Building dimension
- Proposed location
- Important Site conditions
- Major project requirements
- Construction Time Frame (Goal of time period)

Description of 4 primary types of estimates:

  - Unit Price
  - Assemblies
  - Square foot and cubic foot (Probably best to use)
  - Order of magnitude

Criteria that must be studied:

- Price of each assembly
- Quantity of assembly
- Appearance and Quality
- Story height
- Site complication and restrictions
- Zooning limitations
- Maintenance Cost
- Energy considerations
- Budget restrains (stay within 30% margin of RS 1.500,00/m^2)

RS Means Division 3-Concrete

03 05 Common Work Results for Concrete (what does this mean)

- 03 05 13- Basic Concrete Materials
  - Concrete Admixtures and Surface treatments
  - Aggregate
  - Cement
  - Waterproofing and Damp proofing

03 11 Concrete Forms

- 03 11 13 Structural Cast in Place Concrete Forming
  - Forms in Place, Beams and Girders
  - Forms in Place, Columns
  - Forms in Place, Elevated Slabs
  - Forms in Place, Equipment Foundations
  - Forms in Place, Footings
  - Forms in Place, Gas Station Forms (what does this mean)
  - Forms in Place, Grade Beam (what does this mean)
  - Forms in Place, Slab on Grade
  - Forms in Place, Walls
- 03 11 23 Permanent Stair Forming
  - Forms in Place, Stairs

03 15 Concrete Accessories (Check this section with Prof)

- 03 15 05 Concrete Forming Accessories
    - Expansion Joints
    - Hangers
    - Inserts
    - Shores
    - Sleeves and Chases
    - Snap Ties
    - Stair Tread Inserts
    - Wall and Foundation Form Accessories
- 03 15 13 Water stops

03 21 Reinforcement Bars

- 03 21 05 Reinforcing Steel Accessories
    - Rebar accessories
    - Splicing Reinforcing Bars
- 03 21 10 Uncoated Reinforcing Steel
    - Reinforcing in Place
    - Glass fiber Reinforced Polymer Bars
- 03 21 13 Galvanized Reinforcement Steel Bars (Is this a good steel to use)
    - Galvanized Reinforcing steel
- 03 21 16 Epoxy-Coated Reinforcement steel Bars
    - Epoxy-Coated Reinforcing

03 22 Fabric and Grid Reinforcing

- 03 22 05 Uncoated Welded Wire Fabric
- Welded Wire Fabric

03 30 Cast-In-Place Concrete

- 03 30 53 Miscellaneous Cast In Place Concrete
    - Concrete in place

03 31 Structural Concrete

- 03 31 05 Normal Weight Structural Concrete
    - Concrete, Hand Mix
    - Normal Weight Concrete, Ready Mix
    - Placing Concrete

03 35 Concrete Finishing

- 03 35 29 Tooled Concrete Finishing
    - Finishing Floors

    - Control Joints, Saw Cut
    - Finishing Walls
- 03 35 33 Stamped Concrete Finishing
    - Slab Texture Finishing
- 03 35 43 Polished Concrete Finishing
    - Polished Concrete Floors

03 37 Specialty Placed Concrete

- 03 37 13 Shotcrete
    - Gunite (DryMix)
    - Shotcrete (Wet Mix)

03 39 Concrete Curing

- 03 39 13 Water Concrete Curing
    - Water Curing
- 03 39 23 Membrane Concrete Curing
    - Chemical compound concrete curing
    - Sheet membrane Concrete curing

03 51 Cast Roof Decks

- 03 51 13 Cementitious Wood Fiber Decks
- 03 51 16 Gypsum Concrete Roof Decks

03 52 Lightweight Concrete Roof Insulation

- 03 52 16 Lightweight Insulation Concrete
    - Lightweight Cellular Insulation Concrete
    - Lightweight Aggregate Insulation Concrete

05 54 Cast Underlayment

- 03 54 13 Gypsum Cement Underlayment
    - Poured Gypsum Cement Underlayment
- 03 54 16 Hydraulic Cement Underlayment
    - Cement Underlayment

03 62 Non-Shrink Grouting

- 03 62 13 Non Metallic Non Shrink Grouting
    - Grout Non Metallic Non Shrink
- 03 62 16 Metallic Non-Shrink Grouting

    - Grout metallic Non-Shrink

03 63 Epoxy Grouting

- 03 63 05 Grouting of Dowels and Fasteners
    - Epoxy Only

03 81 Concrete Cutting

- 03 81 13 Flat Concrete Sawing
    - Concrete Floor Slab Cutting
- 03 81 16 Track Mounted Concrete Wall Sawing
    - Concrete Wall Cutting

03 82 Concrete Boring

- 03 82 13 Concrete Core Drilling
    - Core Drilling
- 03 82 16 Concrete Drilling
    - Concrete Impact Drilling

APPENDIX I for Hand Calculations

Reinforced Concrete Floor Plan Hand Calculations

Wall Outside (perimeter)	Length mm	Length in m	Height (m)	Wall Thickness (m)	Area m^2	Volume m^3	# of Windows	1st Window Area	2nd Window Area	Wall Area Take-off	# of blocks S.F (19x39)
Wall A 2-7	13400	13.4	2.8	0.15	37.52	5.628	2	0.8	0.8	35.92	434.9696199
Wall 7 A-C	5200	5.2	2.8	0.15	14.56	2.184	2	2.24	1.68	10.64	128.8440077
Wall 7 C-D	2900	2.9	2.8	0.15	8.12	1.218				8.12	98.32832166
Wall 7 D-E	1800	1.8	2.8	0.15	5.04	0.756	1	1.68		3.36	40.68758138
Wall E 7	1948	1.948	2.8	0.15	5.4544	0.81816				5.4544	66.0495071
Wall E-F	1800	1.8	2.8	0.15	5.04	0.756	1	1.68		3.36	40.68758138
Wall F-H	3000	3	2.8	0.15	8.4	1.26				8.4	101.7189534
Wall H-K	5200	5.2	2.8	0.15	14.56	2.184	2	1.68	2.24	10.64	128.8440077

1mm =0.001m

Exterior Walls	Total # of Exterior walls	Total Take off Area	Total # of Blocks	Total # of Blocks + 5% waste	Sacks of Cement	Yards of Sand	Gallons of Water	Cubic Yards of Grout	Length Joint Reinforcement
Wall A 2-7	2	71.84	869.93924	871.12024	29.037341		145.187		
Wall 7 A-C	4	42.56	515.37603	516.55703	17.218568		86.0928		
Wall 7 C-D	4	32.48	393.31329	394.49429	13.14981		65.749		
Wall 7 D-E	4	13.44	162.75033	163.93133	5.4643775		27.3219		
Wall E 7	4	21.8176	264.19803	265.37903	8.8459676		44.2298		
Wall E-F	2	6.72	81.375163	82.556163	2.7518721		13.7594		
Wall F-H	2	16.8	203.43791	204.61891	6.8206302		34.1032		
Wall H-K	2	21.28	257.68802	258.86902	8.6289672		43.1448		
Total		**226.9376**	**2748.078**	**2757.526**					

APPENDIX I for Revit Material Take-off

Foundation Material Take-off

Structural Foundation Material Take-off						
Material: Name	Family and Type	Material: Area (m^2)	Material: Volume (m^3)	Estimated Reinforcement Volume (m^3)	Forms Material Cost (m^2)	
Concrete, Cast-in-Place gray	Foundation Slab: 150mm Foundation Slab	450.65	67.6			
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Concrete, Cast-in-Place gray	M_Footing-Rectangular: 1800 x 1200 x 450mm	7.02	0.97	0.013		
Grand total: 53		**365.04**	**118.14**	**0.676**	**$30.00**	**$10,951.20**

Floor Slab Material Take-off

Floor Material Takeoff				
Material: Name	Family and Type	Material: Area (m^2)	Material: Volume (m^3)	Estimated Reinforcement Volume (m^3)
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.85	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.1	1.45	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	9.99	1.2	0.019
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.86	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.17	1.46	0.023
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	13.55	1.63	0.025
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.85	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.1	1.45	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.86	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.15	1.46	0.023
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	9.99	1.2	0.019
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.85	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.1	1.45	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	9.99	1.2	0.019
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.87	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.17	1.46	0.023
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	13.55	1.63	0.025
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.85	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.1	1.45	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.86	1.3	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.15	1.46	0.023
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	9.99	1.2	0.019
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.32	1.24	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.33	1.24	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	11.92	1.43	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	7.15	0.86	0.015
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	7.15	0.86	0.015
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	11.92	1.43	0.022
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.33	1.24	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.32	1.24	0.02
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	11.16	1.34	0.021
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.06	1.45	0.023
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	16.06	1.93	0.029
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	10.05	1.21	0.019
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	11.6	1.39	0.021
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	12.72	1.53	0.023
Total		**404.04**	**48.49**	**0.756**

Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.85	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.1	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	9.99	0.3	0.019
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.86	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.17	0.36	0.023
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	13.55	0.41	0.025
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.85	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.1	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.86	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.15	0.36	0.023
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	9.99	0.3	0.019
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.85	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.1	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	9.99	0.3	0.019
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.87	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.17	0.36	0.023
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	13.55	0.41	0.025
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.85	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.1	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.86	0.33	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.15	0.36	0.023
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	9.99	0.3	0.019
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.32	0.31	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.33	0.31	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	11.92	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	7.15	0.21	0.015
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	7.15	0.21	0.015
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	11.92	0.36	0.022
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.33	0.31	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.32	0.31	0.02
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	11.16	0.33	0.021
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.06	0.36	0.023
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	16.06	0.48	0.029
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	10.05	0.3	0.019
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	11.6	0.35	0.021
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	12.72	0.38	0.023
Grand total: 72		**404.04**	**12.12**	**0.756**

Column Material Take-off

Structural Column Material Takeoff				
Material: Name	Family and Type	Material: Area (m^2)	Material: Volume (m^3)	Estimated Reinforcement Volume (m^3)
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular-Column: 19x40	5	0.29	0.004
Grand total: 52		1040	15.02	0.208

Beam Material Take-off

Structural Framing Material Takeoff				
Material: Name	Family and Type	Material: Area (m^2)	Material: Volume (m^3)	Estimated Reinforcement Volume (m^3)
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.47	0.31	0.009
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	6.1	0.26	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.47	0.31	0.009
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.04	0.38	0.01
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.04	0.38	0.008
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.04	0.38	0.008
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	4.95	0.21	0.007
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	4.95	0.21	0.007
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.51	0.32	0.009
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.51	0.32	0.005
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.51	0.32	0.007
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.51	0.32	0.009
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.47	0.31	0.009
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	6.11	0.26	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	6.11	0.26	0.004
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.03	0.38	0.008
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.03	0.38	0.008
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	9.04	0.38	0.01
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	4.95	0.21	0.005
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	4.95	0.21	0.005
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	5.5	0.24	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	5.5	0.24	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	5.5	0.24	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	2.71	0.12	0.002
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	4.31	0.18	0.005
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	2.71	0.12	0.002
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	1.76	0.08	0.002
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	1.71	0.07	0.001
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	3.97	0.17	0.003
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	6.1	0.26	0.006
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	3.97	0.17	0.003
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	3.96	0.17	0.003
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	3.97	0.17	0.003
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	7.47	0.31	0.009
Grand total: 34		**203.93**	**8.65**	**0.206**

Retaining Wall Material Take-off

Retaining Wall Material Takeoff				
Material: Name	Family and Type	Material: Area (m^2)	Material: Volume (m^3)	Estimated Reinforcement Volume (m^3)
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	5.95	0.89	0.02
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	6.16	0.92	0.021
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	5.95	0.89	0.02
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	13.22	1.98	0.029
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	7.56	1.13	0.017
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	15.88	2.38	0.035
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	7.14	1.07	0.016
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	2.25	0.34	0.005
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	6.34	0.95	0.021
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	5.74	0.86	0.019
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	5.92	0.89	0.02
Grand total: 11		**164.22**	**12.3**	**0.223**

Exterior Wall Material Take-off

Family and Type	Material: Name	Wall Thickness (m)	Wall Height (m)	Length (m)	Material: Area	Material: Volume	Concrete Block Volume (14x19x39)	# of blocks in a wall
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.3	4.0	0.6	0.0	54.0
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	57.8
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	66.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	56.9
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	130.1
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	57.8
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	0.9	3.0	0.4	0.0	37.6
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	130.1
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	57.8
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	57.8
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.0	3.0	0.4	0.0	39.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.4	4.0	0.6	0.0	57.8
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.3	4.0	0.6	0.0	53.0
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.3	4.0	0.6	0.0	53.0
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.3	4.0	0.6	0.0	53.0
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.0	3.0	0.4	0.0	38.6
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	66.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.0	3.0	0.4	0.0	38.6
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	66.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	131.1
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	131.1
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	65.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	0.9	3.0	0.4	0.0	37.6
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	66.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	0.9	3.0	0.4	0.0	37.6
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	1.6	5.0	0.7	0.0	66.5
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	131.1
Basic Wall: Exterior - 170mm Masonry	Concrete Masonry Units	0.15	2.8	3.2	10.0	1.4	0.0	131.1
Basic Wall: Exterior - 170mm Masonry: 28		**4.2**	**78.4**	**48.69048**	**148**	**20.45**	**0.290472**	**1971.274**

Interior Wall Material Take-off

Family and Type	Material: Name	Wall Thickness (m)	Wall Height (m)	Length (m)	Material: Area	Material: Volume	Concrete Block Volume (14x19x39)	# of blocks in a wall
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.119048	6	0.89	0.010374	85.7914
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.119048	6	0.89	0.010374	85.7914
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.238095	10	1.36	0.010374	131.097
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.595238	5	0.67	0.010374	64.58454
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.238095	10	1.36	0.010374	131.097
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.047619	3	0.44	0.010374	42.41373
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.857143	6	0.78	0.010374	75.18797
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.238095	1	0.1	0.010374	9.639483
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.666667	11	1.54	0.010374	148.448
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	7.190476	22	3.02	0.010374	291.1124
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.02381	6	0.85	0.010374	81.93561
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.071429	9	1.29	0.010374	124.3493
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.619048	5	0.68	0.010374	65.54849
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.071429	9	1.29	0.010374	124.3493
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.119048	3	0.47	0.010374	45.30557
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.833333	6	0.77	0.010374	74.22402
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.142857	3	0.48	0.010374	46.26952
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.547619	11	1.49	0.010374	143.6283
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.190476	1	0.08	0.010374	7.711587
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.214286	10	1.35	0.010374	130.133
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.690476	5	0.71	0.010374	68.44033
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.238095	10	1.36	0.010374	131.097
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.047619	3	0.44	0.010374	42.41373
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.857143	6	0.78	0.010374	75.18797
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.261905	1	0.11	0.010374	10.60343
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.666667	11	1.54	0.010374	148.448
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.666667	2	0.28	0.010374	26.99055
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	7.190476	22	3.02	0.010374	291.1124
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.214286	10	1.35	0.010374	130.133
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.047619	3	0.44	0.010374	42.41373
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.857143	6	0.78	0.010374	75.18797
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.166667	3	0.49	0.010374	47.23347
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.119048	6	0.89	0.010374	85.7914
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.214286	10	1.35	0.010374	130.133
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.619048	5	0.68	0.010374	65.54849
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.238095	10	1.36	0.010374	131.097
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.047619	3	0.44	0.010374	42.41373
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.857143	6	0.78	0.010374	75.18797
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.261905	1	0.11	0.010374	10.60343
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.666667	11	1.54	0.010374	148.448
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.238095	10	1.36	0.010374	131.097
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.261905	1	0.11	0.010374	10.60343
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.02381	3	0.43	0.010374	41.44978
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	9.690476	29	4.07	0.010374	392.327
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.071429	9	1.29	0.010374	124.3493
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.595238	5	0.67	0.010374	64.58454
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.047619	9	1.28	0.010374	123.3854
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.119048	3	0.47	0.010374	45.30557
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.833333	6	0.77	0.010374	74.22402
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.190476	4	0.5	0.010374	48.19742
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.547619	11	1.49	0.010374	143.6283
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.047619	3	0.44	0.010374	42.41373
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.166667	0	0.07	0.010374	6.747638
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.238095	7	0.94	0.010374	90.61114
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.690476	2	0.29	0.010374	27.9545
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.547619	11	1.49	0.010374	143.6283
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.690476	5	0.71	0.010374	68.44033
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	3.833333	12	1.61	0.010374	155.1957
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	2.690476	8	1.13	0.010374	108.9262
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.404762	4	0.59	0.010374	56.87295
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.404762	4	0.59	0.010374	56.87295
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.52381	2	0.22	0.010374	21.20686
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	1.404762	4	0.59	0.010374	56.87295
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.52381	2	0.22	0.010374	21.20686
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.52381	2	0.22	0.010374	21.20686
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.5	2	0.21	0.010374	20.24291
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.5	2	0.21	0.010374	20.24291
Basic Wall: Interior - 150mm Masonry	Concrete Masonry Units	0.15	2.8	0.52381	2	0.22	0.010374	21.20686
Basic Wall: Interior - 150mm Masonry: 75		**11.25**	**210**	**151.0714**	**460**	**63.45**	**0.77805**	**6116.252**
Grand Total: 103					608	83.9		

Finishes Material Take-off (Exterior Mortar)

Finishes Take-off				
Family and Type	Material: Name	Material: Area	Material: Volume	Material: Cost
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.1	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.11	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.1	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.1	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	4	0.1	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	3	0.07	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	5	0.12	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Basic Wall: Exterior - 170mm Masonry	Beige, Textured Mortar	10	0.24	0
Beige, Textured Mortar: 28		148	3.65	

Finishes Material Take-off (Interior and Exterior Plaster)

Basic Wall: Interior - 150mm Masonry	Plaster	13	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	13	0.06	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	1	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	22	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	43	0.22	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	12	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	18	0.09	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	18	0.09	0
Basic Wall: Interior - 150mm Masonry	Plaster	7	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	7	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	21	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	1	0.01	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	2	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	22	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	43	0.22	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	7	0.03	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	13	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	2	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	22	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	19	0.1	0
Basic Wall: Interior - 150mm Masonry	Plaster	2	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Interior - 150mm Masonry	Plaster	58	0.29	0
Basic Wall: Interior - 150mm Masonry	Plaster	18	0.09	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	18	0.09	0
Basic Wall: Interior - 150mm Masonry	Plaster	7	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	11	0.06	0
Basic Wall: Interior - 150mm Masonry	Plaster	7	0.04	0
Basic Wall: Interior - 150mm Masonry	Plaster	21	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	6	0.03	0
Basic Wall: Interior - 150mm Masonry	Plaster	1	0	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	13	0.07	0
Basic Wall: Interior - 150mm Masonry	Plaster	4	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	21	0.11	0
Basic Wall: Interior - 150mm Masonry	Plaster	10	0.05	0

Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	4	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	23	0.12	0
Basic Wall: Interior - 150mm Masonry	Plaster	16	0.08	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	3	0.01	0
Basic Wall: Exterior - 170mm Masonry	Plaster	5	0.02	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Exterior - 170mm Masonry	Plaster	10	0.05	0
Basic Wall: Interior - 150mm Masonry	Plaster	8	0.04	0
Basic Wall: Interior - 150mm Masonry	Plaster	8	0.04	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	8	0.04	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Basic Wall: Interior - 150mm Masonry	Plaster	3	0.02	0
Plaster: 103		1052	5.26	
Grand total: 234		1797	92.78	

APPENDIX I for Cost Estimates

Reinforced Concrete Cost Estimate

DESCRIPTION	UNIT	QUANT	MATERIAL	LABOR	EQUIPMENT	TOTAL
FOUNDATION						$ 133,425.0
CONCRETE 35 MPA	m3	118.04	250.00	400.00	40.00	$ 81,447.6
REINFORCING STEEL	kg	11241.2	3.10			$ 34,847.7
FORMS	m2	815.69	21.00			$ 17,129.5
CONCRETE STRUCTURE						$ 532,941.9
FORMS	m2	7248.76	21.00			$ 152,224.0
SHORING	m2	7248.76	10.00			$ 72,487.6
CONCRETE 35 MPA	m3	303.24	250.00	400.00	40.00	$ 209,235.6
REINFORCING STEEL FOR GENERAL STRUCTURE, CA-50, FOLDED AND BENT	kg	31933.8	3.10			$ 98,994.8
MASONRY						$ 136,192.0
NON-STRUCTURAL MASONRY 4Mpa	m2	2432	30.00	26.00		$ 136,192.0
STRUCTURAL MASONRY 4Mpa	m2		55.00	35.00		N/A
INTERIOR FINISHES						$ 433,697.6
COAT OF PLASTER	m2	4,272.00	9.00	6.00		$ 64,080.0
CERAMIC COATING	m2	3,198.80	30.00	30.00		$ 191,928.0
INTERIOR CERAMIC FLOOR	m2	1,616.16	30.00	30.00		$ 96,969.6
FLOORING MILLWORK	m2	4,036.00	5.00	15.00		$ 80,720.0
EXTERIOR FINISHES						$ 92,015.4
ROUGH CAST APPLIED TO MASONRY BLOCKS	m2	221.60	1.00	3.00		$ 886.4
ROUGH CAST APPLIED TO REINFORCED CONCRETE STRUCTURE	m2	221.6	1.80	1.80		$ 798.0
STUCCO COAT OF EXTERNAL WALLS	m2	813.60	12.00	30.00		$ 34,171.0
DECORATIVE DETAIL	m	9,360.00		6.00		$ 56,160.0
TOTAL						$ 1,328,271.9

Structural Masonry Cost Estimate

DESCRIPTION	UNIT	QUANT	MATERIAL	LABOR	EQUIPMENT	TOTAL
FOUNDATION						$ 35,160
CONCRETE 35 MPA	m2	N/A	$ 250.00	$ 400.00	$ 40.00	N/A
REINFORCING STEEL	kg	N/A	**3.1**			**N/A**
FORMS	m2	N/A	$ 21.00			N/A
STRIP FOOTING	m2	490.0	$ 820.00	$ 400.00		$ 5,880
FOUNDATION FOOTING	m3	54.0	$ 7.75	$ 4.25		$ 29,280
CONCRETE STRUCTURE						$ 260,084
FORMS	m2	2,417.8	$ 21.00			$ 50,773
SHORING	m2	2,417.8	$ 10.00			$ 24,178
STRUCTURE	m3					$ 185,133
CONCRETE 35 MPA	m3	212.0	$ 250.00	$ 400.00	$ 40.00	$ 146,280
REINFORCING STEEL FOR GENERAL STRUCTURE, CA-50, FOLDED AND BENT	kg	12,533.3	$ 3.10			$ 38,853
MASONRY						$ 385,333
NON-STRUCTURAL MASONRY 6Mpa	m2	466.7	$ 30.00	$ 26.00		$ 26,133
STRUCTURAL MASONRY 6Mpa	m2	3,991.1	$ 55.00	$ 35.00		$ 359,200
INTERIOR FINISHES						$ 296,551
COAT OF PLASTER	m2	2,237.3	$ 9.00	$ 6.00		$ 33,560
CERAMIC COATING	m2	1,421.7	$ 30.00	$ 30.00		$ 85,301
INTERIOR CERAMIC FLOOR	m2	1,616.2	$ 30.00	$ 30.00		$ 96,970
FLOORING MILLWORK	m2	4,036.0	$ 5.00	$ 15.00		$ 80,720
ESXTERIOR FINISHES						$ 30,070
STUCCO COAT OF EXTERNAL WALLS	m2	530.0	$ 12.00	$ 30.00		$ 22,260
ROUGH CAST APPLIED TO REINFORCED CONCRETE STRUCTURE	m2	530.0	$ 1.00	$ 3.00		$ 2,120
STUCCO COAT OF EXTERNAL WALLS	m2	25.0	$ 1.80	$ 1.80		$ 90
DECORATIVE DETAIL	m	933.3		$ 6.00		$ 5,600
TOTAL						$ 1,007,199

Alternative Design in Brazil

Major Quality Project

Deborah Silva CE 13’
Janneth Velazquez CE 13’

Professor Leonard Albano
Professor Roberto Pietroforte

Abstract

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies, building process, and cost comparison was analyzed. Cost estimate were proposed for both the original structural masonry design and the proposed reinforced concrete alternative.

Structural Masonry

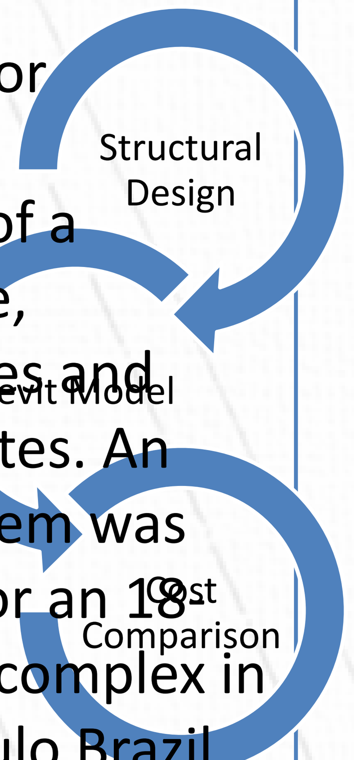
The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies,

Reinforced Concrete

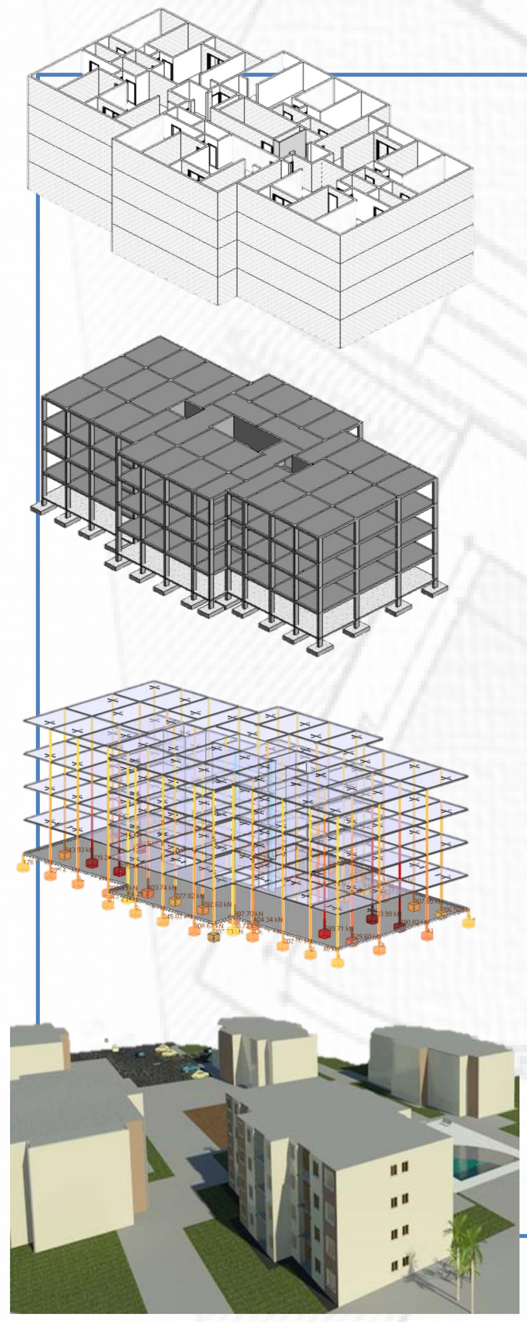
The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies,

Methods?

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil.



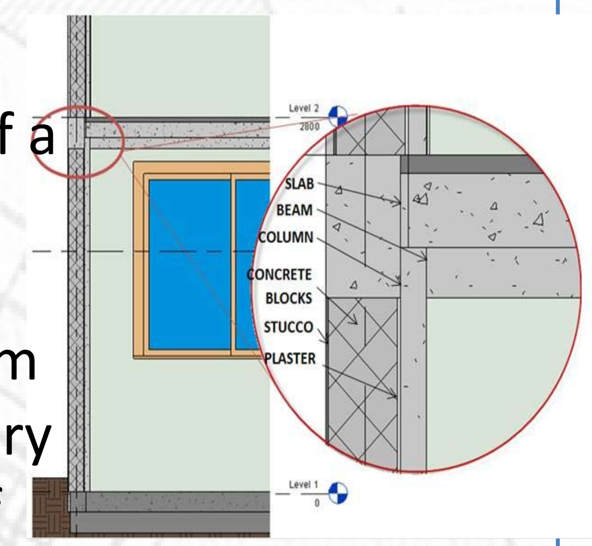
Structural Analysis

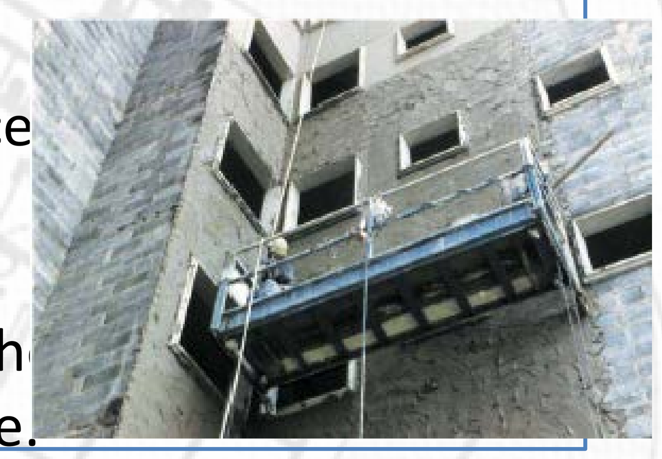


The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies, building process, and cost comparison was analyzed. Cost estimate were proposed for both the original structural masonry design

Construction Technologies

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies, building proce and cost comparison was analyzed. Cost estimate were proposed for both the original structural masonry design and th proposed reinforced concrete alternative.

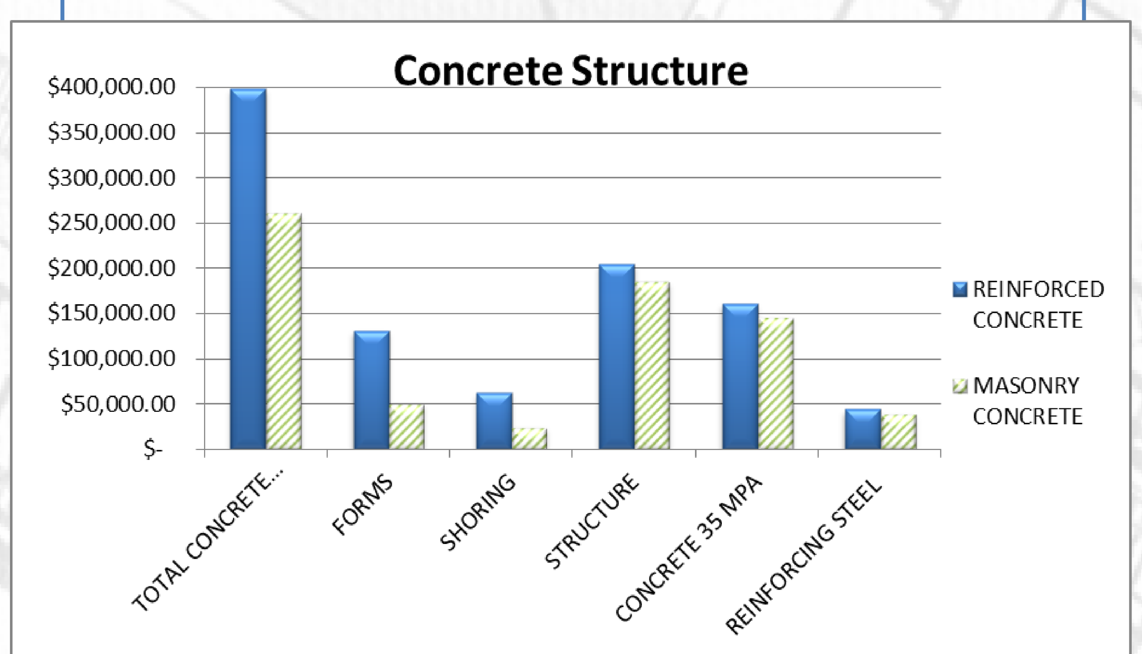




Cost

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai, Sao Paulo Brazil. Comparison in structural practices, design codes, construction technologies, building process, and cost

Cost Comparison



Recommendations

The objective of this Major Qualifying Project was to investigate the adoption of a reinforced concrete frame, considering design changes and construction costs estimates. An alternative structural system was proposed and designed for an 18-story residential building complex in the city of Jundai,

Acknowledgements: We would like to acknowledge and thank the architects and engineers from Pass Arquitetura and Auera Engenharia We will also like to thank our advisors Professors Leonard Albano and Professor Roberto Pietroforte for their overall guidance and advice throughout this project.

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Alternative Design in Brazil

By: Deborah Silva

Janneth Velazquez

Advisors: Leonard Albano

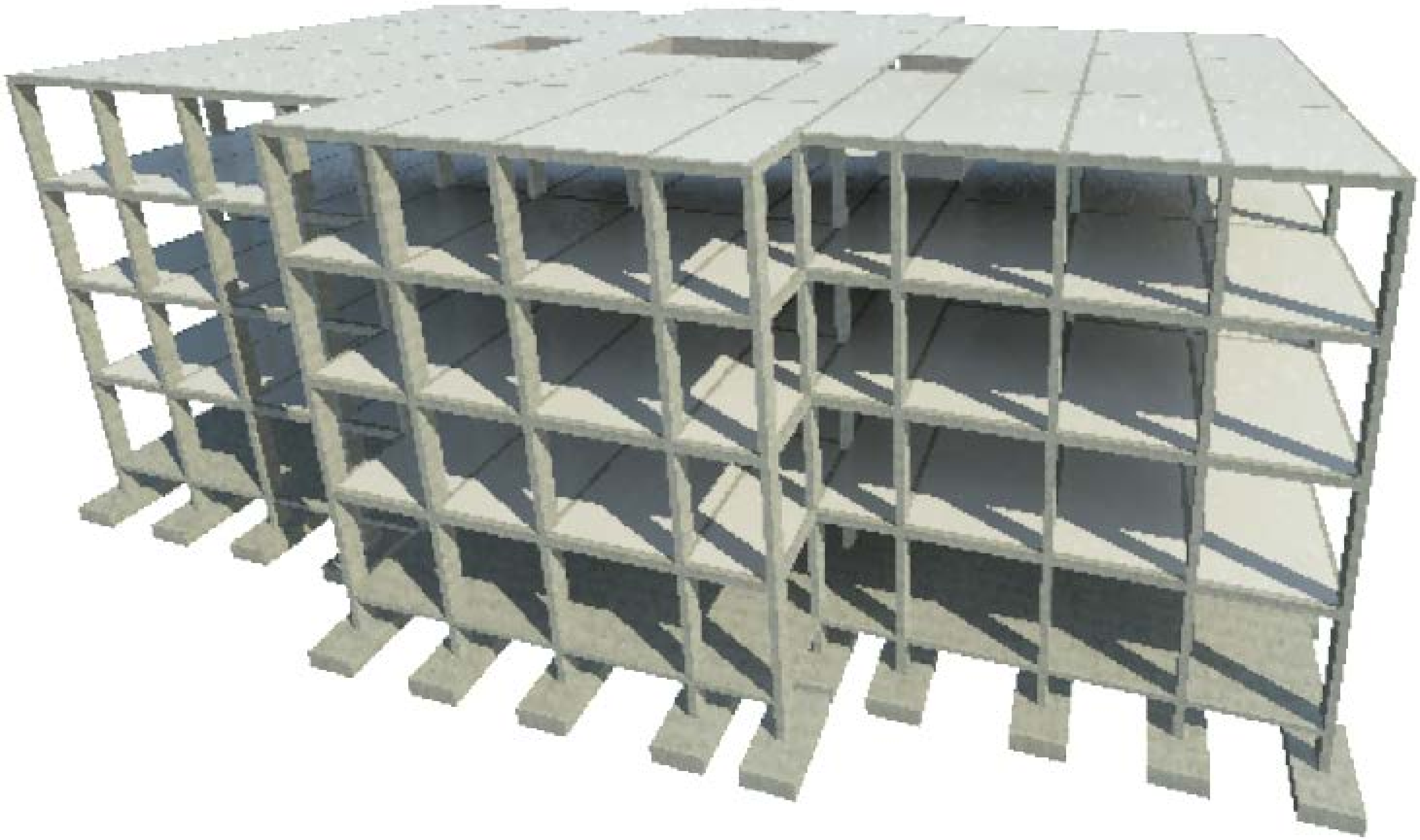
Roberto Pietroforte

WPI

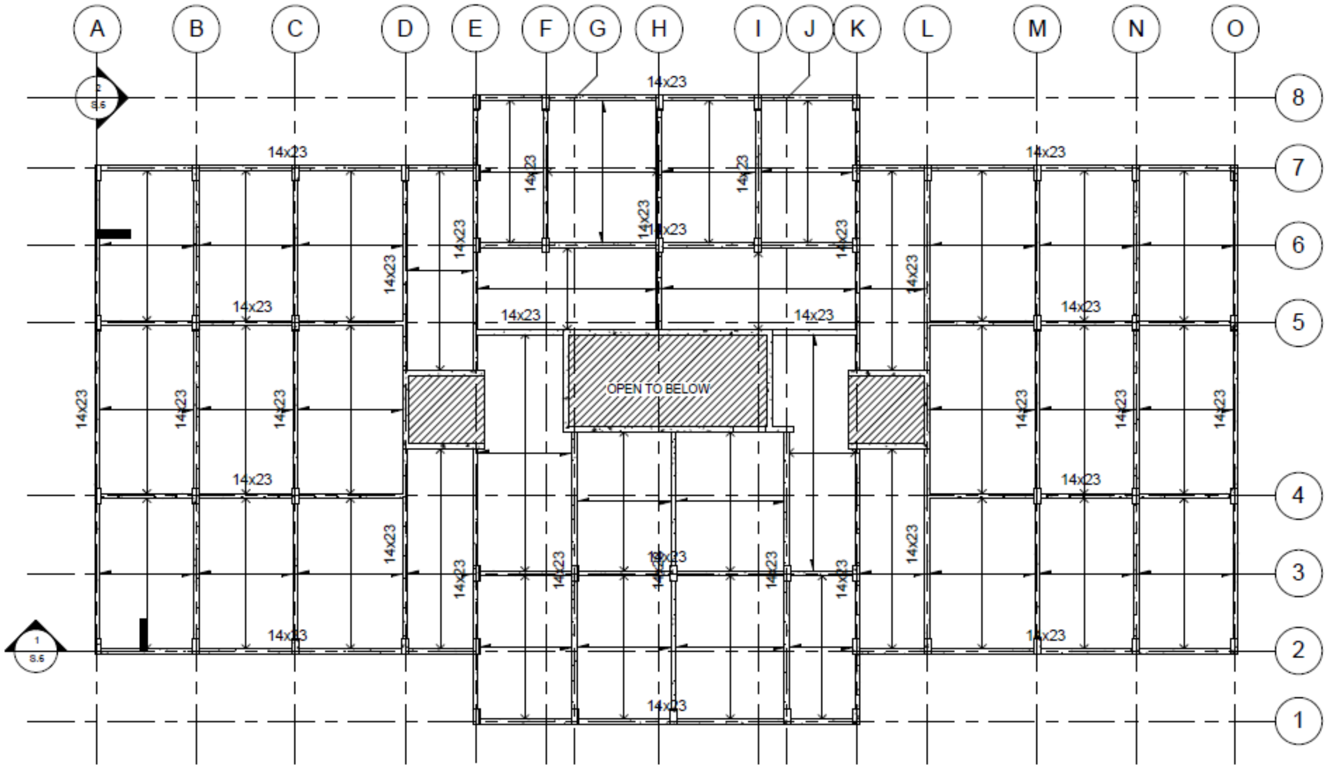
PASS ARQUITETURA

aurea

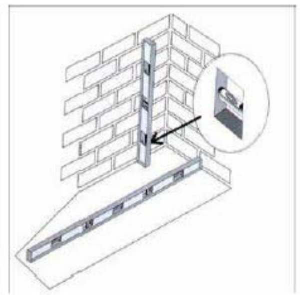
Structural Model

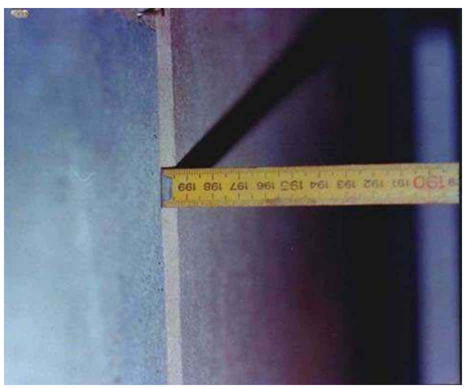


Structural Model



Constructions Technologies





Cost Comparison

DESCRIPTION	UNIT COST			REINFORCED CONCRETE			STRUCTURAL MASONRY		
	MATERIAL	LABOR	EQUIPMENT	UNIT	QUANT	BALANCE	UNIT	QUANT	BALANCE
FOUNDATION						$ 133,425			$ 35,160
CONCRETE 35 MPA	$ 250.00	$ 400.00	$ 40.00	m3	118.0	$ 81,448	m3	54	$ 29,280
REINFORCING STEEL	$ 3.10			kg	11,241.2	$ 34,848			N/A
FORMS	$ 21.00			m2	815.7	$ 17,129	m2	490	$ 5,880.00
CONCRETE STRUCTURE						$ 532,942			$ 260,084
FORMS	$ 21.00			m2	7,248.8	$ 152,224	m2	2,418	$ 50,773
SHORING	$ 10.00			m2	7,248.8	$ 72,488	m2	2,418	$ 24,178
CONCRETE 35 MPA	$ 250.00	$ 400.00	$ 40.00	m3	303.2	$ 209,236	m3	212	$ 146,280
REINFORCING STEEL FOR GENERAL STRUCTURE, CA-50, FOLDED AND BENT	$ 3.10			kg	31,933.8	$ 98,995	kg	12,533	$ 38,853
MASONRY						$ 136,192			$ 385,333
NON-STRUCTURAL MASONRY	$ 30.00	$ 26.00		m2	2,432.0	$ 136,192	m2	467	$ 26,133
STRUCTURAL MASONRY	$ 55.00	$ 35.00				N/A	m2	3,991	$ 359,200
INTERIOR FINISHES						$ 433,698			$ 296,551
COAT OF PLASTER	$ 9.00	$ 6.00		m2	4,272.0	$ 64,080	m2	2,237	$ 33,560
CERAMIC TILES	$ 30.00	$ 30.00		m2	3,198.8	$ 191,928	m2	1,422	$ 85,301
INTERIOR CERAMIC FLOOR TILES	$ 30.00	$ 30.00		m2	1,616.2	$ 96,970	m2	1,616	$ 96,970
FLOORING MILLWORK	$ 5.00	$ 15.00		m2	4,036.0	$ 80,720	m2	4,036	$ 80,720
EXTERIOR FINISHES						$ 92,015			$ 30,070
ROUGH CAST APPLIED TO MASONRY BLOCKS	$ 1.00	$ 3.00		m2	221.6	$ 886	m2	530	$ 2,120
ROUGH CAST APPLIED TO REINFORCED CONCRETE STRUCTURE	$ 1.80	$ 1.80		m2	221.6	$ 798	m2	25	$ 90
STUCCO COAT OF EXTERNAL WALLS	$ 12.00	$ 30.00		m2	813.6	$ 34,171	m2	530	$ 22,260
DECORATIVE DETAIL		$ 6.00		m	9,360.0	$ 56,160	m	933	$ 5,600
TOTAL						$ 1,328,272			$ 1,007,199

STRUCTURAL MASONRY 20% CHEAPER

ALTERNATIVE SOLUTIONS IN BRAZIL

Major Qualifying Project MQP

By: Janneth Velazquez Rosales & Deborah Silva

TEAM MEMBERS

Deborah de Campos Silva

Partner Project

EDUCATION

Class of 2013

Major: Civil Engineering
Concentration: Structural Engineering

Janneth Velazquez Rosales

Partner Project Completion Of Course

EDUCATION

Class of 2013

Major: Civil Engineering
Concentration: Project Management
Minor: Spanish

ADVISORS

Leonard D. Albano

Associate Professor of Civil and Environmental Engineering

EDUCATION

BS, Civil Engineering, Tufts University, 1982

MS, Civil Engineering, Northwestern University, 1983

PhD, Structural Engineering, MIT, 1992

Roberto Pietroforte

Associate Professor Director of Architectural Engineering Program, Civil and Environmental Engineering

EDUCATION

BArch, University of Rome (Italy), 1974

MS, Architecture Studies, MIT, 1987

MS, Civil Engineering, MIT, 1987

PhD, Construction Engineering and Management, MIT, 1992

ULTIMATE GOAL FOR MQP

- The objective of this project is to provide architecture Pass with consultation services as WPI students for future recommendations.
- We will work side by side exchanging information.
- Prepare students for the practice of engineering through development projects incorporating engineering standards and high quality work.

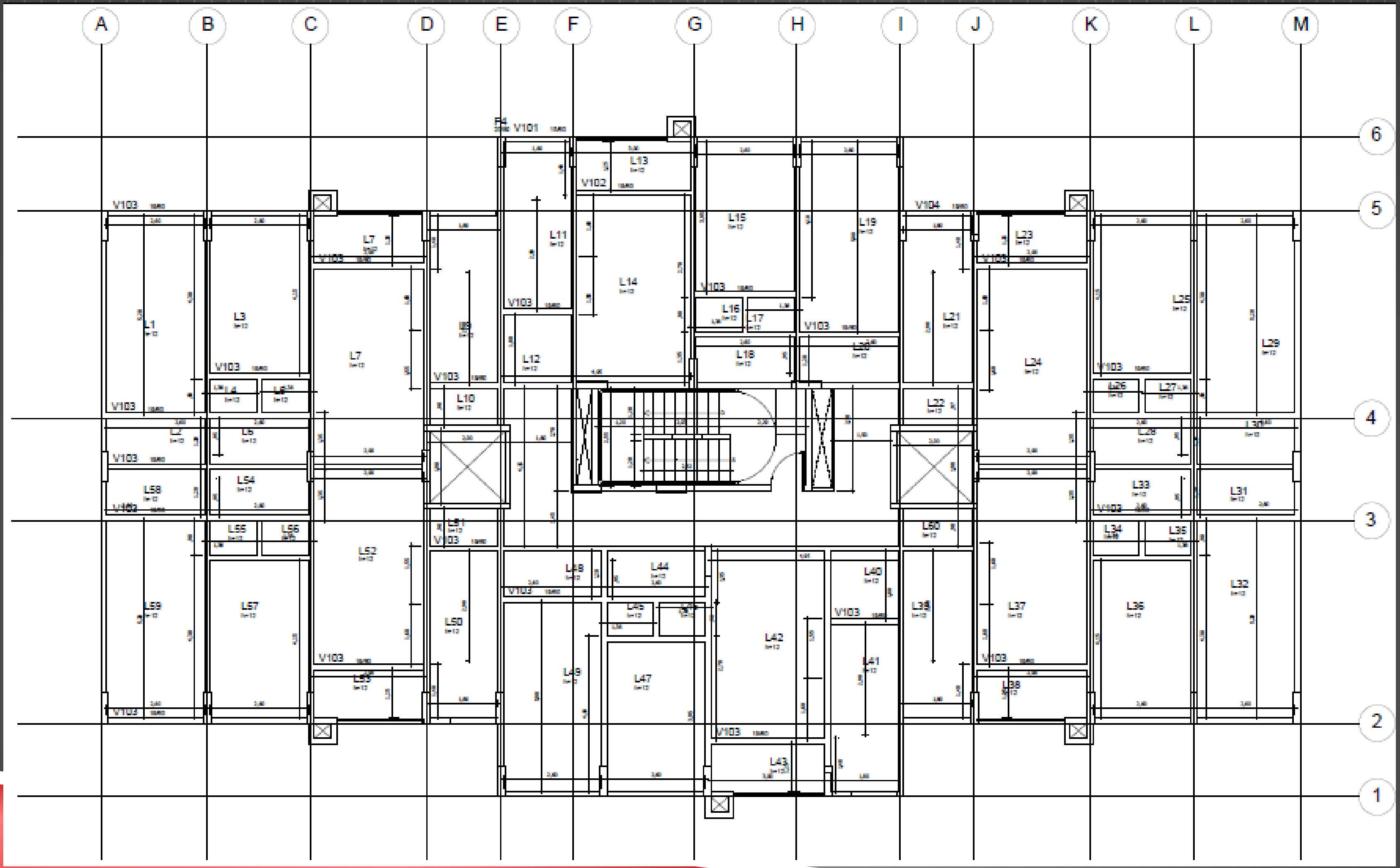
RESEARCH DONE

- We studied the plant Textil Torres 3, 5 and 6
- We looked at the possibility of making this building with reinforced concrete conventional way we can see the benefit of one system against the other
- We analyze the buildings previous architecture that Pass has done in the past in order to get an idea of how this structural design must be done
- We set several modular schematic for beams and columns
- After many designs put the columns and beams in which we believed were necessary

RESEARCH DONE

- We studied for the construction of load paths
- We set a standard for load calculations
- We assume vertical loads applied according to standard U.S.
- We build a model for Revit 2013
- Due to time and suggestions of our teachers for this MQP we are currently working on the structural design of the first four floors of the residential building. If there is still enough time, we continue to focus on the rest of the floors.

