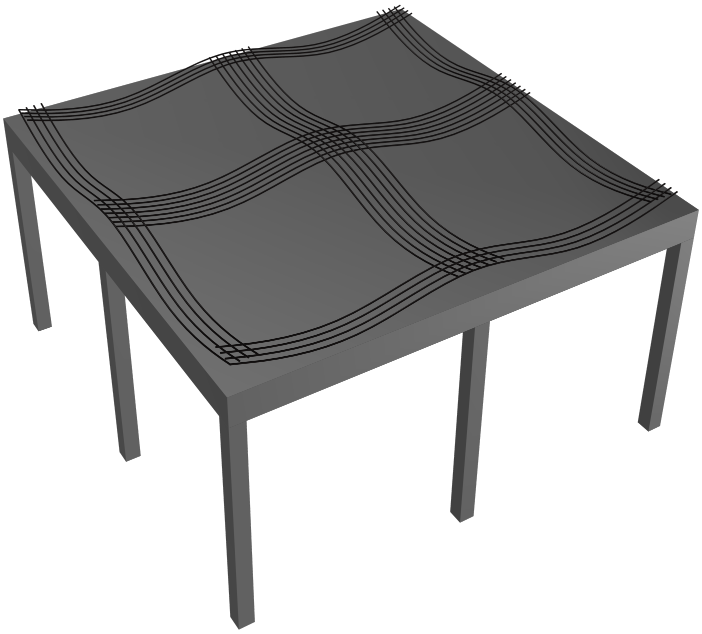

Application of Post-Tensioning in Building Construction

Comparative Study of Material Use in Post-Tensioned and Conventionally Reinforced Concrete Slabs

Master's thesis in Structural engineering and Building technology

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DIVISION OF STRUCTURAL ENGINEERING

CHALMERS UNIVERSITY OF TECHNOLOGY
Master's thesis ACEX30
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Cover:
Layout of a typical slab with post tensioned cables.
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ABSTRACT

The construction industry is a major contributor to global environmental impact, and material-efficient structural systems are therefore important for reducing embodied carbon in buildings. This thesis investigates post-tensioned concrete flat slabs in comparison with conventionally reinforced concrete flat slabs, with focus on material use and CO_2 equivalents. A case study was carried out for span lengths of 6 m, 9 m and 12 m, where the two systems were analysed under comparable geometric and loading conditions. The structural design was performed with numerical FEM model and the resulting quantities of concrete, ordinary reinforcement and prestressing steel were used to calculate CO_2 equivalents for the product stage A1–A3 of the life cycle analysis. In addition, a parametric study was performed to evaluate how slab thickness and concrete strength class influence the total environmental impact. The results show that the benefit of post-tensioning becomes more pronounced for longer spans where reductions in both concrete and reinforcement can be achieved. The study also shows that the most favourable concrete strength class depends on the span length and the required slab thickness, meaning that the lowest concrete class possible does not necessarily result in the lowest total CO_2 equivalents.

Key words: Post-tensioning, reinforced concrete, flat slabs, material efficiency, CO_2 equivalents, embodied carbon, slab thickness, concrete strength class, span length, parametric study

Tillämpning av efterspänning i byggnadskonstruktion
Jämförande studie av materialanvändning mellan efterspända och konventionellt armerade betongbjälklag

Examensarbete inom masterprogrammet Konstruktionsteknik och byggnadsteknologi

ADAM KÖLNÄS

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Institutionen för arkitektur och samhällsbyggnadsteknik
Avdelningen för Konstruktionsteknik
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SAMMANFATTNING

Byggindustrin är en stor bidragande faktor till global miljöpåverkan, och materialeffektiva bärande system är därför viktiga för att minska inbyggt klimatavtryck i byggnader. Detta examensarbete undersöker efterspända betongbjälklag i jämförelse med konventionellt armerade betongbjälklag, med fokus på materialanvändning och CO_2-ekvivalenter. En fallstudie genomfördes för spännvidderna 6 m, 9 m och 12 m, där de två systemen analyserades under jämförbara geometriska förutsättningar och lastförhållanden. Den strukturella dimensioneringen utfördes med numerisk FEM modellering, och de resulterande mängderna betong, vanlig armering och spännstål användes för att beräkna CO_2-ekvivalenter för produktfasen A1–A3 i livscykelanalysen. Utöver detta genomfördes en parametrisk studie för att utvärdera hur plattjocklek och betonghållfasthetsklass påverkar den totala miljöpåverkan. Resultaten visar att nyttan med efterspänning blir tydligare för längre spännvidder där reduktioner av både betong och armering kan uppnås. Studien visar även att den mest fördelaktiga betonghållfasthetsklassen beror på spännvidden och den erforderliga plattjockleken, vilket innebär att den lägsta möjliga betongklassen inte nödvändigtvis resulterar i de lägsta totala CO_2-ekvivalenterna.

Nyckelord: Efterspänning, armerad betong, betongbjälklag, materialeffektivitet, CO_2-ekvivalenter, inbyggt kol, plattjocklek, betonghållfasthetsklass, spännvidd, parametrisk studie

Contents

Preface

This master's thesis was carried out during the spring of 2026 at the Department of Architecture and Civil Engineering, Chalmers University of Technology, in collaboration with the structural engineering department at Tyréns. The work has focused on the application of post-tensioning in building construction, with particular emphasis on material use and embodied carbon in concrete flat slabs.

We would like to express our sincere gratitude to Tyréns for the collaboration and for welcoming us to their structural engineering department. Their willingness to support the project and provide insight into practical structural design has been highly appreciated throughout the work.

We would especially like to thank our supervisors at Tyréns, Mikael Hallgren and Robin Flyman, for their valuable guidance, engagement and support during the project. The knowledge and experience they have shared within the field of structural engineering and post-tensioned concrete have been of great importance for carrying out the investigations presented in this thesis.

We would also like to thank Carlos Gil Berrocal, who has acted as both examiner and supervisor at Chalmers University of Technology. His valuable feedback, technical input and support regarding the structure of the report have contributed significantly to the development of the thesis.

Finally, we would like to thank Simon Larsson at Tyréns structural engineering department for his help in establishing the initial contact and for contributing to a welcoming introduction to the department.

Gothenburg, June 2026

Joel Sand

Adam Kölnäs

Notations

Abbreviations and Symbols

A1–A3	Product stage in the life cycle assessment, including raw material supply, transport and manufacturing.
A4–A5	Construction process stage in the life cycle assessment.
AI	Artificial Intelligence.
API	Application Programming Interface.
BBR	Swedish Building Regulations.
CAD	Computer-Aided Design.
CO_2	Carbon dioxide.
CO_2e	Carbon dioxide equivalents.
EN	European Standard.
FE	Finite Element.
FEM	Finite Element Method.
fib	International Federation for Structural Concrete.
LCA	Life Cycle Assessment.
PT	Post-tensioned.
RC	Reinforced concrete.
SCM	Supplementary Cementitious Material.
SLS	Serviceability Limit State.
SS-EN	Swedish implementation of a European Standard.
ULS	Ultimate Limit State.
UN	United Nations.

Material and designations

B500B	Reinforcing steel grade with characteristic yield strength of 500 MPa and ductility class B.
C20/25	Concrete strength class with characteristic cylinder/cube compressive strength of 20/25 MPa.
C25/30	Concrete strength class with characteristic cylinder/cube compressive strength of 25/30 MPa.
C28/35	Concrete strength class with characteristic cylinder/cube compressive strength of 28/35 MPa.
C30/37	Concrete strength class with characteristic cylinder/cube compressive strength of 30/37 MPa.
C32/40	Concrete strength class with characteristic cylinder/cube compressive strength of 32/40 MPa.
C35/45	Concrete strength class with characteristic cylinder/cube compressive strength of 35/45 MPa.
C40/50	Concrete strength class with characteristic cylinder/cube compressive strength of 40/50 MPa.
C45/55	Concrete strength class with characteristic cylinder/cube compressive strength of 45/55 MPa.

C50/60	Concrete strength class with characteristic cylinder/cube compressive strength of 50/60 MPa.
C55/67	Concrete strength class with characteristic cylinder/cube compressive strength of 55/67 MPa.
C60/75	Concrete strength class with characteristic cylinder/cube compressive strength of 60/75 MPa.
Δc_{dev}	Allowance for deviation in design of concrete cover.
$c_{\mathrm{min,dur}}$	Minimum concrete cover depth required for durability conditions.
c_{nom}	Nominal concrete cover depth.
GUTS	Guaranteed Ultimate Tensile Strength.
R90	Fire resistance requirement of 90 minutes.
Y1860S7	Seven-wire prestressing strand with characteristic tensile strength of 1860 MPa.

Exposure and environmental classes

X0	Exposure class with no risk of corrosion or attack.
XC1	Exposure class for corrosion induced by carbonation in dry or permanently wet conditions.
XD3	Exposure class for corrosion induced by chlorides other than from seawater, with cyclic wet and dry exposure.
XS1–XS3	Exposure classes for corrosion induced by chlorides from seawater.

1 INTRODUCTION

This chapter introduces the background and purpose of the thesis. It presents the motivation for studying material-efficient concrete floor systems and describes the aim, research questions and limitations that define the scope of the study.

1.1 Background

The construction industry is a major contributor to global environmental impact, with cement production accounting for 7% of carbon dioxide (CO_2) emissions (IEA, 2018). Much of the current focus in the industry is prioritized toward streamlining the building process and ensuring rapid installation. While these goals improve productivity, they can sometimes act as a barrier to the adoption of existing methods that may be slower but offer better environmental outcomes through reduced material usage.

Post-tensioned (PT) concrete slabs are relatively uncommon in Swedish buildings compared to conventional reinforced slabs. This is partly due to established construction practices, cost considerations, familiarity of contractors and designers with traditional reinforced slab solutions (Furkhan & Student, 2021). However, PT presents several structural advantages that can be highly beneficial in building applications.

Using PT in the slab makes it possible to achieve longer spans, reduce slab thickness, and improve overall stiffness. These improvements can lead to reduced material usage and lighter structural systems, which in turn can allow for lower floor to floor heights, fewer supporting columns and more flexible architectural layouts. The method also has some drawbacks as more complex design and needs of higher concrete strength in design phase and specialised equipment and longer production times due to the fact that the concrete need to gain certain strength before tensioning in production phase.

In addition to structural performance, the reduction in slab thickness and material consumption contribute to sustainability objectives by reducing concrete and associated $\mathrm{CO_2}$ emissions. As such, PT slabs can be seen as a viable alternative to traditional design solutions, especially in projects where span length, serviceability performance or architectural openness are critical design drivers.

1.2 Aim

The aim of this thesis is to investigate the potential reduction in environmental impact of concrete slabs by use of PT compared to traditionally reinforced concrete (RC) slabs for different span lengths and concrete classes.

1.3 Limitations

The study is limited to cast in situ flat slab systems with conventional reinforcement and PT tendons and excludes precast prestressed concrete elements. The study is also limited to rectangular cross-sections and does not include structural concrete elements with voids or ribs, such as waffle slabs and hollow-core slabs. The study will also only include regular column grids with equally long spans in both directions. The tendon is limited to include only straight unbounded layout profiles. All structural calculations are performed in accordance with the Eurocode.

1.4 Problem definition

This thesis addresses the following specific research questions:

- What are the quantitative differences in the use of material and embodied carbon between PT and RC flat slabs, evaluated under identical structural conditions?
- To what extent is the variance in embodied carbon between conventional and PT slabs affected by changes in span length?
- How can a parametric model be used in an early design stage to preliminarily identify the slab thickness and concrete strength class that result in the lowest embodied carbon for PT flat slabs?

1.5 Method

This project began by establishing theoretical knowledge on PT slab systems. Scientific publications, design guidelines, and relevant standards were studied to identify typical applications, structural and environmental benefits as well as limitations. This background provided the basis for defining the key assumptions and design parameters applied throughout the study.

A case study was conducted on a representative office building. The primary objective was to evaluate and compare the performance of two structural systems of conventional RC flat slabs and PT flat slabs. Several different span lengths were analysed and for each configuration, the systems were evaluated based on three key performance indicators material usage, embodied carbon (CO_2e) and the span to depth ratio.

To complement the case study, a parametric design tool was developed using Grasshopper and FEM- design. This tool allowed key design parameters such slab thickness and concrete strength class to be varied in order to generate preliminary PT slab solutions and estimate material quantities. These parametric analyses were utilized to identify the most efficient combinations of slab thickness and concrete class with the lowest corresponding CO_2e value.

Finally, the results from case study and parametric analyses were combined to assess the potential benefits and limitations of PT slabs in terms of material efficiency, structural performance and flexibility.

1.6 Ethical and Environmental aspects

The primary focus of this thesis lies in ecological sustainability, specifically investigating how the implementation of an established method can reduce emissions of CO_2e in the construction of concrete flat slabs. This research is conducted in alignment with the UN 2030 Agenda for Sustainable Development by addressing Goal 9 regarding Industry, Innovation, and Infrastructure, Goal 11 concerning Sustainable Cities and Communities, and Goal 13 regarding Climate Action ("Globala målen för hållbar utveckling", n.d.).

From an ethical perspective, this study maintains a strictly objective approach to the collected data. This is essential to avoid overstating or downplaying the environmental impact, thereby ensuring a balanced analysis. The thesis highlights both the advantages and disadvantages regarding methods, material selection, and implementation to ensure transparency and prevent bias.

1.7 Statement about use of AI

In this report, AI was used primarily to check grammar, spelling, and to improve phrasing. Additionally, AI served as an assistant to help find relevant references for calculations and limit values according to Eurocode standards and similar standards.

2 THEORETICAL BACKGROUND

This chapter presents the theoretical background required to understand the structural and environmental aspects of the study. The chapter introduces the fundamental behaviour of reinforced and prestressed concrete, with particular focus on flat slab systems, post-tensioning principles, material properties and time-dependent effects. In addition, the chapter describes relevant concepts related to parametric design and climate impact assessment, which form the basis for the methods and comparisons carried out in the thesis.

2.1 Concrete

Concrete is a composite construction material consisting of cement paste and aggregates and is widely used in load bearing structures due to its high compressive strength, durability and versatility (Engström Björn, 2011). In structural applications, concrete primarily resists compressive stresses, while its tensile capacity is limited, often requiring reinforcement to ensure adequate structural performance (Engström Björn, 2011).

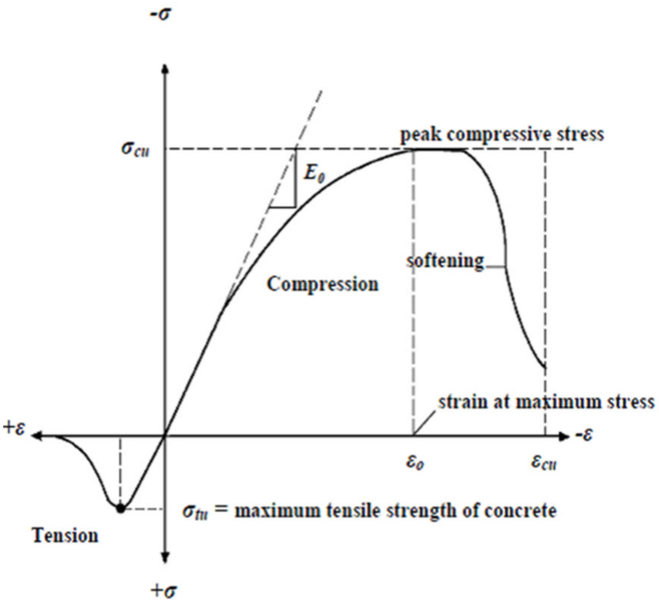


Figure 2.1: Typical stress-strain curve for concrete

The mechanical behaviour of concrete is characterised by non linear stress strain relationships and cracking under tensile loading. The stiffness and strength properties of concrete may vary depending on material composition and loading conditions (Aziz & Abdulkadir, 2022). Furthermore, the structural properties of concrete evolve with time and are influenced by curing conditions and environmental exposure (Obayes et al., 2020). Fundamental material assumptions and design considerations are defined in the design standards as Eurocode and national annex (European Committee for Standardization, 2004).

2.1.1 Long term effects

Concrete has a viscoelastic behavior which leads to deformation gradually changes when subjected to sustained loading and environmental exposure(Engström Björn, 2011).

These changes are governed by both mechanical and environmental factors, such as load duration and relative humidity. Over time, the resulting deformations alter the internal stress state of structural members and affect their long term performance, particularly with regard to serviceability requirements (European Committee for Standardization, 2004).

Shrinkage

Shrinkage is a time dependent long term effect in concrete and can be divided into two main types, autogenous shrinkage and drying shrinkage (Engström Björn, 2011). Shrinkage develops gradually over time, which is why the curing time of the concrete influences the magnitude of shrinkage.

Drying shrinkage develops in relation to the surrounding relative humidity. Depending on environmental conditions, both swelling and shrinkage may occur, however, shrinkage is the most common phenomenon due to the lower relative humidity in the surrounding compared to the concrete. (Engström Björn, 2011).

The second type of shrinkage is autogenous shrinkage, which mainly develops at an early stage of the curing process (Engström Björn, 2011). Autogenous shrinkage occurs within the concrete and is not dependent on the surrounding relative humidity, in contrast to drying shrinkage. Since this type of shrinkage takes place without any exchange of moisture with the environment, it is often referred to as basic shrinkage. High strength concrete with a low water cement ratio generally exhibits a higher magnitude of autogenous shrinkage.

Creep

Concrete structures deform due to an immediate elastic strain and a time-dependent deformation that develops under sustained loading. The time dependent deformation of concrete is referred to as creep (Engström Björn, 2011).

Creep develops gradually over time and tends to stabilise after a prolonged period, approximate 70 years (Engström Björn, 2011). The creep coefficient depends on several factors, including the concrete strength class, relative humidity, loading history and the geometry of the concrete section, such as the cross-sectional area and perimeter (European Committee for Standardization, 2004).

2.1.2 Low carbon concrete

Climate improved concrete, often referred to as low carbon concrete, is defined as concrete in which the environmental impact is reduced through a partial replacement of Portland cement with alternative binders and industrial by products (Damtoft et al., 2001). Common approaches include the use of supplementary cementitious materials (SCMs) such as fly ash, volcanic ash, calcined clays and ground granulated blast furnace slag, which reduce carbon dioxide emissions associated with cement production while maintaining acceptable mechanical and durability properties (Shailendra Tiwari et al., 2015).

According to the Danish center for green concrete, low carbon concrete can be developed through several complementary strategies, including the utilisation of residual materials from other industries, the development of resource efficient binder systems and increased recycling within the concrete industry. These strategies aim to reduce the overall environmental footprint of concrete while still fulfilling technical requirements related to strength development, durability and service life (Damtoft et al., 2001).

Curing time

The curing time of low carbon concrete often differs from that of conventional concrete due to its modified binder composition. Concretes containing high proportions of SCMs, such as fly ash and blast furnace slag, generally exhibit slower hydration kinetics and reduced early-age strength development compared to Portland cement-based concretes, which may necessitate extended or more carefully controlled curing regimes (Dirch H. Bager et al., 2012).

Several studies have shown that although low-carbon concrete may exhibit slower strength development at early ages, it can achieve comparable or even higher compressive strength at later ages, such as 56 or 90 days. Consequently, the conventional 28-day strength criterion may not be fully representative for these concrete types and later age testing is often adopted in practice to account for delayed strength gain (Ward R. Malisch, 2013). Similar conclusions regarding delayed strength development and later age performance have been reported for concrete containing fly ash and slag binders (Dirch H. Bager et al., 2012).

Inadequate curing has been shown to have a more pronounced negative effect on low carbon concrete than on conventional concrete, particularly at early ages. Concretes with slowly reacting binders are more sensitive to premature drying and unfavorable curing conditions, which may adversely affect surface quality and long term durability. Therefore, stricter curing requirements are often recommended for low carbon concrete compared to conventional Portland cement concrete (Dirch H. Bager et al., 2012).

2.2 Reinforcement steel

Conventional reinforcing steel is a essential material in concrete construction. Concrete is strong in compression but weak in tension, so reinforcing steel is embedded within the element to resist tensile forces once the concrete cracks. This type of steel has a clear yield strength and undergoes significant plastic deformation before failure.

2.3 Prestressing steel

Prestressing steel is a high strength material used primarily in concrete construction as reinforcement to reduce material consumption, increase span lengths, and improve crack control. This type of steel usually takes the form of strands or wires characterised by high tensile strength and fatigue resistance. These properties are essential to withstand high prestressing forces over long durations while maintaining structural integrity(Engström Björn, 2011).

2.3.1 Mechanical properties

Prestressing steel is characterised by its high tensile capacity, which significantly exceeds that of conventional reinforcing steel. The mechanical properties are commonly defined by parameters such as the characteristic tensile strength f_{pk}, the modulus of elasticity E_p and the characteristic proof stress $f_{p0.1k}$ (Engström Björn, 2011). The high strength of prestressing steel enables the introduction of large prestressing forces, which are essential for achieving the desired structural behavior.

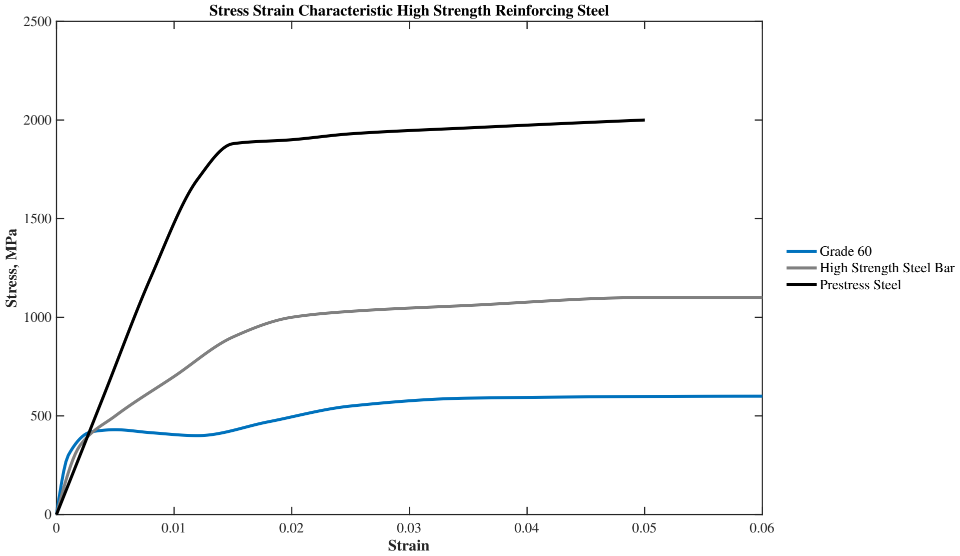


Figure 2.2: Schematic stress-strain behavior of high-strength reinforcing steel, based on Anggraini et al. (2018).

The modulus of elasticity is typically of the same order of magnitude as that of ordinary reinforcing steel. However, the stress levels that can be sustained are considerably higher due to the high-strength nature of the material (International Federation for Structural Concrete (fib), 2013).

2.3.2 Stress-strain behavior

Prestressing steel is characterised by a predominantly linear elastic response up to high stress levels. Unlike conventional reinforcing steel, prestressing steel does not exhibit a distinct yield plateau (Anggraini et al., 2018). The stress strain relationship is instead defined by a gradual transition from elastic to inelastic behaviour. Due to its high strength, the ultimate strain capacity is more limited compared to mild reinforcing steel. For design purposes, idealised stress strain diagrams are commonly adopted (International Federation for Structural Concrete (fib), 2013).

2.3.3 Relaxation

The stress induced during pretensioning gradually decreases over time due to relaxation. This time dependent behavior leads to a loss of the initially applied stressing force and the steel stress. (Engström Björn, 2011). The magnitude of the relaxation increases as the difference between the initial stress and the tensile strength of the steel decreases. For PT members, the stress to be considered as the initial stress should be taken as the stress after tensioning and anchoring in the prestressing reinforcement.

Depending on the type of steel used, prestressing reinforcement is divided into three distinct classes regarding relaxation behavior. Classes 1 and 2 comprise wires and strands with ordinary and low relaxation, respectively. Class 3 comprises hot rolled and processed bars. Class 1 is more sensitive to relaxation, whereas Class 2 has better resistance to relaxation. The final relaxation value is typically assumed to be reached after approximately 500 000 hours which is equal to 57 years (Engström Björn, 2011).

2.4 Prestressed concrete

Presstressed concrete involves introducing compressive stress to the concrete member in production before the service load is applied. This is achieved through two main methods, pre- and post-tensioning. In pre-tensioning, tendons are tensioned before casting the concrete and in post-tensioning tendons are tensioned after the concrete has hardened (The Concrete Society, n.d.). Pretensioning are a method that is exclusively used in pre-casted structures. This rapport are focus mainly on post-tensioning, as this is the methodology applied in the structures analysed in this study.

2.4.1 Post-tensioned concrete

PT is a prestressing technique where the concrete is cast before the tensioning of the reinforcement. This is typically achieved by placing the tendons inside ducts embedded within the formwork before the concrete is poured. The tensioning process is initiated only after the concrete has attained sufficient compressive strength, which is generally required to be approximately 70% of its characteristic 28 day strength (f_{ck}) (Engström Björn, 2011).

A significant advantage of PT elements is the flexibility regarding the tendon profile, which can be strategically placed to accommodate specific design requirements. In practice, the tendon geometry is often designed to follow the bending moment diagram of the structure. For instance, a simply supported beam typically utilises a parabolic tendon layout to counteract the stresses induced by its own self weight.

Due to the curved profile of the tendons, friction is generated between the tendon and the duct during the stressing operation. This results in a reduction of the effective prestress force as the distance from the jacking end increases. These friction losses are primarily a function of the cumulative angle changes in the profile (Lin Tung-Yen & Burns Ned H, 1970). Furthermore, as the curved tendon is tensioned, it attempts to straighten, which generates transverse forces exerting both upward and downward pressure on the concrete member as shown in figure 2.3. This phenomenon is a central principle of the load balancing method, used to effectively manage deflections and internal stresses within the element.

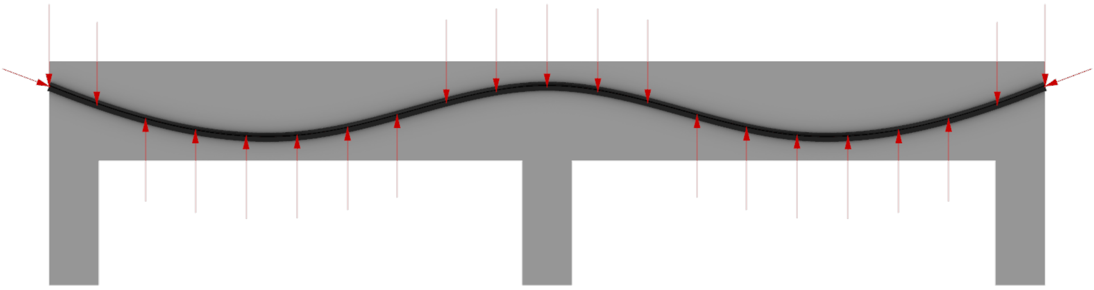


Figure 2.3: Show upward and downward pressure

Tendon adhesion

PT systems are generally categorised as either bonded or unbonded, depending on the interaction between the steel and the concrete. Bonded systems rely on the injection of grout to create a continuous bond along the tendon (*Post-tensioned Concrete Floors*, 2017). In an unbonded arrangement, the tendons are encased in individual plastic sheaths without the use of grout, which results in a total lack of bond along the entire length of the structural member. This report focuses exclusively on unbonded systems.

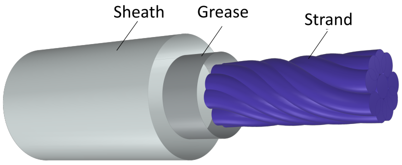


Figure 2.4: Component of a unbonded PT tendon

Due to the lack of bond, the prestressing force is transferred to the concrete almost entirely through the end anchorages. This creates a global structural response where the tendon is free to slide relative to the concrete (European Committee for Standardization, 2004). This mechanical behavior typically leads to lower ductility and a tendency for wider cracks compared to bonded systems. To manage these effects, a higher amount of conventional reinforcement is often required for crack control. Furthermore, design codes restrict the allowable stress increase in unbonded tendons at the ultimate limit state (ULS). Because these tendons can slide freely, their strain is distributed along their entire length rather than being locked to the local strain of the concrete where cracking occurs.

Anchorage

Anchorages are used to secure the ends of the tendons and transfer the prestressing force from the strands to the concrete member. These components typically consist of steel blocks, often referred to as anchor heads, through which single or multiple strands are routed (Lin Tung-Yen & Burns Ned H, 1970). To maintain the tension, the strands are held firmly in place by wedges that lock into the anchor head as the jacking force is released.

Figure 2.5: Example of an anchorage for an unbonded post-tensioning system (DYWIDAG, 2026).

2.4.2 Primary and secondary effects

In continuous PT structures, unlike simply supported members, the presence of internal supports gives rise to secondary reactions (F.K. Kong & R.H. Evans, 1988). When analyzing the prestressing force alone, a moment is generated based on the geometry of the tendon profile. This is referred to as the primary moment (M_1), which is defined as the product of the prestressing force (P) and the eccentricity (e):

$$M_1 = P \cdot e \tag{2.1}$$

An effect of the upward and downward pressure generated by the tendons as shown in figure 2.3 causes the element to deflect upwards in the spans and downwards at the supports. However, because the supports constrain this vertical movement, external reaction forces are generated. These reactions produce an additional external moment known as the secondary moment (M_2). The total internal effect, referred to as the resultant moment (M_3), is the summation of the primary (M_1) and secondary moments:

$$M_3 = M_1 + M_2 \tag{2.2}$$

2.4.3 Prestress losses

Immediate prestress losses in PT concrete members primarily consist of friction, anchorage slip, and elastic shortening. These losses occur during or immediately following the tensioning process and must be accurately accounted for to ensure the required effective prestress is maintained.

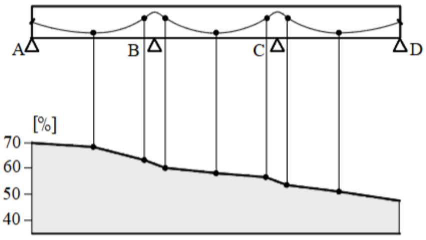


Figure 2.6: Example of how the tendon force may vary in a post-tensioned beam immediately after tensioning. Tensioning from the end A and a passive anchor at the end D (Engström Björn, 2011)

Friction losses arise from the interaction between the tendon and its duct or sheathing, driven by both the intended curvature of the profile and the unintended "wobble" effect (k) (Engström Björn, 2011). Consequently, the prestressing force decreases as the distance x from the active end increases, see figure 2.6. This loss is governed by the friction coefficient (μ) and can be significantly reduced by employing double ended stressing, which effectively halves the friction affected length of the members shown in figure 2.7. The formula according to eurcode is:

$$\Delta P_\mu(x) = P_{\max}\left(1 - e^{-\mu(\theta + kx)}\right) \tag{2.3}$$

Where θ is the sum of the angular displacements over a distance x (irrespective of direction or sign).

In addition to friction losses, anchorage slip, often referred to as wedge set, occurs when the jacking force is transferred from the jack to the anchorage, causing a small shortening when the jack is moving towards the center of the tendon and a corresponding loss of prestress. In unbonded systems, the impact of this seating is particularly critical due the absence of a bond, which allows the loss in stress ($\Delta\sigma$) to propagate over a significant influence length, or even the entire span (Lin Tung-Yen & Burns Ned H, 1970). The loss is most intense at the jacking end and dissipates gradually along the member.

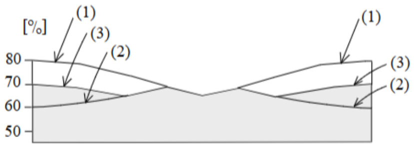


Figure 2.7: Example of how the tendon force may vary in a PT beam immediately after tensioning. Tensioning from both ends(Engström Björn, 2011).

Finally, elastic shortening results from the axial compression of the concrete member as the prestressing force is applied. The magnitude of this loss is highly dependent on the stressing sequence. If all tendons are tensioned simultaneously, the jack automatically compensates for the deformation, resulting in zero loss. However, during sequential stressing, each previously tensioned tendon undergoes a loss in force as subsequent tendons are tightened and further compress the concrete.

Beyond the immediate losses occurring during tensioning, the effective prestress force is further reduced over time by the phenomena of concrete shrinkage, creep and the relaxation of the prestressing steel.

2.5 Flat slabs

A flat slab is a reinforced concrete floor system in which the slab is supported directly by columns without the use of intermediate beams. The system is characterised by a beamless structural layout and is primarily used in building applications.

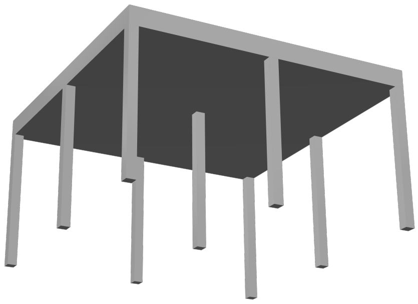


Figure 2.8: Flat slab

Flat slab systems are commonly used in building structures where a beamless floor system is preferred due to its favourable structural layout and architectural flexibility. Typical applications include residential buildings, office buildings and parking structures, where reduced floor depth and simplified construction are advantageous (Furkhan & Student, 2021).

2.5.1 Load transfer and structural behavior

In flat slab systems, vertical loads are transferred directly from the slab to the supporting columns without the use of intermediate beams. Consequently, the slab must resist both bending moments and shear forces while distributing loads in two directions. The structural behavior of flat slabs is therefore governed by the interaction between global flexure response of the slab and local force concentrations at the slab column connections (European Committee for Standardization, 2004).

The magnitude of bending moments is influenced by span length, slab thickness, and reinforcement configuration, which together govern stiffness, cracking behavior and load–deflection response. Experimental investigations on reinforced concrete slabs show that variations in reinforcement layout and material properties significantly affect flexural performance, highlighting the importance of bending behavior in flat slab systems (Mohamed et al., 2020).

2.5.2 Limitations and design challenges

Despite their structural efficiency and architectural advantages, flat slab systems present several design challenges that must be carefully considered. One of the most critical limitations is the susceptibility to punching shear failure at slab column connections. The direct transfer of concentrated loads from the slab to the supporting columns leads to high local shear stresses, which may result in a brittle punching failure with limited deformation capacity. Research has shown that punching shear resistance is closely related to slab rotation and deformation capacity rather than slab thickness alone, making this failure mode particularly critical in flat slab design (Aurelio Muttoni, 2008).

Serviceability limit states represent another important challenge for flat slab systems, particularly with respect to deflection control. The absence of beams reduces the overall structural depth and stiffness, which increases the risk of excessive deflections. Experimental investigations on reinforced concrete slabs indicate that deflections are strongly influenced by cracking behaviour, tension stiffening, and long term effects such as creep and shrinkage. Simplified analytical models may underestimate actual deflections, emphasising the need for careful serviceability assessment in flat slab design (Al-Sunna et al., 2012).

Flat slab systems are also sensitive to geometric discontinuities, such as openings introduced for building services. Openings interrupt load paths and reinforcement continuity, resulting in reduced flexural capacity, shear resistance, and stiffness. Openings located close to columns are particularly critical, as they may significantly reduce punching shear capacity and often require additional local strengthening measures (Al-Quraishy et al., 2025).

2.6 Parametric design

Parametric design can be described as a design approach in which relationships between relevant variables are explicitly defined through parameters and rules that govern the generation and modification of a model. Rather than producing a single static solution, parametric design enables the exploration of multiple design alternatives by systematically varying input parameters while maintaining predefined relationships between them. According to Assasi (2019), parametric design is fundamentally based on algorithmic thinking, where internal and external variables affecting the design are translated into parametric equations and, in more complex cases, combined with algorithms involving conditions, constraints, and iterative procedures.

Parametric design is particularly suited to handling complex design problems involving many interdependent variables. In building and engineering applications, geometric, environmental and performance related parameters often influence each other simultaneously. By linking these variables within a single parametric model, designers can efficiently explore design alternatives and evaluate the impact of parameter changes across the system, supporting informed decision-making in early design stages (Eltaweel & SU, 2017).

2.6.1 Relevance to structural engineering applications

Parametric design is particularly relevant to structural engineering, where design decisions are governed by safety requirements, serviceability criteria, and compliance with design standards. Unlike exploratory design contexts, structural solutions must satisfy strict constraints related to load bearing capacity, deformation limits, and material efficiency. Parametric modeling allows these constraints to be embedded directly into the design framework, supporting consistent evaluation of structural solutions while ensuring compliance with governing requirements (Assasi, 2019).

By expressing geometry and structural properties as explicit functions of parameters, parametric models enable controlled variation of key design variables while preserving internal consistency (Davis, 2013). This is particularly advantageous in early-stage structural design, where multiple alternatives must be assessed under comparable assumptions. Such an approach supports structured comparison of design solutions and facilitates informed decision making without relying on isolated manual changes to individual model components (Lee et al., n.d.).

2.7 Swedish building regulations

Boverket byggregler (BBR) is the Swedish building regulations and constitute the national regulatory framework governing the design, construction and performance of buildings in Sweden (Boverket, 2025). The regulations include requirements related to energy efficiency and environmental performance, which are relevant for the environmental assessment of structures.

2.7.1 Climate impact

Climate impact in buildings is commonly assessed using life cycle assessment (LCA), where greenhouse gas emissions are quantified over the building life cycle. EN 15978 structures this assessment by dividing the building life cycle into standardised stages, enabling a consistent evaluation of climate impact (Swedish Standards Institute, 2011).

The product stage (modules A1-A3) includes raw material extraction, transport, and manufacturing of construction products and often represents a significant share of the total climate impact for material-intensive buildings (Swedish Standards Institute, 2011).

The construction process stage (modules A4–A5) accounts for emissions related to transport to the construction site and on-site construction activities (Swedish Standards Institute, 2011). The use stage (modules B1–B7) covers emissions from operation, maintenance, and replacement during the building's service life (Boverket, 2025).

The end-of-life stage (modules C1–C4) includes demolition, waste transport, processing, and final disposal of materials at the end of the building's life (Swedish Standards Institute, 2011).

2.7.2 Climate database

The values used to calculate the different stages of the life cycle assessment (LCA) are obtained from the Boverket climate database which is one of several possible sources

Concrete class	Mix type	A1–A3 (kg CO_2e/kg)	Density (kg/m^3)	A1–A3 (kg CO_2e/m^3)
C20/25	Conventional	0.1220	2350	286.7
C20/25	Climate-improved	0.0913	2350	214.6
C25/30	Conventional	0.1290	2350	303.2
C25/30	Climate-improved	0.0963	2350	226.3
C28/35	Conventional	0.1360	2350	319.6
C28/35	Climate-improved	0.1020	2350	239.7
C30/37	Conventional	0.1450	2350	340.8
C30/37	Climate-improved	0.1080	2350	253.8
C32/40	Conventional	0.1480	2350	347.8
C32/40	Climate-improved	0.1110	2350	260.9
C35/45	Conventional	0.1630	2350	383.1
C35/45	Climate-improved	0.1220	2350	286.7
C40/50	Conventional	0.1750	2350	411.2
C40/50	Climate-improved	0.1310	2350	307.9
C45/55	Conventional	0.1890	2350	444.1
C45/55	Climate-improved	0.1430	2350	336.0
C50/60	Conventional	0.2040	2350	479.4
C50/60	Climate-improved	0.1530	2350	359.6
C55/67	Conventional	0.2200	2350	517.0
C55/67	Climate-improved	0.1650	2350	387.8
C60/75	Conventional	0.2300	2350	540.5
C60/75	Climate-improved	0.1730	2350	406.5

Table 2.1: A1–A3 climate impact factors for concrete strength classes. The A1–A3 stage definition follows EN 15978. Values are taken from the Boverket climate database (Boverket, 2025).

for climate data. The database provides climate impact factors for different construction materials and for specific life cycle stages. Table 2.1 and Table 2.2 present the climate impact values for concrete and reinforcement steel used in this study, limited to the product stage (A1–A3). The values published by Boverket represent an average from several manufacturers, with an additional 25% margin applied to drive the use of product specific environmental product declaration (EPD) over generic data (Boverket, 2025). These values are intended for use during the early design stages, or when product specific EPDs are not available.

Reinforcement type	Description	A1–A3 (kg CO_2e/kg)	Density (kg/m^3)	A1–A3 (kg CO_2e/m^3)
Reinforcing steel	Unprocessed, 100% scrap-based	0.745	7850	5843
Prestressing steel	Prestressing steel, 100% scrap-based	1.250	7850	9813
Stainless reinforcement steel	72% scrap-based	4.750	7900	37525

Table 2.2: A1–A3 climate impact factors for reinforcement steel products.

3 METHODOLOGY

This study investigates a PT slab system in comparison with a conventional RC slab system. The aim was to compare the total amount of CO_2e for the two alternatives and to examine how the results are influenced by different concrete strength classes. In addition, the study evaluates how the relative contribution from concrete and reinforcement affects the total environmental impact and how these differences vary with span length.

The study consisted of two main parts. The first part was a case study which was used to establish a realistic structural reference system. The second part was a parametric study, in which different combinations of slab thickness, concrete strength class and span length were evaluated in order to identify patterns in the resulting CO_2e.

3.1 Case study

The case study was based on a flat slab system with a regular column grid consisting of three spans in each direction. The model was used as a reference structure for comparing a conventionally reinforced concrete slab with a PT concrete slab.

The purpose of the case study was to evaluate the structural design and material quantities for the two slab alternatives under the same grid layout and loading conditions. The resulting quantities of concrete, conventional reinforcement and prestressing steel were then used to compare the total amount of CO_2e for each alternative and also to see what the influence of different concrete classes would make in different span lengths.

3.1.1 Geometry

The study was a comparative investigation between reinforced concrete slab and PT concrete slabs. The slab was a fictive case of a typical slab layout with a regular column grid. The slab was constructed to have four by four column grid with the distance between columns of 6, 9 and 12 meter to compare the influence of span lengths. The columns were designed as a square cross section of 400 × 400 mm.

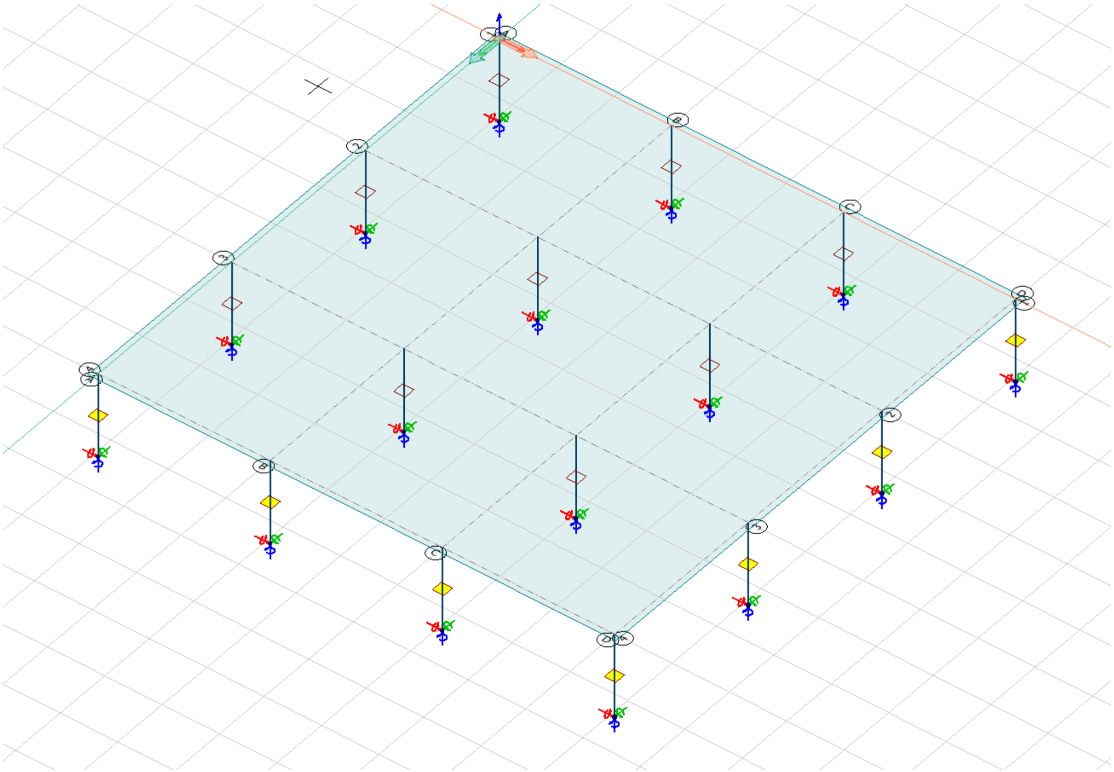


Figure 3.1: Layout of the FEM-Model

3.1.2 Concrete

Several different concrete classes have been used in the different span lengths to compare the influence of the different parameters. The concrete classes considered were C20/25, C35/45 and C60/75 to represent different concrete strength levels and their associated CO_2e.