SCHEMATIC 1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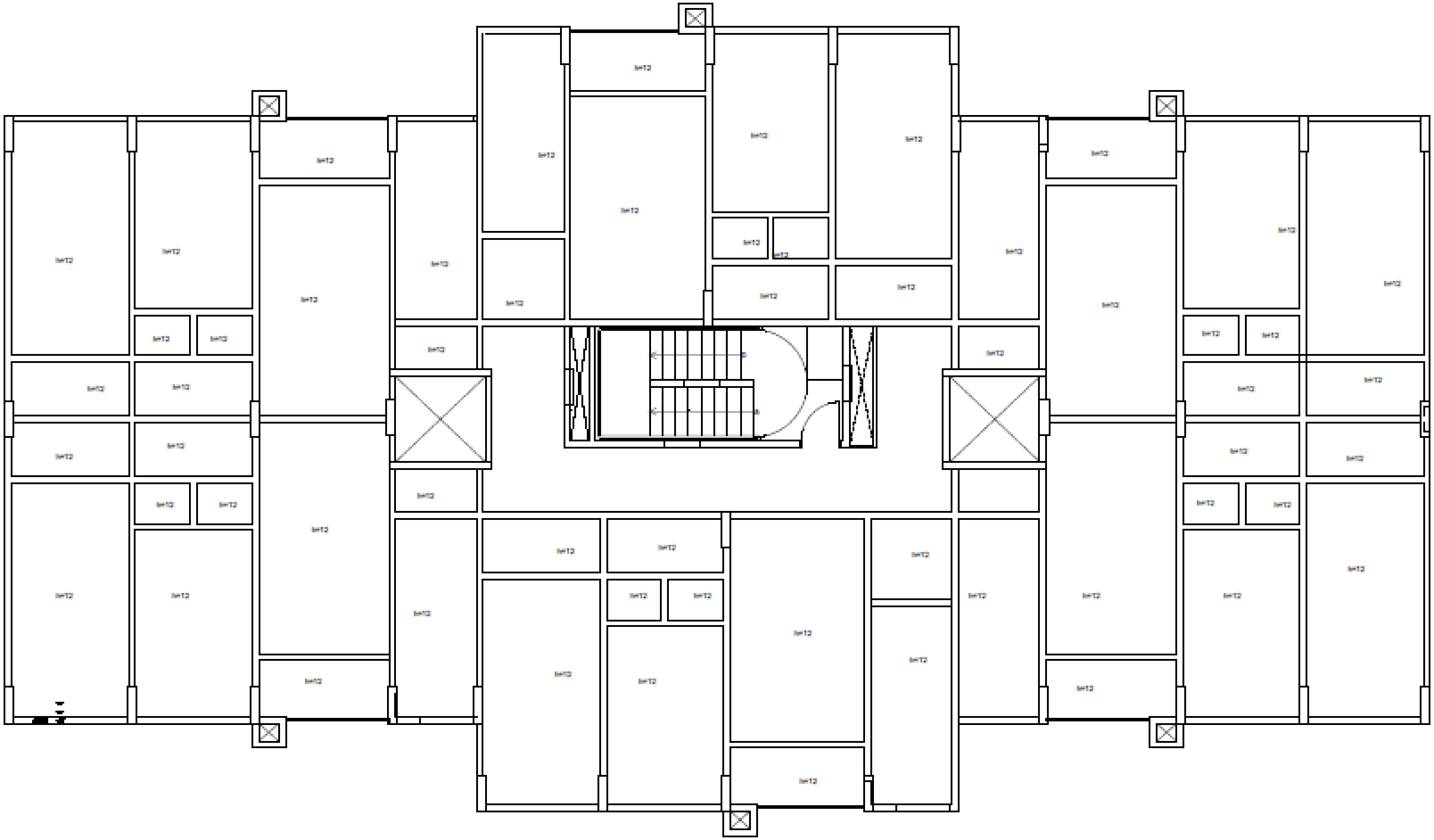
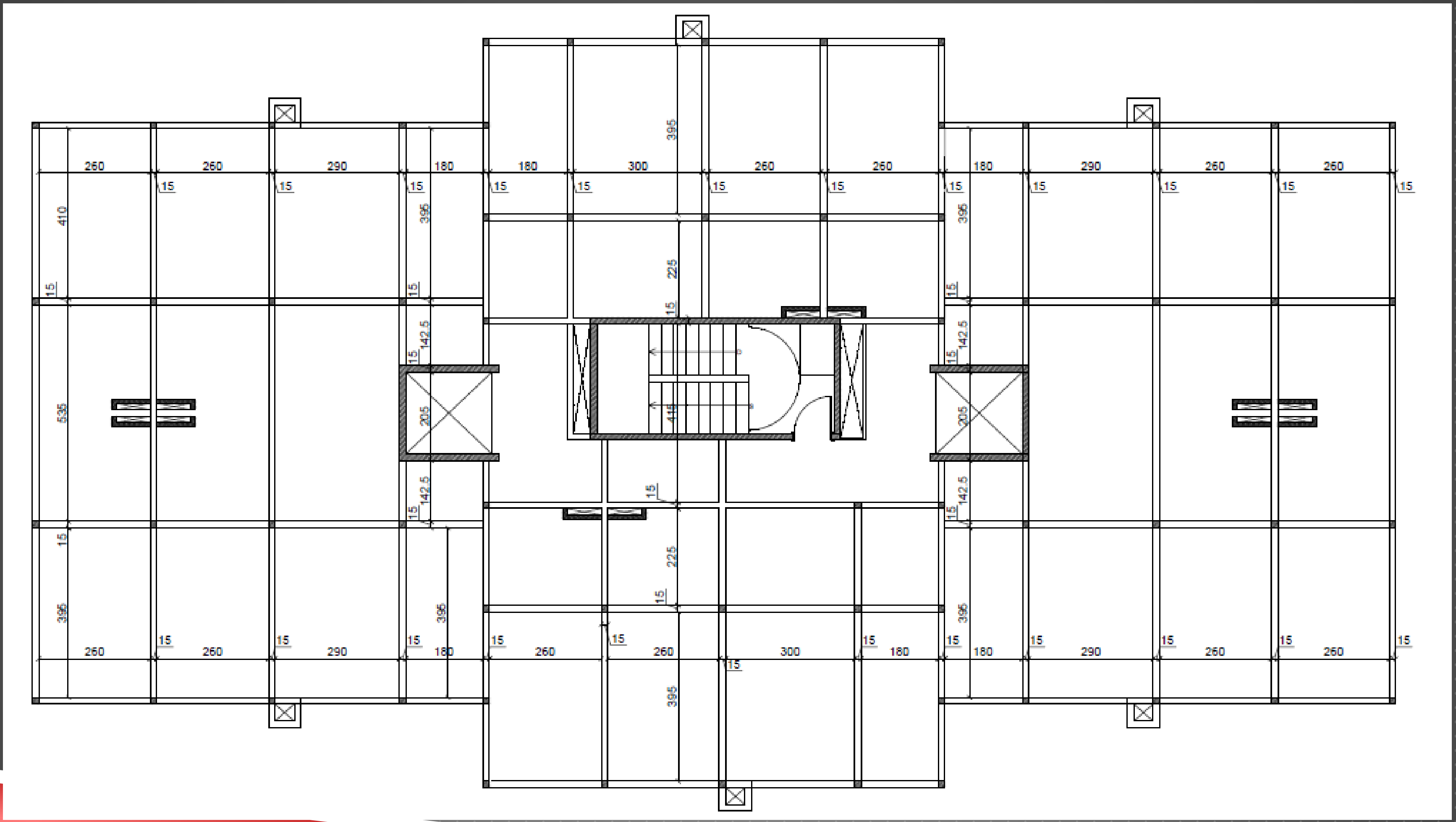
SCHEMATIC 2



SCHEMATIC 3



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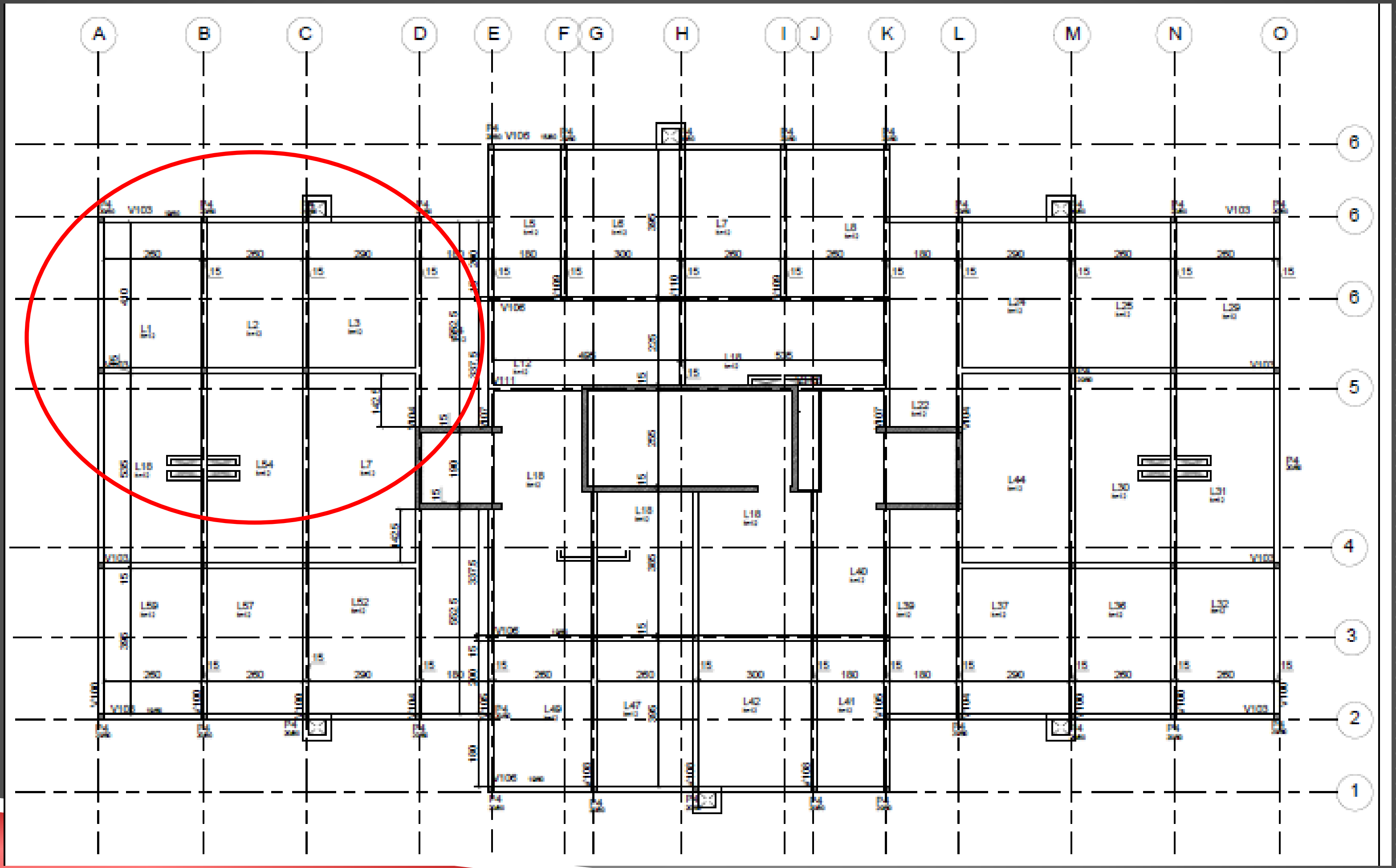
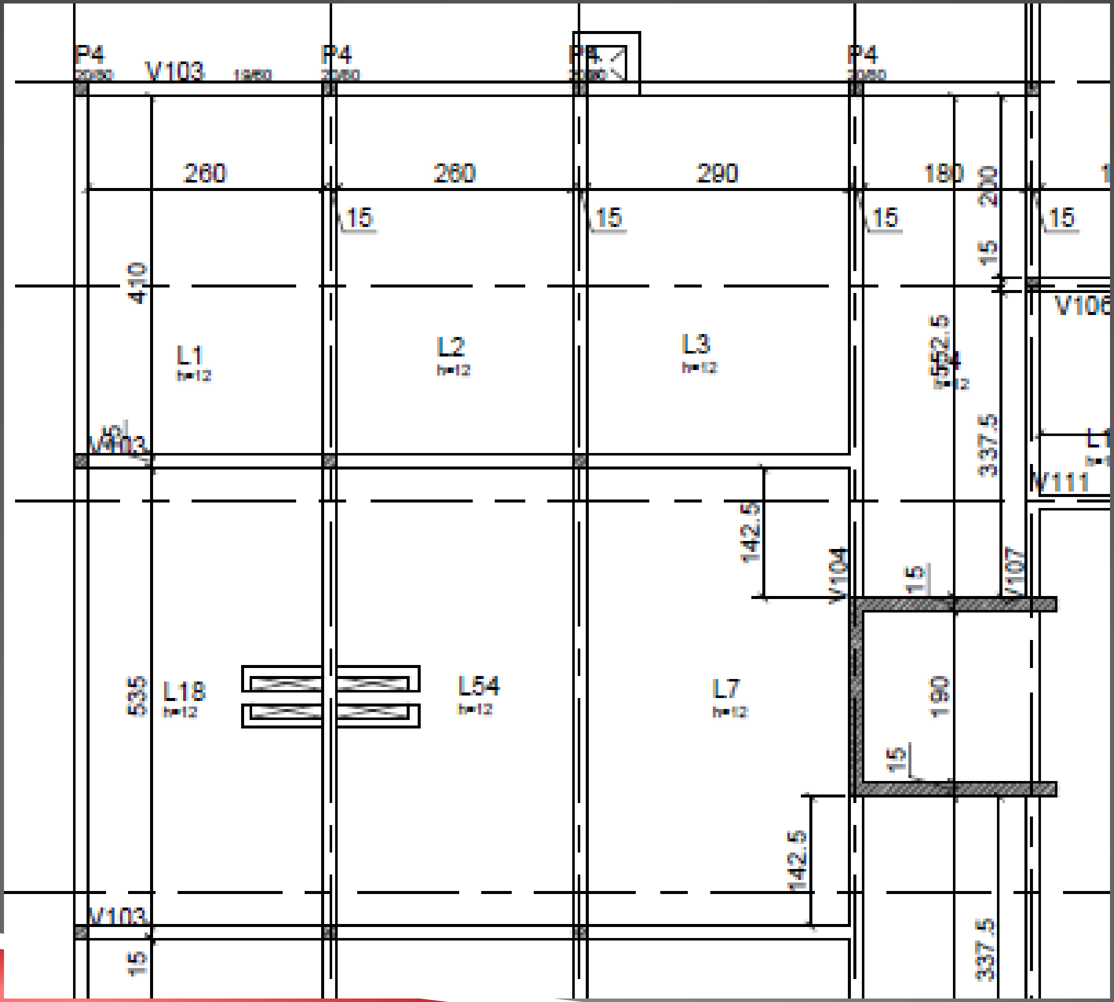
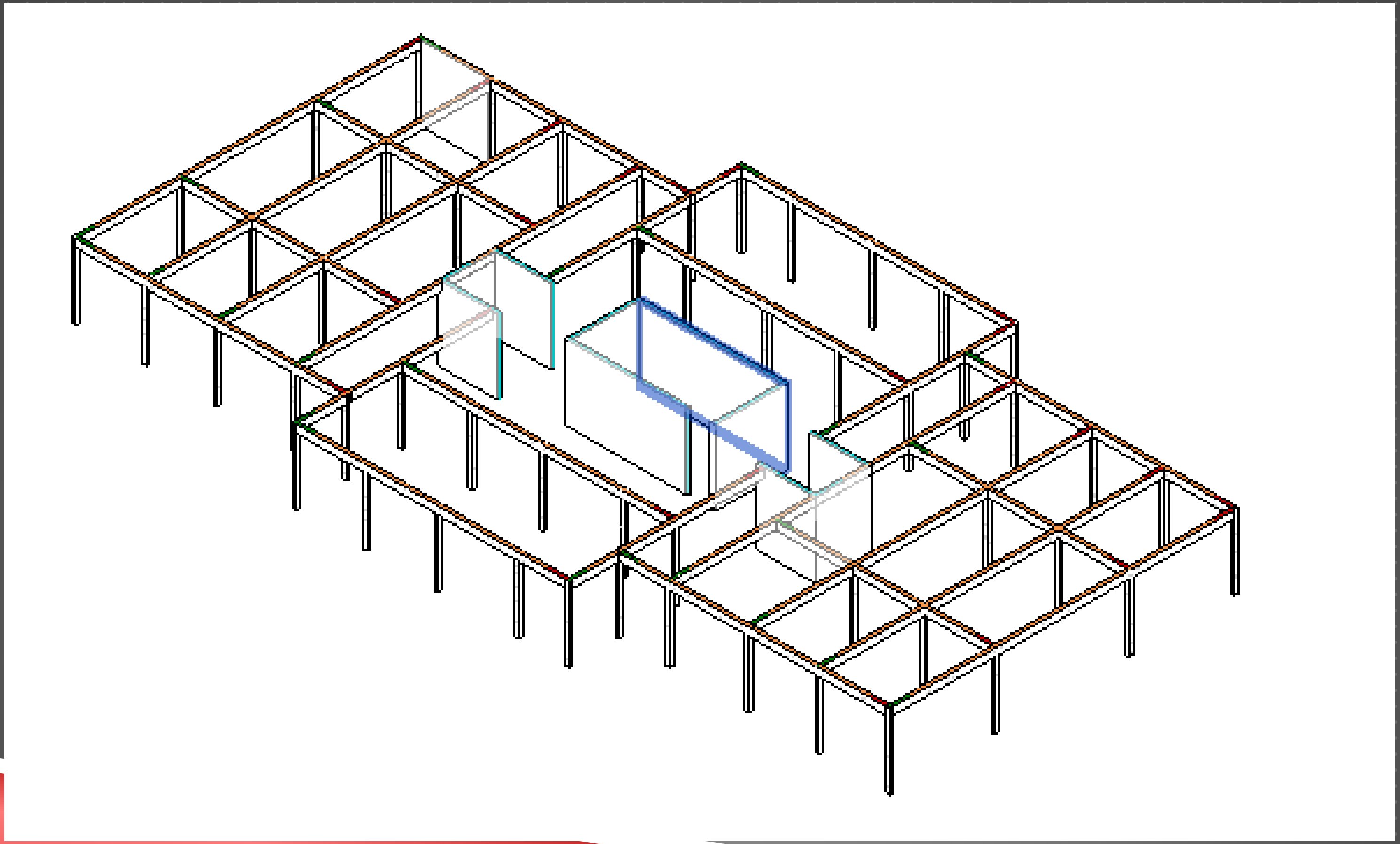
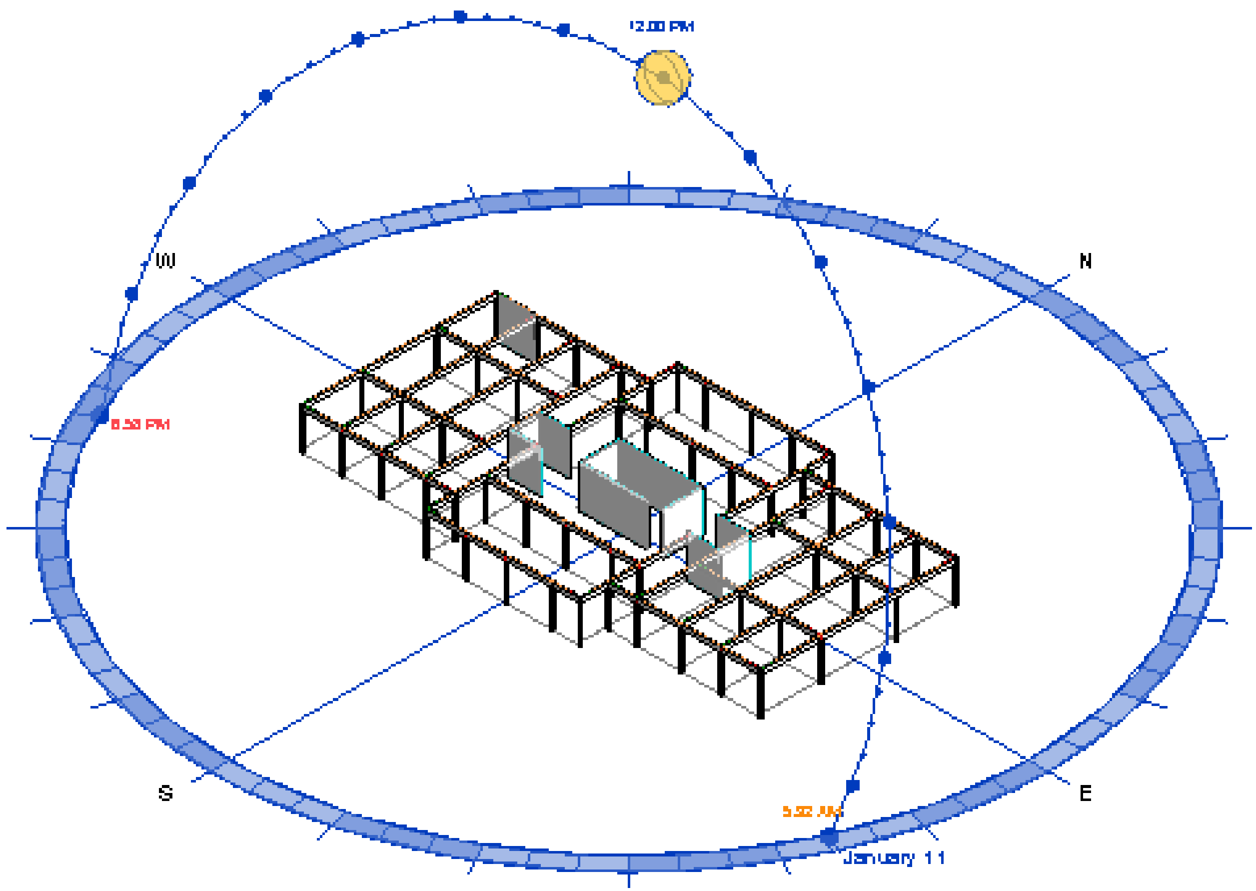
FINAL SCHEMATIC



FINAL SCHEMATIC



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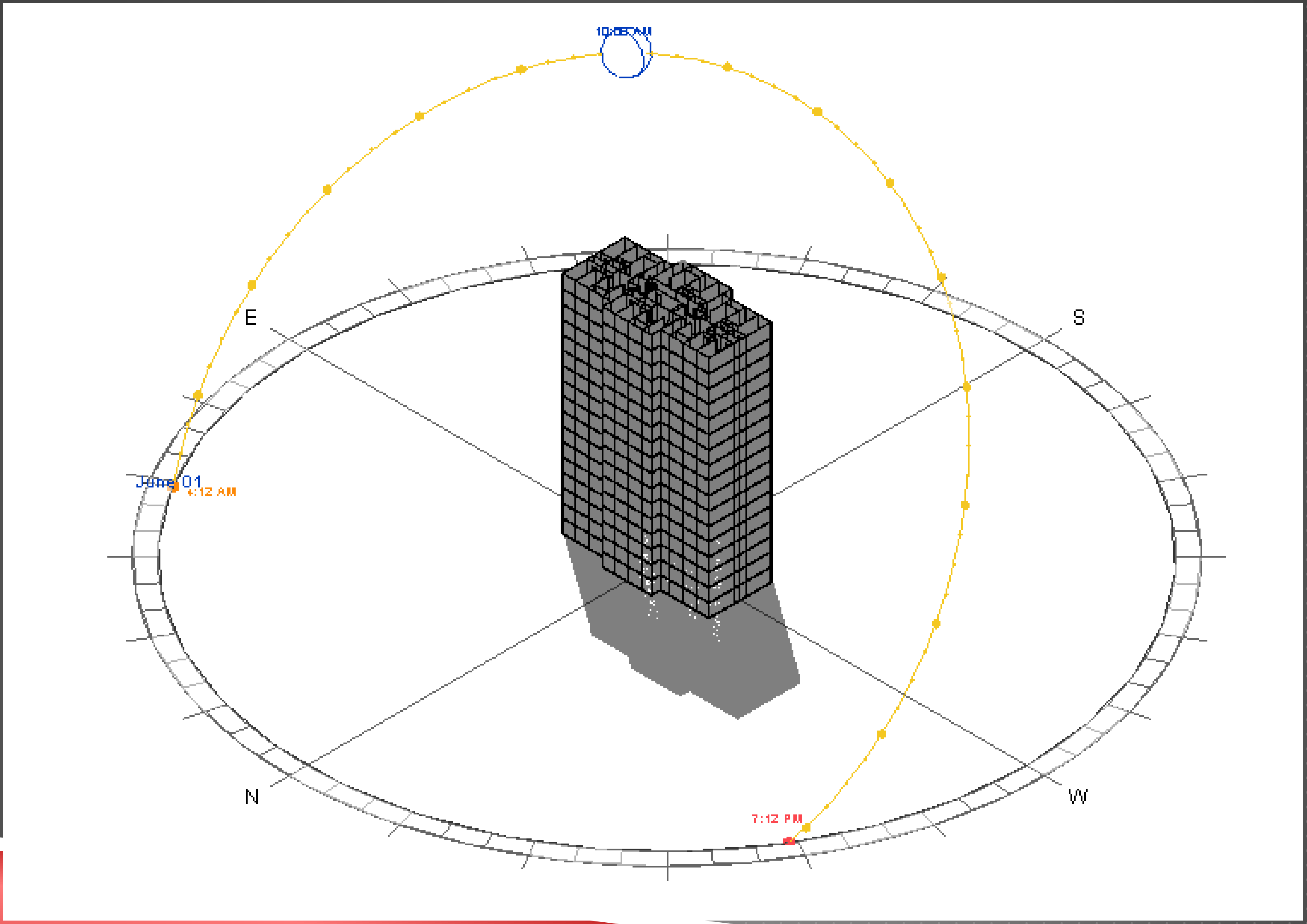

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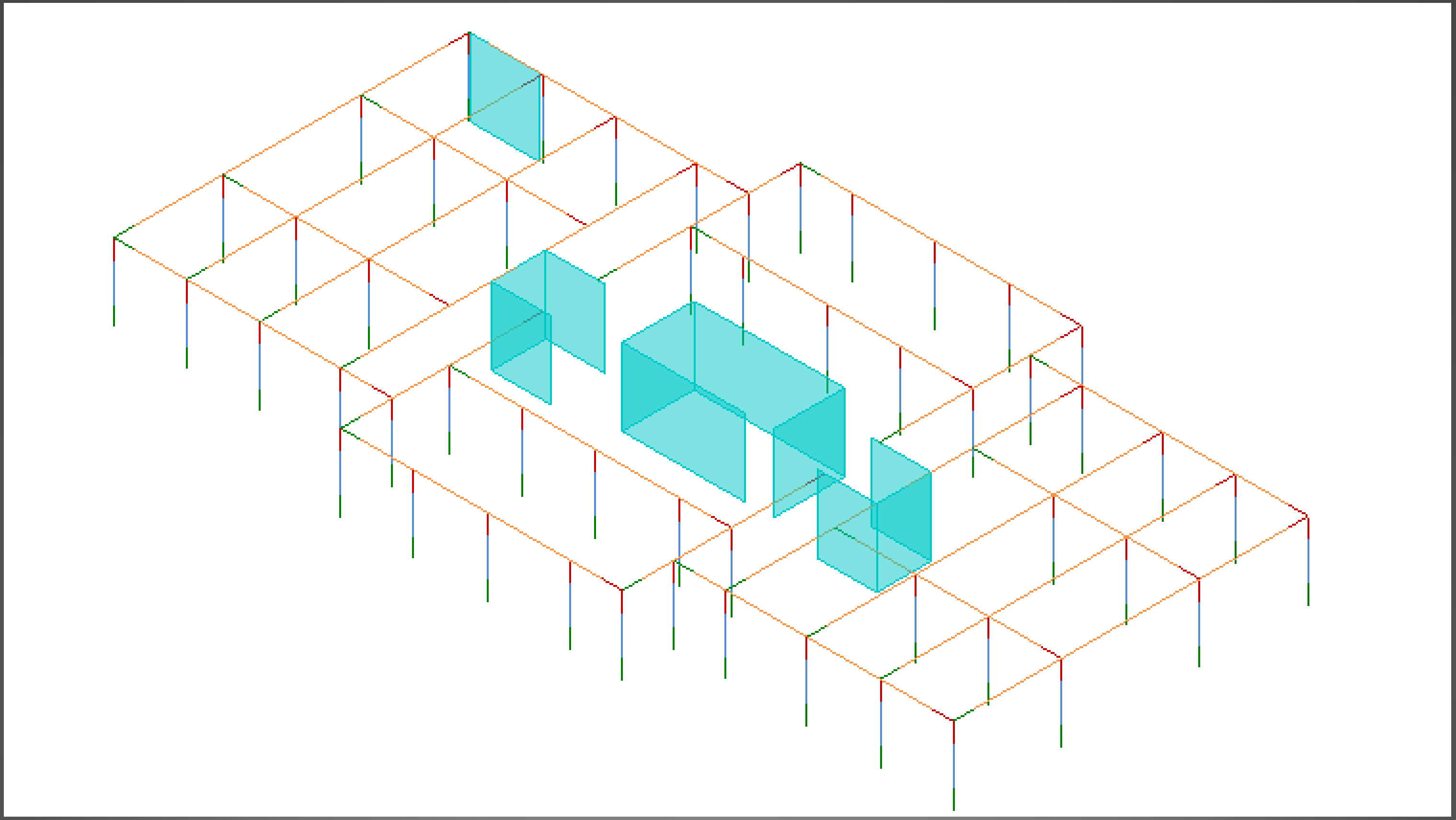


CONSTRUCTION MANAGEMENT

- A cost-benefit analysis will be done to identify the best use of construction materials.
- The two systems being studied are reinforced concrete and structural design system masonry.
- By minimizing the differences in design between the two systems, we then identify the most effective cost of a system over another.

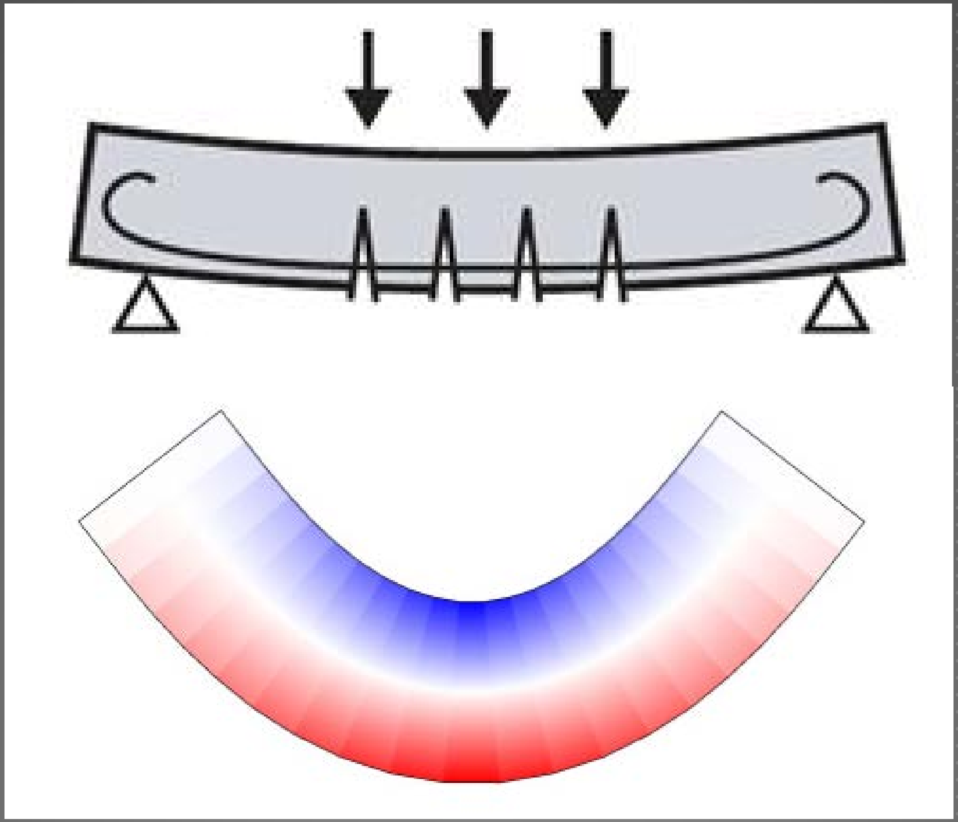
STRUCTURAL SCOPE

- Vertical loads
  - Calculate the moment and shear members for critical
  - Check if the size and strength is sufficient for the loads given
  - Check loads for slabs
  - Finish the locations of beams and columns
  - Continue to calculate the moments and shear stresses during the rest of the building
- Lateral loads
  - Scale all members to lateral loads from wind and seismic to minimize deflection and oscillation of the building
  - Scaling reinforcement for members and calculate the distance between each reinforcement
  - calculate Footing

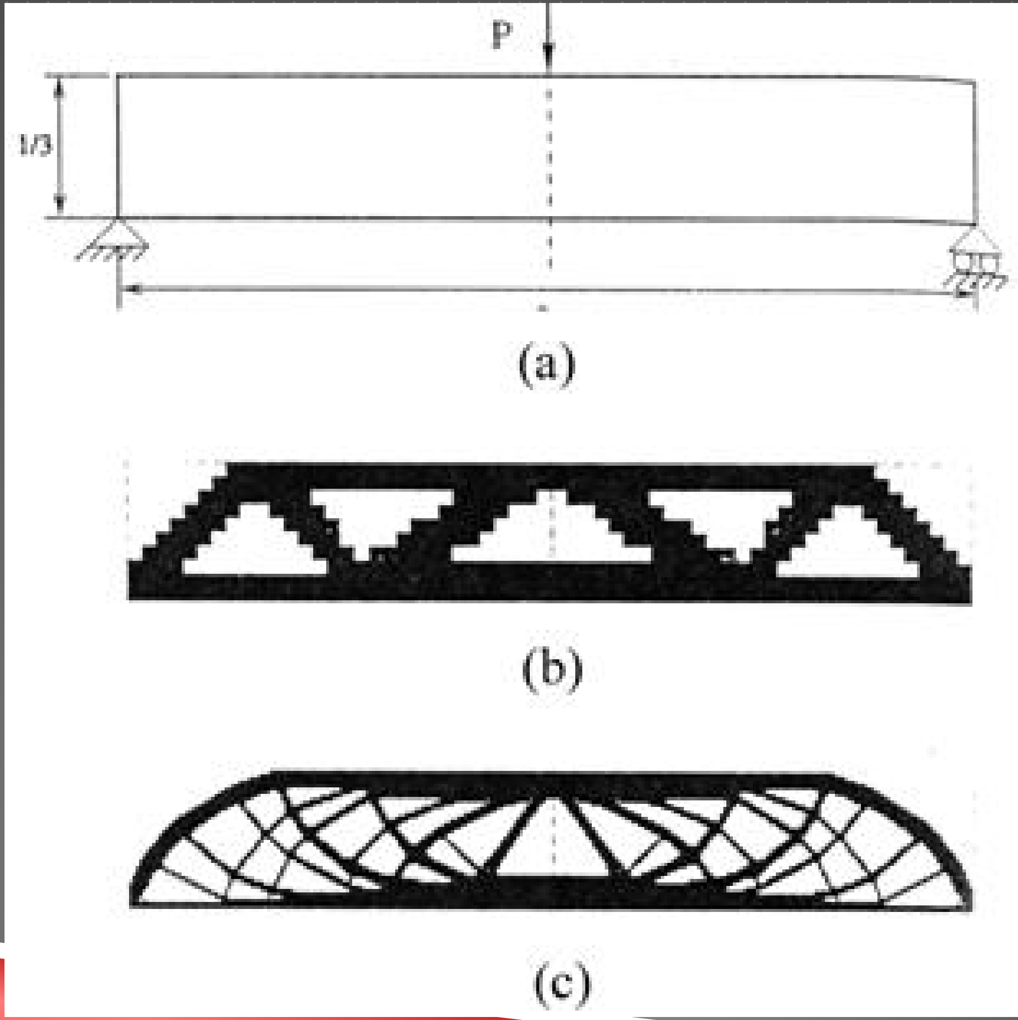
BUILDING TECHNOLOGY

- Innovative Technology for exterior insulation wall to the building's thermal integrity.
- Study possible solutions and alternatives to minimize the use of concrete and see if they are feasible including:
  - lightweight concrete
  - bubble deck
  - waffle slab
  - hollow concrete slabs
  - Pugging
  - Plastic Form work

COMPRESSION AND TENSION

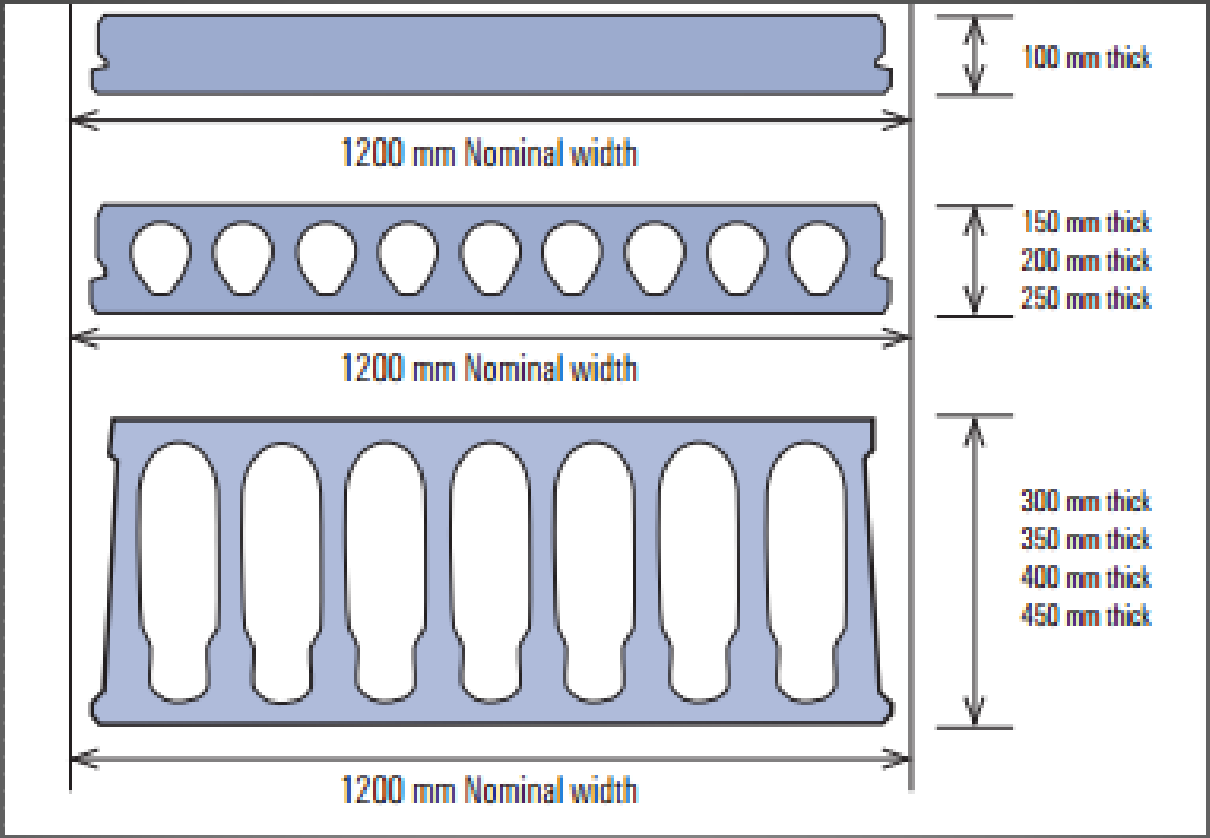


COMPRESSION AND TENSION



HOLLOW CONCRETE SLABS

HOLLOW CONCRETE SLABS



MULTI-HOLED BLOCKS

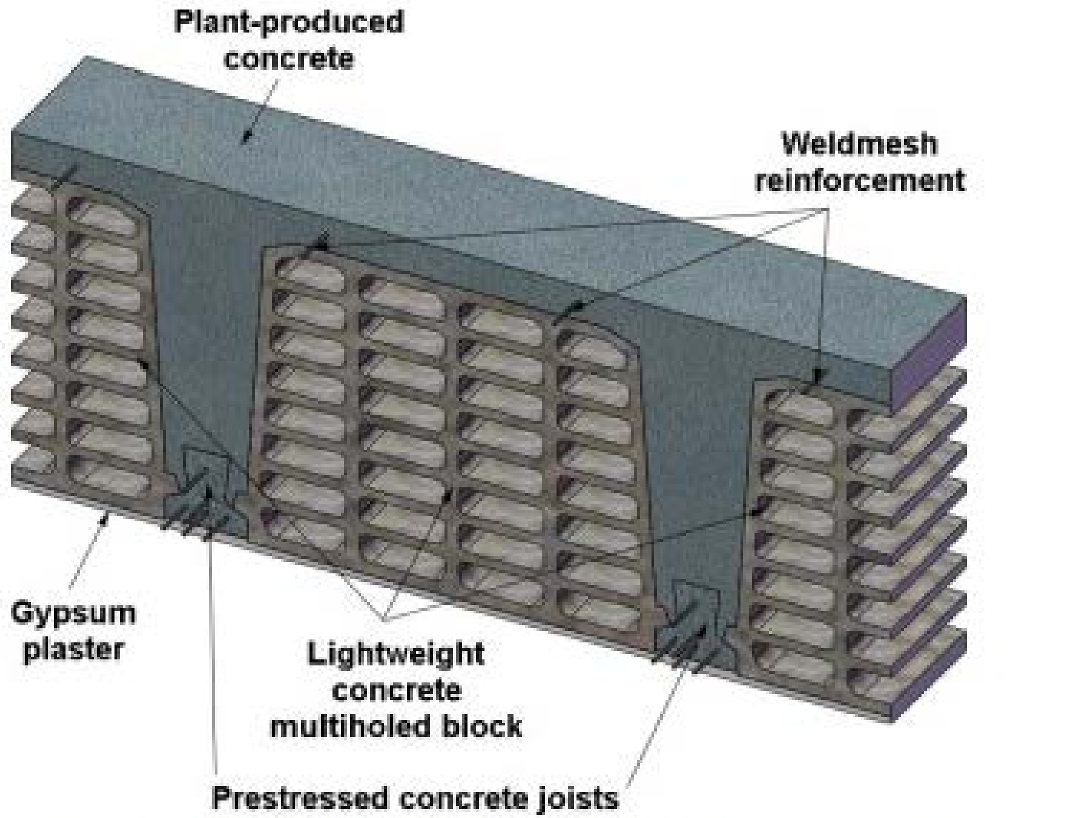


Fig. 3. Materials of an in situ cast floor with one-way spanning slabs.

MULTI-HOLED BLOCKS

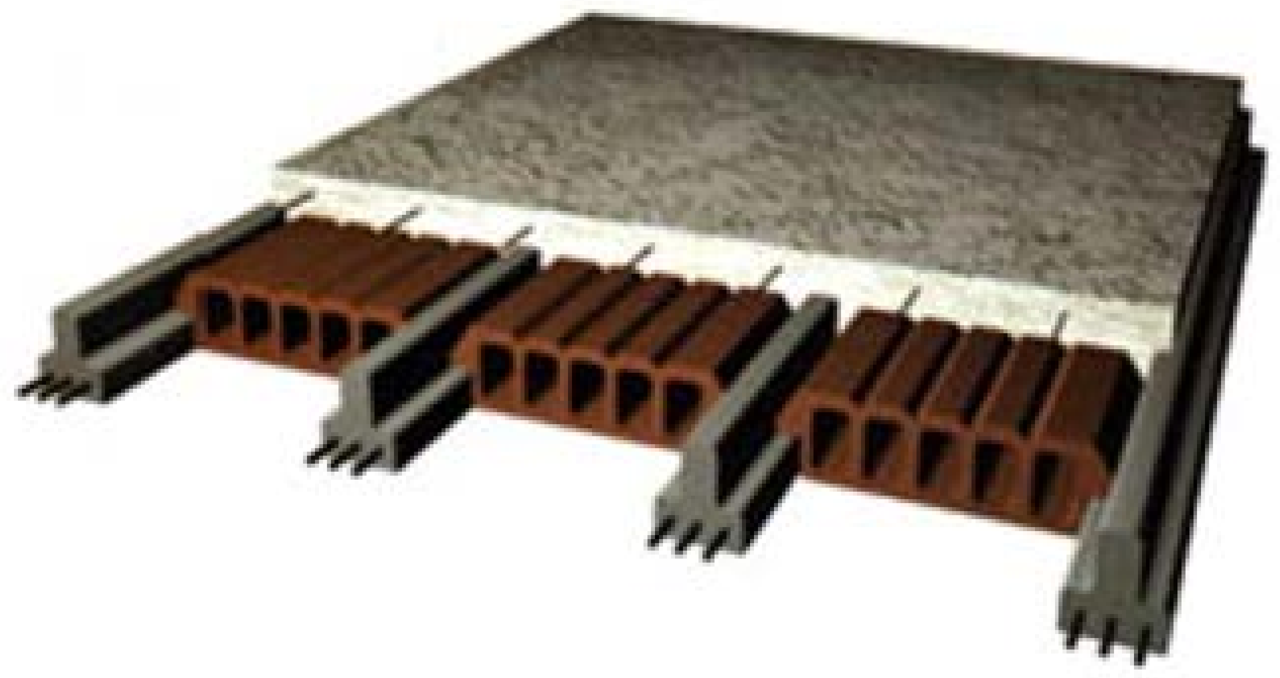
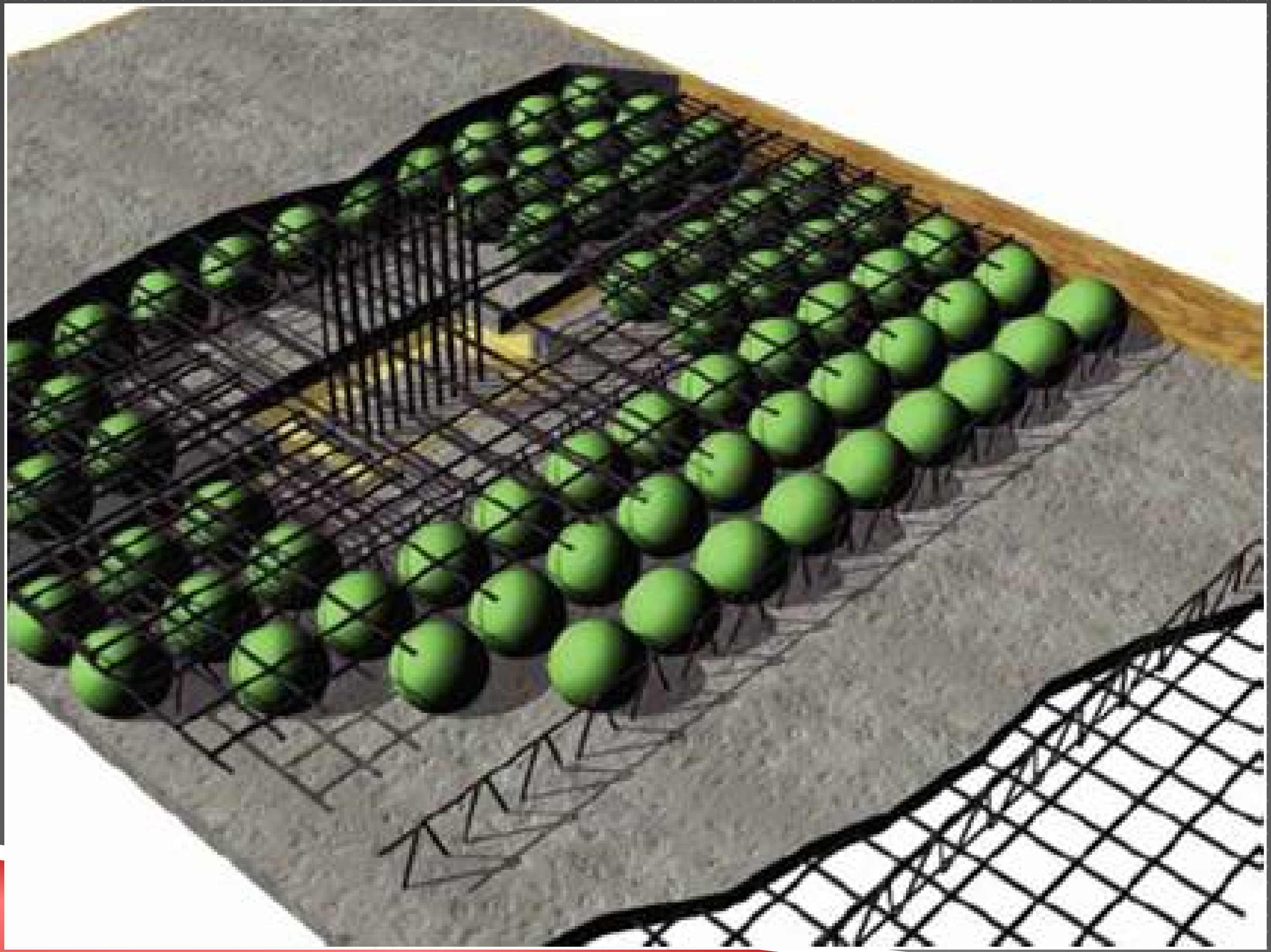


Fig. 2. Geometry of the multilayer one-way slab.

BUBBLE DECK



BUBBLE DECK

PLASTIC FORMS

BUILDING INFORMATION TECHNOLOGY

- Search software that can be implemented in the company to the efficiency of time and money.
- Provide suggestions for the future implementation of the software system.
- Such programs can be utilized for visualization, interoperability and cost analysis.
- Some software we include research Revit and STAAD.

ALVENARIA ESTRUTURAL

EXECUÇÃO DA ESTRUTURA E CONTROLE TECNOLÓGICO

Arqto. NIVALDO CALLEGARI
Pass Arquitetura

Engº. ARNOLDO WENDLER
Wendler Projetos

Revisões:
R00-10/12/12 – Emissão inicial

Sumário

PASS ARQUITETURA E COMÉRCIO LTDA **WENDLER PROJETOS ESTRUTURAIS**
Rua Dom Amaury Castanho, n.º 150 – Jardim Paulista – Jundiaí-SP - CEP: 13208-270 - Fone/Fax: (11) 4583-2844

APRESENTAÇÃO

O presente trabalho técnico foi elaborado pelo Arquiteto Nivaldo Callegari e pelo Engenheiro Arnoldo Wendler, para a empresa **JACITARA HOLDING**, com o objetivo de estabelecer os requisitos e critérios a serem observados na execução do empreendimento multifamiliar denominado **PREMIUM RESIDENCE**, localizado na Rua Das Orquídeas, Gleba "D-2A/6", Fazenda Bom Princípio, Indaiatuba – SP, em alvenaria estrutural, que emprega blocos vazados de concreto com função estrutural.

Este manual é parte integrante dos projetos e deve ser lido e respeitado na execução do projeto.

1. ALVENARIA ESTRUTURAL

O Sistema Construtivo de Alvenaria Estrutural em blocos de concreto consiste em um conjunto de paredes, que além de servir como divisórias dos espaços resistem aos carregamentos verticais como o peso próprio, reações das lajes e ações horizontais (ação do vento, etc...)

Com relação à execução da alvenaria, o que muda são as tolerâncias de prumo, alinhamento, nivelamento e planicidade. Com os componentes e projetos elaborados por etapas de serviço, as paredes serão executadas com precisão de milímetros.

2. BLOCOS DE CONCRETO

O bloco de concreto é um componente industrializado, produzido em maquinas que dosam os insumos, misturando, vibrando e prensando, além de terem durante sua cura um controle rigoroso de umidade. Por serem moldados em formas de aço possuem precisão dimensional que confere a facilidade na execução da alvenaria.

3. FABRICAÇÃO DOS BLOCOS IN LOCO

Para a fabricação dos blocos no local, deverão ser respeitadas as normas técnicas vigentes para a execução dos mesmos e ser montada uma indústria no canteiro.

Segue relação de ensaios previstos específicos de alvenaria estrutural. A presente relação é indicativa, não eximindo a responsabilidade do responsável técnico do conhecimento das normas de execução e controle de qualidade. Não citamos aqui os ensaios de materiais convencionais como argamassa, graute (concreto) e aço.

3.1. Blocos de Concreto

3.1.1. Ensaios Previstos

- NBR 6136 – dimensões mínimas;
- NBR 7184 – resistência a compressão;
- NBR 12117 – absorção (< 10% do peso do bloco);
- NBR 12117 – umidade (< 40% da absorção total);
- NBR 12118 – retração (< 0,065%);

3.1.2. Definição de lote pela NBR 6136/2006:

- Fabricação em 5 dias, 1.000m² de parede, 20.000 blocos.
- Amostra: 12 blocos: 6 para resistência
  3 para absorção e umidade
  3 para retração (opcional pela NBR 6136/2006)

3.1.3. NBR 8798 – Execução e Controle de obras em Alvenaria Estrutural de Blocos Vazados de Concreto

- Tolerância na execução
  - junta horizontal: espessura 1cm ± 3mm
    Nível ± 2mm/m, Max 10mm

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- junta vertical argamassada: espessura ± 3mm
- prumo: ± 2mm/m
± 10mm por piso
± 25mm no total
- alinhamento: ± 2mm/m
± 10mm no máximo

3.1.4. Definição de lote (NBR 8798)
- 1 semana de produção
- 1 andar
- 200m² de área construída
- 500m² de parede

3.1.5. Ensaio de Prisma: NBR 8215 – Prisma de Blocos Vazados de Concreto Simples para a Alvenaria Estrutural – Preparação e Ensaio a Compressão
- Amostra: 6 prismas de 2 blocos
- Aceitação: resistência característica de 6 prismas

Devem-se respeitar as resistências dos blocos (MPA) definidas no projeto estrutural, não eximindo a responsabilidade do responsável técnico pela fabricação do bloco do conhecimento das normas de execução e controle de qualidade.

A resistência dos blocos altera conforme o pavimento. Devem-se respeitar as resistências especificadas em projeto.

4. MODULAÇÃO

Os Blocos utilizados são da família de 39.
Serão utilizados os seguintes insumos:

- Bloco 14 x 19 x 34
- Bloco 14 x 19 x 39
- Bloco 14 x 19 x 54
- Bloco 14 x 19 x 19

- Bloco para passagem de tubulações

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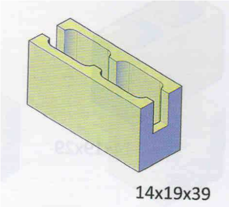
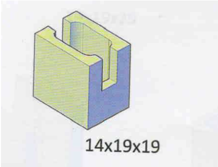
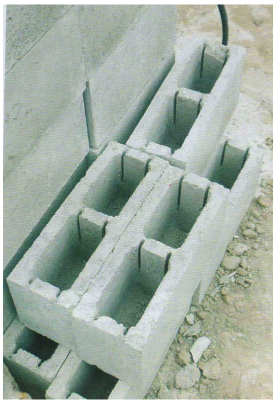
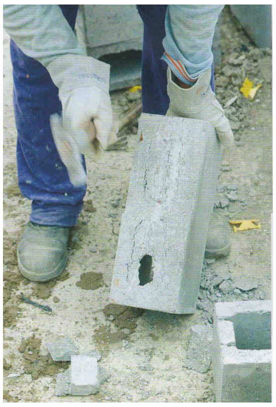
- **Bloco Canaleta 14 x 19 x 34**
- **Bloco Canaleta 14 x 19 x 39**
- **Bloco Canaleta 14 x 19 x 19**









- **"Bolacha" 5 x 14 x 19**

- **Bloco Compensador (comumente chamado de "Palito") 5 x 9 x 19**

A modulação é um procedimento absolutamente fundamental para que uma edificação em alvenaria estrutural possa-se resultar econômica e racional.

A amarração da modulação deverá ser respeitada.

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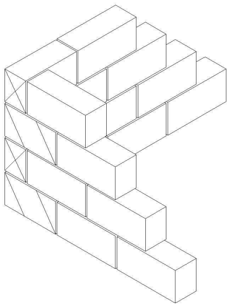
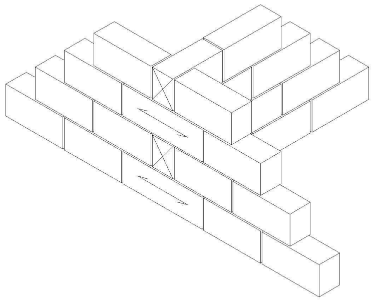
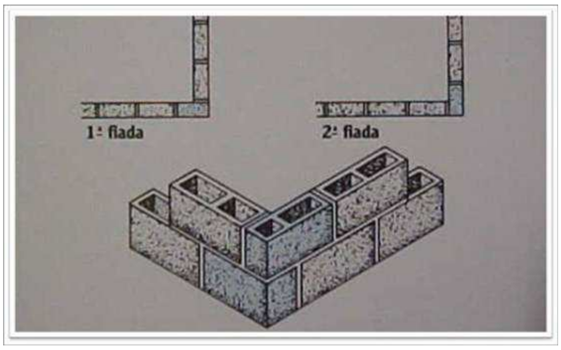
DETALHE DE AMARRAÇÃO EM "L"

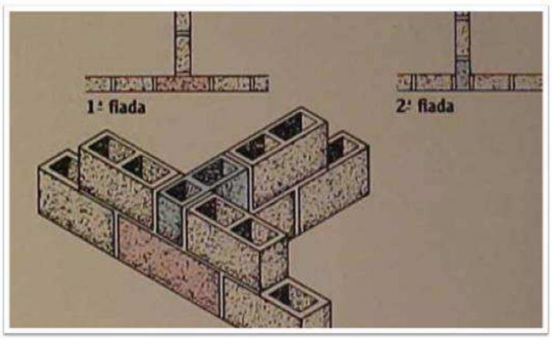


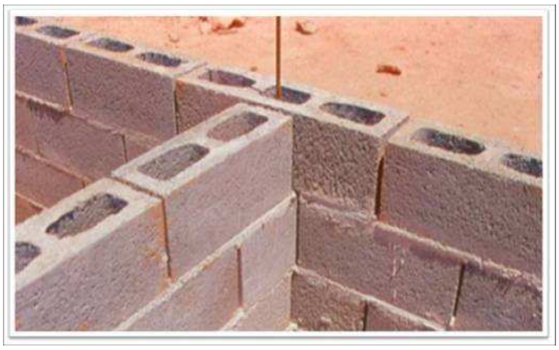
DETALHE DE AMARRAÇÃO EM "T"





Detalhe amarração em L.





Detalhe amarração em T

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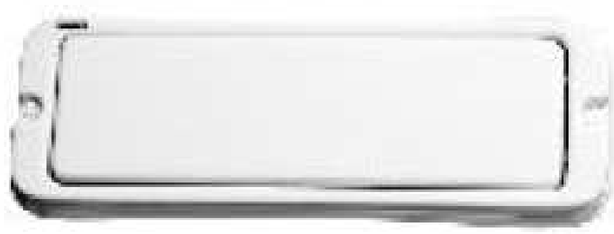
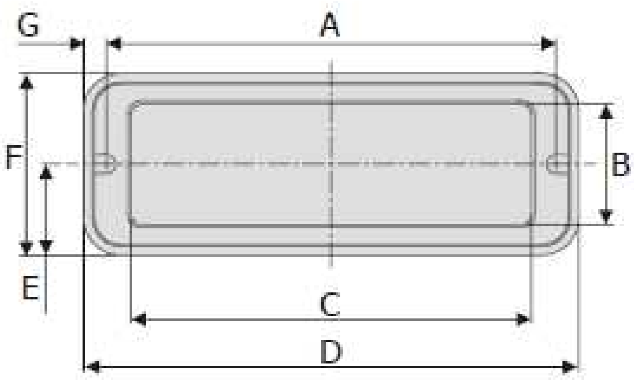
5. SHAFT

Exemplo de acabamento para Shafts visitáveis.