3.1.3 Conventional reinforcement

For the conventional reinforcement, B500B was used, and the reinforcement parameters are presented in Table 3.1.

Parameter	**B500B**
f_{yk} [MPa]	500
f_{tk} [MPa]	540
E_s [GPa]	200
ε_{yk} [-]	0.0025
ε_{uk} [-]	0.05
Ductility class [-]	B
γ_s [-]	1.15
$f_{yd} = f_{yk}/\gamma_s$ [MPa]	435

Table 3.1: Material properties for conventional reinforcement

3.1.4 Prestressing steel

The material properties of the steel used for the PT cables are presented in Table 3.2.

Parameter	**Y1860S7**
Form	7-wire strand
Nominal diameter [mm]	15.7
A_p [mm^2]	150
f_{pk} [MPa]	1860
$f_{p0.1k}$ [MPa]	1640
E_p [GPa]	195
$\varepsilon_{p0.1k}$ [-]	0.00841
ε_{uk} [-]	0.035
Relaxation class [-]	2
γ_p [-]	1.15
f_{pd} [MPa]	1426
$f_{p0.1d}$ [MPa]	1426

Table 3.2: Prestressing steel material properties.

3.1.5 Loads and load combinations

The applied loads consist of the self weight of the slab, treated as a permanent action G_k, and an imposed load for office areas, treated as a variable action Q_k. The imposed load was taken as $3.0\ \mathrm{kN/m^2}$ for Category B: office areas.

Load combinations were established in accordance with SS-EN 1990 and its Swedish National Annex. Permanent actions are denoted G_k and variable actions $Q_{k,i}$, where $Q_{k,1}$ represents the leading variable action in the combination. The prestressing forces are represented in the value of P_k where the value of P_k is zero in the traditionally reinforced cases.

Load combination in ULS

The load combinations were obtained from the Swedish National Annex, applying a partial factor of 0.91 as follows:

$$0.91 \cdot 0.89 \cdot 1.35\, G_k + P_k + 0.91 \cdot 1.5\, Q_k \tag{3.1}$$

Load combination in SLS

Characteristic:

$$G_k + P_k + Q_k \tag{3.2}$$

Frequent:

$$G_k + P_k + 0.5 \cdot Q_k \tag{3.3}$$

Quasi-permanent:

$$G_k + P_k + 0.3 \cdot Q_k \tag{3.4}$$

3.1.6 Structural Checks

The structural checks that was carried out according to Eurocode included bending moment capacity, deflection, shear capacity, crack widths and punching shear. These checks were used to evaluate whether the slab satisfied both SLS and ULS requirements as mentioned earlier.

3.1.7 Slab thickness

The slab thickness was treated as a design variable in the iterative design process. For each slab alternative, the combination of slab thickness and reinforcement amount was adjusted until the relevant structural design criteria were satisfied. The final slab thickness, therefore, represents an acceptable design solution within the assumptions and limitations of the study. The choice of a minimum slab thickness of 200 mm was set to meet other structural requirements as sound regulations.

3.1.8 Concrete cover

Certain assumptions were required to perform the design calculations. The indoor climate was assumed to have a relative humidity of 50%. The design life was set to 50 years.

The exposure class was selected based on the environmental conditions. The slab forms the roof of a parking garage and the floor of an office area. Therefore, the exposure classes were taken as XD3 (garage side) and XC1 (office side). For simplicity, a single concrete cover was used for the slab and the durability requirement for XD3 was assumed to govern fore both side.

For ordinary reinforcement with a diameter of at least $4\ \mathrm{mm}$, the minimum cover for durability was taken as $c_{\mathrm{min,dur}} = 35\ \mathrm{mm}$ for exposure class XD3 and design life L50. With an allowance for deviation of $\Delta c_{\mathrm{dev}} = 10\ \mathrm{mm}$, this resulted in a nominal cover of $c_{\mathrm{nom}} = c_{\mathrm{min,dur}} + \Delta c_{\mathrm{dev}} = 45\ \mathrm{mm}.$

For prestressing steel, the required minimum cover was increased by 10 mm according to the Swedish National Annex. In the present slab, the ordinary reinforcement was placed closest to the concrete surface, while the prestressing steel was located further inside the section. The actual cover to the prestressing steel was therefore larger than that of the ordinary reinforcement and was assumed to satisfy the increased cover requirement.

3.1.9 Allowed Crack width

Crack control was assessed using the same limiting crack width for both design alternatives. The reference slab with conventional bonded reinforcement and the PT slab with unbonded tendons were both treated according to EN 1992-1-1 Table NA2.3. For the assumed parking garage exposure class XD3, the limiting crack width was taken as $w_{\mathrm{max}} = 0.15\,\mathrm{mm}$ under the quasi-permanent load combination.

Exposure class	Corrosion-sensitive			Less corrosion-sensitive		
Life time (years)	L100	L50	L20	L100	L50	L20
X0	-	-	-	-	-	-
XC1	0,40	0,45	-	0,45	-	-
XC2	0,30	0,40	0,45	0,40	0,45	-
XC3, XC4	0,20	0,30	0,40	0,30	0,40	-
XS1, XS2, XD1, XD2	0,15	0,20	0,30	0,20	0,30	0,40
XS3, XD3	0,10	0,15	0,20	0,15	0,20	0,30

Table 3.3: Acceptable crack width w_k (mm)

3.1.10 Layout of tendons

The tendon layout used in this thesis consisted of banded tendons in both principal directions, corresponding to alternative to the left in figure 3.2. According to Lin Tung-Yen and Burns Ned H (1970), banded and distributed tendon layouts can provide comparable flexural strength, although the tendon arrangement may influence shear behaviour. In this study, the selected tendon layout was kept constant for all PT alternatives to ensure a consistent basis for comparison.

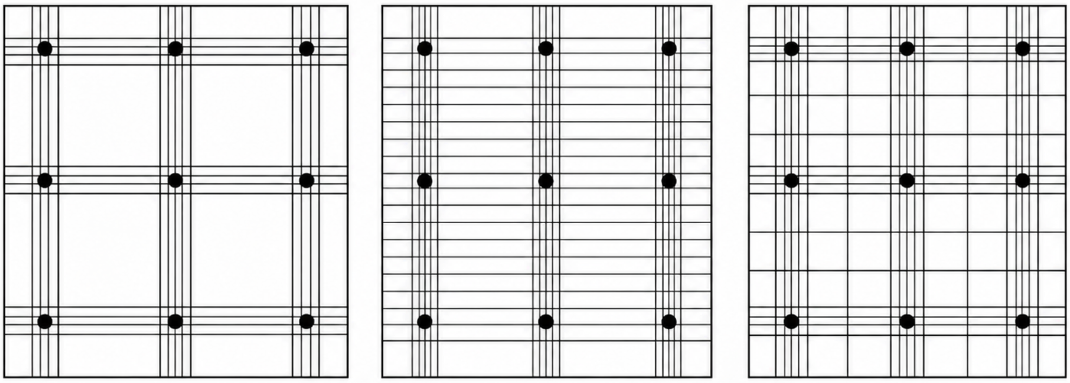


Figure 3.2: Post-tensioned tendon layout

3.2 Numerical modeling

For the case study, FEM-Design was used as the main structural analysis and design software. The software was used to model, analyse and design both the conventionally reinforced concrete slab and the PT slab alternatives. The purpose of the FEM model was to obtain internal forces, deformations and design results for the relevant ultimate and serviceability limit state checks.

The FEM model also provided the output needed for the environmental comparison. Reinforcement quantities, tendon quantities and concrete quantities were extracted from the analyses to calculate the total amount of CO_2e for each slab alternative.

The same modelling approach was used for all analysed cases in the case study. The support conditions, load application and analysis settings were kept consistent, while the span length, slab thickness and concrete strength class were varied. This ensured that differences in the results were mainly related to the defined study parameters.

3.2.1 Element type and mesh

The slab was modelled using slab/plate elements in FEM-Design. The finite element mesh was generated automatically by the software based on the defined slab geometry and mesh settings.

The target element size was selected based on recommendations for finite element modelling of flat slabs, where a suitable starting point is that the element size should not exceed the span length divided by 10, or $1000\ \mathrm{mm}$, whichever is smaller (E Halliwell, n.d.). For the analysed span lengths, this resulted in target element sizes of $600\ \mathrm{mm}$, $900\ \mathrm{mm}$ and $1000\ \mathrm{mm}$ for the $6\ \mathrm{m}$, $9\ \mathrm{m}$ and $12\ \mathrm{m}$ span models, respectively.

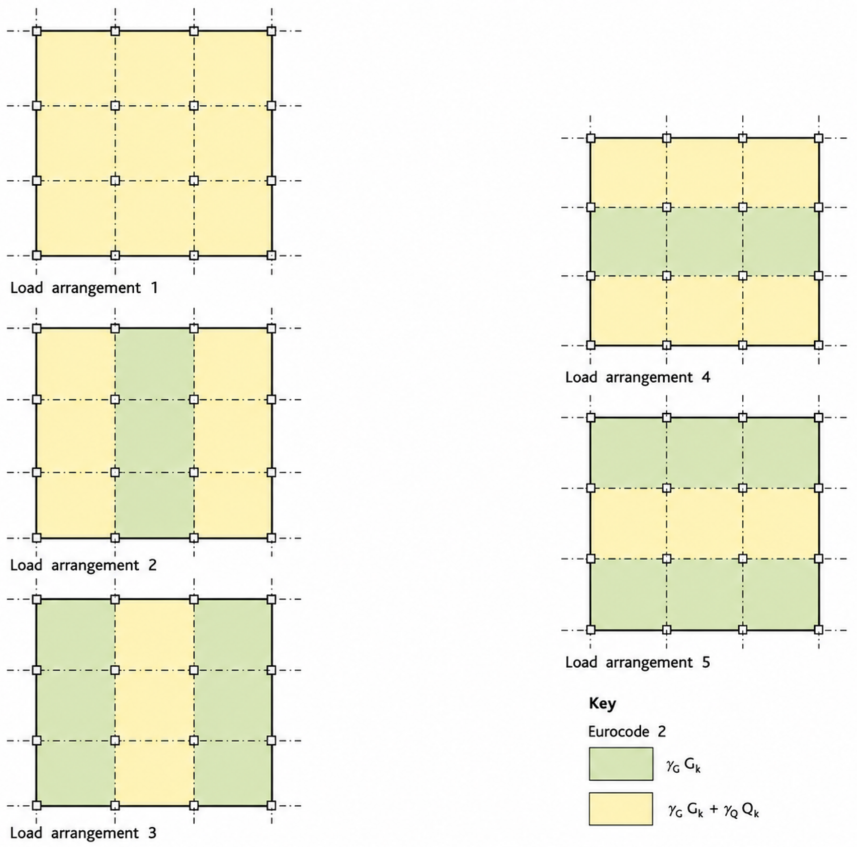
The same mesh criterion was used for both the conventionally reinforced and PT slab alternatives. This was done to maintain a consistent modelling approach between the analysed cases. Due to the automatic mesh generation in FEM-Design, local variations in element size could occur close to columns, slab edges and other geometry intersections.

3.2.2 Load application

The loads were applied in FEM-Design as separate load cases. The self-weight of the slab was generated automatically by the software based on the defined material density and slab thickness. The imposed office load was applied as a uniformly distributed area load on the slab surface.

For the flat slab model, different load arrangements were considered to account for unfavourable live load patterns. The permanent load was applied over the full slab area, while the variable load was applied according to the relevant load arrangements for flat slabs. This approach follows the recommendation that, for Eurocode-based design, the full permanent load should be applied over the whole slab together with the variable load on alternate bays (E Halliwell, n.d.). The load arrangements were considered in both principal directions of the slab.

For the PT slab alternatives, the prestressing action was applied through the defined tendon layout in FEM-Design. The tendon layout and prestressing force were included as part of the analysis model for the PT alternatives with its long term effect losses.



Load arrangements 1–3

Load arrangements 4–5

Figure 3.3: Load arrangements considered for the flat slab model.

3.2.3 Analysis type and design settings

The structural analysis was carried out in two main steps. First, a linear elastic finite element analysis was performed to obtain internal forces, reactions and deformations for the slab models. This analysis was used as the basis for the ULS design checks, including bending, shear and punching shear.

For the serviceability limit state, a cracked-section analysis was performed in FEM-Design. This analysis was used to account for the reduced stiffness of the concrete slab after cracking. The cracked-section analysis is an iterative calculation in which the stiffness of the slab is adjusted based on the cracking behavior. This was used for the evaluation of serviceability-related results, such as deflections and crack widths.

The design process was also iterative. After each analysis, the relevant ULS and SLS checks were evaluated. If one or more checks were not satisfied, the slab thickness or reinforcement amount was adjusted and the model was analysed again. This procedure was repeated until the analysed slab alternative fulfilled the required structural criteria with the aim of minimizing material use and CO_2e.

The analyses and design checks were carried out using the Eurocode-based settings in FEM-Design. The same analysis procedure and design settings were used for all analysed cases in order to maintain a consistent basis for comparison between the conventionally reinforced and PT slab alternatives.

3.2.4 Model output

The output from FEM-Design was used both to verify the structural performance of each slab alternative and to obtain the material quantities required for the environmental comparison. The structural output included utilisation ratios for the relevant ULS checks, such as bending, shear and punching shear, as well as SLS results such as deflections and crack widths.

For the environmental comparison, the main extracted data were the total weight of the concrete, the amount of conventional reinforcement and the amount of prestressing tendons. For the PT alternatives, both the tendon quantity and the additional conventional reinforcement required in the slab were included. These quantities were extracted for each analysed case and used as input for the calculation of CO_2e.

Each slab alternative was designed through an iterative process until the relevant ULS and SLS requirements were satisfied. The material quantities used for the environmental comparison therefore represent slab solutions that fulfilled the structural requirements, rather than initial trial models.

3.3 Parametric study

The purpose of the parametric study was to compare how different combinations of slab thickness and concrete strength class affect the total CO_2e for the selected span lengths. The study was limited to a predefined design space, where slab thickness and concrete strength class were varied while the remaining modelling assumptions were kept constant.

For each span length, the calculated CO_2e values were used to compare the investigated combinations and to identify the alternative with the lowest environmental impact within the defined design space. The results were presented in graphs showing the relationship between CO_2e and slab depth for each span length and concrete strength class.

3.3.1 Rhino 3D

Geometric modelling was carried out in Grasshopper. Rhino is a 3D modelling software primarily used to create and edit geometry and Grasshopper is a graphical algorithm editor integrated in Rhino. In this study, Grashopper was used only to generate and visualise the slab geometry and layout. The geometry was then transferred to FEM-Design through an API-based workflow and ensure that the same conditions for the geometry were used for all analyses, after which all structural analysis and design verifications were performed in FEM-Design.

3.3.2 FE Modeling

The geometry was modeled as a rectangular slab consisting of 3 equal spans in each direction, supported by a total of 16 columns and had the same geometry as the case study. The columns were modeled using their geometric dimensions as rectangular cross-sections with a width of 400 mm. The connection between the slab and the columns was assumed to be fixed.

The PT cables were represented as equivalent line loads. These act either upwards or downwards depending on the cable profile at the specific section, combined with axial compressive forces at the anchorages. The number of cables was varied in the model depending on the self-weight of the structure. The cable layout was performed according to the banded distribution principle, centered over the column lines, with a fixed internal spacing of 100 mm between the cables in both the x- and y-directions.

3.3.3 Load-Balancing assumptions for the PT Slabs

The number of PT cables was determined based on the load-balancing method. For a parabolic tendon profile, the equivalent uniform upward load was calculated using equation (3.5):

$$w = \frac{8 \cdot P \cdot e}{L^2} \tag{3.5}$$

Where:

- w is the equivalent uniform load (upward balancing load).
- P is the prestressing force in the tendon.
- e is the tendon eccentricity (drape, i.e., the distance from the centroidal axis to the highest/lowest point of the tendon).
- L is the span length.

The design criterion was set so that the cables balance 70% of the slab's self-weight in both the x- and y-directions. Based on this requirement, the necessary number of cables was calculated. Furthermore, the calculations assumed that the cables are stressed from both ends. Time-dependent prestress losses (long-term losses) were simplified and assumed to be a flat rate of 20%.

3.3.4 Design Criteria

The slab is designed to meet fire safety and durability requirements according to Eurocode:

- **Fire Resistance:** R90 (90 minutes).
- **Exposure Class:** XD3 (Corrosion induced by chlorides other than from seawater, e.g., de-icing salts).

Loads

The loads considered in the FE model are:

- **Self-weight (g_k):** Automatically calculated based on concrete density and slab geometry.
- **Imposed load (q_k):** $3.0\,\text{kN/m}^2$, corresponding to Category B (Office areas) per Eurocode.

Material Properties

The material data for conventional reinforcement and PT steel are summarized in table 3.2 and table 3.1.

3.3.5 Design variables

The numerical model was defined using slab thickness and concrete class as variable parameters. These were used as parameters to evaluate their influence on the structural design and the resulting CO_2e. The concrete strength classes included in the study were C20/25, C25/30, C28/35, C30/37, C32/40, C35/45, C40/50, C45/55, C50/60, C55/67 and C60/75.

The thickness of the slab, h, is determined based on a span-to-depth ratio (L/h) ranging from 20 to 42. Additionally, a minimum thickness constraint of 200 mm has been established for all iterations.

3.3.6 Design evaluation

The structural verification in the parametric study was restricted to the ULS. To be considered valid for the CO_2 comparison, all design alternatives were required to satisfy the requirements for bending, shear and punching shear. SLS criteria, specifically crack control and deflection, were not included as constraints in this part of the study.

This limitation was primarily driven by the need to optimise computational efficiency and data management. Implementing cracked section analysis within an iterative evaluation of numerous design alternatives would have significantly increased both the processing time and the computational storage required. Consequently, the study was narrowed to ULS verification to facilitate a high volume comparison within the defined design space. These results should be interpreted as ULS optimised design alternatives, whereas serviceability performance would require more detailed assessment in a refined design stage.

3.3.7 Parametric evaluation of design combinations

The results from the parametric evaluation were investigated for each span length by comparing the calculated CO_2e for the selected design combinations. Each combination consisted of a specific slab thickness and concrete strength class and only alternatives that satisfied the structural verification criteria included in the study were considered valid.

4 RESULTS AND DISCUSSION

This chapter will present the result of CO_2e for the structures. The discussion of the result is also included in this chapter. The result chapter is divided in to two parts were the result of the case study and the parametric study are presented separately.

4.1 Case study

The case study compares the RC and PT slab alternatives for the selected span lengths. The comparison is based on the calculated CO_2e from concrete, reinforcement and prestressing steel.

In this study, the most decisive structural requirement in ULS was generally the punching shear check. For larger spans with lower concrete strength classes, the concrete compression limitation in the punching shear check resulted in significantly larger required slab thicknesses compared with the other alternatives. In SLS, deflection was the governing criterion for the slab thickness and therefore had a major influence on the required concrete volume. The amount of ordinary reinforcement was mainly governed by crack width control. However, for shorter spans where no cracking occurred, the reinforcement requirement was instead governed by minimum reinforcement requirements and bending resistance. The result of the case study are shown in Appendix B.

4.1.1 Comparison of span lengths

Figures 4.1–4.3 show the CO_2e for the RC and PT alternatives for the investigated span lengths. The results are divided into reinforcement, concrete and total CO_2e, where the reinforcement category for the PT alternatives includes both ordinary reinforcement and prestressing steel. The concrete class for this comparison was C35/45. The slab thicknesses are shown in Table 4.1.

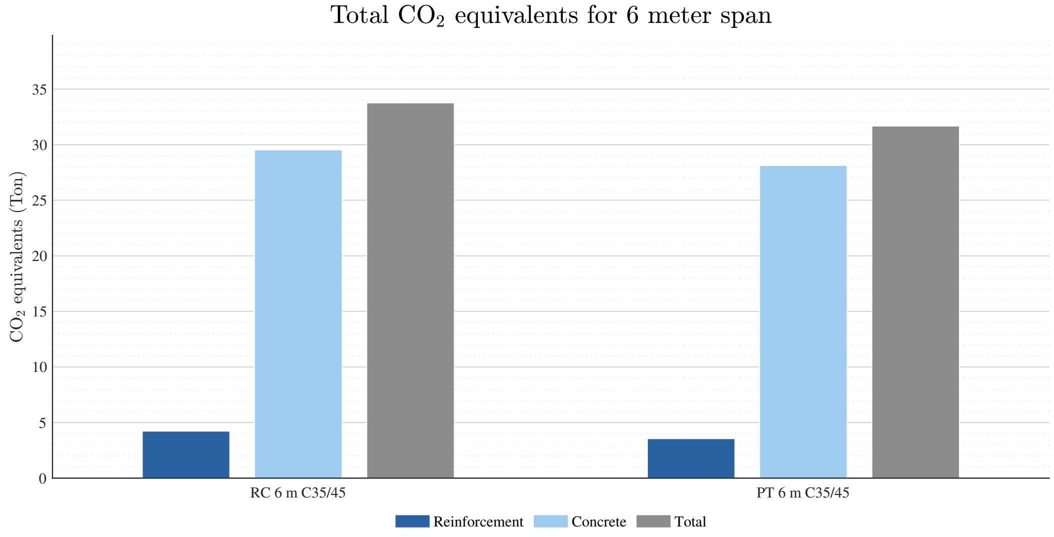


Figure 4.1: Comparison of RC and PT for 6 meter span

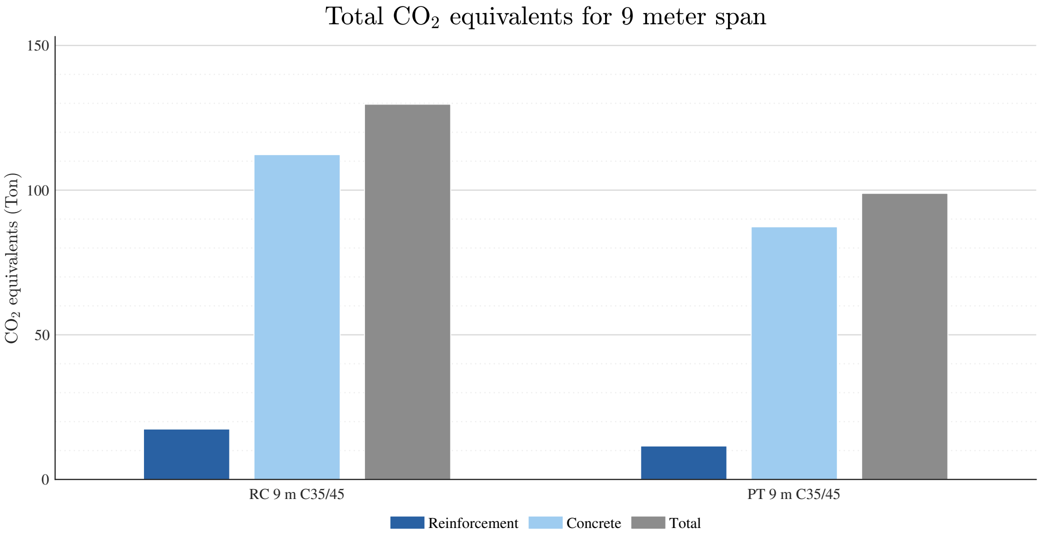


Figure 4.2: Comparison of RC and PT for 9 meter span

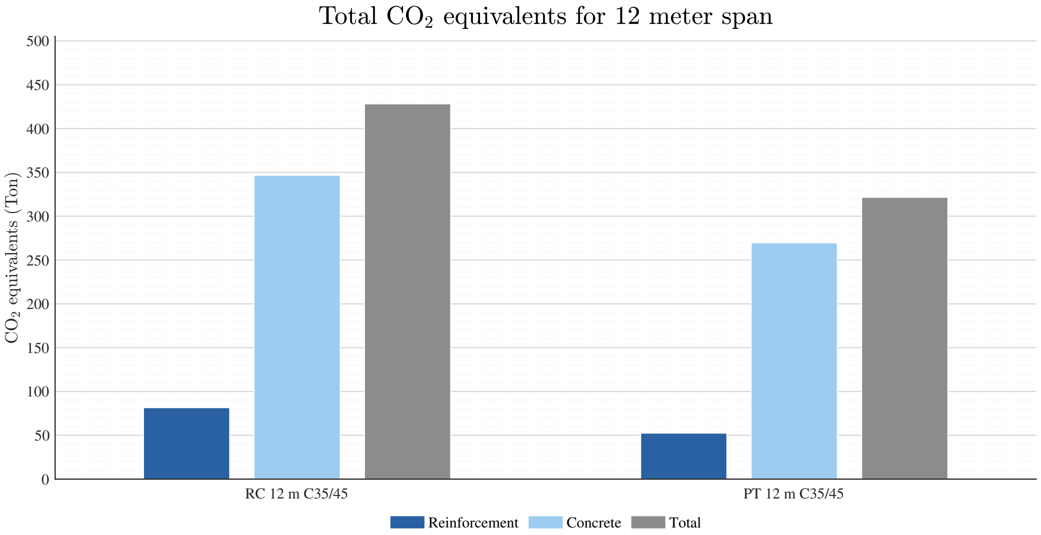


Figure 4.3: Comparison of RC and PT for 12 meter span

Table 4.1: Slab thicknesses for the investigated RC and PT slab models.

Span / case	Concrete class	RC thickness [mm]*	PT thickness [mm]
6 m	C35/45	210	200
9 m	C20/25	–	320
9 m	C35/45	360	280
9 m	C60/75	–	240
12 m	C20/25	–	920
12 m	C35/45	630	490
12 m	C60/75	–	380

*The RC comparison was only carried out for concrete class C35/45. Therefore, RC thicknesses are not presented for the other concrete strength classes.

The results show that the difference between the RC and PT alternatives becomes more clear as the span length increases. For the 6 m span, the total difference is still relatively small compared with the longer spans, but reductions are obtained in both reinforcement- and concrete-related CO_2e. The PT alternative reduces the total CO_2e by approximately 6%, mainly due to a lower reinforcement contribution, while the reduction in concrete related CO_2e is more limited.

For the 9 m and 12 m spans, the PT alternatives show a larger reduction in total CO_2e. This is related to reductions in both reinforcement- and concrete-related CO_2e. The percentage reduction increases for the longer spans, which indicates that the PT system becomes more effective when the span length increases.

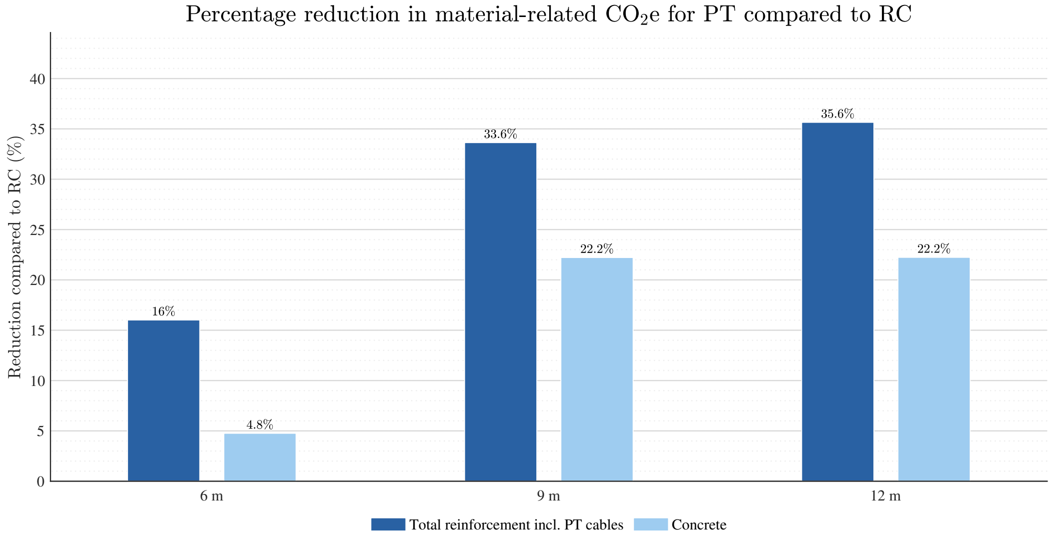


Figure 4.4: Relative reduction of material use in PT slab vs RC slab for different span lengths. Concrete class C35/45

Figure 4.4 further illustrates this trend by showing the percentage reduction in material related CO_2e for the PT alternatives compared with the RC alternatives. For the 6 m span, reductions are obtained for both reinforcement and concrete, although the concrete-related reduction is relatively small compared with the longer spans. This results in a limited reduction in total CO_2e for the shortest span.

For the 9 m and 12 m spans, the reductions become more pronounced. In these cases, the PT alternatives reduce both reinforcement- and concrete-related CO_2e to a greater extent. The increasing reduction in reinforcement related CO_2e may be explained by the larger bending demands for longer spans, where the PT system can reduce the need for ordinary reinforcement more effectively.

One reason why the difference increases with span length is that longer spans generally require thicker slabs and larger bending capacity. In thicker slabs, the prestressing tendons can be used with a larger eccentricity, which increases their moment contribution. Longer spans also lead to higher self weight and larger bending moments, which increase the amount of reinforcement required in the RC alternatives. This makes the potential material reduction from post-tensioning more significant for the longer spans.

4.1.2 Comparison of post-tensioned slabs with different concrete classes

Figures 4.5–4.6 present the CO_2e for the PT alternatives with different concrete strength classes for the investigated span lengths. The results are divided into reinforcement, concrete and total CO_2e, where the reinforcement category includes both ordinary reinforcement and prestressing steel. The comparison includes the concrete strength classes C20/25, C35/45 and C60/75 and the corresponding slab thicknesses are presented in Table 4.1.

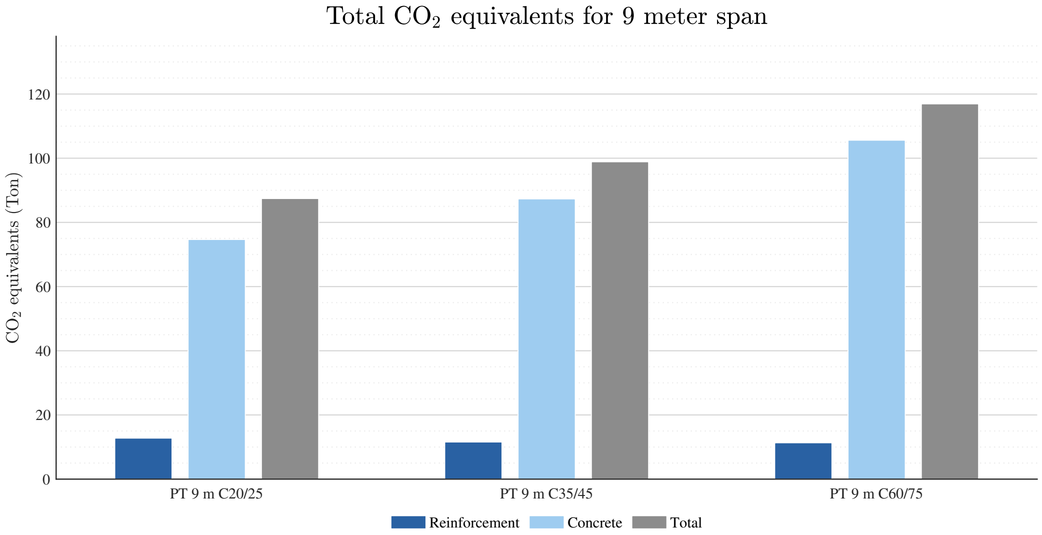


Figure 4.5: Comparison between different concrete classes for 9 meter span.

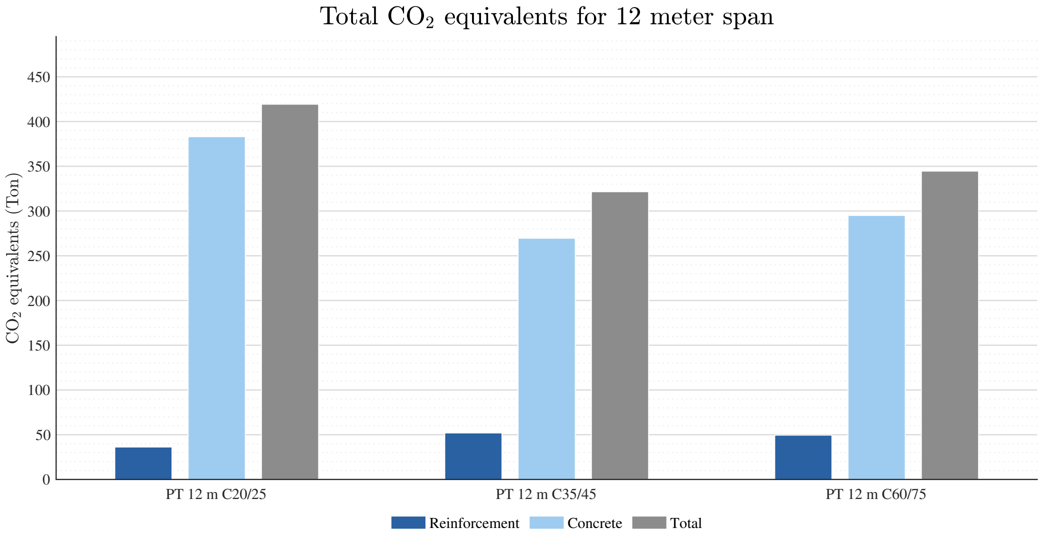


Figure 4.6: Comparison between different concrete classes for 12 meter span.

For the 9 m span, the C20/25 alternative gives the lowest total CO_2e. Although this alternative has a larger slab thickness than the higher concrete classes, the lower CO_2 factor per kg of concrete results in a lower total impact. For this span, the reduced thickness obtained with C35/45 and C60/75 is not sufficient to compensate for the higher CO_2 intensity of the concrete. Moreover, a thinner slab also decreases the positive contribution of the post-tensioning.

For the 12 m span, the C20/25 alternative gives the highest total CO_2e. This is mainly due to concrete compression limitations, which require a significantly thicker slab. Since this limitation is related to the compressive capacity of the concrete, it is not possible to solve it by adding more ordinary reinforcement. The size of the columns also has an influence on this phenomena which makes this structural problem could benefit from an increased column size.

The results show that the most favourable concrete class depends on the span length and the governing structural requirements. For shorter or less demanding cases, a lower concrete class may be advantageous due to its lower CO_2 factor. For longer spans, however, it may be beneficial to increase the concrete class in order to make better use of the higher strength and reduce the required slab thickness.

The results indicate that serviceability requirements, especially deflection, have a significant influence on the required slab thickness. Punching shear was also found to affect the final design, although its influence depended on which part of the punching shear check was governing. In several cases, the required punching shear resistance could be satisfied by increasing the amount of ordinary reinforcement beyond what was required for bending resistance. This was preferred over increasing the slab thickness, since an increased concrete volume generally had a larger effect on the total CO_2e than additional reinforcement.

For the 12 m span with concrete class C20/25, however, this strategy was not sufficient. In this case, the governing limitation was related to the concrete compression capacity in the punching shear check, which could not be resolved by increasing the amount of ordinary reinforcement. The slab thickness therefore had to be increased to satisfy this requirement. This explains why the lowest concrete strength class did not result in the lowest CO_2e for the longest span.

4.1.3 Durability and maintenance considerations

In addition to the material related CO_2e presented in the results, the structural behaviour of the slab systems may also affect their long term performance. These aspects were not included in the environmental calculations, which were limited to the production stage, A1–A3, but they are still relevant when comparing the two structural systems.

The results from the structural design showed that the post-tensioned slabs generally had reduced cracking compared with the conventionally reinforced alternatives. This can be seen as a potential advantage of the PT system, since reduced cracking may be beneficial from a durability perspective and may contribute to lower maintenance needs over the service life of the structure. However, durability is not only governed by cracking, but also by factors such as concrete cover, exposure class, concrete quality, detailing and workmanship.

At the same time, post-tensioned slabs may involve more complex maintenance considerations. The tendons are cast into the slab and are therefore more difficult to inspect, repair or replace if damage or corrosion occurs. Normal prestress losses due to long term effects such as creep, shrinkage and relaxation are accounted for in the design, but additional or unexpected damage to the tendons may be more difficult to detect and address. Since the tendons have an important role in the load bearing behaviour of the slab, this places high demands on proper detailing and quality control during construction.

4.2 Parametric study

This section presents the results of the parametric study, which evaluates the combined effects of slab thickness and concrete strength classes on post-tensioned slabs. The objective was to identify structural and environmental trends to determine the most optimal slab configurations in terms of CO_2e per square meter.

In the result from the ULS analysis, the structural behaviour is characterised by shifting governing criteria based on span length. For the longer spans, punching shear governs the design. On the other hand, for the shortest span, the design is governed by the flexural moment and minimum reinforcement requirements. Additionally, the configurations for the shorter spans are significantly constrained by the minimum thickness limitations of the concrete slab.

4.2.1 Parametric material mapping

Figure 4.7 - 4.11 present the CO_2e emissions per square meter in relation to concrete strength class and slab thickness, categorized by span length. The plots include only the parametric combinations that successfully passed all structural and design checks.

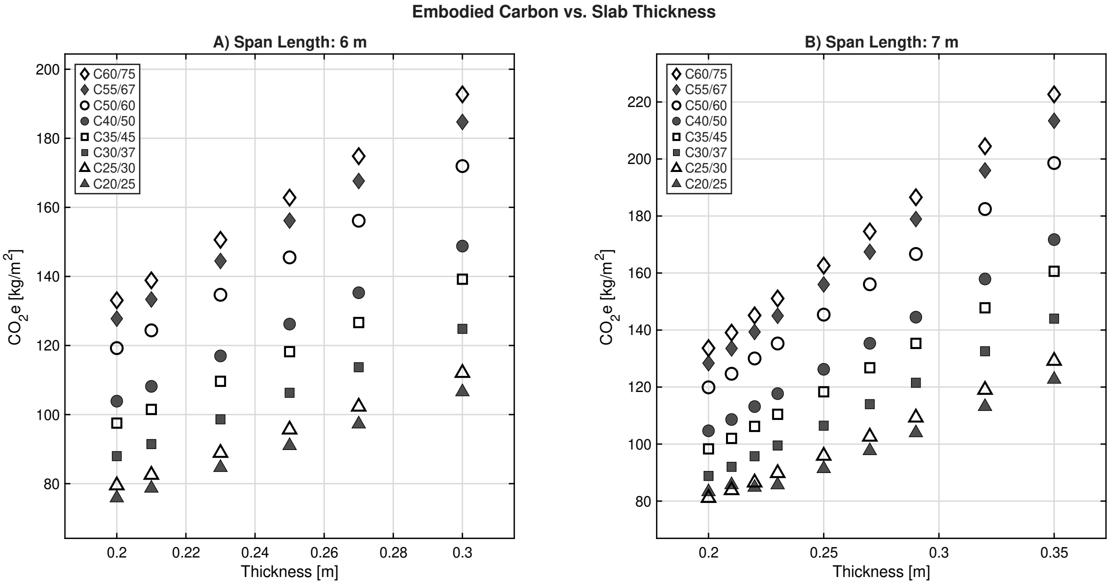


Figure 4.7: Parametric mapping for span length 6 and 7 meter.

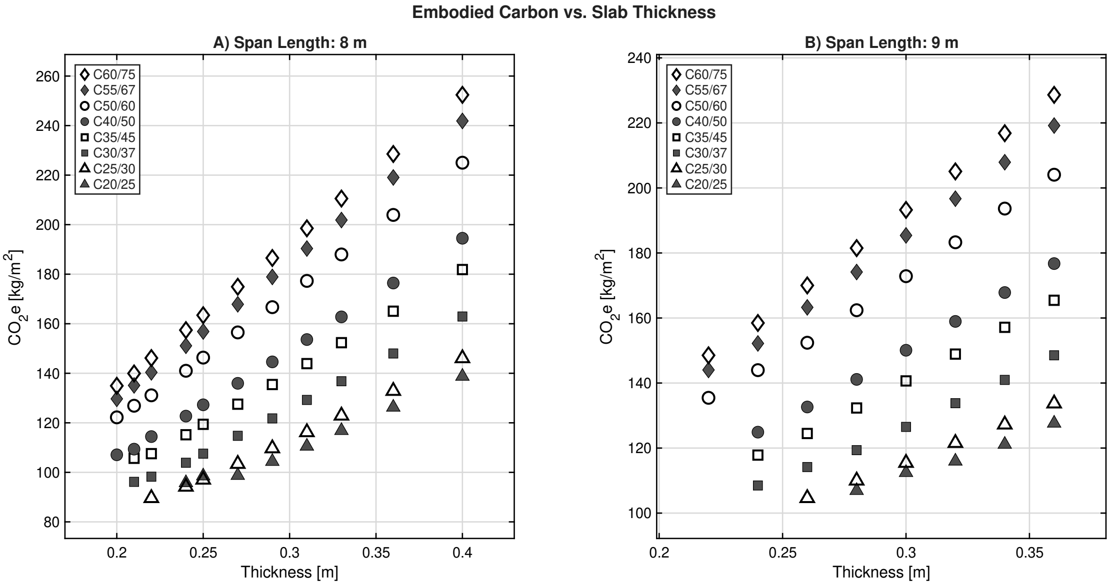


Figure 4.8: Parametric mapping for span length 8 and 9 meter.

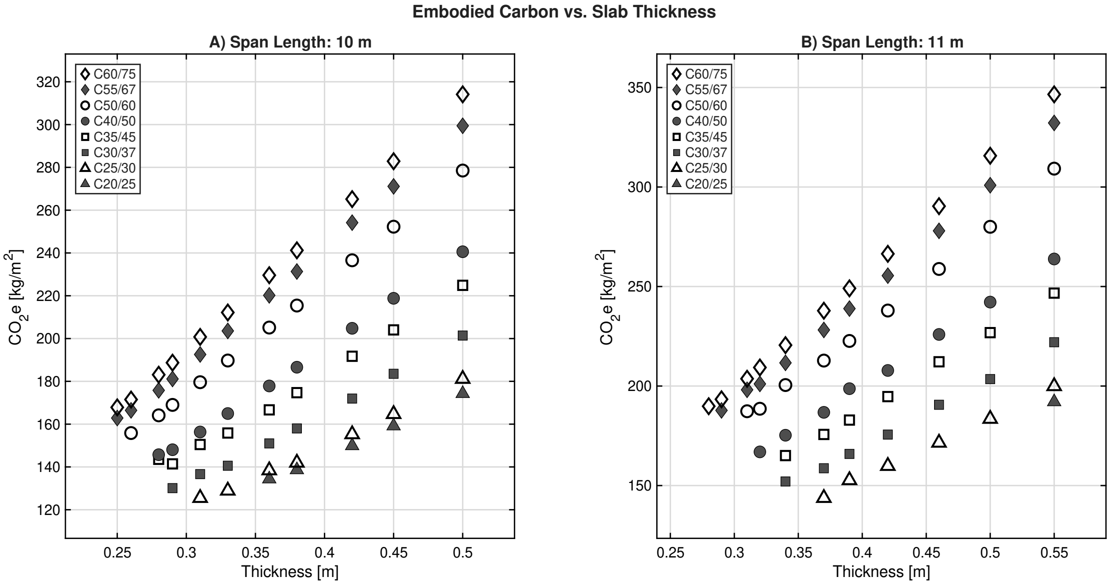


Figure 4.9: Parametric mapping for span length 10 and 11 meter.

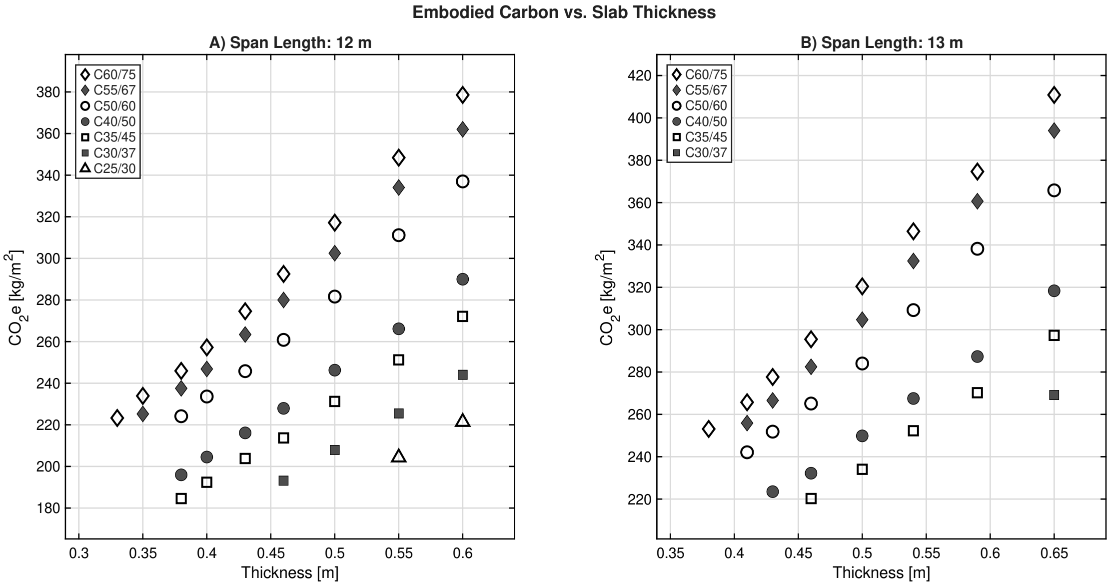


Figure 4.10: Parametric mapping for span length 12 and 13 meter.

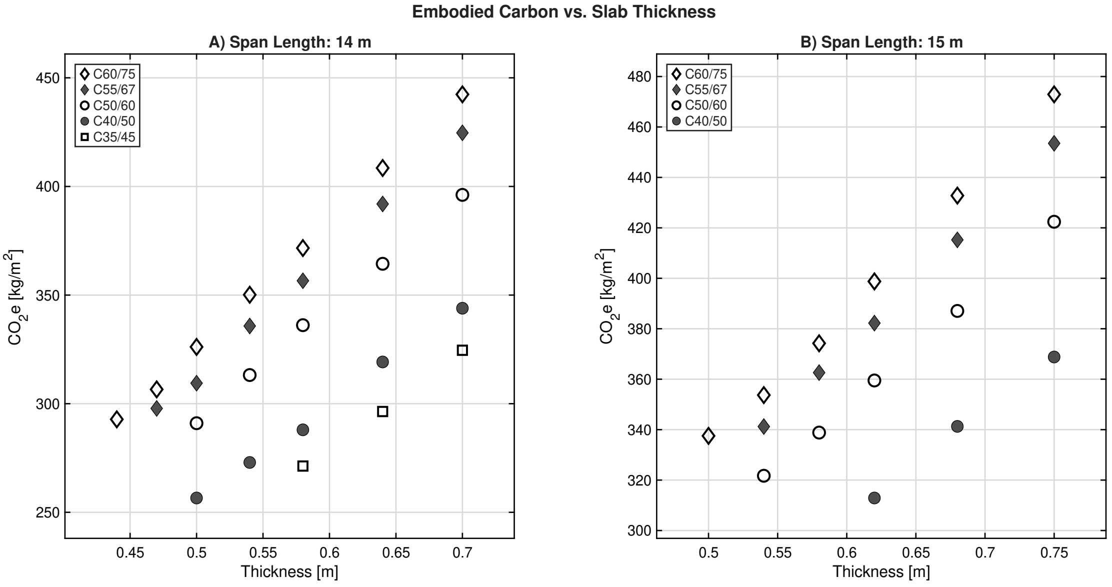


Figure 4.11: Parametric mapping for span length 14 and 15 meter.

For span length of 6 meter (Figure 4.7), all configurations satisfy the structural requirements, with the lowest total CO_2e emissions per square meter obtained by combining the thinnest slab with the lowest concrete strength class. However, at an 8 meter span (Figure 4.8), the lowest concrete class is no longer viable for the thinnest slab option due to concrete compression limits. Instead, a higher concrete class and a thicker slab become optimal, specifically the lowest environmental impact is achieved with a 220 mm slab of class C25/30. For spans of 9 meters and beyond, this trend becomes increasingly complex, as the optimal alternative shifts based on the specific combination of slab thickness, concrete strength class and reinforcement demand.

These findings demonstrate that for longer spans, finding the right balance between concrete class and slab thickness is critical, rather than just choosing the extreme thin or thick options. While increasing the concrete strength allows for a thinner slab and reduces the total concrete volume, the absolute thinnest slab with the highest concrete grade is rarely the most sustainable choice. Instead, the optimal solution lies in the sweet spot in between a combination of a relatively thin slab and a lower concrete grade. This is because the total volume of concrete carries a much greater environmental impact than the reinforcement steel demand, making a slight increase in thickness with a weaker, less CO_2 intensive concrete the most favorable trade off.

4.2.2 Structural and environmental optimisation

Figure 4.12 presents a comparison between two optimisation choices across different span lengths. graph A illustrates the thickness optimised design strategy along with its corresponding CO_2e emissions per square meter, while graph B highlights the carbon optimised design strategy and its associated slab thickness. Furthermore, Figure 4.13 displays the length to depth (L/D) ratio for both design options across the investigated span lengths.

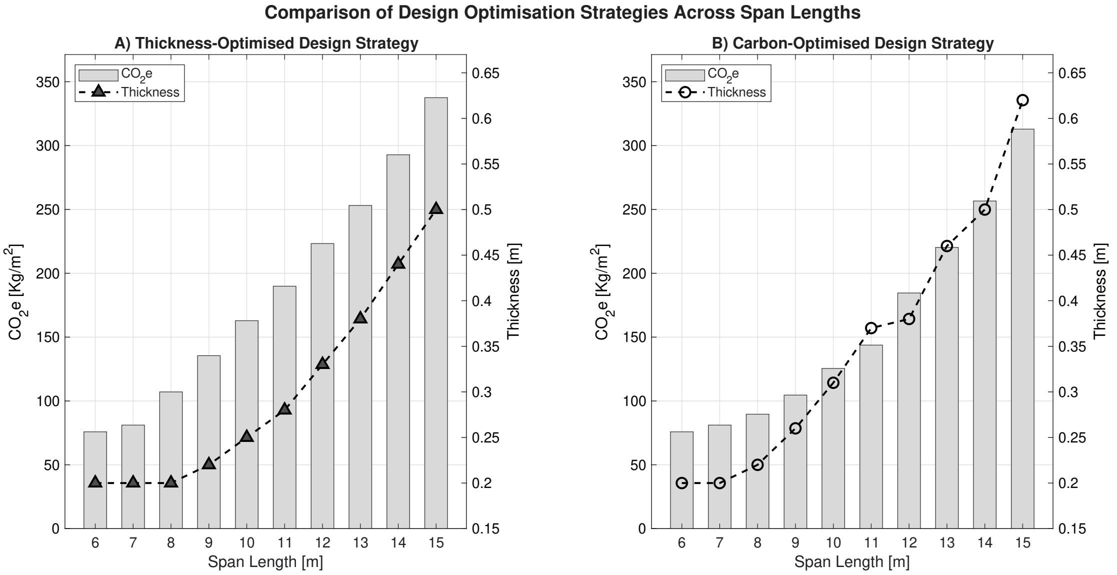


Figure 4.12: Comparison of structural and environmental options.

The results demonstrate that for span lengths of 8 meters and longer, the slab option with the lowest CO_2e emissions per square meter is no longer the thinnest alternative. For spans shorter than 8 meters, however, the carbon optimised and thickness optimised solutions produce identical designs. This alignment is due to the structural requirement of a minimum slab thickness of 200 mm, which dictates the design at shorter spans. Additionally, the analysis indicates that larger span lengths significantly accelerate the environmental footprint. For instance the CO_2e emissions per square meter increase by as much as 28.4% over the interval between 11 and 12 meters span which was the biggest difference.

This sharp increase in CO_2e emissions per square meter shows how difficult it is to design larger spans if strict climate requirements are introduced. From an environmental perspective, shorter spans decrease the Co_2e per square meter which indicates that shorter spans are an important design choice to minimise environmental impact. Therefore, these results show how important it is to plan the building layout early in the design phase, since the choice of span length has a direct impact on whether the project can meet its sustainability targets. It should be noted that the environmental impact associated with the columns is excluded from this comparison which could reduce the difference slightly since smaller spans would require more columns.

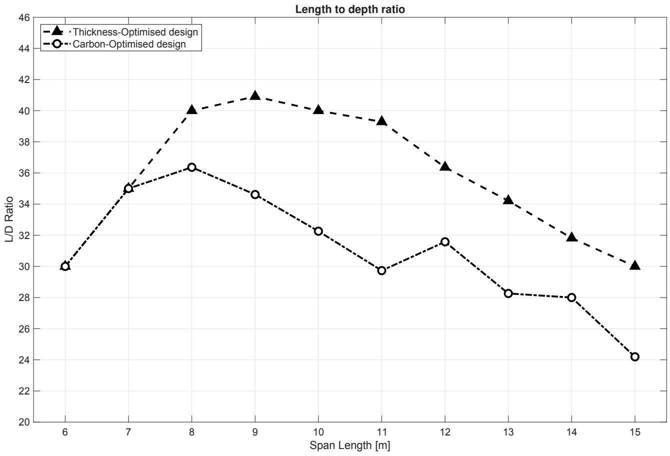


Figure 4.13: Length to depth ratio for the slab.

The carbon optimised design approach, illustrated in Figure 4.13, shows a downgoing trend from span lengths of 8 meters and longer with a local deviation at 12 meters while it follows a steady increasing path at shorter spans of 6 and 7 meters due to the minimum thickness. The trend for the thickness optimised design shows the same trend as the carbon optimised design but with a higher slab to depth ratio for all spans except for 6 and 7 meters.

From this graph, even if its possible to identify a downward trend for increasing span lengths, an optimal value for the length to depth ratio cannot be identified as all cases shows a different value compared to other span lengths. This proves that when designing for the lowest environmental impact, there is no single rule to follow, instead you have to find the specific ratio for every individual case.

4.2.3 Cost and time

From a construction perspective, the choice of concrete strength class may also affect the construction schedule. For lower concrete strength classes, it may take longer for the concrete to reach sufficient strength for stressing of the tendons. This could delay the post-tensioning process and may increase labour related costs due to increased time for installation and placement of the tendons and overall construction time.

In several cases, the results indicate that a relatively thin slab combined with additional reinforcement where needed can be favourable from a CO_2 perspective. However, this solution may not necessarily be the most cost efficient. Reinforcement steel is generally more expensive than concrete and a higher reinforcement amount also requires more labour for placing and fixing the bars on site. The same applies to prestressing tendons, which require additional installation work compared with a slab containing only ordinary reinforcement.

Therefore, the alternative with the lowest CO_2e is not necessarily the most favourable solution in terms of cost or construction time. Since cost and construction time were not included in the quantitative assessment, a complete evaluation should also consider material prices, labour requirements, construction sequence and the time needed before stressing can be carried out.

In this study, only the product stage, A1–A3, was included in the environmental assessment. However, maintenance and durability aspects may also influence the total CO_2e

over the full life cycle of the structure. For shorter spans, the PT alternatives showed very limited cracking compared to the RC alternatives, which could potentially reduce future maintenance needs and thereby lower the environmental impact related to repair and maintenance.

On the other hand, post-tensioned systems may introduce additional challenges during the use stage. The inspection, repair and possible replacement of tendons are more difficult since the tendons are embedded in the concrete slab. Since the tendons also have an important role in the load bearing system, damage or corrosion of the prestressing steel may be more critical than for ordinary reinforcement. These aspects were not included in the A1–A3 comparison but could affect the overall environmental performance from a life cycle perspective.

5 CONCLUSION

This thesis investigated the material use and embodied carbon of conventionally reinforced and post-tensioned concrete flat slabs under comparable structural conditions. The results show that the post-tensioned alternatives generally resulted in lower material-related CO_2e than the conventionally reinforced alternatives. This difference originated mainly from reductions in ordinary reinforcement and, for longer spans, reductions in concrete volume due to smaller required slab thicknesses.

The comparison also showed that the environmental benefit of post-tensioning depends strongly on the span length. For shorter spans, the difference between the RC and PT alternatives was relatively limited, since the structural demands could be satisfied with similar slab dimensions. For longer spans, the difference became more obvious, both in terms of material use and percentage reduction in CO_2e. This indicates that post-tensioning becomes more effective as the span length increases, where larger bending moments and greater self-weight make the prestressing effect more beneficial. The results also showed that the total CO_2e per square metre increased with increasing span length, which highlights the importance of span length when evaluating the environmental performance of slab systems.

The study further showed that the choice of concrete strength class has a significant influence on the total environmental impact. A lower concrete strength class, or a concrete with lower CO_2e intensity, does not automatically result in the lowest total CO_2e. For some span lengths, a lower concrete class may be favourable even if it requires a slightly thicker slab, since the lower CO_2e factor can compensate for the increased concrete volume. For longer or more demanding spans, however, a low-strength concrete may require a substantially larger slab thickness in order to satisfy structural requirements, which can instead increase the total environmental impact. The most favourable alternative is therefore not necessarily the thinnest slab or the concrete class with the lowest CO_2e factor, but rather a balanced combination of slab thickness, concrete strength and reinforcement demand.

The parametric study demonstrated that parametric design can be used as an effective tool for evaluating post-tensioned slab alternatives from both a structural and environmental perspective. By varying slab thickness and concrete strength class within a defined design space, the developed workflow made it possible to identify trends and compare different design alternatives in a systematic way. The results show that such an approach can support early-stage design decisions, where several structural solutions can be evaluated before a final design is selected.

Overall, the study shows that post-tensioning can reduce material use and embodied carbon in concrete flat slabs, especially for longer spans. However, the results also show that the environmental performance of a slab system cannot be assessed from one parameter alone. Span length, slab thickness, concrete strength, reinforcement demand and governing structural requirements all influence the final result. The lowest material-related CO_2e were therefore found through the interaction between structural efficiency and material choice, rather than through a single design measure.

The environmental assessment in this thesis was limited to the production stage, A1–A3. Aspects such as durability, maintenance, construction process and end-of-life scenarios were therefore not included in the calculated CO_2e. These aspects may influence the overall environmental performance over the full service life of the structure and could be included in future studies.

5.1 Further research questions

Some topics for further research have been identified, which could provide a deeper understanding of the method, its applicability, and the challenges that may occur during the design and construction process:

- How does the choice between a distributed and a banded tendon layout influence the structural behaviour and material efficiency of post-tensioned flat slabs?
- How does the use of non-straight tendon profiles influence the structural behavior of the slab and how does this affect the embodied carbon of the structure?
- How would the percentage difference in embodied carbon change if post-tensioned slabs were compared with prefabricated concrete elements or hollow-core slabs?
- How do construction costs and construction time differ between post-tensioned slabs and conventional reinforced concrete slabs, including the additional time required for tendon installation and stressing on site?
- How would the inclusion of additional life-cycle stages, such as construction, maintenance and end-of-life scenarios, affect the environmental comparison between the slab systems?

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A CONCRETE STRENGTH PARAMETERS

Table A.1: Concrete material properties for selected strength classes.

Parameter	**C20/25**	**C25/30**	**C30/37**	**C35/45**	**C40/50**	**C50/60**	**C55/67**	**C60/75**
f_{ck} [MPa]	20	25	30	35	40	50	55	60
$f_{ck,cube}$ [MPa]	25	30	37	45	50	60	67	75
f_{cm} [MPa]	28	33	38	43	48	58	63	68
f_{ctm} [MPa]	2.2	2.6	2.9	3.2	3.5	4.1	4.2	4.4
$f_{ctk,0.05}$ [MPa]	1.5	1.8	2.0	2.2	2.5	2.9	3.0	3.1
$f_{ctk,0.95}$ [MPa]	2.9	3.3	3.8	4.2	4.6	5.3	5.5	5.7
E_{cm} [GPa]	30	31	33	34	35	37	38	39
ε_{c1} [‰]	3.5	3.5	3.5	3.5	3.5	3.5	2.5	2.6
ε_{cu1} [‰]	3.5	3.5	3.5	3.5	3.5	3.5	3.2	3.0
ε_{c2} [‰]	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.3
ε_{cu2} [‰]	3.5	3.5	3.5	3.5	3.5	3.5	3.1	2.9
n	2.0	2.0	2.0	2.0	2.0	2.0	1.8	1.6
ε_{c3} [‰]	1.75	1.75	1.75	1.75	1.75	1.75	1.8	1.9
ε_{cu3} [‰]	3.5	3.5	3.5	3.5	3.5	3.5	3.1	2.9

B CASE STUDY RESULTS

Numerical modelling results RC slab 6m

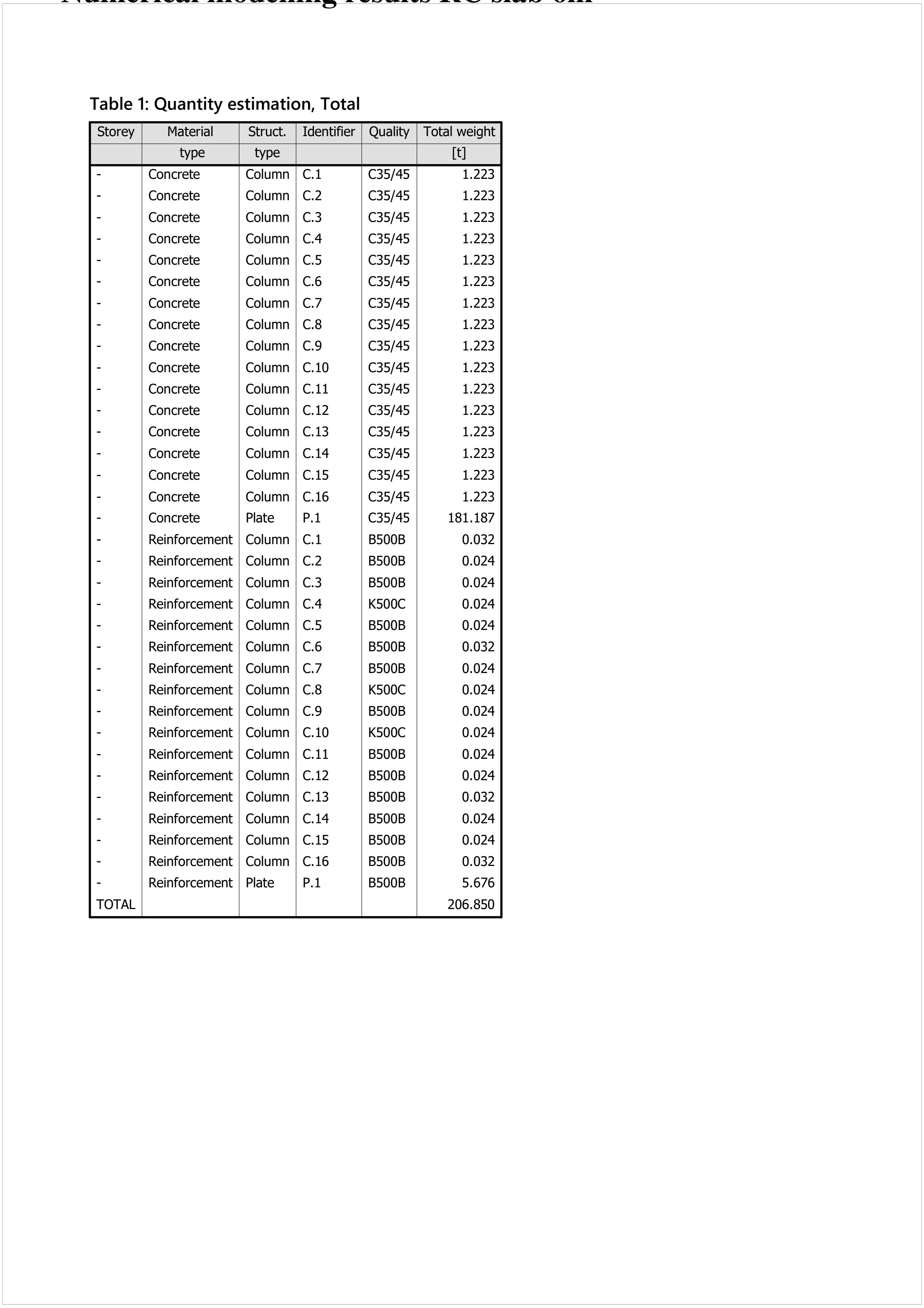

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	181.187
-	Reinforcement	Column	C.1	B500B	0.032
-	Reinforcement	Column	C.2	B500B	0.024
-	Reinforcement	Column	C.3	B500B	0.024
-	Reinforcement	Column	C.4	K500C	0.024
-	Reinforcement	Column	C.5	B500B	0.024
-	Reinforcement	Column	C.6	B500B	0.032
-	Reinforcement	Column	C.7	B500B	0.024
-	Reinforcement	Column	C.8	K500C	0.024
-	Reinforcement	Column	C.9	B500B	0.024
-	Reinforcement	Column	C.10	K500C	0.024
-	Reinforcement	Column	C.11	B500B	0.024
-	Reinforcement	Column	C.12	B500B	0.024
-	Reinforcement	Column	C.13	B500B	0.032
-	Reinforcement	Column	C.14	B500B	0.024
-	Reinforcement	Column	C.15	B500B	0.024
-	Reinforcement	Column	C.16	B500B	0.032
-	Reinforcement	Plate	P.1	B500B	5.676
TOTAL					206.850

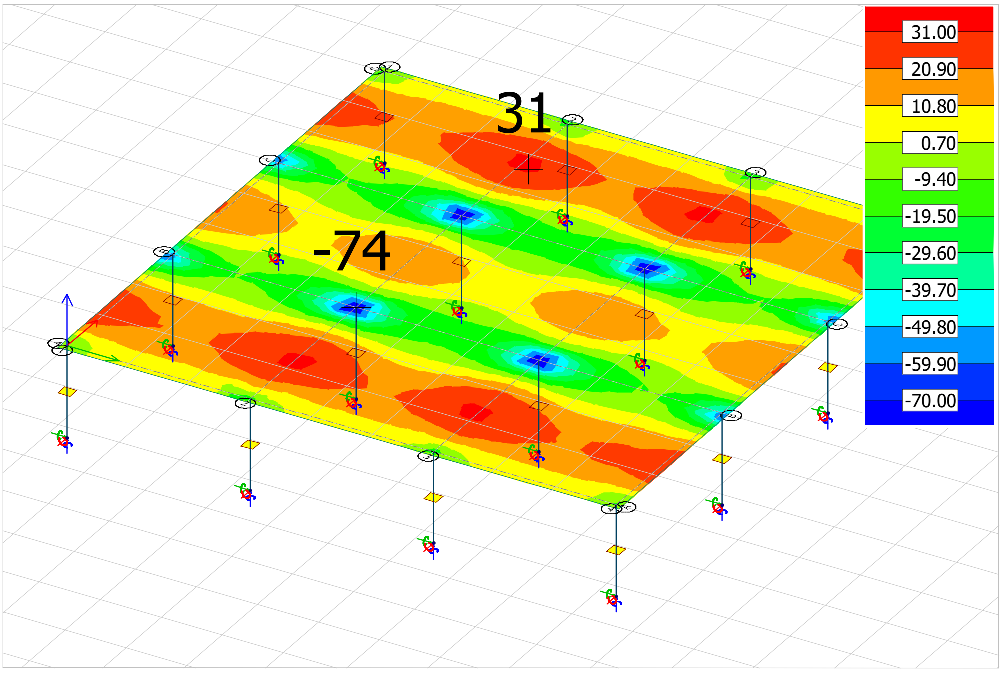

Figure 1: Load comb.: ULS - Shells, My' - [kNm/m]

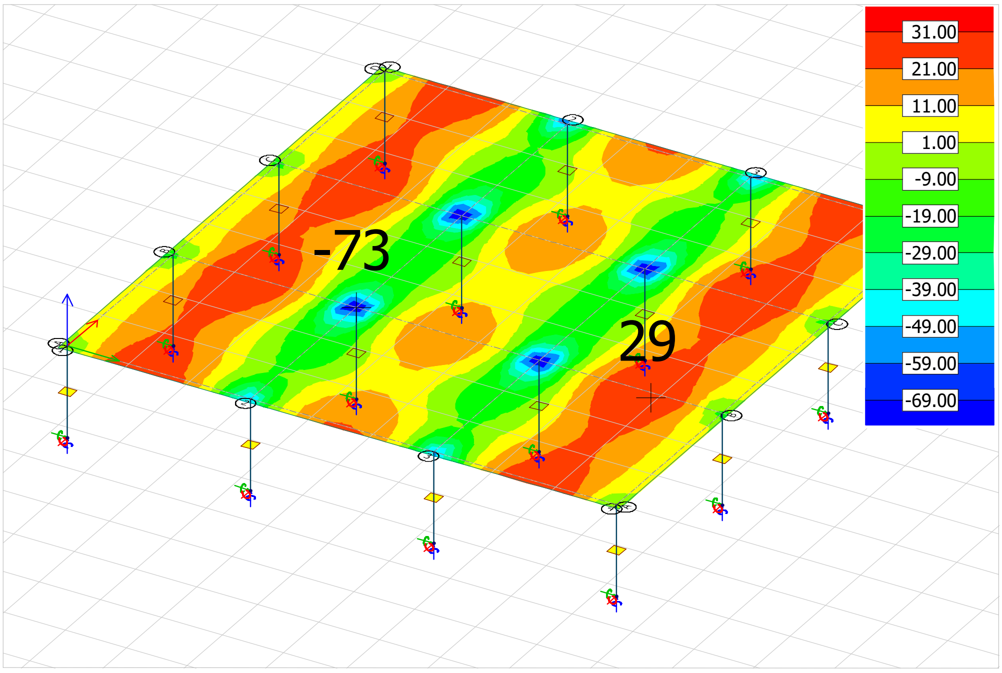

Figure 2: Load comb.: ULS - Shells, Mx' - [kNm/m]

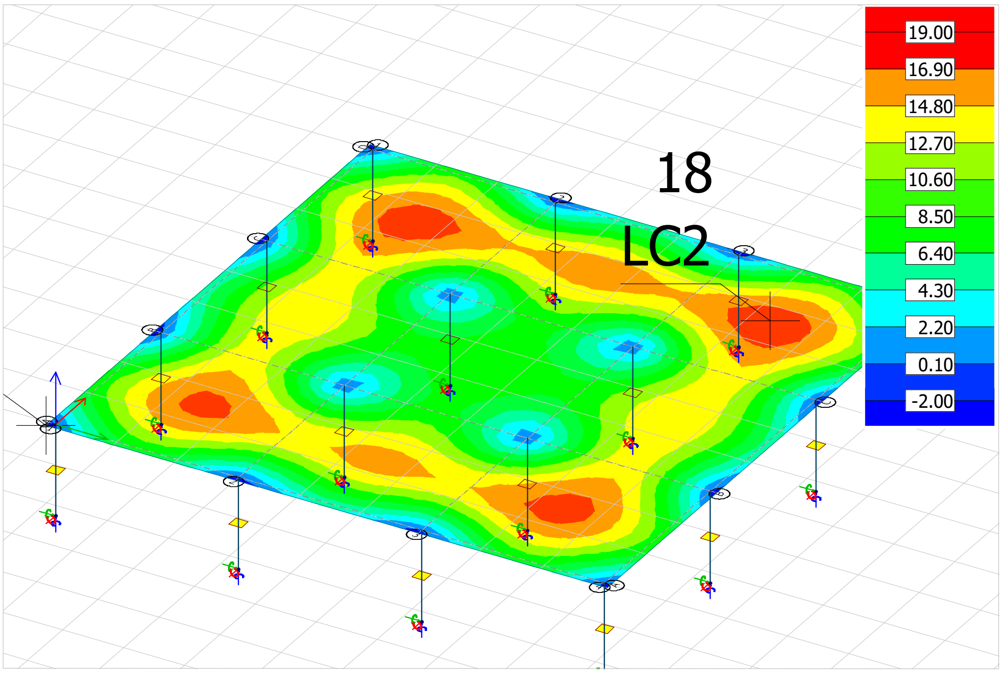

Figure 3: Cmax, Sq - Shell deflection value - [mm]

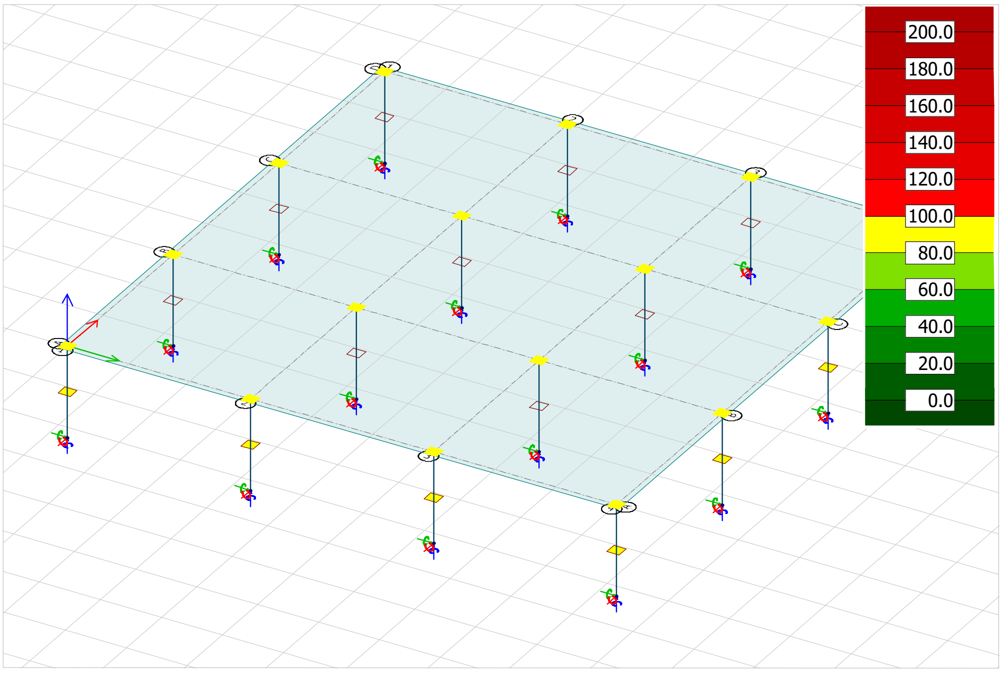

Figure 4: RC punching - Load comb.: ULS - [%]

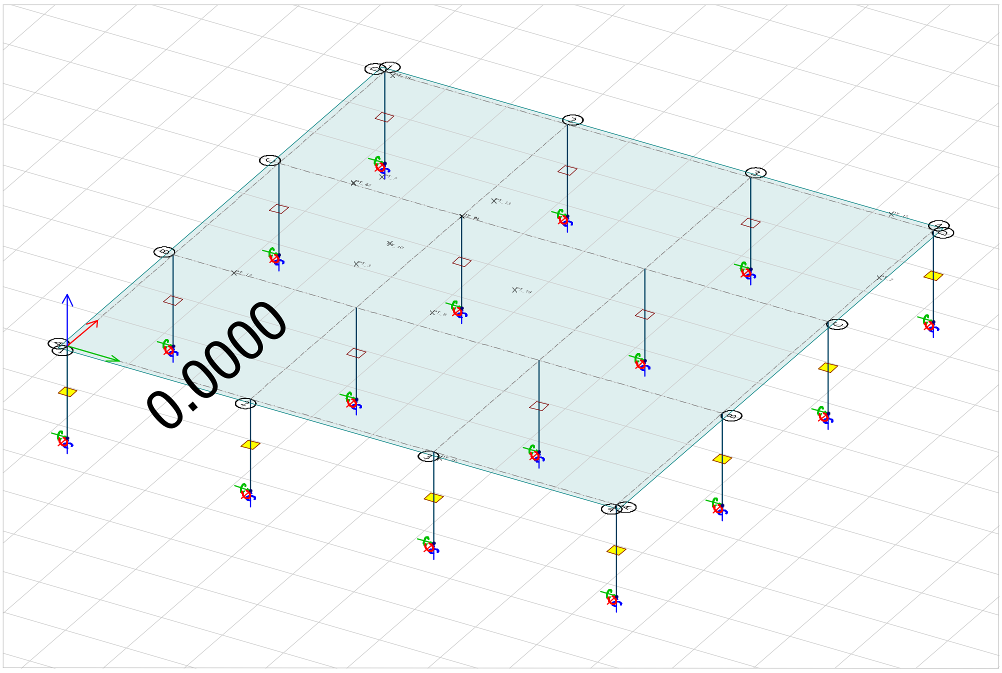

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLS - [mm]

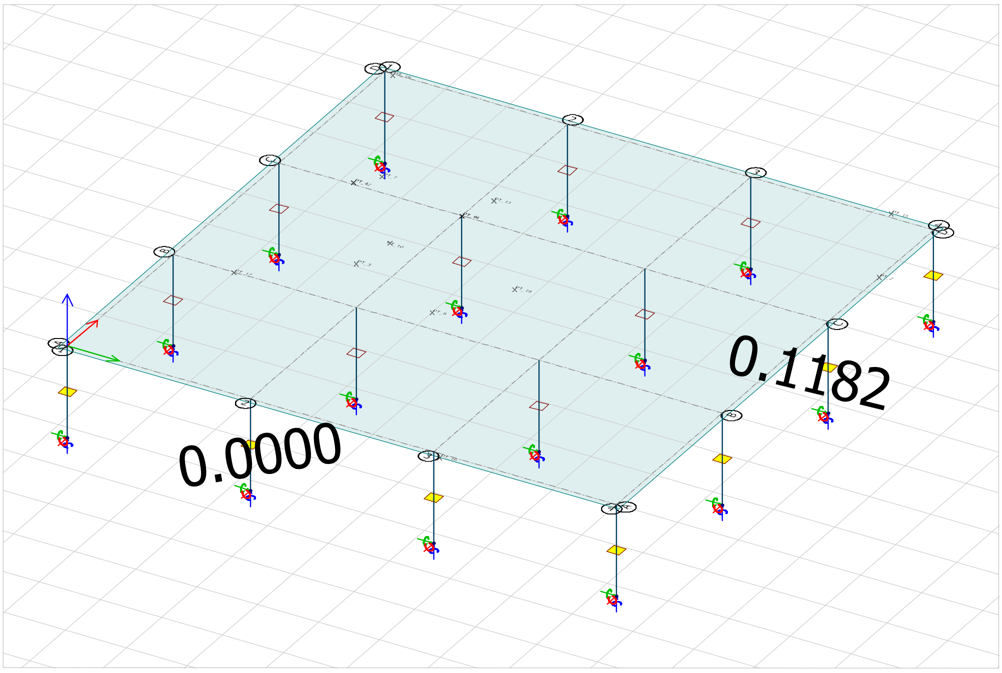

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLS - [mm]

Numerical modelling results RC slab 9m

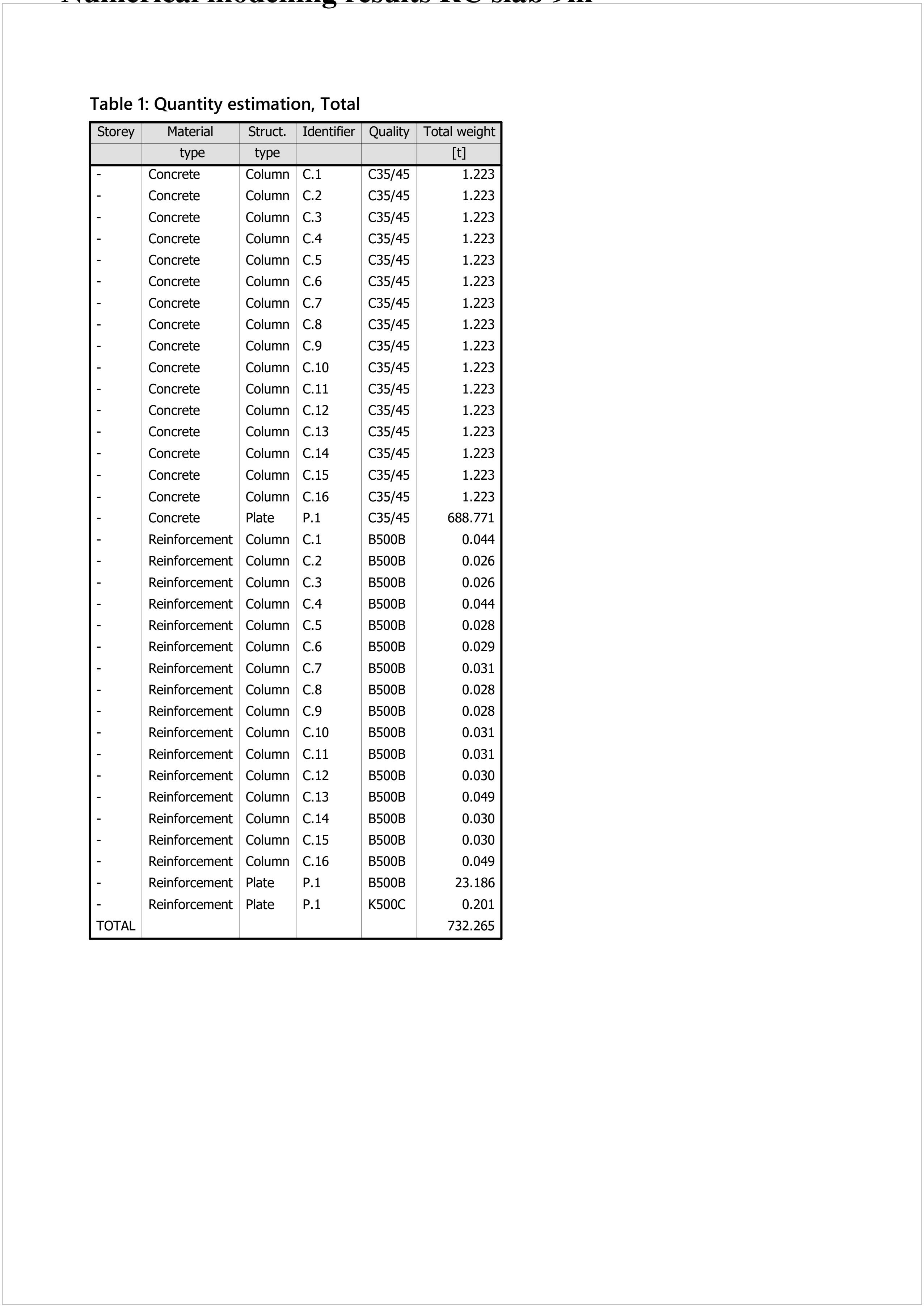

Table 1: Quantity estimation, Total

Storey	Material type	Struct. type	Identifier	Quality	Total weight [t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	688.771
-	Reinforcement	Column	C.1	B500B	0.044
-	Reinforcement	Column	C.2	B500B	0.026
-	Reinforcement	Column	C.3	B500B	0.026
-	Reinforcement	Column	C.4	B500B	0.044
-	Reinforcement	Column	C.5	B500B	0.028
-	Reinforcement	Column	C.6	B500B	0.029
-	Reinforcement	Column	C.7	B500B	0.031
-	Reinforcement	Column	C.8	B500B	0.028
-	Reinforcement	Column	C.9	B500B	0.028
-	Reinforcement	Column	C.10	B500B	0.031
-	Reinforcement	Column	C.11	B500B	0.031
-	Reinforcement	Column	C.12	B500B	0.030
-	Reinforcement	Column	C.13	B500B	0.049
-	Reinforcement	Column	C.14	B500B	0.030
-	Reinforcement	Column	C.15	B500B	0.030
-	Reinforcement	Column	C.16	B500B	0.049
-	Reinforcement	Plate	P.1	B500B	23.186
-	Reinforcement	Plate	P.1	K500C	0.201
TOTAL					732.265