SH54C





Dimensões					
A	512 mm		E	99 mm
B	136 mm		F	198 mm
C	456 mm		G	24 mm
D	560 mm			

Fonte: *http://www.astra-sa.com.br/criativos/site/2102/a10s1000/081218/0146a.pdf*

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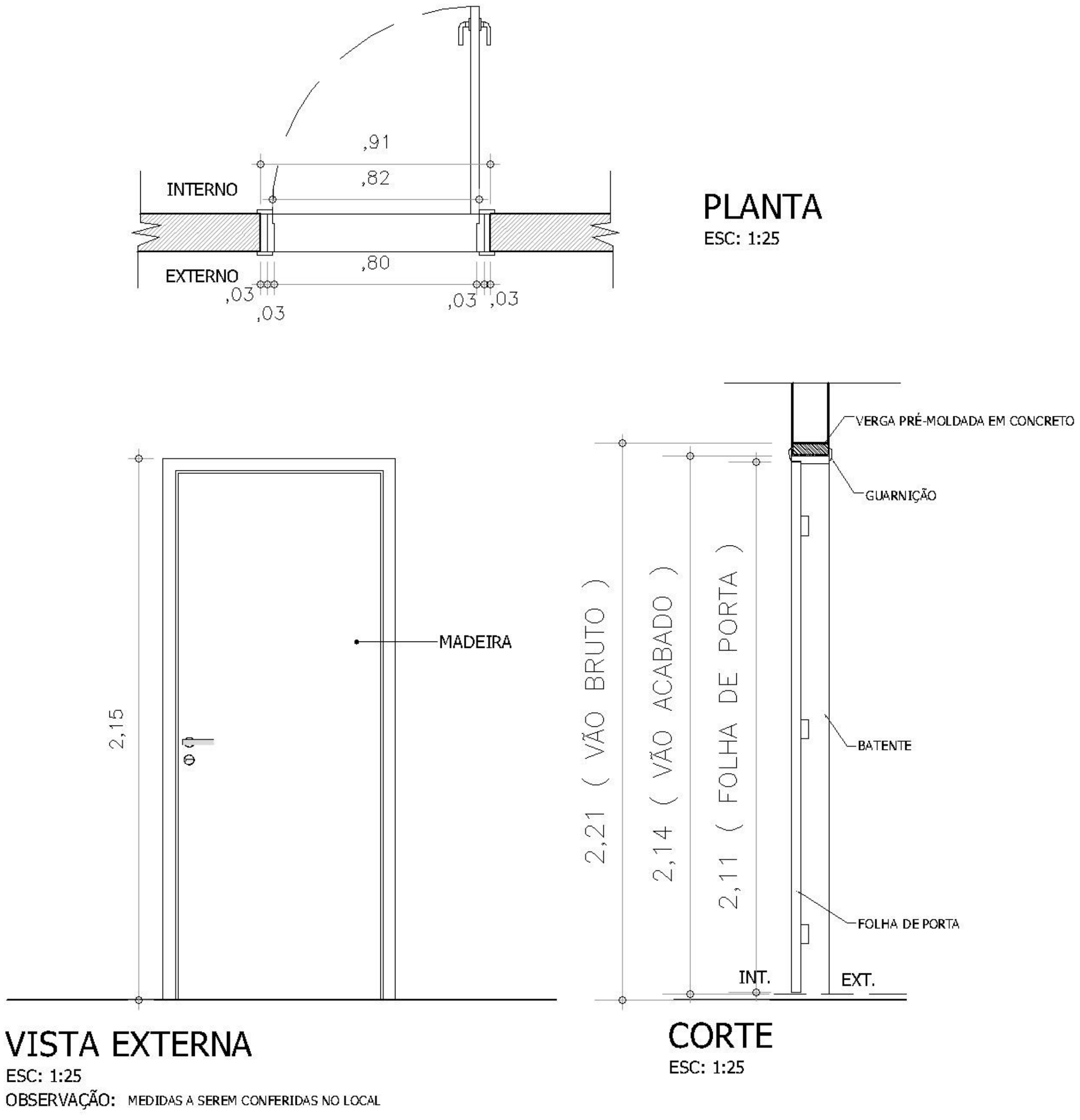
6. PORTAS PARA ALVENARIA ESTRUTURAL

PORTA 91cm (MEDIDA DO VÃO):



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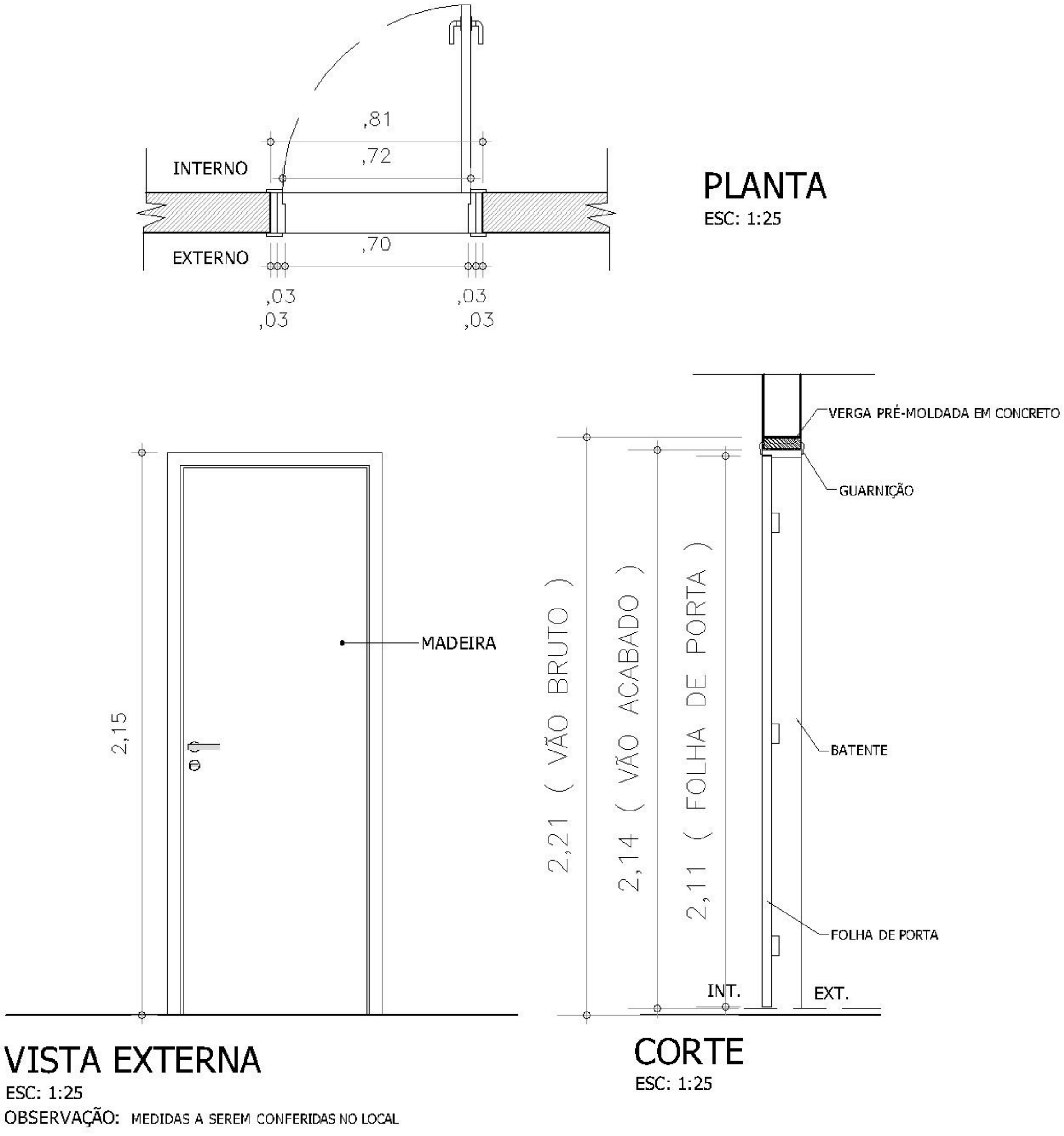
PORTA 81cm (MEDIDA DO VÃO):



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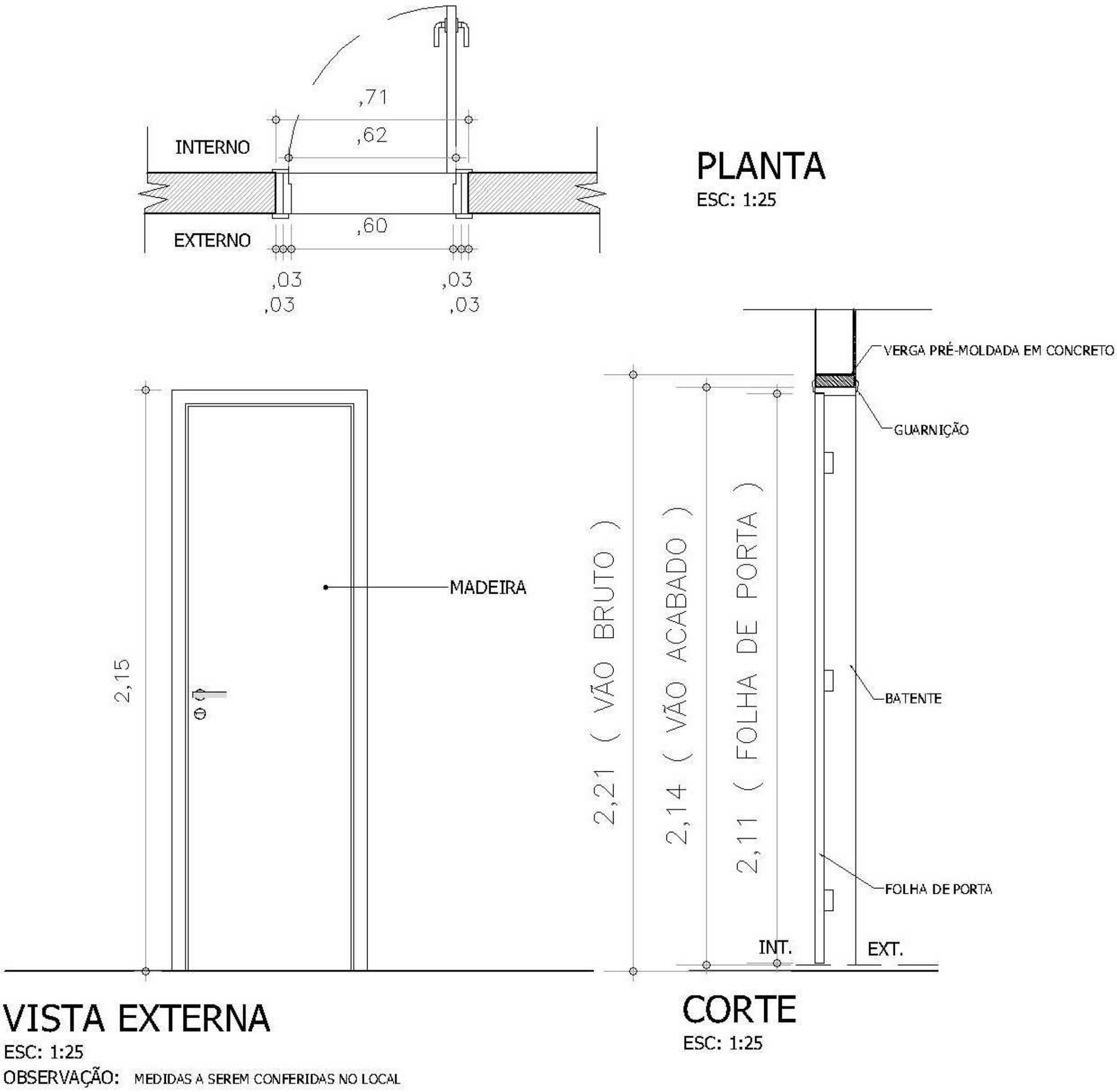
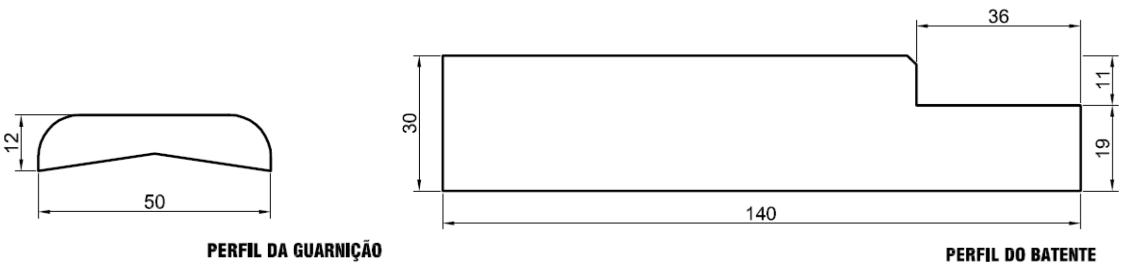
PORTA 71cm (MEDIDA DO VÃO):



PERFIL:



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METODOLOGIA PARA EXECUÇÃO DE ALVENARIA ESTRUTURAL EM BLOCO DE CONCRETO

Este manual foi desenvolvido para explicar a metodologia para a execução de Alvenaria Estrutural em bloco de concreto, lembrando que **os projetos imperam sobre este manual**, devendo os mesmos, serem seguidos na sua íntegra. Qualquer discordância deste manual com os projetos fica valendo os projetos.

1. FUNDAÇÃO

As fundações deverão seguir o projeto específico, devendo ter os aterros devidamente controlados e o acompanhamento do consultor de solo.

2. BALDRAMES

Os baldrames serão em concreto armado, de acordo com projeto específico, será executado com escavação no terreno natural, abrindo as valas, colocando as formas, armações e a concretagem.

Devem-se colocar todas as ferragens horizontais e as esperas das ferragens verticais para depois concretar.

Após a concretagem dos baldrames, deverão ser impermeabilizadas as laterais do mesmo e o topo, e 1 metro de alvenaria para cima.

3. LAJES

As lajes deverão ser produzidas com a face acabada e regularizada, isto é, prontas para receber o piso.

No projeto das lajes já estão previstas as tubulações secas de elétrica, as furações da parte hidráulica e os shafts.

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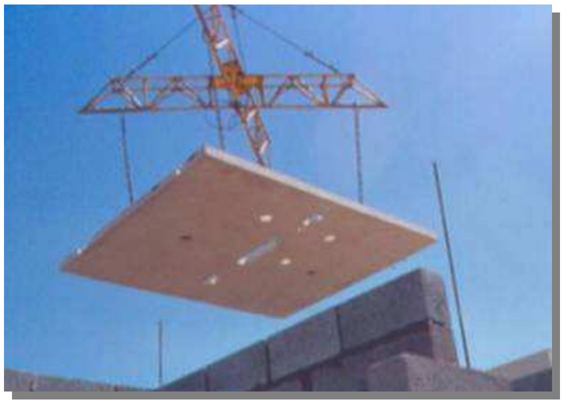
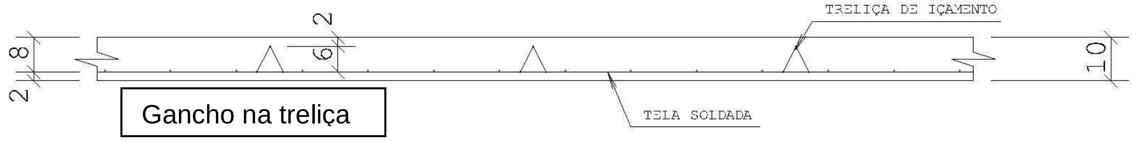


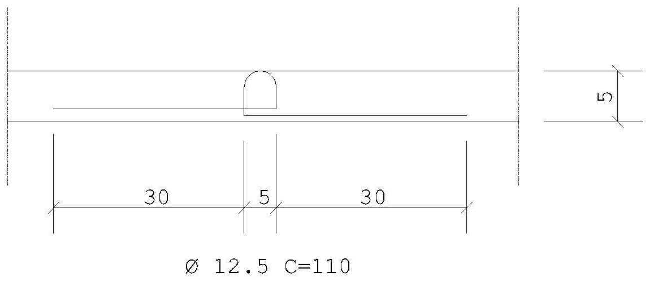
Devem-se observar os ganchos para o içamento, os quais serão embutidos juntamente com as treliças, conforme detalhe específico, para permitir o uso de acabadora de superfície.

O diâmetro da armadura do gancho deve ser respeitado, pois é ele quem garante a resistência no momento do içamento.

DETALHE DA ARMAÇÃO DAS LAJES IÇADAS



Detalhe do Gancho para içamento
Sem escala



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Gancho na treliça

Os painéis de laje que serão lançados nos pavimentos devem ser apoiados na lateral do bloco, deixando o meio do bloco livre para a passagem das tubulações necessárias. Por isso é necessário o perfeito nivelamento da última fiada para que as lajes sejam totalmente apoiadas em todos os pontos e todos os painéis fiquem nivelados.

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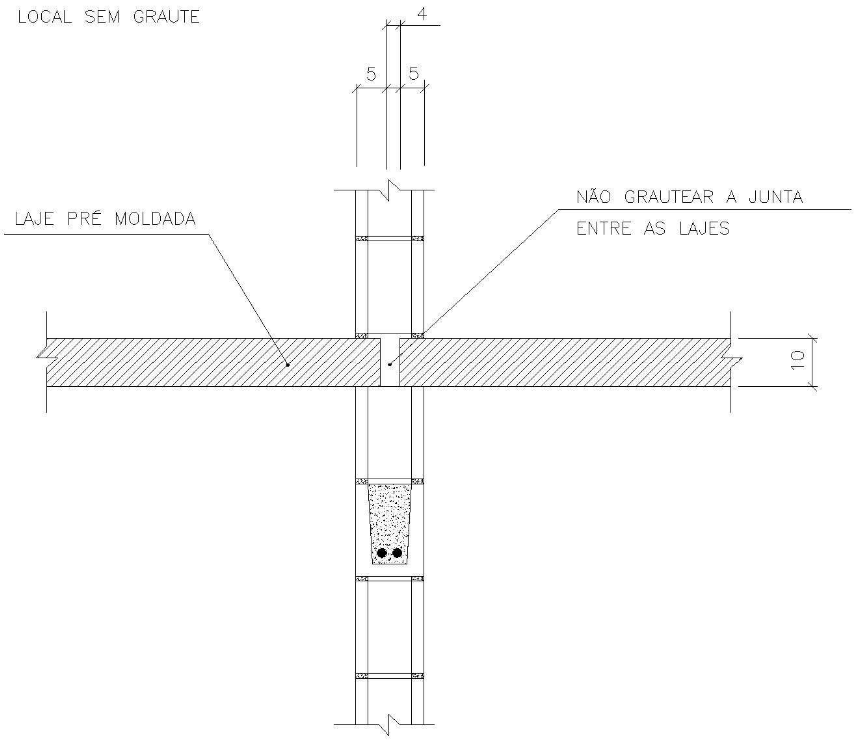
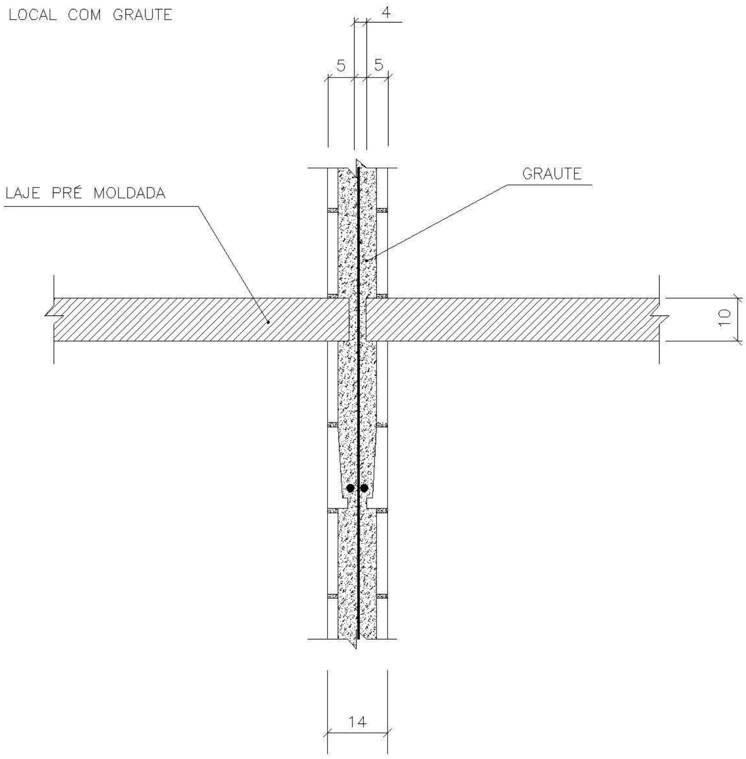
DETALHE LAJES INTERNAS

LOCAL SEM GRAUTE



DETALHE LAJES INTERNAS

LOCAL COM GRAUTE



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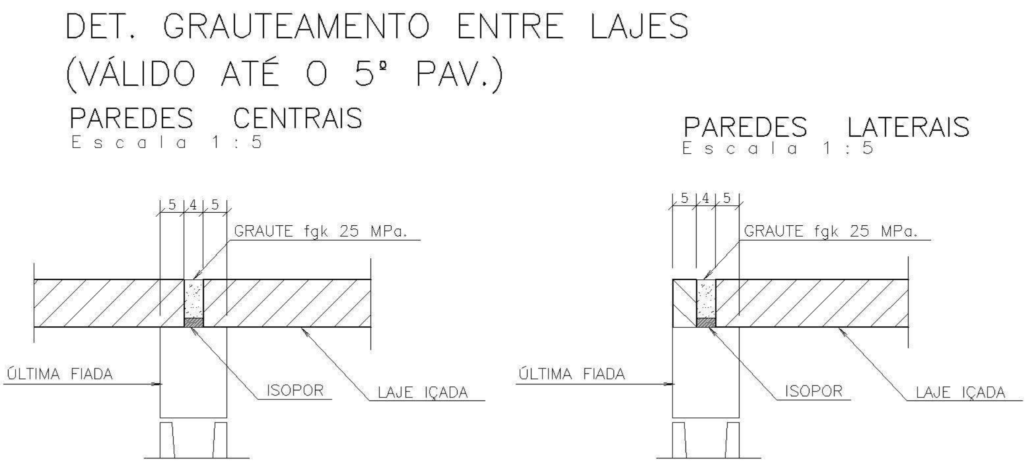
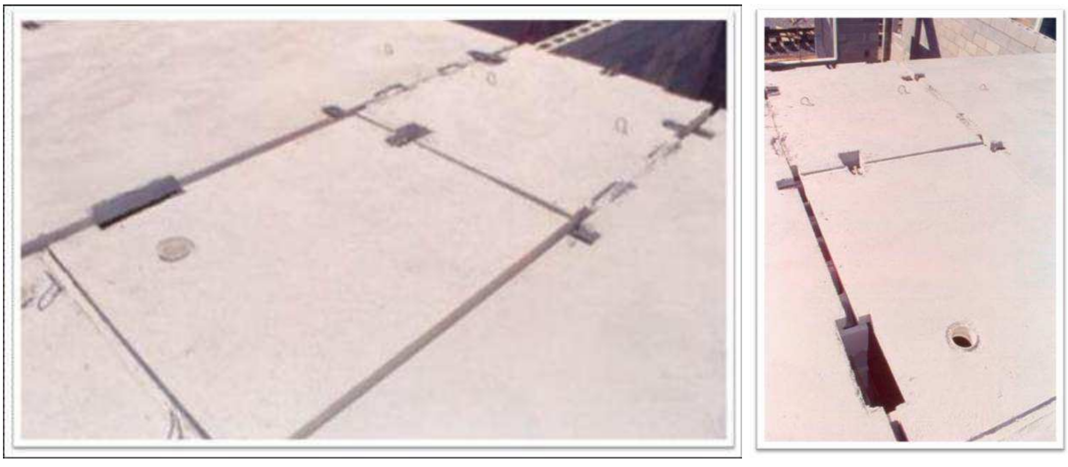
Até o 5º pavimento de cada torre deve ser feito o grauteamento entre as lajes. Ver detalhe abaixo. Do 6º pavimento em diante este grauteamento não é mais necessário.





Deve-se atentar ao correto posicionamento dos conduites, caixinhas e furações, pois os mesmos já estão previstos em outras peças, como na “descida” para a caixa da parede ou na junção com outro painel de laje.

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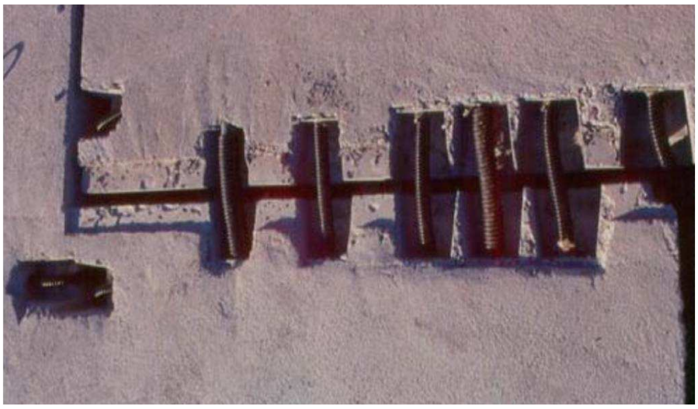

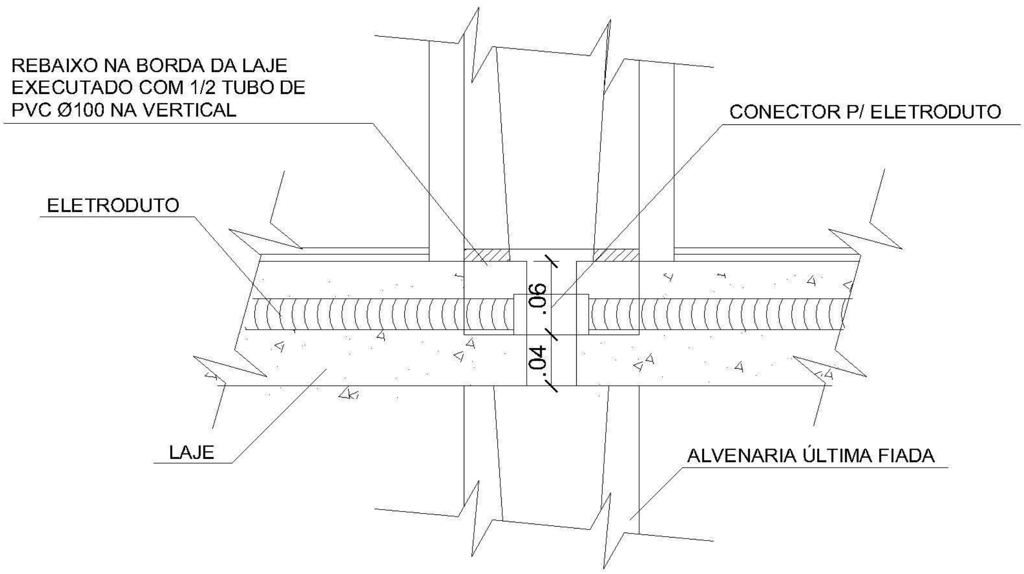

DET.1 - PASSAGEM ELETRODUTO LAJE - LAJE

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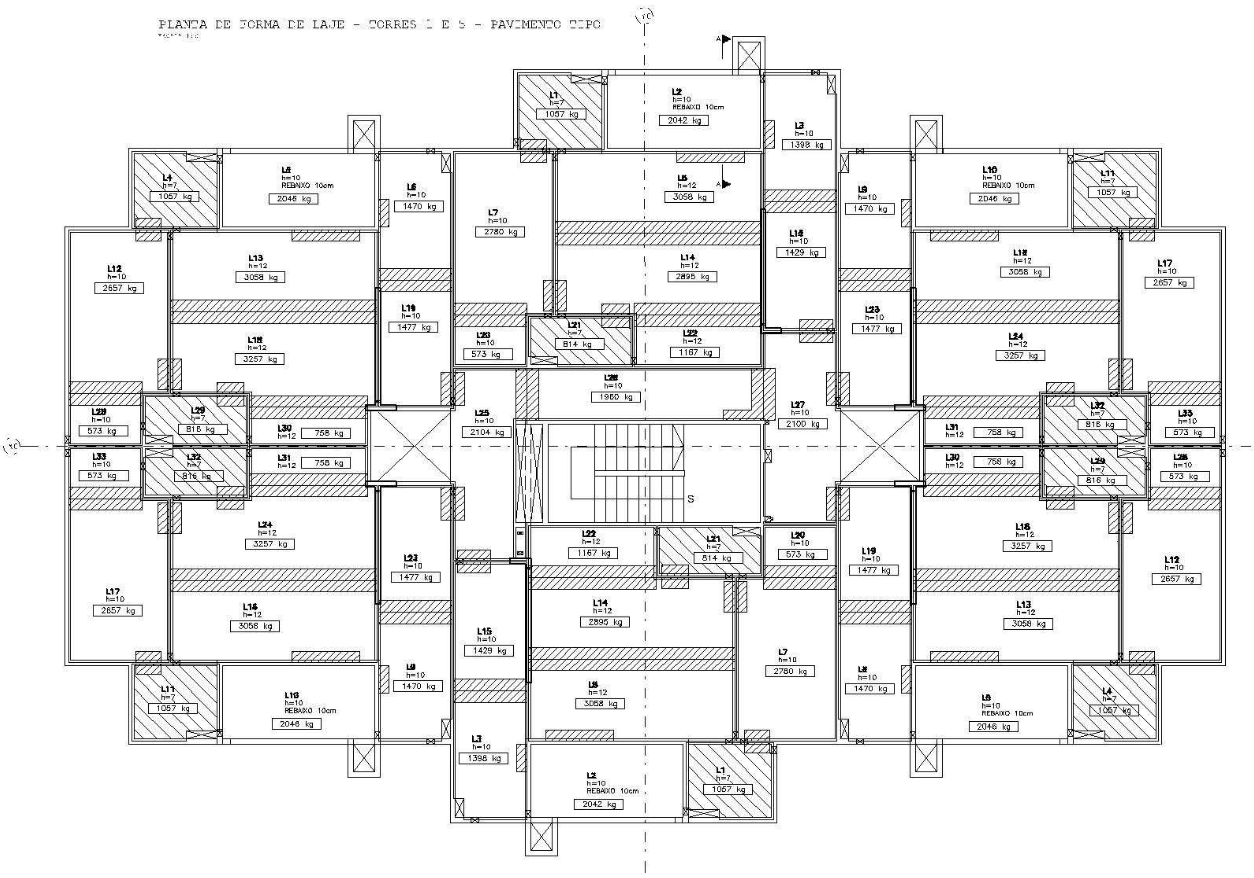
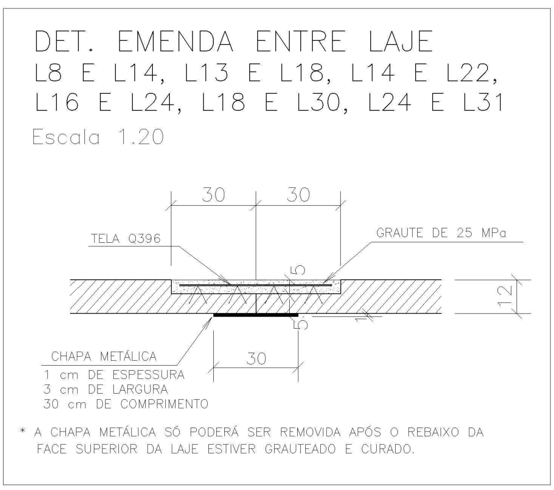
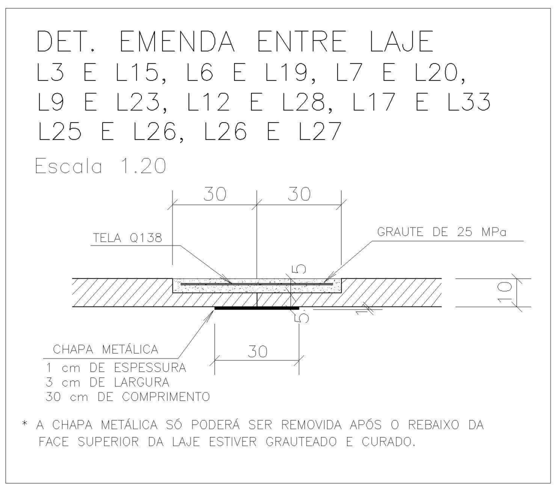
Existem casos em que o tamanho do ambiente é muito grande e as lajes devem ser divididas, devido ao seu peso. Nestes casos o projeto prevê uma emenda entre as lajes. Esta mesma emenda se repete nos vãos das portas.

As emendas de lajes consistem em executar um rebaixo durante a concretagem.

Com a laje posicionada no seu devido local, elas devem ser niveladas, pois as lajes já são acabadas, prontas para receber o piso. Os rebaixos são preenchidos com uma malha de acordo com projeto específico e então feito o grauteamento.







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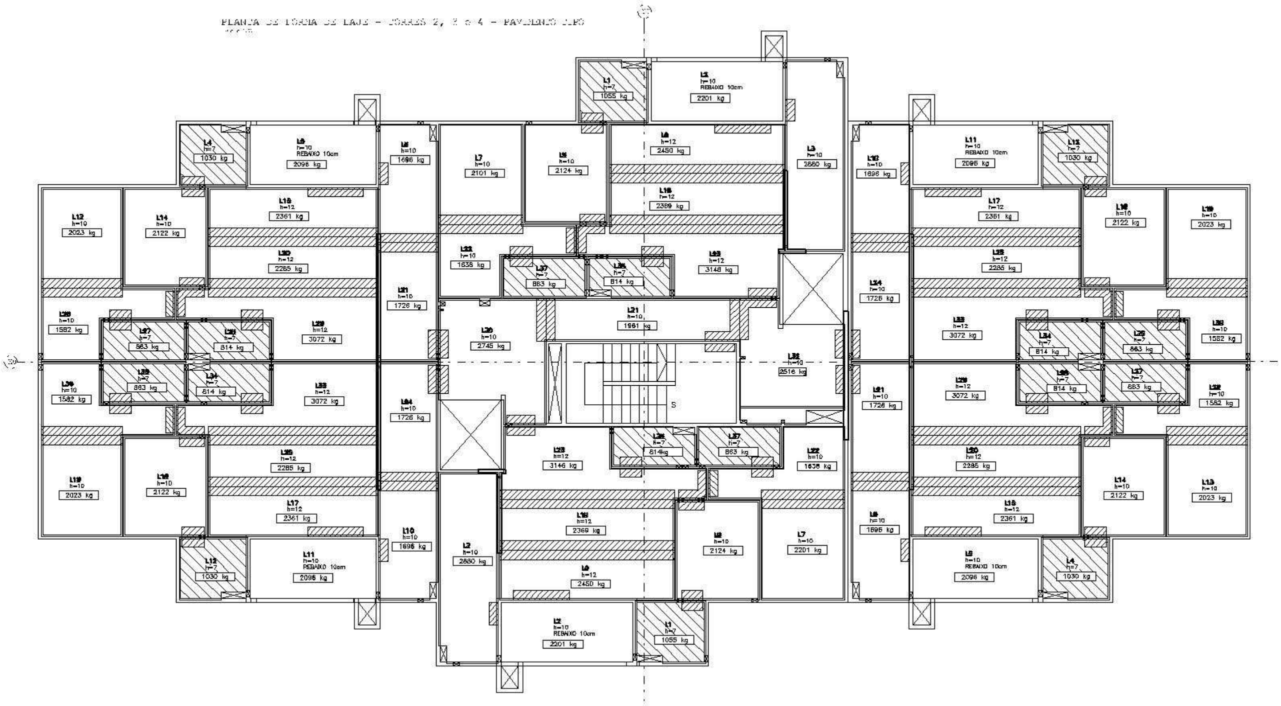
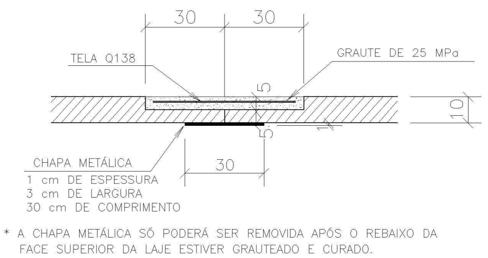


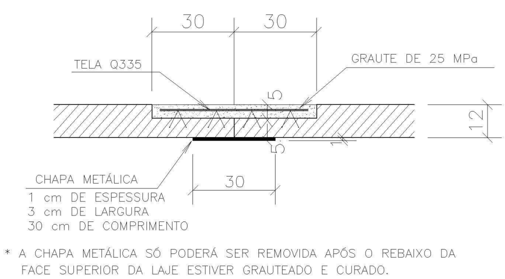
DET. EMENDA ENTRE LAJE L6 E L21, L7 E L22, L10 E L24, L13 E L26, L19 E L36, L30 E L31, L31 E L32

Escala 1.20



DET. EMENDA ENTRE LAJE L9 E L16, L15 E L20, L17 E L25, L16 E L23, L20 E L29, L25 E L33

Escala 1.20



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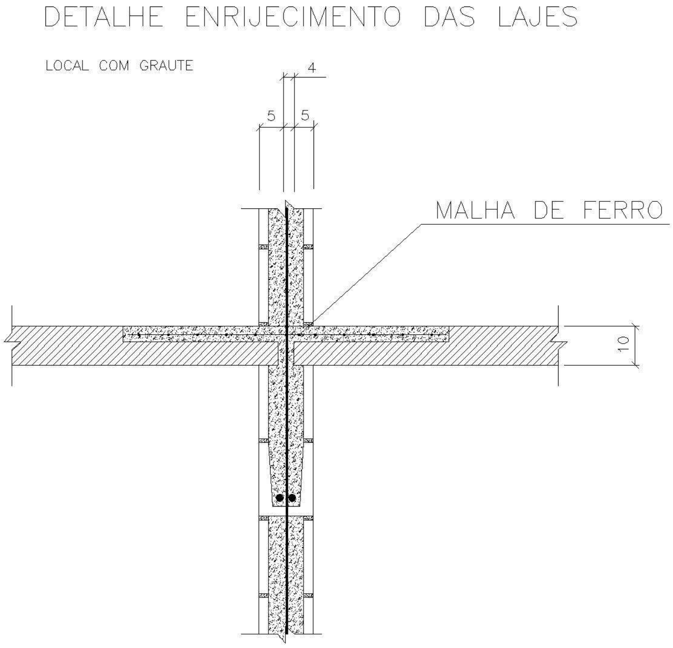

O enrijecimento é uma peça metálica que auxilia no correto posicionamento das lajes nos pontos de grauteamento. Ele deve ser mantido por 14 dias após o grauteamento para a correta cura do graute.

Enrijecimento

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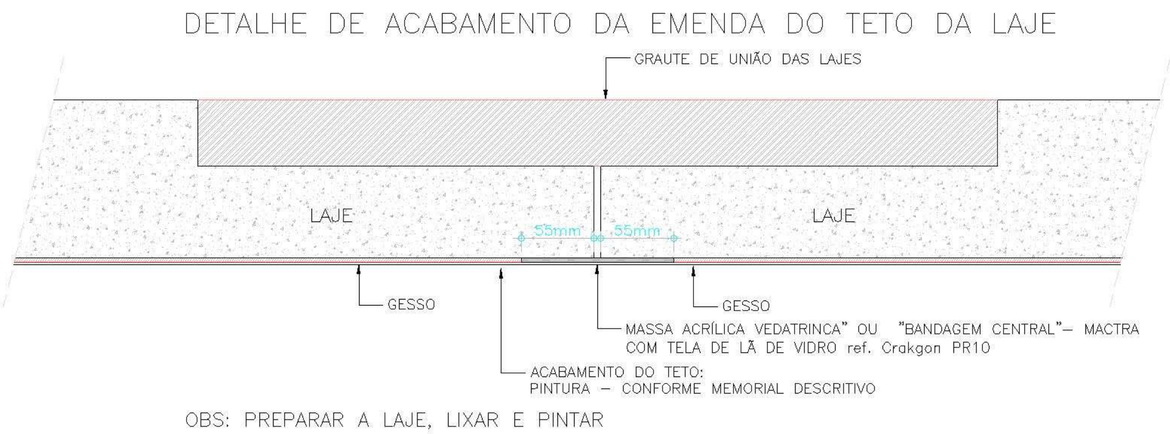
Enrijecimento

Se as lajes forem executadas corretamente, respeitando os rebaixos, cobrimentos, armação e ferragens, tempo de cura do concreto, posicionamento, içamento, apoio uniforme em todas as paredes, e etc..., a junta inferior das lajes ficará imperceptível com o acabamento final. Para prevenção de microfissuras caso algum dos itens acima não sejam atendidos em sua totalidade, segue o detalhe de acabamento para prevenção de microfissuras na união das lajes.



A divisão da varanda para a sala será feita com rebaixo de 10cm, para garantir a devida impermeabilização e manter um degrau de 5cm entre os ambientes, para evitar a entrada de água e facilitar a limpeza.

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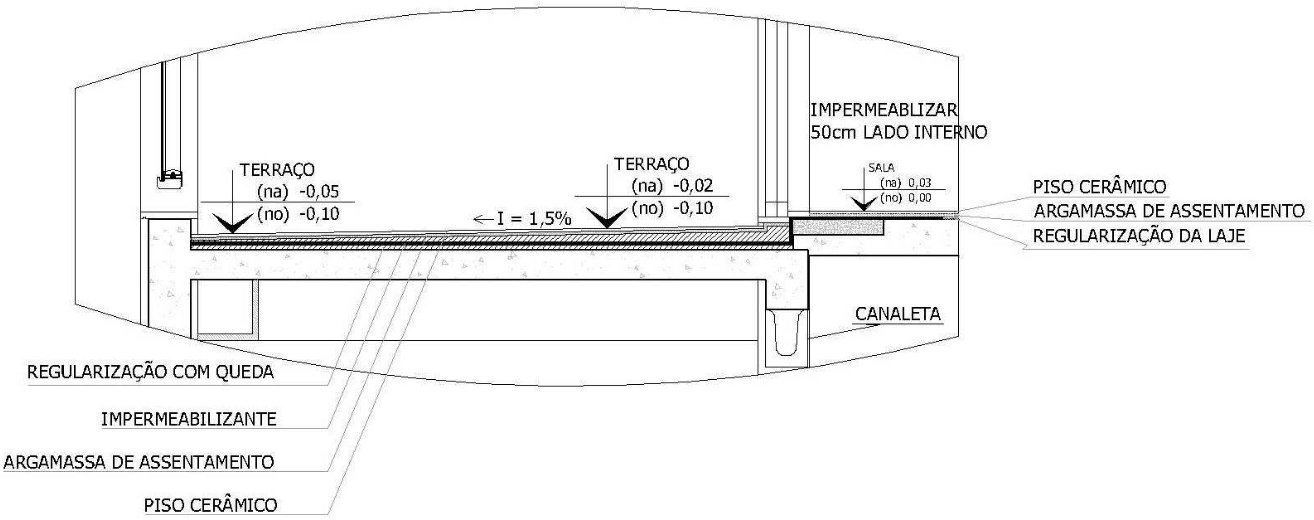
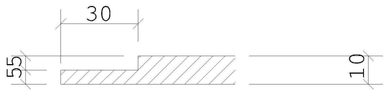
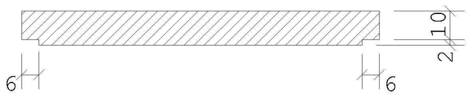


Exemplos de Detalhe das lajes

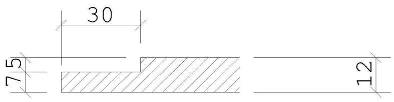
DET.1 LAJE=10cm
Escala 1.20



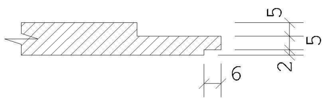
DET.P/APOIO DAS LAJES H=12cm
Escala 1.20



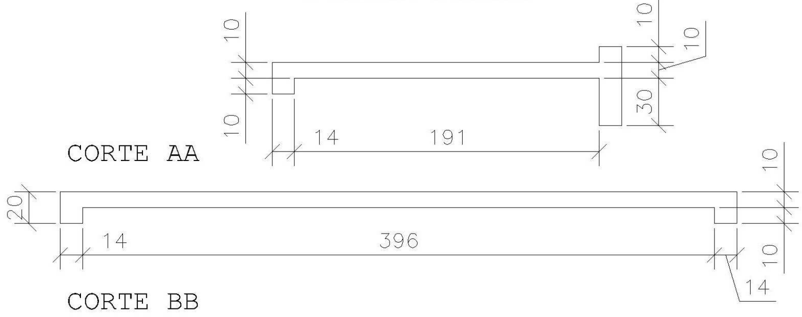
DET.2 LAJE=12cm
Escala 1.20



DET.P/APOIO DAS LAJES h=12cm
COM REBAIXO
Escala 1.20



DETALHE SACADA



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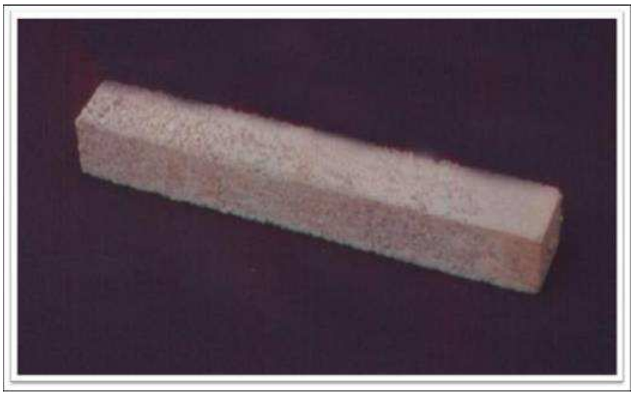
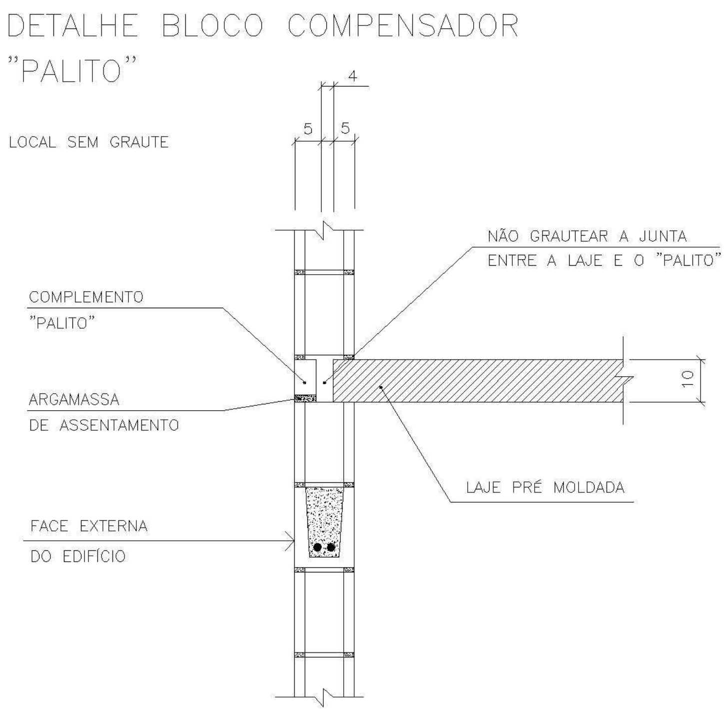
Na modulação das paredes existe um insumo denominado bloco compensador, comumente chamado de “palito”, para que haja a correta modulação com a junção da laje.

Devem-se atentar aos locais onde existem os grautes. Nesse caso, grauteia-se até a canaleta, assenta-se a última fiada, grauteia-se os pontos indicados em projeto na última fiada e posicionam-se as lajes, assenta-se o bloco compensador (palito), grauteia-se os pontos posicionados em projeto e só então continuam os assentamentos dos blocos do próximo pavimento.





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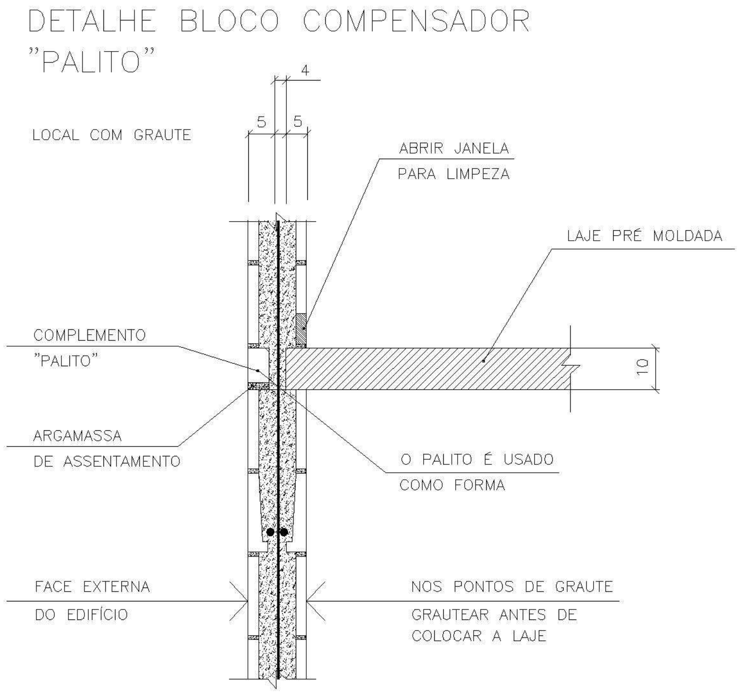

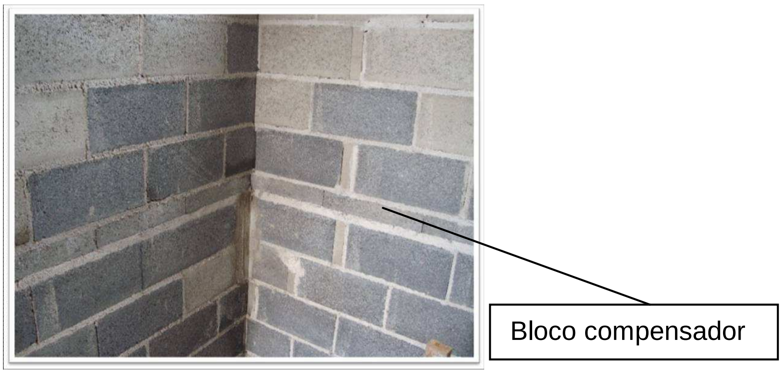

4. ESCADA

A escada será pré-moldada e deverá ser produzida com os devidos ganchos para içamento pela grua.

O acabamento da escada na sua execução deverá ter a face acabada e regularizada, pois não haverá regularização depois de instalada.