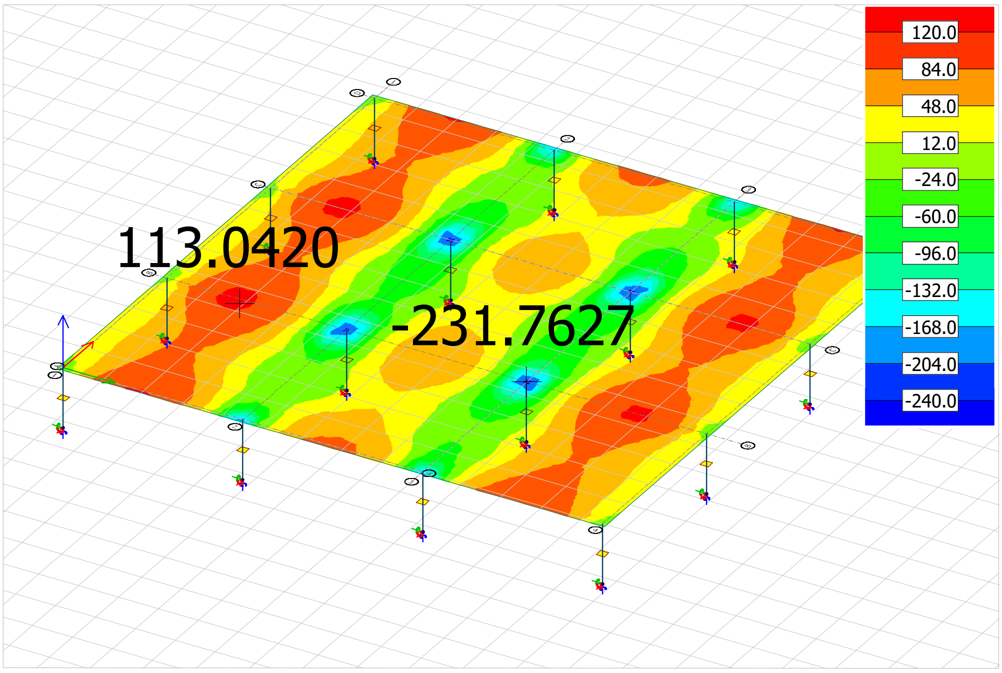

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

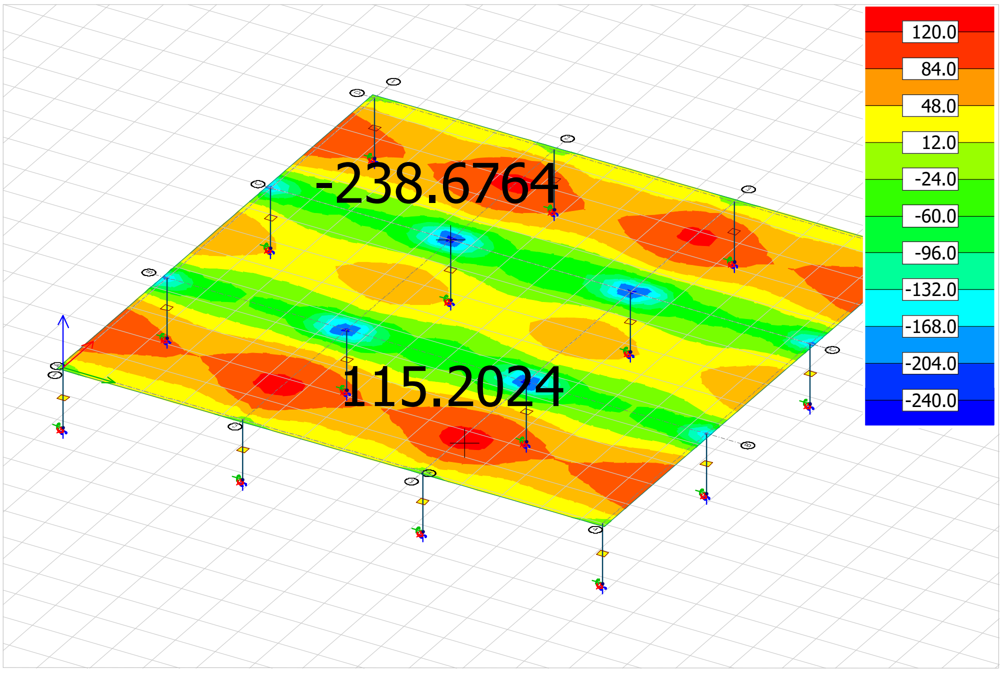

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

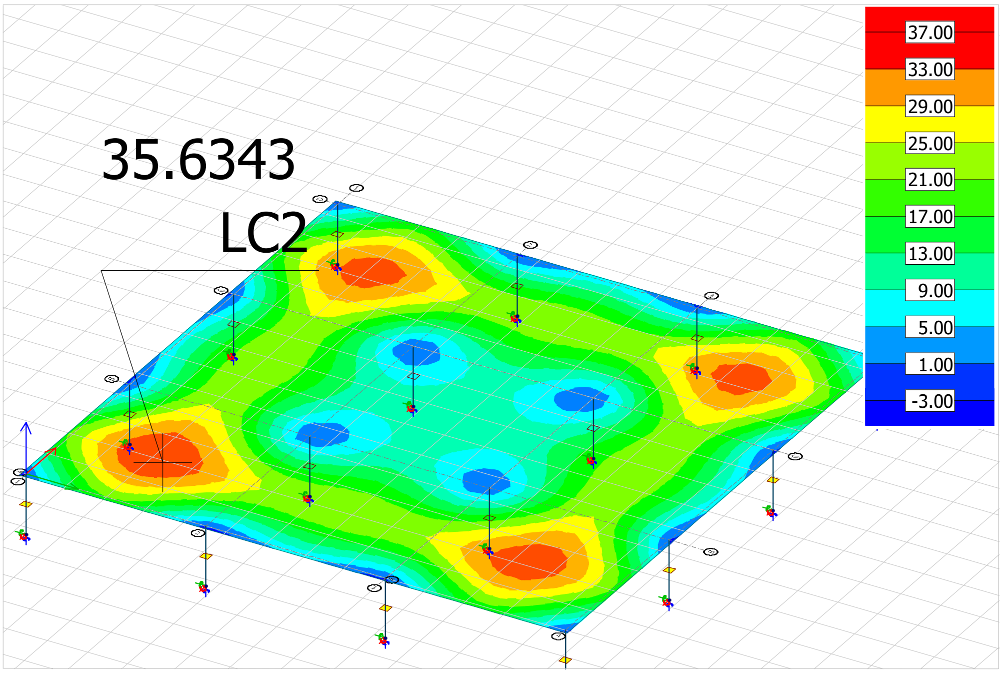

Figure 3: Cmax, Sq - Shell deflection value - [mm]

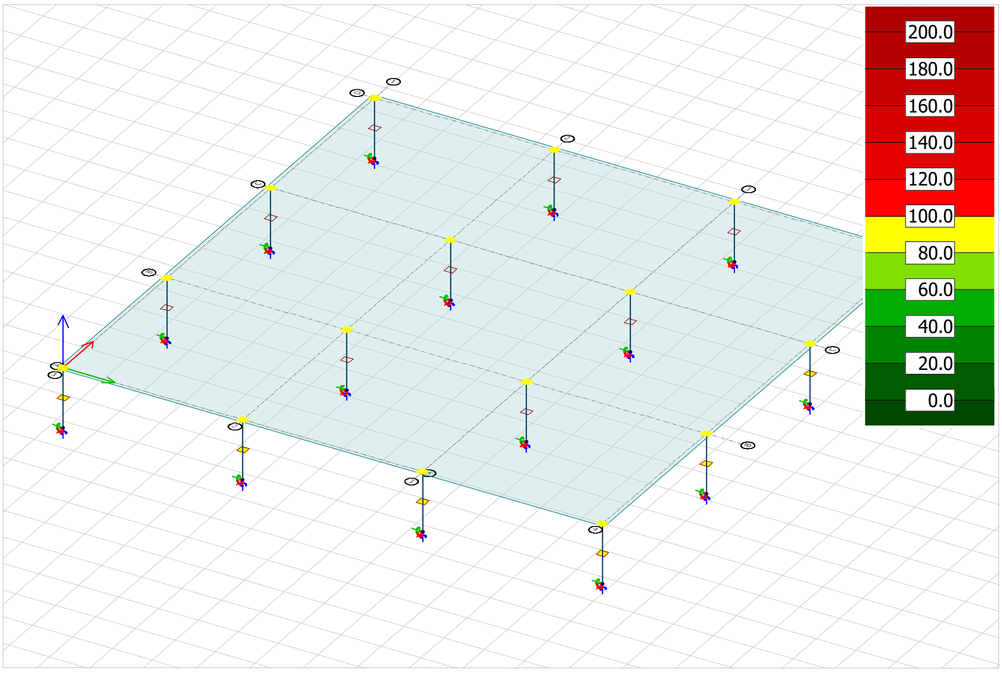

Figure 4: RC punching - Load comb.: ULS - [%]

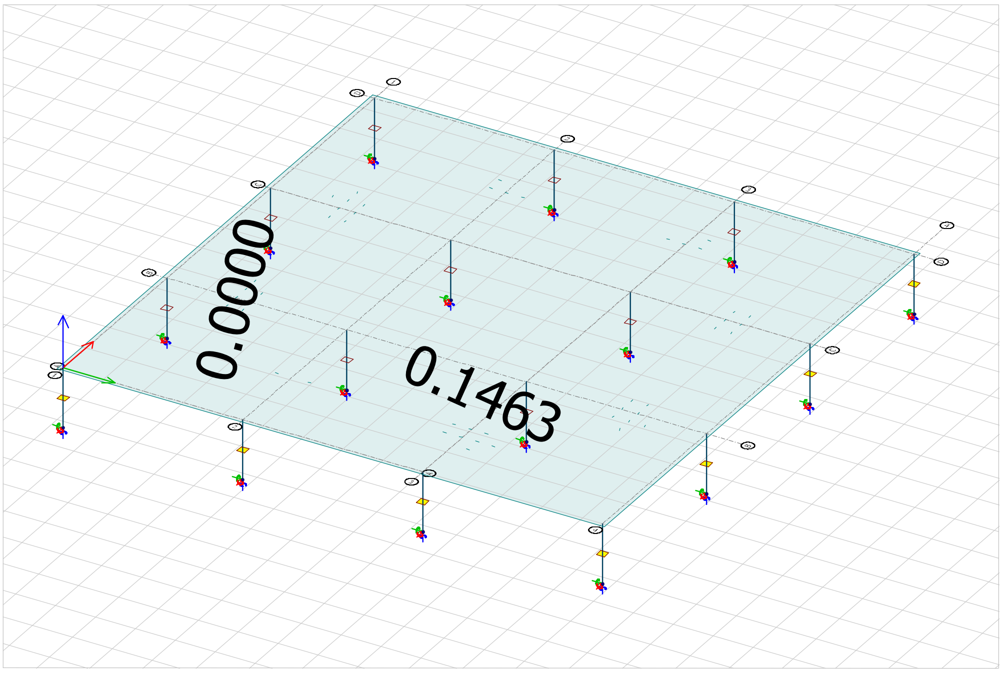

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLS - [mm]

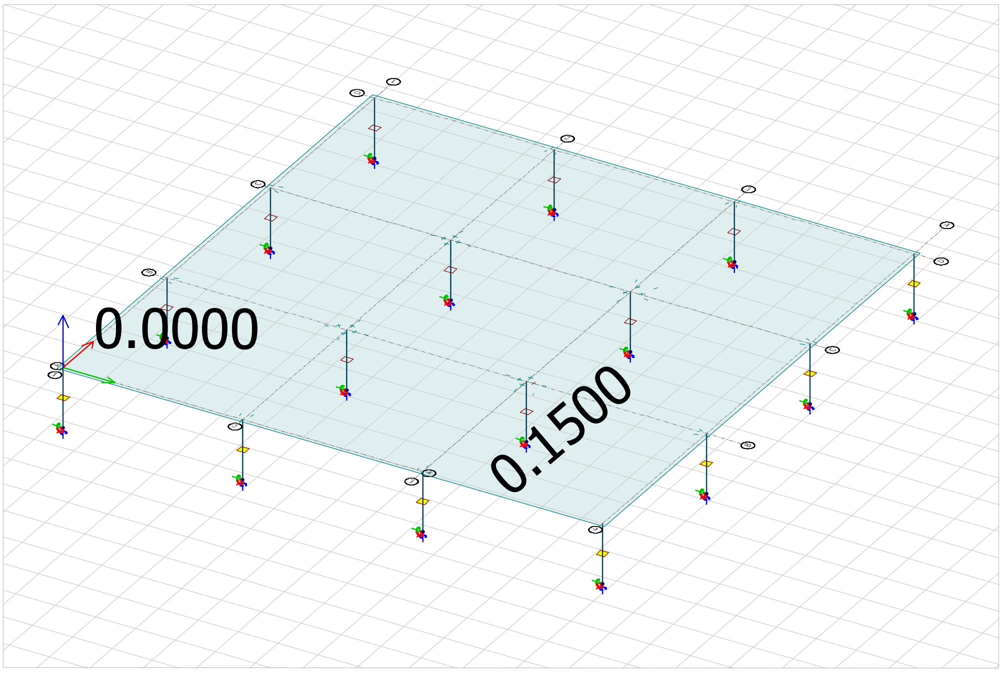

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLS - [mm]

Numerical modelling results RC slab 12m

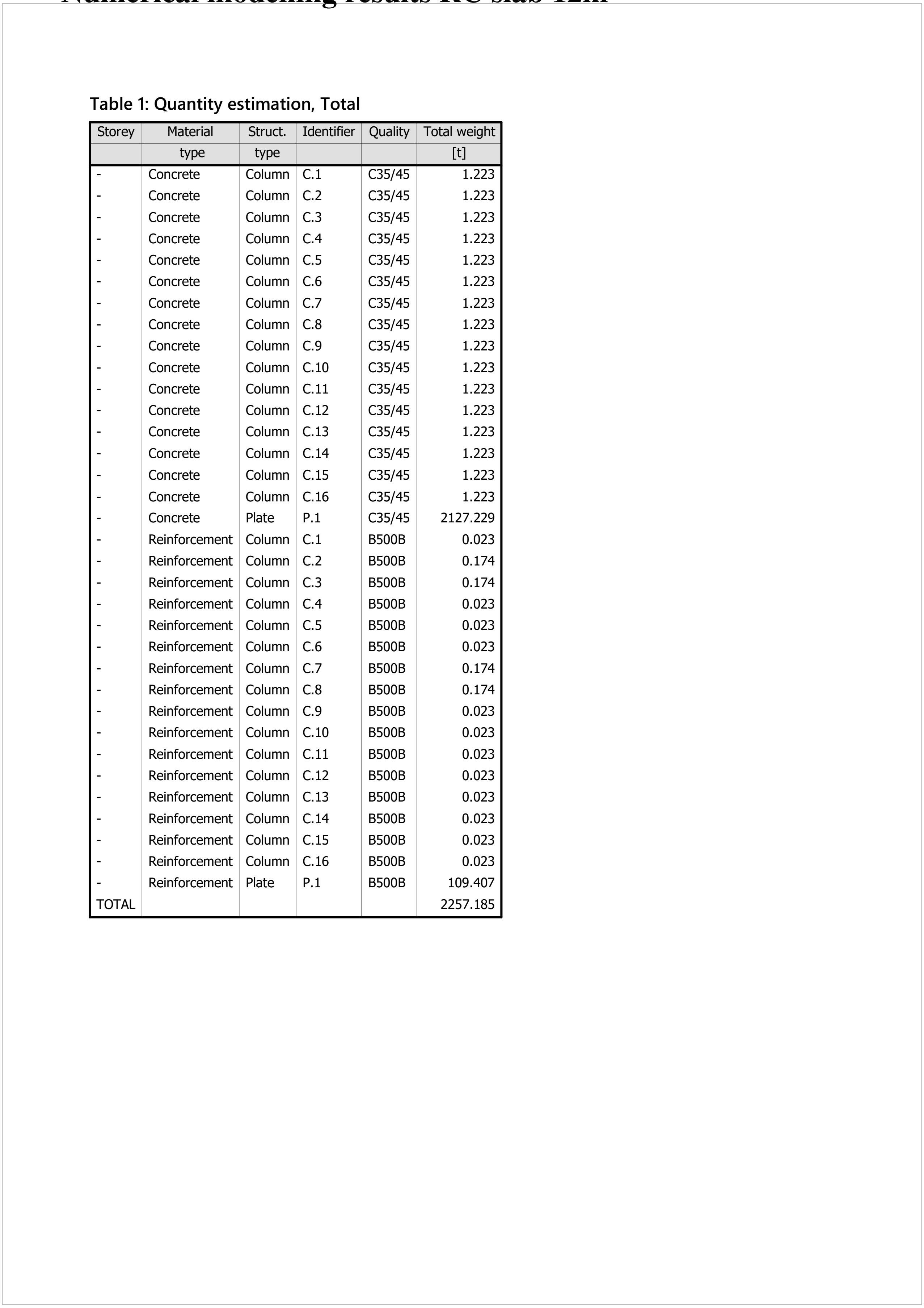

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	2127.229
-	Reinforcement	Column	C.1	B500B	0.023
-	Reinforcement	Column	C.2	B500B	0.174
-	Reinforcement	Column	C.3	B500B	0.174
-	Reinforcement	Column	C.4	B500B	0.023
-	Reinforcement	Column	C.5	B500B	0.023
-	Reinforcement	Column	C.6	B500B	0.023
-	Reinforcement	Column	C.7	B500B	0.174
-	Reinforcement	Column	C.8	B500B	0.174
-	Reinforcement	Column	C.9	B500B	0.023
-	Reinforcement	Column	C.10	B500B	0.023
-	Reinforcement	Column	C.11	B500B	0.023
-	Reinforcement	Column	C.12	B500B	0.023
-	Reinforcement	Column	C.13	B500B	0.023
-	Reinforcement	Column	C.14	B500B	0.023
-	Reinforcement	Column	C.15	B500B	0.023
-	Reinforcement	Column	C.16	B500B	0.023
-	Reinforcement	Plate	P.1	B500B	109.407
TOTAL					2257.185

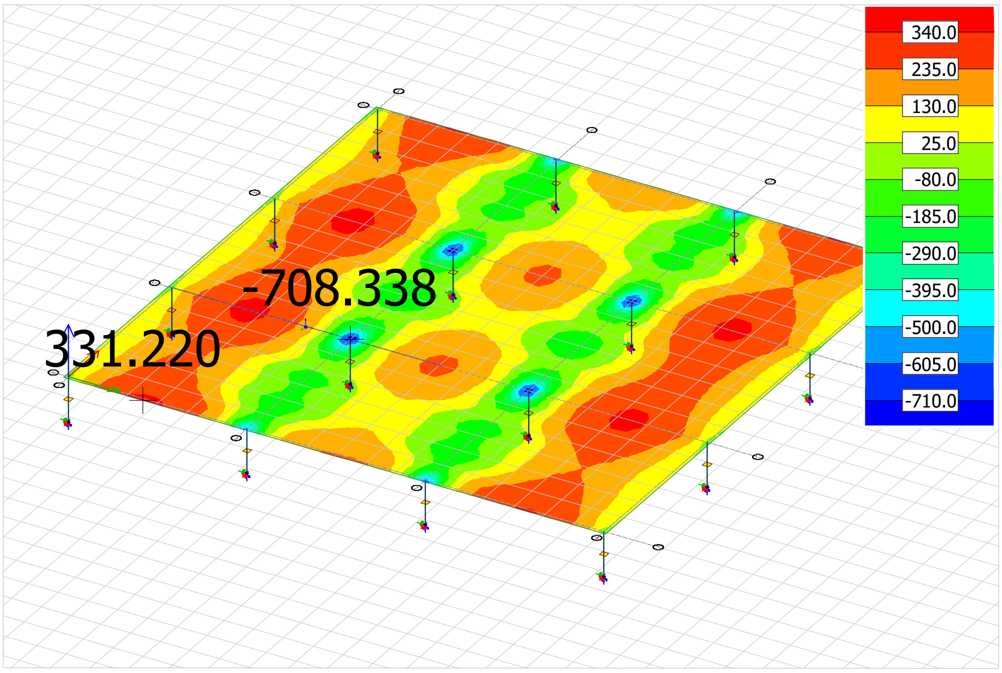

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

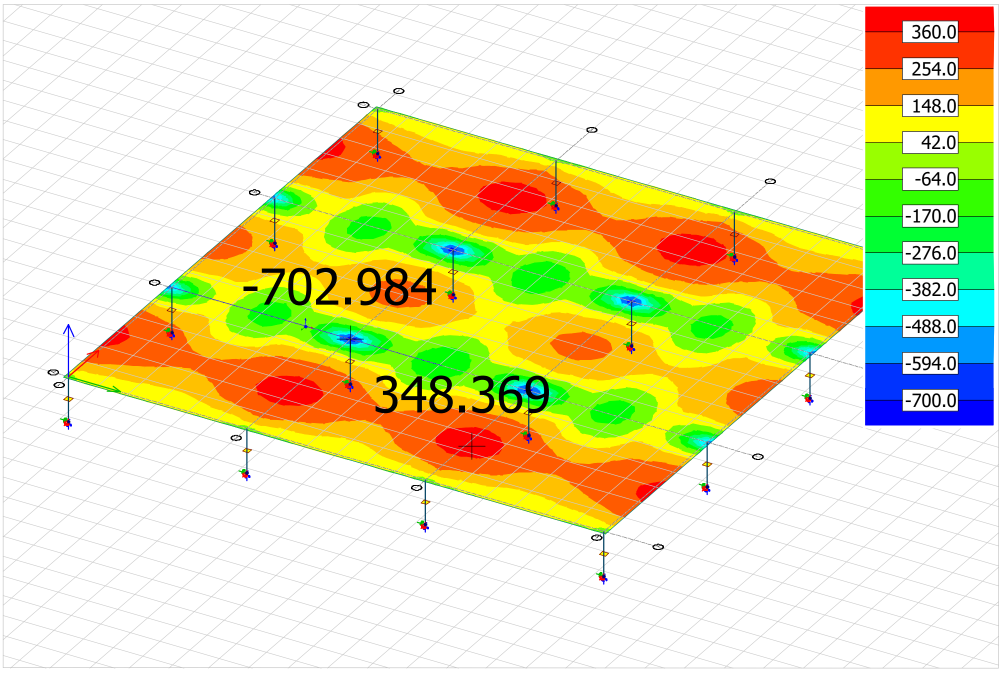

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

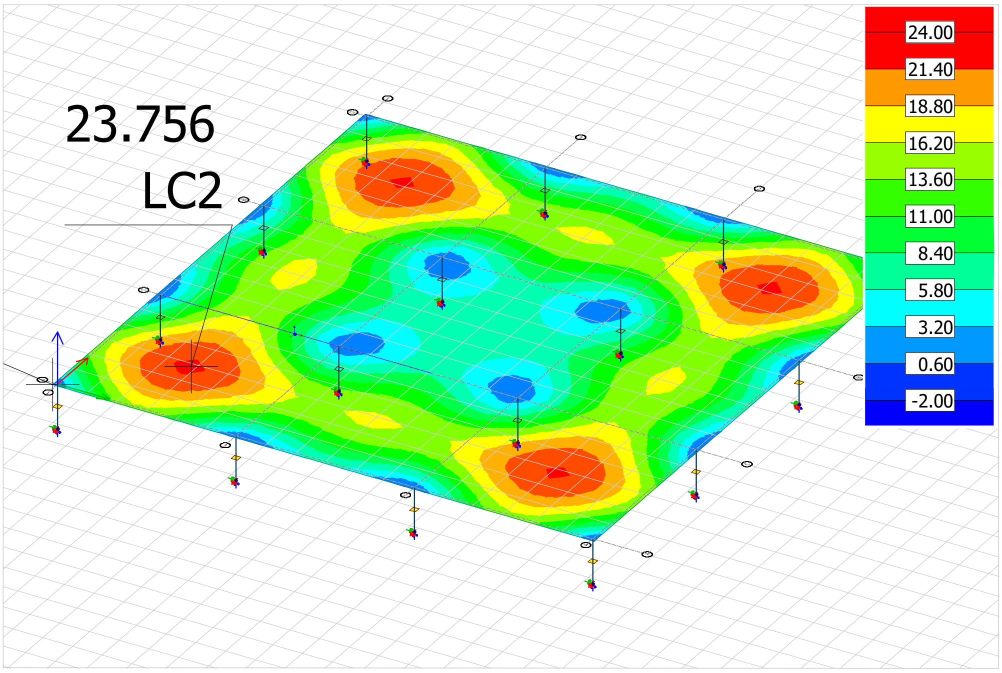

Figure 3: Cmax, Sq - Shell deflection value - [mm]

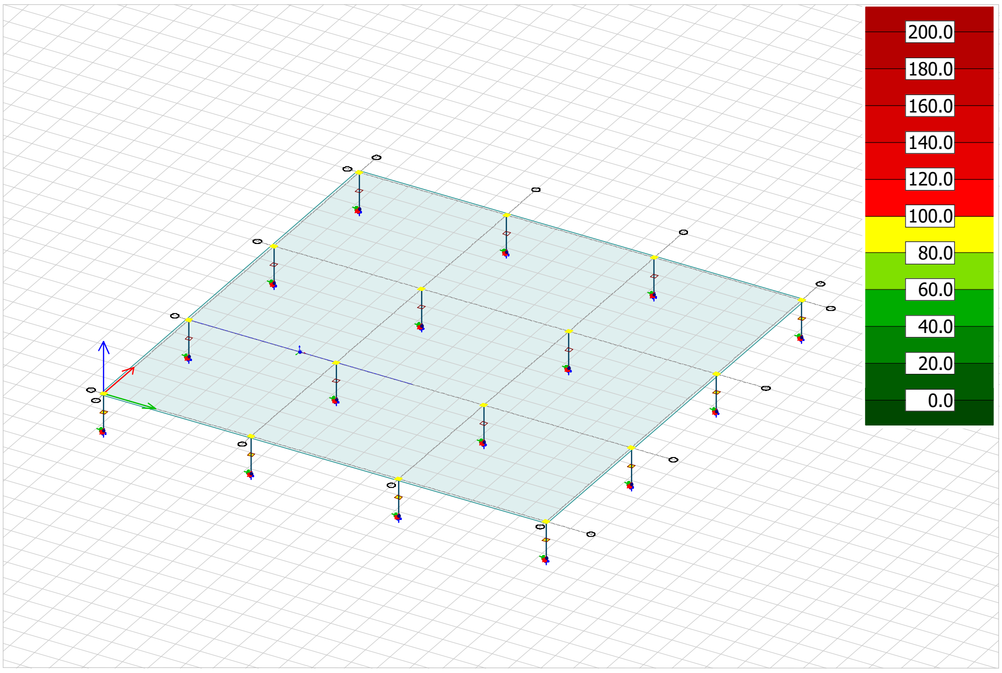

Figure 4: RC punching - Load comb.: ULS - [%]

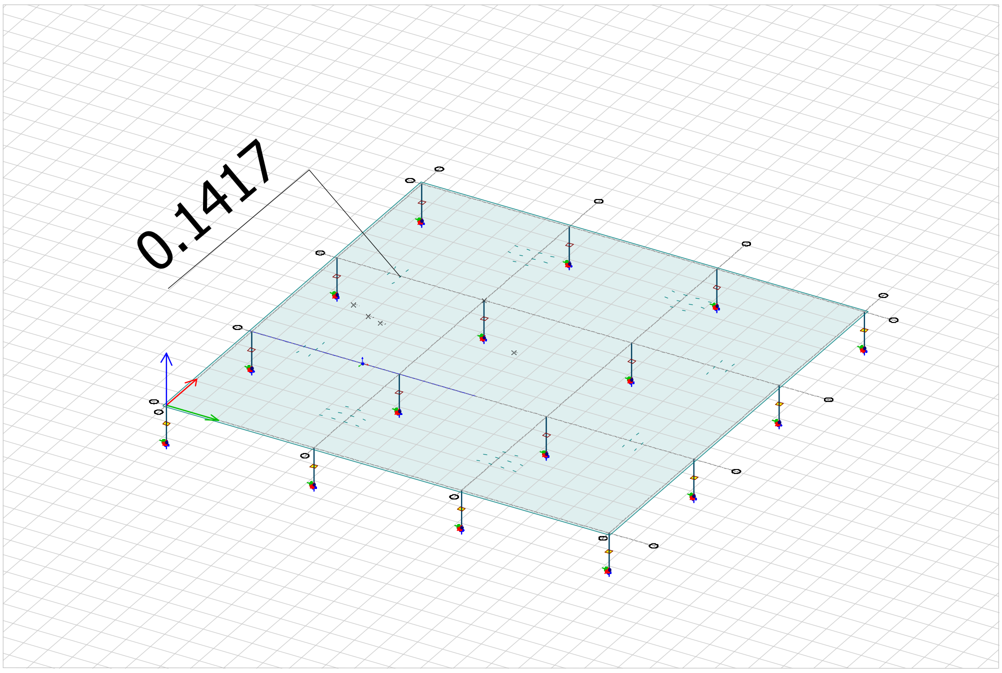

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLSq - [mm]

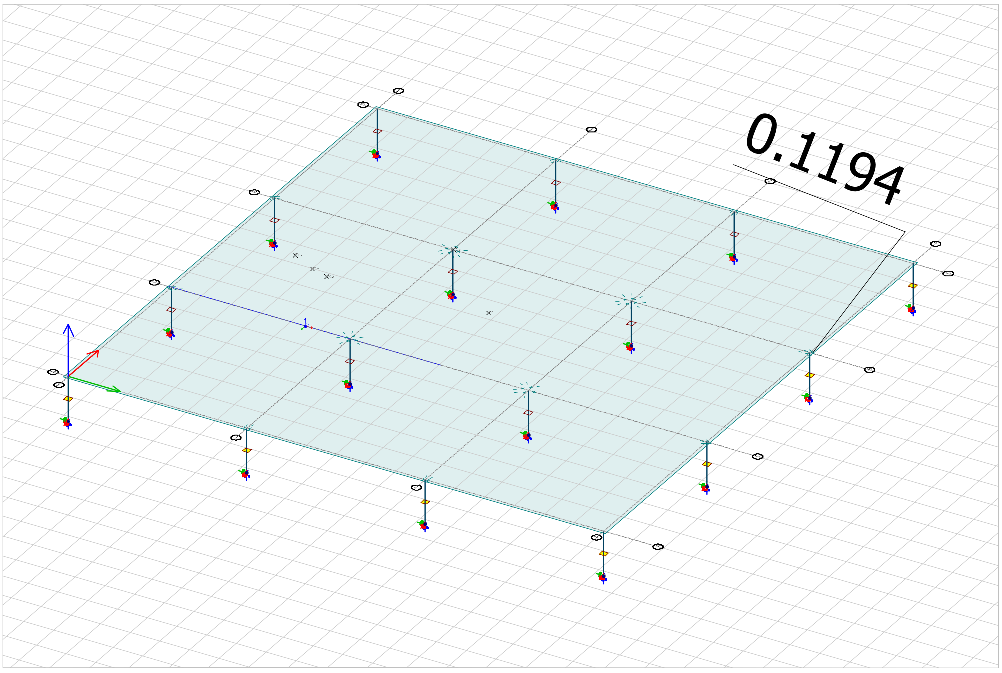

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLSq - [mm]

Numerical modelling results PT slab 6m

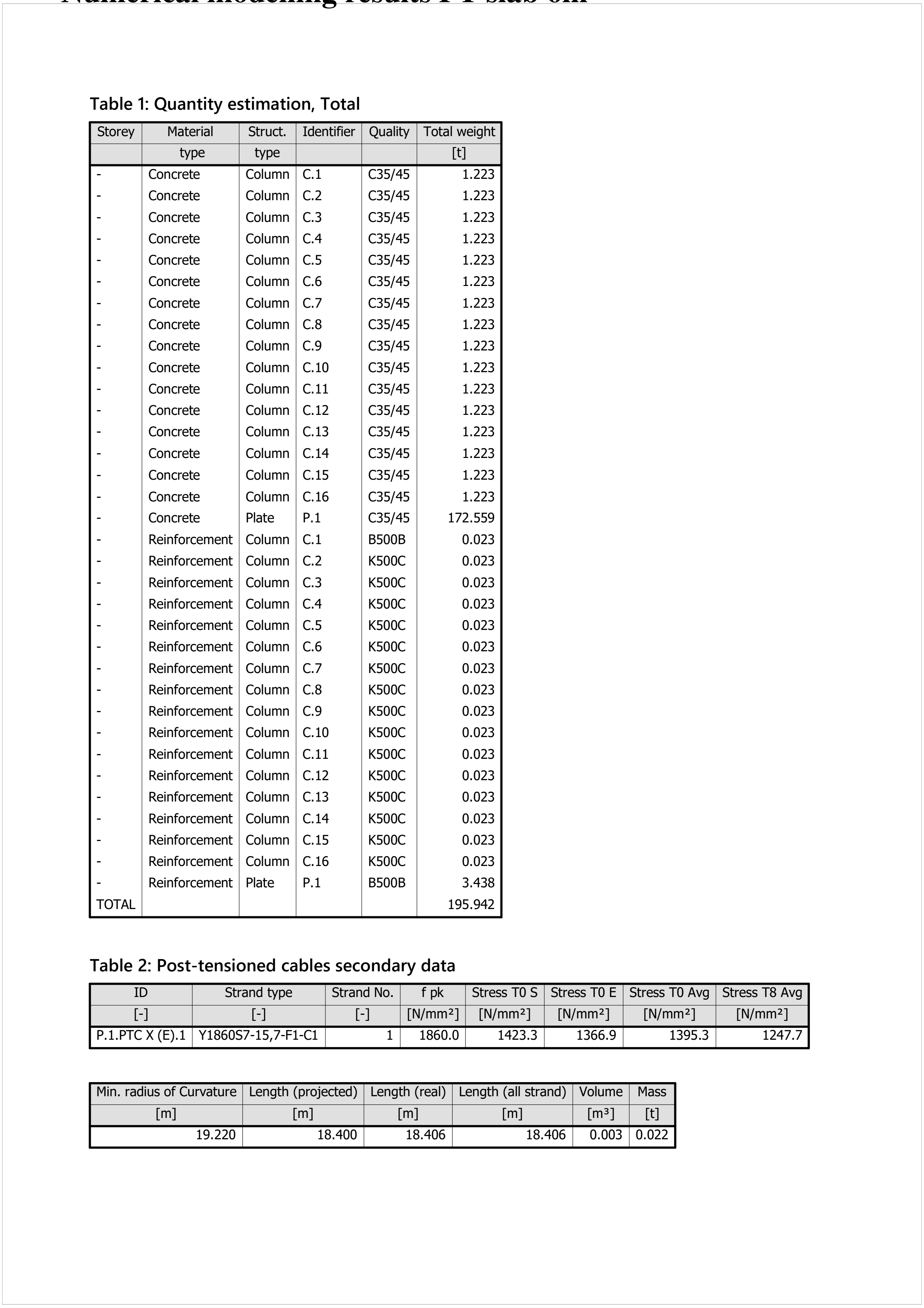

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	172.559
-	Reinforcement	Column	C.1	B500B	0.023
-	Reinforcement	Column	C.2	K500C	0.023
-	Reinforcement	Column	C.3	K500C	0.023
-	Reinforcement	Column	C.4	K500C	0.023
-	Reinforcement	Column	C.5	K500C	0.023
-	Reinforcement	Column	C.6	K500C	0.023
-	Reinforcement	Column	C.7	K500C	0.023
-	Reinforcement	Column	C.8	K500C	0.023
-	Reinforcement	Column	C.9	K500C	0.023
-	Reinforcement	Column	C.10	K500C	0.023
-	Reinforcement	Column	C.11	K500C	0.023
-	Reinforcement	Column	C.12	K500C	0.023
-	Reinforcement	Column	C.13	K500C	0.023
-	Reinforcement	Column	C.14	K500C	0.023
-	Reinforcement	Column	C.15	K500C	0.023
-	Reinforcement	Column	C.16	K500C	0.023
-	Reinforcement	Plate	P.1	B500B	3.438
TOTAL					195.942

Table 2: Post-tensioned cables secondary data

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg	Stress T8 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7

Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[m]	[m]	[m]	[m]	[m³]	[t]
19.220	18.400	18.406	18.406	0.003	0.022

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg	Stress T8 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7

Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[m]	[m]	[m]	[m]	[m³]	[t]
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg	Stress T8 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.3	1366.9	1395.3	1247.7

Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[m]	[m]	[m]	[m]	[m³]	[t]
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022
19.220	18.400	18.406	18.406	0.003	0.022

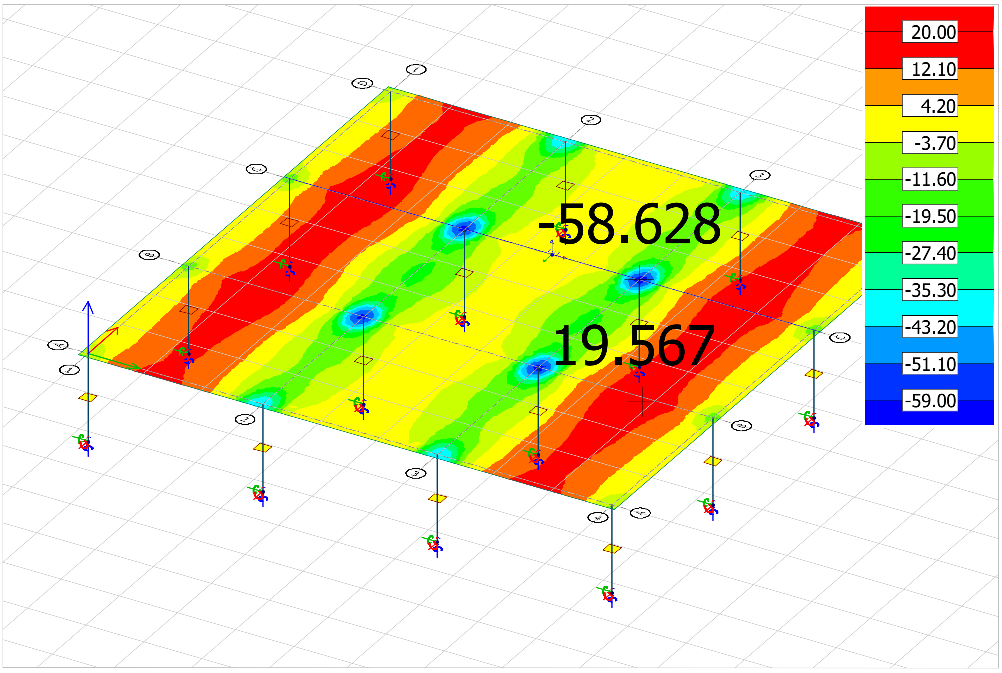

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

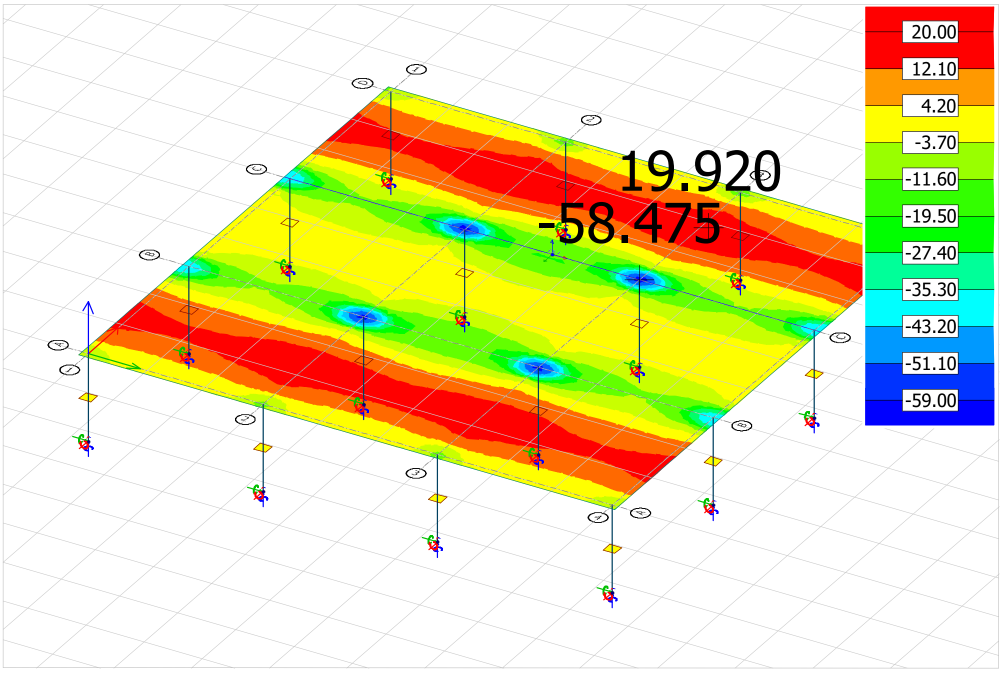

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

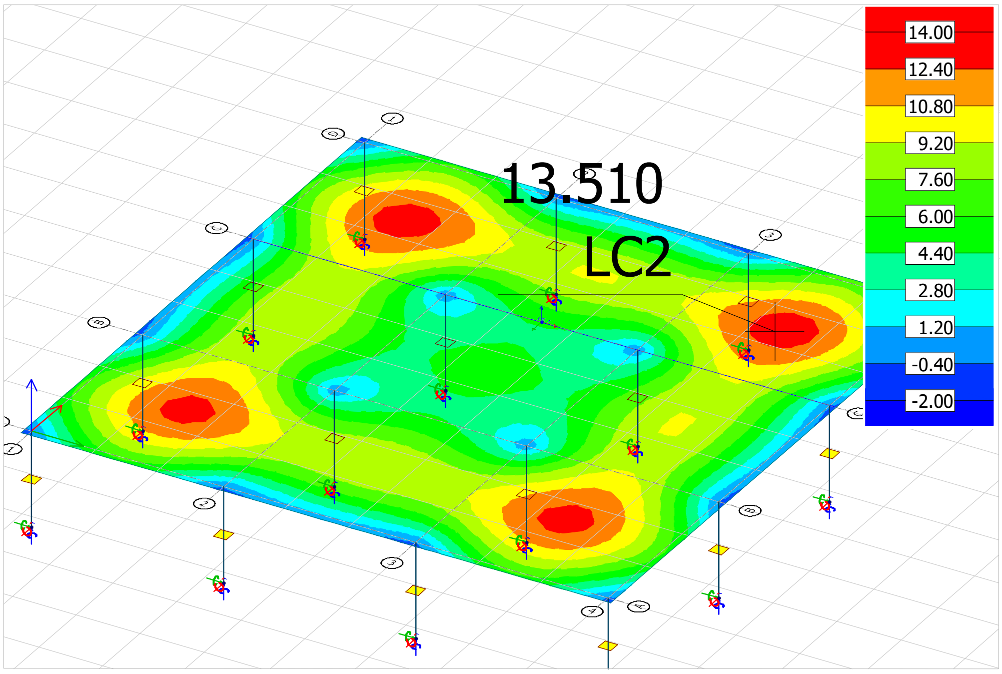

Figure 3: Cmax, Sq - Shell deflection value - [mm]

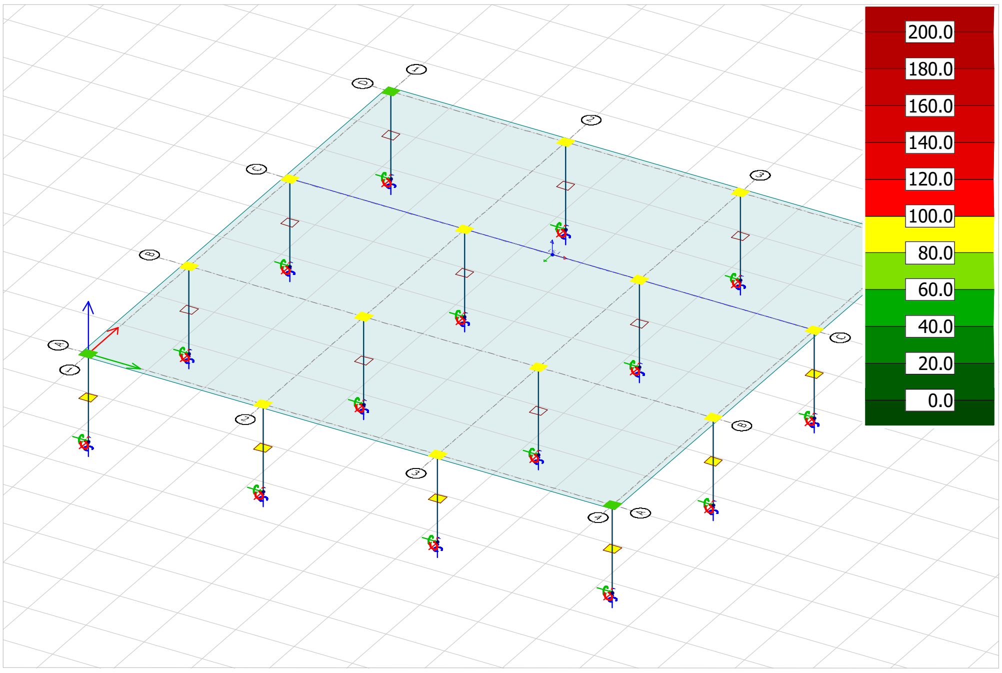

Figure 4: RC punching - Load comb.: ULS - [%]

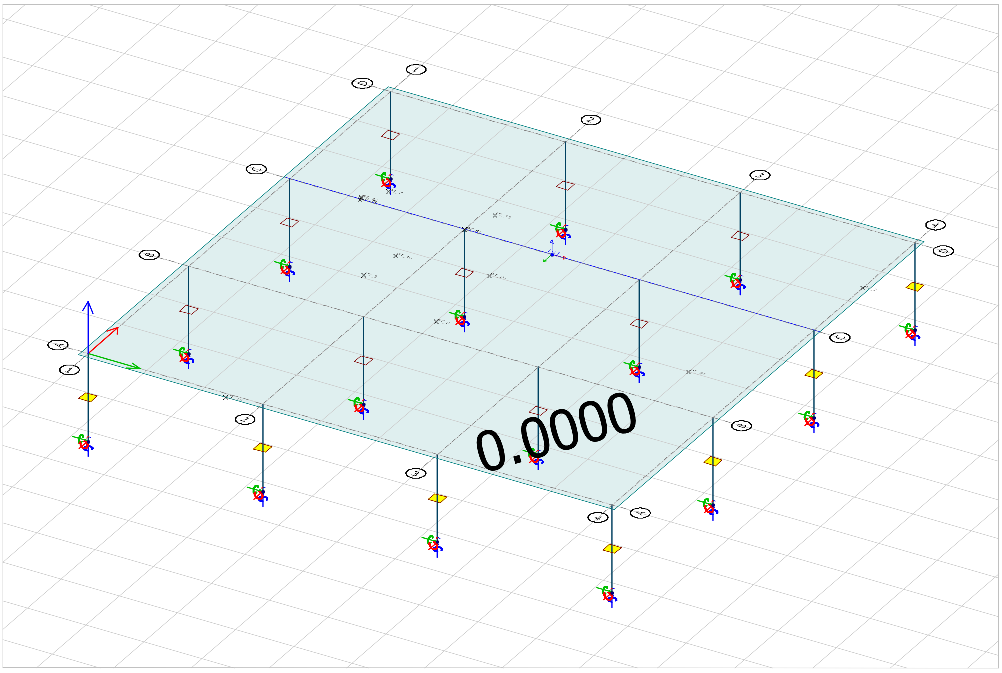

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLSq - [mm]

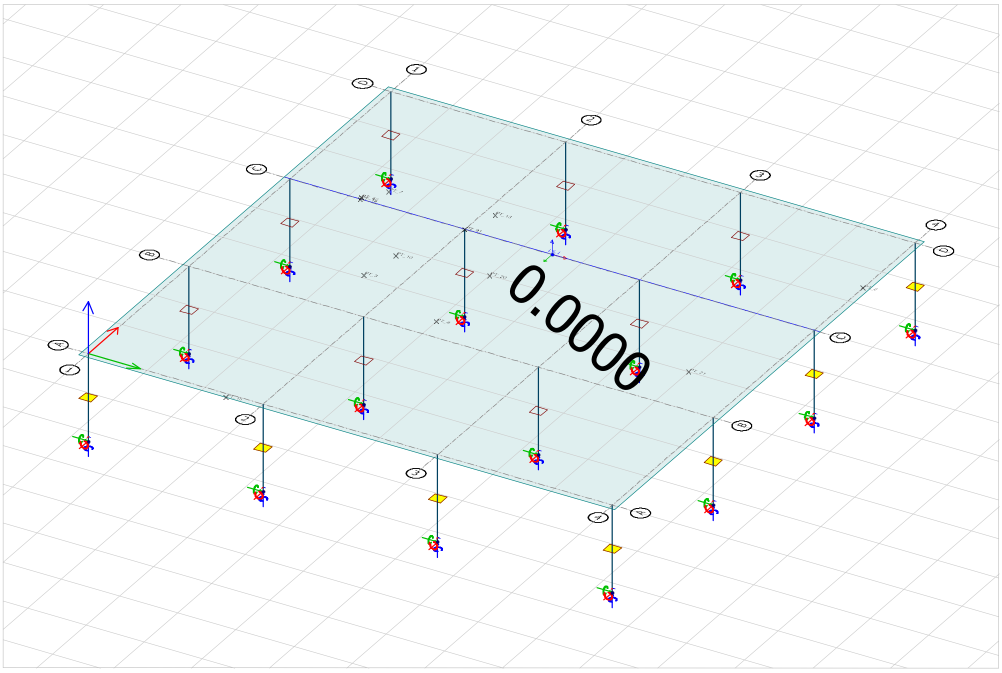

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLSq - [mm]

Numerical modelling results PT slab 9m Concrete Class C20/25

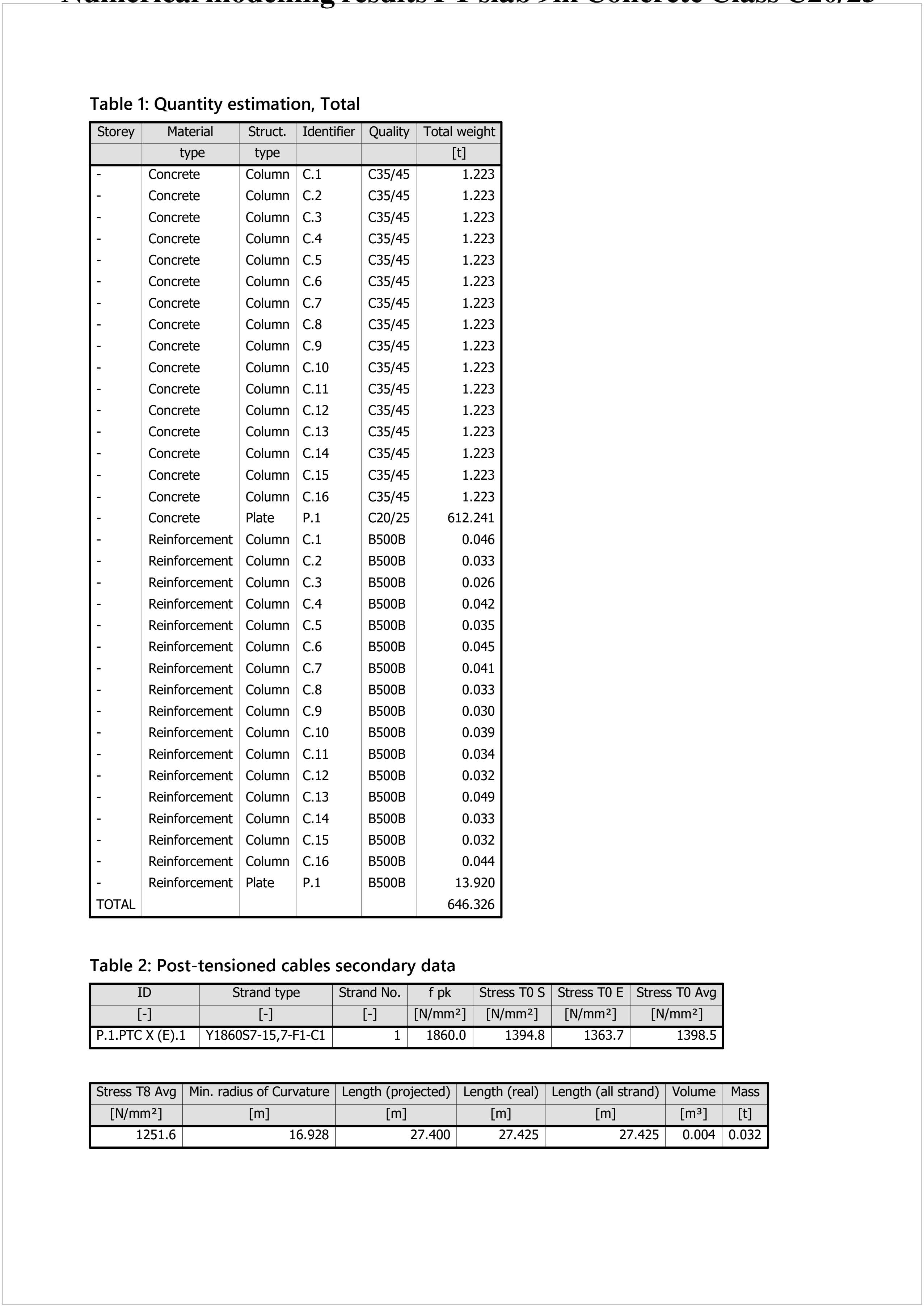

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C20/25	612.241
-	Reinforcement	Column	C.1	B500B	0.046
-	Reinforcement	Column	C.2	B500B	0.033
-	Reinforcement	Column	C.3	B500B	0.026
-	Reinforcement	Column	C.4	B500B	0.042
-	Reinforcement	Column	C.5	B500B	0.035
-	Reinforcement	Column	C.6	B500B	0.045
-	Reinforcement	Column	C.7	B500B	0.041
-	Reinforcement	Column	C.8	B500B	0.033
-	Reinforcement	Column	C.9	B500B	0.030
-	Reinforcement	Column	C.10	B500B	0.039
-	Reinforcement	Column	C.11	B500B	0.034
-	Reinforcement	Column	C.12	B500B	0.032
-	Reinforcement	Column	C.13	B500B	0.049
-	Reinforcement	Column	C.14	B500B	0.033
-	Reinforcement	Column	C.15	B500B	0.032
-	Reinforcement	Column	C.16	B500B	0.044
-	Reinforcement	Plate	P.1	B500B	13.920
TOTAL					646.326

Table 2: Post-tensioned cables secondary data

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1251.6	16.928	27.400	27.425	27.425	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1394.8	1363.7	1398.5

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032
1251.6	16.928	27.400	27.425	27.425	0.004	0.032

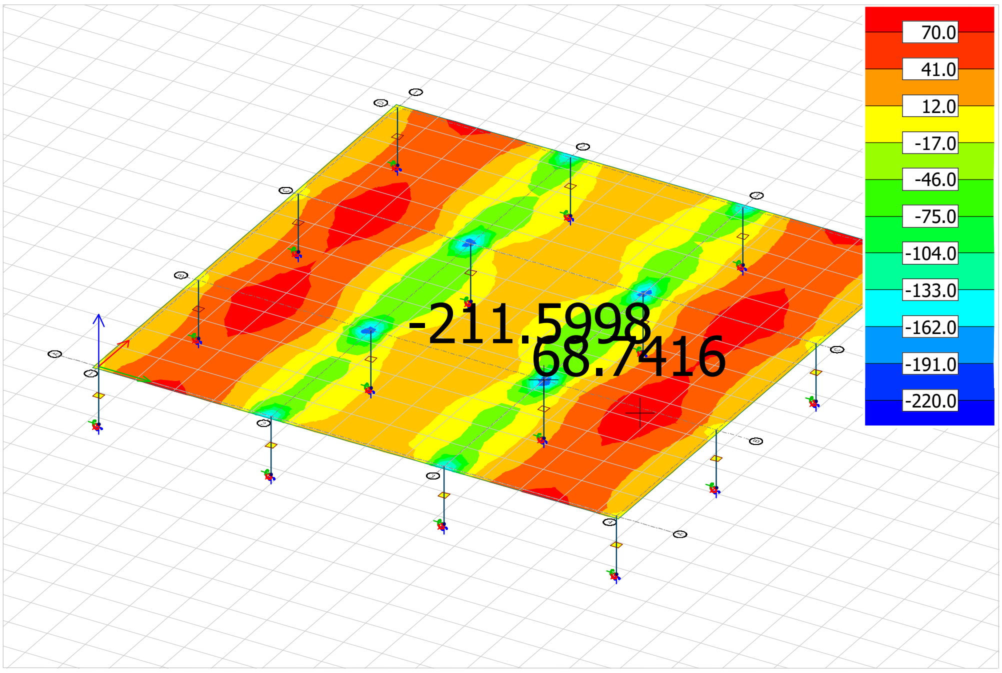

Figure 1: Load comb.: ULS1 - Shells, Mx' - [kNm/m]

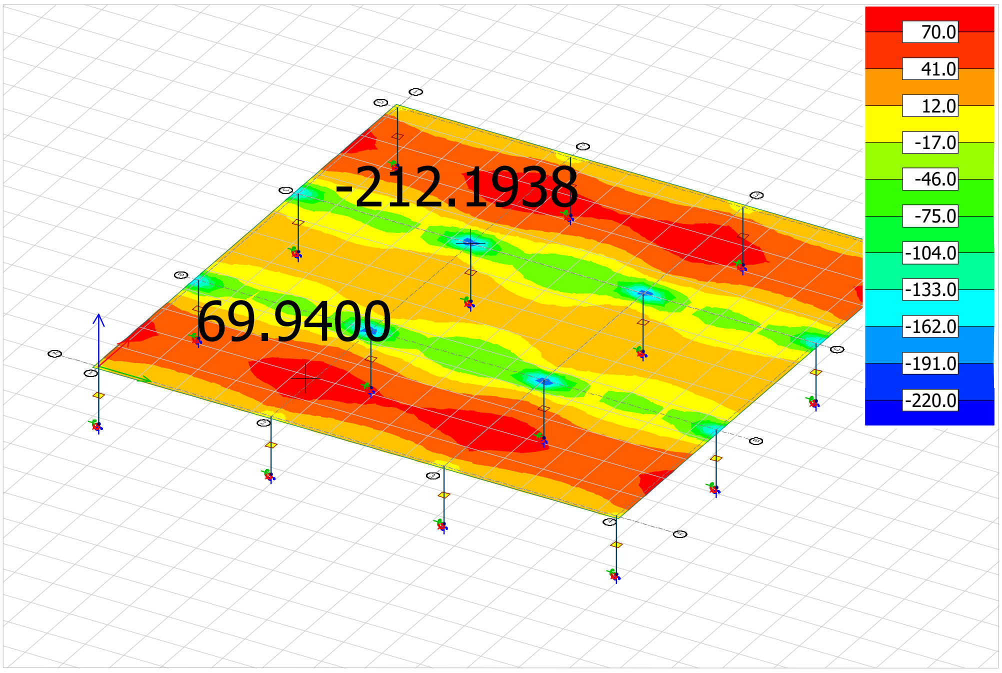

Figure 2: Load comb.: ULS1 - Shells, My' - [kNm/m]

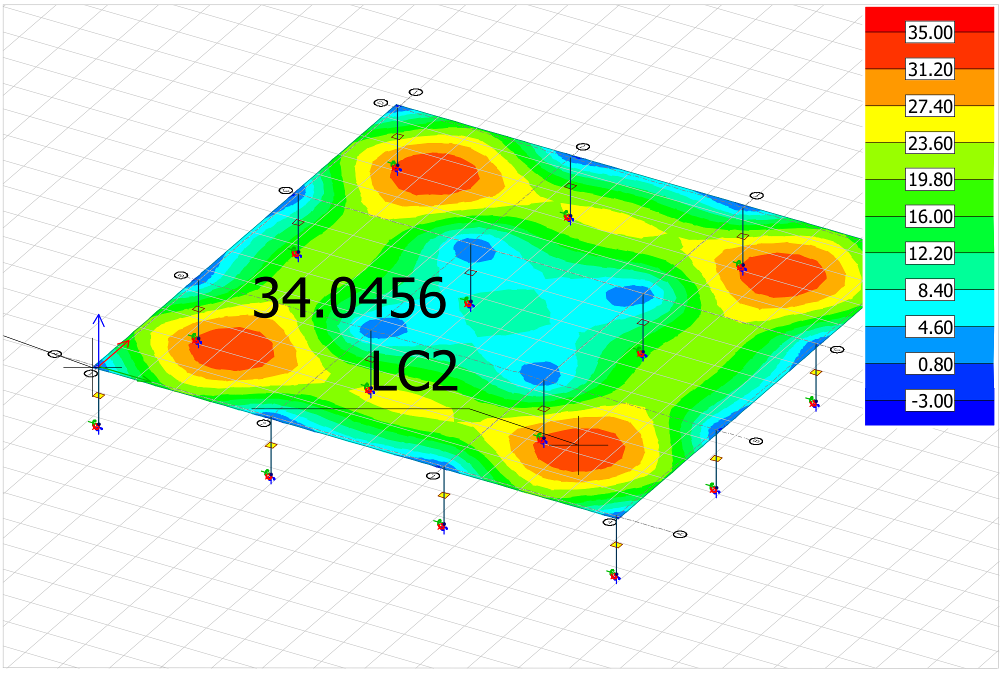

Figure 3: Cmax, Sq - Shell deflection value - [mm]

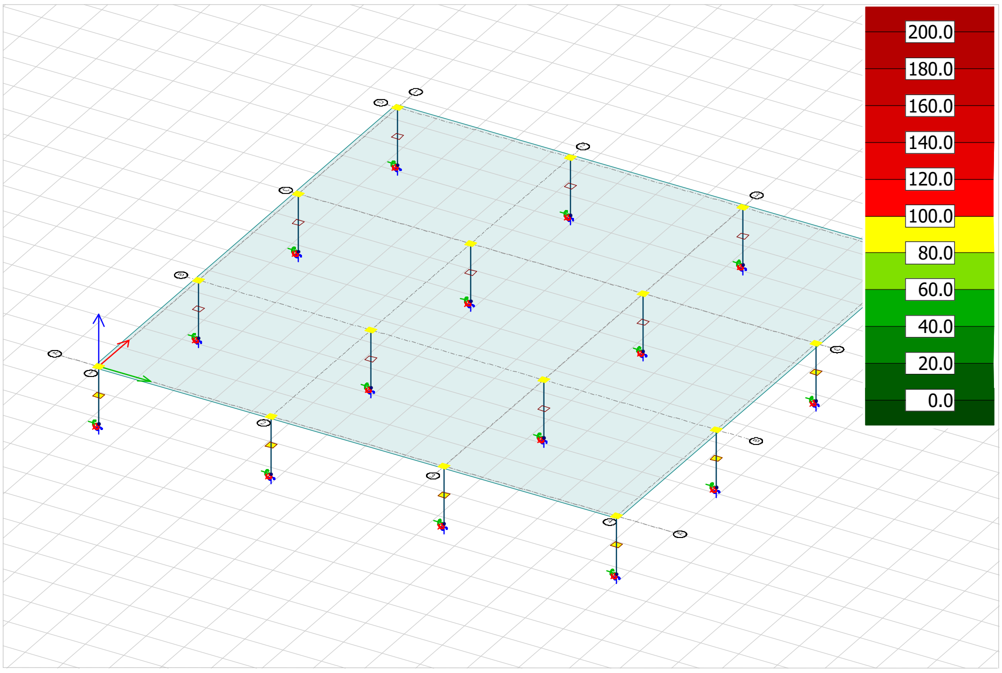

Figure 4: RC punching - Load comb.: ULS1 - [%]

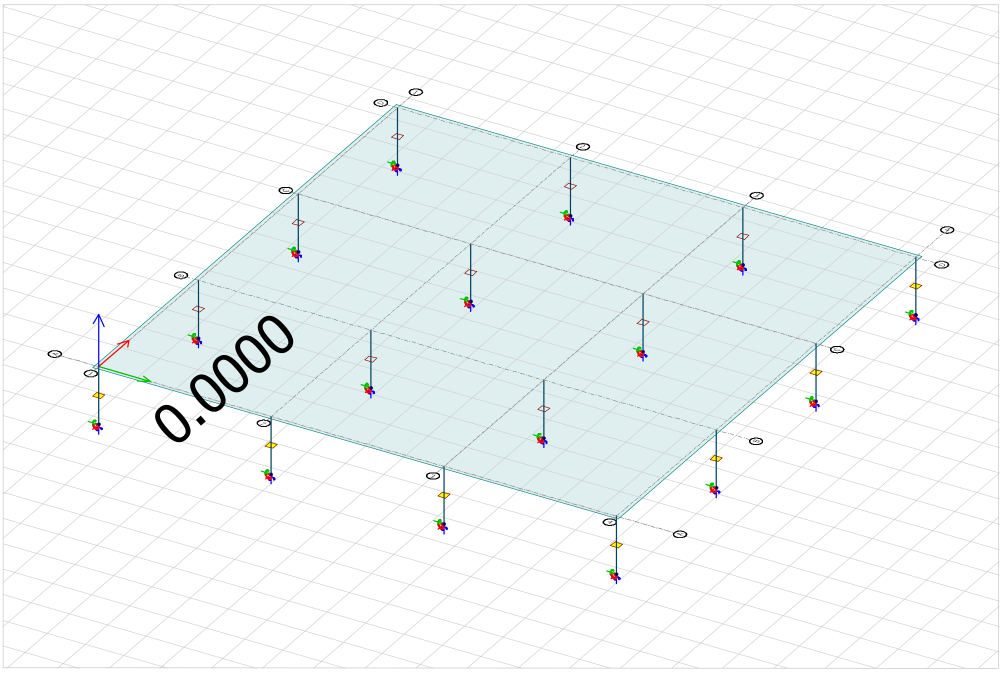

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLS - [mm]

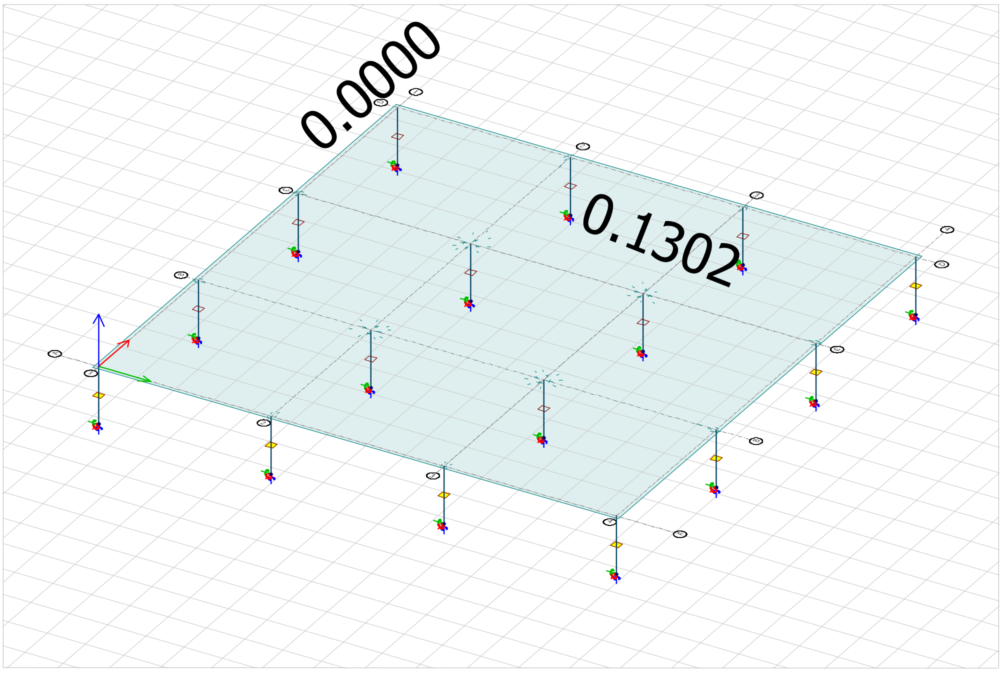

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLS - [mm]

Numerical modelling results PT slab 9m Concrete Class C35/45

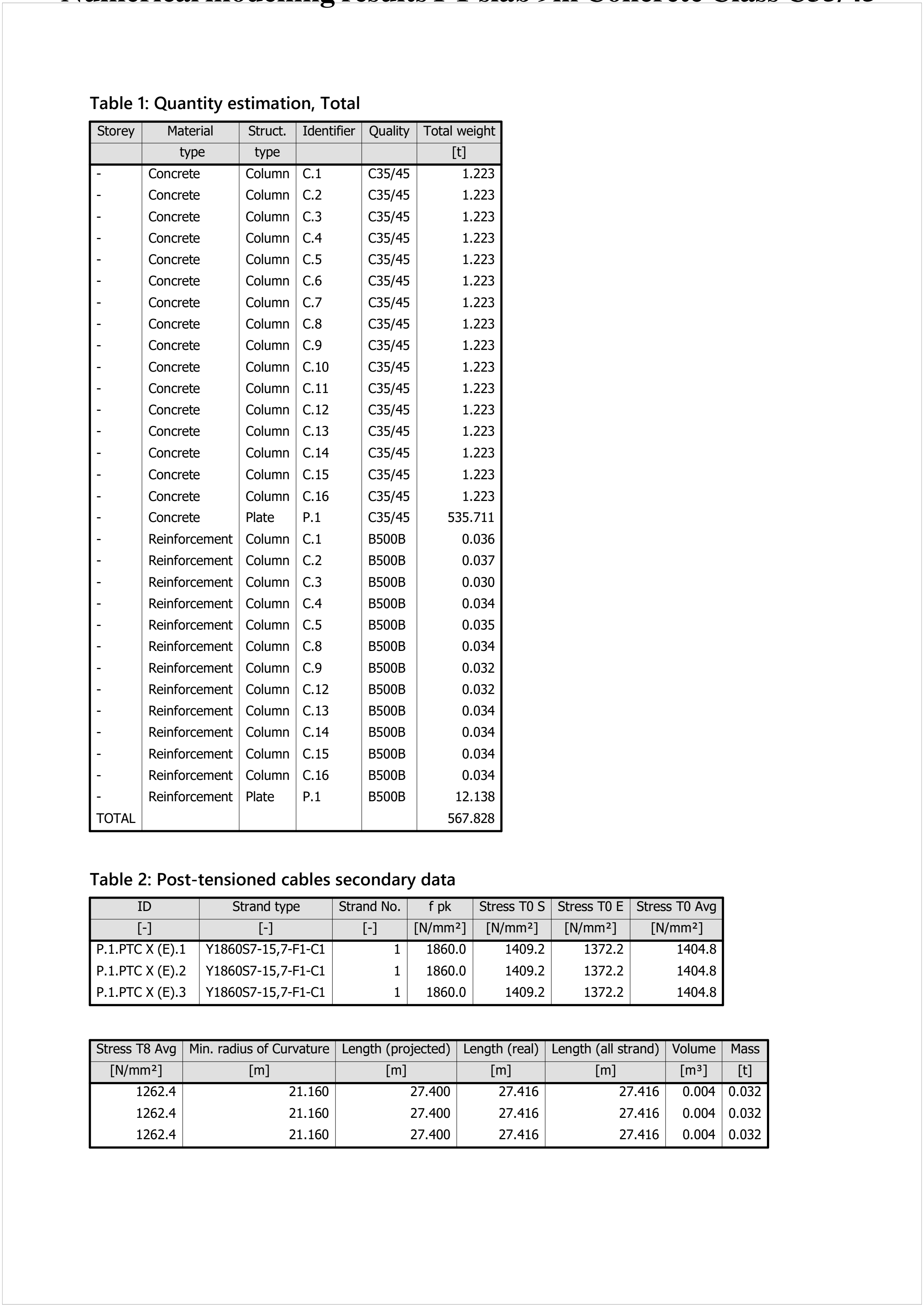

Table 1: Quantity estimation, Total

Storey	Material type	Struct. type	Identifier	Quality	Total weight [t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	535.711
-	Reinforcement	Column	C.1	B500B	0.036
-	Reinforcement	Column	C.2	B500B	0.037
-	Reinforcement	Column	C.3	B500B	0.030
-	Reinforcement	Column	C.4	B500B	0.034
-	Reinforcement	Column	C.5	B500B	0.035
-	Reinforcement	Column	C.8	B500B	0.034
-	Reinforcement	Column	C.9	B500B	0.032
-	Reinforcement	Column	C.12	B500B	0.032
-	Reinforcement	Column	C.13	B500B	0.034
-	Reinforcement	Column	C.14	B500B	0.034
-	Reinforcement	Column	C.15	B500B	0.034
-	Reinforcement	Column	C.16	B500B	0.034
-	Reinforcement	Plate	P.1	B500B	12.138
TOTAL					567.828

Table 2: Post-tensioned cables secondary data

ID [-]	Strand type [-]	Strand No. [-]	f pk [N/mm^2]	Stress T0 S [N/mm^2]	Stress T0 E [N/mm^2]	Stress T0 Avg [N/mm^2]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8

Stress T8 Avg [N/mm^2]	Min. radius of Curvature [m]	Length (projected) [m]	Length (real) [m]	Length (all strand) [m]	Volume [m^3]	Mass [t]
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC X (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8
P.1.PTC Y (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1409.2	1372.2	1404.8

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032
1262.4	21.160	27.400	27.416	27.416	0.004	0.032

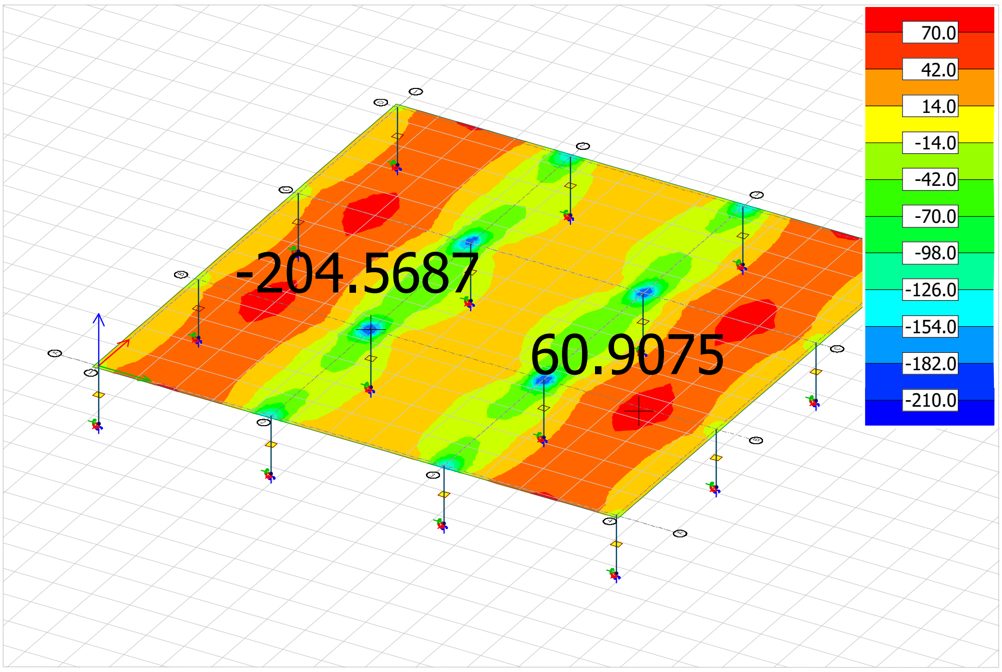

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

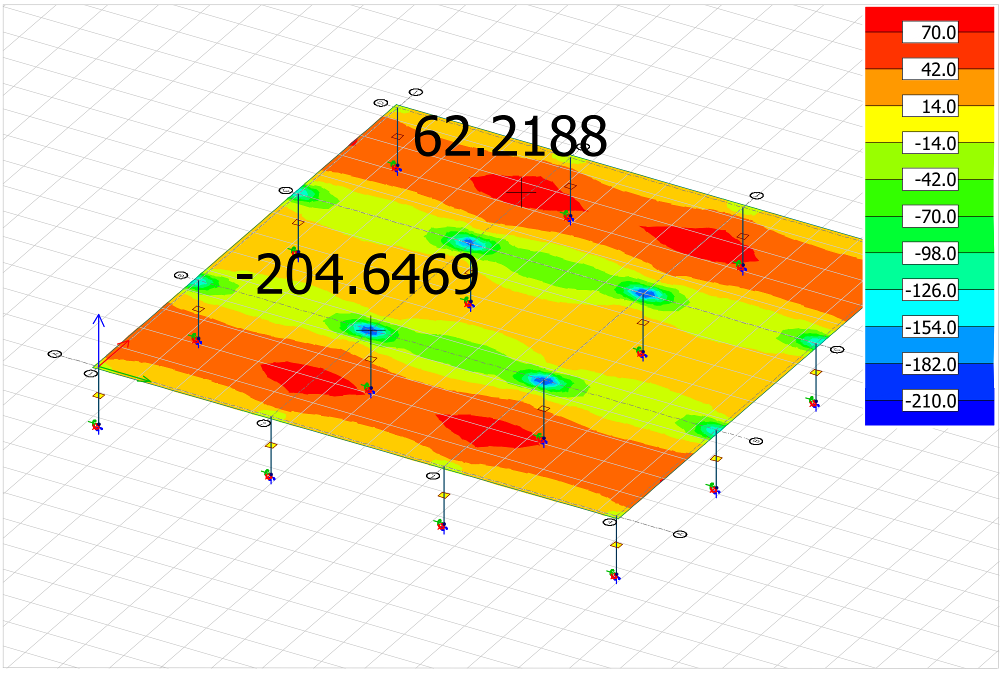

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

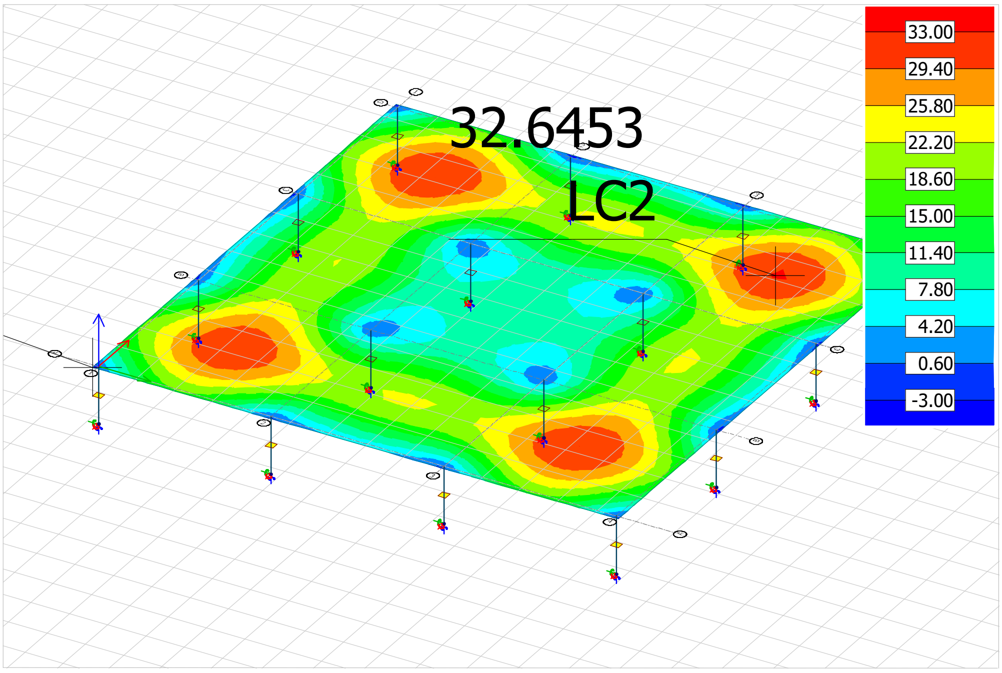

Figure 3: Cmax, Sq - Shell deflection value - [mm]

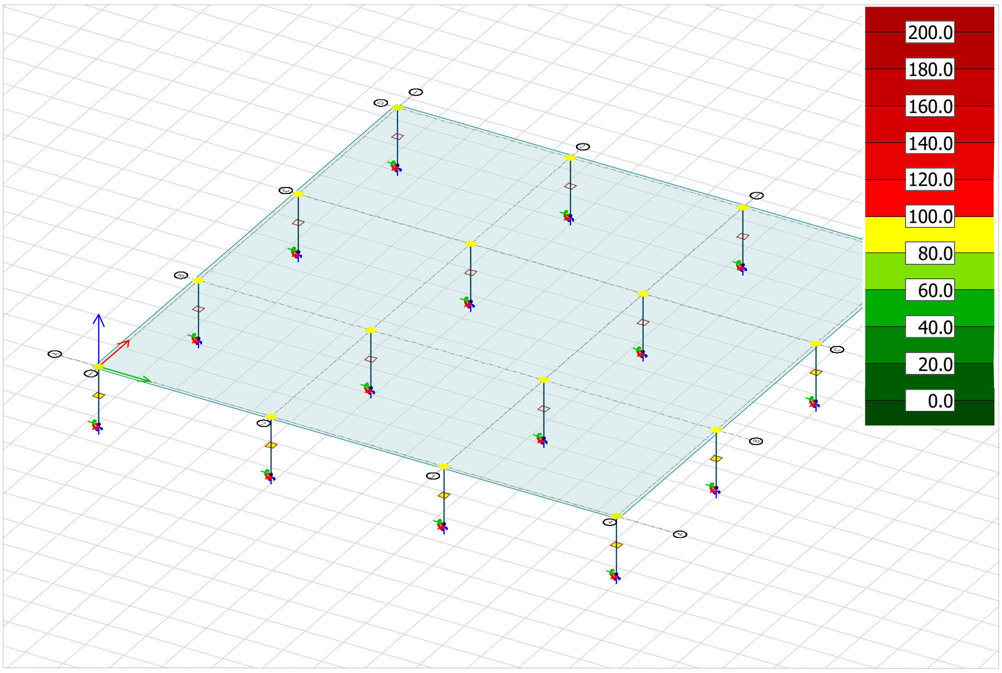

Figure 4: RC punching - Load comb.: ULS - [%]

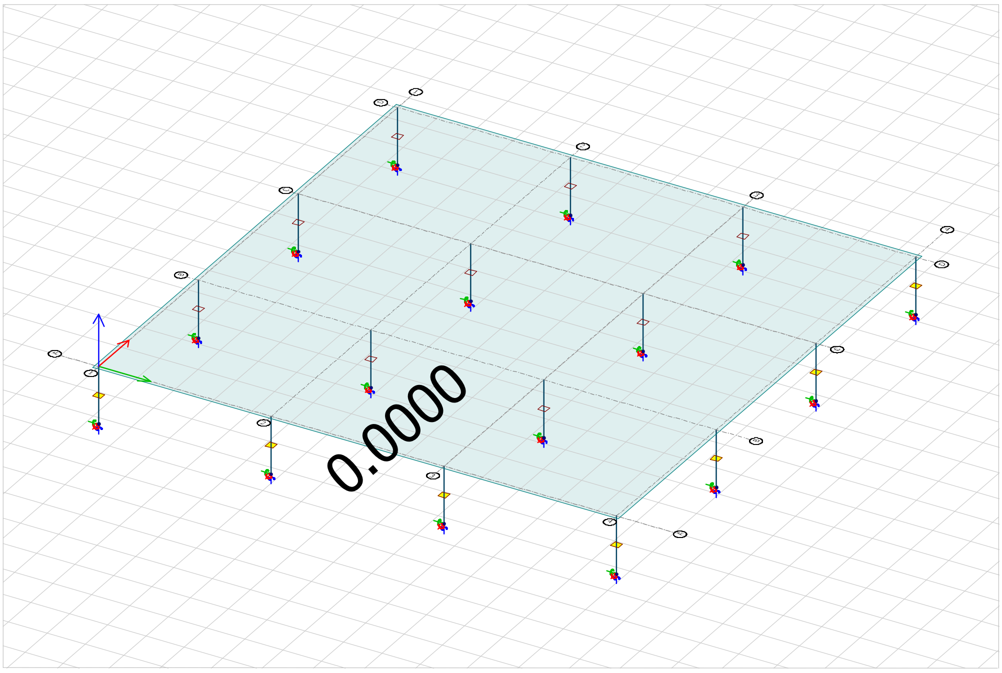

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLS - [mm]

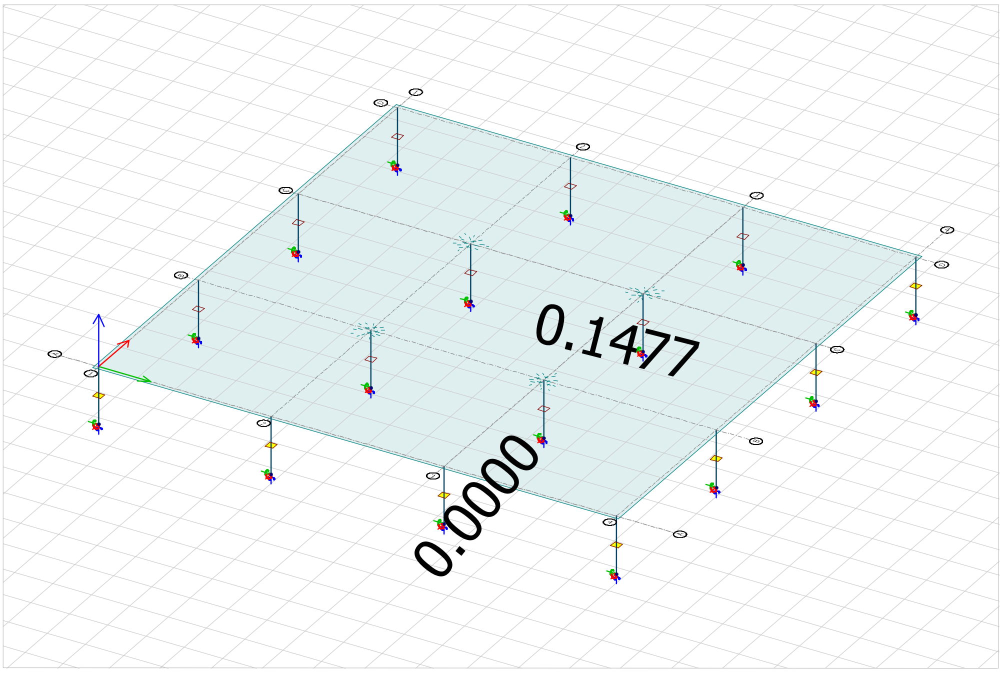

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLS - [mm]

Numerical modelling results PT slab 9m Concrete Class C60/75

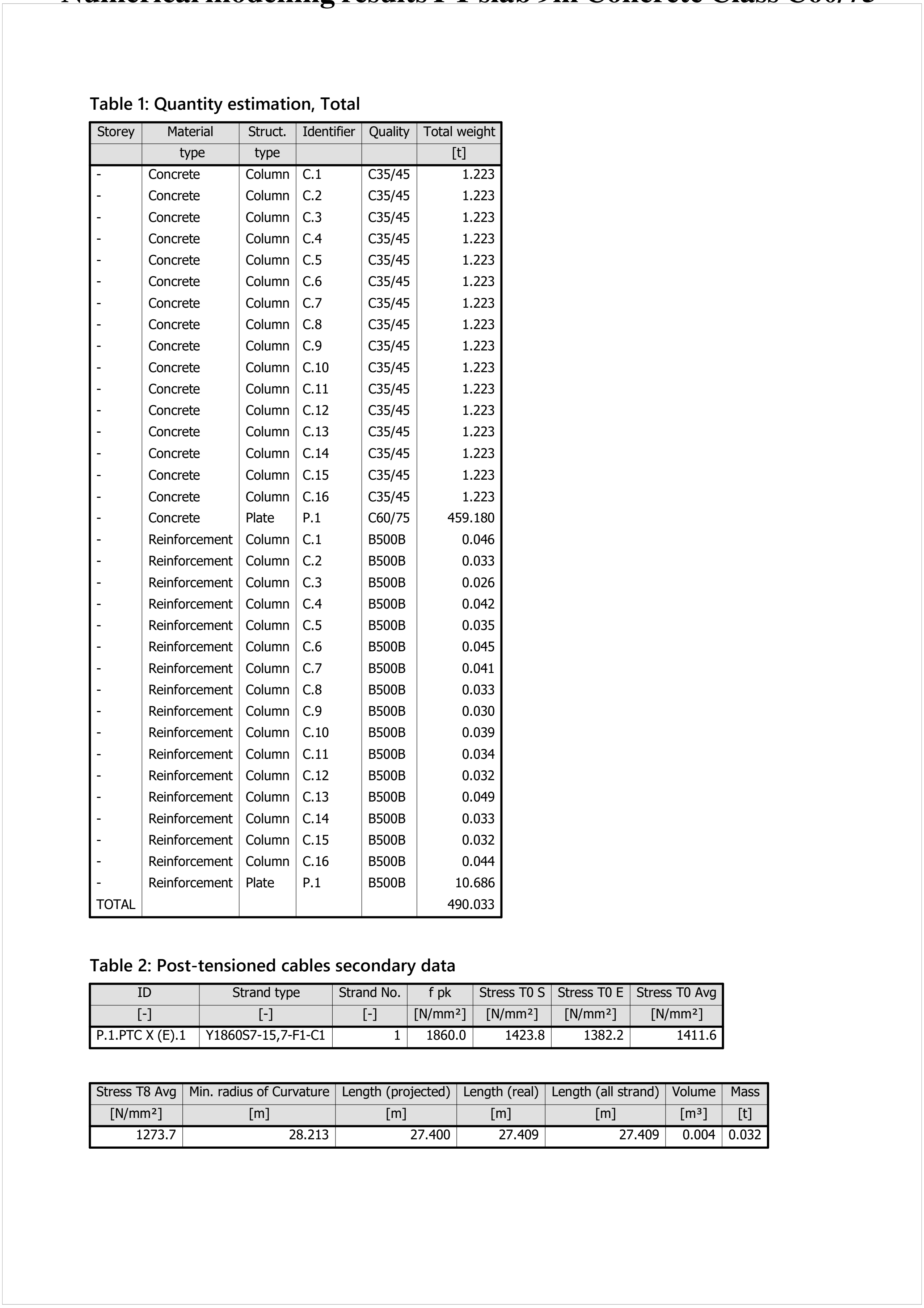

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C60/75	459.180
-	Reinforcement	Column	C.1	B500B	0.046
-	Reinforcement	Column	C.2	B500B	0.033
-	Reinforcement	Column	C.3	B500B	0.026
-	Reinforcement	Column	C.4	B500B	0.042
-	Reinforcement	Column	C.5	B500B	0.035
-	Reinforcement	Column	C.6	B500B	0.045
-	Reinforcement	Column	C.7	B500B	0.041
-	Reinforcement	Column	C.8	B500B	0.033
-	Reinforcement	Column	C.9	B500B	0.030
-	Reinforcement	Column	C.10	B500B	0.039
-	Reinforcement	Column	C.11	B500B	0.034
-	Reinforcement	Column	C.12	B500B	0.032
-	Reinforcement	Column	C.13	B500B	0.049
-	Reinforcement	Column	C.14	B500B	0.033
-	Reinforcement	Column	C.15	B500B	0.032
-	Reinforcement	Column	C.16	B500B	0.044
-	Reinforcement	Plate	P.1	B500B	10.686
TOTAL					490.033