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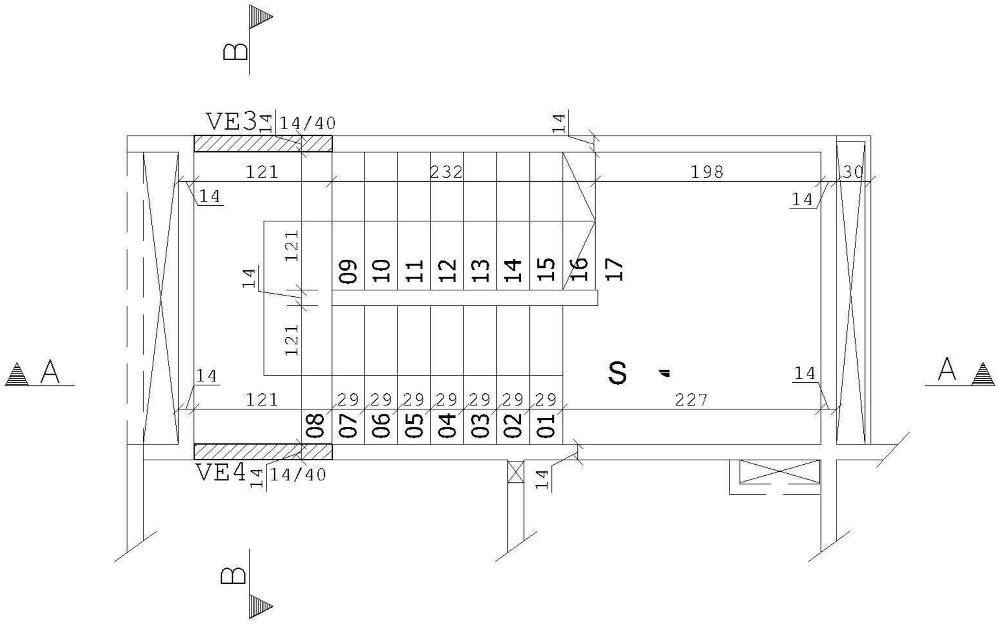
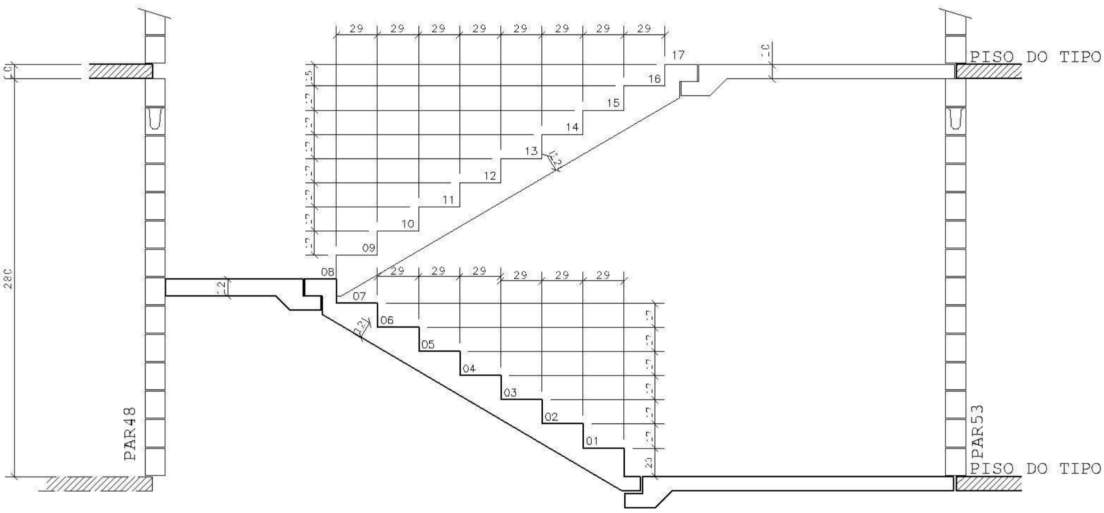
PLANTA DE FORMA DA ESCADA – PAV. TIPO



CORTE A-A
ESCALA 1 : 25



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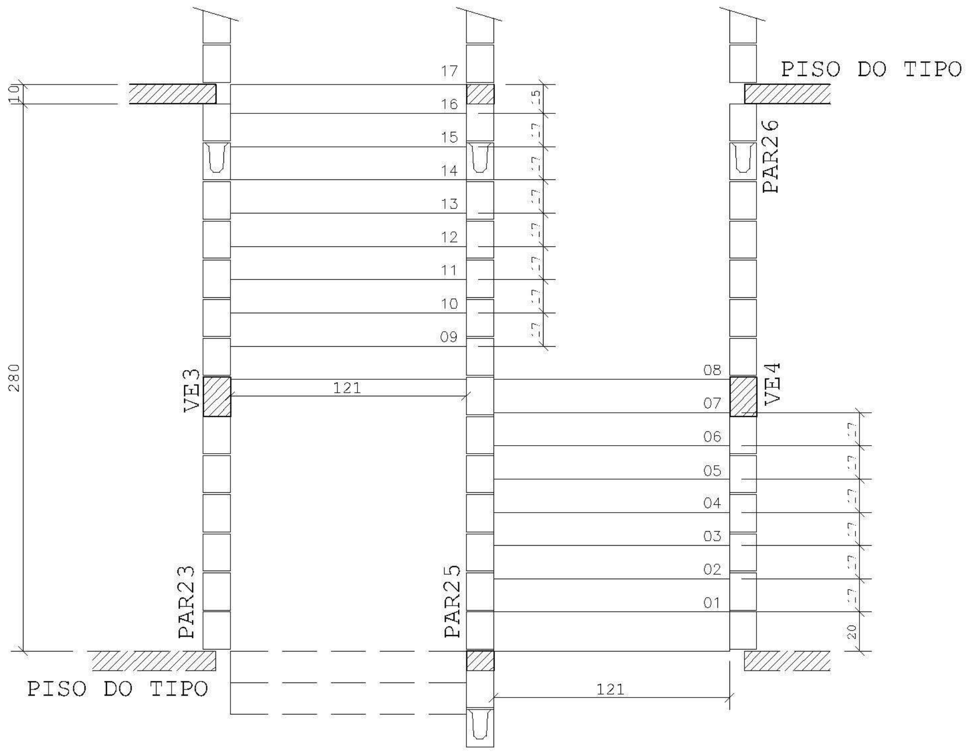
CORTE B–B



5. ELEVAÇÃO DAS PAREDES

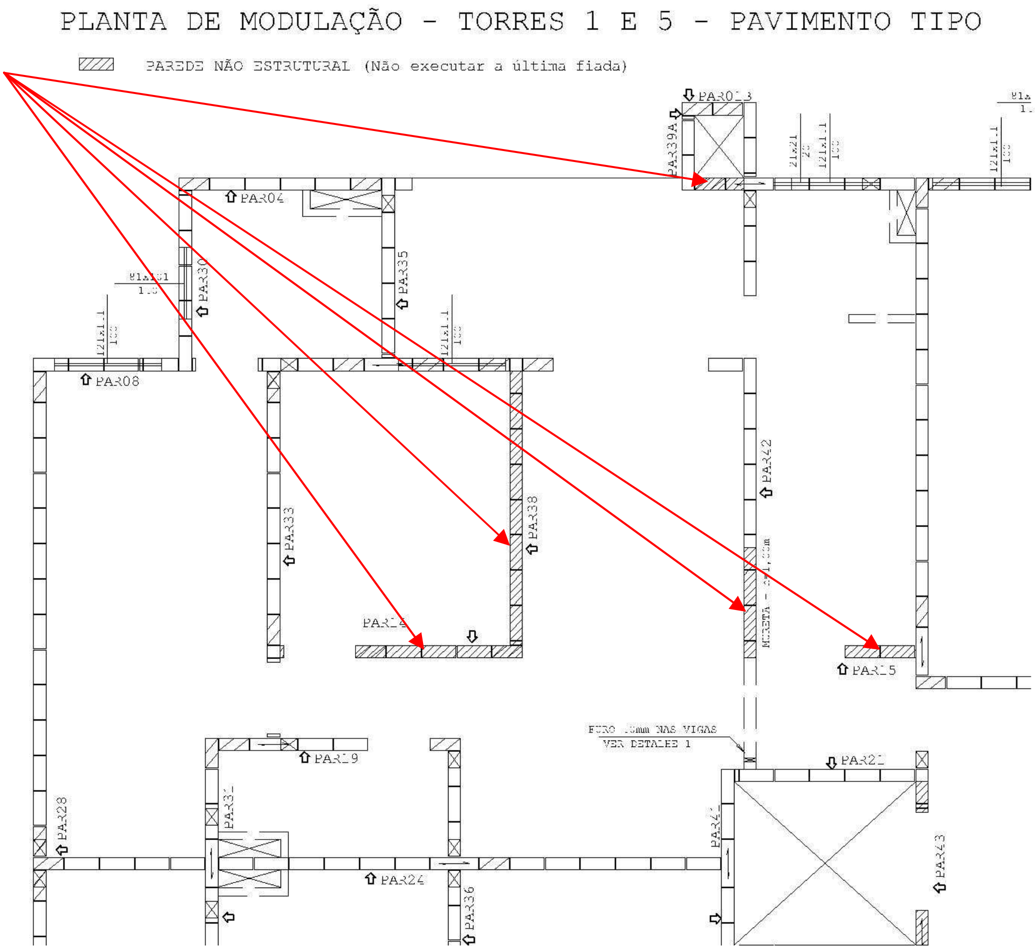
No projeto estrutural há o desenho da elevação de todas as paredes. Com a devida modulação projetada, ferro, canaletas, vergas e a localização dos pontos de instalações elétricas.

Deverão observar os seguintes detalhes:

- A canaleta deve ser grauteada na penúltima fiada, para que os conduites possam fazer a devida curva para entrarem nas laje, seguindo os projetos estruturais e de instalações elétricas.

- Em alguns lugares há paredes, ou somente trechos de paredes de vedação (paredes não estruturais). Essas paredes estão demarcadas em projeto com hachuras e deverão receber especial atenção, pois os blocos da última fiada deverão ser colocados após a elevação total do edifício, para que não haja carregamento nessa parede ou nesse trecho de alvenaria.

Exemplo Torres 01 e 05:



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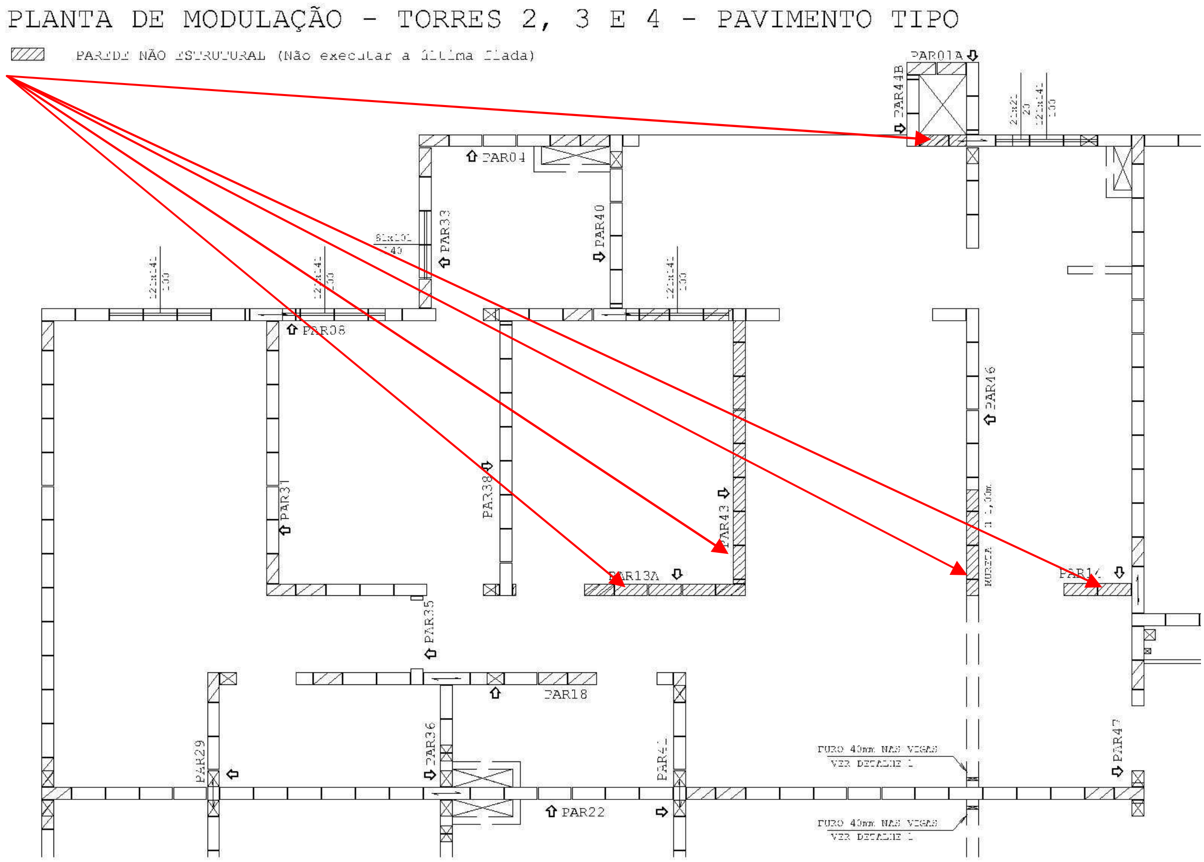
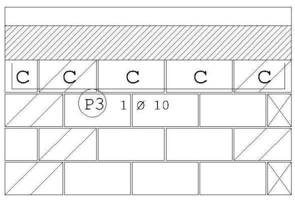
Exemplo Torres 02, 03 e 04:



O assentamento da última fiada das alvenarias de vedação (paredes não estruturais), deve ser executado do último pavimento para o primeiro, para não transferir carga do pavimento superior para a laje inferior.

LEGENDA DE RESPALDO DAS PAREDES
NÃO ESTRUTURAIS

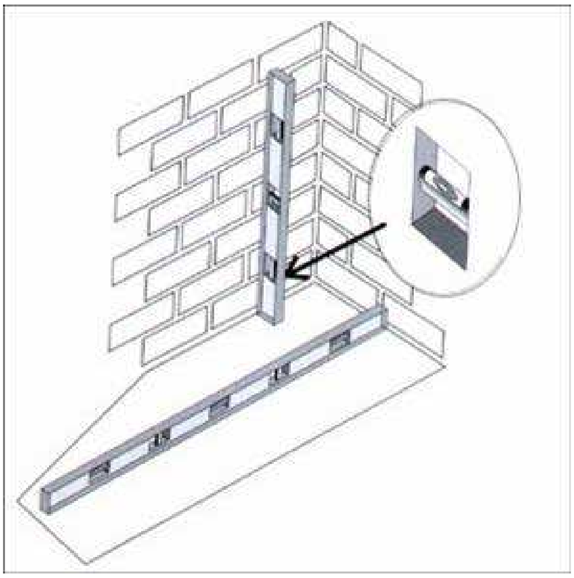


O RESPALDO DA ALVENARIA DEVE SER EXECUTADO APÓS A EXECUÇÃO TOTAL DA ALVENARIA, E DEVE SER FEITO DE CIMA PARA BAIXO PARA NÃO SOBRECARREGAR A LAJE.

A modulação descrita em projeto deve ser seguida na íntegra.

Para uma correta execução das paredes deverá ser feito o controle de esquadro, escantilhão, prumo e níveis das mesmas.

Os níveis das paredes devem ser tirados com nível à laser, pelo menos 2 vezes em cada pavimento.



Nível e prumo Laser

Nível e prumo manual

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Escantilhão

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6. ARGAMASSA, GRAUTE E RESISTÊNCIA DOS BLOCOS

A argamassa e o graute deverão ser industrializados em silos, para o devido controle das resistências.

A Argamassa para assentamento dos blocos de concreto na alvenaria estrutural deve sempre seguir a recomendação do projetista, conforme descrito em projeto. A argamassa industrializada é a mais recomendada, por ser um dos produtos mais constantes e homogêneo, tanto no seu uso diário, como ao longo da obra.

A resistência dos blocos muda conforme os pavimentos, podendo ser observados no projeto estrutural.

Segue abaixo um exemplo de como consta no projeto de estrutura a resistência da argamassa, graute e blocos:

TABELA DE fp TORRES 01 E 05

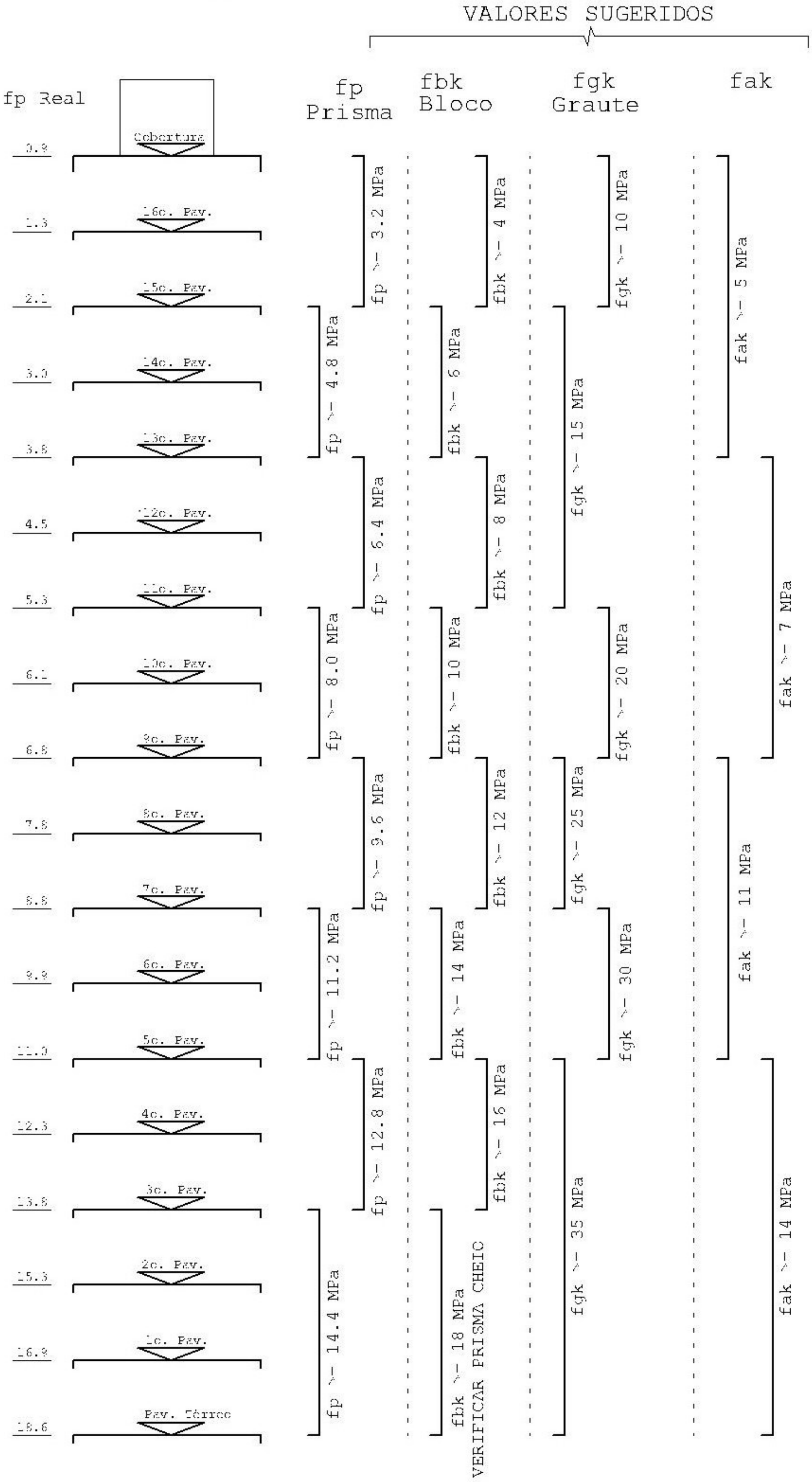

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TABELA DE fp TORRE 02

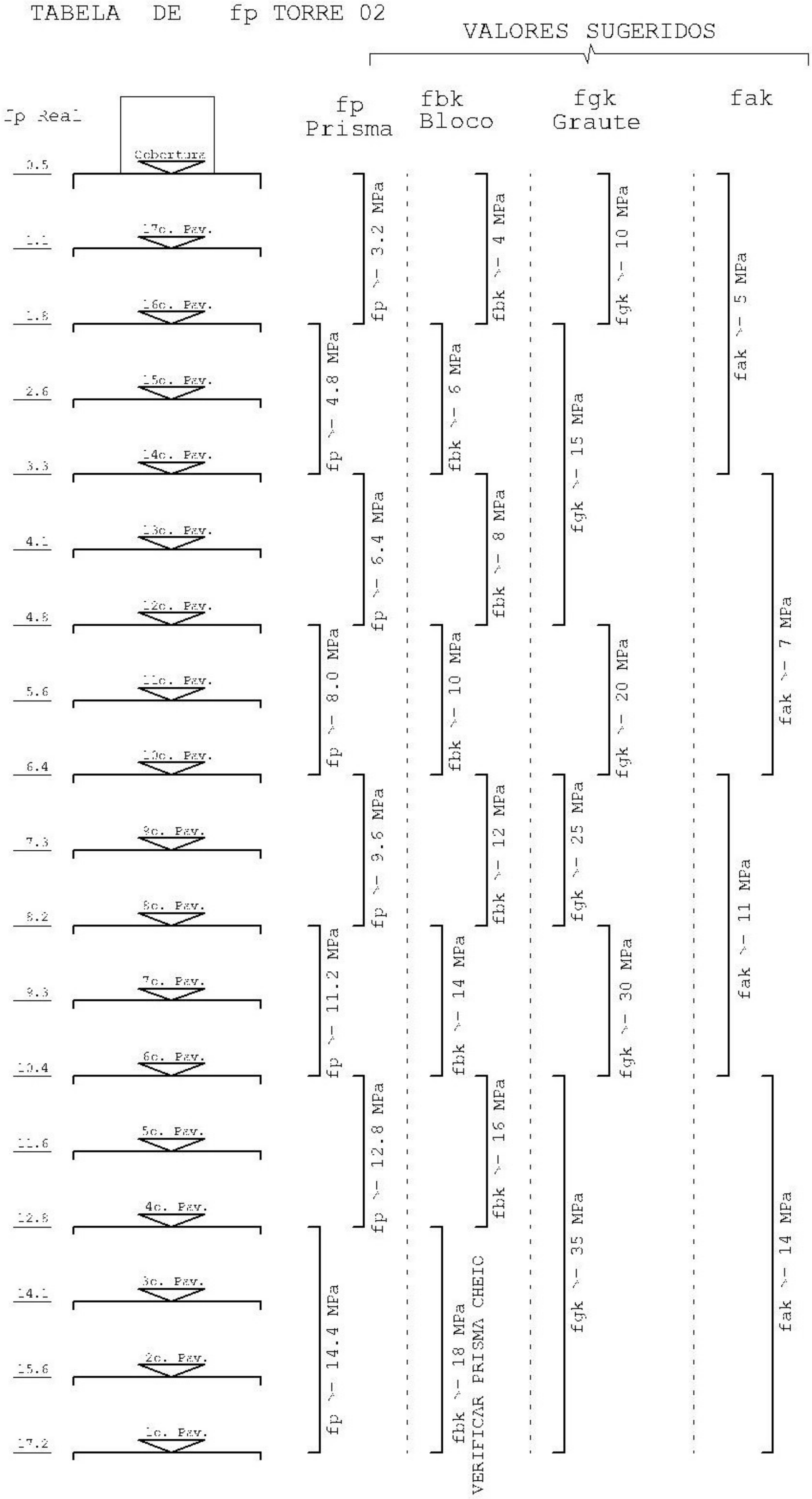

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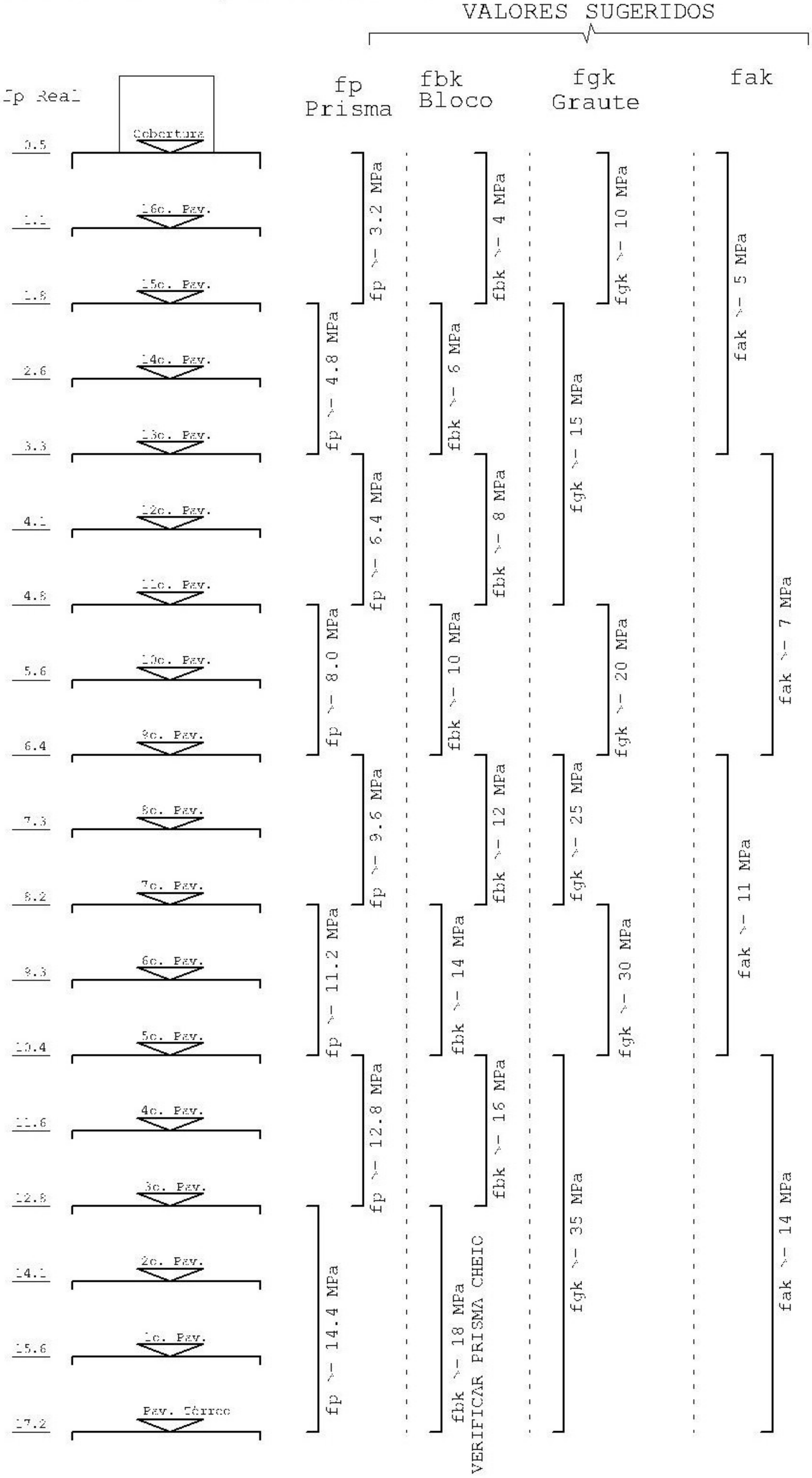
TABELA DE fp TORRES 03 E 04



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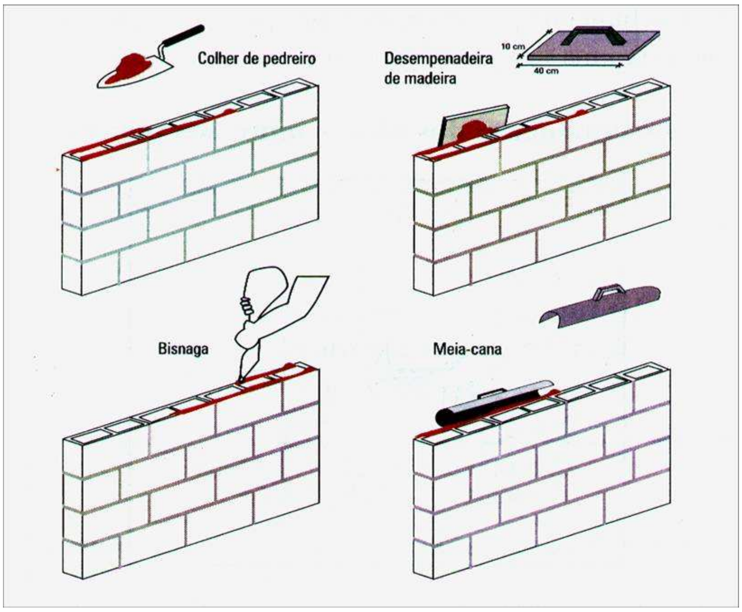
O traço da argamassa dependerá dos insumos que serão utilizados, conforme os fornecedores da região.

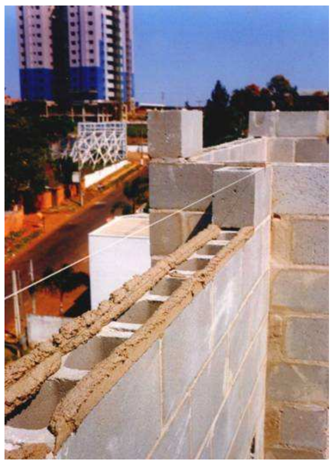
Deverá ser feito ensaios em laboratórios credenciados, obtendo-se assim, o traço compatível com a resistência desejada.

A argamassa deve ser aplicada no sentido longitudinal do bloco, de maneira que fique 2 “cordões” de argamassa, sem que tenham contato um com o outro. Na junta vertical, poderá ser empregada uma argamassa fraca, semelhante ao revestimento.

Para a correta aplicação da argamassa pode-se utilizar os seguintes equipamentos:

- colher de pedreiro
- desempenadeira de madeira
- bisnaga
- meia cana





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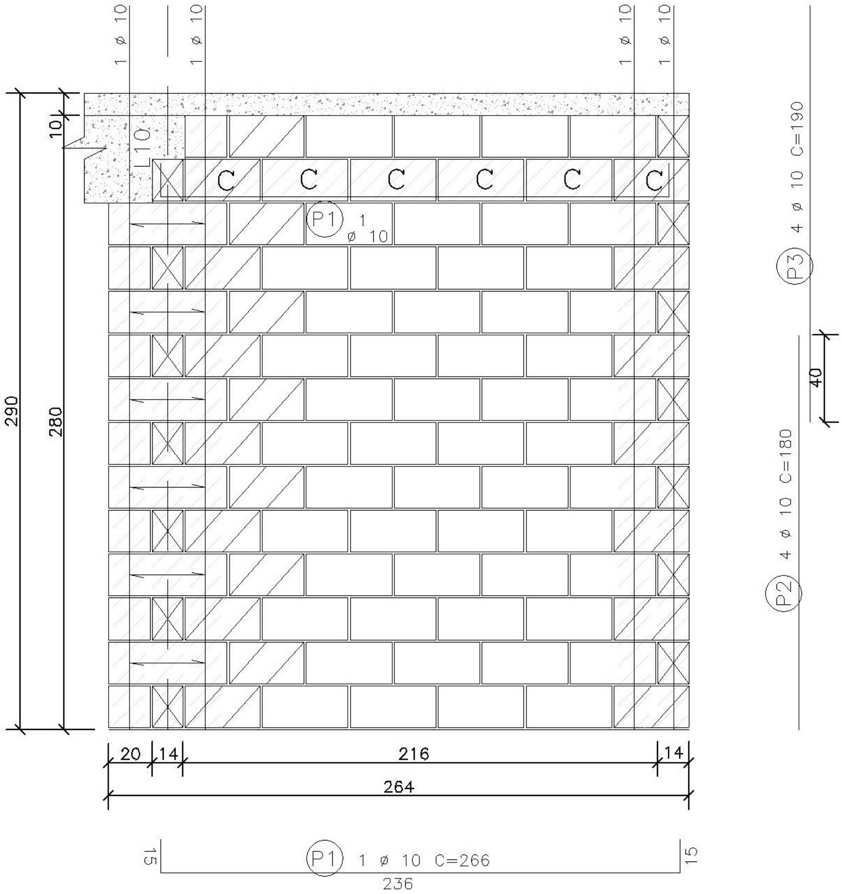
Detalhe da modulação com o insumo “bolacha”

No projeto de estrutura o grauteamento está previsto conforme destacado em detalhe.



O Graute é um tipo especial de concreto utilizado para o preenchimento dos vazios dos blocos e canaletas de concreto. É resultado da mistura de cimento, areia, pedrisco e água.

A resistência do graute é definida pelo projetista de estruturas.

Ao assentar os blocos, devem-se garantir a total limpeza de seus “furos”, para posterior grauteamento.

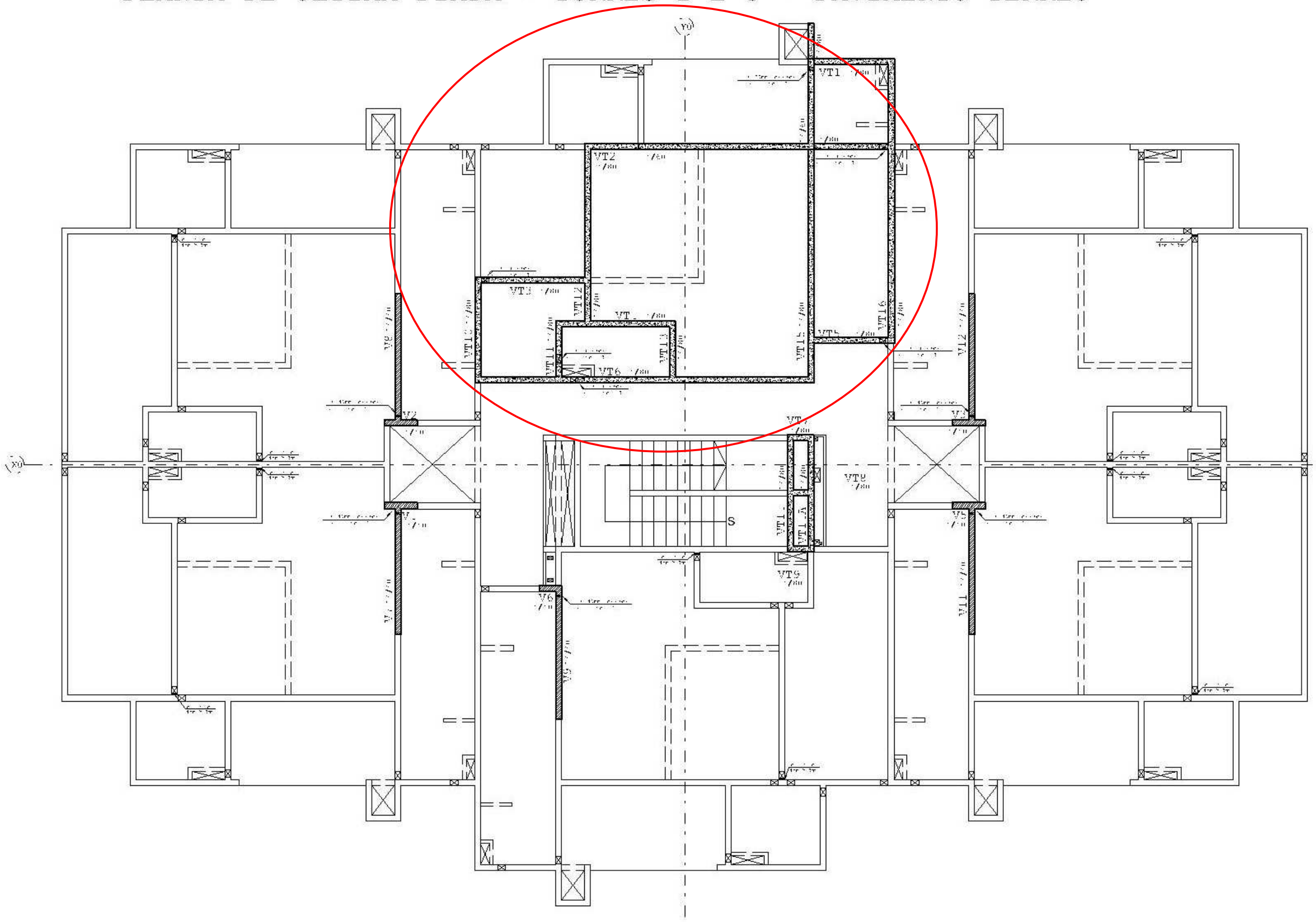
Deverá ser feita a inspeção na primeira fiada do bloco para a devida limpeza e conferencia do total grauteamento.

O Grauteamento deve ser feito a cada 5 fiadas.

7. PAVIMENTO TÉRREO

Podemos observar no projeto, que no pavimento térreo, há vigas de transição suportando as paredes do pavimento tipo, onde houveram a supressão de algumas paredes ou trechos para a viabilização dos ambientes sociais e hall de entrada dos edifícios, tendo assim, o pavimento térreo a sua modulação específica.

PLANTA DE ÚLTIMA FIADA - TORRES 1 E 5 - PAVIMENTO TÉRREO



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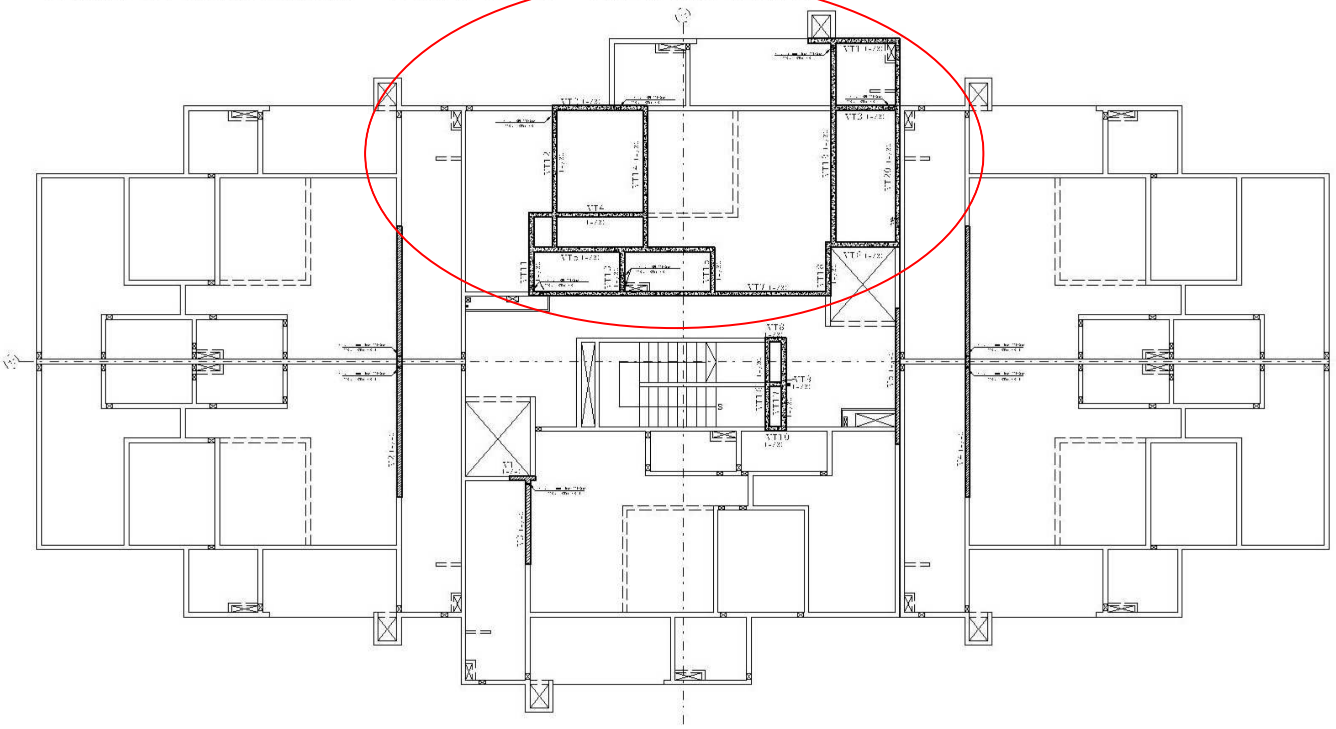
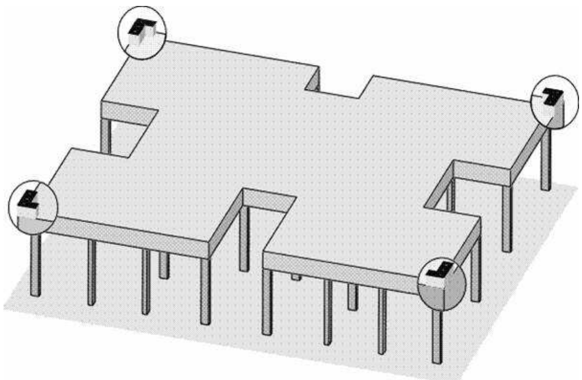
PLANTA DE ÚLTIMA FIADA – TORRES 3 E 4 – PAVIMENTO TÉRREO

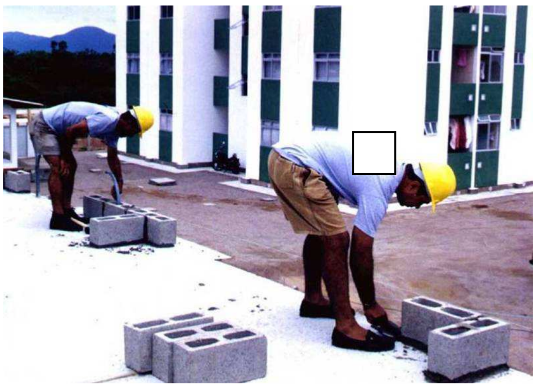


OBS: O térreo da torre 02 sera feito em estrutura convencional, por isso não esta citado.

Esquema para início do assentamento dos blocos

- lançamento de blocos estratégicos (extremidades, cruzamentos, portas)
- primeira fiada
- colocação dos escantilhões
- castelos iniciais nas extremidades





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Verificação

- Verificar as medidas finais e esquadro;
- Verificar nível da fiada
- Verificar posição das ferragens
- Verificar posição dos conduites
- Observar as plantas de elevação das paredes

Execução das demais fiadas

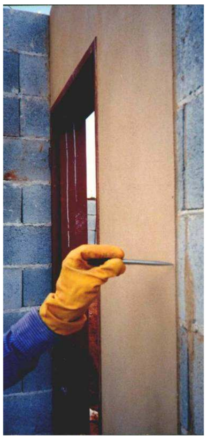
– junta horizontal : 0,7 a 1,3 cm
– junta vertical não argamassada : 0,7 a 1,3 cm
– Nível : +/- 2 mm/m , máx 10 mm
– Alinhamento : +/- 2 mm/m , máx 10 mm
– Prumo : +/- 2mm/m ; máx de 0,5 cm por piso; 2,5 cm no total
– colocação da elétrica
– acompanhar o projeto

Obs: O projeto de estrutura deverá ser seguido na íntegra, pois é nele que se encontra o posicionamento dos blocos na modulação.

8. REVESTIMENTO

Em caso de aplicação de revestimento interno de gesso, a junta vertical não argamassada deverá ser preenchida com massa de vedação antes da aplicação do gesso.

Interno:
Gesso 5mm ou Massa única 5 a 8 mm



Cerâmica aplicada em cima da argamassa de regularização e Cimento cola.

Externo: Recomenda-se massa de 2,5 cm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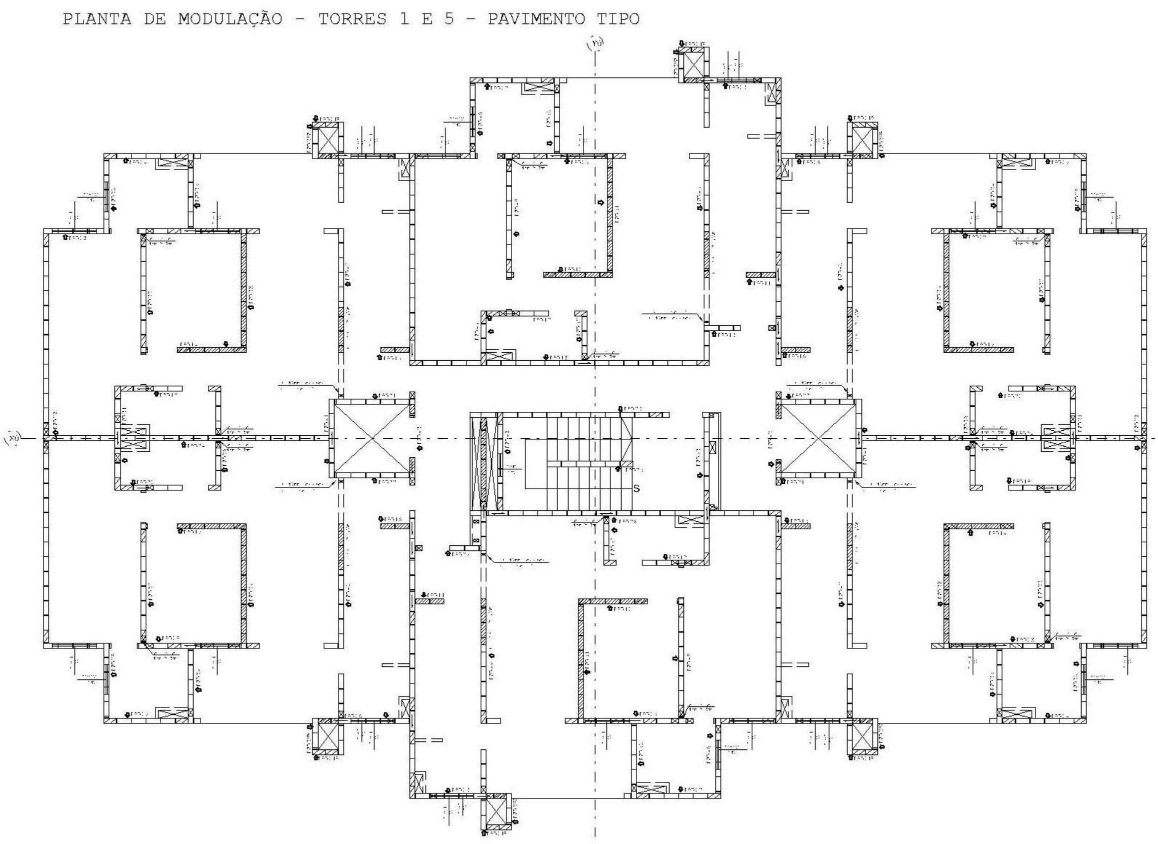
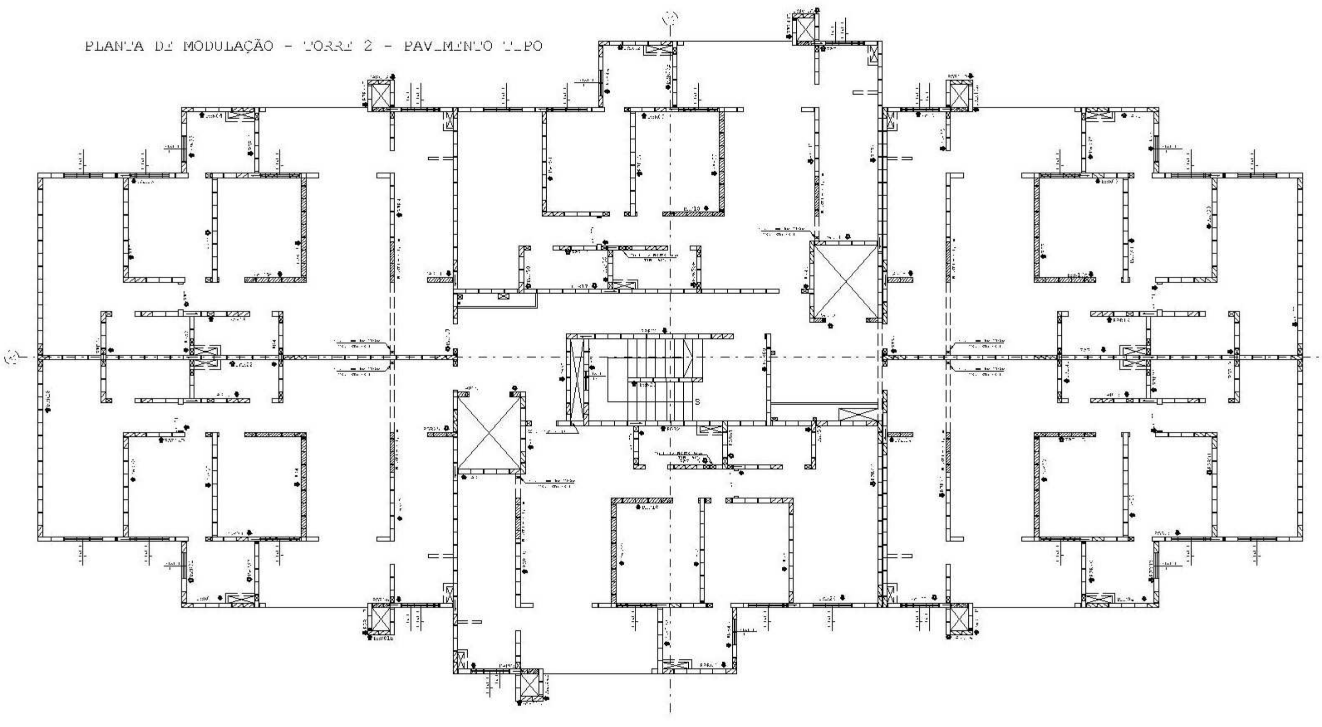
9. PAVIMENTO TIPO

Modulação do tipo será repetida em todos os andares.





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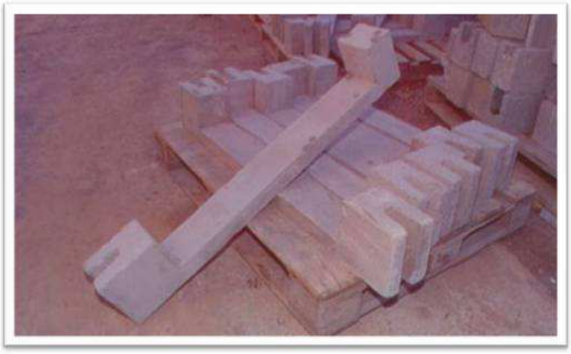
10. VERGA

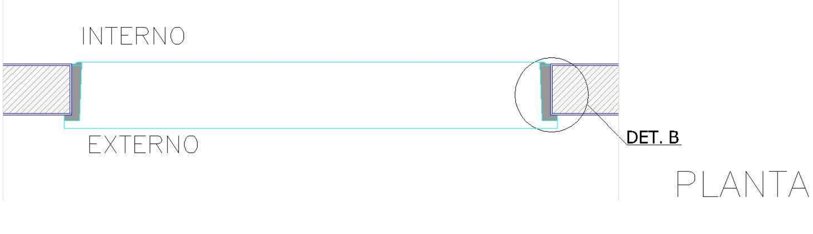
Será utilizada verga pré-moldada para compensação de medida para utilização de portas padrão de mercado.



11. CONTRA MARCO

Será utilizado contra marco pré-moldado em concreto nas torres de 01 a 05, conforme detalhe abaixo.

Os contra marcos devem ser assentados após a execução de 3 fiadas laterais, e deve ter argamassa em todo o seu requadro, enchendo-se durante a execução da alvenaria.



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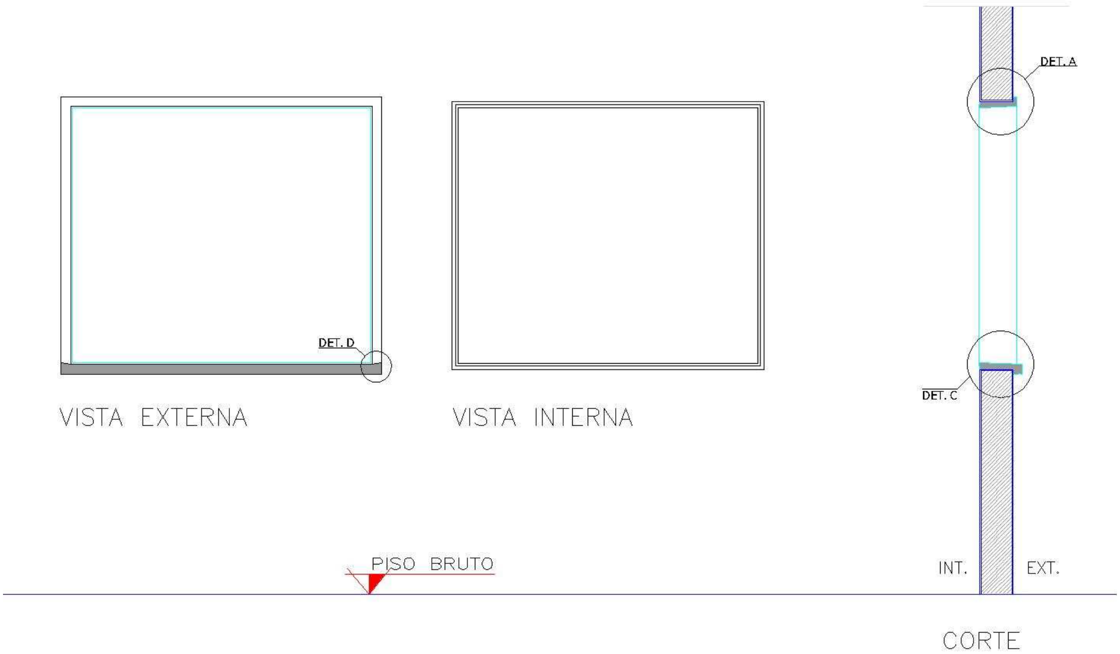

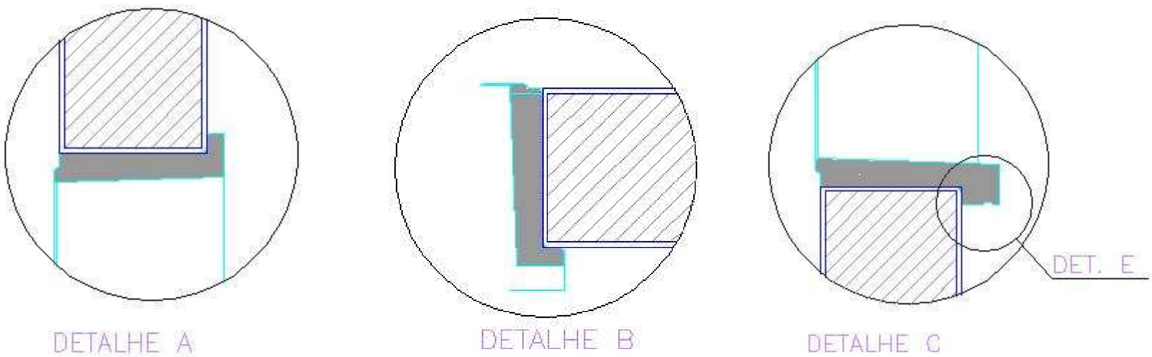

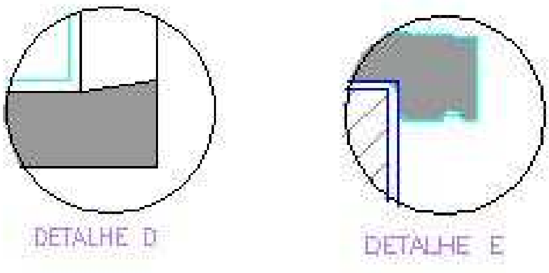

Informações sobre a fibra para produção do contramarco: Micro fibra sintética estrutural Fortaferro – 54ml da Construquimica – 3kg/m³ - concreto 25mpa.

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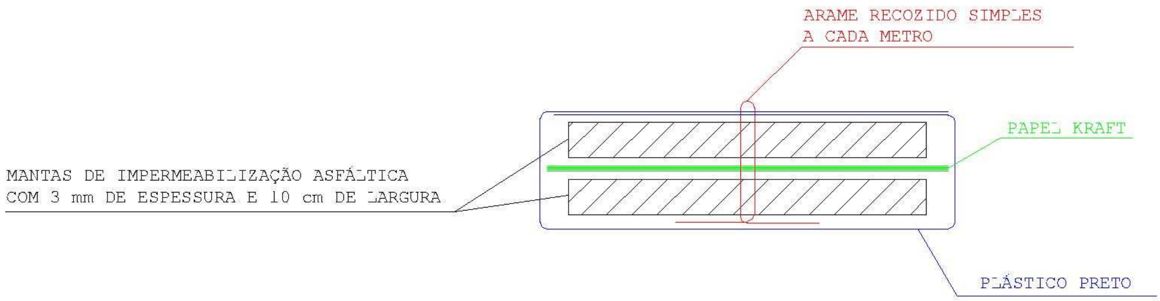
12. JUNTA DE APOIO DA LAJE DE COBERTURA

Em projeto está discriminada a utilização de Borindus na junta de apoio da laje de cobertura. Caso não seja utilizado o Borindus, segue abaixo detalhe para execução da junta de apoio da laje de cobertura do último pavimento tipo.

Essa junta deverá ser sempre centrada nas paredes que não possuem continuidade para cima.

O arame descrito no detalhe tem a função de estruturar o conjunto para que não desmorone durante a aplicação. Caso queira substituir o arame por grampo de grampeador, deve-se utilizar um grampo fino para não enrijecer demais o conjunto.

O plástico preto tem a função de impermeabilizar o conjunto. Ele pode ser substituído por plástico transparente.



Ou ainda podemos usar o viapol, conforme imagem abaixo:

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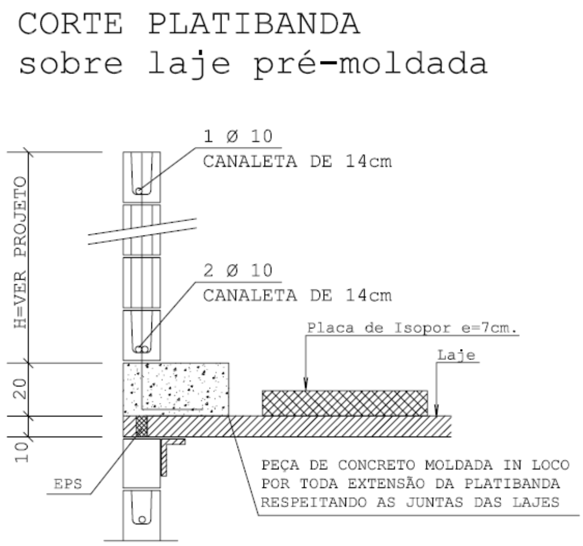
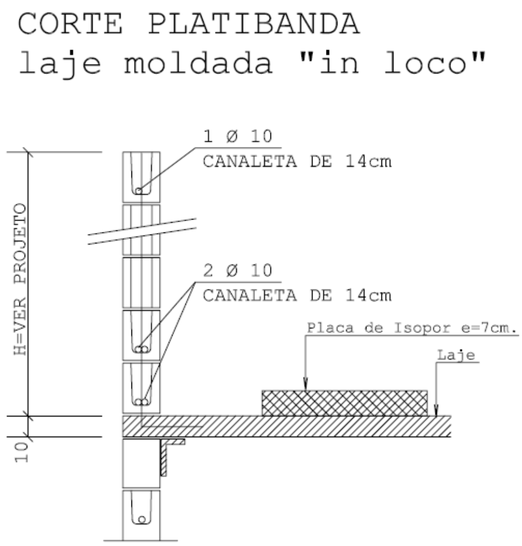
13. PLATIBANDA E LAJE DE COBERTURA

Segue abaixo detalhe para execução da armação da Platibanda. Toda a laje de cobertura deve receber tratamento térmico, com placa de isopor.





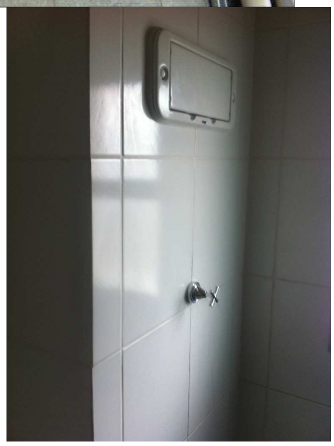
14. HIDRÁULICA

Os Shafts serão externos a alvenaria estrutural. Seu fechamento será em dry wall resistente a água (placa verde), e devera ser previsto na sua base 20cm em alvenaria com bloco de 9cm. Quando houver equipamento fixado no shaft (exemplo tanque), o fechamento deverá ser executado em alvenaria até a altura de 0,80m.

A tubulação de distribuição corre pelo teto do pavimento inferior o qual será recoberta com forro de gesso. A alimentação e esgoto da pia serão executadas externamente a parede e protegidas com carenagem.









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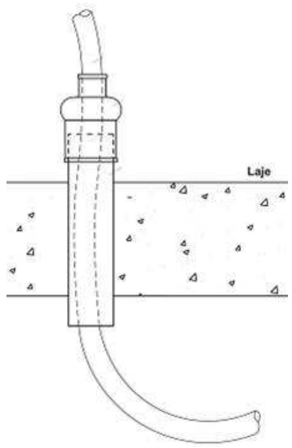
15. VEDAÇÃO DA FURAÇÃO

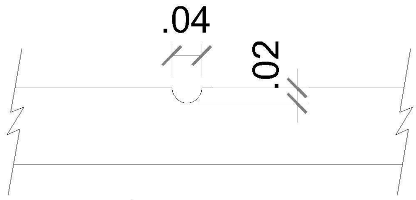
Todas as furações das lajes devem receber o devido tratamento para garantir a impermeabilização.



16. GÁS

Toda a tubulação deverá ser em cobre, PEAD ou galvanizadas, próprias para a condução de gás natural ou GLP, e deverá ser embutida no rebaixo de 2cm da laje e preenchido com argamassa conforme determinado em projeto.

Detalhe tipo do rebaixo da laje para embutimento da tubulação de gás



Corte AA

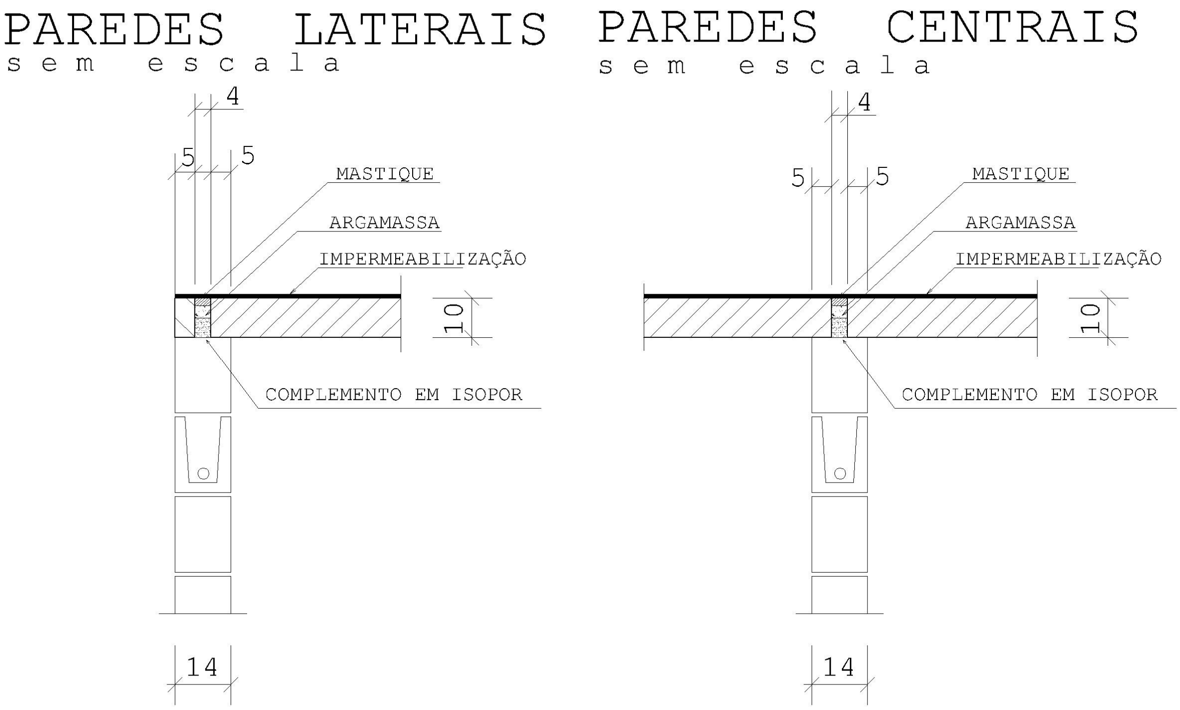
17. CAIXA D´AGUA

Será executada em fibra de vidro, apoiada em cima de um estrado de madeira de 20cm de altura que distribuido em cima da laje.

PASS ARQUITETURA E COMÉRCIO LTDA WENDLER PROJETOS ESTRUTURAIS
Rua Dom Amaury Castanho, n.º 150 – Jardim Paulista – Jundiaí-SP - CEP: 13208-270 - Fone/Fax: (11) 4583-2844

18. COBERTURA

As lajes de cobertura deverão ter todas as juntas preenchidas, conforme figuras abaixo, e serem impermeabilizadas com manta evitando a infiltração de água em caso de vazamento ou quebra de telha. Recomenda-se verificar com empresa local especializada em impermeabilização a melhor solução, devido às características da região.

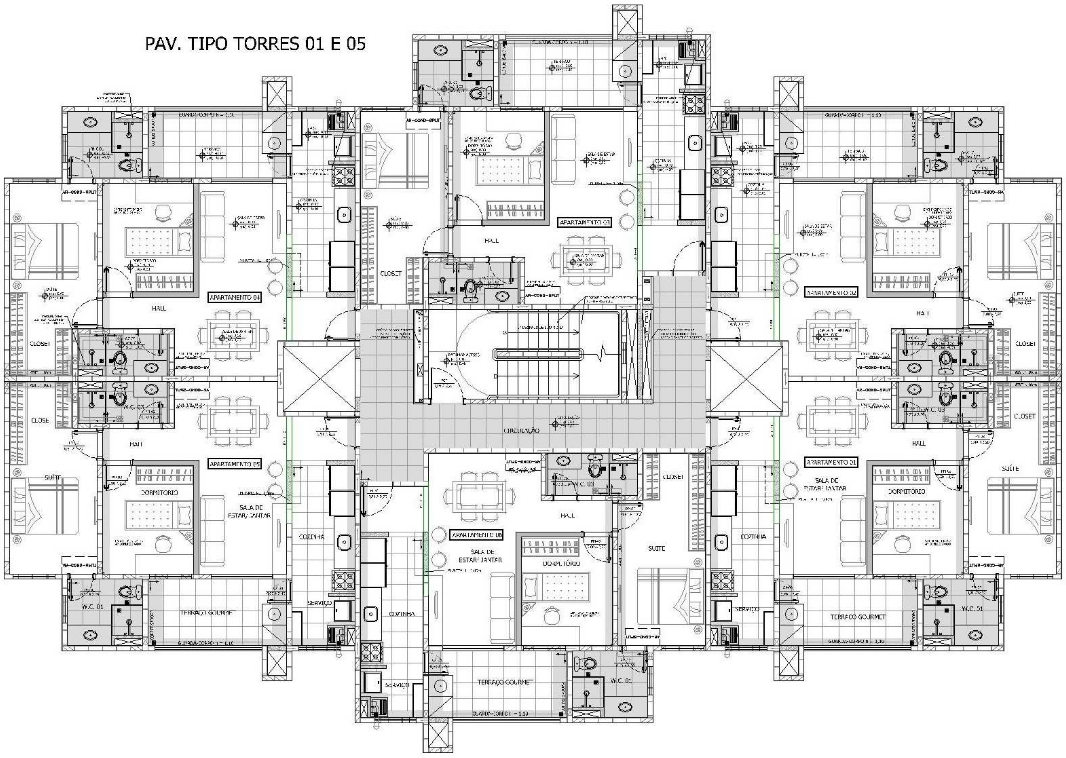


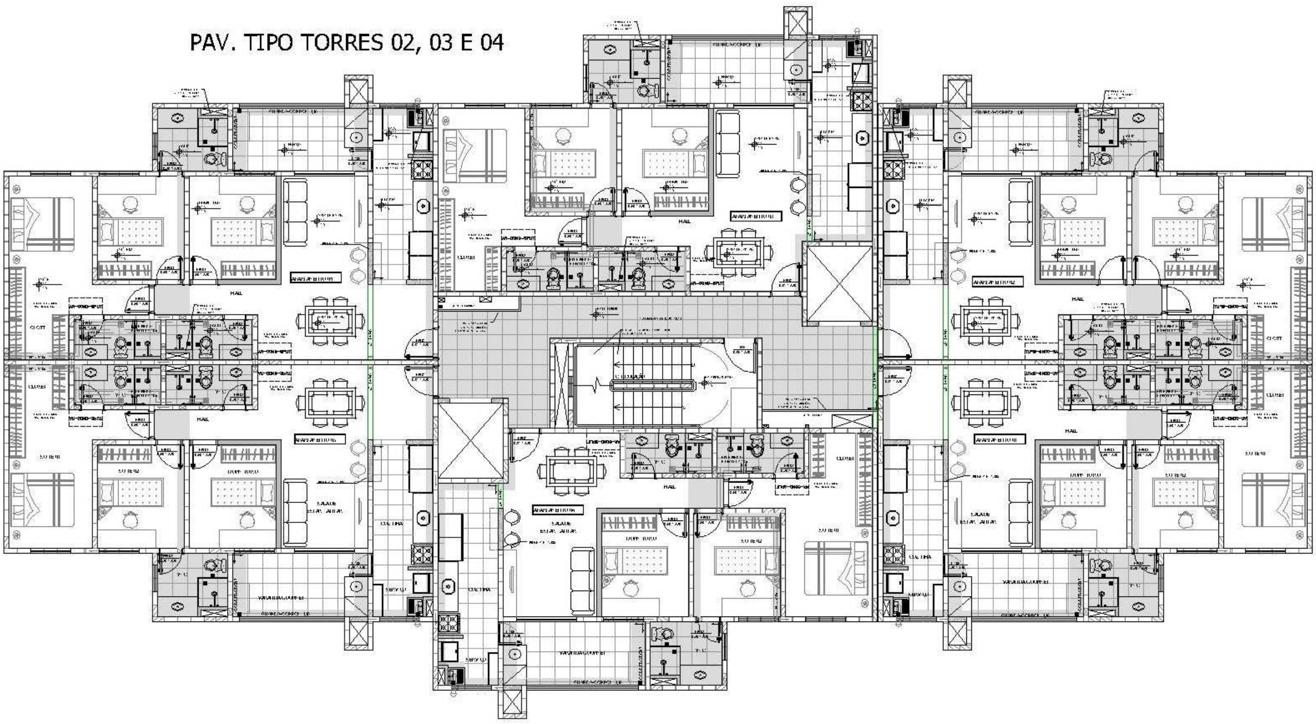
PASS ARQUITETURA E COMÉRCIO LTDA WENDLER PROJETOS ESTRUTURAIS
Rua Dom Amaury Castanho, n.º 150 – Jardim Paulista – Jundiaí-SP - CEP: 13208-270 - Fone/Fax: (11) 4583-2844

19. FORRO DE GESSO E SANCAS

Os forros de gesso e sancas serão colocados apenas nas áreas demarcadas no projeto de arquitetura, a fim de “esconder” as tubulações de banheiros, áreas de serviços e tubulações de ar condicionado.

Verificar posicionamento no projeto arquitetônico.

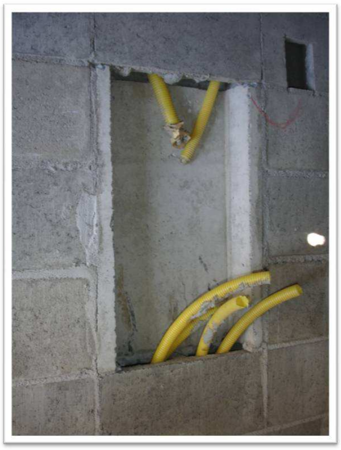




PASS ARQUITETURA E COMÉRCIO LTDA WENDLER PROJETOS ESTRUTURAIS
Rua Dom Amaury Castanho, n.º 150 – Jardim Paulista – Jundiaí-SP - CEP: 13208-270 - Fone/Fax: (11) 4583-2844

20. ELÉTRICA

A parte elétrica está prevista nos projetos de elevações das paredes e nas lajes, devendo ser executada, exatamente na medida do projeto, para que possa haver a interligação horizontal e vertical.



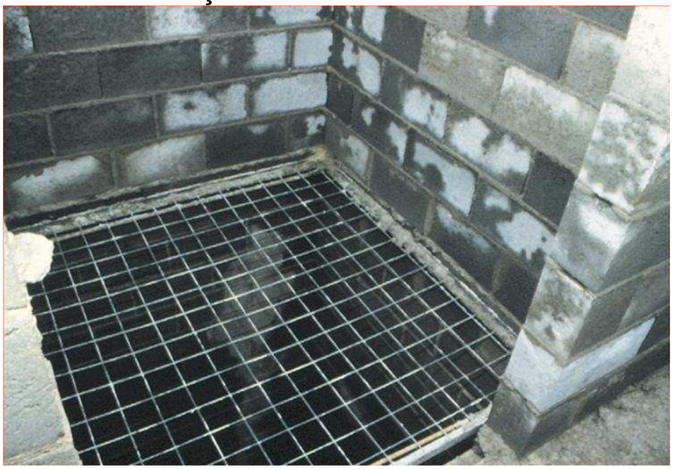
21. AR CONDICIONADO

Está previsto em projeto, o dreno para as unidades internas e ponto de energia para as unidades externas, para futura instalação por parte dos adquirentes das unidades autônomas, equipamento de ar condicionado tipo split.

22. SISTEMA DE SEGURANÇA

GUARDA CORPO


Proteção da caixa do elevador



RESUMO DOS ITENS A SEREM SEGUIDOS

CONDIÇÕES PARA INÍCIO DOS SERVIÇOS DE MARCAÇÃO

Colocação de guarda-corpo metálico e corda no perímetro
Limpeza da laje
Nível da laje (ponto crítico)
Blocos e argamassa no pavimento
Projeto 1ª fiada pronto
Equipamentos instalados
Escoramentos de lajes (somente na cobertura)
Escada de acesso executada
Ensaios de Resistência a Compressão (Prismas, blocos, argamassa)
Ensaios de Aderência (Prisma)

CONDIÇÕES PARA INÍCIO DOS SERVIÇOS DE ELEVAÇÃO (marcação pronta)

Limpeza da laje
Nível 1ª fiada
Espessura 1ª junta horizontal
Dimensões dos cômodos
Prumo dos cantos externos
Esquadro / Alinhamento
Espessuras das juntas verticais

Pontos de Instalação Elétrica
Demarcação de vãos (portas e shafts)
Blocos soltos 1ª fiada
Colocação dos escantilhões

FICHAS DE CONTROLE DE EXECUÇÃO

MARCAÇÃO DA ALVENARIA ESTRUTURAL

Limpeza da laje
Nível da laje (pontos de referências)
Prumo e nível dos cantos externos
Esquadro e fechamento das medidas
Complementação 1ª fiada
Junta seca vertical
Junta horizontal
Nível 1ª fiada
Posição dos pontos de instalações
Argamassa de assentamento do escantilhão
Argamassa de assentamento dos blocos
Nível e prumo dos escantilhões
Rebarbas de massa
Operação com os equipamentos
Manuseio dos materiais
Terminalidade

ELEVAÇÃO DA ALVENARIA ESTRUTURAL

Excessos de argamassa
Espessura / Nível das juntas verticais
Pontos de graute
Instalações das áreas grauteadas
Instalações em geral
Colocação batentes (sentido abertura)
Vergas
Escada
Nível das paredes
Prumo das paredes
Amarração das paredes / interpenetração entre paredes
Nível do respaldo
Operação dos equipamentos
Manuseio dos materiais
Segurança no trabalho
Terminalidade

OBSERVAÇÕES

Todas as fotos e/ou imagens deste documento são ilustrativas. Deverão ser seguidos os projetos na íntegra.

Este documento não pode ser repassado a terceiros. Direitos autorais reservados a **Pass Arquitetura e a Wendler Projetos**, não sendo permitida cópia, mesmo que parcial ou reutilização deste documento a qualquer tempo.

BIBLIOGRAFIA DE REFERÊNCIA

NBR 6136 – Blocos Vazados de Concreto Simples para Alvenaria Estrutural

NBR 8798 – Execução e Controle de Obras em Alvenaria Estrutural de Blocos Vazados de Concreto

NBR 12117 – Blocos Vazados de Concreto para Alvenaria – Retração por secagem

NBR 7184 – Blocos Vazados de Concreto Simples para Alvenaria – Determinação da resistência à compressão

NBR 12118 – Blocos Vazados de Concreto Simples para Alvenaria – Determinação da absorção de água, teor de umidade e área liquida

NBR 15961-1 – Alvenaria Estrutural – Blocos de Concreto Parte 1: Projeto

NBR 15961-2 – Alvenaria Estrutural – Blocos de Concreto Parte 2: Execução e Controle de Obras

Revista Prisma – Soluções Construtivas com Blocos de Concreto: Artigos Técnicos

Práticas Recomendadas – Alvenaria Estrutural – Associação Brasileira de Cimento Portland

Alvenaria Estrutural com Blocos de Concreto – Caderno do Instrutor – ABCP

QUADRO DE ÁREAS			
ÁREA DO TERRENO			14.000,00
APROVEITAMENTO MÁXIMO (4x)			56.000,00
DESCRIÇÃO	ÁREA (m²)	QUANTIDADE	TOTAL (m²)
PORTARIA	99,74	1	97,79
CHURRASQUEIRA SIMPLES	35,40	3	106,20
CLUBE	200,00	1	200,00
SALÃO DE FESTAS	320,00	1	320,00
TORRES 01, 02 E 04			
PAVIMENTO TÉRREO			
APARTAMENTO 01	78,96	3	236,88
APARTAMENTO 02	78,96	3	236,88
APARTAMENTO 03	80,06	3	240,18
APARTAMENTO 04	78,96	3	236,88
APARTAMENTO 05	78,96	3	236,88
CAIXA DE ESCADA	15,71	3	47,13
CIRCULAÇÃO	35,30	3	105,90
RECEPÇÃO	29,51	3	88,53
W.C. SOCIAL	4,24	3	12,72
SALA DE PRESSURIZAÇÃO	17,20	3	51,60
BRINQUEDOTECA	15,80	3	47,40
TERRAÇO COBERTO	7,35	3	22,05
PAVIMENTO TIPO (18X)			
APARTAMENTO 01	78,96	54	4.263,84
APARTAMENTO 02	78,96	54	4.263,84
APARTAMENTO 03	80,06	54	4.323,24
APARTAMENTO 04	78,96	54	4.263,84
APARTAMENTO 05	78,96	54	4.263,84
APARTAMENTO 06	80,06	54	4.323,24
CAIXA DE ESCADA	15,71	54	848,34
CIRCULAÇÃO	32,31	54	1.744,74
BARRILETE / CASA DE MÁQUINAS			
CAIXA DE ESCADA	15,71	3	47,13
BARRILETE / CASA DE MÁQUINAS	59,49	3	178,47
CAIXA D´ÁGUA			
CAIXA D´ÁGUA	75,20	3	225,60
TORRES 03, 05 E 06			
PAVIMENTO TÉRREO			
APARTAMENTO 01	69,63	3	208,89
APARTAMENTO 02	69,63	3	208,89
APARTAMENTO 03	70,46	3	211,38
APARTAMENTO 04	69,63	3	208,89
APARTAMENTO 05	69,63	3	208,89
RECEPÇÃO	29,79	3	89,37
SALA DE PRESSURIZAÇÃO	21,50	3	64,50
W.C. SOCIAL	8,36	3	25,08
CIRCULAÇÃO	29,43	3	88,29
CAIXA DE ESCADA	15,71	3	47,13
TERRAÇO COBERTO	4,41	3	13,23
PAVIMENTO TIPO (17X)			
APARTAMENTO 01	69,63	51	3.551,13
APARTAMENTO 02	69,63	51	3.551,13
APARTAMENTO 03	70,46	51	3.593,46
APARTAMENTO 04	69,63	51	3.551,13
APARTAMENTO 05	69,63	51	3.551,13
APARTAMENTO 06	70,46	51	3.593,46
CIRCULAÇÃO	24,41	51	1.244,91
CAIXA DE ESCADA	15,71	51	801,21
BARRILETE / CASA DE MÁQUINAS			
CAIXA DE ESCADA	15,71	1	15,71
BARRILETE / CASA DE MÁQUINAS	49,48	1	49,48
CAIXA D´ÁGUA			
CAIXA D´ÁGUA	65,19	1	65,19
SUBSOLO 01	11.123,52	1	11.123,52
SUBSOLO 02	11.123,52	1	11.123,52
SUBSOLO 03	6.768,98	1	8.968,53
TOTAL ÁREA DE LAZER			673,60
TOTAL ÁREA COMUM			5.974,10
TOTAL ÁREA PRIVATIVA			49.327,92
TOTAL APROVEITAMENTO			55.277,94
TOTAL CONSTRUÇÃO			87.191,19
PISCINA	173,81	1	173,81

IMPLANTAÇÃO GERAL
ESC: 1/200

TOTAL VAGAS DE VISITANTES 43
29 VAGAS MÉDIAS
14 VAGAS GRANDES

TOTAL VAGAS MORADORES 1322
645 VAGAS MÉDIAS
677 VAGAS GRANDES

SITUAÇÃO SEM ESCALA

A responsabilidade pelo atendimento às exigências do Código Sanitário e Código de Obras vigente, é do autor do projeto, responsável técnico e proprietário do imóvel.

Observação: Este projeto foi elaborado com base nas medidas do terreno constantes no título público de propriedade do terreno.

QUADRO DE INFORMAÇÕES

AMBIENTE OU LOCAL ESPECÍFICO	DESCRIÇÃO				
	Pé Direito	B. Imperm. Pintura	Forro	Cobertura	Piso
Sala Estar	2,80	Pintura Latéx acrílico	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Sala Jantar					
Dormitórios					
Var./Sacada		Latéx acrílico e na parede hidráulica azulejo			
Cozinha		Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo			
Banheiros		Azulejo em tudo			
A. Serviços		Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo			
Capacidade da Caixa d'água = 900.000 litros					
Altura mínima de passagem no vão da escada = 2,00m					

PROJETO SIMPLIFICADO

FOLHA 01/07

ASSUNTO Construção de Conjunto Residencial Multifamiliar

LOCAL Rua SD. João Carlos de Oliveira Junior e esquida para Rua Pérsio Sampaio filho
Bairro: Santa Cruz - Indaiatuba - SP

PROP. JEAF INCORPORADORA PARTICIPACOES E EMPREENDIMENTOS IMOBILIARIOS LTDA.

ESCALAS Indicadas ZONA ZPR 1

Nº CADASTRO CAT. USO R2

INSCRIÇÃO CADASTRAL

SITUAÇÃO SEM ESCALA

VER ACIMA

ÁREAS (m²)

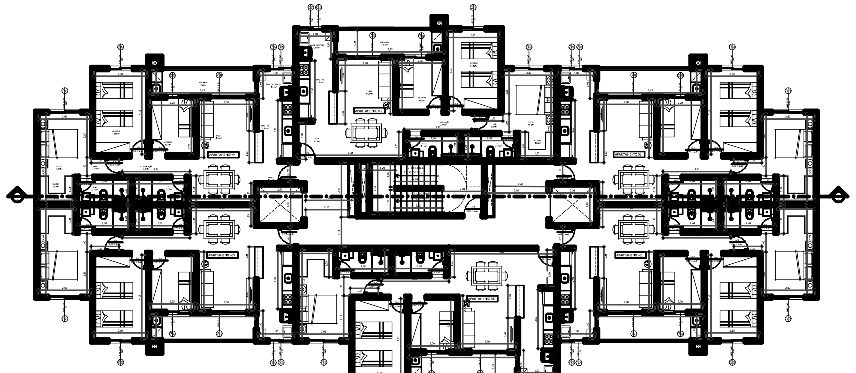
VER AO LADO

Declaro que a aprovação do projeto não implica no reconhecimento por parte da Prefeitura no direito de propriedade do terreno.
Declaro ser de responsabilidade do proprietário e do responsável tecnico o atendimento das normas de acessibilidade para portadores de deficiência ou com mobilidade reduzida conforme legislação vigente.

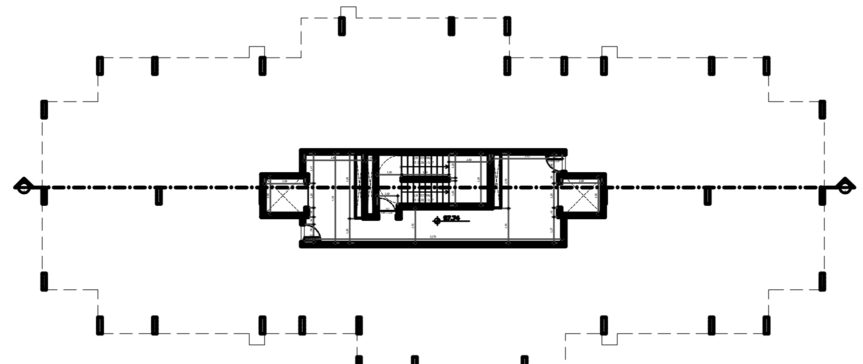
Proprietário
JEAF INCORPORADORA PARTICIPACOES E EMPREEDIMENTOS IMOBILIARIOS LTDA.
JOSUE ERALDO DA SILVA
RG: 19.707.348-7
CPF: 082.003.288-30

NIVALDO CALLEGARI
ARQUITETO
CAU nº 22235-6
INSC. MUN. nº
RRT. nº 182528
AUTOR DO PROJETO

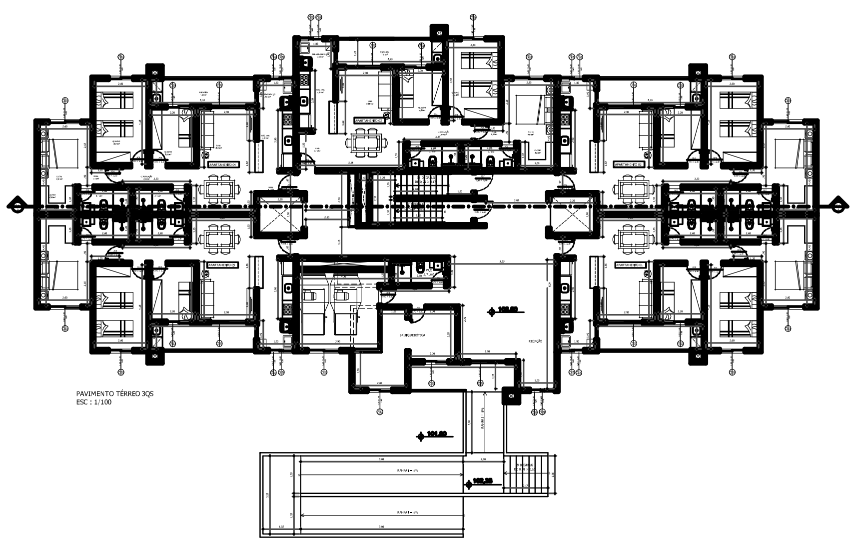
TORRES 01, 02 E 04



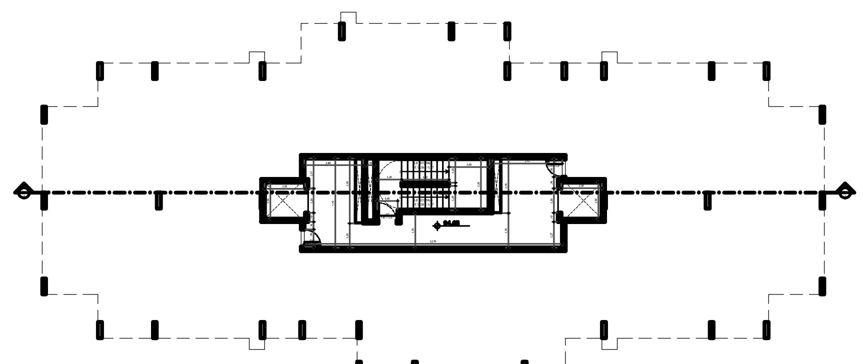
PAVIMENTO TIPO 3QS (18X)
ESC.: 1/100



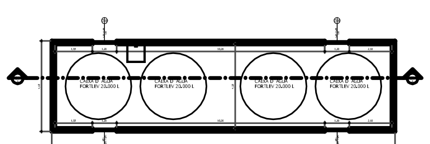
SUB SOLO 01
ESC.: 1/100



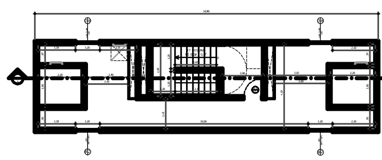
PAVIMENTO TÉRREO 3QS
ESC.: 1/100



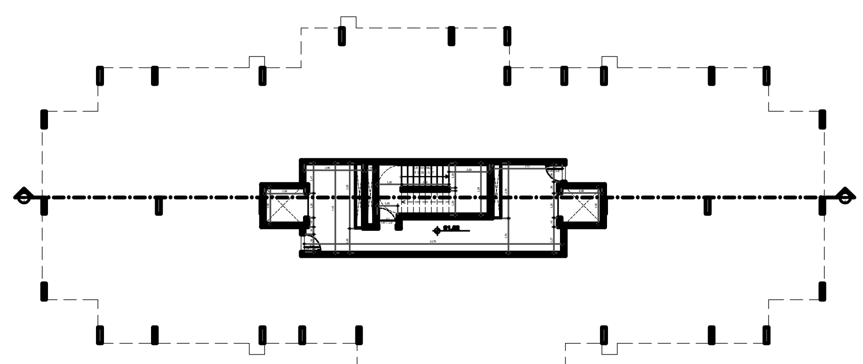
SUB SOLO 02
ESC.: 1/100



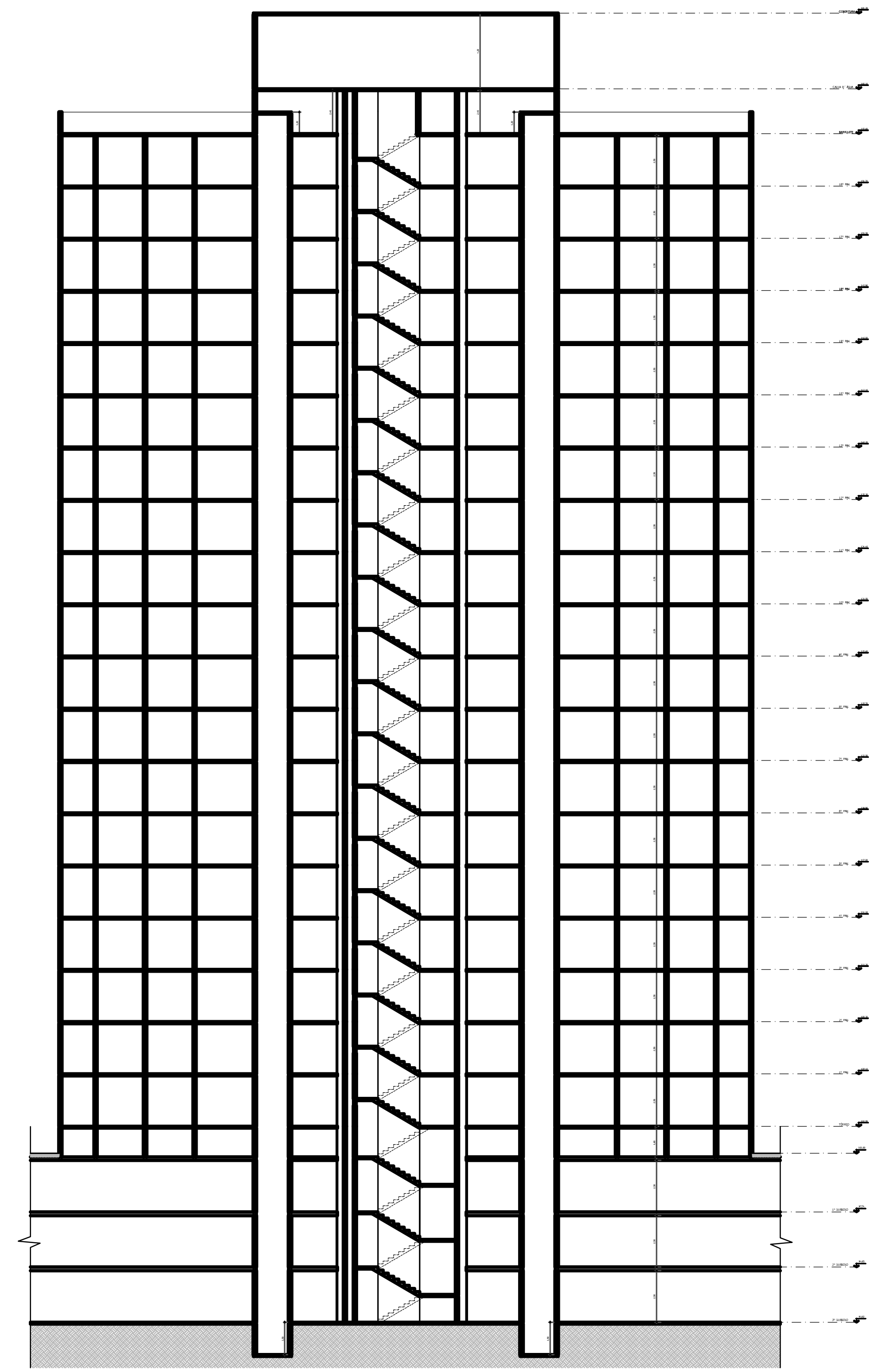
CAIXA D´ ÁGUA
ESC. 1/100



BARRILETE / CASA DE MÁQUINAS TORRES 01 E 05
ESC. 1/100



SUB SOLO 03
ESC.: 1/100



CORTE ESQUEMÁTICO_AA 3QS
ESC. 1/100

ABERTURAS

COD.	LARG.	ALT.	PEIT.
CA01	0,80	1,00	1,40
CA02	1,60	1,40	1,00
CA03	1,20	1,40	1,00
CA04	1,20	1,40	1,00
CA05	0,20	0,20	0,20
CA06	1,20	1,00	1,00
CA07	2,00	1,00	1,60
P01	2,00	2,40	
P02	0,86	2,20	
P03	0,70	2,20	
P04	0,80	2,20	
PCF	0,90	2,20	

A responsabilidade pelo atendimento às exigências do Código Sanitário e Código de Obras vigente, é do autor do projeto, responsável técnico e proprietário do imóvel.

Observação: Este projeto foi elaborado com base nas medidas do terreno constantes no título público de propriedade do terreno.

QUADRO DE INFORMAÇÕES

AMBIENTE OU LOCAL ESPECÍFICO	DESCRIÇÃO: Pé Direito	B. Imperm. Pintura	Forro	Cobertura	Piso
Sala Estar	2,80	Pintura Latéx acrílico	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeablizada	Cerâmico
Sala Jantar					
Dormitórios					
Var./Sacada		Latéx acrílico e na parede hidráulica azulejo			
Cozinha		Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo			
Banheiros		Azulejo em tudo			
A. Serviços		Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo			

Capacidade da Caixa d'água = 900.000 litros

Altura mínima de passagem no vão da escada = 2,00m

PROJETO SIMPLIFICADO

FOLHA 06/07

ASSUNTO Construção de Conjunto Residencial Multifamiliar

LOCAL Rua SD. João Carlos de Oliveira Junior e esquida para Rua Pérsio Sampaio filho
Bairro: Santa Cruz - Indaiatuba - SP

PROP. JEAF INCORPORADORA PARTICIPACOES E EMPREENDIMENTOS IMOBILIARIOS LTDA.

ESCALAS Indicadas

ZONA ZPR 1

Nº CADASTRO

CAT. USO R2

INSCRIÇÃO CADASTRAL

SITUAÇÃO SEM ESCALA

VER FOLHA 01/07

ÁREAS (m²)

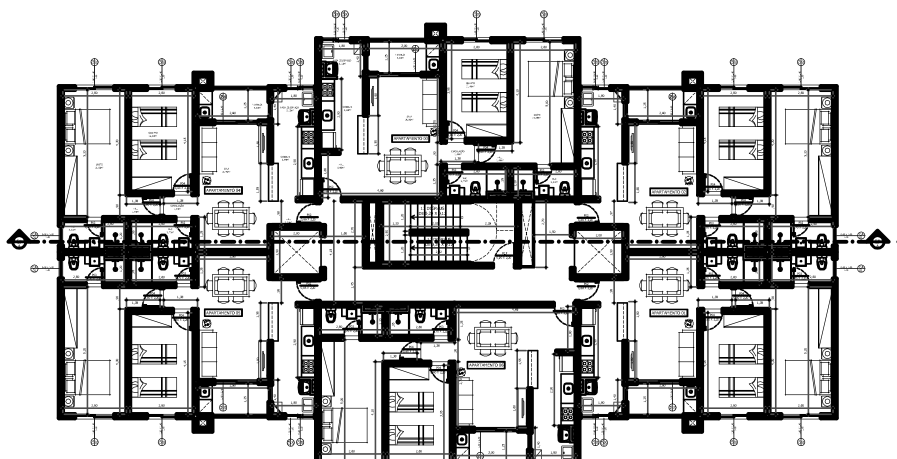
VER FOLHA 01/07

Declaro que a aprovação do projeto não implica no reconhecimento por parte da Prefeitura no direito de propriedade do terreno.
Declaro ser de responsabilidade do proprietário e do responsável tecnico o atendimento das normas de acessibilidade para portadores de deficiência ou com mobilidade reduzida conforme legislação vigente.

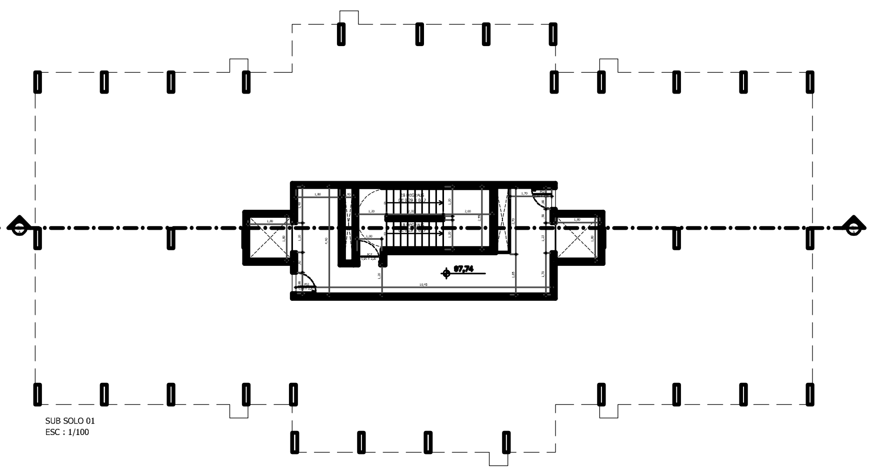
Proprietário
JEAF INCORPORADORA PARTICIPACOES E EMPREEDIMENTOS IMOBILIARIOS LTDA.
JOSUE ERALDO DA SILVA
RG: 19.707.348-7
CPF: 082.003.288-30

NIVALDO CALLEGARI
ARQUITETO
CAU nº 22235-6
INSC. MUN. nº
RRT. nº 182528
AUTOR DO PROJETO

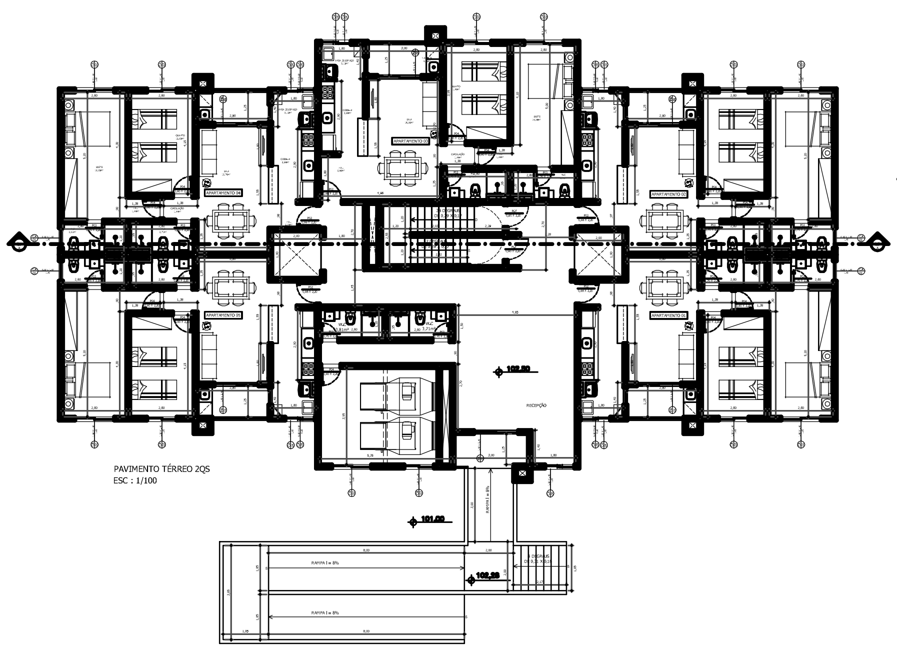
TORRES 03, 05 E 06



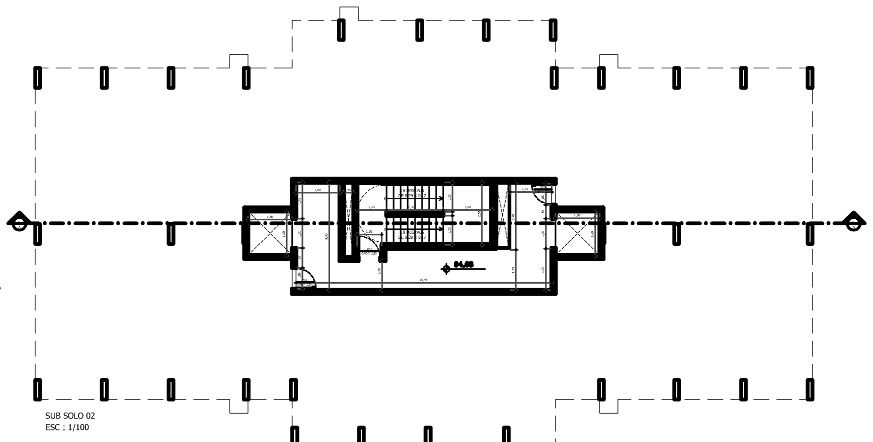
PAVIMENTO TIPO 2QS (17X)
ESC : 1/100



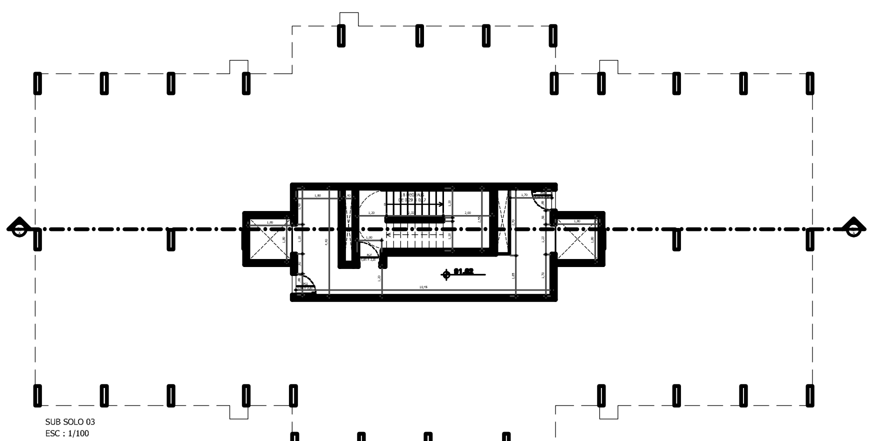
SUB SOLO 01
ESC : 1/100



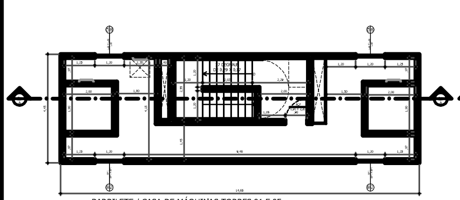
PAVIMENTO TÉRREO 2QS
ESC : 1/100



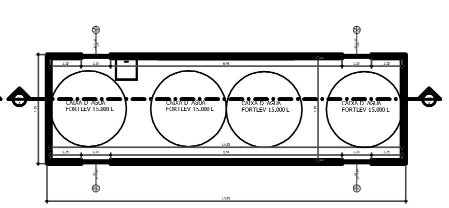
SUB SOLO 02
ESC : 1/100



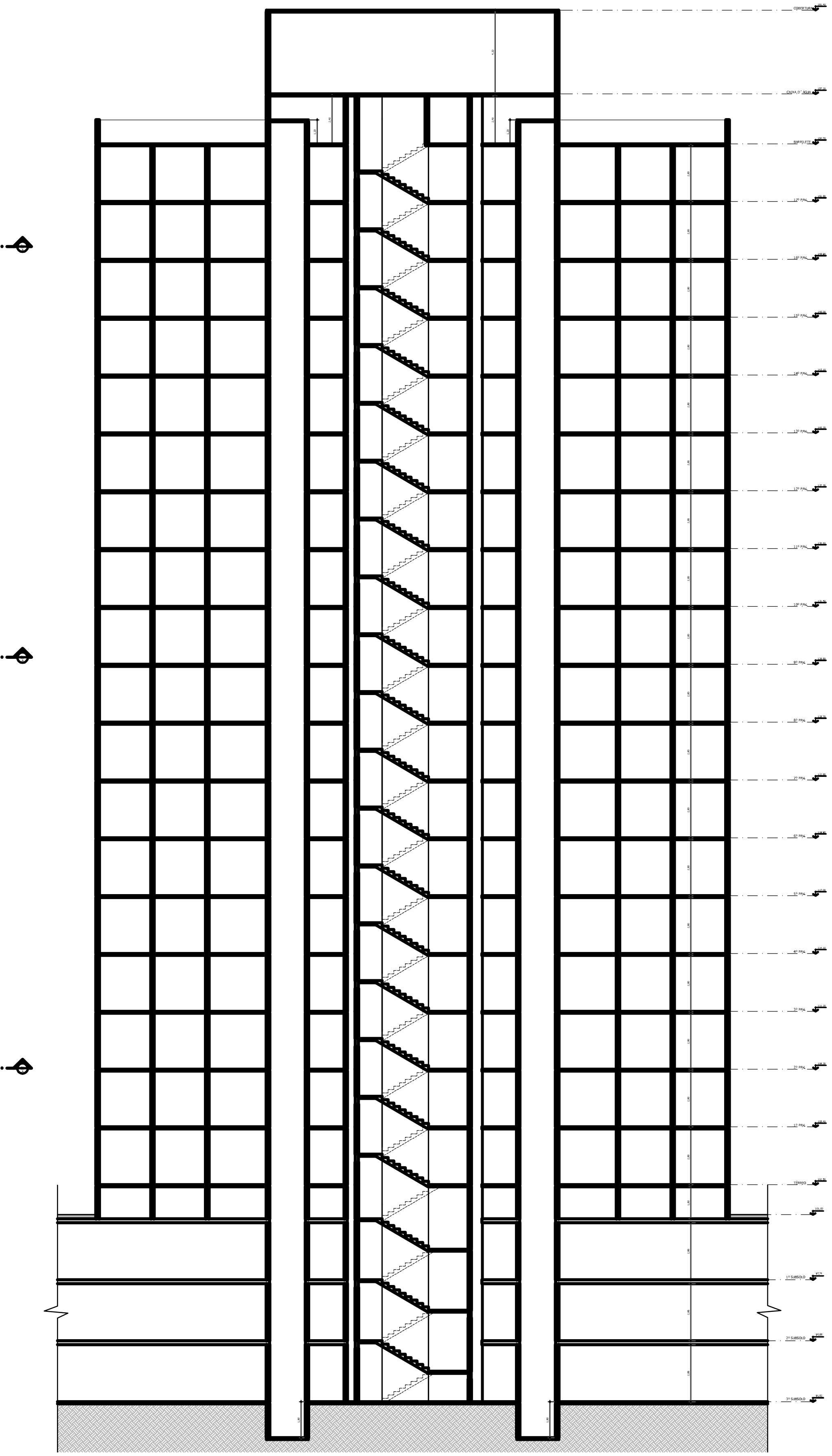
SUB SOLO 03
ESC : 1/100



BARRILETE / CASA DE MÁQUINAS TORRES 01 E 05
ESC. 1:100



CAIXA D´ ÁGUA
ESC. 1:100



CORTE ESQUEMÁTICO_AA 2QS
ESC. 1:150

ABERTURAS

COD.	LARG.	ALT.	PEIT.
CA01	0,80	1,00	1,40
CA02	1,60	1,40	1,00
CA03	1,20	1,40	1,00
CA04	1,20	1,40	1,00
CA05	0,20	0,20	0,20
CA06	1,20	1,00	1,00
CA07	2,00	1,00	1,60
P01	2,00	2,40	
P02	0,86	2,20	
P03	0,70	2,20	
P04	0,80	2,20	
PCF	0,90	2,20	

A responsabilidade pelo atendimento às exigências do Código Sanitário e Código de Obras vigente, é do autor do projeto, responsável técnico e proprietário do imóvel.

Observação: Este projeto foi elaborado com base nas medidas do terreno constantes no título público de propriedade do terreno.

QUADRO DE INFORMAÇÕES

AMBIENTE OU LOCAL ESPECÍFICO	DESCRIÇÃO				
	Pé Direito	B. Imperm. Pintura	Forro	Cobertura	Piso
Sala Estar	2,80	Pintura Latéx acrílico	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Sala Jantar	2,80	Pintura Latéx acrílico	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Dormitórios	2,80	Pintura Latéx acrílico	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Var./Sacada	2,80	Latéx acrílico e na parede hidráulica azulejo	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Cozinha	2,80	Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Banheiros	2,80	Azulejo em tudo	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
A. Serviços	2,80	Argamassa ou gesso liso com pintura latex acrílico e na parede hidráulica azulejo	Laje pré fabricada e/ou gesso	Telhas metálicas e/ou fibrocimento sobre estrutura de madeira, ou laje impermeabilizada	Cerâmico
Capacidade da Caixa d'água = 900.000 litros					
Altura mínima de passagem no vão da escada = 2,00m					

PROJETO SIMPLIFICADO

FOLHA 05/07

ASSUNTO Construção de Conjunto Residencial Multifamiliar

LOCAL Rua SD. João Carlos de Oliveira Junior e esquida para Rua Pérsio Sampaio filho
Bairro: Santa Cruz - Indaiatuba - SP

PROP. JEAF INCORPORADORA PARTICIPACOES E EMPREENDIMENTOS IMOBILIARIOS LTDA.

ESCALAS Indicadas — ZONA ZPR 1

Nº CADASTRO — CAT. USO R2

INSCRIÇÃO CADASTRAL

SITUAÇÃO SEM ESCALA

VER FOLHA 01/07

Declaro que a aprovação do projeto não implica no reconhecimento por parte da Prefeitura no direito de propriedade do terreno.
Declaro ser de responsabilidade do proprietário e do responsável tecnico o atendimento das normas de acessibilidade para portadores de deficiência ou com mobilidade reduzida conforme legislação vigente.