Table 2: Post-tensioned cables secondary data

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1273.7	28.213	27.400	27.409	27.409	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC X (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6
P.1.PTC Y (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1423.8	1382.2	1411.6

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032
1273.7	28.213	27.400	27.409	27.409	0.004	0.032

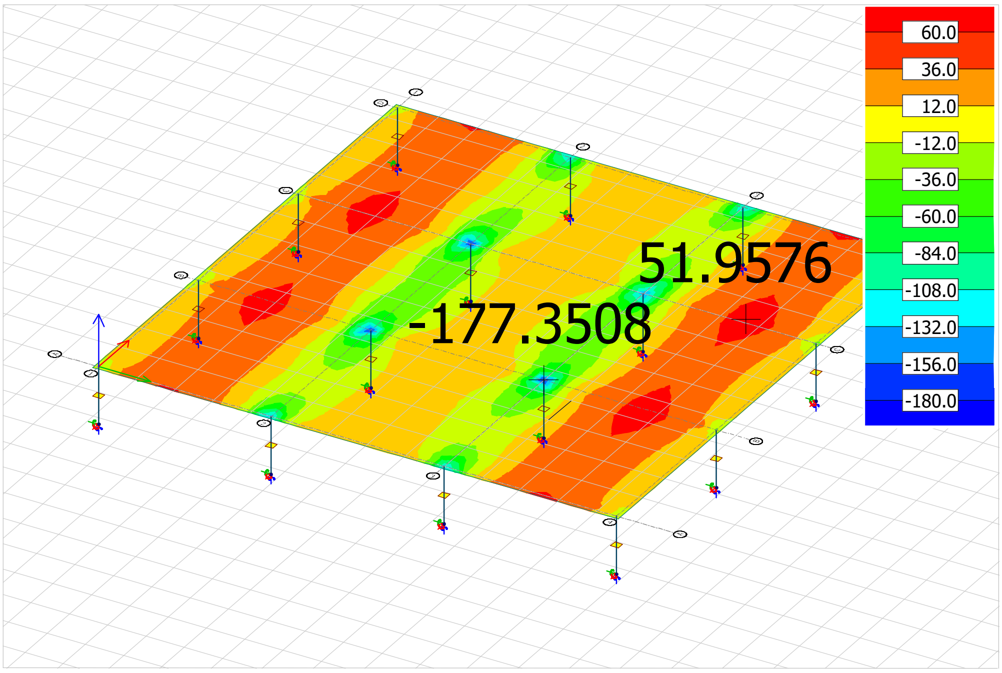

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

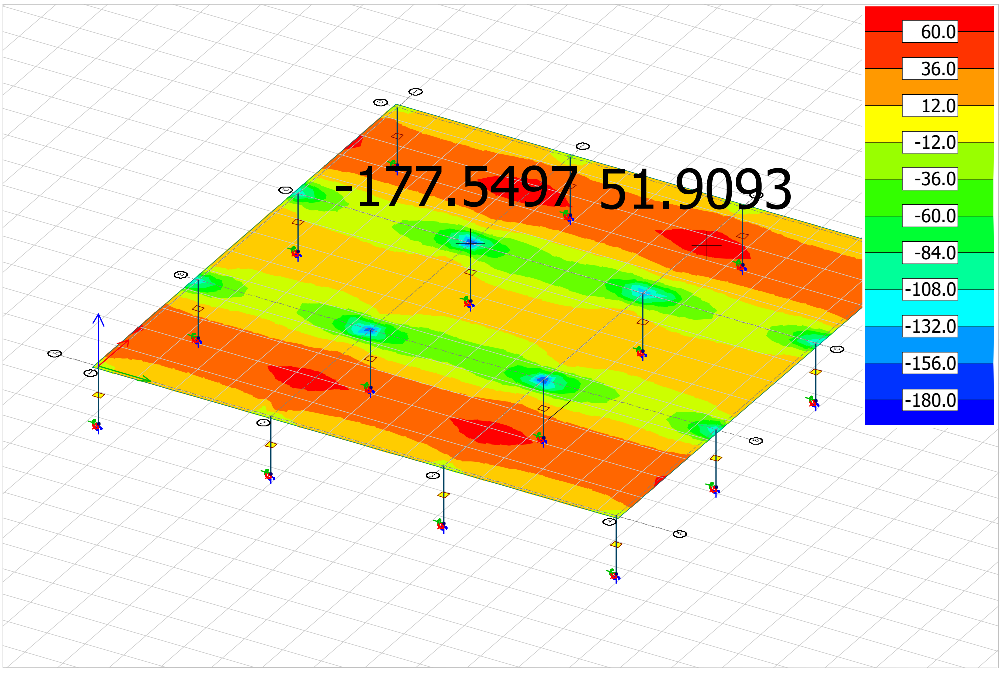

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

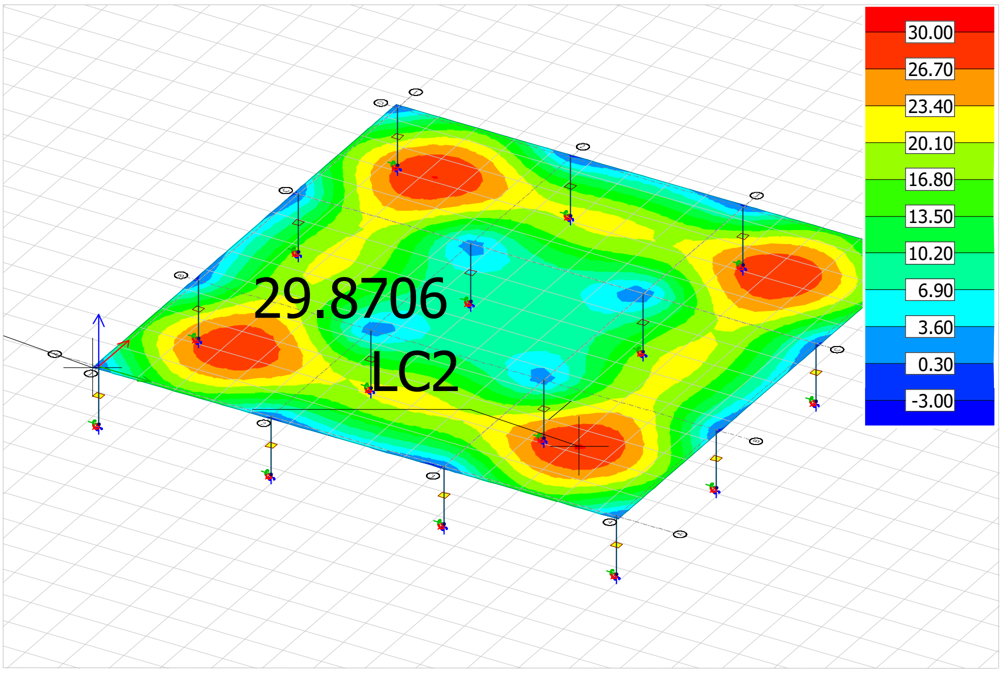

Figure 3: Cmax, Sq - Shell deflection value - [mm]

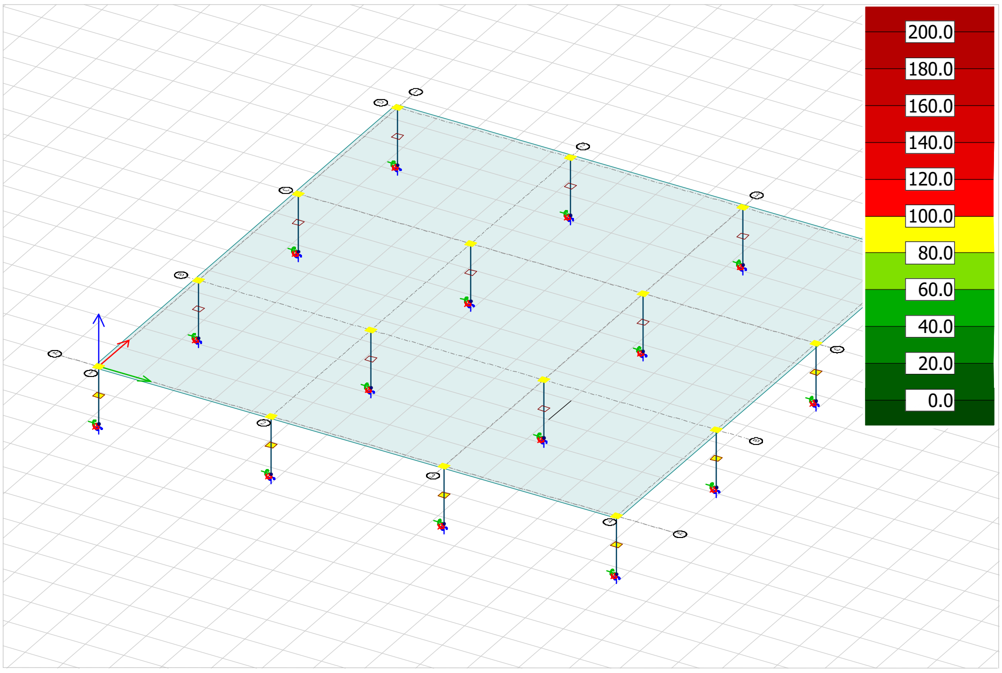

Figure 4: RC punching - Load comb.: ULS - [%]

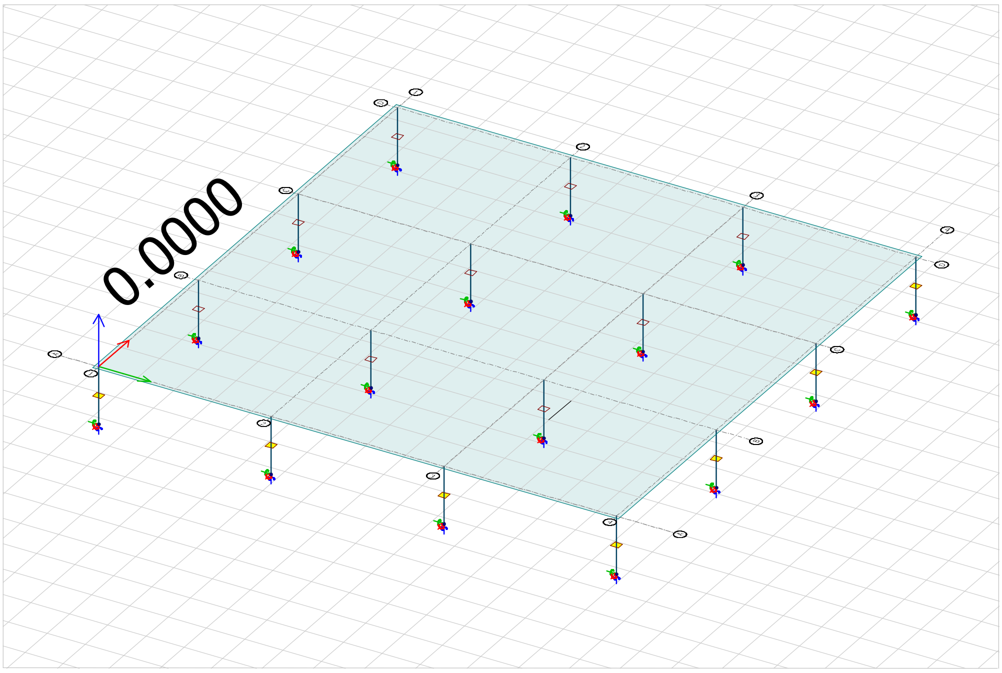

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLS - [mm]

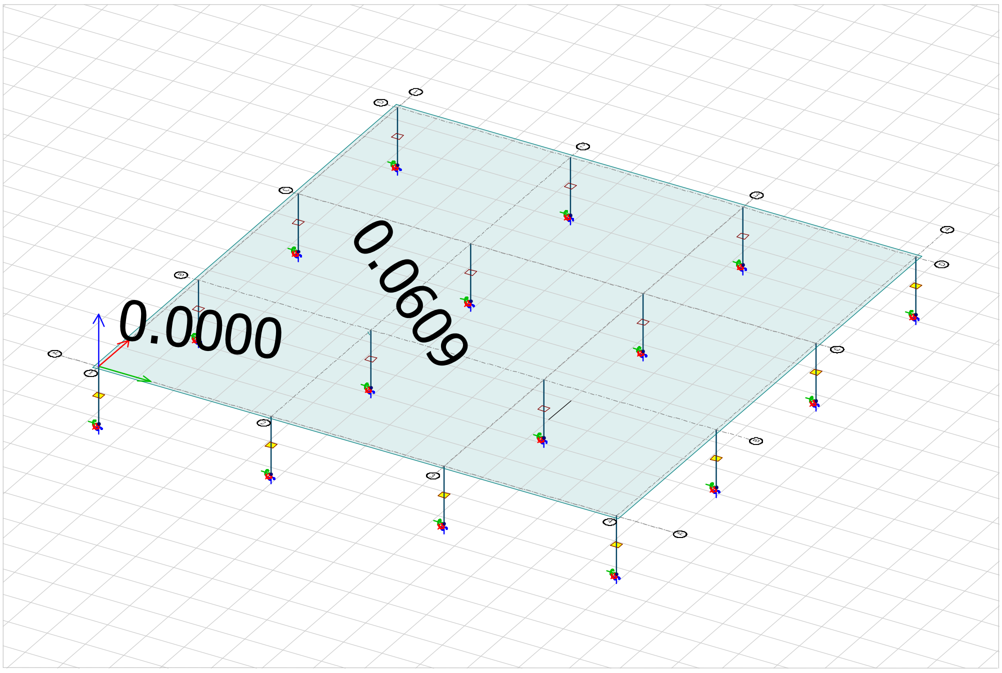

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLS - [mm]

Numerical modelling results PT slab 12m Concrete Class C20/25

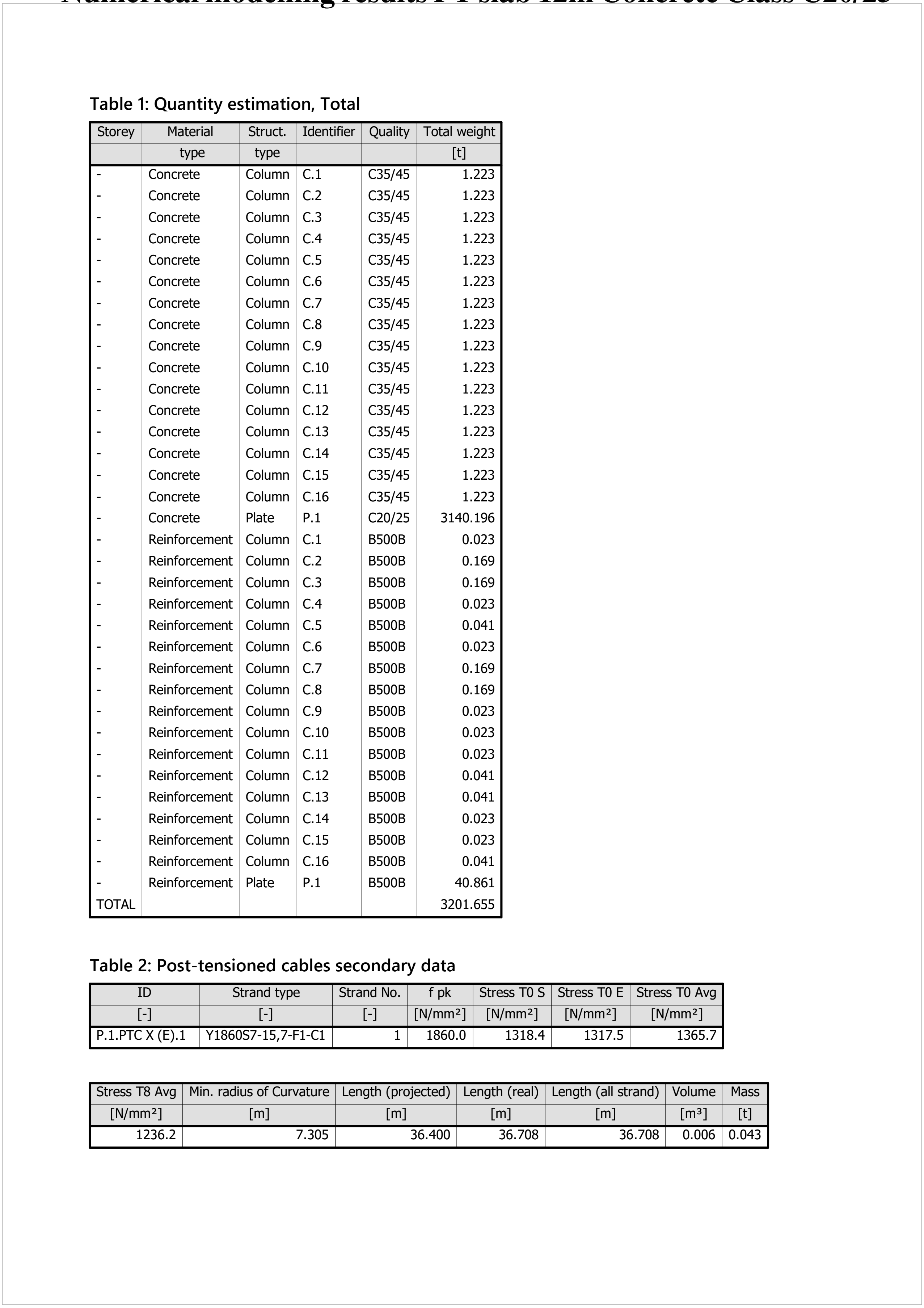

Table 1: Quantity estimation, Total

Storey	Material type	Struct. type	Identifier	Quality	Total weight [t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C20/25	3140.196
-	Reinforcement	Column	C.1	B500B	0.023
-	Reinforcement	Column	C.2	B500B	0.169
-	Reinforcement	Column	C.3	B500B	0.169
-	Reinforcement	Column	C.4	B500B	0.023
-	Reinforcement	Column	C.5	B500B	0.041
-	Reinforcement	Column	C.6	B500B	0.023
-	Reinforcement	Column	C.7	B500B	0.169
-	Reinforcement	Column	C.8	B500B	0.169
-	Reinforcement	Column	C.9	B500B	0.023
-	Reinforcement	Column	C.10	B500B	0.023
-	Reinforcement	Column	C.11	B500B	0.023
-	Reinforcement	Column	C.12	B500B	0.041
-	Reinforcement	Column	C.13	B500B	0.041
-	Reinforcement	Column	C.14	B500B	0.023
-	Reinforcement	Column	C.15	B500B	0.023
-	Reinforcement	Column	C.16	B500B	0.041
-	Reinforcement	Plate	P.1	B500B	40.861
TOTAL					3201.655

Table 2: Post-tensioned cables secondary data

ID [-]	Strand type [-]	Strand No. [-]	f pk [N/mm²]	Stress T0 S [N/mm²]	Stress T0 E [N/mm²]	Stress T0 Avg [N/mm²]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg [N/mm²]	Min. radius of Curvature [m]	Length (projected) [m]	Length (real) [m]	Length (all strand) [m]	Volume [m³]	Mass [t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC X (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7
P.1.PTC Y (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1318.4	1317.5	1365.7

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043
1236.2	7.305	36.400	36.708	36.708	0.006	0.043

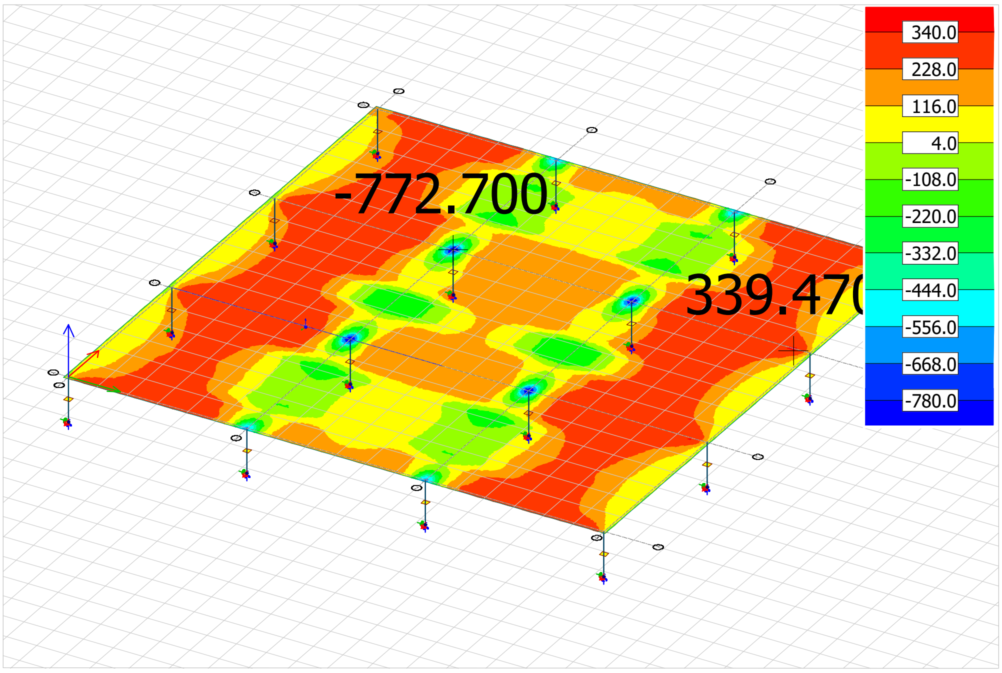

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

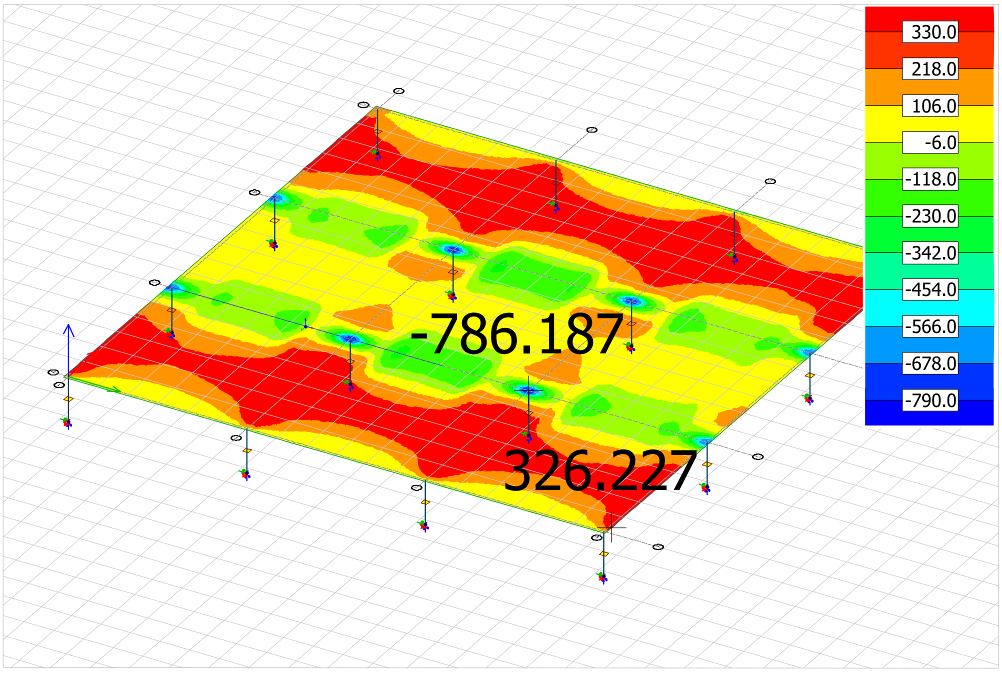

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

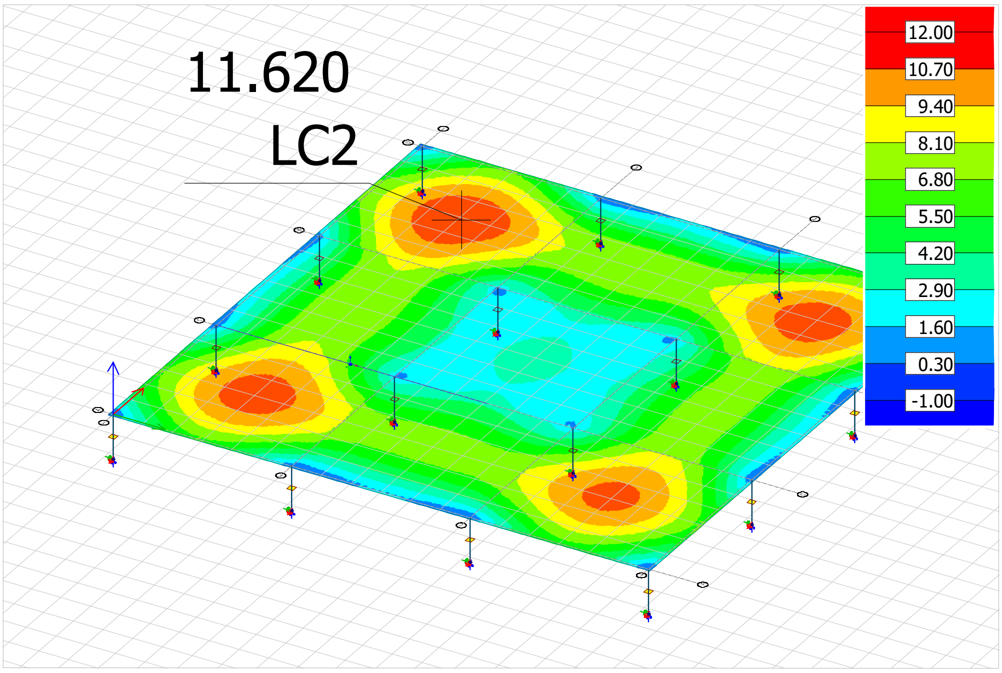

Figure 3: Cmax, Sq - Shell deflection value - [mm]

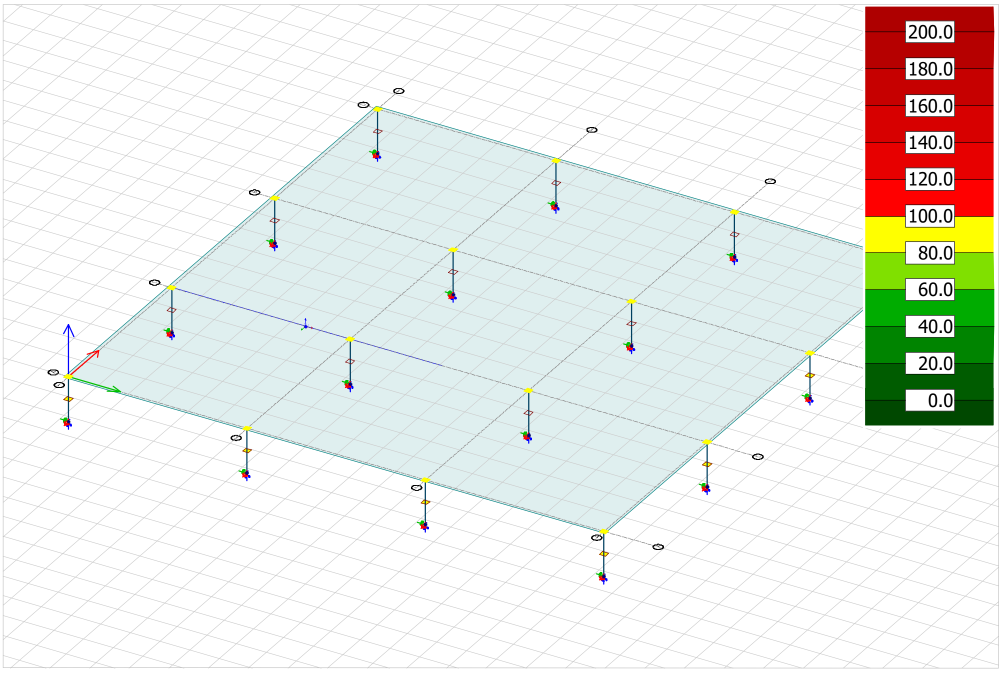

Figure 4: RC punching - Load comb.: ULS - [%]

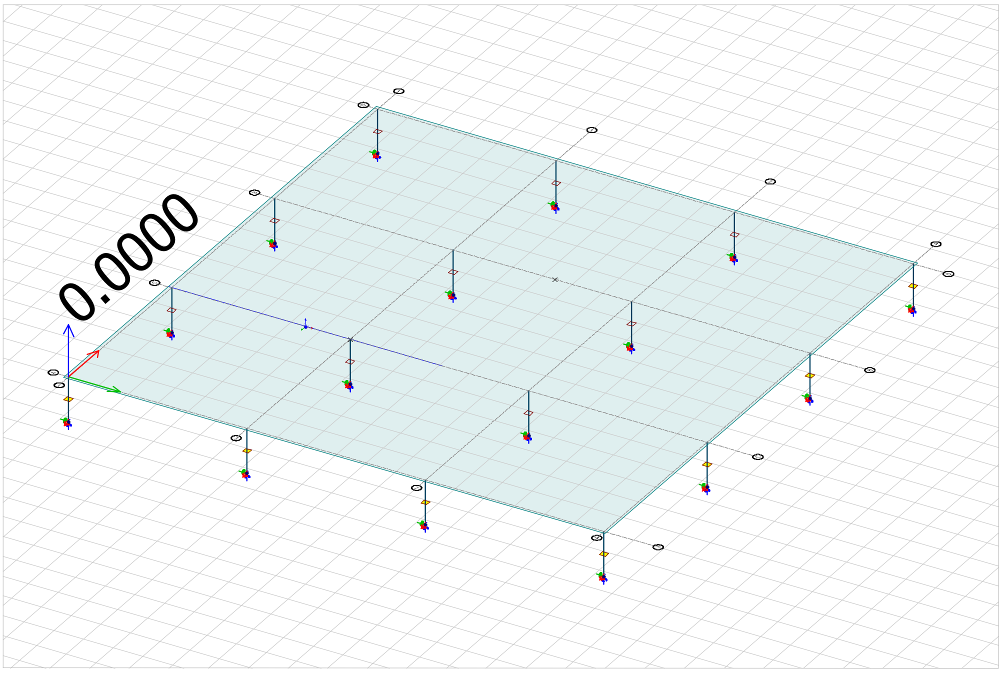

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLSq - [mm]

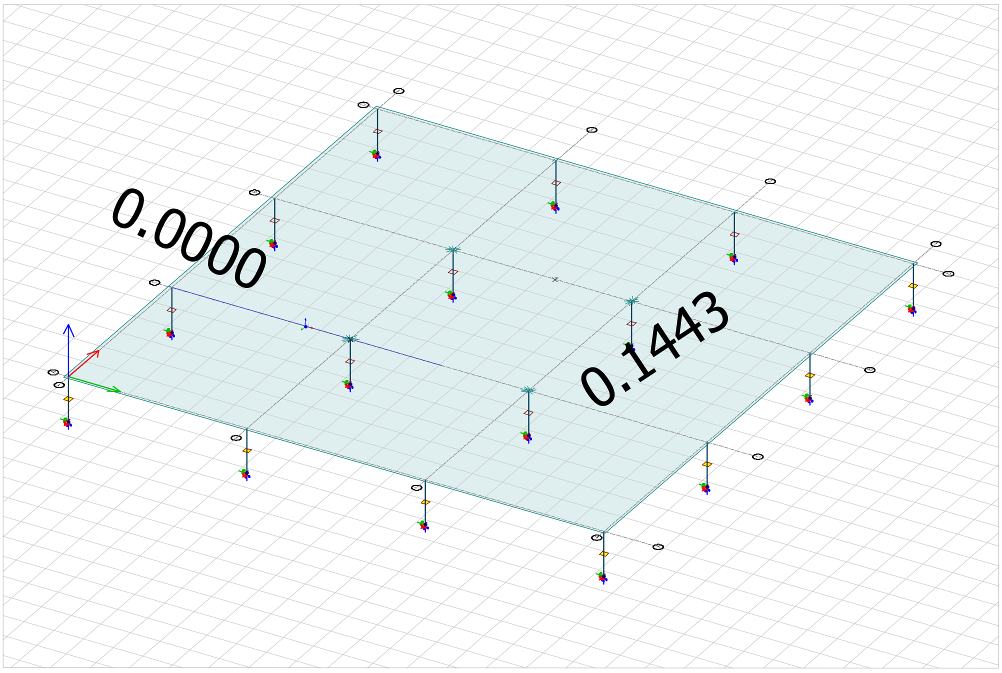

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLSq - [mm]

Numerical modelling results PT slab 12m Concrete Class C35/45

Table 1: Quantity estimation, Total

Storey	Material type	Struct. type	Identifier	Quality	Total weight [t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C35/45	1654.512
-	Reinforcement	Column	C.1	B500B	0.033
-	Reinforcement	Column	C.2	B500B	0.067
-	Reinforcement	Column	C.3	B500B	0.072
-	Reinforcement	Column	C.4	B500B	0.029
-	Reinforcement	Column	C.5	B500B	0.036
-	Reinforcement	Column	C.6	B500B	0.028
-	Reinforcement	Column	C.7	B500B	0.067
-	Reinforcement	Column	C.8	B500B	0.067
-	Reinforcement	Column	C.9	B500B	0.028
-	Reinforcement	Column	C.10	B500B	0.033
-	Reinforcement	Column	C.11	B500B	0.033
-	Reinforcement	Column	C.12	B500B	0.036
-	Reinforcement	Column	C.13	B500B	0.036
-	Reinforcement	Column	C.14	B500B	0.033
-	Reinforcement	Column	C.15	B500B	0.028
-	Reinforcement	Column	C.16	B500B	0.036
-	Reinforcement	Plate	P.1	B500B	61.746
TOTAL					1736.489

Table 2: Post-tensioned cables secondary data

ID [-]	Strand type [-]	Strand No. [-]	f pk [N/mm²]	Stress T0 S [N/mm²]	Stress T0 E [N/mm²]	Stress T0 Avg [N/mm²]	Stress T8 Avg [N/mm²]	Min. radius of Curvature [m]	Length (projected) [m]	Length (real) [m]	Length (all strand) [m]	Volume [m³]	Mass [t]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1	1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).28	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).29	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (E).30	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).28	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).29	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC X (S).30	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).28	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (E).29	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
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1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).30	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).28	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).29	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1
P.1.PTC Y (S).30	Y1860S7-15,7-F1-C1	1	1860.0	1366.2	1365.7	1396.1

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043
1264.3	15.993	36.400	36.465	36.465	0.005	0.043

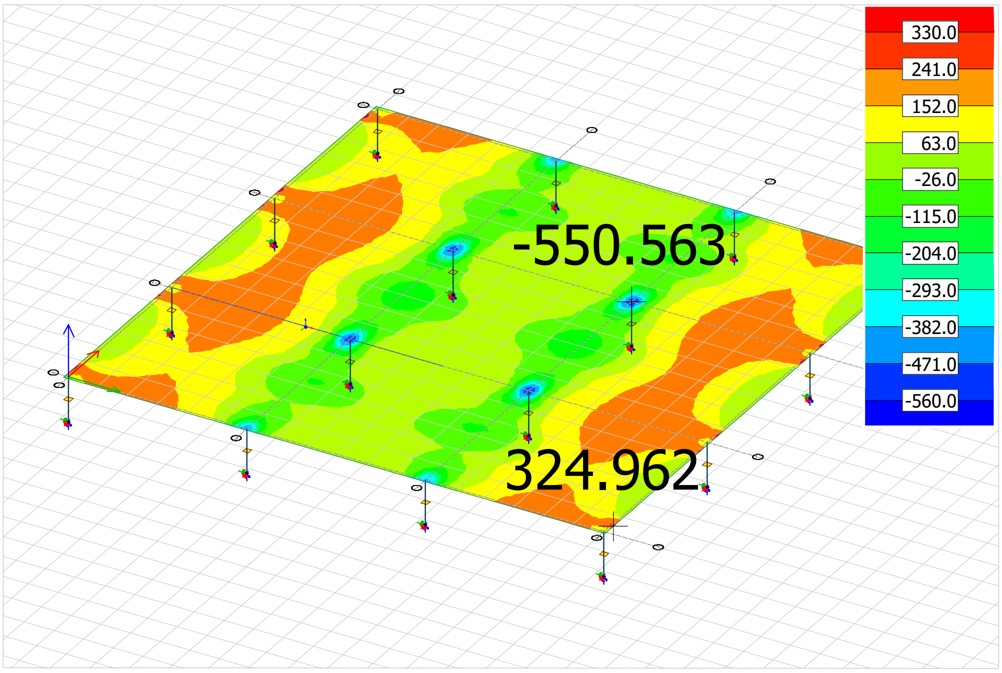

Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

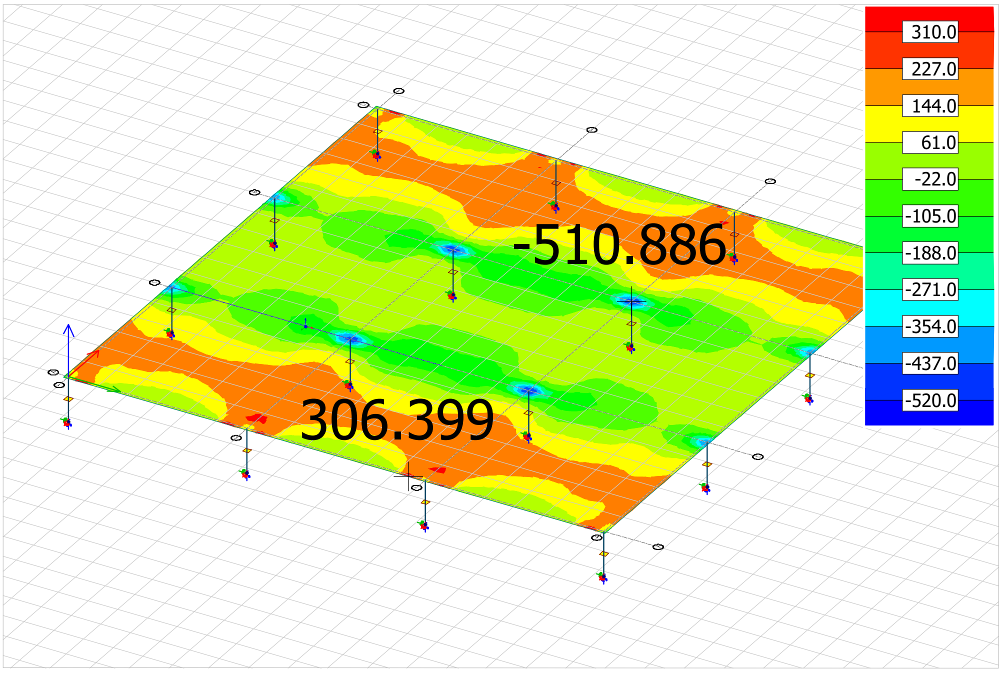

Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

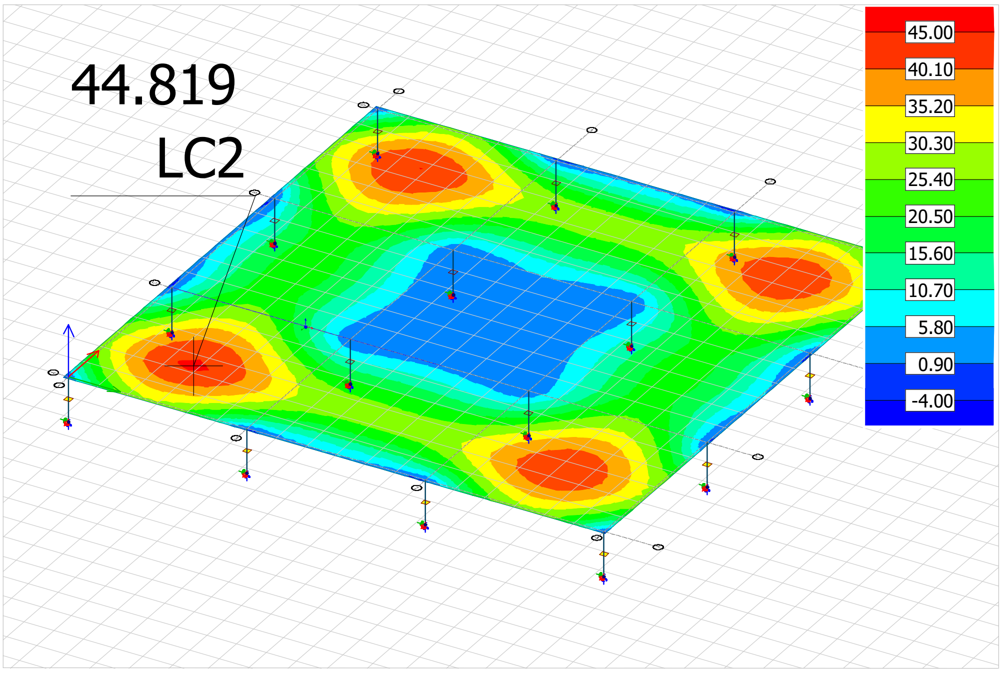

Figure 3: Cmax, Sq - Shell deflection value - [mm]

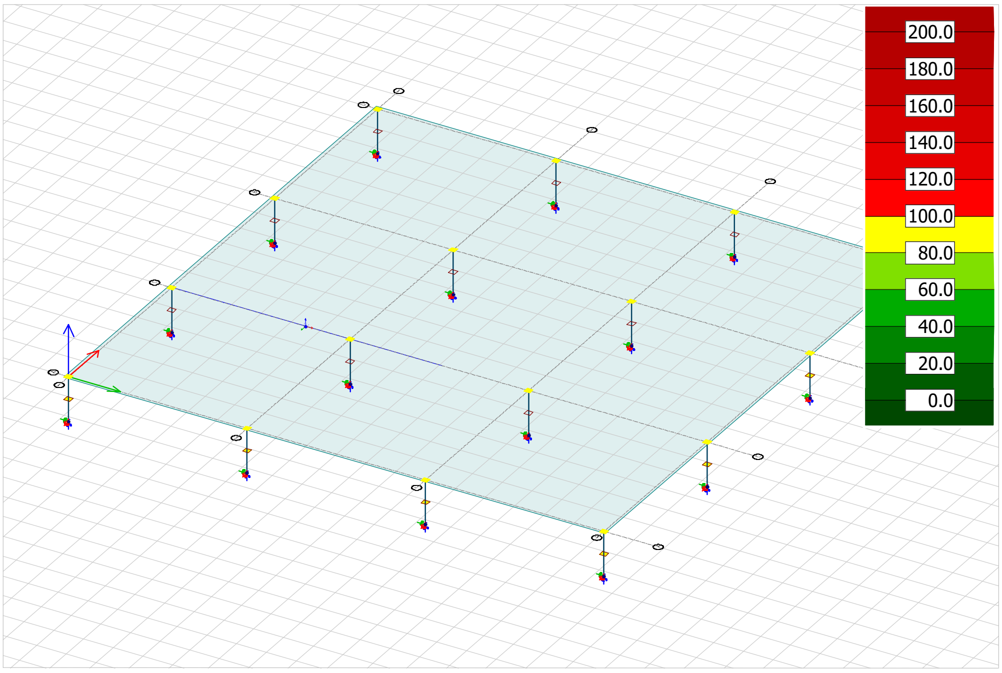

Figure 4: RC punching - Load comb.: ULS - [%]

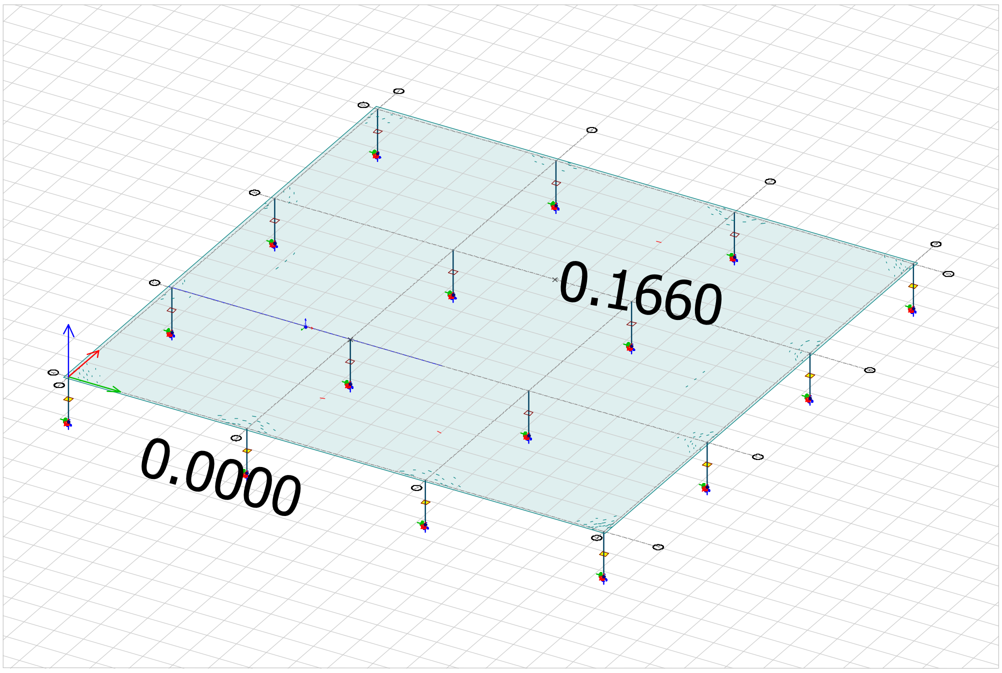

Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLSq - [mm]

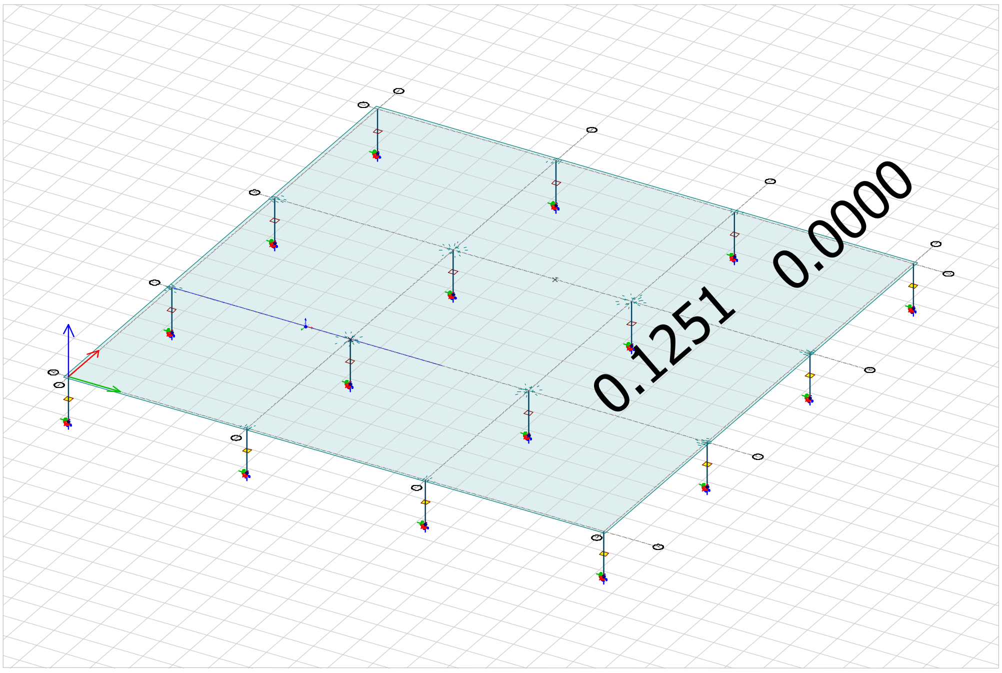

Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLSq - [mm]

Numerical modelling results PT slab 12m Concrete Class C60/75

Table 1: Quantity estimation, Total

Storey	Material	Struct.	Identifier	Quality	Total weight
	type	type			[t]
-	Concrete	Column	C.1	C35/45	1.223
-	Concrete	Column	C.2	C35/45	1.223
-	Concrete	Column	C.3	C35/45	1.223
-	Concrete	Column	C.4	C35/45	1.223
-	Concrete	Column	C.5	C35/45	1.223
-	Concrete	Column	C.6	C35/45	1.223
-	Concrete	Column	C.7	C35/45	1.223
-	Concrete	Column	C.8	C35/45	1.223
-	Concrete	Column	C.9	C35/45	1.223
-	Concrete	Column	C.10	C35/45	1.223
-	Concrete	Column	C.11	C35/45	1.223
-	Concrete	Column	C.12	C35/45	1.223
-	Concrete	Column	C.13	C35/45	1.223
-	Concrete	Column	C.14	C35/45	1.223
-	Concrete	Column	C.15	C35/45	1.223
-	Concrete	Column	C.16	C35/45	1.223
-	Concrete	Plate	P.1	C60/75	1283.091
-	Reinforcement	Column	C.1	B500B	0.029
-	Reinforcement	Column	C.2	B500B	0.051
-	Reinforcement	Column	C.3	B500B	0.062
-	Reinforcement	Column	C.4	B500B	0.039
-	Reinforcement	Column	C.5	B500B	0.041
-	Reinforcement	Column	C.6	B500B	0.039
-	Reinforcement	Column	C.7	B500B	0.041
-	Reinforcement	Column	C.8	B500B	0.051
-	Reinforcement	Column	C.9	B500B	0.029
-	Reinforcement	Column	C.10	B500B	0.039
-	Reinforcement	Column	C.11	B500B	0.044
-	Reinforcement	Column	C.12	B500B	0.047
-	Reinforcement	Column	C.13	B500B	0.047
-	Reinforcement	Column	C.14	B500B	0.044
-	Reinforcement	Column	C.15	B500B	0.039
-	Reinforcement	Column	C.16	B500B	0.052
-	Reinforcement	Plate	P.1	B500B	56.949
TOTAL					1360.305

Table 2: Post-tensioned cables secondary data

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
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1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).28	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).29	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).30	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).31	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).32	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (E).33	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC X (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
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1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
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1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC X (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).28	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).29	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).30	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).31	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).32	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC X (S).33	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (E).1	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
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1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm^2]	[N/mm^2]	[N/mm^2]	[N/mm^2]
P.1.PTC Y (E).2	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).3	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).4	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).5	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).6	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).7	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).8	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).9	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).10	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).11	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).12	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).13	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).14	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).15	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).16	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).17	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).18	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).19	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).20	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).21	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).22	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).23	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm^2]	[m]	[m]	[m]	[m]	[m^3]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (E).24	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).25	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).26	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).27	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).28	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).29	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).30	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).31	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).32	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (E).33	Y1860S7-15,7-F1-C1	1	1860.0	1393.2	1381.8	1409.9
P.1.PTC Y (S).1	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).2	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).3	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).4	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).5	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).6	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).7	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).8	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).9	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).10	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).11	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).12	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

ID	Strand type	Strand No.	f pk	Stress T0 S	Stress T0 E	Stress T0 Avg
[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
P.1.PTC Y (S).13	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).14	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).15	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).16	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).17	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).18	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).19	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).20	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).21	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).22	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).23	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).24	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).25	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).26	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).27	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).28	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).29	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).30	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).31	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).32	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9
P.1.PTC Y (S).33	Y1860S7-15,7-F1-C1	1	1860.0	1381.8	1393.2	1409.9

Stress T8 Avg	Min. radius of Curvature	Length (projected)	Length (real)	Length (all strand)	Volume	Mass
[N/mm²]	[m]	[m]	[m]	[m]	[m³]	[t]
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043
1409.9	22.898	36.400	36.432	36.432	0.005	0.043

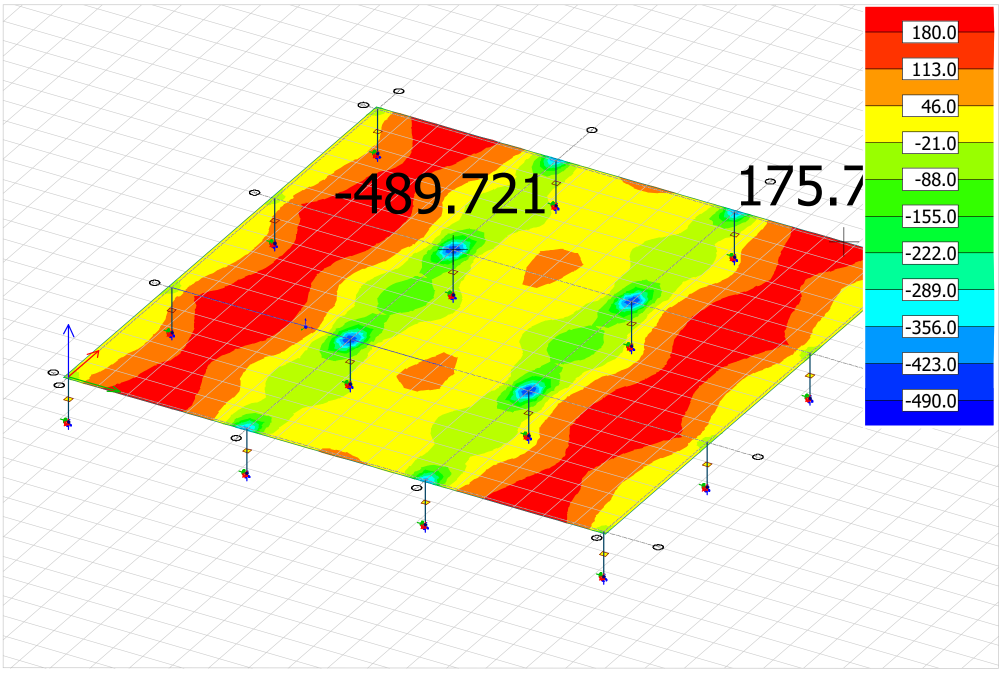


Figure 1: Load comb.: ULS - Shells, Mx' - [kNm/m]

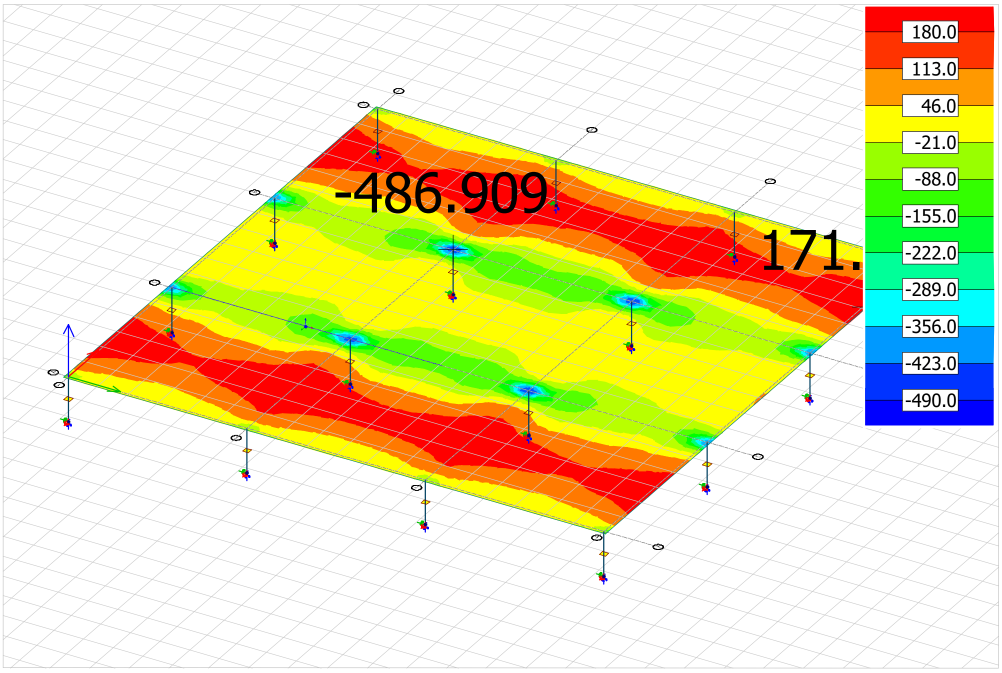


Figure 2: Load comb.: ULS - Shells, My' - [kNm/m]

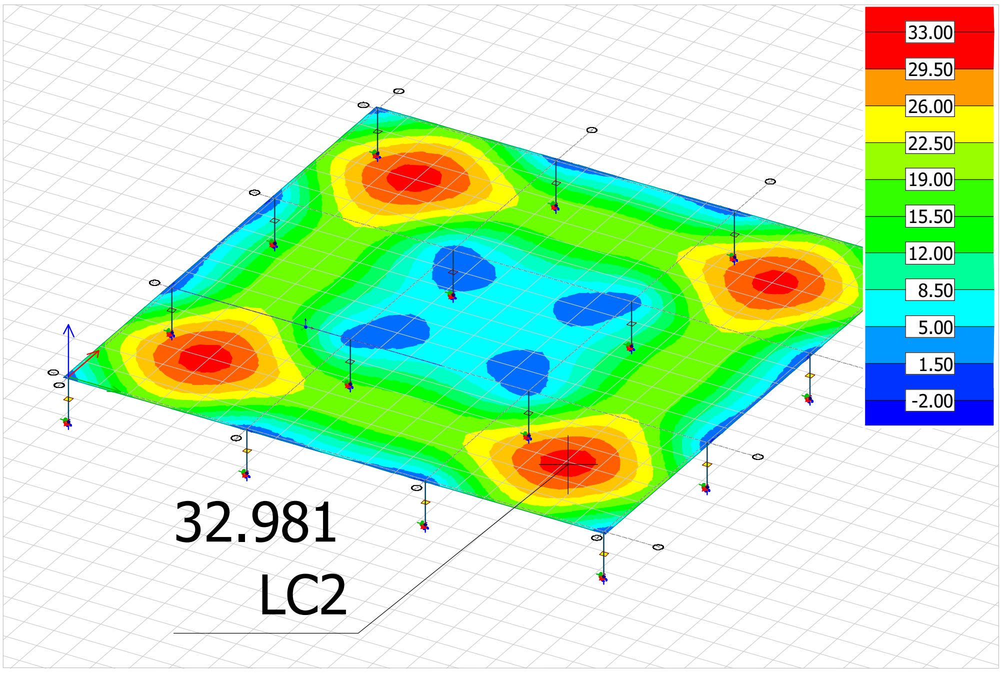


Figure 3: Cmax, Sq - Shell deflection value - [mm]

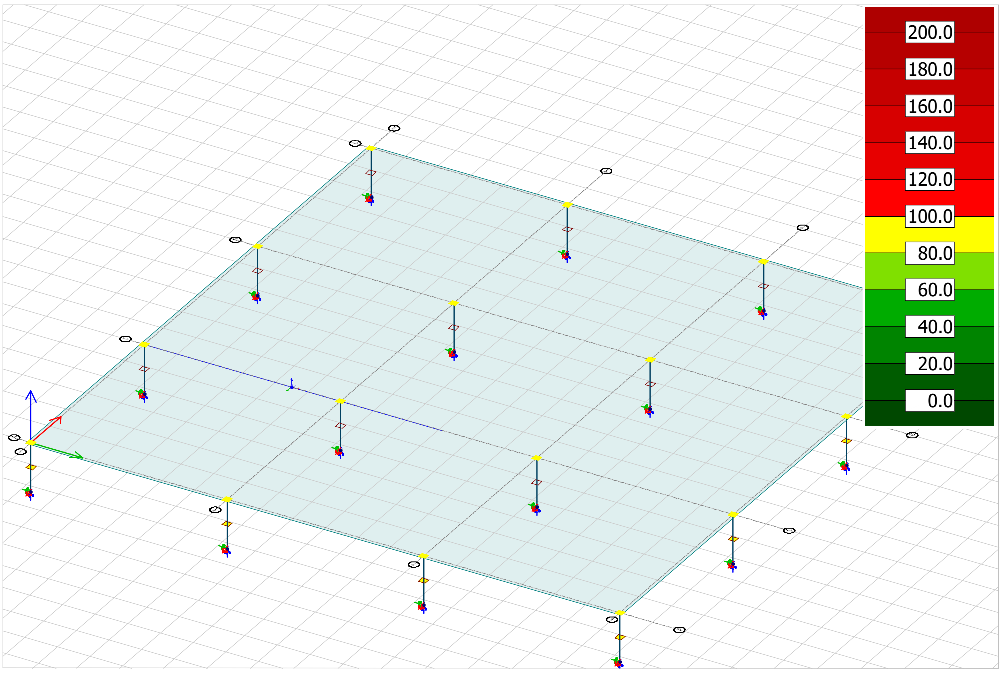


Figure 4: RC punching - Load comb.: ULS - [%]

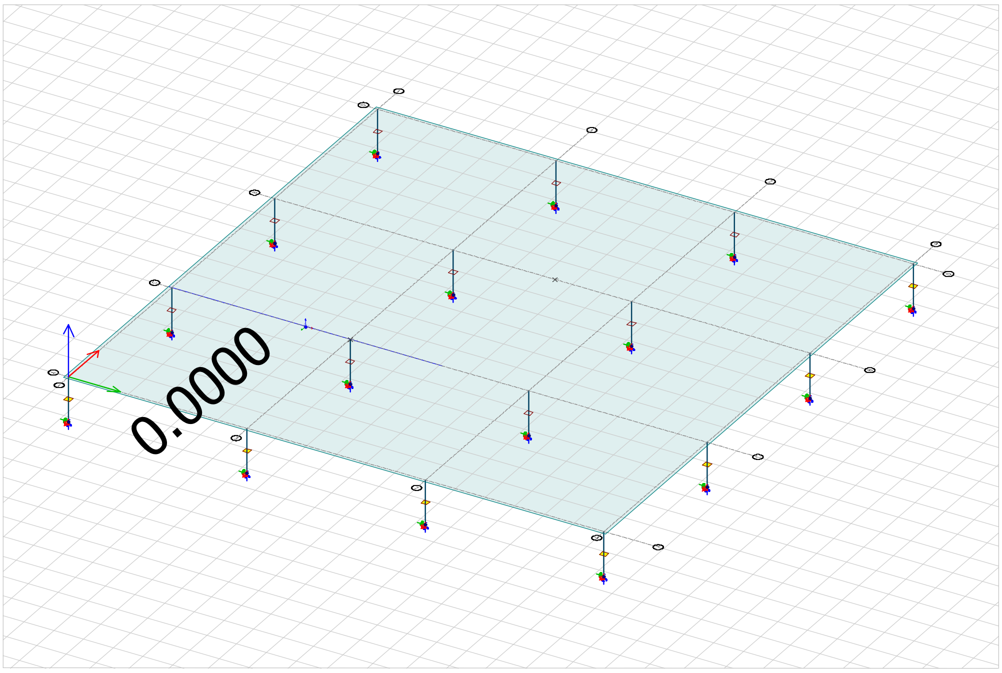


Figure 5: Cracking considered - RC shell - Crack width - bottom - Load comb.: SLSq - [mm]

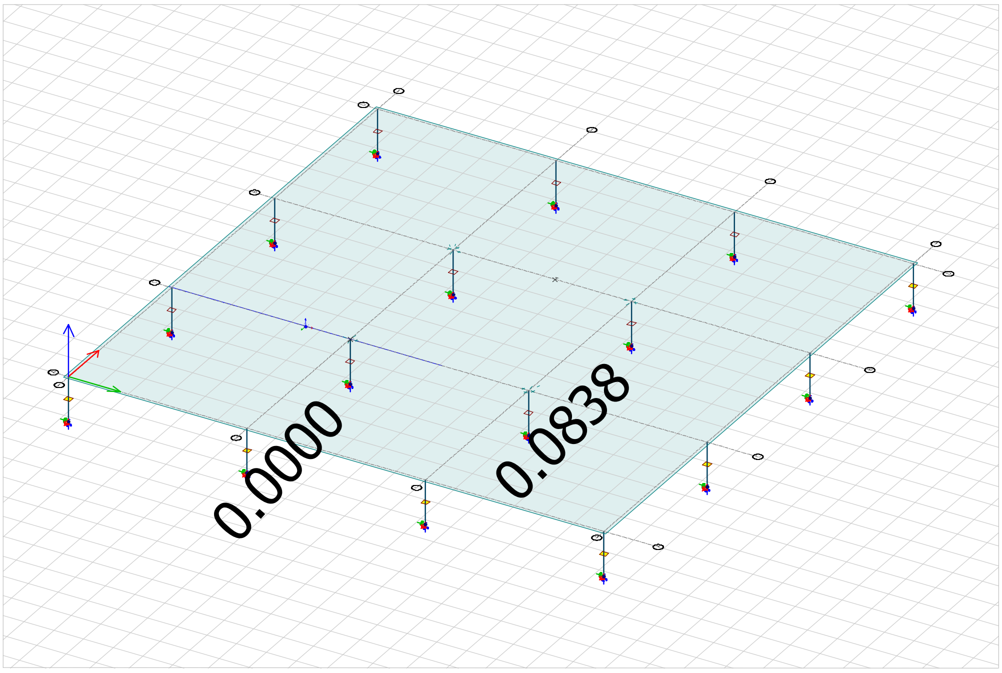


Figure 6: Cracking considered - RC shell - Crack width - top - Load comb.: SLSq - [mm]

Hand Verification Calculations for RC Slab 6m

Geometry:

$t_p := 0{,}20\ \mathrm{m}$ $\qquad$ $c := 45\ \mathrm{mm}$

$w_c := 0{,}4\ \mathrm{m}$

$h_c := 0{,}4\ \mathrm{m}$

$l_p := 6\ \mathrm{m}$

$b_p := 6\ \mathrm{m}$

Load :

$g_{k,s} := 25\ \frac{\mathrm{kN}}{\mathrm{m}^3} \cdot t_p = 5\ \frac{\mathrm{kN}}{\mathrm{m}^2}$

$q_k := 3{,}0\ \frac{\mathrm{kN}}{\mathrm{m}^2}$

Load Combinations:

$g_d := 1{,}35 \cdot g_{k,s} = 6{,}75\ \frac{\mathrm{kN}}{\mathrm{m}^2}$

$q_d := 1{,}5 \cdot q_k = 4{,}5\ \frac{\mathrm{kN}}{\mathrm{m}^2}$

$q_{d,ULS} := 1{,}35 \cdot g_{k,s} + 1{,}5 \cdot q_k = 11{,}25\ \frac{\mathrm{kN}}{\mathrm{m}^2}$

Material Properties:

Concrete: C30 /37

$f_{ck} := 30\ \mathrm{MPa}$

$\gamma_c := 1{,}5$

$f_{cd} := \frac{f_{ck}}{\gamma_c} = 20\ \mathrm{MPa}$

$f_{ctm} := 2{,}9\ \mathrm{MPa}$

$E_{cm} := 33\ \mathrm{GPa}$

Reinforcement: *B500B*

$f_y := 460\ \mathrm{MPa}$

$\gamma_r := 1{,}15$

$f_{yd} := \frac{f_y}{\gamma_r} = 400\ \mathrm{MPa}$

$E := 200\ \mathrm{GPa}$

$d_r := 12\ \mathrm{mm}$

$A_r := \frac{\pi \cdot d_r^{\,2}}{4} = 113{,}0973\ \mathrm{mm}^2$

Bending momnet:

$x - direction$

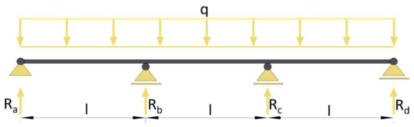
Max posetive bending momnet

$$M_{max,1} := 0{,}08 \cdot q_{d,ULS} \cdot l_p^{\ 2} = 32{,}4 \ \frac{kN\ m}{m}$$

Max negativ bending moment (at support b&c)

$$M_{b,1} := -0{,}1 \cdot q_{d,ULS} \cdot l_p^{\ 2} = -40{,}5 \ \frac{kN\ m}{m}$$

$$M_{c,1} := M_{b,1}$$



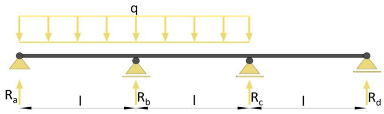
Max posetive bending momnet

$$M_{max,2} := \left(0{,}08 \cdot g_d \cdot l_p^{\ 2} + 0{,}0735 \cdot q_d \cdot l_p^{\ 2}\right) = 31{,}347 \ \frac{kN\ m}{m}$$

Max negativ bending moment (at support b&c)

$$M_{b,2} := \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2} - 0{,}117 \cdot q_d \cdot l_p^{\ 2}\right) = -43{,}254 \ \frac{kN\ m}{m}$$

$$M_{c,2} := -0{,}1 \cdot g_d \cdot l_p^{\ 2} - 0{,}033 \cdot q_d \cdot l_p^{\ 2} = -29{,}646 \ \frac{kN\ m}{m}$$



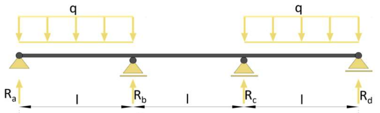
Max posetive bending momnet

$$M_{max,3} := \left(0{,}08 \cdot g_d \cdot l_p^{\ 2} + 0{,}101 \cdot q_d \cdot l_p^{\ 2}\right) = 35{,}802 \ \frac{kN\ m}{m}$$

Max negativ bending moment (at support b&c)

$$M_{b,3} := \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2} - 0{,}05 \cdot q_d \cdot l_p^{\ 2}\right) = -32{,}4 \ \frac{kN\ m}{m}$$

$$M_{c,3} := M_{b,3}$$



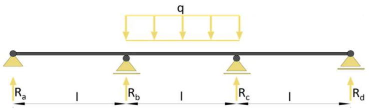
Max posetive bending momnet

$$M_{max,4} := \left(\left(\frac{g_d \cdot l_p^{\ 2}}{8} + \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2}\right)\right) + 0{,}101 \cdot q_d \cdot l_p^{\ 2}\right) = 22{,}437 \ \frac{kN\ m}{m}$$

Max negativ bending moment (at support b&c)

$$M_{b,4} := \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2} - 0{,}05 \cdot q_d \cdot l_p^{\ 2}\right) = -32{,}4 \ \frac{kN\ m}{m}$$

$$M_{c,4} := M_{b,4}$$



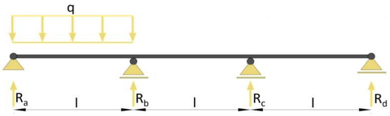
Max posetive bending momnet

$$M_{max,5} := \left(0{,}08 \cdot g_d \cdot l_p^{\ 2} + 0{,}094 \cdot q_d \cdot l_p^{\ 2}\right) = 34{,}668 \ \frac{kN\ m}{m}$$

Max negativ bending moment (at support b&c)

$$M_{b,5} := \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2} - 0{,}067 \cdot q_d \cdot l_p^{\ 2}\right) = -35{,}154 \ \frac{kN\ m}{m}$$

$$M_{c,5} := \left(-0{,}1 \cdot g_d \cdot l_p^{\ 2} + 0{,}017 \cdot q_d \cdot l_p^{\ 2}\right) = -21{,}546 \ \frac{kN\ m}{m}$$



$$M_{max} := \max\left(\begin{bmatrix} M_{max,1} & M_{max,2} & M_{max,3} & M_{max,4} & M_{max,5} \end{bmatrix}\right) = 35{,}802 \ \frac{kN\ m}{m}$$

$$M_b := \min\left(\begin{bmatrix} M_{b,1} & M_{b,2} & M_{b,3} & M_{b,4} & M_{b,5} \end{bmatrix}\right) = -43{,}254 \ \frac{kN\ m}{m}$$

$$M_c := \min\left(\begin{bmatrix} M_{c,1} & M_{c,2} & M_{c,3} & M_{c,4} & M_{c,5} \end{bmatrix}\right) = -40{,}5 \ \frac{kN\ m}{m}$$

$$M_{bc} := \min\left(\begin{bmatrix} M_b \\ M_c \end{bmatrix}\right) = -43{,}254 \ kN$$

Frame Method:

$$l_{x,c} := \frac{l_p}{2} = 3\ \mathrm{m}$$

$$l_{y,c} := \frac{b_p}{2} = 3\ \mathrm{m}$$

$$l_{x,m} := l_p - \frac{b_p}{2} = 3\ \mathrm{m}$$

$$l_{y,m} := \frac{b_p}{2} = 3\ \mathrm{m}$$

Middle value of EN 1992-1-1 Table I.1 will be used

$$M_{Ed,c,n,x,b} := M_{bc} \cdot b_p \cdot 0{,}8 \cdot \frac{1}{l_{y,c}} = -69{,}2064\ \frac{\mathrm{kN\ m}}{\mathrm{m}}$$

$$M_{Ed,m,n,x,b} := M_{bc} \cdot b_p \cdot 0{,}2 \cdot \frac{1}{l_{y,c}} = -17{,}3016\ \frac{\mathrm{kN\ m}}{\mathrm{m}}$$

$$M_{Ed,c,p,x} := M_{max} \cdot b_p \cdot 0{,}5 \cdot \frac{1}{l_{y,m}} = 35{,}802\ \frac{\mathrm{kN\ m}}{\mathrm{m}}$$

$$M_{Ed,m,p,x} := M_{max} \cdot b_p \cdot 0{,}5 \cdot \frac{1}{l_{y,m}} = 35{,}802\ \frac{\mathrm{kN\ m}}{\mathrm{m}}$$

$$d_x := t_p - c - \frac{d_r}{2} = 0{,}149\ \mathrm{m}$$

$$\mu_x := \frac{\begin{bmatrix} \left|M_{Ed,c,n,x,b}\right| \\ \left|M_{Ed,m,n,x,b}\right| \\ \left|M_{Ed,c,p,x}\right| \\ \left|M_{Ed,m,p,x}\right| \end{bmatrix} \cdot 10^3}{1000 \cdot {d_x}^2 \cdot f_{cd}} = \begin{bmatrix} 0{,}1559 \\ 0{,}039 \\ 0{,}0806 \\ 0{,}0806 \end{bmatrix}$$

$$\omega_x := \overrightarrow{1 - \sqrt{1 - 2 \cdot \mu_x}} = \begin{bmatrix} 0{,}1704 \\ 0{,}0398 \\ 0{,}0842 \\ 0{,}0842 \end{bmatrix}$$

$$A_{s,req,x} := \frac{\omega_x \cdot d_x \cdot f_{cd}}{f_{yd}} = \begin{bmatrix} 1269{,}3123 \\ 296{,}1828 \\ 627{,}0974 \\ 627{,}0974 \end{bmatrix} \frac{\mathrm{mm}^2}{\mathrm{m}}$$

$$A_{s,min,x} := \max\left(\begin{bmatrix} 0{,}26 \cdot \dfrac{f_{ctm}}{f_y} \cdot 1 \cdot d_x \\ 0{,}0013 \cdot 1 \cdot d_x \end{bmatrix}\right) = 244{,}2304 \cdot \frac{1}{\mathrm{m}}\ \mathrm{mm}^2$$

$$d_y := t_p - c - d_r - \frac{d_r}{2} = 0{,}137\ \mathrm{m}$$

$$\mu_y := \frac{\begin{bmatrix} \left|M_{Ed,c,n,x,b}\right| \\ \left|M_{Ed,m,n,x,b}\right| \\ \left|M_{Ed,c,p,x}\right| \\ \left|M_{Ed,m,p,x}\right| \end{bmatrix} \cdot 10^3}{1000 \cdot d_y^{\,2} \cdot f_{cd}} = \begin{bmatrix} 0{,}1844 \\ 0{,}0461 \\ 0{,}0954 \\ 0{,}0954 \end{bmatrix}$$

$$\omega_y := \overrightarrow{1 - \sqrt{1 - 2 \cdot \mu_y}} = \begin{bmatrix} 0{,}2055 \\ 0{,}0472 \\ 0{,}1004 \\ 0{,}1004 \end{bmatrix}$$

$$A_{s,req,y} := \frac{\omega_y \cdot d_y \cdot f_{cd}}{f_{yd}} = \begin{bmatrix} 1407{,}4914 \\ 323{,}3546 \\ 687{,}8575 \\ 687{,}8575 \end{bmatrix} \frac{\mathrm{mm}^2}{\mathrm{m}}$$

$$A_{s,min,y} := \max\left(\begin{bmatrix} 0{,}26 \cdot \dfrac{f_{ctm}}{f_y} \cdot 1 \cdot d_y \\ 0{,}0013 \cdot 1 \cdot d_y \end{bmatrix}\right) = 224{,}5609\ \frac{\mathrm{mm}^2}{\mathrm{m}}$$

$$A_x := \overrightarrow{\begin{array}{l} \text{if } A_{s,req,x} > A_{s,min,x} \\ \quad A_{s,req,x} \\ \text{else} \\ \quad A_{s,min,x} \end{array}} = \begin{bmatrix} 1269{,}3123 \\ 296{,}1828 \\ 627{,}0974 \\ 627{,}0974 \end{bmatrix} \frac{\mathrm{mm}^2}{\mathrm{m}}$$

$$A_y := \overrightarrow{\begin{array}{l} \text{if } A_{s,req,y} > A_{s,min,y} \\ \quad A_{s,req,y} \\ \text{else} \\ \quad A_{s,min,x} \end{array}} = \begin{bmatrix} 1407{,}4914 \\ 323{,}3546 \\ 687{,}8575 \\ 687{,}8575 \end{bmatrix} \frac{\mathrm{mm}^2}{\mathrm{m}}$$

C PARAMETRIC STUDY RESULTS

Parametric study results

Table C.1: Summary of concrete, reinforcement and post-tensioning tendon quantities with associated total CO_2-e

Span	**Concrete Class**	**Thickness (m)**	**Concrete (tons)**	**Concrete (kg CO_2-e)**	**Reinforcement (tons)**	**Reinforcement (kg CO_2-e)**	**Cables (tons)**	**Cables (kg CO_2-e)**	**Total CO_2-e**
6	C20/25	0,20	172,56	21052,20	3,24	2414,90	0,88	1105,88	24572,98
6	C25/30	0,20	172,56	22260,10	3,21	2389,70	0,88	1105,88	25755,68
6	C30/37	0,20	172,56	25021,00	3,19	2374,60	0,88	1105,88	28501,48
6	C35/45	0,20	172,56	28127,10	3,17	2363,80	0,88	1105,88	31596,78
6	C40/50	0,20	172,56	30197,80	3,16	2353,60	0,88	1105,88	33657,78
6	C50/60	0,20	172,56	35202,00	3,12	2327,50	0,88	1105,88	38635,38
6	C55/67	0,20	172,56	37962,90	3,12	2327,50	0,88	1105,88	41396,28
6	C60/75	0,20	172,56	39688,50	3,12	2323,90	0,88	1105,88	43118,28
6	C20/25	0,21	181,19	22104,80	3,16	2353,10	0,82	1026,94	25484,84
6	C25/30	0,21	181,19	23373,10	3,14	2340,20	0,82	1026,94	26740,24
6	C30/37	0,21	181,19	26272,00	3,13	2332,90	0,82	1026,94	29631,84
6	C35/45	0,21	181,19	29533,40	3,12	2321,90	0,82	1026,94	32882,24
6	C40/50	0,21	181,19	31707,60	3,10	2311,40	0,82	1026,94	35045,94
6	C50/60	0,21	181,19	36962,10	3,10	2311,40	0,82	1026,94	40300,44
6	C55/67	0,21	181,19	39861,00	3,10	2311,40	0,82	1026,94	43199,34
6	C60/75	0,21	181,19	41672,90	3,08	2292,80	0,82	1026,94	44992,64
6	C20/25	0,23	198,44	24210,00	3,15	2346,70	0,70	869,09	27425,79
6	C25/30	0,23	198,44	25599,10	3,13	2333,80	0,70	869,09	28801,99
6	C30/37	0,23	198,44	28774,10	3,10	2309,90	0,70	869,09	31953,09
6	C35/45	0,23	198,44	32346,10	3,10	2305,90	0,70	869,09	35521,09
6	C40/50	0,23	198,44	34727,40	3,10	2305,90	0,70	869,09	37902,39
6	C50/60	0,23	198,44	40482,30	3,07	2284,70	0,70	869,09	43636,09
6	C55/67	0,23	198,44	43657,30	3,07	2284,70	0,70	869,09	46811,09
6	C60/75	0,23	198,44	45641,80	3,07	2284,20	0,70	869,09	48795,09
6	C20/25	0,25	215,70	26315,20	3,08	2296,50	0,70	869,24	29480,94
6	C25/30	0,25	215,70	27825,10	3,08	2296,30	0,70	869,24	30990,64
6	C30/37	0,25	215,70	31276,20	3,08	2296,30	0,70	869,24	34441,74
6	C35/45	0,25	215,70	35158,80	3,05	2274,20	0,70	869,24	38302,24
6	C40/50	0,25	215,70	37747,20	3,05	2274,20	0,70	869,24	40890,64
6	C50/60	0,25	215,70	44002,40	3,05	2274,20	0,70	869,24	47145,84
6	C55/67	0,25	215,70	47453,60	3,05	2274,10	0,70	869,24	50596,94
6	C60/75	0,25	215,70	49610,60	3,05	2274,10	0,70	869,24	52753,94
6	C20/25	0,27	232,95	28420,40	3,08	2297,40	0,63	790,38	31508,18
6	C25/30	0,27	232,95	30051,10	3,08	2297,30	0,63	790,38	33138,78
6	C30/37	0,27	232,95	33778,30	3,05	2273,50	0,63	790,38	36842,18
6	C35/45	0,27	232,95	37971,50	3,05	2273,50	0,63	790,38	41035,38
6	C40/50	0,27	232,95	40767,00	3,05	2273,50	0,63	790,38	43830,82
6	C50/60	0,27	232,95	47522,60	3,05	2273,50	0,63	790,38	50586,48
6	C55/67	0,27	232,95	51249,90	3,05	2273,50	0,63	790,38	54313,78
6	C60/75	0,27	232,95	53579,40	3,05	2273,50	0,63	790,38	56643,28
6	C20/25	0,30	258,84	31578,20	3,11	2317,20	0,51	632,56	34527,96
6	C25/30	0,30	258,84	33390,10	3,06	2280,90	0,51	632,56	36303,56
6	C30/37	0,30	258,84	37531,50	3,06	2277,10	0,51	632,56	40441,16
6	C35/45	0,30	258,84	42190,60	3,06	2277,10	0,51	632,56	45100,26
6	C40/50	0,30	258,84	45296,60	3,06	2277,10	0,51	632,56	48206,26
6	C50/60	0,30	258,84	52802,90	3,06	2277,10	0,51	632,56	55712,56
6	C55/67	0,30	258,84	56944,30	3,06	2277,10	0,51	632,56	59853,96