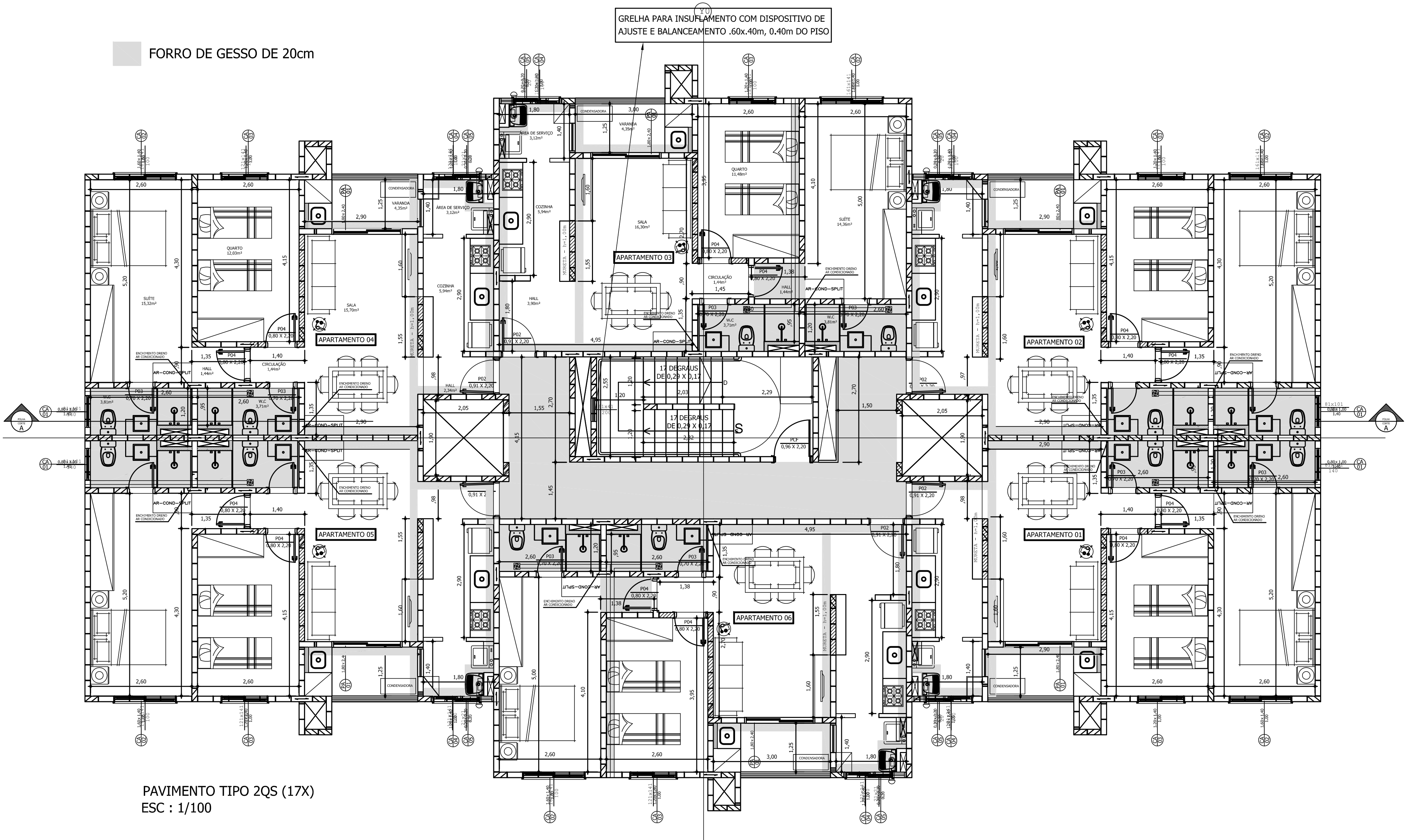
Proprietário
JEAF INCORPORADORA PARTICIPACOES E EMPREEDIMENTOS IMOBILIARIOS LTDA.
JOSUE ERALDO DA SILVA
RG: 19.707.348-7
CPF: 082.003.288-30

ÁREAS (m²)

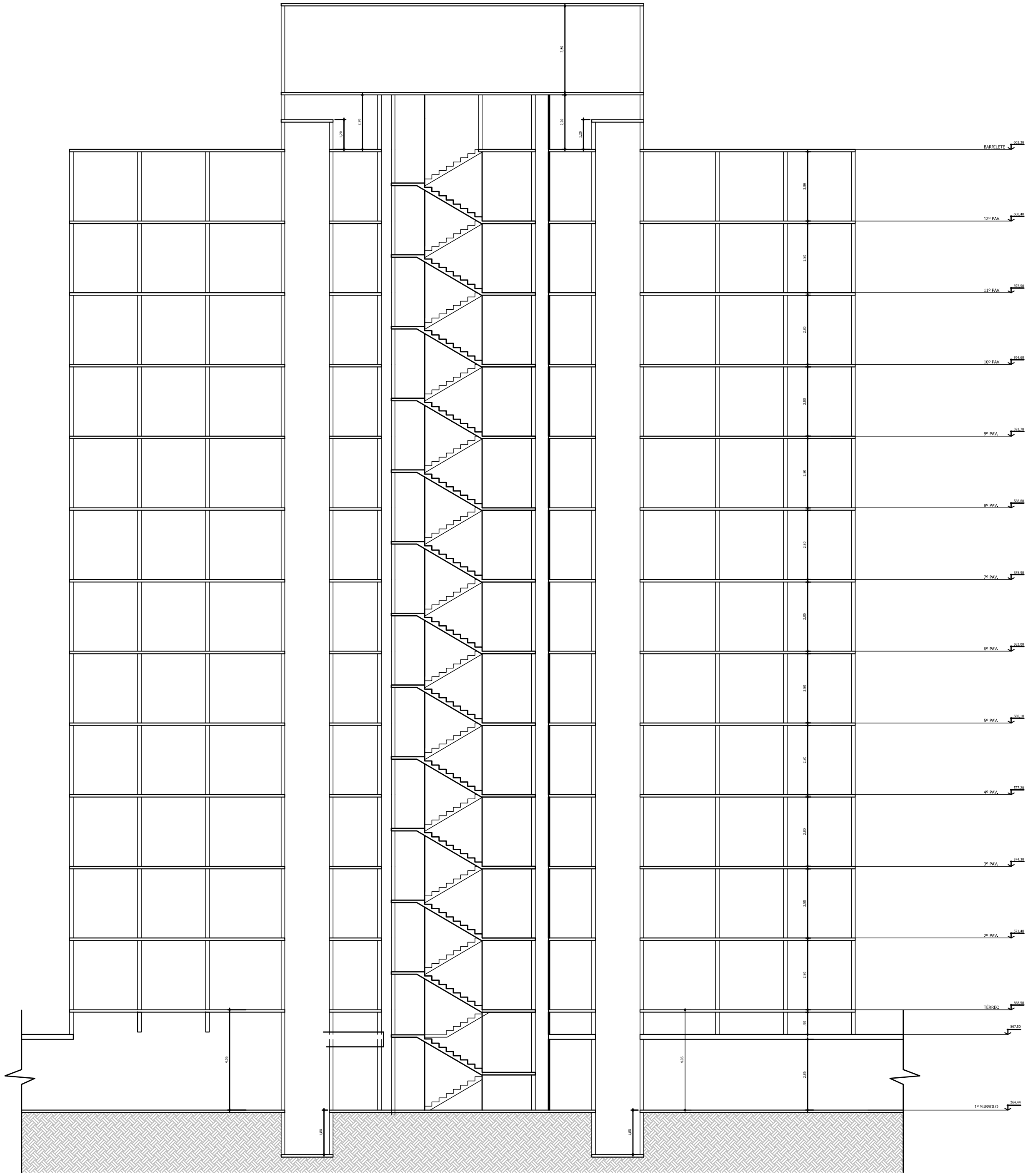
VER FOLHA 01/07

NIVALDO CALLEGARI
ARQUITETO
CAU nº 22235-6
INSC. MUN. nº
RRT. nº 182528
AUTOR DO PROJETO

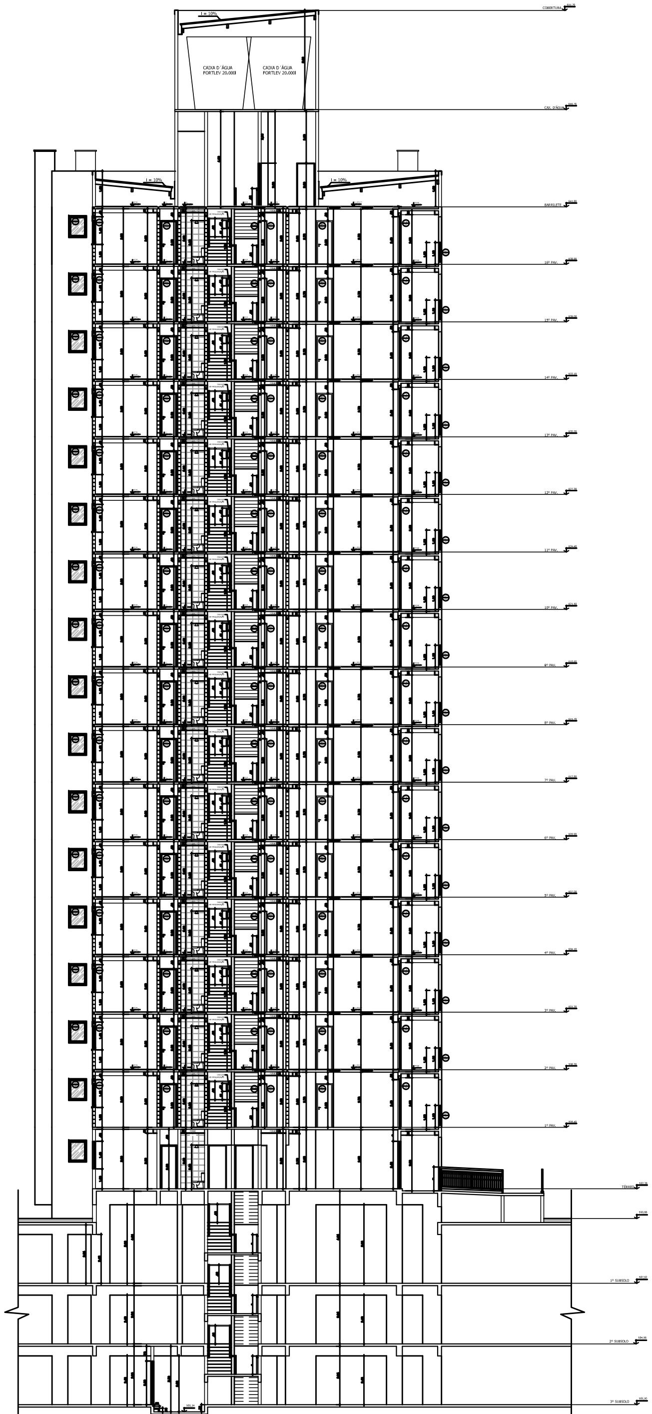
FORRO DE GESSO DE 20cm



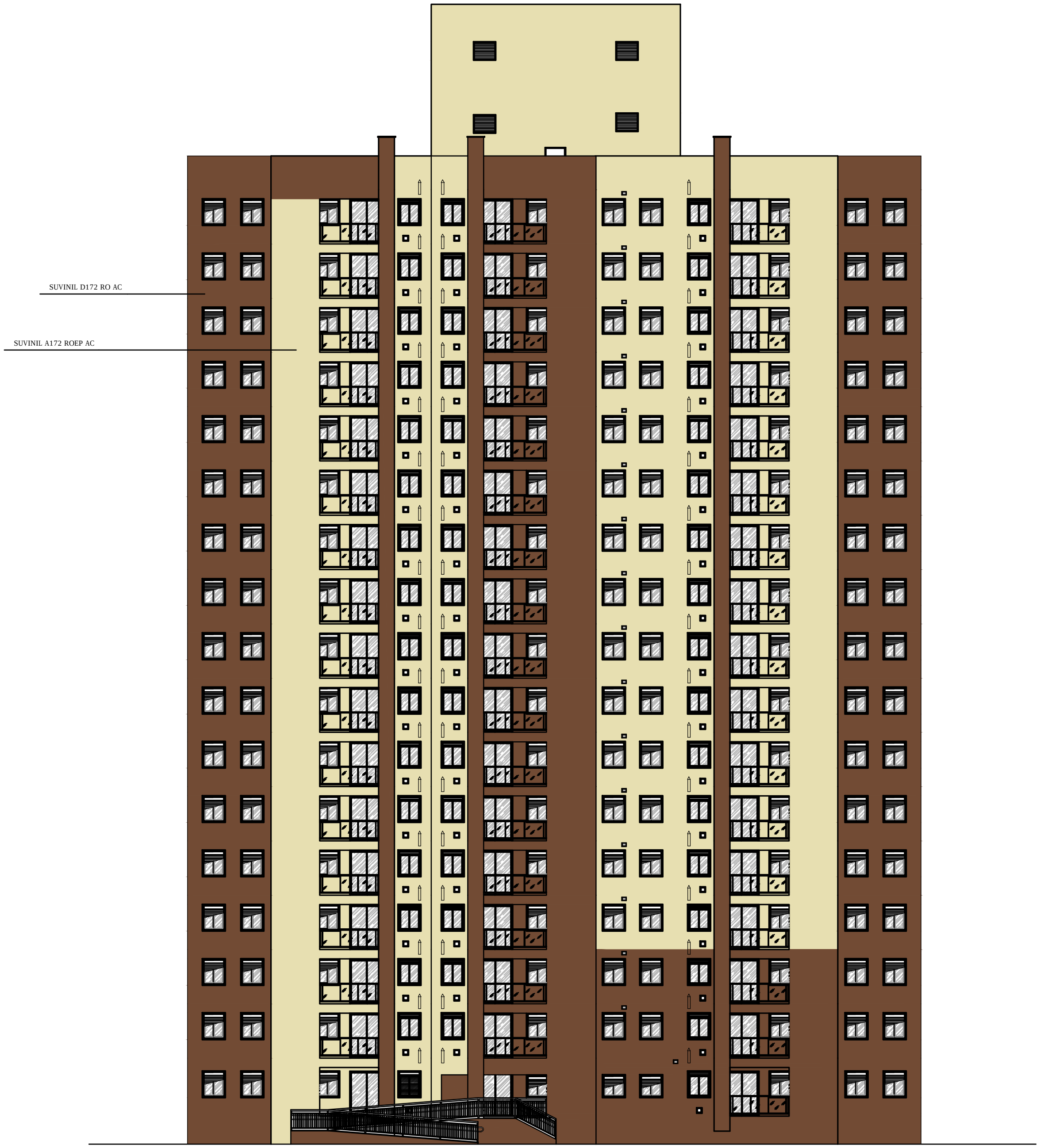
PAVIMENTO TIPO 2QS (17X)
ESC : 1/100



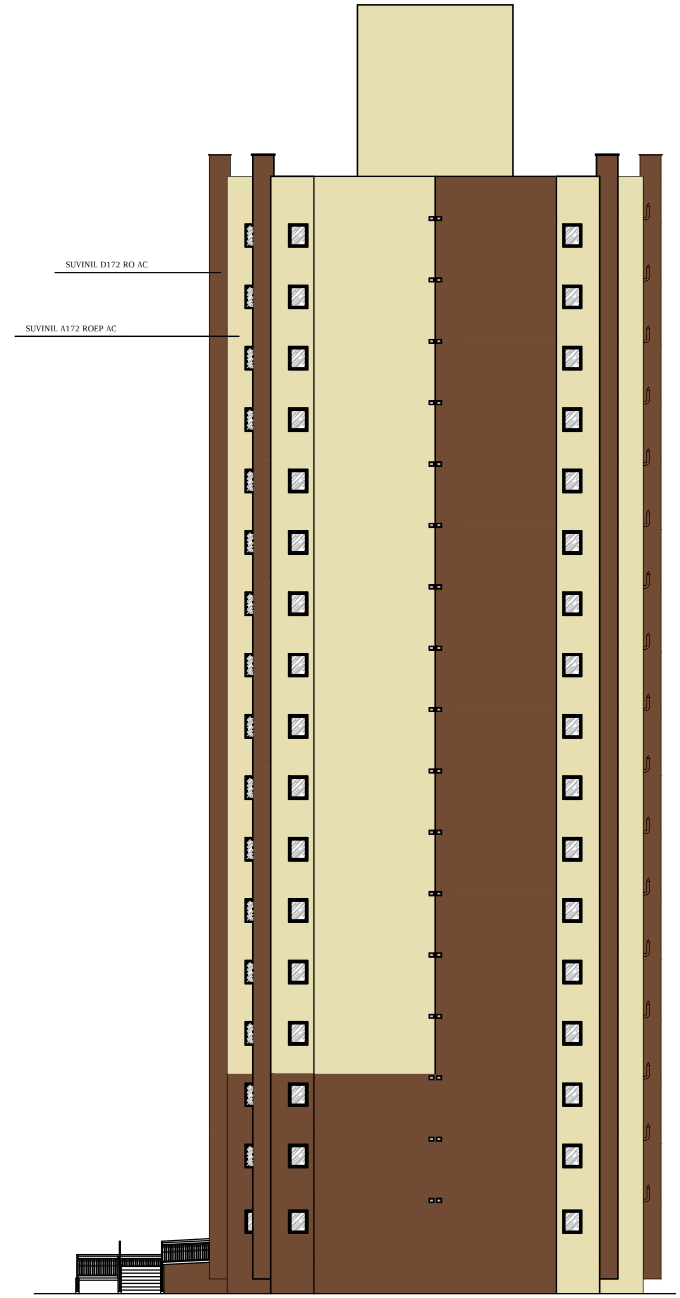
CORTE AA 2QS
ESC. 1:150



CORTE BB TORRE 03
ESC. 1:100

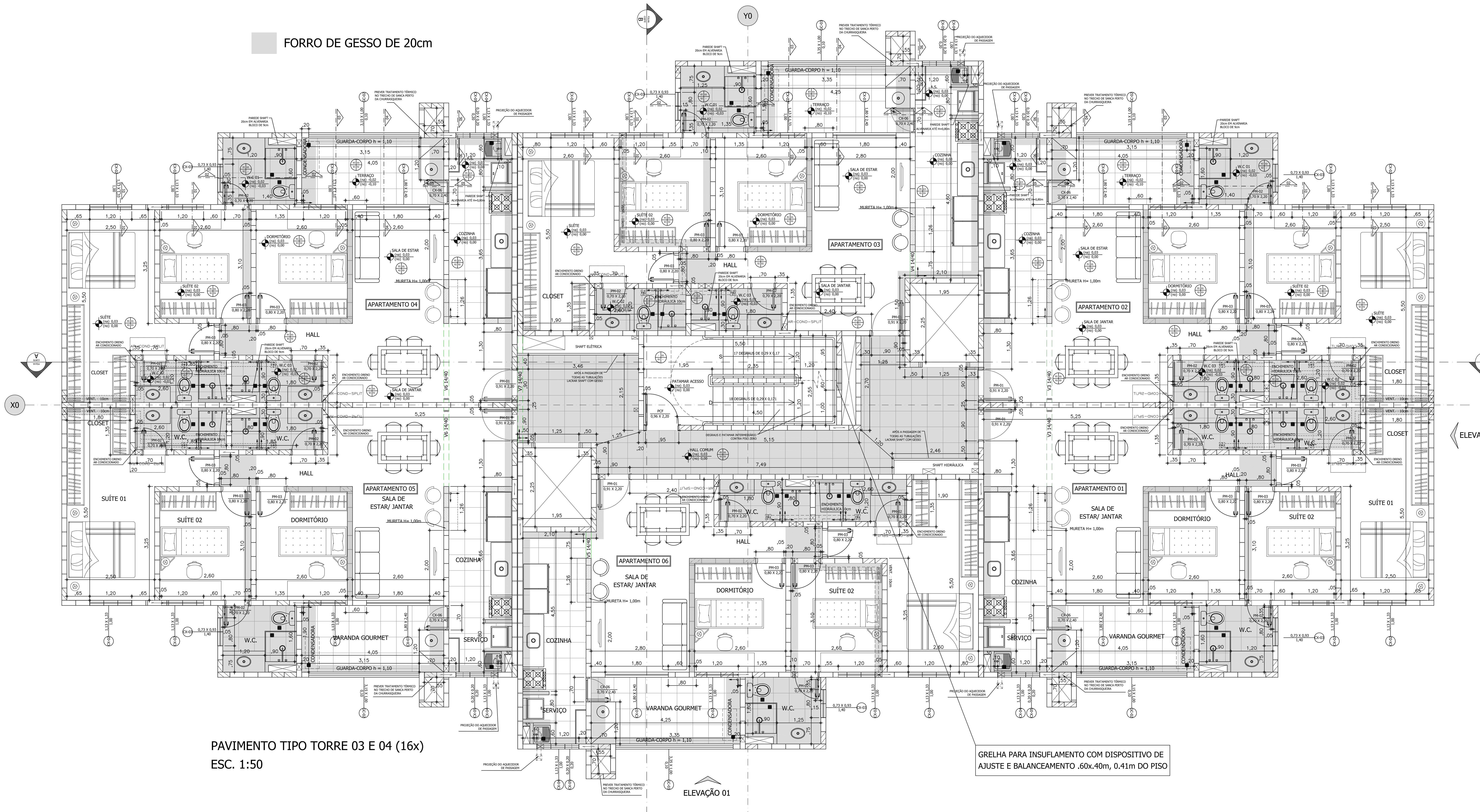


ELEVAÇÃO 01 TORRES 03 E 04
ESC. 1:75

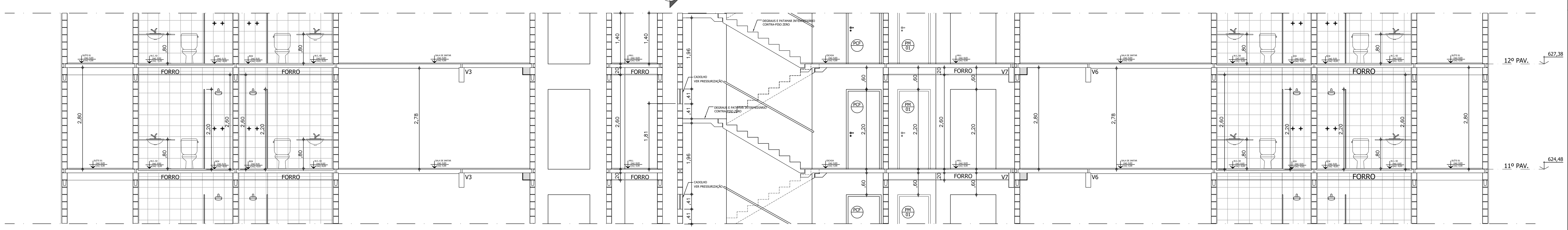


ELEVAÇÃO 02 TORRES 03 E 04
ESC. 1:75

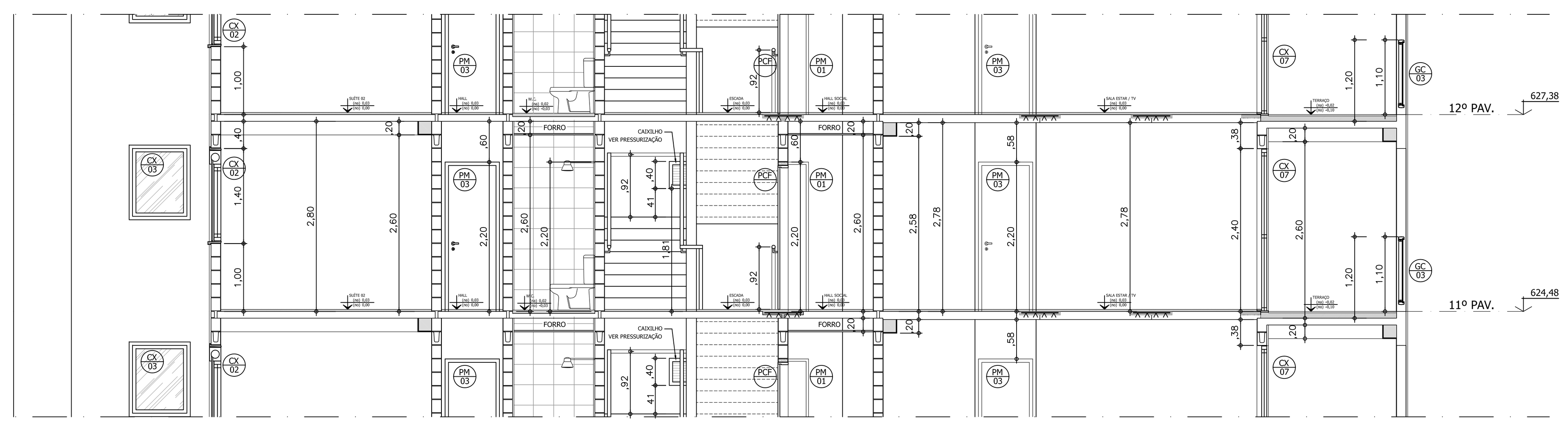
FORRO DE GESSO DE 20cm



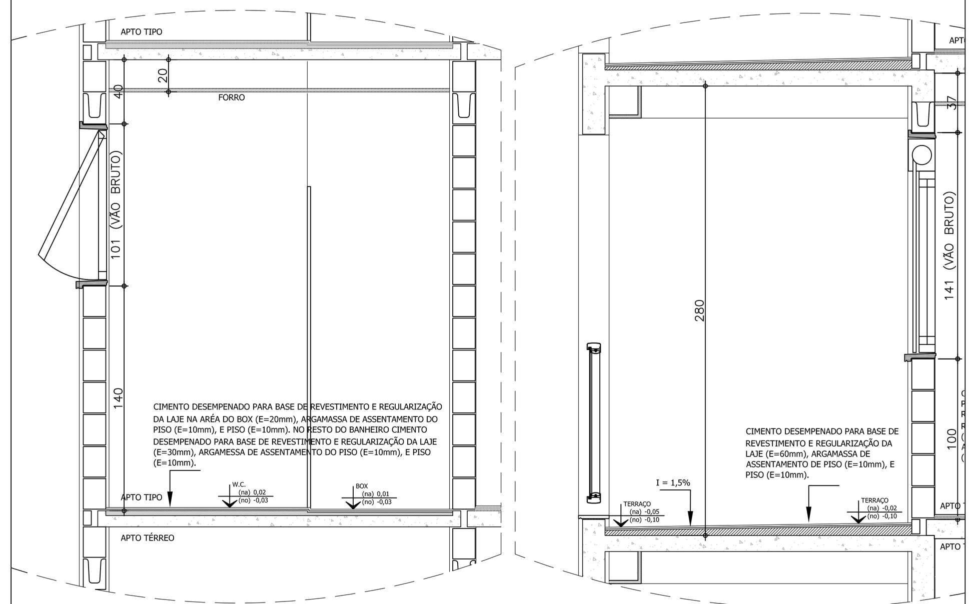
PAVIMENTO TIPO TORRE 03 E 04 (16x)
ESC. 1:50



CORTE PARCIAL AA - PAV. TIPO - TORRES 03 E 04
ESCALA 1:50

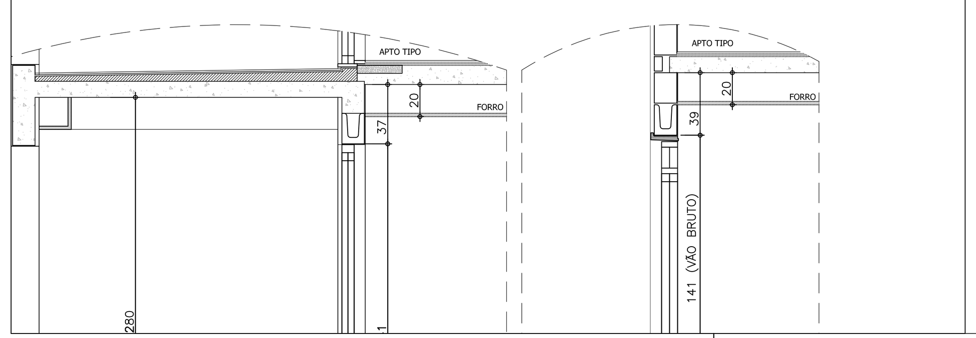


CORTE PARCIAL BB - PAV. TIPO - TORRES 03 E 04
ESCALA 1:50



HE CORTE 02 TIPO TORRE 03/04

DETALHE CORTE 03 TIPO TORRE 03/04
ESC. 1:25



EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE CAIXILHOS - (por pavimento) - PAV. TIPO TORRE 03 e 04

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
CX-02	113	133	100	18	JANELA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR
CX-03	73	93	140	06	JANELA - MAXIM-AR COM VIDRO MINI BOREAL OU FANTASIA
CX-04	113	133	100	06	JANELA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR
CX-05	20	20	20	06	JANELA - COM VENTILAÇÃO PERMANENTE
CX-06	70	240	-	06	PORTA - 1 FOLHA DE ABRIR EM VIDRO INCOLOR E VENEZIANA
CX-07	180	240	-	06	PORTA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR

QUADRO DE PORTAS - PM (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PM-01	91	220	--	06	PORTA - 1 FOLHA DE ABRIR EM MADEIRA
PM-02	70	220	--	18	PORTA - 1 FOLHA DE ABRIR EM MADEIRA
PM-03	80	220	--	18	PORTA - 1 FOLHA DE ABRIR EM MADEIRA

QUADRO DE SERRALHERIA - GC (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
GC-02	315	100	10	04	GUARDA-CORPO EM FERRO COM PINTURA DE ESMALTE SINTÉTICO ACETINADO
GC-03	335	100	10	02	GUARDA-CORPO EM FERRO COM PINTURA DE ESMALTE SINTÉTICO ACETINADO

QUADRO DE PORTAS CORTA FOGO - PCF (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PCF-01	96	220	--	01	PORTA - 1 FOLHA DE ABRIR, CONFORME ESPECIFICAÇÃO DA NBR

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

CX CAIXILHO ALUMÍNIO
PA PORTA ALUMÍNIO
PM PORTA MADEIRA
PCF PORTA CORTA FOGO
PAREDE REMOVÍVEL
PAREDE NÃO ESTRUTURAL
FORRO EM GESSO
FORRO ESTANQUE
FECHAMENTO DOS SHAFTS EM DRY-WALL
PI PA TE RO REVESTIMENTOS
RALO
INICIO DE PAGINAÇÃO
NÍVEL ACABADO NÍVEL OSSO
NÍVEL ACABADO NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

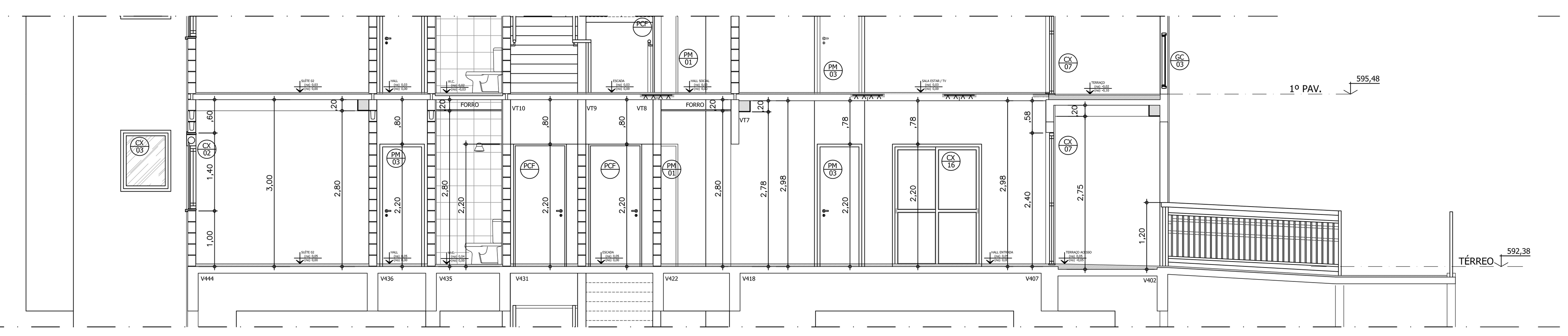
01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

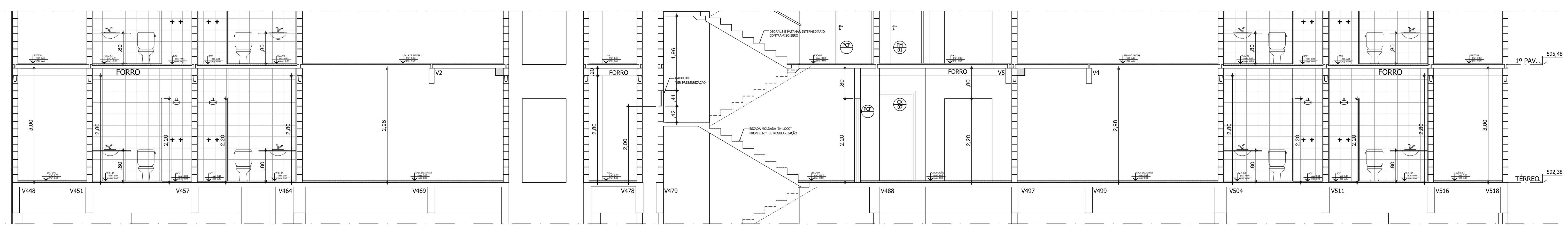
INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento	PREMIUM RESIDENCE
Endereço do Empreendimento	RUA DAS ORQUÍDEAS - GLEBA "D-2A/6". BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP
Código Empreendimento	434-12
DISCIPLINA DE PROJETO	ARQUITETURA
TÍTULO DO DESENHO	TORRES 03 E 04 PAVIMENTO TIPO
Fase	EXECUTIVO
Nome do Arquivo	Wall Partitions Detail Layout
PROJETISTA	PASS arquitetura
Folha Nº	24
Revisão	00
Nome do Arquivo (Projetista)	434-12-ARQ-EX-PLA-TORRE 03 E 04-R00
Responsável	NIVALDO CALLEGARI
Coordenador	DOUGLAS FACINA
Desenhista	DOUGLAS FACINA
Escala	1:50

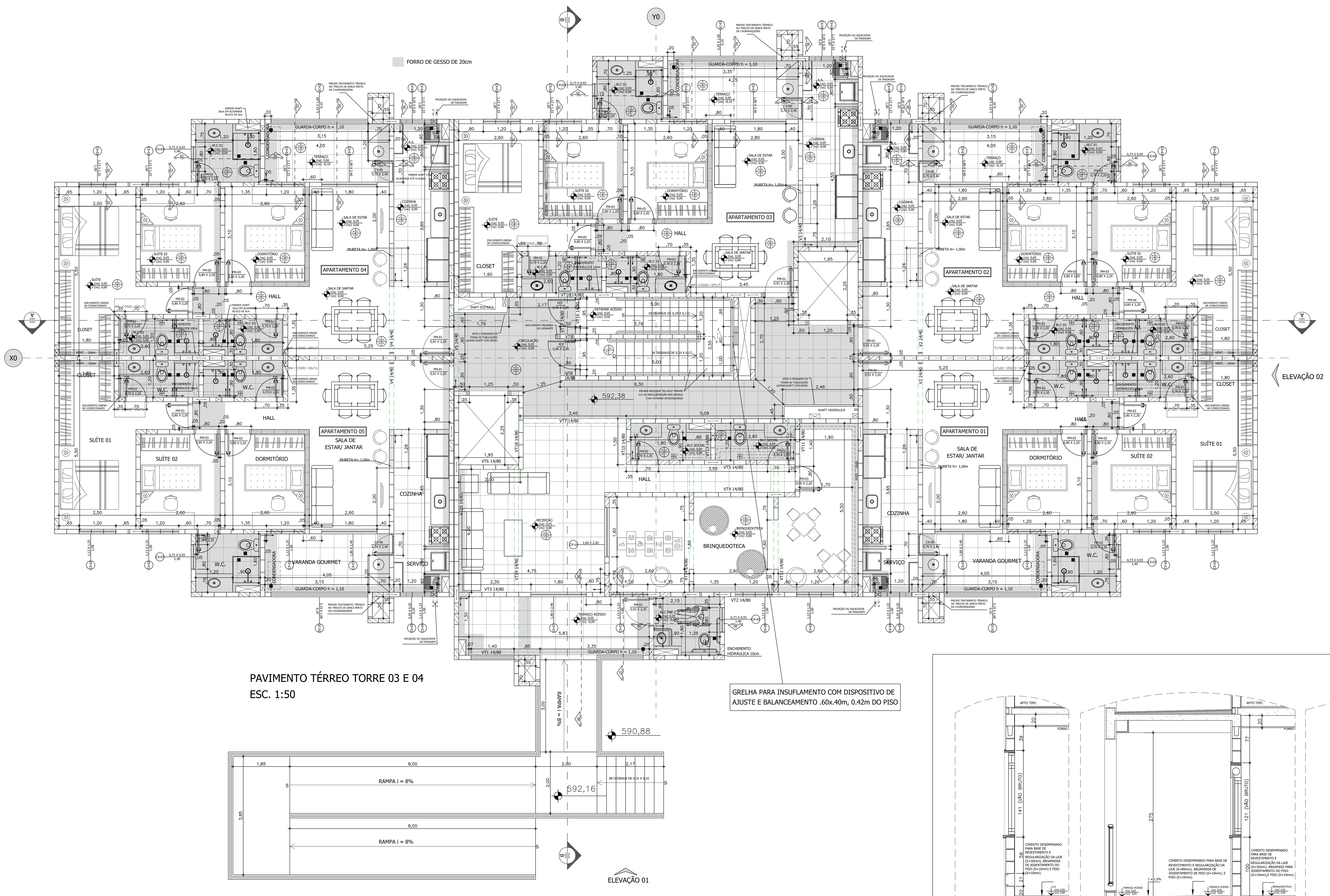


CORTE PARCIAL BB - PAV. TÉRREO - TORRES 03 E 04
ESCALA 1:50



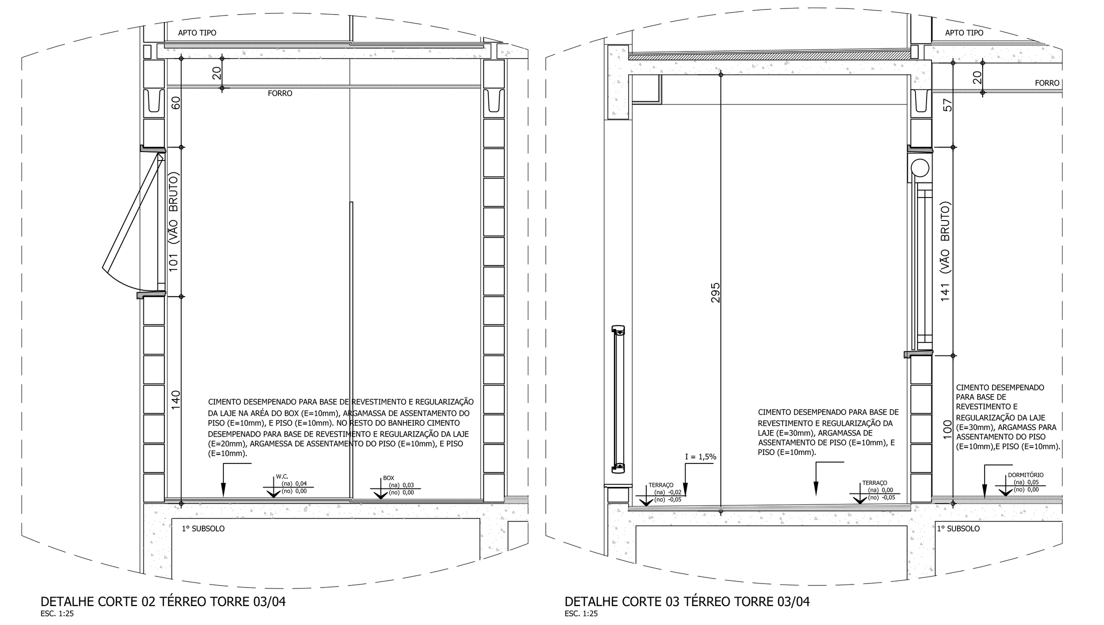
CORTE PARCIAL AA - PAV. TÉRREO - TORRES 03 E 04
ESCALA 1:50

EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO



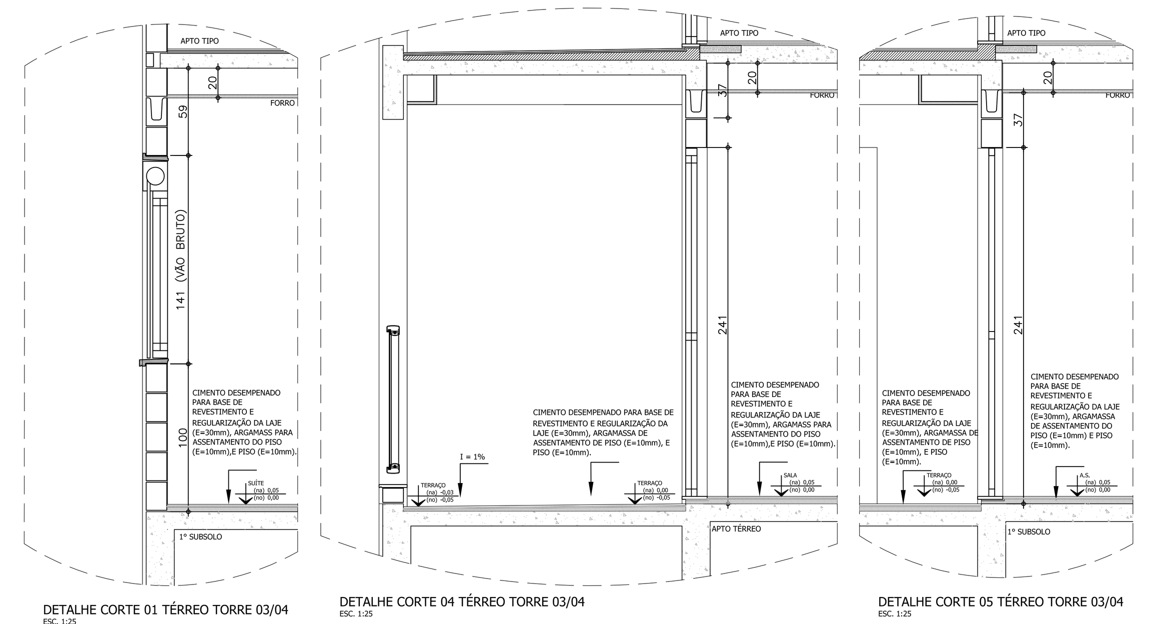
PAVIMENTO TÉRREO TORRE 03 E 04
ESC. 1:50

GRELHA PARA INSUFLAMENTO COM DISPOSITIVO DE AJUSTE E BALANCEAMENTO .60x.40m, 0.42m DO PISO



DETALHE CORTE 02 TÉRREO TORRE 03/04

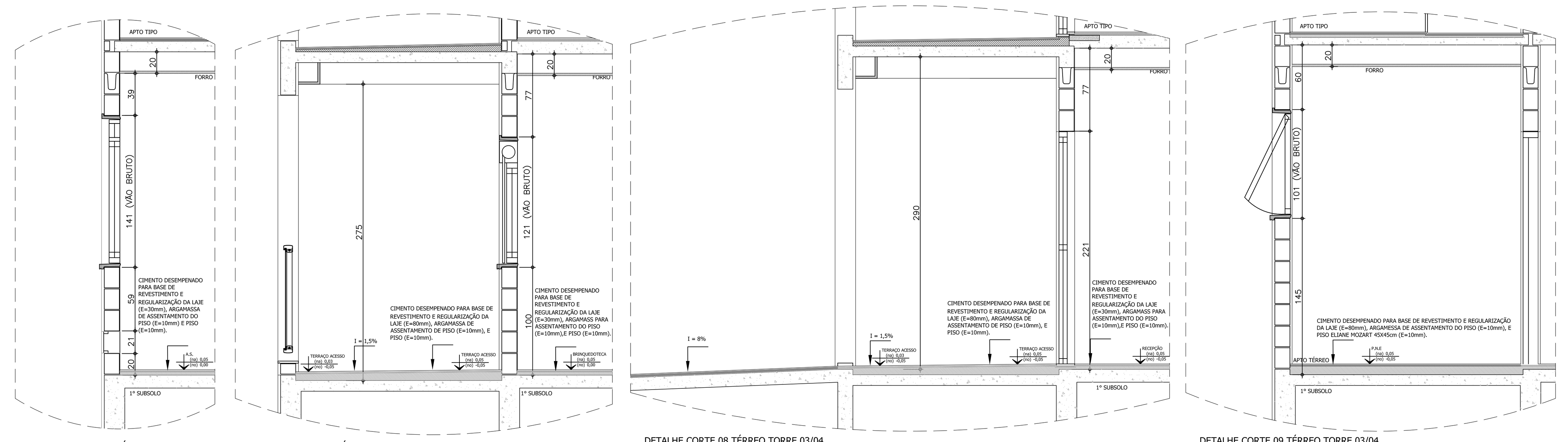
DETALHE CORTE 03 TÉRREO TORRE 03/04



DETALHE CORTE 01 TÉRREO TORRE 03/04

DETALHE CORTE 04 TÉRREO TORRE 03/04

DETALHE CORTE 05 TÉRREO TORRE 03/04



DETALHE CORTE 06 TÉRREO TORRE 03/04

DETALHE CORTE 07 TÉRREO TORRE 03/04

DETALHE CORTE 08 TÉRREO TORRE 03/04

DETALHE CORTE 09 TÉRREO TORRE 03/04

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE CAIXILHOS - (por pavimento) - PAV. TÉRREO TORRE 03 e 04

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
CX-02	113	133	100	17	JANELA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR
CX-03	73	93	140	06	JANELA - MAXIM-AR COM VIDRO MINI BOREAL OU FANTASIA
CX-04	113	133	100	05	JANELA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR
CX-05	20	20	20	05	JANELA - COM VENTILAÇÃO PERMANENTE
CX-06	70	240	-	05	PORTA - 1 FOLHA DE ABRIR EM VIDRO INCOLOR E VENEZIANA
CX-07	180	240	-	06	PORTA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR
CX-16	160	220	-	01	PORTA - 2 FOLHAS DE CORRER DE VIDRO INCOLOR

QUADRO DE PORTAS - PM (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PM-01	91	220	--	06	PORTA - 1 FOLHA DE ABRIR EM MADEIRA
PM-02	70	220	--	17	PORTA - 1 FOLHA DE ABRIR EM MADEIRA
PM-03	80	220	--	16	PORTA - 1 FOLHA DE ABRIR EM MADEIRA

QUADRO DE PORTAS CORTA FOGO - PCF (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PCF-01	96	220	--	02	PORTA - 1 FOLHA DE ABRIR, CONFORME ESPECIFICAÇÃO DA NBR

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

- CX - CAIXILHO ALUMÍNIO
- PA - PORTA ALUMÍNIO
- PM - PORTA MADEIRA
- PCF - PORTA CORTA FOGO
- PAREDE REMOVÍVEL
- PAREDE NÃO ESTRUTURAL
- FORRO EM GESSO
- FORRO ESTANQUE
- FECHAMENTO DOS SHAFTS EM DRY-WALL
- PI PA TE RO - REVESTIMENTOS
- RALO
- INICIO DE PAGINAÇÃO
- NÍVEL ACABADO / NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento: PREMIUM RESIDENCE

Endereço do Empreendimento: RUA DAS ORQUÍDEAS - GLEBA "D-2A/6". BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento: 434-12

DISCIPLINA DE PROJETO: ARQUITETURA

TÍTULO DO DESENHO: TORRES 03 E 04 PAVIMENTO TÉRREO

Fase: EXECUTIVO

Nome do Arquivo: Wall Partitions Detail Layout

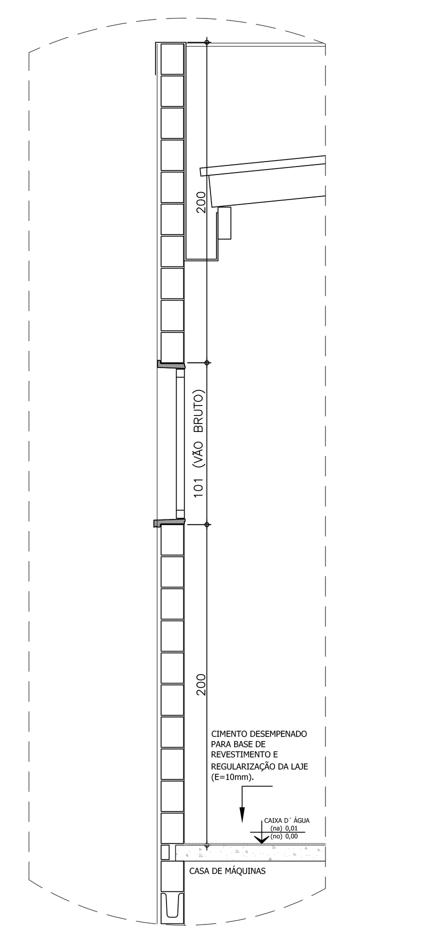
PROJETISTA: PASS arquitetura

Folha Nº: 25

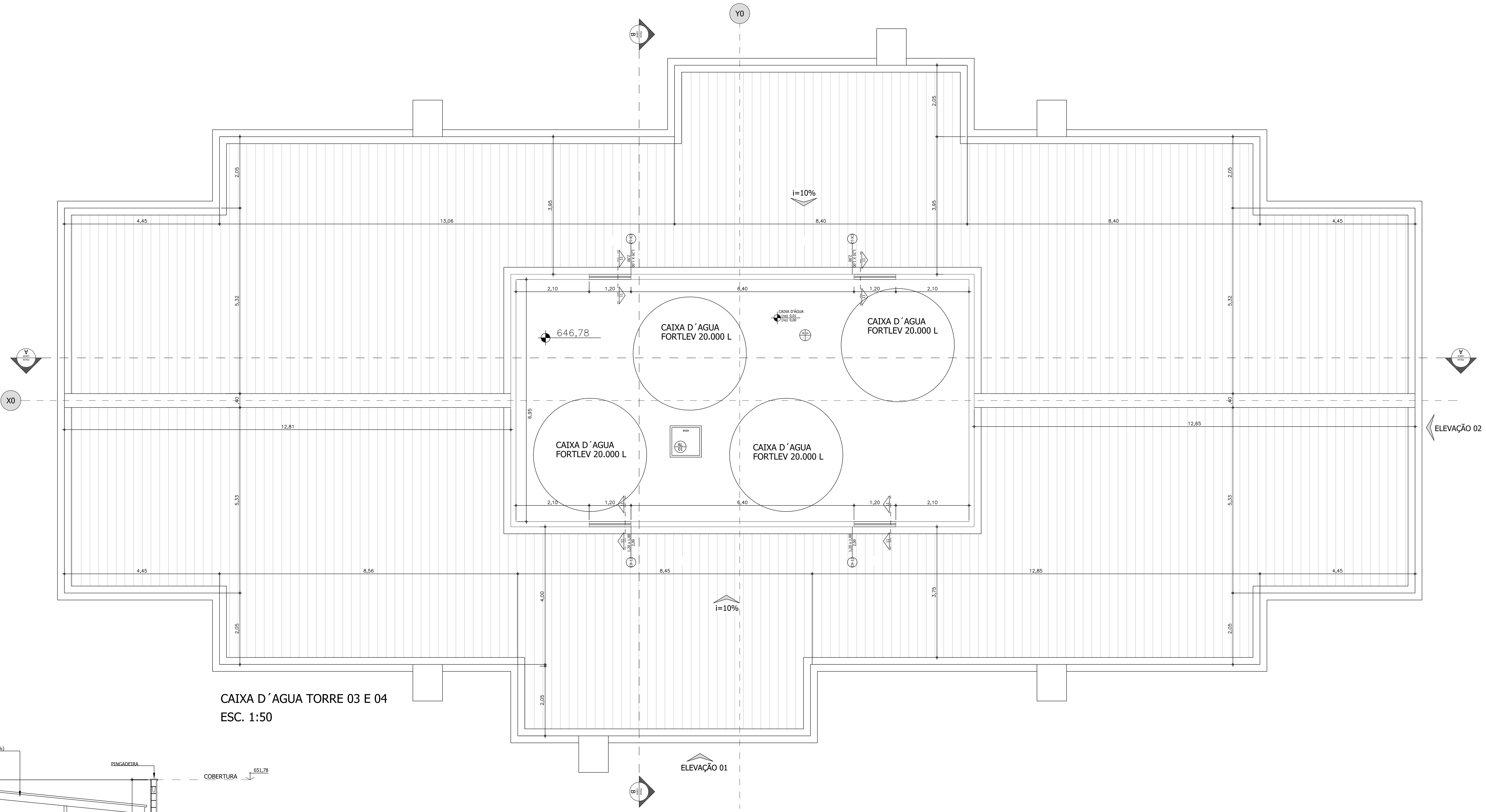
Revisão: 00

Nome do Arquivo (Projetista): 434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

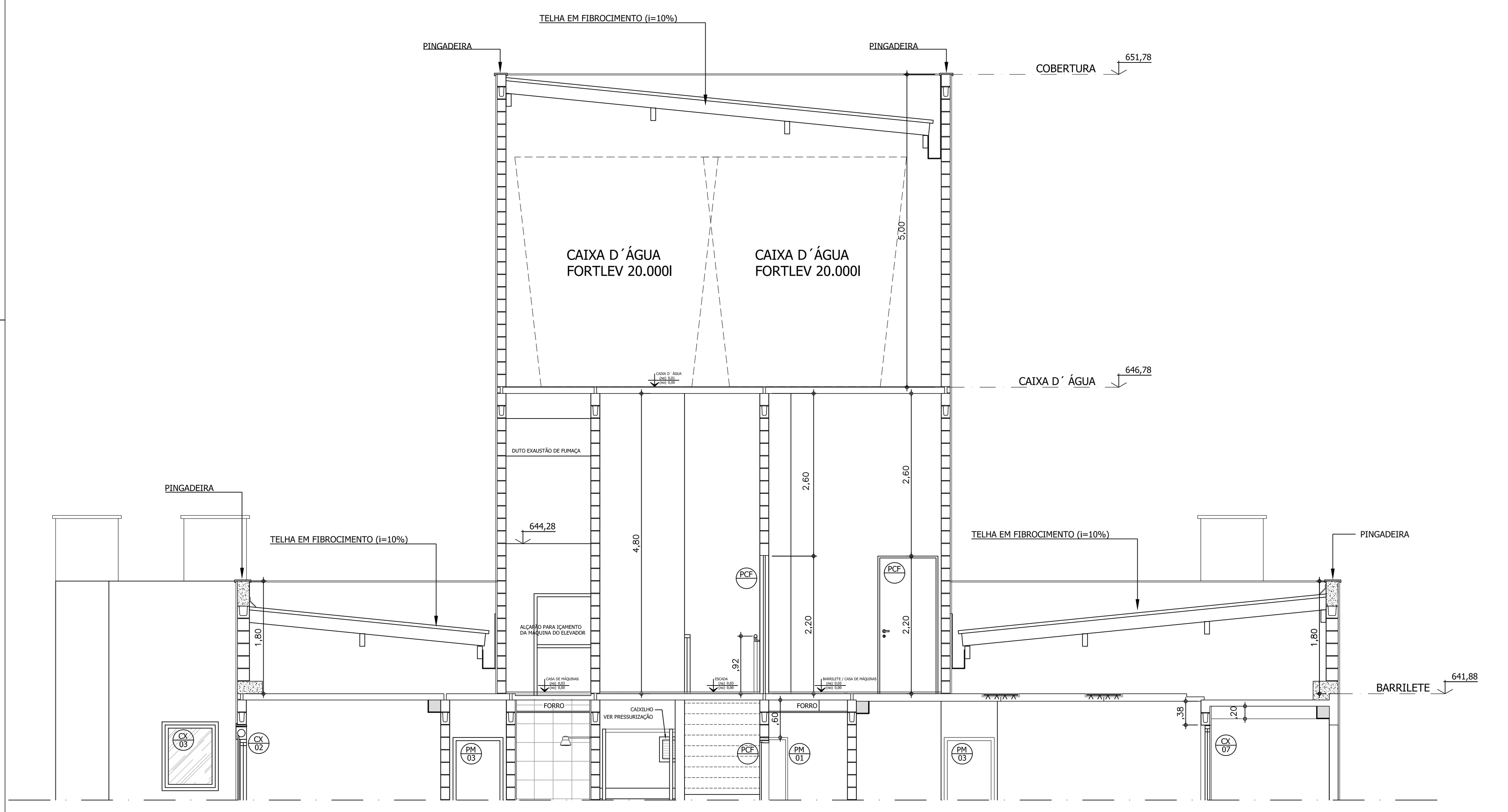
Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50