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
6	C60/75	0,30	258,84	59532,70	3,06	2277,10	0,51	632,56	62442,36
7	C20/25	0,20	233,42	28476,60	8,46	6304,90	1,55	1935,18	36716,68
7	C20/25	0,22	256,76	31324,30	5,93	4417,60	1,33	1658,89	37400,79
7	C20/25	0,23	268,43	32748,10	4,53	3374,20	1,33	1658,95	37781,28
7	C20/25	0,21	245,09	29900,40	8,37	6236,80	1,33	1658,80	37796,00
7	C20/25	0,25	291,77	35595,80	4,45	3312,80	1,11	1382,67	40291,27
7	C20/25	0,27	315,11	38443,40	4,35	3239,00	1,11	1382,89	43065,29
7	C20/25	0,29	338,45	41291,10	4,37	3255,00	1,03	1290,92	45837,02
7	C20/25	0,32	373,46	45562,60	4,33	3227,80	0,89	1106,86	49897,26
7	C20/25	0,35	408,48	49834,10	4,25	3169,70	0,89	1107,27	54111,07
7	C25/30	0,20	233,42	30110,50	4,99	3714,30	1,55	1935,18	35759,98
7	C25/30	0,21	245,09	31616,00	4,96	3691,20	1,33	1658,80	36966,00
7	C25/30	0,22	256,76	33121,60	4,52	3365,10	1,33	1658,89	38145,59
7	C25/30	0,23	268,43	34627,10	4,46	3319,00	1,33	1658,98	39605,08
7	C25/30	0,25	291,77	37638,20	4,38	3262,70	1,11	1382,67	42283,57
7	C25/30	0,27	315,11	40649,20	4,30	3204,70	1,11	1382,89	45236,79
7	C25/30	0,29	338,45	43660,30	4,35	3242,60	1,03	1290,92	48193,82
7	C25/30	0,32	373,46	48176,80	4,30	3199,70	0,89	1106,86	52483,36
7	C25/30	0,35	408,48	52693,40	4,25	3169,30	0,89	1107,27	56969,97
7	C30/37	0,20	233,42	33845,20	4,55	3390,90	1,55	1935,18	39171,28
7	C30/37	0,21	245,09	35537,40	4,54	3383,00	1,33	1658,80	40579,20
7	C30/37	0,22	256,76	37229,70	4,47	3332,70	1,33	1658,89	42221,29
7	C30/37	0,23	268,43	38921,90	4,43	3297,90	1,33	1658,98	43878,78
7	C30/37	0,25	291,77	42306,40	4,37	3253,50	1,11	1382,67	46942,57
7	C30/37	0,27	315,11	45691,00	4,30	3200,10	1,11	1382,89	50273,99
7	C30/37	0,29	338,45	49075,50	4,32	3217,30	1,03	1290,92	53583,72
7	C30/37	0,32	373,46	54152,30	4,30	3199,50	0,89	1106,86	58458,66
7	C30/37	0,35	408,48	59229,00	4,25	3167,10	0,89	1107,27	63503,37
7	C35/45	0,20	233,42	38046,60	4,53	3374,90	1,55	1935,18	43356,68
7	C35/45	0,21	245,09	39949,00	4,52	3369,20	1,33	1658,80	44977,00
7	C35/45	0,22	256,76	41851,30	4,46	3323,80	1,33	1658,89	46833,99
7	C35/45	0,23	268,43	43753,60	4,42	3290,40	1,33	1658,98	48702,98
7	C35/45	0,25	291,77	47558,30	4,36	3248,00	1,11	1382,67	52188,97
7	C35/45	0,27	315,11	51362,90	4,24	3160,70	1,11	1382,89	55906,49
7	C35/45	0,29	338,45	55167,60	4,32	3217,30	1,03	1290,92	59675,82
7	C35/45	0,32	373,46	60874,60	4,30	3199,50	0,89	1106,86	65180,96
7	C35/45	0,35	408,48	66581,60	4,21	3138,00	0,89	1107,27	70826,87
7	C40/50	0,20	233,42	40847,60	4,52	3370,20	1,55	1935,18	46152,98
7	C40/50	0,21	245,09	42890,00	4,50	3351,80	1,33	1658,80	47900,60
7	C40/50	0,22	256,76	44932,40	4,45	3310,70	1,33	1658,89	49901,99
7	C40/50	0,23	268,43	46974,70	4,39	3268,80	1,33	1658,98	51902,48
7	C40/50	0,25	291,77	51059,50	4,33	3224,60	1,11	1382,67	55666,77
7	C40/50	0,27	315,11	55144,30	4,24	3159,40	1,11	1382,89	59686,59
7	C40/50	0,29	338,45	59229,00	4,31	3211,10	1,03	1290,92	63731,02
7	C40/50	0,32	373,46	65356,20	4,26	3173,10	0,89	1106,86	69636,16
7	C40/50	0,35	408,48	71483,30	4,22	3140,20	0,89	1107,27	75730,77
7	C50/60	0,20	233,42	47616,60	4,47	3326,10	1,55	1935,18	52877,88
7	C50/60	0,21	245,09	49997,50	4,46	3318,90	1,33	1658,80	54975,20
7	C50/60	0,22	256,76	52378,30	4,44	3305,90	1,33	1658,89	57343,09
7	C50/60	0,23	268,43	54759,10	4,35	3239,40	1,33	1658,98	59657,48
7	C50/60	0,25	291,77	59520,80	4,32	3218,10	1,11	1382,67	64121,57
7	C50/60	0,27	315,11	64282,50	4,24	3157,60	1,11	1382,89	68822,99
7	C50/60	0,29	338,45	69044,10	4,25	3167,70	1,03	1290,92	73502,72
7	C50/60	0,32	373,46	76186,60	4,25	3166,40	0,89	1106,86	80459,86
7	C50/60	0,35	408,48	83329,10	4,21	3140,10	0,89	1107,27	87576,47

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
7	C55/67	0,20	233,42	51351,30	4,46	3324,50	1,55	1935,18	56610,98
7	C55/67	0,21	245,09	53191,80	4,46	3318,90	1,33	1658,80	58896,50
7	C55/67	0,22	256,76	56486,40	4,43	3301,80	1,33	1658,89	61447,09
7	C55/67	0,23	268,43	59054,00	4,33	3228,00	1,33	1658,98	63940,98
7	C55/67	0,25	291,77	64189,10	4,32	3218,10	1,11	1382,67	6789,87
7	C55/67	0,27	315,11	69324,20	4,21	3133,10	1,11	1382,89	73840,19
7	C55/67	0,29	338,45	74459,30	4,24	3156,20	1,03	1290,92	78906,42
7	C55/67	0,32	373,46	82162,00	4,25	3166,40	0,89	1106,86	86435,26
7	C55/67	0,35	408,48	89864,70	4,21	3140,10	0,89	1107,27	94112,07
7	C60/75	0,20	233,42	53685,40	4,46	3321,00	1,55	1935,18	58941,58
7	C60/75	0,21	245,09	56369,70	4,44	3310,40	1,33	1658,80	61338,90
7	C60/75	0,22	256,76	59054,00	4,42	3293,60	1,33	1658,89	64006,49
7	C60/75	0,23	268,43	61738,20	4,33	3227,70	1,33	1658,98	66624,88
7	C60/75	0,25	291,77	67106,80	4,32	3218,10	1,11	1382,67	71707,57
7	C60/75	0,27	315,11	72475,30	4,21	3133,10	1,11	1382,89	76991,29
7	C60/75	0,29	338,45	77843,90	4,22	3143,70	1,03	1290,92	82278,52
7	C60/75	0,32	373,46	85896,70	4,25	3166,40	0,89	1106,86	90169,96
7	C60/75	0,35	408,48	93949,50	4,21	3140,10	0,89	1107,27	98196,87
8	C25/30	0,20	303,45	39144,50	8,16	6081,10	2,19	2738,32	47963,92
8	C20/25	0,22	333,79	40722,40	7,47	5565,90	2,19	2738,32	49026,62
8	C25/30	0,21	318,62	41101,70	6,86	5112,60	2,36	2948,84	49163,14
8	C20/25	0,21	318,62	38871,40	11,33	8442,20	2,36	2948,84	50262,44
8	C25/30	0,22	333,79	43058,90	7,80	5808,50	2,19	2738,32	51605,72
8	C30/37	0,20	303,45	43999,60	6,84	5095,60	2,44	3054,06	52149,26
8	C25/30	0,24	364,14	46973,40	6,52	4855,20	1,94	2422,59	54251,19
8	C20/25	0,24	364,14	44424,40	11,19	8335,00	1,94	2422,59	55181,99
8	C30/37	0,21	318,62	46199,60	8,38	6241,80	2,36	2948,84	55390,24
8	C25/30	0,25	379,31	48930,60	6,24	4646,90	1,85	2317,66	55894,88
8	C30/37	0,22	333,79	48399,60	7,32	5454,70	2,19	2738,32	56592,62
8	C20/25	0,25	379,31	46275,40	10,94	8153,30	1,85	2317,66	56746,08
8	C20/25	0,27	409,65	49977,50	6,14	4575,10	1,85	2317,66	56870,26
8	C35/45	0,20	303,45	49461,60	6,66	4957,50	2,44	3054,06	57473,16
8	C25/30	0,27	409,65	52845,00	5,90	4396,20	1,85	2317,66	59558,86
8	C30/37	0,24	364,14	52799,50	6,19	4612,40	1,94	2422,59	59834,49
8	C20/25	0,29	439,99	53679,50	5,96	4442,80	1,60	2001,89	60124,19
8	C35/45	0,21	318,62	51934,70	8,03	5983,10	2,36	2948,84	60866,64
8	C40/50	0,20	303,45	53103,00	7,42	5525,00	2,44	3054,06	61682,06
8	C30/37	0,25	379,31	54999,50	6,22	4630,90	1,85	2317,66	61947,78
8	C35/45	0,22	333,79	54407,80	6,50	4801,80	2,19	2738,32	61947,92
8	C25/30	0,29	439,99	55758,10	7,10	4287,90	2,36	2948,84	62994,84
8	C20/25	0,29	439,99	56759,50	5,93	4416,70	1,60	2001,89	63178,09
8	C20/25	0,31	470,34	57381,50	5,75	4284,50	1,60	2002,20	63668,20
8	C25/30	0,22	333,79	58413,30	6,40	4766,90	2,19	2738,32	65918,52
8	C30/37	0,27	409,65	59399,50	5,88	4381,70	1,85	2317,66	66098,86
8	C35/45	0,24	364,14	59353,90	6,13	4567,20	1,94	2422,59	66343,69
8	C20/25	0,31	470,34	60673,90	5,71	4252,90	1,60	2002,20	66929,00
8	C20/25	0,33	500,69	61083,60	5,81	4327,30	1,52	1897,15	67308,05
8	C35/45	0,25	379,31	61827,00	6,21	4626,10	1,85	2317,66	68770,48
8	C30/37	0,29	439,99	63799,40	5,83	4341,00	1,60	2001,89	70142,29
8	C50/60	0,20	303,45	61902,90	7,30	5435,20	2,44	3054,06	70392,16
8	C40/50	0,24	364,14	63723,50	6,08	4528,70	1,94	2422,59	70674,79
8	C25/30	0,33	500,69	64588,40	5,78	4303,00	1,52	1897,15	70788,55
8	C20/25	0,36	546,20	66535,60	5,64	4202,40	1,52	1897,71	72635,71
8	C20/25	0,21	318,62	37020,30	43,95	32740,30	2,44	3054,06	72814,66
8	C50/60	0,21	318,62	64998,00	6,90	5139,90	2,36	2948,84	73086,74

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
8	C40/50	0,25	379,31	66378,70	6,19	4511,70	1,85	2317,66	73208,06
8	C35/45	0,27	409,65	66773,20	5,85	4360,20	1,85	2317,66	73451,06
8	C30/37	0,31	470,34	68199,40	5,69	4237,80	1,60	2002,20	74439,20
8	C55/67	0,20	303,45	66758,00	5,56	4883,80	2,44	3054,06	74695,86
8	C25/30	0,31	470,34	68003,20	8,29	4882,50	2,36	2948,84	75834,54
8	C25/30	0,36	546,20	70460,00	5,61	4175,40	1,52	1897,71	76533,11
8	C60/75	0,20	303,45	69702,50	5,56	4880,80	2,44	3054,06	77727,16
8	C55/67	0,21	318,62	70095,50	5,41	4773,60	2,36	2948,84	77818,34
8	C30/37	0,29	439,99	71719,30	5,78	4304,40	1,60	2001,89	78025,59
8	C45/50	0,27	409,65	71589,00	5,77	4295,10	1,85	2317,66	78201,76
8	C30/37	0,33	500,69	72599,30	5,76	4292,60	1,52	1897,15	78788,75
8	C20/25	0,40	606,89	74040,70	5,63	4192,60	1,35	1687,64	79920,94
8	C60/75	0,21	318,62	73282,10	5,37	4739,80	2,36	2948,84	80970,74
8	C55/67	0,22	333,79	73433,80	5,28	4680,80	2,19	2738,32	80852,72
8	C50/60	0,24	364,14	74283,50	6,05	4510,20	1,94	2422,59	81216,29
8	C35/45	0,31	470,34	76565,50	5,66	4217,40	1,60	2002,20	82785,10
8	C30/37	0,29	439,99	76909,30	5,76	4288,40	1,60	2001,89	83200,59
8	C25/30	0,40	606,89	78288,90	5,57	4152,10	1,35	1687,64	84128,64
8	C35/45	0,22	333,79	76771,70	6,27	4670,80	2,19	2738,32	84180,82
8	C50/60	0,25	379,31	77378,60	6,16	4587,40	1,85	2317,38	84283,38
8	C30/37	0,36	546,20	79199,30	5,56	4144,80	1,52	1897,71	85241,61
8	C55/67	0,24	364,14	80109,60	6,04	4503,10	1,94	2422,59	87035,29
8	C45/50	0,33	500,69	81811,70	5,90	4244,80	1,52	1897,15	87953,45
8	C40/50	0,31	470,34	82309,60	5,60	4169,20	1,60	2002,20	88481,00
8	C35/45	0,27	409,65	83568,90	5,71	4258,10	1,85	2317,66	90144,66
8	C55/67	0,25	379,31	83447,50	6,16	4587,30	1,85	2317,38	90352,18
8	C60/75	0,24	364,14	83750,90	6,05	4503,90	1,94	2422,59	90677,39
8	C40/50	0,33	500,69	87619,90	5,69	4238,20	1,52	1897,15	93755,25
8	C30/37	0,40	606,89	87999,20	5,57	4151,90	1,35	1687,64	93838,74
8	C60/75	0,25	379,31	87240,60	6,15	4580,70	1,85	2317,38	94138,68
8	C35/45	0,36	546,20	89030,90	5,56	4144,50	1,52	1897,71	95073,11
8	C50/60	0,29	439,99	89759,20	5,71	4252,10	1,60	2001,89	96013,19
8	C40/50	0,27	409,65	90123,30	5,89	4232,80	1,85	2317,66	96673,56
8	C60/75	0,27	409,65	94219,80	5,67	4224,80	1,85	2317,66	100762,26
8	C40/50	0,36	546,20	95585,30	5,56	4142,40	1,52	1897,71	101625,41
8	C50/60	0,31	470,34	95949,50	5,60	4168,00	1,60	2002,20	102119,70
8	C55/67	0,29	439,99	96799,10	5,70	4246,20	1,60	2001,89	103047,19
8	C35/45	0,40	606,89	98923,20	5,57	4151,50	1,35	1687,64	104762,34
8	C60/75	0,29	439,99	101199,10	5,70	4246,20	1,60	2001,89	107447,19
8	C50/60	0,33	500,69	102138,70	5,69	4235,40	1,52	1897,15	108272,25
8	C40/50	0,40	606,89	103474,90	5,60	4168,00	1,35	1687,64	109330,54
8	C50/60	0,40	606,89	106205,90	5,56	4144,60	1,35	1687,64	112038,14
8	C60/75	0,31	470,34	108178,30	5,60	4167,80	1,60	2002,20	114348,30
8	C55/67	0,33	500,69	110150,70	5,67	4224,40	1,52	1897,15	116272,25
8	C50/60	0,36	546,20	111425,20	5,56	4139,40	1,52	1897,71	117462,31
8	C55/67	0,33	500,69	115157,60	5,66	4216,40	1,52	1897,15	121271,15
8	C55/67	0,36	546,20	120164,40	5,52	4110,00	1,52	1897,71	126172,11
8	C60/75	0,36	546,20	123805,80	5,52	4114,00	1,52	1897,71	129607,93
8	C60/75	0,36	546,20	125826,40	5,52	4110,50	1,52	1897,71	131634,11
8	C55/67	0,40	606,89	133516,00	5,52	4114,50	1,35	1687,64	139318,14
8	C60/75	0,40	606,89	139584,90	5,52	4114,50	1,35	1687,64	145387,04
9	C20/25	0,20	382,65	46683,30	158,88	118363,80	3,98	4975,88	170022,98
9	C25/30	0,20	382,65	49361,90	52,85	39374,50	3,98	4975,88	93712,28
9	C30/37	0,20	382,65	55484,30	25,31	18855,50	3,98	4975,88	79315,68
9	C35/45	0,20	382,65	62372,00	11,42	8503,70	3,98	4975,88	75851,58

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
9	C40/50	0,20	382,65	66963,80	9,64	7179,00	3,98	4975,88	79118,68
9	C50/60	0,20	382,65	78060,70	9,43	7024,40	3,98	4975,88	90060,98
9	C55/67	0,20	382,65	84183,10	9,30	6928,10	3,98	4975,88	96087,08
9	C60/75	0,20	382,65	88009,60	9,29	6918,70	3,98	4975,88	99904,18
9	C20/25	0,22	420,92	51351,70	55,92	41656,50	3,41	4265,29	97273,49
9	C25/30	0,22	420,92	54298,10	11,36	8457,90	3,41	4265,29	67021,29
9	C30/37	0,22	420,92	61032,70	9,64	7184,30	3,41	4265,29	72482,29
9	C35/45	0,22	420,92	68609,20	9,33	6953,00	3,41	4265,29	79827,49
9	C40/50	0,22	420,92	73660,20	9,06	6746,20	3,41	4265,29	84671,69
9	C50/60	0,22	420,92	85866,70	11,56	8615,30	3,41	4265,29	98747,29
9	C55/67	0,22	420,92	92601,40	10,91	8128,00	3,41	4265,29	104994,69
9	C60/75	0,22	420,92	96810,50	9,66	7198,40	3,41	4265,29	108274,19
9	C20/25	0,24	459,18	56020,00	9,83	7323,50	3,13	3910,14	67253,64
9	C25/30	0,24	459,18	59234,30	8,68	6469,90	3,13	3910,14	69614,34
9	C30/37	0,24	459,18	66581,20	11,54	8597,90	3,13	3910,14	79089,24
9	C35/45	0,24	459,18	74846,40	9,60	7150,30	3,13	3910,14	85906,84
9	C40/50	0,24	459,18	80356,60	9,10	6779,80	3,13	3910,14	91046,54
9	C50/60	0,24	459,18	93672,80	9,62	7366,80	3,13	3910,14	104949,74
9	C55/67	0,24	459,18	101019,70	8,06	6005,30	3,13	3910,14	110935,14
9	C60/75	0,24	459,18	105611,50	8,06	6003,80	3,13	3910,14	115525,44
9	C20/25	0,26	497,45	60688,30	8,78	6539,80	2,84	3554,98	70783,08
9	C25/30	0,26	497,45	64170,50	11,45	8531,10	2,84	3554,98	76256,58
9	C30/37	0,26	497,45	72129,60	10,12	7538,50	2,84	3554,98	83223,08
9	C35/45	0,26	497,45	81083,60	8,20	6109,60	2,84	3554,98	90748,18
9	C40/50	0,26	497,45	87053,00	8,16	6082,20	2,84	3554,98	96690,18
9	C50/60	0,26	497,45	101478,90	8,13	6059,80	2,84	3554,98	111093,68
9	C55/67	0,26	497,45	109438,00	8,09	6029,60	2,84	3554,98	119022,58
9	C60/75	0,26	497,45	114412,50	8,03	5978,70	2,84	3554,98	123946,18
9	C20/25	0,28	535,71	65356,70	12,61	9393,60	2,56	3199,82	77950,12
9	C25/30	0,28	535,71	69106,70	10,58	7879,60	2,56	3199,82	80186,12
9	C30/37	0,28	535,71	77678,00	8,24	6136,20	2,56	3199,82	87014,02
9	C35/45	0,28	535,71	87320,80	7,98	5946,30	2,56	3199,82	96466,92
9	C40/50	0,28	535,71	93749,30	7,95	5925,40	2,56	3199,82	102874,52
9	C50/60	0,28	535,71	109284,90	7,92	5899,30	2,56	3199,82	118384,02
9	C55/67	0,28	535,71	117856,30	7,91	5895,00	2,56	3199,82	126951,12
9	C60/75	0,28	535,71	123213,40	7,91	5895,30	2,56	3199,82	132308,52
9	C20/25	0,30	573,98	70025,00	11,91	8874,00	2,47	3081,66	81980,66
9	C25/30	0,30	573,98	74042,80	9,44	7031,10	2,47	3081,66	84155,56
9	C30/37	0,30	573,98	83226,50	7,95	5918,30	2,47	3081,66	92226,46
9	C35/45	0,30	573,98	93558,00	7,91	5895,70	2,47	3081,66	102535,36
9	C40/50	0,30	573,98	100445,70	7,90	5882,70	2,47	3081,66	109410,06
9	C50/60	0,30	573,98	117091,00	7,84	5842,70	2,47	3081,66	126015,36
9	C55/67	0,30	573,98	126274,60	7,79	5799,70	2,47	3081,66	135155,96
9	C60/75	0,30	573,98	132014,40	7,76	5778,90	2,47	3081,66	140874,96
9	C20/25	0,32	612,24	74693,40	9,07	6760,30	2,47	3082,06	84535,76
9	C25/30	0,32	612,24	78979,00	8,80	6556,60	2,47	3082,06	88617,66
9	C30/37	0,32	612,24	88774,90	7,63	5687,70	2,47	3082,06	97544,66
9	C35/45	0,32	612,24	99795,20	7,61	5671,80	2,47	3082,06	108549,06
9	C40/50	0,32	612,24	107142,10	7,59	5652,50	2,47	3082,06	115876,66
9	C50/60	0,32	612,24	124897,10	7,57	5637,50	2,47	3082,06	133616,66
9	C55/67	0,32	612,24	134692,90	7,54	5615,80	2,47	3082,06	143390,76
9	C60/75	0,32	612,24	140815,30	7,53	5607,90	2,47	3082,06	149505,26
9	C20/25	0,34	650,51	79361,70	8,19	6098,90	2,28	2845,40	88306,00
9	C25/30	0,34	650,51	83915,20	8,04	5990,80	2,28	2845,40	92751,40
9	C30/37	0,34	650,51	94323,30	7,51	5593,40	2,28	2845,40	102762,10

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
9	C35/45	0,34	650,51	106032,40	7,62	5677,60	2,28	2845,40	114555,40
9	C40/50	0,34	650,51	113838,50	7,06	5666,70	2,28	2845,40	122350,60
9	C50/60	0,34	650,51	132703,10	7,55	5623,80	2,28	2845,40	141172,30
9	C55/67	0,34	650,51	143111,20	7,53	5609,50	2,28	2845,40	151566,10
9	C60/75	0,34	650,51	149616,30	7,53	5610,00	2,28	2845,40	158071,70
9	C20/25	0,36	688,77	84030,00	8,44	6286,90	2,18	2727,27	93044,17
9	C25/30	0,36	688,77	88851,40	7,91	5892,60	2,18	2727,27	97471,27
9	C30/37	0,36	688,77	99871,70	7,62	5680,00	2,18	2727,27	108278,97
9	C35/45	0,36	688,77	112269,60	7,54	5617,50	2,18	2727,27	120614,37
9	C40/50	0,36	688,77	120534,90	7,49	5579,40	2,18	2727,27	128841,57
9	C50/60	0,36	688,77	140509,20	7,42	5528,20	2,18	2727,27	148764,67
9	C55/67	0,36	688,77	151529,50	7,42	5528,10	2,18	2727,27	159784,87
9	C60/75	0,36	688,77	158417,20	7,42	5527,80	2,18	2727,27	166672,27
10	C20/25	0,23	541,68	66258,40	17,98	13397,40	3,27	4083,57	120919,07
10	C25/30	0,26	612,34	78591,70	12,63	9405,30	4,32	5397,99	93795,99
10	C20/25	0,29	682,95	83325,10	11,68	8703,30	4,32	5397,99	96001,38
10	C20/25	0,28	659,44	80451,90	15,58	11605,90	4,00	5002,27	97062,13
10	C30/37	0,23	541,68	76544,20	17,32	12907,00	4,74	5924,02	97375,22
10	C25/30	0,24	565,24	71958,10	13,65	10169,40	4,63	5792,55	97921,05
10	C25/30	0,24	565,24	72915,40	25,84	19251,10	4,63	5792,55	97959,05
10	C35/45	0,28	659,44	85067,90	11,98	8925,7	4,00	5002,40	98996,03
10	C25/30	0,25	588,79	85374,10	12,54	9343,20	4,32	5397,79	100115,09
10	C30/37	0,29	682,95	88106,10	11,16	8314,80	3,90	4871,98	101292,88
10	C20/25	0,31	730,10	89071,70	12,34	9194,20	3,58	4477,40	102743,30
10	C30/37	0,26	612,34	88789,10	11,49	8559,10	4,32	5397,99	102746,19
10	C35/45	0,23	541,68	86294,50	14,11	10515,10	4,74	5924,02	104733,62
10	C20/25	0,26	612,34	74705,30	34,12	25421,20	4,32	5397,99	105524,49
10	C25/30	0,33	777,20	94818,30	11,01	8199,60	3,58	4477,90	107495,80
10	C35/45	0,24	565,24	92133,40	12,89	9609,40	4,63	5792,55	107525,35
10	C30/37	0,28	659,44	95610,00	11,72	8731,80	4,00	5002,27	109354,03
10	C40/50	0,25	588,79	95572,30	11,95	8899,50	4,32	5397,79	109869,59
10	C30/37	0,23	541,68	94794,70	13,86	10325,70	4,74	5924,02	111045,42
10	C25/30	0,31	730,10	94182,40	19,17	14277,80	3,58	4477,40	112937,60
10	C35/45	0,26	612,34	99811,20	11,41	8503,40	4,32	5397,99	113712,59
10	C40/50	0,24	565,24	98918,20	12,81	9545,70	4,63	5792,55	114256,45
10	C25/30	0,23	541,68	69877,20	52,48	39095,30	4,74	5924,02	114896,52
10	C40/50	0,33	777,20	100258,60	15,15	11287,00	3,58	4477,90	116023,50
10	C30/37	0,29	682,95	99034,00	17,69	13179,70	3,90	4871,98	117085,68
10	C50/60	0,25	588,79	103037,70	11,80	8790,40	4,32	5397,79	117225,89
10	C20/25	0,36	847,85	103439,10	17,98	13397,40	3,27	4083,57	120919,07
10	C40/50	0,26	612,34	107159,20	11,32	8431,40	4,32	5397,99	120988,59
10	C30/37	0,31	730,10	105863,90	16,97	12844,10	3,58	4477,40	123185,40
10	C25/30	0,36	847,85	109373,10	14,91	11103,90	3,27	4083,57	124560,57
10	C20/25	0,38	894,96	109184,70	15,45	11509,80	3,27	4084,15	124778,65
10	C50/60	0,23	541,68	110503,50	12,61	9391,10	4,74	5924,02	125818,62
10	C50/60	0,33	777,20	112890,80	12,53	9331,00	3,58	4477,90	126702,70
10	C35/45	0,29	682,95	111327,80	14,88	11084,50	3,90	4871,98	127284,28
10	C30/37	0,38	894,96	116449,30	11,04	8227,00	3,27	4084,15	128760,45
10	C35/45	0,28	659,44	107488,90	22,43	16713,10	4,00	5002,40	129205,40
10	C60/75	0,24	565,24	115309,00	12,50	9310,30	4,63	5792,55	130411,85
10	C40/50	0,25	588,79	71832,00	72,13	53738,10	4,32	5397,79	130967,89
10	C40/50	0,26	612,34	116402,20	14,42	10744,10	4,32	5397,99	131149,73
10	C50/60	0,29	682,95	119523,80	11,87	8839,00	3,90	4871,98	133235,68
10	C40/50	0,25	588,79	120112,50	11,58	8626,40	4,32	5397,79	134136,69
10	C55/67	0,23	541,68	119170,50	12,59	9378,20	4,74	5924,02	134472,72

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
10	C25/30	0,42	989,16	120677,80	13,78	10264,30	3,16	3953,64	134895,74
10	C35/45	0,31	730,10	119005,80	16,04	11962,80	3,58	4477,40	135446,00
10	C30/37	0,36	847,85	122538,70	11,91	8873,30	3,27	4083,57	135495,57
10	C55/67	0,24	565,24	124351,80	12,20	9091,50	4,63	5792,55	139235,85
10	C30/37	0,42	989,16	127601,90	10,98	8179,30	3,16	3953,64	139734,84
10	C60/75	0,23	541,68	124587,30	12,57	9366,30	4,74	5924,02	139877,62
10	C35/45	0,26	612,34	124917,00	13,35	9942,80	4,32	5397,99	140257,79
10	C35/45	0,33	777,20	126583,40	12,22	9103,80	3,58	4477,90	140165,10
10	C40/50	0,31	730,10	127768,50	11,36	8496,30	3,58	4477,40	140742,20
10	C35/45	0,38	854,96	129763,80	11,19	8340,00	3,27	4084,15	142187,95
10	C20/25	0,45	1059,82	129297,80	13,38	9973,70	3,16	3954,70	143226,20
10	C60/75	0,24	565,24	130004,20	12,10	9015,50	4,63	5792,55	144812,25
10	C55/67	0,29	682,95	129533,10	15,62	11635,50	3,90	4871,98	146040,58
10	C25/30	0,28	659,44	134128,00	10,96	8171,80	4,00	5002,27	147302,07
10	C35/45	0,45	1059,82	136718,30	10,14	7556,40	3,16	3954,70	148229,40
10	C40/50	0,33	777,20	136003,80	10,70	7574,80	3,58	4477,90	148056,50
10	C20/25	0,24	565,24	68968,70	99,10	73832,70	4,63	5792,55	148593,95
10	C55/67	0,26	612,34	134714,90	12,99	9727,90	4,32	5397,99	149740,79
10	C35/45	0,36	847,85	138200,10	10,36	7721,40	3,27	4083,57	150005,07
10	C60/75	0,29	682,95	135421,00	13,74	10234,30	3,90	4871,98	150527,28
10	C50/60	0,29	682,95	139330,50	10,59	7889,20	3,90	4871,98	152091,68
10	C55/67	0,28	659,44	140537,80	10,88	8105,30	4,00	5002,27	153645,37
10	C25/30	0,42	989,16	143425,50	9,90	7373,20	3,16	3953,64	154752,34
10	C25/30	0,50	1177,57	143864,00	12,91	9621,20	2,85	3561,03	157046,23
10	C35/45	0,38	854,96	146877,90	9,77	7281,00	3,27	4084,15	158243,05
10	C55/67	0,28	659,44	145077,10	10,92	8139,00	4,00	5003,43	158219,53
10	C40/50	0,36	847,85	148374,30	10,20	7601,00	3,27	4083,57	160058,87
10	C50/60	0,31	730,10	148933,90	11,03	8218,80	3,58	4477,40	161630,10
10	C55/67	0,29	682,95	150258,40	10,57	7875,90	3,90	4871,98	163006,28
10	C25/30	0,50	1177,57	151307,00	10,14	7552,30	2,85	3561,03	162420,33
10	C55/67	0,28	659,44	151871,50	10,89	8114,90	4,00	5003,43	164989,83
10	C30/37	0,45	1059,82	153873,40	10,13	7547,80	3,16	3954,70	165375,90
10	C40/50	0,38	854,96	156617,30	9,71	7236,10	3,27	4084,15	167937,55
10	C50/60	0,29	682,95	157088,40	10,59	7890,00	3,90	4871,98	169850,38
10	C50/60	0,33	777,20	158548,80	10,39	7738,80	3,58	4477,90	170765,50
10	C35/45	0,42	989,16	161233,40	9,88	7360,40	3,16	3953,64	172547,44
10	C55/67	0,31	730,10	160821,10	11,01	8204,90	3,58	4477,40	173503,40
10	C60/75	0,31	730,10	167322,00	11,13	8287,50	3,58	4477,40	180086,90
10	C30/37	0,50	1177,57	170748,20	9,33	6952,10	2,85	3561,03	181261,33
10	C50/60	0,33	777,20	170983,70	10,40	7748,70	3,58	4477,90	183210,30
10	C35/45	0,45	1059,82	172750,10	9,31	6934,50	3,16	3954,70	183639,30
10	C40/50	0,42	989,16	173103,40	9,73	7250,20	3,16	3953,64	184307,24
10	C50/60	0,36	847,85	172962,10	10,17	7578,70	3,27	4083,57	184624,37
10	C60/75	0,33	777,20	178755,70	10,38	7731,60	3,58	4477,90	190965,20
10	C50/60	0,38	854,96	182571,10	9,70	7230,20	3,27	4084,15	193885,45
10	C20/25	0,23	541,68	66085,40	164,35	122439,20	4,74	5924,02	194448,62
10	C40/50	0,45	1059,82	185467,90	10,08	7508,00	3,16	3954,70	196930,60
10	C55/67	0,36	847,85	186527,70	10,14	7555,90	3,27	4083,57	198167,17
10	C45/50	0,31	730,10	191344,50	9,24	6880,50	3,58	4477,40	202702,40
10	C60/75	0,36	847,85	195005,20	10,13	7544,80	3,27	4083,57	206633,57
10	C55/67	0,38	854,96	196890,40	9,70	7223,40	3,27	4084,15	208197,95
10	C40/50	0,42	989,16	201789,10	9,63	7177,20	3,16	3953,64	212919,94
10	C50/60	0,50	1177,57	206075,40	9,24	6880,90	2,85	3561,03	216517,33
10	C60/75	0,38	854,96	205839,90	9,64	7184,70	3,27	4084,15	217108,75
10	C50/60	0,45	1059,82	216202,80	9,25	6888,00	3,16	3954,70	227045,50

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
10	C55/67	0,42	989,16	217615,70	9,64	7180,30	3,16	3953,64	228749,64
10	C60/75	0,42	989,16	227507,30	9,64	7181,80	3,16	3953,64	238642,74
10	C55/67	0,45	1059,82	233158,60	9,25	6889,20	3,16	3954,70	244002,50
10	C55/67	0,50	1177,57	240225,10	9,24	6882,30	2,85	3561,03	250668,43
10	C60/75	0,45	1059,82	243757,80	9,23	6871,70	3,16	3954,70	254584,20
10	C60/75	0,50	1177,57	251066,30	9,23	6868,20	2,85	3561,03	261495,53
10	C60/75	0,50	1177,57	270842,00	11,15	8306,90	2,85	3561,03	282709,93
11	C25/30	0,28	796,02	102888,10	20,40	15197,30	5,68	7096,55	125181,95
11	C25/30	0,29	824,45	106553,50	19,54	14556,40	5,68	7096,83	128206,72
11	C20/25	0,31	881,30	107519,10	18,58	13841,90	5,33	6662,88	128023,88
11	C30/37	0,25	710,73	103055,70	23,16	17252,50	6,49	8109,55	128417,75
11	C30/37	0,26	739,16	107177,90	18,89	14076,30	6,14	7675,34	128929,54
11	C20/25	0,32	909,73	110987,40	18,87	14058,10	5,21	6518,32	131563,82
11	C25/30	0,31	881,30	113888,20	18,89	14070,80	5,33	6662,88	134421,88
11	C20/25	0,32	909,73	117355,50	17,39	12951,80	5,21	6518,32	136825,62
11	C20/25	0,28	796,02	115422,40	19,27	14357,80	5,68	7096,55	136876,75
11	C20/25	0,34	966,59	117924,10	17,35	12926,20	4,98	6229,23	137079,53
11	C35/45	0,25	710,73	115848,80	20,62	15361,10	6,49	8109,55	139319,45
11	C30/37	0,29	824,45	119544,60	18,88	14066,80	5,68	7096,82	140708,22
11	C20/25	0,26	739,16	95351,40	51,18	38132,20	6,14	7675,34	141158,94
11	C35/45	0,26	739,16	120482,80	19,71	14683,50	6,14	7675,34	142841,64
11	C30/37	0,34	966,59	124890,30	16,36	12184,40	4,98	6229,23	143303,93
11	C20/25	0,37	1051,88	128329,20	16,28	12128,00	4,87	6085,36	146542,56
11	C40/50	0,25	710,73	124377,50	18,97	14132,70	6,49	8109,55	146619,75
11	C30/37	0,31	881,30	127789,00	17,60	13113,10	5,33	6662,88	147564,98
11	C25/30	0,28	796,02	100582,30	55,58	41409,50	5,68	7096,55	149088,35
11	C35/45	0,28	796,02	129750,70	18,95	14114,10	5,68	7096,55	150961,35
11	C40/50	0,26	739,16	129352,70	18,92	14092,90	6,14	7675,34	151120,94
11	C30/37	0,32	909,73	131911,30	17,31	12896,00	5,21	6518,32	151325,62
11	C25/30	0,39	1108,74	135265,90	14,68	10933,40	4,75	5941,18	152140,48
11	C35/45	0,29	824,45	134384,60	17,02	12678,90	5,68	7096,82	154160,32
11	C25/30	0,25	710,73	91084,00	75,13	55972,10	6,49	8109,55	155165,65
11	C40/50	0,28	796,02	139302,90	18,62	13872,80	5,68	7096,55	160272,25
11	C20/25	0,28	796,02	97114,00	75,82	56487,10	5,68	7096,55	160697,65
11	C20/25	0,42	1194,02	145671,00	14,23	10604,60	4,52	5652,51	161928,11
11	C45/50	0,31	881,30	143552,50	17,56	13079,00	5,33	6662,88	163294,38
11	C40/50	0,29	824,45	144278,00	16,96	12633,30	5,68	7096,82	164008,12
11	C50/60	0,25	710,73	144988,70	18,78	13993,80	6,49	8109,55	167092,05
11	C35/45	0,32	909,73	148286,50	16,50	12289,40	5,21	6518,32	167094,22
11	C40/50	0,26	739,16	110788,20	18,07	13462,70	6,14	7675,34	171926,24
11	C50/60	0,31	881,30	154228,20	17,51	13047,20	5,33	6662,88	173938,28
11	C25/30	0,46	1307,74	159544,40	13,87	10333,40	4,41	5509,21	175387,01
11	C55/67	0,25	710,73	116360,30	17,91	13309,90	6,49	8109,55	177869,75
11	C50/60	0,28	796,02	162387,30	17,19	12807,00	5,68	7096,55	182290,85
11	C55/67	0,26	739,16	162614,80	17,87	13315,70	6,14	7675,34	183605,84
11	C60/75	0,25	710,73	163467,60	17,66	13162,20	6,49	8109,55	184729,35
11	C55/67	0,29	824,45	168186,90	16,70	12442,80	5,68	7096,82	187726,52
11	C25/30	0,50	1421,46	173417,80	13,52	10143,80	4,18	5221,04	188782,64
11	C60/75	0,26	739,16	170008,30	17,77	13233,40	6,14	7675,34	190901,04
11	C55/67	0,28	796,02	175123,60	17,19	12804,30	5,68	7096,55	195024,45
11	C50/60	0,26	739,16	90177,30	192,67	143538,20	6,14	7675,34	241390,84
11	C20/25	0,25	710,73	86708,90	222,43	185711,10	6,49	8109,55	280529,55
11	C25/30	0,37	1051,88	135892,40	19,82	14765,80	4,87	6085,36	156743,56
11	C30/37	0,34	966,59	140155,70	25,77	19197,70	4,98	6229,23	165582,63
11	C25/30	0,39	1108,74	143027,10	23,23	17303,40	4,75	5941,18	166271,68

Table C.1 – Continued from previous page

Span	Concrete	Thickness	Concrete		Reinforcement		Cables		Total
	Class	(m)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	(tons)	(kg CO_2-e)	CO_2-e
11	C30/37	0,37	1051,88	152522,40	19,07	14204,70	4,87	6085,36	172812,46
11	C25/30	0,42	1194,02	154029,20	19,30	14381,20	4,52	5652,51	174062,91
11	C35/45	0,34	966,59	157554,40	21,44	15971,40	4,98	6229,23	179755,03
11	C40/50	0,32	909,73	157205,80	18,73	13949,00	5,21	6518,32	177673,12
11	C30/37	0,39	1108,74	159203,30	21,54	16049,00	4,75	5941,18	181170,62
11	C25/30	0,46	1307,74	168998,60	16,86	12598,30	4,41	5509,21	187106,11
11	C40/50	0,34	966,59	169153,50	20,80	15495,50	4,98	6229,23	190878,23
11	C30/37	0,42	1194,02	173133,50	16,72	12495,40	4,52	5652,51	191281,41
11	C35/45	0,37	1051,88	171455,20	18,48	13768,80	4,87	6085,36	191310,35
11	C35/45	0,39	1108,74	180724,10	16,80	12512,10	4,75	5941,18	199177,38
11	C30/37	0,50	1421,46	183365,00	15,10	11245,50	4,18	5221,04	199831,54
11	C40/50	0,37	1051,88	184075,80	17,77	13238,70	4,87	6085,36	203402,85
11	C30/37	0,31	881,30	179789,00	23,57	17555,80	5,33	6662,88	204004,48
11	C55/67	0,29	824,45	181378,00	21,47	15995,50	5,68	7096,82	204470,32
11	C50/60	0,32	909,73	186585,50	17,80	13252,20	5,21	6518,32	206356,02
11	C35/45	0,28	796,02	183083,80	22,25	16572,90	5,68	7096,55	206753,25
11	C30/37	0,46	1307,74	189822,50	16,67	12419,00	4,41	5509,21	207750,71
11	C50/60	0,55	1563,60	190753,60	17,87	13311,90	4,06	5078,41	209149,91
11	C30/37	0,29	824,45	189822,50	18,55	13819,40	5,68	7096,82	210638,72
11	C35/45	0,42	1194,02	194828,00	15,77	11750,40	4,52	5652,51	212230,91
11	C45/50	0,31	881,30	193888,80	20,39	15185,90	5,33	6662,88	215737,58
11	C40/50	0,39	1108,74	194029,00	22,00	16391,80	4,75	5941,18	216361,98
11	C25/30	0,55	1563,60	201704,80	14,67	10932,00	4,06	5078,41	217715,21
11	C50/60	0,34	966,59	197184,80	20,04	14927,30	4,98	6229,23	218341,33
11	C35/45	0,32	909,73	200141,20	16,50	12293,20	5,21	6518,32	218952,72
11	C30/37	0,50	1421,46	206111,40	13,79	10271,00	4,18	5221,04	221603,44
11	C60/75	0,31	881,30	202600,90	16,68	12423,50	5,33	6662,88	221687,28
11	C40/50	0,42	1194,02	208954,30	15,72	11717,90	4,52	5652,51	226324,71
11	C60/75	0,32	909,73	209238,80	16,37	12199,20	5,21	8518,32	229956,32
11	C35/45	0,34	966,59	212650,10	15,58	11605,90	4,98	6229,23	230485,23
11	C25/30	0,46	1307,74	213151,80	16,66	12405,70	4,41	5509,21	231076,71
11	C50/60	0,37	1051,88	214583,50	14,85	11061,80	4,87	6085,36	231730,46
11	C30/37	0,34	966,59	222318,00	15,61	11629,70	4,98	6229,23	240177,93
11	C50/60	0,55	1563,60	216722,50	13,38	9970,30	4,06	5078,41	231771,21
11	C50/60	0,39	1108,74	226182,40	13,89	10344,00	4,75	5941,18	242467,58
11	C40/50	0,46	1307,74	228854,70	15,87	11870,50	4,41	5509,21	246234,41
11	C55/67	0,50	1421,46	231897,80	13,56	10104,10	4,18	5221,04	247222,94
11	C55/67	0,37	1051,88	231413,30	14,75	10990,50	4,87	6085,36	248489,16
11	C60/75	0,37	1051,88	241332,10	14,76	10994,00	4,87	6085,36	259011,46
11	C45/50	0,42	1194,02	243181,00	13,26	9881,20	4,52	5652,51	259114,71
11	C40/50	0,39	1108,74	243922,10	13,83	10306,30	4,75	5941,18	260169,58
11	C40/50	0,50	1421,46	248755,10	13,10	9757,70	4,18	5221,04	263733,84
11	C35/45	0,55	1563,60	254867,40	11,68	8697,60	4,06	5078,41	268643,31
11	C60/75	0,39	1108,74	255009,50	13,82	10293,00	4,75	5941,18	271243,68
11	C55/67	0,42	1194,02	262685,40	13,23	9859,30	4,52	5652,51	278197,21
11	C35/45	0,46	1307,74	266773,20	12,85	9571,80	4,41	5509,21	281854,21
11	C60/75	0,55	1563,60	273630,60	11,56	8609,00	4,06	5078,41	287318,01
11	C50/60	0,42	1194,02	274825,90	13,23	9856,80	4,52	5652,51	290134,71
11	C50/60	0,46	1307,74	287703,00	12,77	9510,80	4,41	5509,21	302722,81
11	C50/60	0,46	1421,46	289977,40	13,05	9722,50	4,18	5221,04	304920,94
11	C55/67	0,46	1307,74	300780,50	13,33	9927,40	4,41	5509,21	316217,11
11	C55/67	0,50	1421,46	312720,70	13,06	9728,70	4,18	5221,04	327670,44
11	C60/75	0,55	1563,60	318975,10	17,31	12897,00	4,06	5078,41	336950,51
11	C60/75	0,50	1421,46	326835,30	15,64	11649,10	4,18	5221,04	343705,44
11	C55/67	0,55	1563,60	343992,80	17,03	12685,30	4,06	5078,41	361756,51

Table C.1 – Continued from previous page

Span	Concrete Class	Thickness (m)	Concrete (tons)	Concrete (kg CO_2-e)	Reinforcement (tons)	Reinforcement (kg CO_2-e)	Cables (tons)	Cables (kg CO_2-e)	Total CO_2-e
11	C60/75	0,55	1563,60	359268,20	17,03	12684,40	4,06	5078,41	377031,01

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