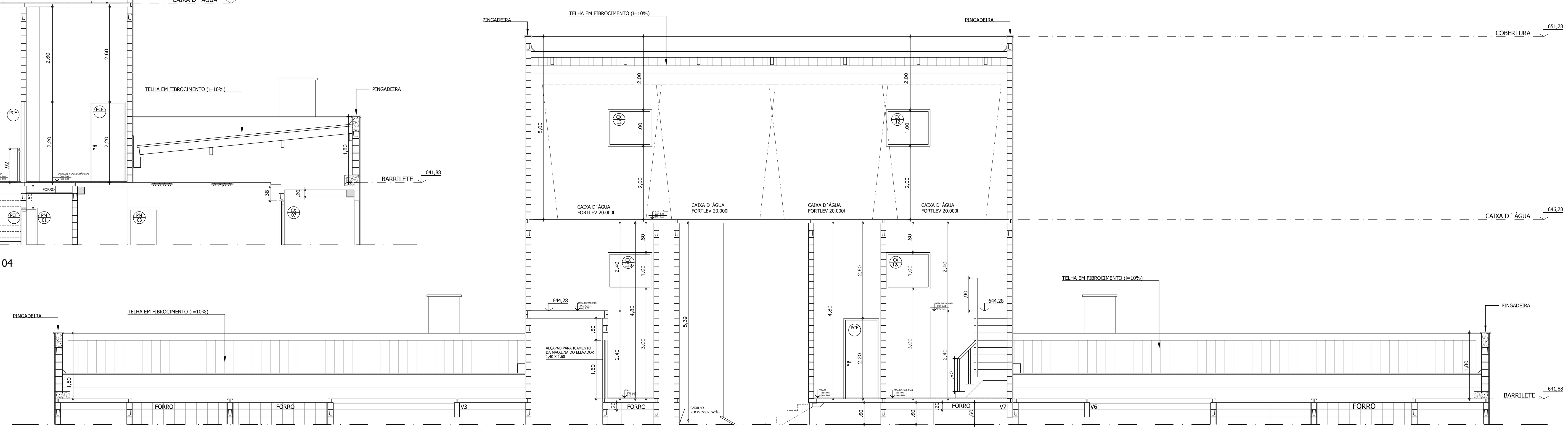
DETALHE CORTE 11 CAIXA D'ÁGUA TORRE 03/04
ESC. 1:25



CAIXA D´ÁGUA TORRE 03 E 04
ESC. 1:50



CORTE PARCIAL BB - BARRILETE / CASA DE MÁQUINAS E CAIXA D´ ÁGUA - TORRES 03 E 04
ESCALA 1:50



CORTE PARCIAL AA - CAIXA D´ ÁGUA - TORRES 03 E 04
ESCALA 1:50

EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE CAIXILHOS - (por pavimento) - CAIXA D' ÁGUA TORRE 03 E 04

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
CX-12	120	100	200	04	JANELA - VENTILAÇÃO PERMANENTE COM VENEZIANA

QUADRO DE ALÇAPÃO - AL (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
AL-01	96	90	--	01	ALCAPÃO - EM ALUMINIUM

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

CX CAIXILHO ALUMÍNIO
PA PORTA ALUMÍNIO
PM PORTA MADEIRA
PCF PORTA CORTA FOGO
PAREDE REMOVÍVEL
PAREDE NÃO ESTRUTURAL
FORRO EM GESSO
FORRO ESTANQUE
FECHAMENTO DOS SHAFTS EM DRY-WALL
PI PA TE RO REVESTIMENTOS
RALO
INICIO DE PAGINAÇÃO
NÍVEL ACABADO / NÍVEL OSSO
NÍVEL ACABADO / NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).
02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).
03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).
04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).
05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).
06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).
07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).
08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento: PREMIUM RESIDENCE

Endereço do Empreendimento: RUA DAS ORQUÍDEAS - GLEBA "D-2A/6".
BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento: 434-12

DISCIPLINA DE PROJETO: ARQUITETURA

TÍTULO DO DESENHO: TORRES 03 E 04
CAIXA D´ ÁGUA

Fase: EXECUTIVO

Nome do Arquivo: Wall Partitions Detail Layout

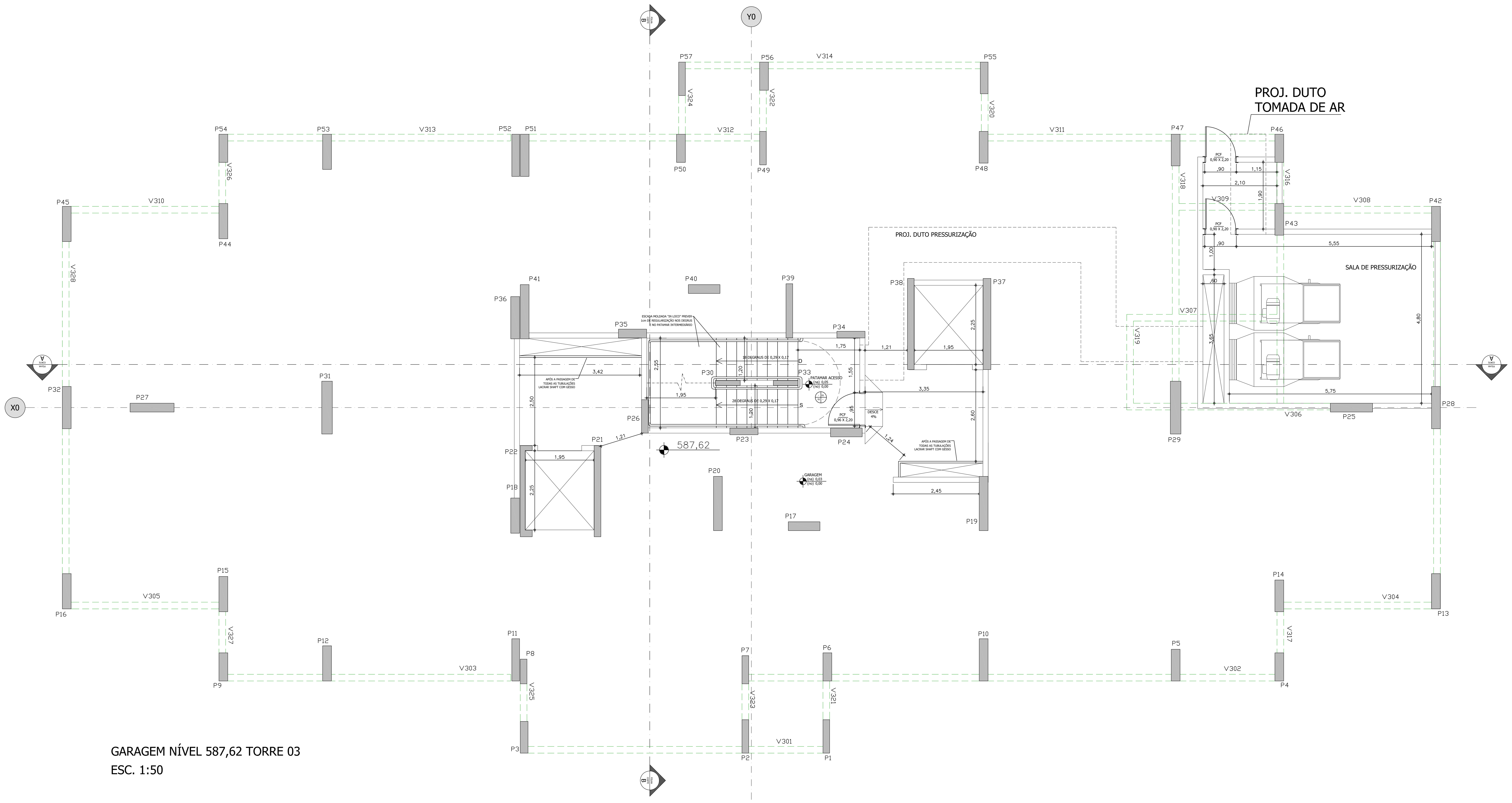
PROJETISTA: PASS arquitetura

Folha Nº: 27

Revisão: 00

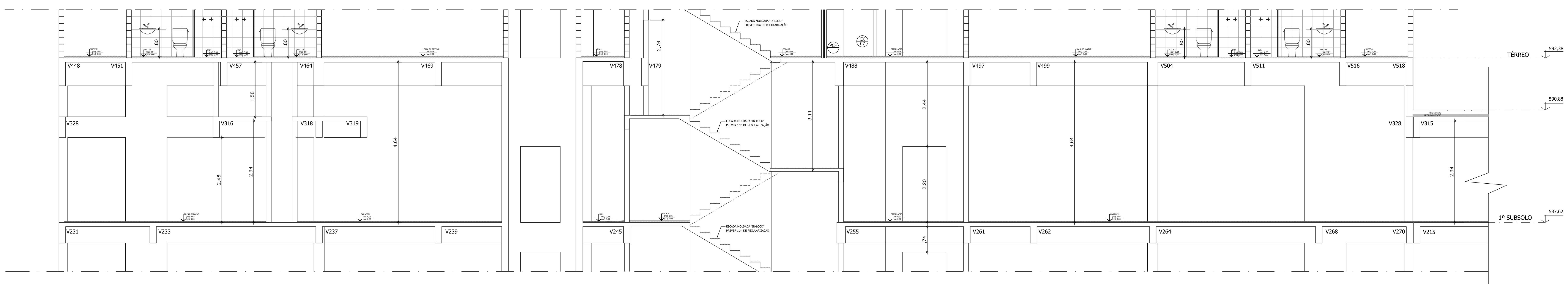
Nome do Arquivo (Projetista): 434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50

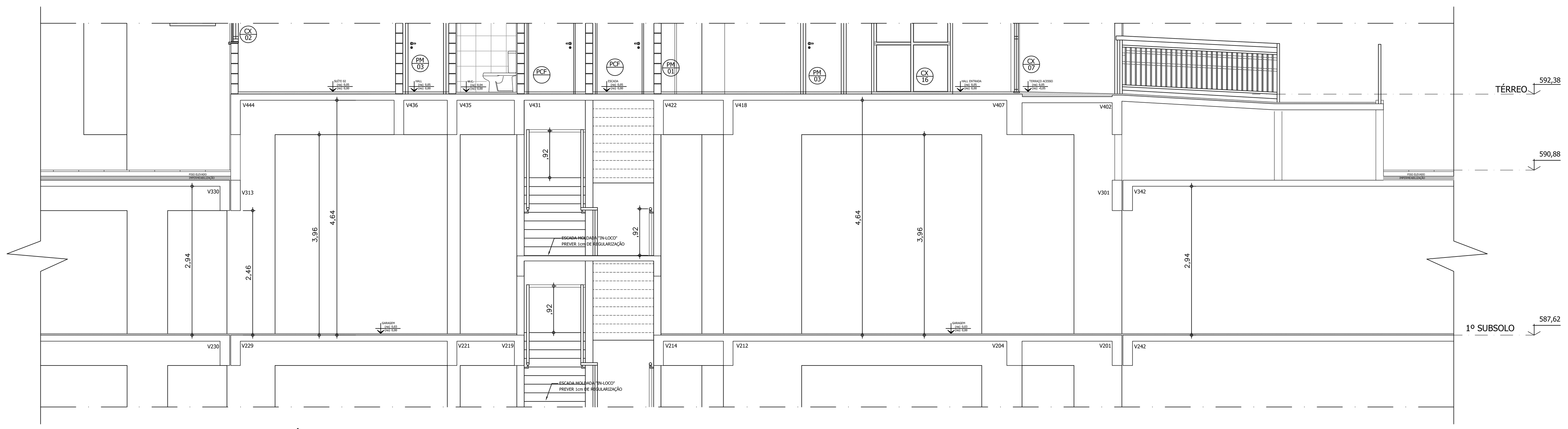


GARAGEM NÍVEL 587,62 TORRE 03
ESC. 1:50

EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO



CORTE PARCIAL AA - GARAGEM NÍVEL 587,62 - TORRE 03
ESCALA 1:50



CORTE PARCIAL BB - GARAGEM NÍVEL 587,62 - TORRE 03
ESCALA 1:50

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE PORTAS CORTA FOGO - PCF (por pavimento)-GARAGEM NÍVEL 587,62 TORRE 03

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PCF-01	96	220	--	03	PORTA - 1 FOLHA DE ABRIR, CONFORME ESPECIFICAÇÃO DA NBR

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

CX CAIXILHO ALUMÍNIO
PA PORTA ALUMÍNIO
PM PORTA MADEIRA
PCF PORTA CORTA FOGO
PAREDE REMOVÍVEL
PAREDE NÃO ESTRUTURAL
FORRO EM GESSO
FORRO ESTANQUE
FECHAMENTO DOS SHAFTS EM DRY-WALL
PI PA TE RO REVESTIMENTOS
RALO
INICIO DE PAGINAÇÃO
NÍVEL ACABADO / NÍVEL OSSO
NÍVEL ACABADO / NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento: PREMIUM RESIDENCE

Endereço do Empreendimento: RUA DAS ORQUÍDEAS - GLEBA "D-2A/6".
BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento: 434-12

DISCIPLINA DE PROJETO: ARQUITETURA

TÍTULO DO DESENHO: TORRE 03
GARAGEM NÍVEL 587,62

Fase: EXECUTIVO

Nome do Arquivo: Wall Partitions Detail Layout

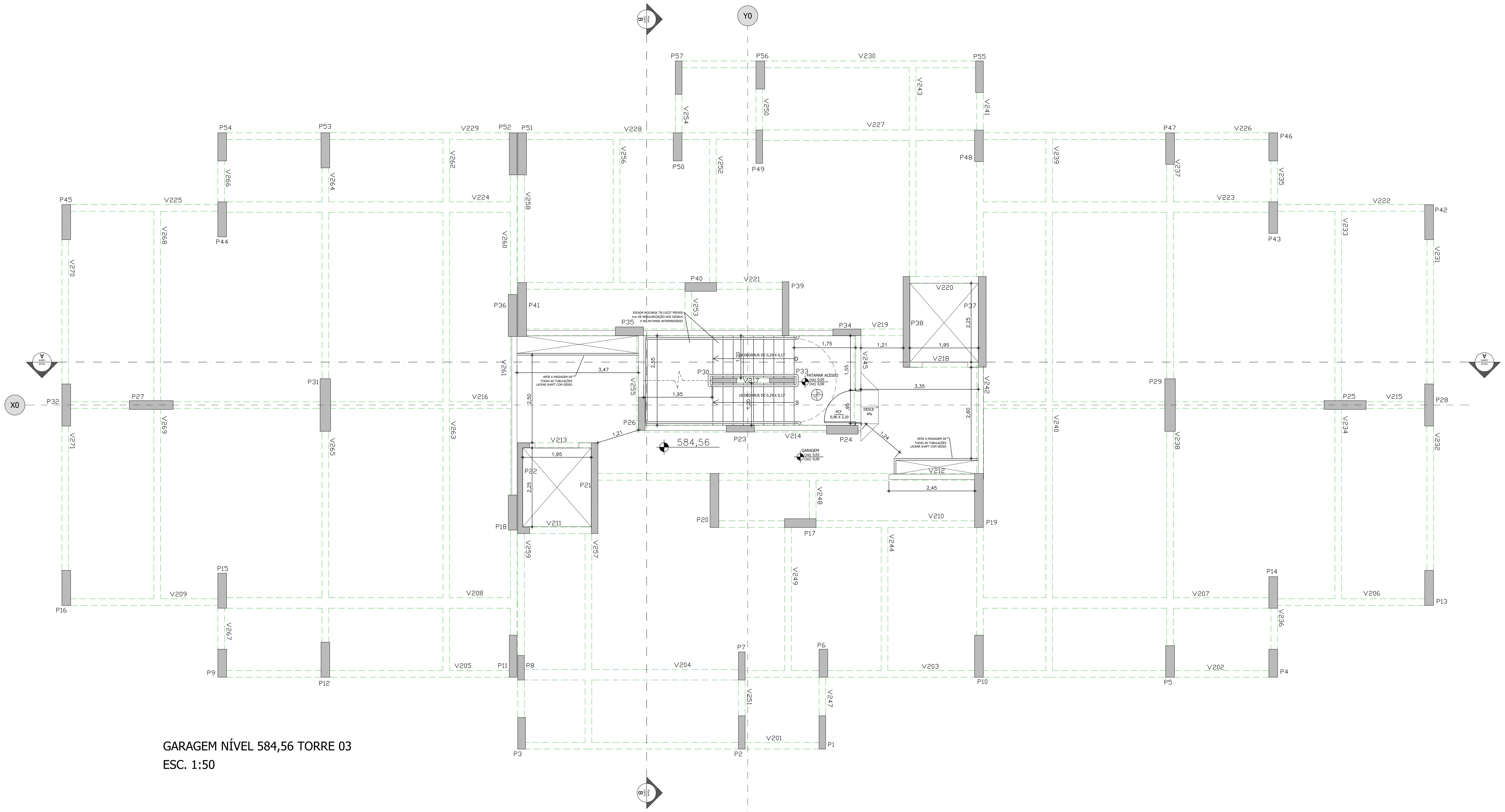
PROJETISTA: PASS arquitetura

Folha Nº 29

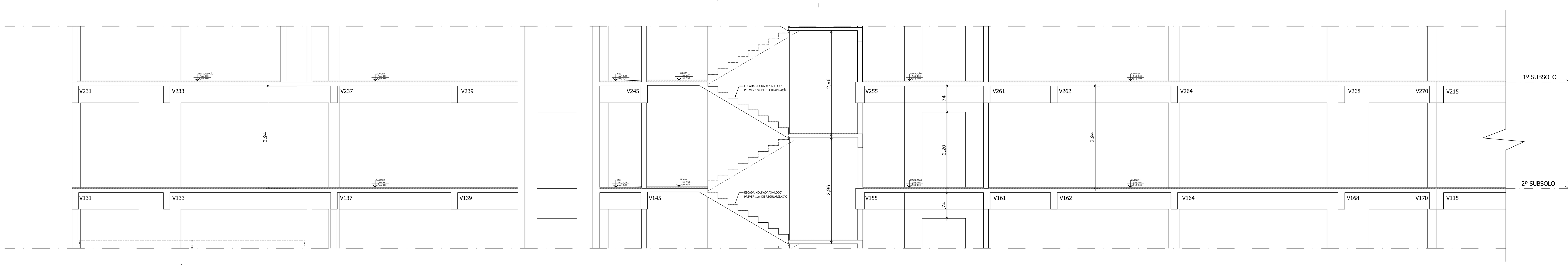
Revisão 00

Nome do Arquivo (Projetista): 434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

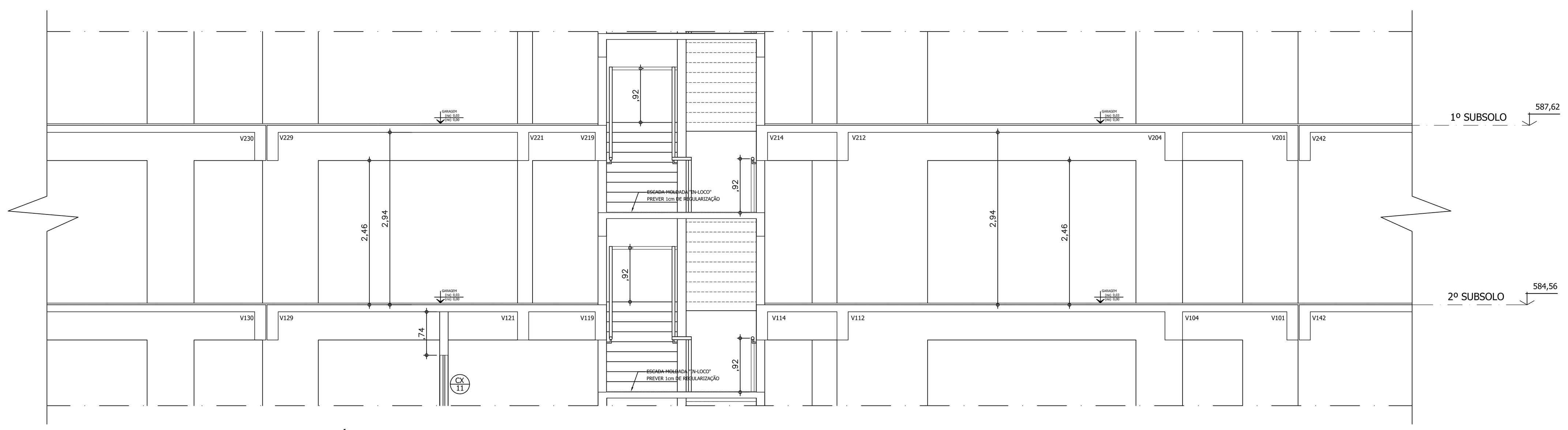
Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50



GARAGEM NÍVEL 584,56 TORRE 03
ESC. 1:50



CORTE PARCIAL AA - GARAGEM NÍVEL 584,56 - TORRE 03
ESCALA 1:50



CORTE PARCIAL BB - GARAGEM NÍVEL 584,56 - TORRE 03
ESCALA 1:50

EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE PORTAS CORTA FOGO - PCF (por pavimento)-GARAGEM NÍVEL 584,56 TORRE 03

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PCF-01	96	220	--	01	PORTA - 1 FOLHA DE ABRIR, CONFORME ESPECIFICAÇÃO DA NBR

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

CX - CAIXILHO ALUMÍNIO
PA - PORTA ALUMÍNIO
PM - PORTA MADEIRA
PCF - PORTA CORTA FOGO
PAREDE REMOVÍVEL
PAREDE NÃO ESTRUTURAL
FORRO EM GESSO
FORRO ESTANQUE
FECHAMENTO DOS SHAFTS EM DRY-WALL
PI PA TE RO - REVESTIMENTOS
RALO
INICIO DE PAGINAÇÃO
NÍVEL ACABADO / NÍVEL OSSO
NÍVEL ACABADO / NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento: PREMIUM RESIDENCE

Endereço do Empreendimento: RUA DAS ORQUÍDEAS - GLEBA "D-2A/6".
BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento: 434-12

DISCIPLINA DE PROJETO: ARQUITETURA

TÍTULO DO DESENHO: TORRE 03 GARAGEM NÍVEL 584,56

Fase: EXECUTIVO

Nome do Arquivo: Wall Partitions Detail Layout

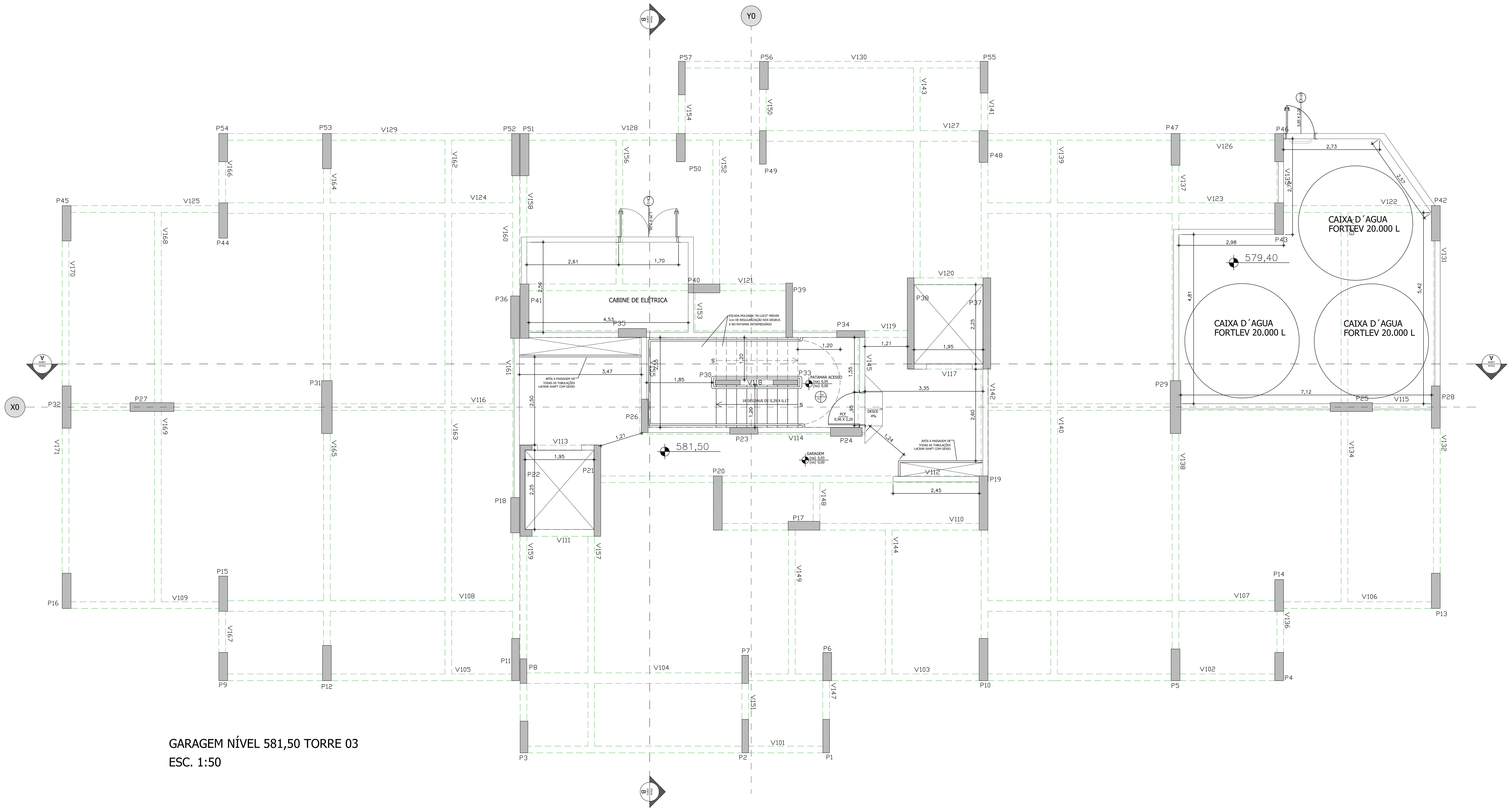
PROJETISTA: PASS arquitetura

Folha Nº: 30

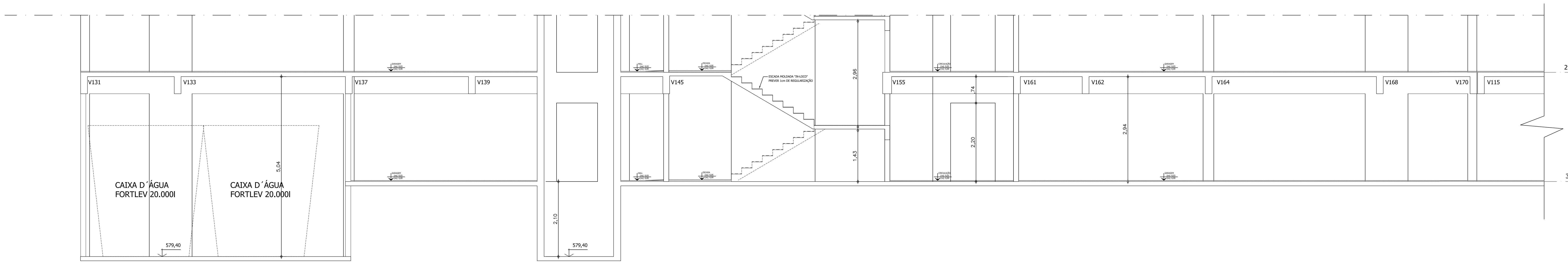
Revisão: 00

Nome do Arquivo (Projetista): 434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

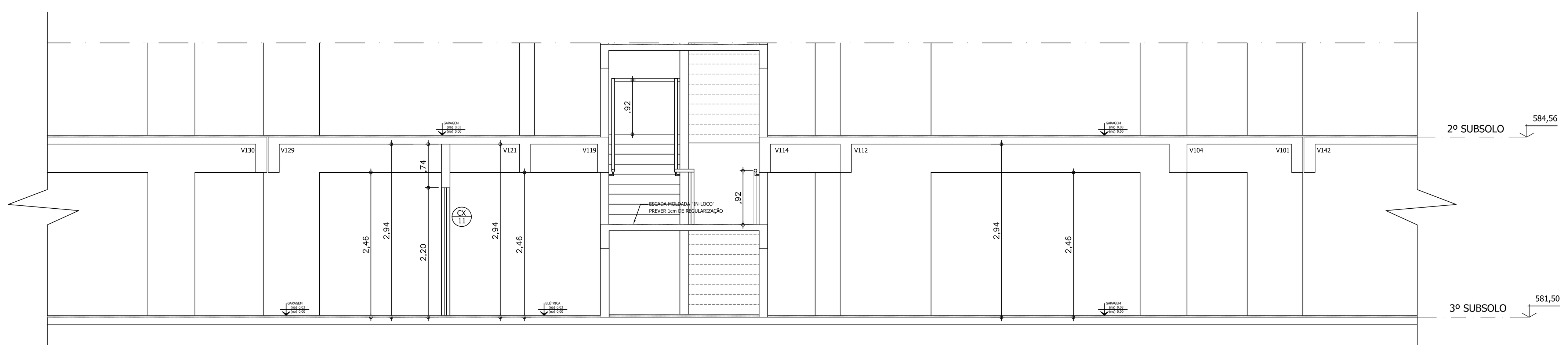
Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50



GARAGEM NÍVEL 581,50 TORRE 03
ESC. 1:50



CORTE PARCIAL AA - GARAGEM NÍVEL 581,50 - TORRE 03
ESCALA 1:50



CORTE PARCIAL BB - GARAGEM NÍVEL 581,50 - TORRE 03
ESCALA 1:50

EM DESENVOLVIMENTO
NÃO LIBERADO PARA CONSTRUÇÃO

TABELA DE NÍVEIS - PREMIUM RESIDENCE - (NÍVEL OSSO)

PAVIMENTO	TORRE 1	TORRE 2	TORRE 3	TORRE 4	TORRE 5
GARAGEM 03	581,50	581,50	581,50	581,50	581,50
GARAGEM 02	584,56	584,56	584,56	584,56	584,56
GARAGEM 01	587,62	587,62	587,62	587,62	587,62
COBERTURA GARAGEM	590,68	590,68	590,68	590,68	590,68
TÉRREO	592,38	590,88	592,38	592,38	592,38
1° PAVIMENTO	595,48	595,28	595,48	595,48	595,48
2° PAVIMENTO	598,38	598,18	598,38	598,38	598,38
3° PAVIMENTO	601,28	601,08	601,28	601,28	601,28
4° PAVIMENTO	604,18	603,98	604,18	604,18	604,18
5° PAVIMENTO	607,08	606,88	607,08	607,08	607,08
6° PAVIMENTO	609,98	609,78	609,98	609,98	609,98
7° PAVIMENTO	612,88	612,68	612,88	612,88	612,88
8° PAVIMENTO	615,78	615,58	615,78	615,78	615,78
9° PAVIMENTO	618,68	618,48	618,68	618,68	618,68
10° PAVIMENTO	621,58	621,38	621,58	621,58	621,58
11° PAVIMENTO	624,48	624,28	624,48	624,48	624,48
12° PAVIMENTO	627,38	627,18	627,38	627,38	627,38
13° PAVIMENTO	630,28	630,08	630,28	630,28	630,28
14° PAVIMENTO	633,18	632,98	633,18	633,18	633,18
15° PAVIMENTO	636,08	635,88	636,08	636,08	636,08
16° PAVIMENTO	638,98	638,78	638,98	638,98	638,98
17° PAVIMENTO	-	641,68	-	-	-
BARRILETE	641,88	644,58	641,88	641,88	641,88
CASA DE MÁQUINAS	643,88	646,98	644,28	644,28	643,88
RESERVATÓRIO SUP.	646,18	649,48	646,78	646,78	646,18

QUADRO DE CAIXILHOS - (por pavimento) -GARAGEM NÍVEL 581,50 TORRE 03

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
CX-10	85	220	-	01	PORTA - 1 FOLHA DE ABRIR EM VENEZIANA
CX-11	170	220	-	01	PORTA - 2 FOLHAS DE ABRIR COM VENEZIANA

QUADRO DE PORTAS CORTA FOGO - PCF (por pavimento)

CAIX.	LARG.	ALT.	PEIT.	QUANT.	DESCRIÇÃO
PCF-01	96	220	--	01	PORTA - 1 FOLHA DE ABRIR, CONFORME ESPECIFICAÇÃO DA NBR

NOTAS GERAIS:

- COTAS E NÍVEIS NO OSSO, SEM ACABAMENTO;
- MEDIDAS EM METROS, SALVO INDICAÇÃO CONTRÁRIA;
- NÃO TOMAR MEDIDAS EM ESCALA;
- CONFERIR MEDIDAS , NÍVEIS E PRUMOS NA OBRA;
- MODULAÇÃO: VER PROJETO EM ALVENARIA ESTRUTURAL;
- NAS ÁREAS MOLHADAS AS LAJES SERÃO REBAIXADAS PARA IMPERMEABILIZAÇÃO.
- LARGURA INDICADA PARA PORTAS DE PASSAGEM CORRESPONDE AO VÃO DA PORTA NA ALVENARIA, SALVO INDICAÇÃO CONTRÁRIA;
- VÃOS INDICADOS PARA CAIXILHOS CORRESPONDEM A MEDIDAS BRUTAS
- ESPESSURAS E TIPOS DE ACABAMENTOS CONSIDERADOS VER DETALHES E MEMORIAL DESCRITIVO;
- ESPALETAS DE PORTAS NÃO COTADAS, TERÃO 5cm;
- PISOS NAS ÁREAS COMUNS, DEVEM TER SUPERFÍCIE REGULAR, FIRME E ANTIDERRAPANTE, COM INCLINAÇÃO LONGITUDINAL MÁXIMA DE 5% NAS ÁREAS EXTERNAS. ADMITE-SE DESNÍVEL MÁXIMO DE 5mm SEM TRATAMENTO ESPECIAL;
- DETALHES CAIXILHOS - VER CADERNOS DE CAIXILHOS
- DETALHES GERAIS - VER CADERNOS DE DETALHES
- DETALHES IMPERMEABILIZAÇÃO - VER CADERNO DE IMPERMEABILIZAÇÃO
- DETALHES INSTALAÇÕES - VER CADERNOS DE INSTALAÇÕES
- DETALHES PRESSURIZAÇÃO - VER CADERNO DE PRESSURIZAÇÃO.
- CIRCULAÇÕES E RAMPAS EXTERNAS - VER CADERNO DE PAISAGISMO;
- COTAS DE NÍVEL EXTERNAS - VER CADERNO DE PAISAGISMO;
- DETALHES EXTERNOS - VER CADERNO DE PAISAGISMO;

LEGENDA:

CX CAIXILHO ALUMÍNIO
PA PORTA ALUMÍNIO
PM PORTA MADEIRA
PCF PORTA CORTA FOGO
PAREDE REMOVÍVEL
PAREDE NÃO ESTRUTURAL
FORRO EM GESSO
FORRO ESTANQUE
FECHAMENTO DOS SHAFTS EM DRY-WALL
PI PA TE RO REVESTIMENTOS
RALO
INICIO DE PAGINAÇÃO
NÍVEL ACABADO / NÍVEL OSSO
NÍVEL ACABADO / NÍVEL OSSO

REVESTIMENTOS

PI - PISO

01 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

02 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

03 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=60mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

04 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=30mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

05 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE NA ÁREA DO BOX (E=10mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm). NO RESTO DO BANHEIRO CIMENTO DESEMPENADO PARA BASE DE REVESTIMENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA DE ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

06 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=80mm), ARGAMASSA DE ASSENTAMENTO DE PISO (E=10mm), E PISO (E=10mm).

07 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=20mm), ARGAMASSA PARA ASSENTAMENTO DO PISO (E=10mm), E PISO (E=10mm).

08 - CIMENTO DESEMPENADO PARA BASE DE REVESTIENTO E REGULARIZAÇÃO DA LAJE (E=10mm)

TE - TETO

01 - LAJE ACABADA COM PINTURA LATEX PVA
02 - FORRO EM GESSO
03 - SANCA DE GESSO
04 - FORRO DE PVC OU AZULEJO

PA - PAREDE

01 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO COM PINTURA LATEX PVA (E=5mm).
02 - REVESTIMENTO DE ARGAMASSA PARA REGULARIZAÇÃO E ASSENTAMENTO DE AZULEZO (E=10mm), E AZULEJO (E=10mm).
03 - REVESTIMENTO DE ARGAMASSA COM TEXTURA (E=25mm)
04 - REVESTIMENTO DE ARGAMASSA OU GESSO LISO (E=5mm).

RO - RODAPÉ

01 - CERÂMICA IDEM AO PISO (h=7cm)

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento: PREMIUM RESIDENCE

Endereço do Empreendimento: RUA DAS ORQUÍDEAS - GLEBA "D-2A/6".
BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento: 434-12

DISCIPLINA DE PROJETO: ARQUITETURA

TÍTULO DO DESENHO: TORRE 03 GARAGEM NÍVEL 581,50

Fase: EXECUTIVO

Nome do Arquivo: Wall Partitions Detail Layout

PROJETISTA: PASS arquitetura

Folha Nº 31

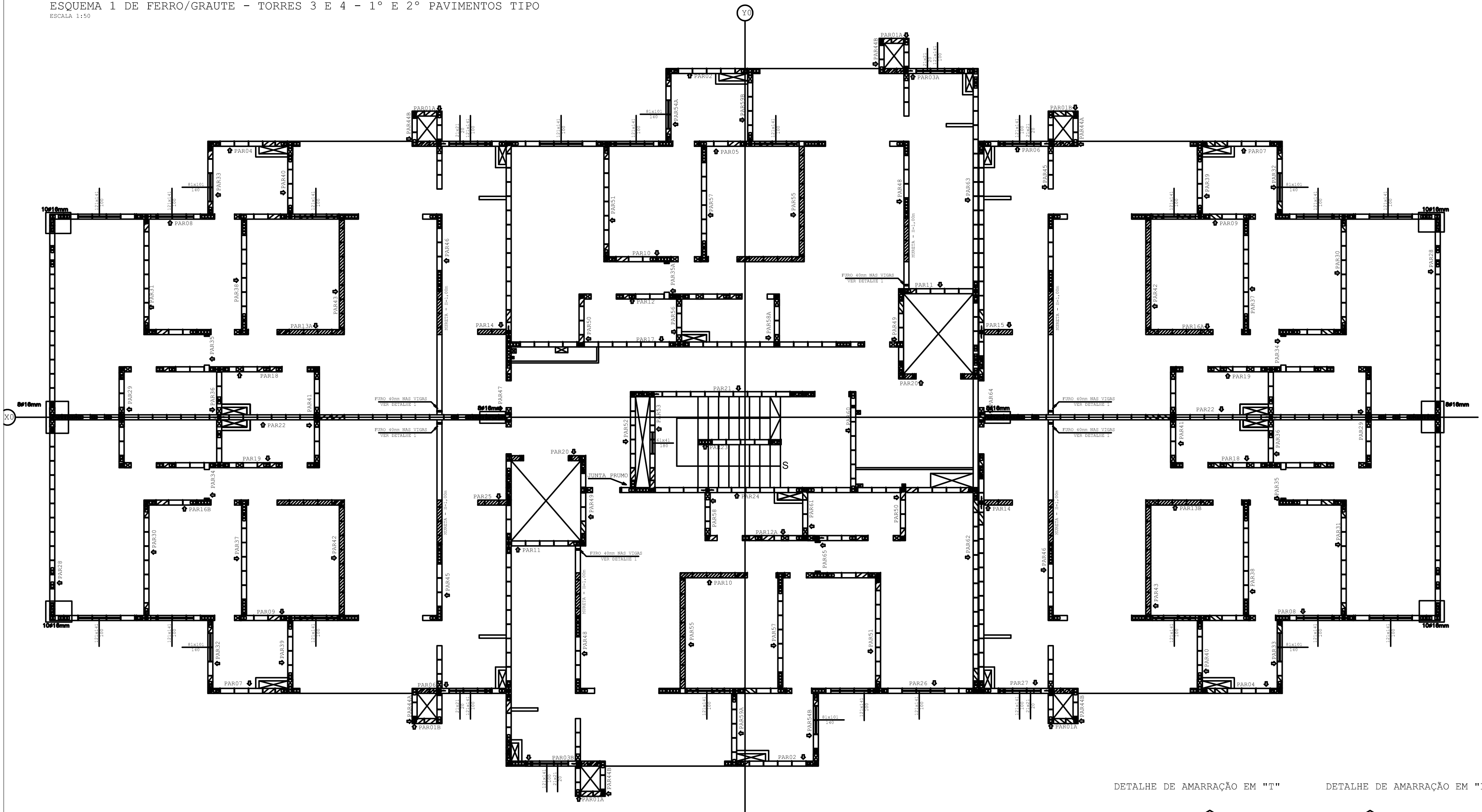
Revisão 00

Nome do Arquivo (Projetista): 434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50

ESQUEMA 1 DE FERRO/GRAUTE - TORRES 3 E 4 - 1° E 2° PAVIMENTOS TIPO

ESCALA 1:50



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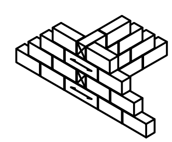
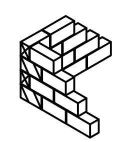
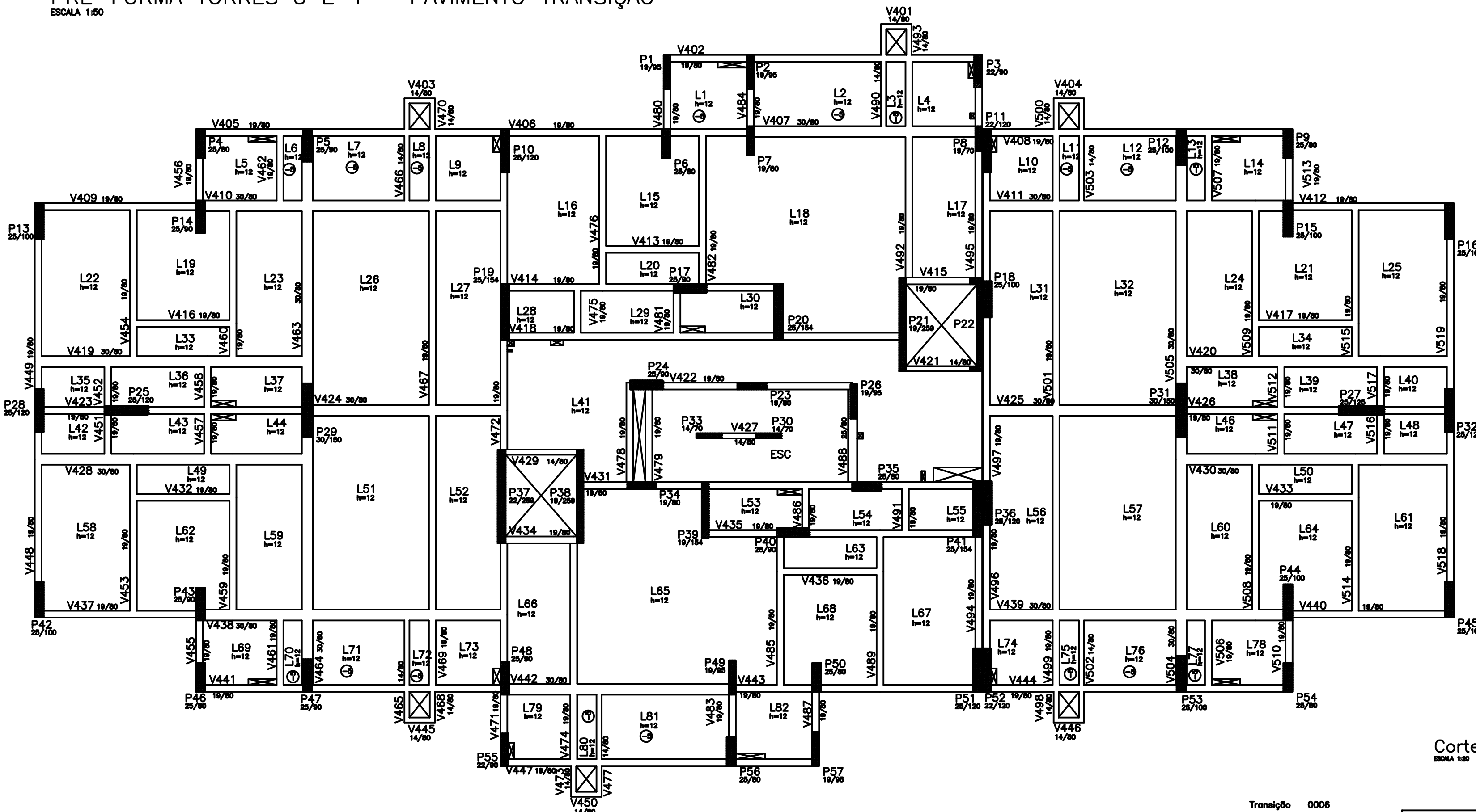


DETALHE DE AMARRAÇÃO EM "L"



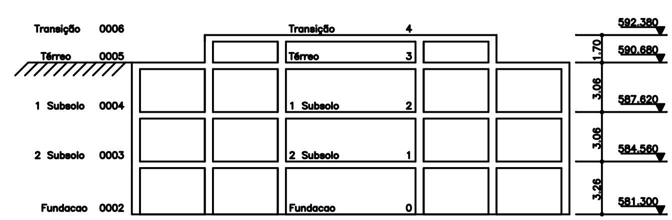
PRÉ-FORMA TORRES 3 E 4 – PAVIMENTO TRANSIÇÃO

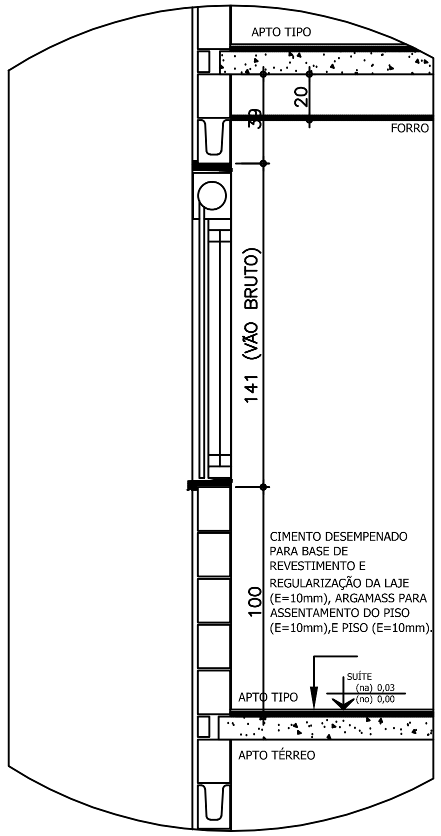
ESCALA 1:50



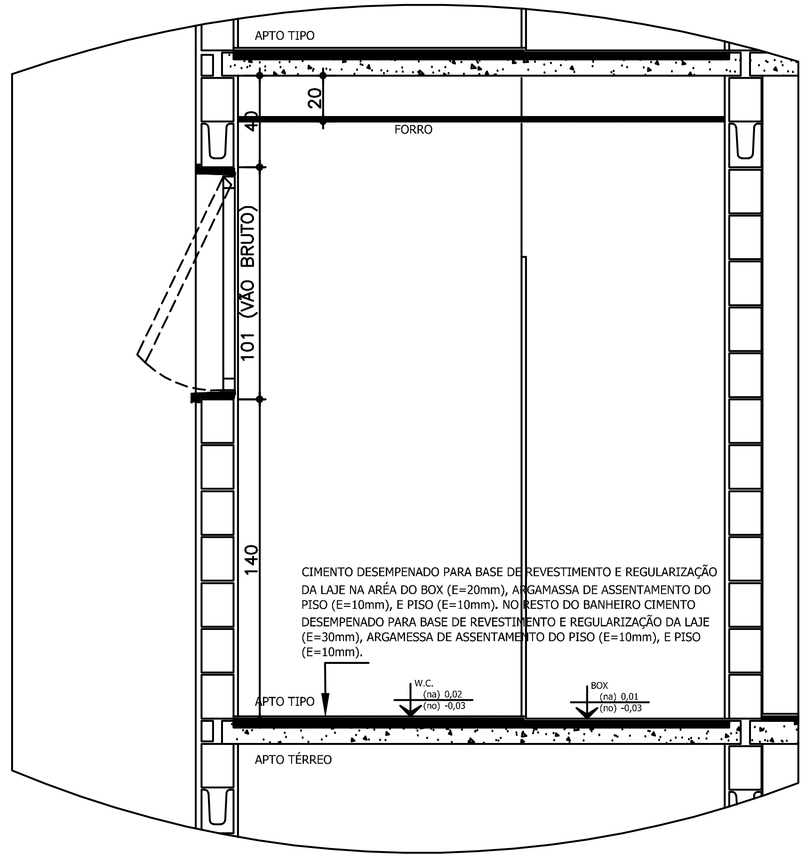
Corte esquematico

ESCALA 1:50

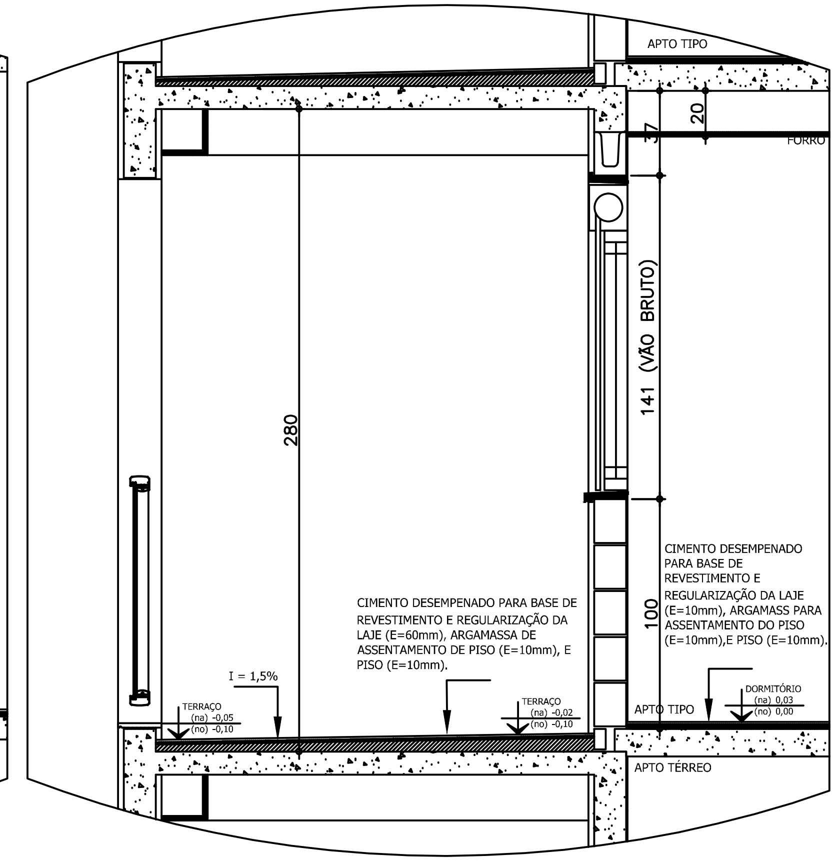




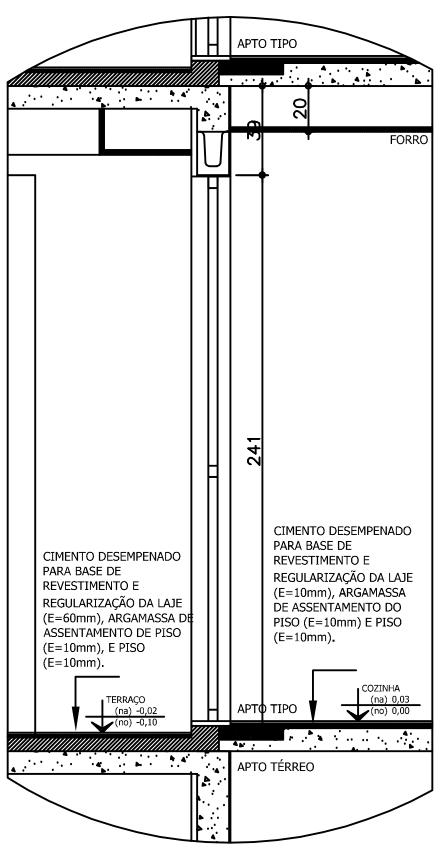
DETALHE CORTE 01 TIPO TORRE 03/04
ESC. 1:25



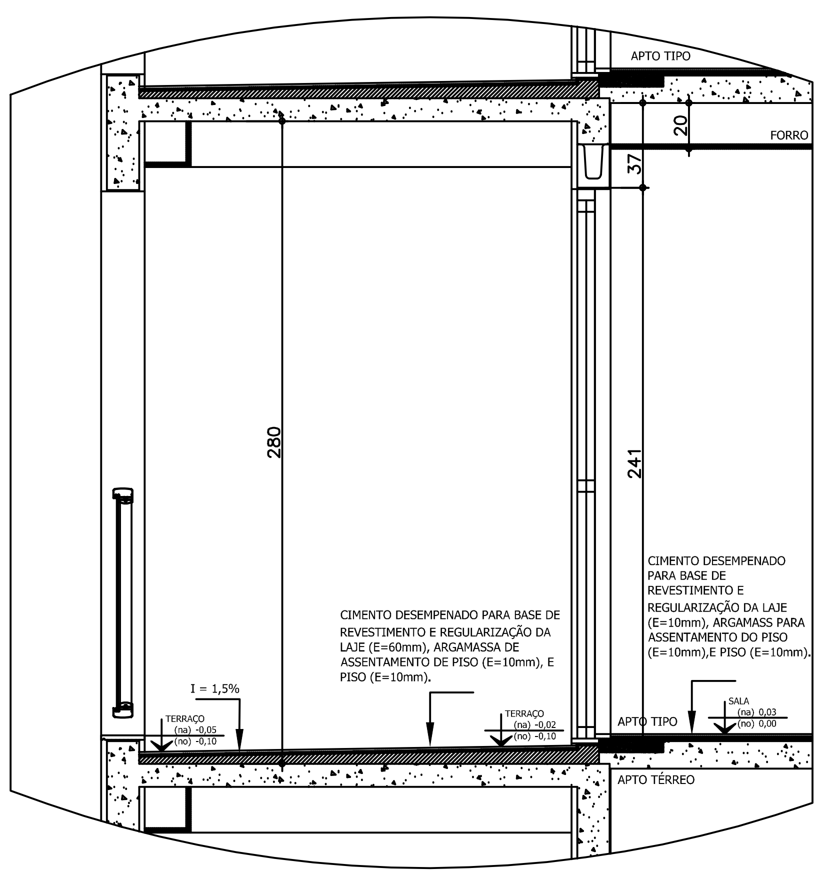
DETALHE CORTE 02 TIPO TORRE 03/04
ESC. 1:25



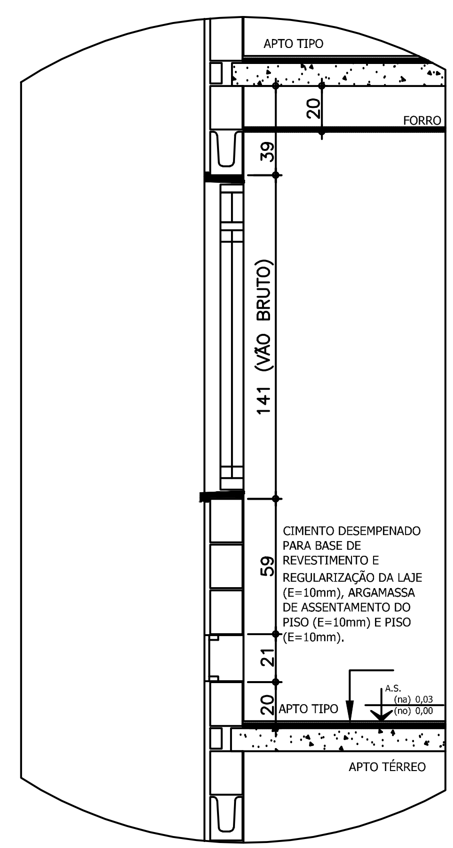
DETALHE CORTE 03 TIPO TORRE 03/04
ESC. 1:25



DETALHE CORTE 05 TIPO TORRE 03/04
ESC. 1:25



DETALHE CORTE 04 TIPO TORRE 03/04
ESC. 1:25



DETALHE CORTE 06 TIPO TORRE 03/04
ESC. 1:25

REV. Nº	DATA	EMISSÃO INICIAL	PASS

INCORPORAÇÃO E REALIZAÇÃO: JACITARA HOLDING

EMPREENDIMENTO: PREMIUM Residence

Nome do Empreendimento
PREMIUM RESIDENCE

Endereço do Empreendimento
RUA DAS ORQUÍDEAS - GLEBA "D-2A/6".
BAIRRO: FAZENDA BOM PRINCÍPIO, INDAIATUBA - SP

Código Empreendimento
434-12

DISCIPLINA DE PROJETO
ARQUITETURA

TÍTULO DO DESENHO
TORRES 03 E 04
PAVIMENTO TIPO

Fase
EXECUTIVO

Nome do Arquivo
Wall Partitions Detail Layout

PROJETISTA

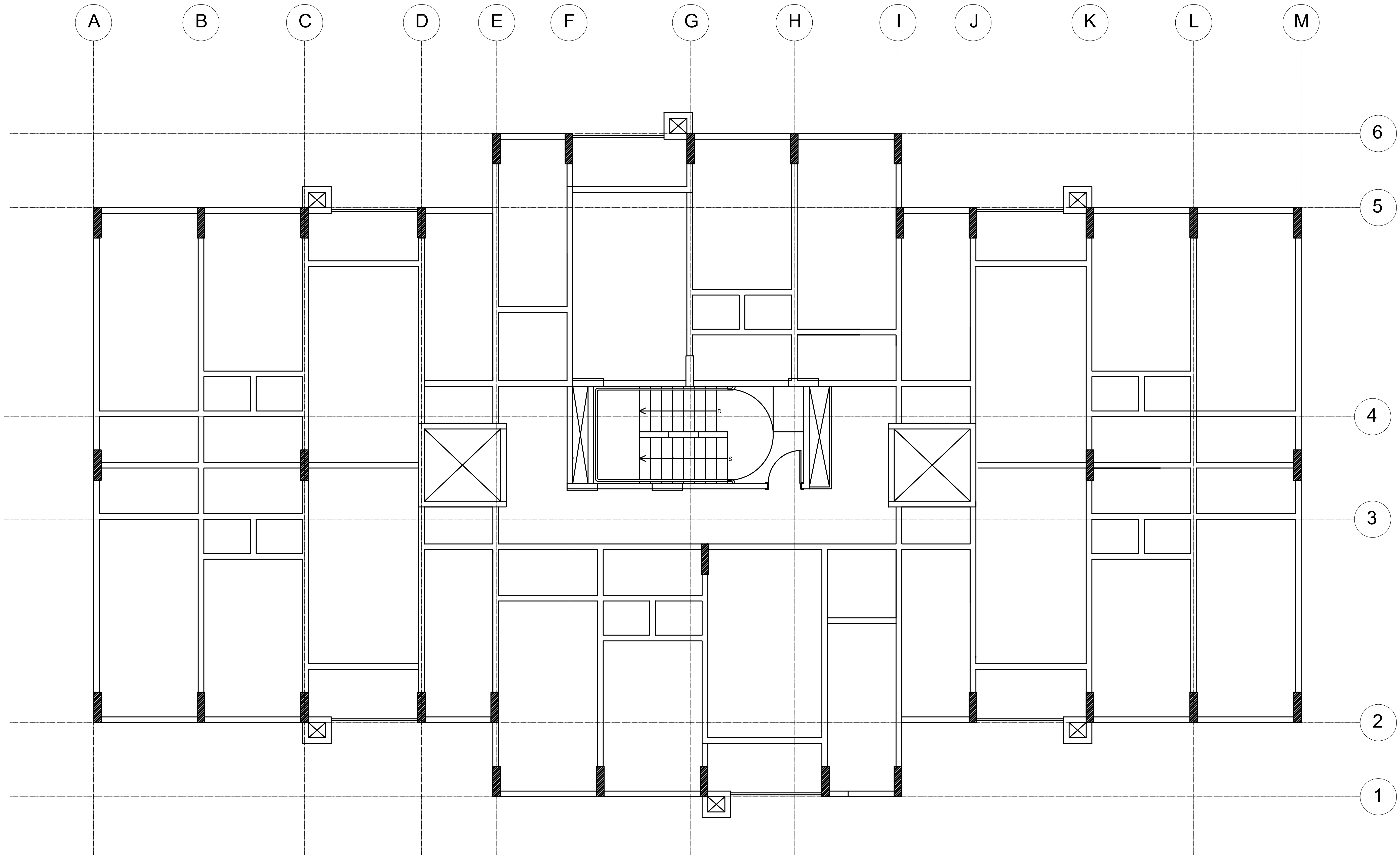
PASS arquitetura
R. DOM AMAURY CASTANHO, 150
JD. PAULISTA - JUNDIAÍ-SP
FONE 4583-2844 FAX 4521-2627
www.passarquitetura.com.br
passprojetos@passarquitetura.com.br
nivaldo@passarquitetura.com.br
douglasfacina@passarquitetura.com.br

Folha Nº
24

Revisão
00

Nome do Arquivo (Projetista)
434-12-ARQ-EX-PLA-TORRE 03 E 04-R00

Responsável	Coordenador	Desenhista	Escala
NIVALDO CALLEGARI	DOUGLAS FACINA	DOUGLAS FACINA	1:50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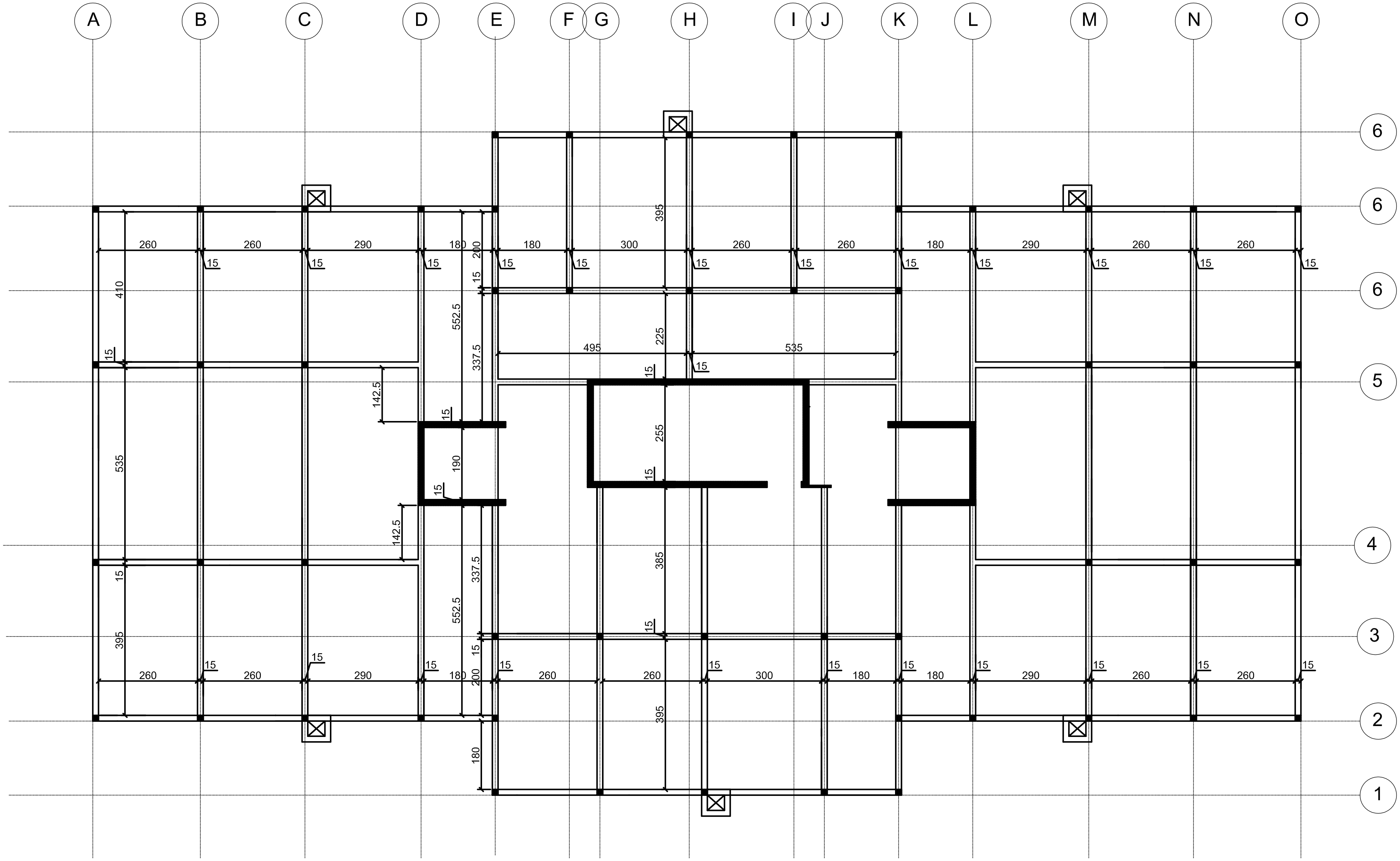
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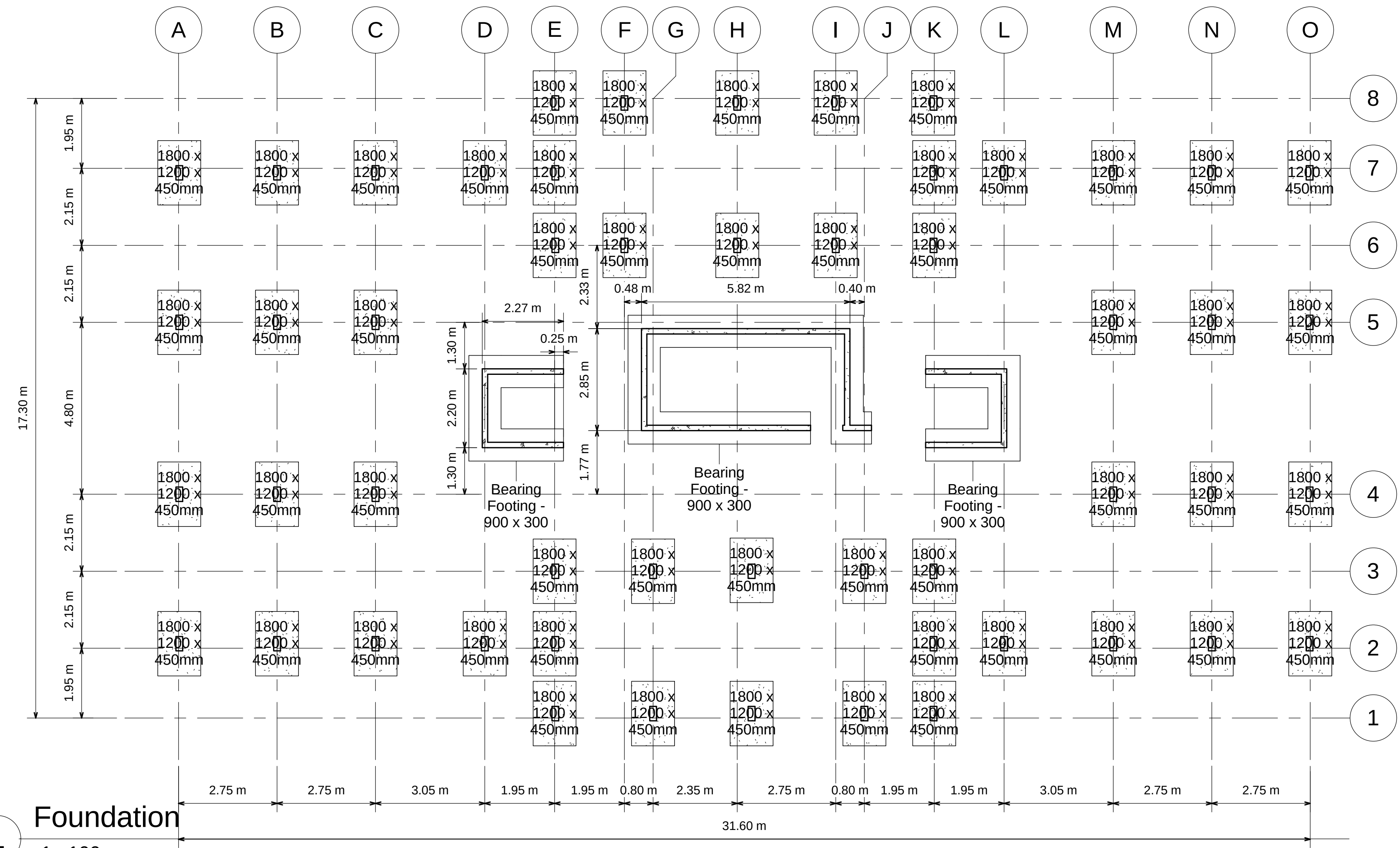


1 Foundation

1 : 100

No.	Description	Date

MQP-LDA 1308

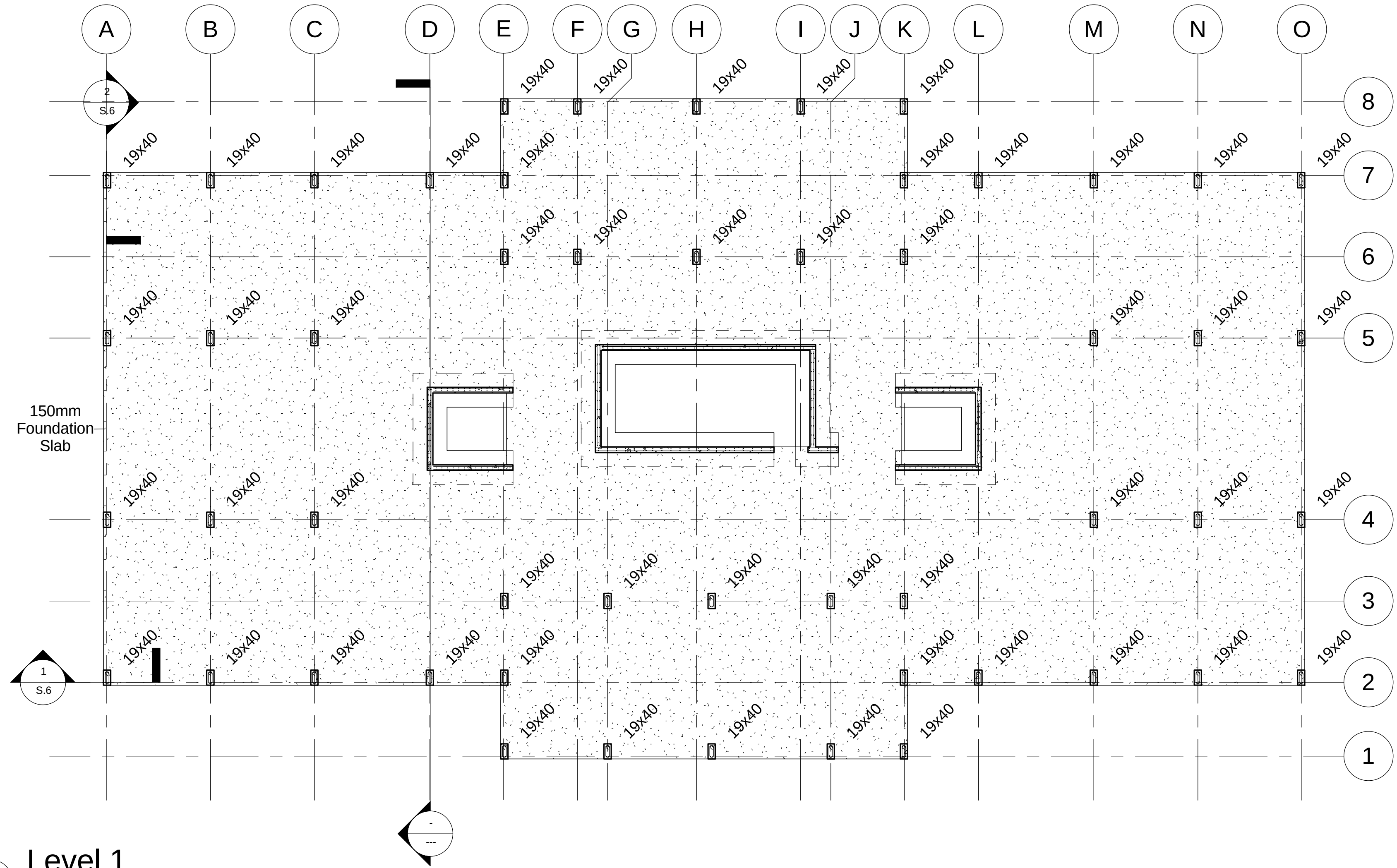
RP-AAD7

TOWER 3 BUILDING

Foundation

Project number	RP-AAD7	S.1
Date	4-25-13	
Drawn by	DCS	
Checked by	Checker	Scale 1 : 100

4/24/2013 5:19:36 AM



Level 1

1 : 100

No.	Description	Date

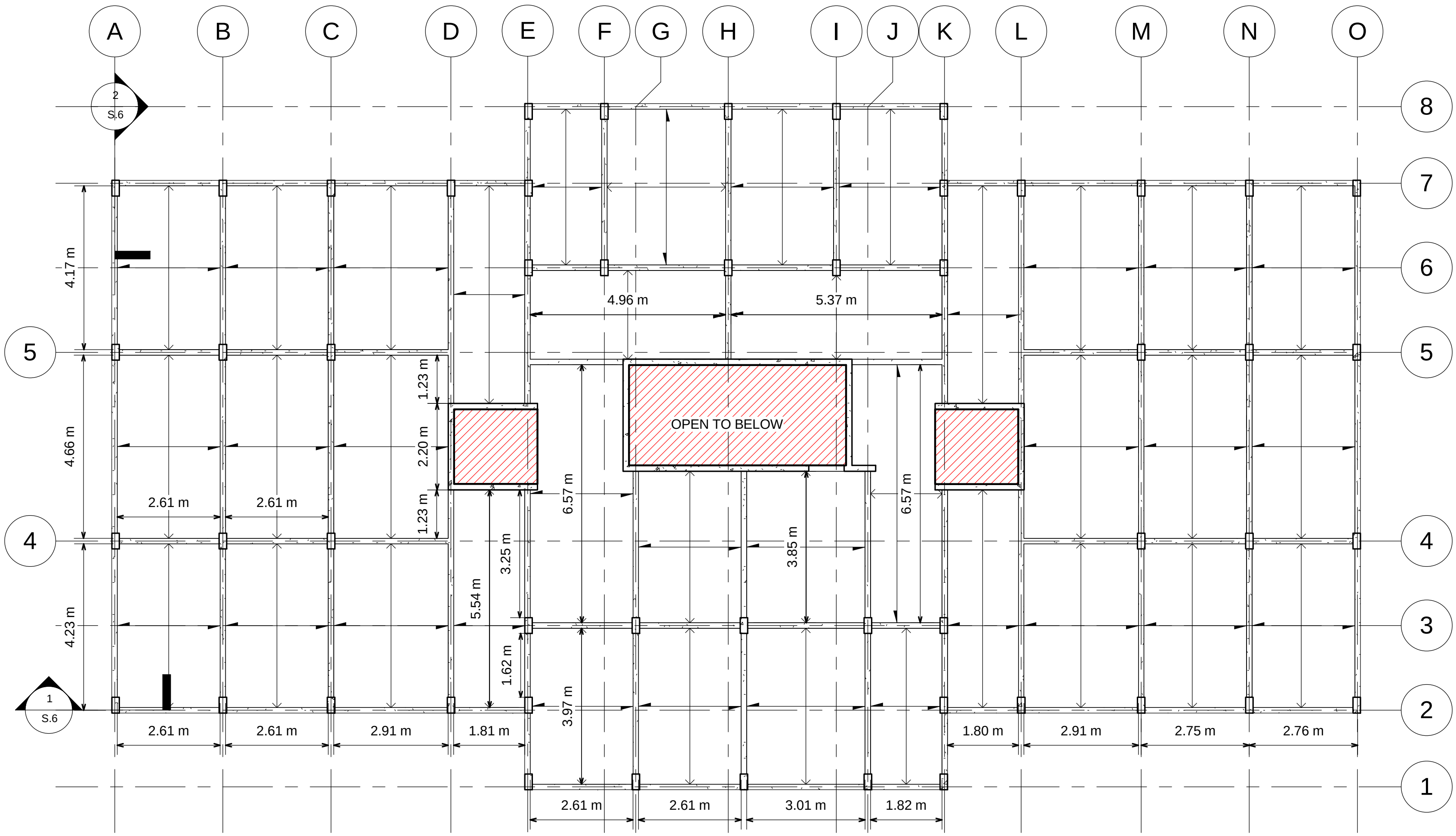
MQP-LDA 1308
RP-AAD7
TOWER 3 BUILDING

Level 1

Project number	RP-AAD7
Date	4-25-13
Drawn by	DCS
Checked by	Checker
Scale	1 : 100

S.2

4/24/2013 5:19:37 AM



1 Level 2

1 : 100

WPI

No.	Description	Date

MQP-LDA 1308

RP-AAD7

TOWER 3 BUILDING

Level 2- Typical Framing

Project number	RP-AAD7	S.3
Date	4-25-13	
Drawn by	DCS	
Checked by	Checker	Scale 1 : 100

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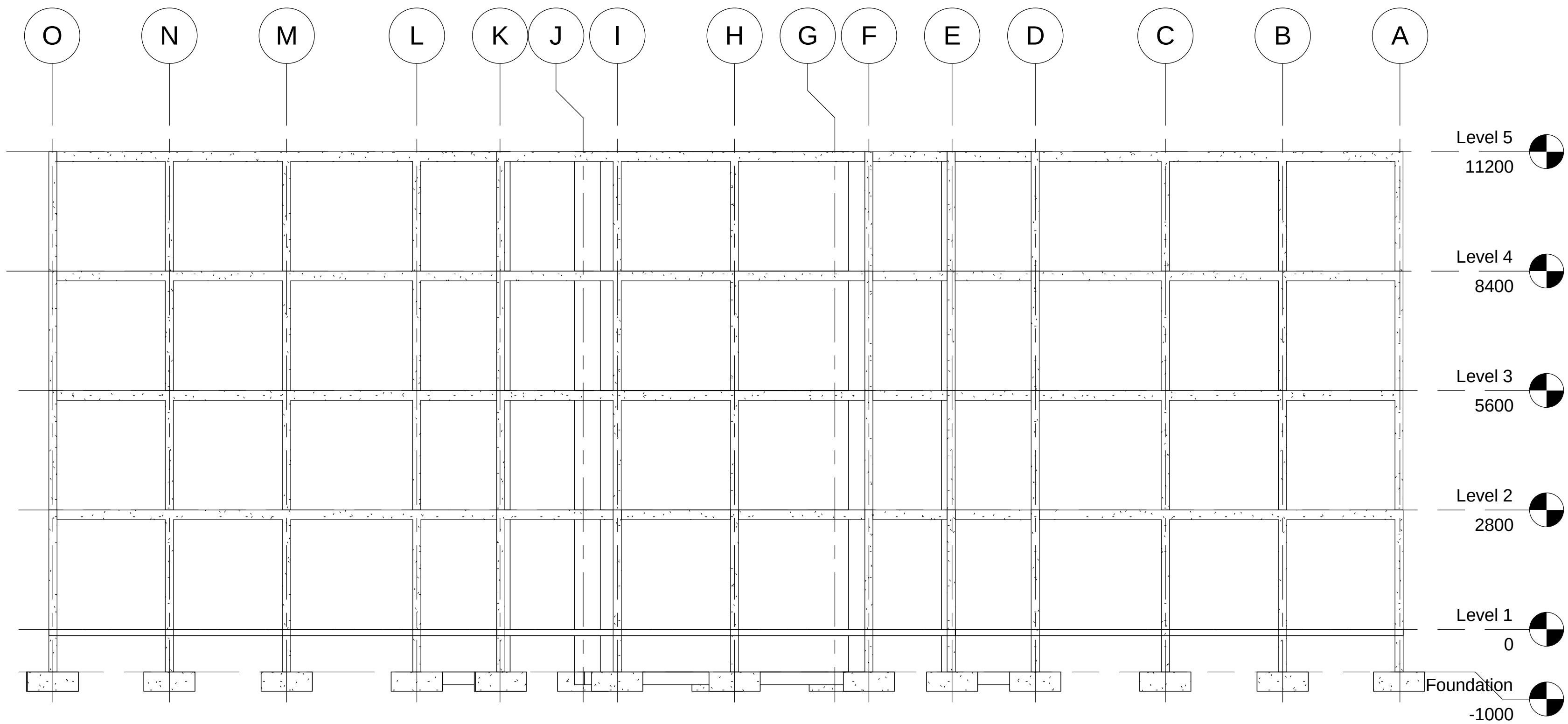

1 North

1 : 100

WPI

No.	Description	Date

MQP-LDA 1308
RP-AAD7
TOWER 3 BUILDING

North Elevation

Project number	RP-AAD7	S.4
Date	4-25-13	
Drawn by	DCS	
Checked by	Checker	Scale 1 : 100

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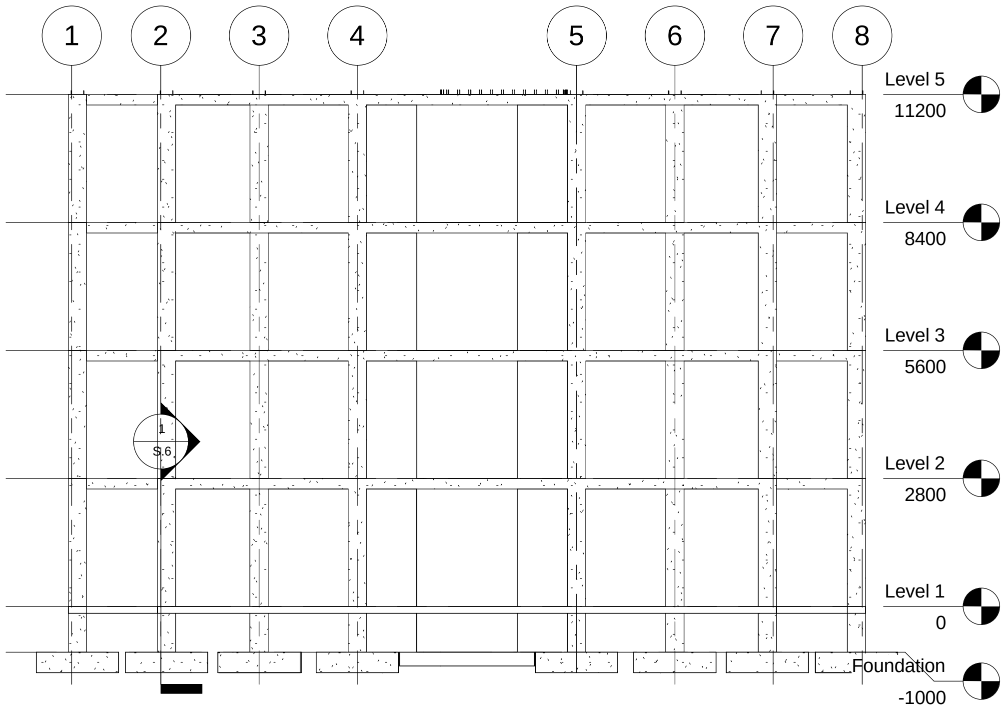

1 East
1 : 100

WPI

No.	Description	Date

MQP-LDA 1308
RP-AAD7
TOWER 3 BUILDING

East Elevation

Project number	RP-AAD7
Date	4-25-13
Drawn by	DCS
Checked by	Checker

S.5

Scale 1 : 100

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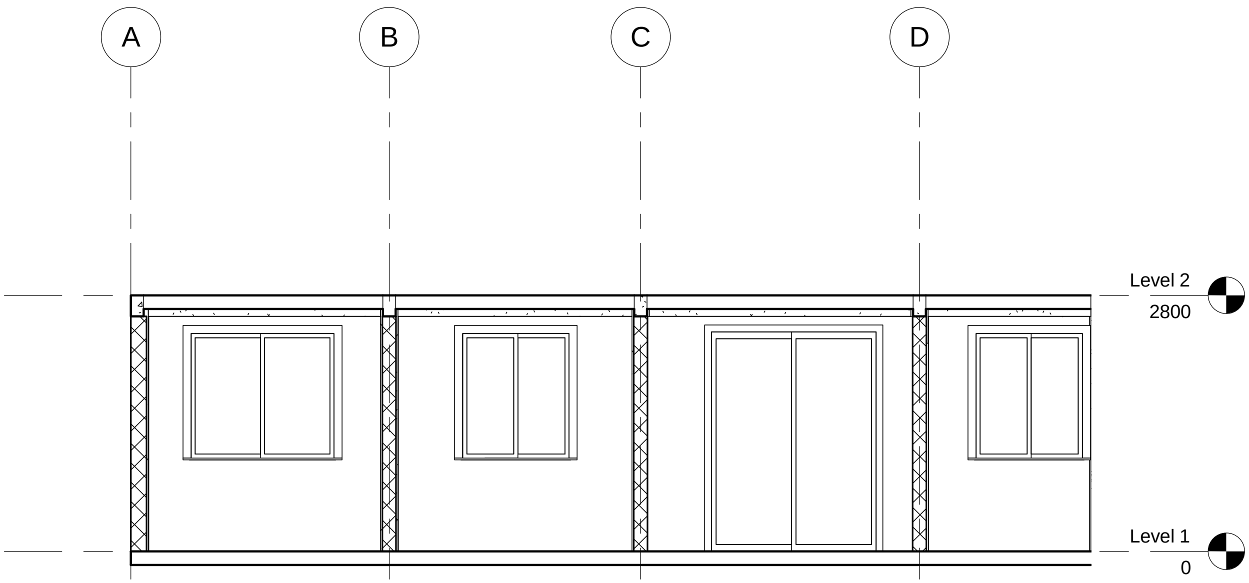


Section 1
1 : 50

No.	Description	Date

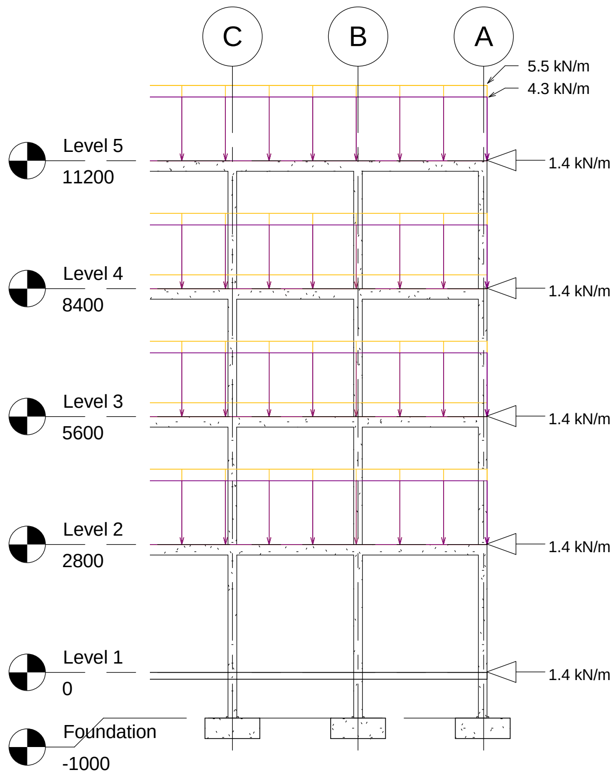
MQP-LDA 1308

TOWER 3 BUILDING

WALL SECTION

Project number	Project Number	A101
Date	4-25-13	
Drawn by	DCS	
Checked by	Checker	Scale 1 : 50

4/1/2013 5:24:27 PM



1 Copy of North

1 : 100

WPI

No.	Description	Date

MQP-LDA 1308
RP-AAD7
TOWER 3 BUILDING

Unnamed

Project number	RP-AAD7	S.13	
Date	4-25-13		
Drawn by	Author		
Checked by	Checker	Scale	1 : 100

4/20/2013 11:33:13 PM

Floor Material Takeoff					
Material: Name	Family and Type	Material: Area	Material: Volume	Estimated Reinforcement Volume	Cost
Concrete - Cast-in-Place Concrete - 35 MPa	Floor: Floor Slab 120 mm	1616.14	193.94		
Slab, Tiles 15 x 15	Floor: Floor Slab 120 mm	1616.14	48.48		
Grand total: 288		3232.27	242.42		

Structural Foundation Material Takeoff					
Material: Name	Family and Type	Material: Area	Material: Volume	Estimated Reinforcement Volume	Cost
Concrete, Cast-in-Place gray		815.70	118.14		
Grand total: 53		815.70	118.14		

Structural Column Material Takeoff					
Material: Name	Family and Type	Material: Area	Material: Volume	Estimated Reinforcement Volume	Cost
	M_Concrete-Rectangular-Column: 19x40	780	48.21		
Grand total: 252		780	48.21		

Structural Framing Material Takeoff					
Material: Name	Family and Type	Material: Area	Material: Volume	Estimated Reinforcement Volume	Cost
Concrete, Cast-in-Place gray	M_Concrete-Rectangular Beam: 14x23	802.19	34.52		
Grand total: 136		802.19	34.52		

Wall Material Takeoff					
Material: Name	Family and Type	Material: Area	Material: Volume	Estimated Reinforcement Volume	Cost
Concrete, Cast In Situ	Basic Wall: Retaining - 150mm Concrete 2	328.30	49.24		
Grand total: 44		328.30	49.24		

WPI

No.	Description	Date

MQP-LDA 1308

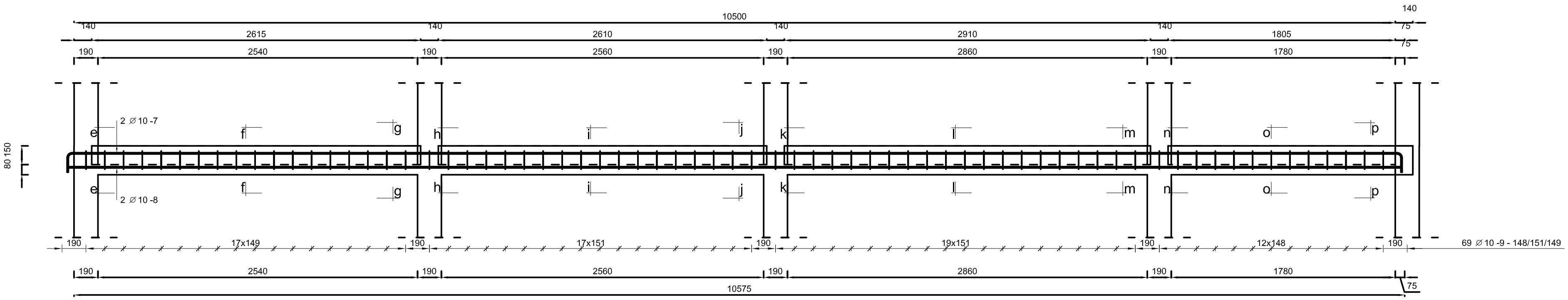
TOWER 3 BUILDING

Material Takeoff Summary

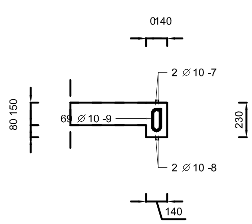
Project number	Project Number	S.11
Date	4-25-13	
Drawn by	DCS	
Checked by	Checker	Scale

4/1/2013 4:19:51 PM

Beam (182755) (B)
Scale 1 : 20



e-e



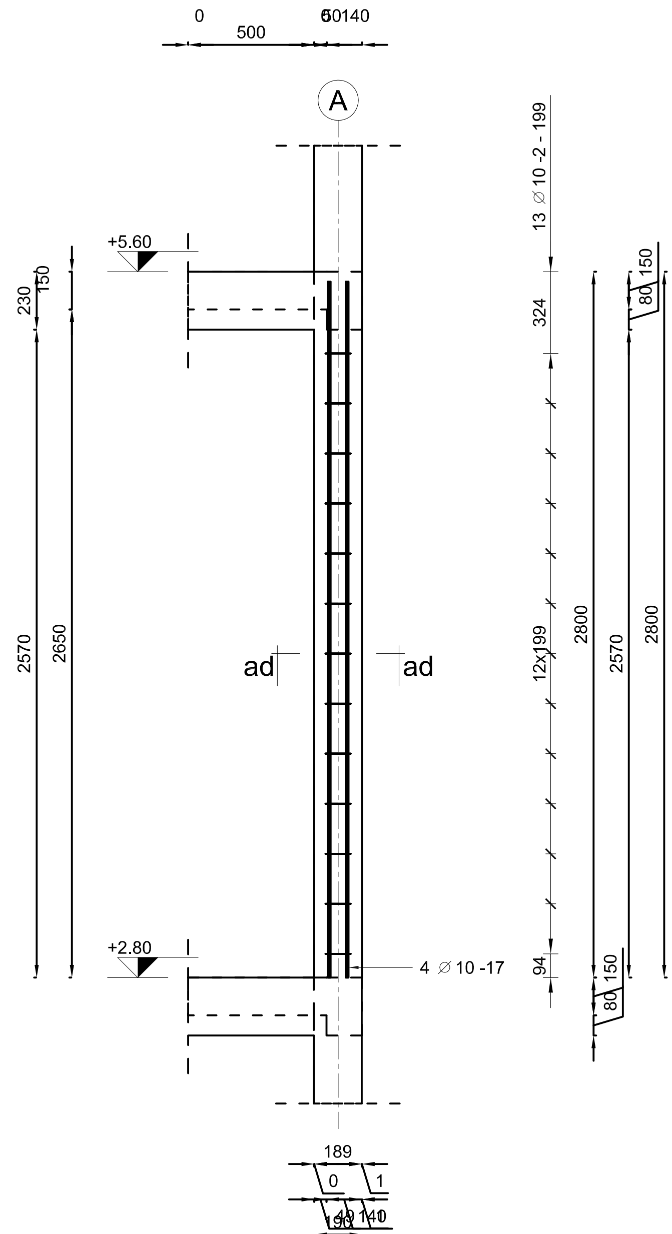
Beam name	Num	Size		Longitudinal reinforcement				Stirrups		
		b (mm)	h (mm)	Bottom	Top left	Top center	Top right	Dimensions	Type/Name	Spacing
Beam (182755) (B).1	1		140	2∅ 10cont.		2∅ 10cont.		69 ∅ 10	Closed	69 @149|151|148
Beam (182755) (B).2	1		140	2∅ 10		2∅ 10				
Beam (182755) (B).3	1		140	2∅ 10		2∅ 10				
Beam (182755) (B).4	1		140	2∅ 10		2∅ 10				

Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40

TITLE: BEAM CROSS SECTION

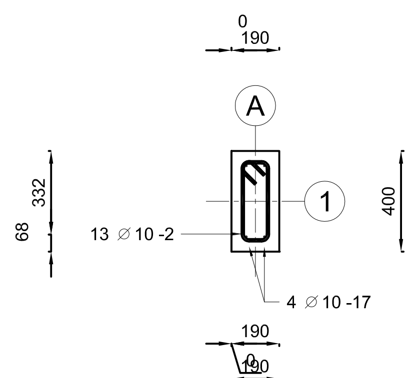
DWG NO: S.9	Revision : 4/25/19	Page: A4 ASD

Column (2) (C)
Scale 1 : 20



Name	Column (2) (C)
Num	1
Level 3 5600	
	400x190 4 ∅ 10 13 ∅ 10 @199 Closed
Level 2 2800	

ad-ad



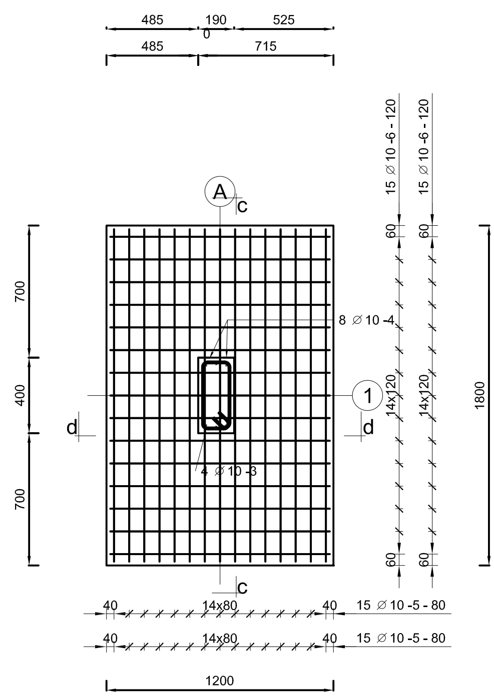
Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40

TITLE: COLUMN CROSS SECTION

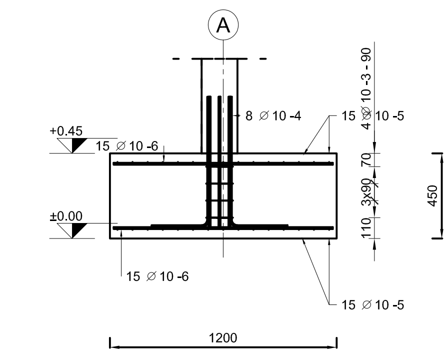
DWG NO: S.8	Revision : 4-25-13	Page: A4 RoboBAT

Spread footing (1) (F)
Scale 1 : 20

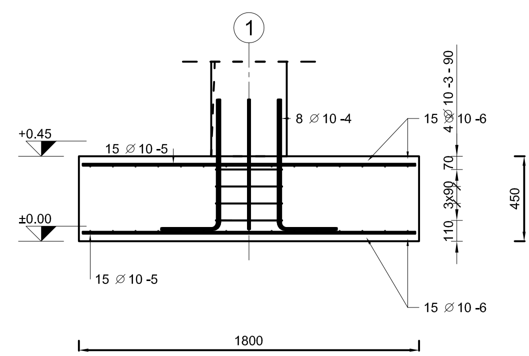
b-b



d-d



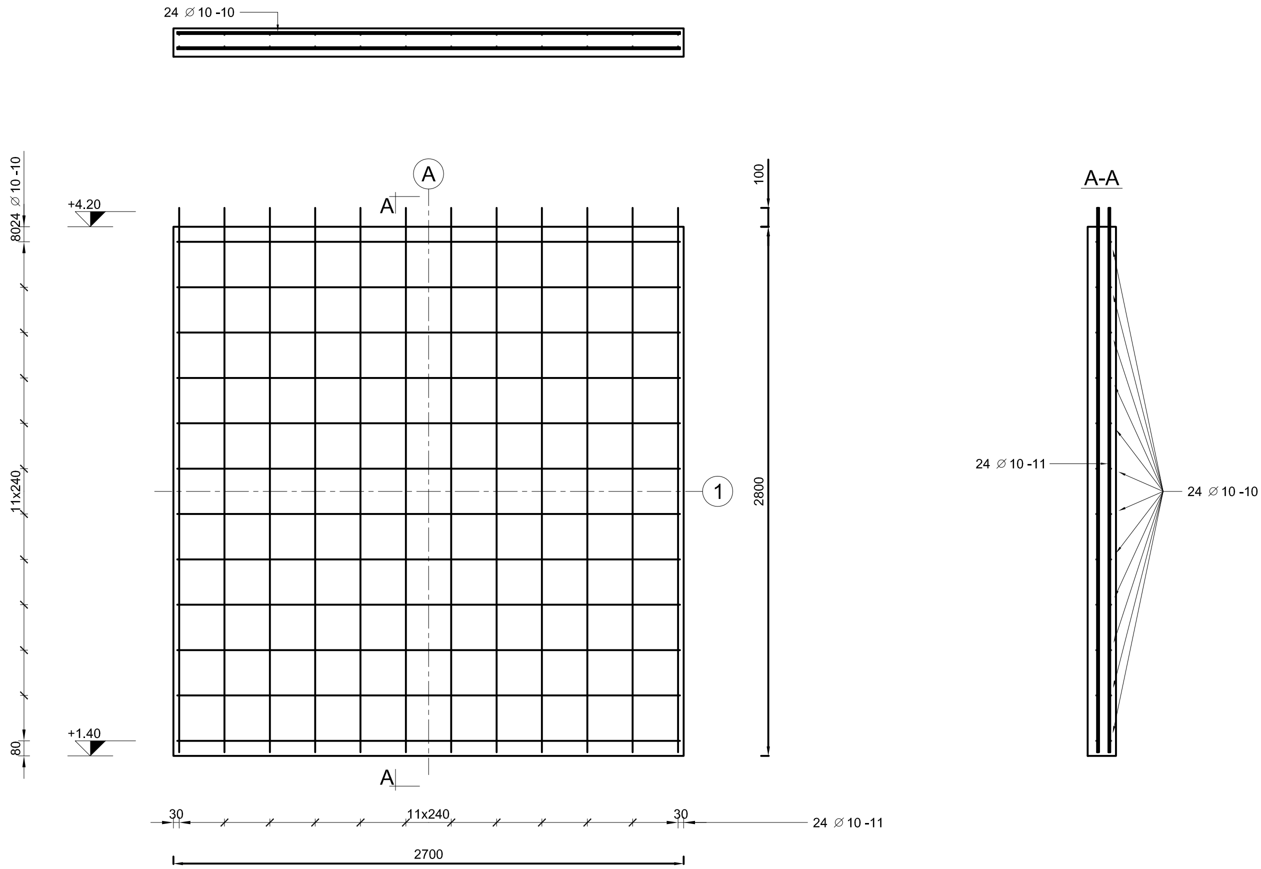
c-c



Elements		Position	Diameter	Length (mm)	Number		Total length (mm)	Mass (kg)	Total mass (kg)
Name	Number				in the element	total			
Spread footing (1) (F)	1	3	10	1130	4	4	4520	2.53	55.93
		4	10	970	8	8	7760	4.35	
		5	10	1760	30	30	52800	29.57	
		6	10	1160	30	30	34800	19.49	

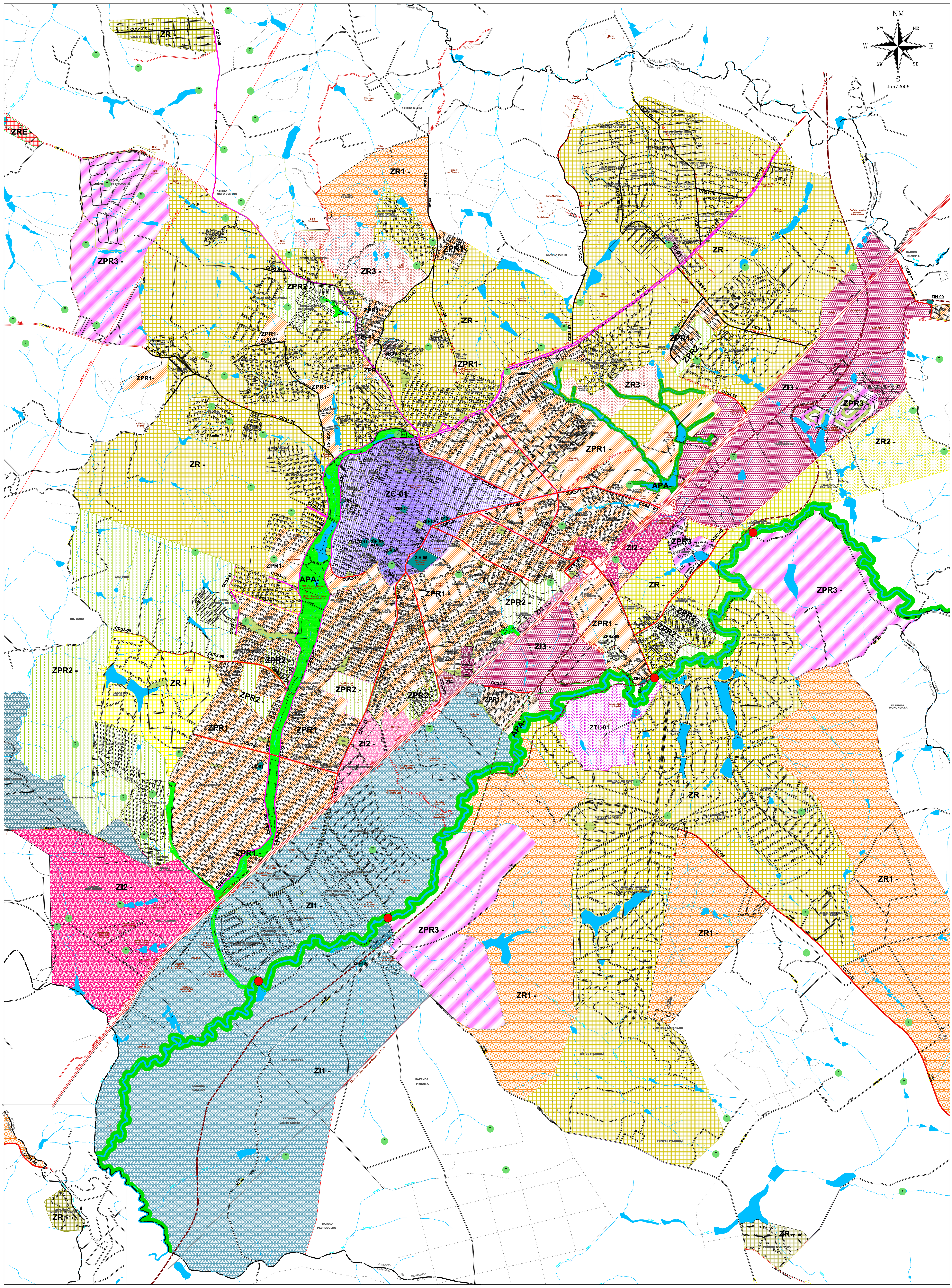
Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40
		TITLE: FOOTING CROSS SECTION			
		DWG NO: S.7		Revision : 4-25-13	Page: A4 RoboBAT

Wall (371709)
Position: 1.1.1
Number of elements: 1



Elements		Position	Diameter	Length (mm)	Number		Total length (mm)	Mass (kg)	Total mass (kg)
Name	Number				in the element	total			
Wall (371709)	1	10	10	2660	24	24	63840	35.75	74.46
		11	10	2880	24	24	69120	38.71	

Sign :	Format :			References :	
Designed by : DCS	Verified :	Approved :	File :	Date : 4-25-13	Scale. 1:40
		TITLE: WALL CROSS SECTION			
		DWG NO: S.12		Revision : 4-25-13	Page: A4 RoboBAT



PREFEITURA MUNICIPAL DE INDAIATUBA

MAPA USO DE SOLO - atualizado em 2011

Secretaria Municipal de Planejamento Urbano e Engenharia

Depto de Cartografia/ Depto Planej. Urbano

Elaboração: Agrimensor Carlos Castilho

Atualização: Arq. Janaina M. Tozzato

Escala 1:15.000

LEGENDA

ZR	ZI1	ZPR2	CCS1
ZRE	ZI2	ZPR3	CCS2
ZR1	ZI3	ZC	CCS3
ZR2	ZI4	ZTL	
ZR3	ZPR1	APA	

Zona de Interesse Histórico (ZIH) Lei 4066/01 e 4980/06

1 - Fazenda Engenho D'Água
2 - Casa n°1
3 - Casarão Pau Preto
4 - Igreja Matriz Nossa Senhora da Candelária
5 - Busto de Dom José de Camargo Barros
6 - Edificações do Hospital Augusto de Oliveira Camargo
7 - Antiga Estação Ferroviária Urbana de Indaiatuba
8 - Antiga Estação Ferroviária de Itaici
9 - Antiga Estação Ferroviária do Helvétia
10 - Antiga Estação Ferroviária do Pimenta
11 - Caixa D'Água (Casarão Pau Preto)
12 - Muro de Taipa, Rua Padre Luiz Soriano (atrás da Casa nº 01)
13 - Caixa D'Água Praça Rotary (Rodoviária)
14 - Edifício da Praça Dom Pedro II (Antiga Escola EEPSG Randolfo Moreira Fernandes)
15 - Chafariz, Praça Elis Regina
16 - Residência Família Coppini (Rua Adhemar de Barros)